**KONGU ENGINEERING COLLEGE** 

(Autonomous Institution Affiliated to Anna University, Chennai)

# PERUNDURAI ERODE - 638 060

# TAMILNADU INDIA



# **REGULATIONS, CURRICULUM & SYLLABI – 2022**

(CHOICE BASED CREDIT SYSTEM AND OUTCOME BASED EDUCATION)

(For the students admitted during 2022 - 2023 and onwards)

# BACHELOR OF ENGINEERING DEGREE IN ELECTRONICS AND INSTRUMENTATION ENGINEERING

DEPARTMENT OF ELECTRONICS AND INSTRUMENTATION ENGINEERING



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#### KONGU ENGINEERING COLLEGE PERUNDURAI ERODE – 638 060 (Autonomous)

#### **INSTITUTE VISION**

To be a centre of excellence for development and dissemination of knowledge in Applied Sciences, Technology, Engineering and Management for the Nation and beyond.

#### **INSTITUTE MISSION**

We are committed to value based Education, Research and Consultancy in Engineering and Management and to bring out technically competent, ethically strong and quality professionals to keep our Nation ahead in the competitive knowledge intensive world.

#### **QUALITY POLICY**

We are committed to

- Provide value based quality education for the development of students as competent and responsible citizens.
- Contribute to the nation and beyond through research and development
- Continuously improve our services

DEPARTMENT OF ELECTRONICS AND INSTRUMENTATION ENGINEERING							
	VISION						
To b	ecome a technically competent centre in the domain of Electronics and						
Instrum	entation Engineering to take care of the national and international needs.						
	MISSION						
Departn	nent of Electronics and Instrumentation Engineering is committed to:						
MS1:	To develop innovative, competent, efficient, disciplined and quality Electronics and Instrumentation						
	Engineers.						
MS2: To produce engineers who can participate in technical advancement and social upliftment of the country.							
MS3:	To excel in academic and research activities by facilitating the students to explore the state- of – the –art						
	techniques to meet the industrial needs						

#### PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

Graduates of Electronics and Instrumentation Engineering will

PEO1:	Excel in professional career and higher education using their fundamental knowledge in mathematical and
	engineering principles
PEO2:	Analyse, design, develop and maintain the instrumentation systems of an industry and also offer solutions
	that are technically feasible, economically viable and socially relevant.
PEO3:	Exhibit Professional and Ethical code of conduct, communication skills, team work and lifelong learning
	to resolve societal issues

#### MAPPING OF MISSION STATEMENTS (MS) WITH PEOS

BE- Electronics and Instrumentation Engineering, Regulation, Curriculum and Syllabus - R2022

<b>MS\PEO</b>	PEO1	PEO2	PEO3
MS1	3	3	2
MS2	3	3	2
MS3	2	2	2

1-Slight, 2-Moderate, 3-Substantial

	PROGRAM OUTCOMES (POs)
Gradua	tes of Automobile Engineering will:
PO1	<b>Engineering knowledge:</b> Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2	<b>Problem analysis:</b> Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3	<b>Design/development of solutions:</b> Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO4	<b>Conduct investigations of complex problems:</b> Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5	<b>Modern tool usage:</b> Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO6	<b>The engineer and society:</b> Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO7	<b>Environment and sustainability:</b> Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO8	<b>Ethics:</b> Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9	<b>Individual and team work:</b> Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10	<b>Communication:</b> Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO11	<b>Project management and finance:</b> Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO12	Life-long learning: Recognize the need for, and have the preparation and ability to engage in

BE- Electronics and Instrumentation Engineering, Regulation, Curriculum and Syllabus - R2022

	independent and life-long learning in the broadest context of technological change.					
	PROGRAM SPECIFIC OUTCOMES (PSOs)					
Gradua	tes of Electronics and Instrumentation Engineering will:					
PSO1	<b>PSO1</b> Development and Automation: Develop an industrial instrumentation system and provide automation by using modern automation tools.					
PSO2	Entrepreneurship: Become an entrepreneur by inculcating the skills of project management and					
	finance with the knowledge of instrumentation technology.					

<b>PEO\PO</b>	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
PEO1	2	3	2	1	2	2	2	1	1	2	1	3	2	2
PEO2	1	2	3	3	2	3	1	1	1	2	3	3	3	2
PEO3	2	3	1	2	3	1	3	3	3	3	2	3	2	3

#### MAPPING OF PEOs WITH POS AND PSOs

1 – Slight, 2 – Moderate, 3 – Substantial

#### KONGU ENGINEERING COLLEGE, PERUNDURAI, ERODE – 638060

#### (Autonomous)

#### **REGULATIONS 2022**

#### CHOICE BASED CREDIT SYSTEM AND OUTCOME BASED EDUCATION

#### BACHELOR OF ENGINEERING (BE) / BACHELOR OF TECHNOLOGY (BTech) DEGREE PROGRAMMES

These regulations are applicable to all candidates admitted into BE/BTech Degree programmes from the academic year 2022 – 2023 onwards.

#### 1. DEFINITIONS AND NOMENCLATURE

In these Regulations, unless otherwise specified:

- i. "University" means ANNA UNIVERSITY, Chennai.
- ii. "College" means KONGU ENGINEERING COLLEGE.
- iii. "Programme" means Bachelor of Engineering (BE) / Bachelor of Technology (BTech) Degree programme
- iv. "Branch" means specialization or discipline of BE/BTech Degree programme, like Civil Engineering, Information Technology, etc.
- v. "Course" means a Theory / Theory cum Practical / Practical course that is normally studied in a semester like Mathematics, Physics etc.
- vi. "Credit" means a numerical value allocated to each course to describe the candidate's workload required per week.
- vii. "Grade" means the letter grade assigned to each course based on the marks range specified.
- viii. "Grade point" means a numerical value (0 to 10) allocated based on the grade assigned to each course.
- ix. "Principal" means Chairman, Academic Council of the College.

- x. "Controller of Examinations (COE)" means authorized person who is responsible for all examination related activities of the College.
- xi. "Head of the Department (HOD)" means Head of the Department concerned.

#### 2. PROGRAMMES AND BRANCHES OF STUDY

The following programmes and branches of study approved by Anna University, Chennai and All India Council for Technical Education, New Delhi are offered by the College.

Programme	Branch
	Civil Engineering
	Mechanical Engineering
	Electronics and Communication Engineering
	Computer Science and Engineering
BE	Electrical and Electronics Engineering
	Electronics and Instrumentation Engineering
	Mechatronics Engineering
	Automobile Engineering
	Computer Science and Design
	Chemical Engineering
	Information Technology
BTech	Food Technology
	Artificial Intelligence and Data Science
	Artificial Intelligence and Machine Learning

#### 3. ADMISSION REQUIREMENTS

#### 3.1 First Semester Admission

The candidates seeking admission to the first semester of the eight semester BE / BTech Degree Programme:

Should have passed the Higher Secondary Examination (10 + 2) in the academic stream with Mathematics, Physics and Chemistry as three of the four subjects of study under Part-III subjects of the study conducted by the Government of Tamil Nadu or any examination of any other University or authority accepted by the Anna University, Chennai as equivalent thereto.

#### (OR)

Should have passed the Higher Secondary Examination of Vocational stream (Vocational groups in Engineering / Technology) as prescribed by the Government of Tamil Nadu.

They should also satisfy other eligibility conditions as prescribed by the Anna University, Chennai and Directorate of Technical Education, Chennai from time to time.

#### 3.2 Lateral Entry Admission

The candidates who hold a Diploma in Engineering / Technology awarded by the State Board of Technical Education, Tamilnadu or its equivalent are eligible to apply for Lateral entry admission to the third semester of BE / BTech.

#### (OR)

The candidates who hold a BSc degree in Science(10+2+3 stream) with mathematics as one of the subjects at the BSc level from a recognised University are eligible to apply for Lateral entry admission to the third semester of BE / BTech. Such candidates shall undergo two additional Engineering course(s) in the third and fourth semesters as prescribed by the College.

They should also satisfy other eligibility conditions prescribed by the Anna University, Chennai and Directorate of Technical Education, Chennai from time to time.

#### 4. STRUCTURE OF PROGRAMMES

#### 4.1 Categorisation of Courses

The BE / BTech programme shall have a curriculum with syllabi comprising of theory, theory cum practical, practical courses in each semester, professional skills training/industrial training, project work, internship, etc that have been approved by the respective Board of Studies and Academic Council of the College. All the programmes have well defined Programme Outcomes (PO), Programme Specific Outcomes (PSO) and Programme Educational Objectives (PEOs) as per Outcome Based Education (OBE). The content of each course is designed based on the Course Outcomes (CO). The courses shall be categorized as follows:

- i. Humanities and Social Sciences (HS) including Management Courses, English Communication Skills, Universal Human Values and Yoga & Values for Holistic Development.
- ii. Basic Science (BS) Courses
- iii. Engineering Science (ES) Courses
- iv. Professional Core (PC) Courses
- v. Professional Elective (PE) Courses
- vi. Open Elective (OE) Courses
- vii. Employability Enhancement Courses (EC) like Project work, Professional Skills/Industrial Training, Comprehensive Test & Viva, Entrepreneurships/Start ups and Internship / In-plant Training in Industry or elsewhere
- viii. Audit Courses (AC)
- ix. Mandatory Courses (MC) like Student Induction Program and Environmental Science.
- x. Honours Degree Courses (HC)

#### 4.2 Credit Assignment and Honours Degree

#### 4.2.1. Credit Assignment

Each course is assigned certain number of credits as follows:

Contact period per week	Credits
1 Lecture / Tutorial Period	1
2 Practical Periods	1
2 Project Work Periods	1
40 Training / Internship Periods	1

The minimum number of credits to complete the BE/BTech programme is 168.

#### 4.2.2 Honours Degree

If a candidate earns 18 to 20 additional credits in an emerging area, then he/she can be awarded with Honours degree mentioning that emerging area as his/her specialization. The respective board of studies shall recommend the specializations for honours degree and appropriate additional courses to be studied by the candidate which shall get approval from Academic Council of the institution. A candidate shall have not less than 7.5 CGPA and no history of arrears to opt for the honours degree and has to maintain the same during the entire programme.

Various specializations for various branches recommended by the respective boards of studies are given below:

S.No	Specializations for Honours degree in emerging areas	To be offered as Honours, Only for the following branches mentioned against the specialization		
1.	Construction Technology	BE – Civil Engineering		
2.	Smart Cities	BE – Civil Engineering		
3.	Smart Manufacturing *	BE – Mechanical Engineering		
4.	Computational Product Design *	BE – Mechanical Engineering		
5.	Intelligent Autonomous Systems *	BE – Mechatronics Engineering		
6.	E-Mobility *	BE – Automobile Engineering		
7.	Artificial Intelligence and	BE – Electronics and Communication		
1.	Machine Learning	Engineering		
8.	Sustan on Chin Design *	BE – Electronics and Communication		
0.	System on Chip Design *	Engineering		
9.	Electric Vehicles	BE – Electrical and Electronics		
7.		Engineering		

10.	Miero erid Technologias	BE – Electrical and Electronics		
10.	Microgrid Technologies	Engineering		
11.	Intelligent Sensors Technology *	BE – Electronics and Instrumentation		
11.		Engineering		
12.	Smart Industrial Automation *	BE – Electronics and Instrumentation		
-		Engineering		
13.	Data Science	BE – Computer Science and Engineering		
14.	Cyber Security	BE – Computer Science and Engineering		
15.	Data Science	BTech – Information Technology		
16.	Cyber Security	BTech – Information Technology		
17.	Petroleum and Petrochemical	BTech – Chemical Engineering		
17.	Engineering *	Breen – Chennear Engineering		
18.	Waste Technology *	BTech – Chemical Engineering		
19.	Food Processing and Management *	BTech – Food Technology		
20.	Virtual and Augumented Reality	BE- Computer Science and Design		
21.	Data Science	BE- Computer Science and Design		
22.	Internet of Things (IoT)	BTech – Artificial Intelligence and Data		
22.	Internet of Things (IoT)	Science		
23.	Blockchain	BTech – Artificial Intelligence and Data		
23.	Biockenain	Science		
24.	Internet of Things (IoT)	BTech – Artificial Intelligence and		
∠-⊤.	Internet of Things (101)	Machine Learning		
25.	Blockchain	BTech – Artificial Intelligence and		
25.		Machine Learning		

\*Title by KEC

The courses specified under Honours degree in the emerging area may include theory, theory cum practical, practical, project work, etc. under the particular specialization. A candidate can choose and study these specified courses from fourth semester onwards and he/she shall successfully complete the courses within the stipulated time vide clause 5. Total number of credits earned in each semester may vary from candidate to candidate based on the courses chosen. The registration, assessment & evaluation pattern and classification of grades of these courses shall be the same as that of the courses in the regular curriculum of the programme of the candidate vide clause 6, clause 7 and clause 15 respectively. A candidate can earn Honours degree in only one specialization during the entire duration of the programme.

#### 4.3 Employability Enhancement Courses

A candidate shall be offered with the employability enhancement courses like project work, internship, professional skills training/industrial training, comprehensive test & viva, and entrepreneurships/start ups during the programme to gain/exhibit the

knowledge/skills.

#### 4.3.1 Professional Skills Training/ Indsutrial Training/Entrepreneurships/Start Ups/ Inplant Training

A candidate may be offered with appropriate training courses imparting programming skills, communication skills, problem solving skills, aptitude skills etc. It is offered in two phases as phase I in fourth semester and phase II in fifth semester including vacation periods and each phase can carry two credits.

#### (OR)

A candidate may be allowed to go for training at research organizations or industries for a required number of hours in fifth semester vacation period. Such candidate can earn two credits for this training course in place of Professional Skills Training course II in fifth semester. He/She shall attend Professional Skills Training Phase I in fourth semester and can earn two credits.

#### (OR)

A candidate may be allowed to set up a start up and working part-time for the start ups by applying his/her innovations and can become a student entrepreneur during BE/BTech programme. Candidates can set up their start up from fifth semester onwards either inside or outside of the college. Such student entrepreneurs may earn 2 credits in place of Professional Skills Training II. The area in which the candidate wants to initiate a start up may be interdisciplinary or multidisciplinary. The progress of the startup shall be evaluated by a panel of members constituted by the Principal through periodic reviews.

#### 4.3.2 Comprehensive Test and Viva

The overall knowledge of the candidate in various courses he/she studied shall be evaluated by (i) conducting comprehensive tests with multiple choice questions generally with pattern similar to GATE and/or (ii) viva-voce examination conducted by a panel of experts assigned by the Head of the department. The members can examine the knowledge of the candidate by asking questions from various domains and the marks will be assigned based on their answers. This course shall carry two credits.

#### 4.3.3 Full Time Project through Internships

The curriculum enables a candidate to go for full time project through internship during a part of seventh semester and/or entire final semester and can earn credits vide clause 7.6 and clause 7.11.

A candidate is permitted to go for full time projects through internship in seventh semester with the following condition: The candidate shall complete a part of the seventh semester courses with a total credit of about 50% of the total credits of seventh semester including Project Work-II Phase-I in the first two months from the commencement of the seventh semester under fast track mode. The balance credits required to complete the seventh semester shall be earned by the candidate through either approved One/Two Credit Courses /Online courses / Self Study Courses or Add/Drop courses as per clause 4.4 and clause 4.5 respectively.

A candidate is permitted to go for full time projects through internship during eighth semester. Such candidate shall earn the minimum number of credits required to complete eighth semester other than project through either approved One / Two Credit Courses /Online courses / Self Study Courses or Add/Drop courses as per clause 4.4 and clause 4.5 respectively.

Assessment procedure is to be followed as specified in the guidelines approved by the Academic Council.

**4.3.4** A student shall go for in-plant training for duration of two weeks during the entire programme. It is mandatory for all the students.

#### 4.4 One / Two Credit Courses / Online Courses / Self Study Courses

The candidates may optionally undergo One / Two Credit Courses / Online Courses / Self Study Courses as elective courses.

- **4.4.1 One / Two Credit Courses:** One / Two credit courses shall be offered by the college with the prior approval from respective Board of Studies. A candidate can earn a maximum of six credits through one / two credit courses during the entire duration of the programme.
- **4.4.2 Online Courses:** Candidates may be permitted to earn credits for online courses, offered by NPTEL / SWAYAM / a University / Other Agencies, approved by respective Board of Studies.
- **4.4.3** Self Study Courses: The Department may offer an elective course as a self study course. The syllabus of the course shall be approved by the respective Board of Studies. However, mode of assessment for a self study course will be the same as that used for other courses. The candidates shall study such courses on their own under the guidance of member of the faculty following due approval procedure. Self study course is limited to one per semester.
- **4.4.4** The elective courses in the final year may be exempted if a candidate earns the required credits vide clause 4.4.1, 4.4.2 and 4.4.3 by registering the required number of courses in advance.

**4.4.5** A candidate can earn a maximum of 30 credits through all one / two credit courses, online courses and self study courses.

#### 4.5 Flexibility to Add or Drop Courses

- **4.5.1** A candidate has to earn the total number of credits specified in the curriculum of the respective programme of study in order to be eligible to obtain the degree. However, if the candidate wishes, then the candidate is permitted to earn more than the total number of credits prescribed in the curriculum of the candidate's programme.
- **4.5.2** From the first to seventh semesters the candidates have the option of registering for additional elective/Honours courses or dropping of already registered additional elective/Honours courses within two weeks from the start of the semester. Add / Drop is only an option given to the candidates.
- **4.6** Maximum number of credits the candidate can enroll in a particular semester cannot exceed 30 credits.
- **4.7** The blend of different courses shall be so designed that the candidate at the end of the programme would have been trained not only in his / her relevant professional field but also would have developed to become a socially conscious human being.
- **4.8** The medium of instruction, examinations and project report shall be English.

#### 5. DURATION OF THE PROGRAMME

- **5.1** A candidate is normally expected to complete the BE / BTech Degree programme in 8 consecutive semesters/4 Years (6 semesters/3 Years for lateral entry candidate), but in any case not more than 14 semesters/7 Years (12 semesters/6 Years for lateral entry candidate).
- **5.2** Each semester shall consist of a minimum of 90 working days including continuous assessment test period. The Head of the Department shall ensure that every teacher imparts instruction as per the number of periods specified in the syllabus for the course being taught.

**5.3** The total duration for completion of the programme reckoned from the commencement of the first semester to which the candidate was admitted shall not exceed the maximum duration specified in clause 5.1 irrespective of the period of break of study (vide clause 11) or prevention (vide clause 9) in order that the candidate may be eligible for the award of the degree (vide clause 16). Extension beyond the prescribed period shall not be permitted.

#### 6. COURSE REGISTRATION FOR THE EXAMINATION

- **6.1** Registration for the end semester examination is mandatory for courses in the current semester as well as for the arrear courses failing which the candidate will not be permitted to move on to the higher semester. This will not be applicable for the courses which do not have an end semester examination.
- **6.2** The candidates who need to reappear for the courses which have only continuous assessment shall enroll for the same in the subsequent semester, when offered next, and repeat the course. In this case, the candidate shall attend the classes, satisfy the attendance requirements (vide clause 8) and earn continuous assessment marks. This will be considered as an attempt for the purpose of classification.
- **6.3** If a candidate is prevented from writing end semester examination of a course due to lack of attendance, the candidate has to attend the classes, when offered next, and fulfill the attendance requirements as per clause 8 and earn continuous assessment marks. If the course, in which the candidate has a lack of attendance, is an elective, the candidate may register for the same or any other elective course in the subsequent semesters and that will be considered as an attempt for the purpose of classification.
- 6.4 A candidate shall register for the chosen courses as well as arrear courses (if any vide clause 6.2 and 6.3) from the list of courses specified under Honours degree.

### 7. ASSESSMENT AND EXAMINATION PROCEDURE FOR AWARDING MARKS

7.1 The BE/BTech programmes consist of Theory Courses, Theory cum Practical courses, Practical courses, Comprehensive Test and Viva, Project Work, Industrial Training /Professional Skills Training, Internship/In-plant Training and Entrepreneurships/ Start ups. Performance in each course of study shall be evaluated based on (i) Continuous Assessments (CA) throughout the semester and (ii) End Semester Examination (ESE) at the end of the semester except for the courses which are evaluated based on continuous assessment only. Each course shall be evaluated for a maximum of 100 marks as shown below:

Sl. No.	Category of Course	Continuous Assessment Marks	End Semester Examination Marks		
1.	Theory	40	60		
2.	Theory cum Practical (The distribution of marks shall be decided based on the credit	50	50		
3.	Practical	60	40		
4.	Professional Skills Training / Comprehensive Test & Viva / Entrepreneurships / Start ups / Project Work I / Mandatory Course/Industrial Training/ Universal Human Values / Yoga and Values for	100			
5.	Project Work II Phase I / Project Work II Phase II / Internships	50	50		
6.	One / Two credit Course	The distribution of			
7.	All other Courses	marks shall be decided based on the credit weightage assigned			

**7.2** Examiners for setting end semester examination question papers for theory courses, theory cum practical courses and practical courses and evaluating end semester examination answer scripts, project works, internships and entrepreneurships/start ups shall be appointed by the Controller of Examinations after obtaining approval from the Principal.

#### 7.3 Theory Courses

For all theory courses out of 100 marks, the continuous assessment shall be 40 marks and the end semester examination shall be for 60 marks. However, the end semester examinations shall be conducted for 100 marks and the marks obtained shall be reduced to 60. The continuous assessment tests shall be conducted as per the schedule laid down in the academic schedule. The total of the continuous assessment marks and the end semester examination marks shall be rounded off to the nearest integer.

**7.3.1** The assessment pattern for awarding continuous assessment marks shall be as follows:

Sl. No.	Туре	Max. Marks	Remarks
1.	Test - I	20	Average of best 2 tests
1.	Test - II	20	Average of best 2 tests (20 marks)
	Test - III	20	(20 marks)
2.	Tutorial: (Tutorial/Problem Solving (or) Simulation (or) Simulation & Mini Project (or) Mini Project (or) Case Studies (or) Any other relevant to the course)	15	Type of assessment is to be chosen based on the nature of the course and to be approved by Principal
3.	Others: Assignment / Paper Presentation in Conference / Seminar / Comprehension / Activity based learning / Class notes	05	To be assessed by the Course Teacher based on any one type.
	Total	40	Rounded off to the one decimal place

However, the assessment pattern for awarding the continuous assessment marks may be changed based on the nature of the course and is to be approved by the Principal.

- **7.3.2** A reassessment test or tutorial covering the respective test or tutorial portions may be conducted for those candidates who were absent with valid reasons (Sports or any other reason approved by the Principal).
- **7.3.3** The end semester examination for theory courses shall be for a duration of three hours and shall be conducted between November and January during odd semesters and between April and June during even semesters of every year.

#### 7.4 Theory cum Practical Courses

For courses involving theory and practical components, the evaluation pattern as per the clause 7.1 shall be followed. Depending on the nature of the course, the end semester examination shall be conducted for theory and the practical components. The apportionment of continuous assessment and end semester examination marks shall be decided based on the credit weightage assigned to theory and practical components approved by Principal.

#### 7.5 Practical Courses

For all practical courses out of 100 marks, the continuous assessment shall be for 60 marks and the end semester examination shall be for 40 marks. Every exercise / experiment shall be evaluated based on the candidate's performance during the practical class and the candidates' records shall be maintained.

- **7.5.1** The assessment pattern for awarding continuous assessment marks for each course shall be decided by the course coordinator based on rubrics of that particular course, and shall be based on rubrics for each experiment.
- **7.5.2** The end semester examination shall be conducted for a maximum of 100 marks for duration of 3 hours and reduced to 40 marks. The appointment of examiners and the schedule shall be decided by chairman of Board of Study of the relevant board.

#### 7.6 Project Work II Phase I / Project Work II Phase II

- **7.6.1** Project work shall be assigned to a single candidate or to a group of candidates not exceeding 4 candidates in a group. The project work is mandatory for all the candidates.
- **7.6.2** The Head of the Department shall constitute review committee for project work. There shall be two assessments by the review committee during the semester. The candidate shall make presentation on the progress made by him/her before the committee.
- **7.6.3** The continuous assessment and end semester examination marks for Project Work II Phase I /Project Work II Phase II and the Viva-Voce Examination shall be distributed as below.

	(	Continuous	Asses	sment		End Sen	nester l	Exami	nation	
		(Max. 5	0 Marl	ks)		(Max. 50 Marks)				
	eroth view	Review I (Max Mark		Review II ⁄Iax. 30 Mar		Report Evaluation (Max. 20 Marks)	Viva Max. 3	- Voce 0 Marl		
Rv.	Supe	Review	Sup	Review	Supe	Ext.	Sup	Exr.	Exr.2	
Co	r	Commit	ervi	Committ	r	Exr.	er	1		
m	visor	tee	sor	ee	visor		viso			
		(excludi		(excludi			r			
		ng supervi		ng supervis						
		sor)		or)						
0	0	10	10	15	15	20	10	10	10	

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- **7.6.4** The Project Report prepared according to approved guidelines and duly signed by the Supervisor shall be submitted to Head of the Department. The candidate(s) must submit the project report within the specified date as per the academic schedule of the semester. If the project report is not submitted within the specified date then the candidate is deemed to have failed in the Project Work and redo it in the subsequent semester.
- **7.6.5** If a candidate fails to secure 50% of the continuous assessment marks in the project work, he / she shall not be permitted to submit the report for that particular semester and shall have to redo it in the subsequent semester and satisfy attendance requirements.
- **7.6.6** The end semester examination of the project work shall be evaluated based on the project report submitted by the candidate in the respective semester and viva-voce examination by a committee consisting of two examiners and supervisor of the project work.
- **7.6.7** If a candidate fails to secure 50 % of the end semester examination marks in the project work, he / she shall be required to resubmit the project report within 30 days from the date of declaration of the results and a fresh viva-voce examination shall be conducted as per clause 7.6.6.
- **7.6.8** A copy of the approved project report after the successful completion of viva-voce examination shall be kept in the department library.

#### 7.7 Project Work I / Industrial Training

The evaluation method shall be same as that of the Project Work II as per clause 7.6 excluding 7.6.3, 7.6.5, 7.6.6 and 7.6.7. The marks distribution is given below.

	0 .	, 7.0.0, 7.0.0		tinuous Ass						
			(N	Max. 100 M	(arks)					
					Review III			II		
						(Max. 5	0 Marks	3)		
Zer	Zeroth Review I Review II Report					Report				
Rev	iew	(Max 20 N	/larks)	ax 30 Marl	ks)	Evaluation	Viva - V	Voce		
						(Max. 20	(Max.	30 Marks)		
						Marks)				
Revie	Supe	Review	Supe	Review	Sup	Review	Super	Review		
W	r	Committee	r	Committee	er	Committe	visor	Committee		
Comm	visor	(excluding	visor	(excluding	viso	e				
ittee		supervisor)		supervisor	r					
0	0	10	10	15	15	20	10	20		

If a candidate fails to secure 50 % of the continuous assessment marks in this course, he / she shall be required to resubmit the project report within 30 days from the date of declaration of the results and a fresh viva-voce examination shall be conducted.

#### 7.8 Professional Skills Training

Phase I training shall be conducted for minimum of 80 hours in 3<sup>rd</sup> semester vacation and during 4<sup>th</sup> semester. Phase II training shall be conducted for minimum of 80 hours in 4<sup>th</sup> semester vacation and during 5<sup>th</sup> semester. The evaluation procedure shall be approved by the board of the offering department and Principal.

#### 7.9 Comprehensive Test and Viva

A candidate can earn 2 credits by successfully completing this course. The evaluation procedures shall be approved by the Principal.

#### 7.10 Entrepreneurships/ Start ups

A start up/business model may be started by a candidate individually or by a group of maximum of three candidates during the programme vide clause 4.3.1. The head of the department concerned shall assign a faculty member as a mentor for each start up.

A review committee shall be formed by the Principal for reviewing the progress of the Start ups / Business models, innovativeness, etc. The review committee can recommend the appropriate grades for academic performance for the candidate(s) involved in the start ups. This course shall carry a maximum of two credits in fifth semester and shall be evaluated through continuous assessments for a maximum of 100 marks vide clause 7.1. A report about the start ups is to be submitted to the review committee for evaluation for each start up and the marks will be given to Controller of Examinations after getting approval from Principal.

#### 7.11 In-Plant Training

Each candidate shall go for In-Plant training for a duration of minimum of two weeks during the entire programme of study and submit a brief report about the training undergone and a certificate issued from the organization concerned.

#### 7.12 One / Twe Credit Courses

For all one/ two credit courses out of 100 marks, the continuous assessment shall be 50 marks and the model examination shall be for 50 marks. Minimum of two continuous assessments tests shall be conducted during the one / two credit course duration by the offering department concerned. Model examination shall be conducted at the end of the course.

#### 7.13 Online Course

The Board of Studies will provide methodology for the evaluation of the online courses. The Board can decide whether to evaluate the online courses through continuous assessment and end semester examination or through end semester examination only. In case of credits earned through online mode from NPTEL / SWAYAM / a University / Other Agencies approved by Chairman, Academic Council, the credits may be transferred and grades shall be assigned accordingly.

#### 7.14 Self Study Course

The member of faculty approved by the Head of the Department shall be responsible for periodic monitoring and evaluation of the course. The course shall be evaluated through continuous assessment and end semester examination. The evaluation methodology shall be the same as that of a theory course.

#### 7.15 Audit Course

A candidate may be permitted to register for specific course not listed in his/her programme curriculum and without undergoing the rigors of getting a 'good' grade, as an Audit course, subject to the following conditions.

The candidate can register only one Audit course in a semester starting from second semester subject to a maximum of two courses during the entire programme of study. Such courses shall be indicated as 'Audit' during the time of registration itself. Only courses currently offered for credit to the candidates of other branches can be audited.

A course appearing in the curriculum of a candidate cannot be considered as an audit course. However, if a candidate has already met the Professional Elective and Open Elective credit requirements as stipulated in the curriculum, then, a Professional Elective or an Open Elective course listed in the curriculum and not taken by the candidate for credit can be considered as an audit course.

Candidates registering for an audit course shall meet all the assessment and examination requirements (vide clause 7.3) applicable for a credit candidate of that course. Only if the candidate obtains a performance grade, the course will be listed in the semester Grade Sheet and in the Consolidated Grade Sheet along with the grade SC (Successfully Completed). Performance grade will not be shown for the audit course.

Since an audit course has no grade points assigned, it will not be counted for the purpose of GPA and CGPA calculations.

#### 7.16 Mandatory Courses

A candidate joined in first semester shall attend and complete a mandatory course namely Student Induction Program of duration three weeks at the beginning of first semester. The candidates studying in second year shall attend and complete another one mandatory course namely Environmental Science. No credits shall be given for mandatory courses and shall be evaluated through continuous assessment tests only vide clause 7.1 for a maximum of 100 marks each. Upon the successful completion, these courses will be listed in the semester grade sheet and in the consolidated grade sheet with the grade "SC" (Successfully Completed). Since no grade points are assigned, these courses will not be counted for the purpose of GPA and CGPA calculations.

# 7.17 Universal Human Values (UHV) and Yoga and Values for Holistic Development (YVHD)

Courses YVHD shall be offered to all first year candidates of all BE/ BTech programmes to impart knowledge on yoga and human values. Course UHV shall be offered to all the second year BE/ BTech students. These courses shall carry a maximum of 100 marks each and shall be evaluated through continuous assessment tests only vide clause 7.1. The candidate(s) can earn 2 credits for UHV and 1 credit for YVHD by successfully completing these courses. Two continuous assessment tests will be conducted and the average marks will be taken for the calculation of grades.

#### 8. REQUIREMENTS FOR COMPLETION OF A SEMESTER

- **8.1** A candidate who has fulfilled the following conditions shall be deemed to have satisfied the requirements for completion of a semester and permitted to appear for the examinations of that semester.
  - **8.1.1** Ideally, every candidate is expected to attend all classes and secure 100 % attendance. However, a candidate shall secure not less than 80 % (after rounding off to the nearest integer) of the overall attendance taking into account the total number of working days in a semester.
  - **8.1.2** A candidate who could not satisfy the attendance requirements as per clause 8.1.1 due to medical reasons (hospitalization / accident / specific illness) but has secured not less than 70 % in the current semester may be permitted to appear for the current semester examinations with the approval of the Principal on payment of a condonation fee as may be fixed by the authorities from time to time. The medical certificate needs to be submitted along with the leave application. A candidate can avail this provision only twice during the entire duration of the degree programme.

A candidate who could not satisfy the attendance requirements as per clause 8.1.1 due to his/her entrepreneurships/ start ups activities, but has secured not less than 60 % in the current semester can be permitted to appear for the current semester examinations with the recommendation of review committee and approval from the Principal.

- **8.1.3** In addition to clause 8.1.1 or 8.1.2, a candidate shall secure not less than 60 % attendance in each course.
- **8.1.4** A candidate shall be deemed to have completed the requirements of study of any semester only if he/she has satisfied the attendance requirements (vide clause 8.1.1 to 8.1.3) and has registered for examination by paying the prescribed fee.
- 8.1.5 Candidate's progress is satisfactory.
- **8.1.6** Candidate's conduct is satisfactory and he/she was not involved in any indisciplined activities in the current semester.
- **8.2.** The candidates who do not complete the semester as per clauses from 8.1.1 to 8.1.6 except 8.1.3 shall not be permitted to appear for the examinations at the end of the semester and not be permitted to go to the next semester. They have to repeat the incomplete semester in next academic year.
- **8.3** The candidates who satisfy the clause 8.1.1 or 8.1.2 but do not complete the course as per clause 8.1.3 shall not be permitted to appear for the end semester examination of that course alone. They have to repeat the incomplete course in the subsequent semester when it is offered next.

#### 9. **REQUIREMENTS FOR APPEARING FOR END SEMESTER EXAMINATION**

- **9.1** A candidate shall normally be permitted to appear for end semester examination of the current semester if he/she has satisfied the semester completion requirements as per clause 8, and has registered for examination in all courses of that semester. Registration is mandatory for current semester examinations as well as for arrear examinations failing which the candidate shall not be permitted to move on to the higher semester.
- **9.2** When a candidate is deputed for a National / International Sports event during End Semester examination period, supplementary examination shall be conducted for such a candidate on return after participating in the event within a reasonable period of time. Such appearance shall be considered as first appearance.
- **9.3** A candidate who has already appeared for a course in a semester and passed the examination is not entitled to reappear in the same course for improvement of letter

grades / marks.

#### 10. PROVISION FOR WITHDRAWAL FROM EXAMINATIONS

- **10.1** A candidate may, for valid reasons, be granted permission to withdraw from appearing for the examination in any regular course or all regular courses registered in a particular semester. Application for withdrawal is permitted only once during the entire duration of the degree programme.
- **10.2** The withdrawal application shall be valid only if the candidate is otherwise eligible to write the examination (vide clause 9) and has applied to the Principal for permission prior to the last examination of that semester after duly recommended by the Head of the Department.
- **10.3** The withdrawal shall not be considered as an appearance for deciding the eligibility of a candidate for First Class with Distinction/First Class.
- **10.4** If a candidate withdraws a course or courses from writing end semester examinations, he/she shall register the same in the subsequent semester and write the end semester examinations. A final semester candidate who has withdrawn shall be permitted to appear for supplementary examination to be conducted within reasonable time as per clause 14.
- **10.5** The final semester candidate who has withdrawn from appearing for project viva-voce for genuine reasons shall be permitted to appear for supplementary viva-voce examination within reasonable time with proper application to Controller of Examinations and on payment of prescribed fee.

#### 11. PROVISION FOR BREAK OF STUDY

**11.1** A candidate is normally permitted to avail the authorised break of study under valid reasons (such as accident or hospitalization due to prolonged ill health or any other valid reasons) and to rejoin the programme in a later semester. He/She shall apply in advance to the Principal, through the Head of the Department, stating the reasons therefore, in any case, not later than the last date for registering for that semester examination. A candidate is permitted to avail the authorised break of study only once during the entire period of study for a maximum period of one year. However, in extraordinary situation the candidate may apply for additional break of study not exceeding another one year by paying prescribed fee for the break of study.

- **11.2** The candidates permitted to rejoin the programme after break of study / prevention due to lack of attendance shall be governed by the rules and regulations in force at the time of rejoining.
- **11.3** The candidates rejoining in new Regulations shall apply to the Principal in the prescribed format through Head of the Department at the beginning of the readmitted semester itself for prescribing additional/equivalent courses, if any, from any semester of the regulations in-force, so as to bridge the curriculum in-force and the old curriculum.
- **11.4** The total period of completion of the programme reckoned from the commencement of the semester to which the candidate was admitted shall not exceed the maximum period specified in clause 5 irrespective of the period of break of study in order to qualify for the award of the degree.
- **11.5** If any candidate is prevented for want of required attendance, the period of prevention shall not be considered as authorized break of study.
- 11.6 If a candidate has not reported to the college for a period of two consecutive semesters without any intimation, the name of the candidate shall be deleted permanently from the college enrollment. Such candidates are not entitled to seek readmission under any circumstances.

#### **12. PASSING REQUIREMENTS**

- **12.1** A candidate who secures not less than 50 % of total marks (continuous assessment and end semester examination put together) prescribed for the course with a minimum of 45 % of the marks prescribed for the end semester examination in all category of courses vide clause 7.1 except for the courses which are evaluated based on continuous assessment only shall be declared to have successfully passed the course in the examination.
- **12.2** A candidate who secures not less than 50 % in continuous assessment marks prescribed for the courses which are evaluated based on continuous assessment only shall be declared to have successfully passed the course. If a candidate secures less than 50% in the continuous assessment marks, he / she shall have to re-enroll for the same in the subsequent semester and satisfy the attendance requirements.
- **12.3** For a candidate who does not satisfy the clause 12.1, the continuous assessment marks secured by the candidate in the first attempt shall be retained and considered valid for subsequent attempts. However, from the fourth attempt onwards the marks scored in the

end semester examinations alone shall be considered, in which case the candidate shall secure minimum 50 % marks in the end semester examinations to satisfy the passing requirements.

#### 13. REVALUATION OF ANSWER SCRIPTS

A candidate shall apply for a photocopy of his / her semester examination answer script within a reasonable time from the declaration of results, on payment of a prescribed fee by submitting the proper application to the Controller of Examinations. The answer script shall be pursued and justified jointly by a faculty member who has handled the course and the course coordinator and recommended for revaluation. Based on the recommendation, the candidate can register for revaluation through proper application to the Controller of Examinations. The Controller of Examinations will arrange for revaluation and the results will be intimated to the candidate concerned. Revaluation is permitted only for Theory courses and Theory cum Practical courses where end semester examination is involved.

#### 14. SUPPLEMENTARY EXAMINATION

If a candidate fails to clear all courses in the final semester after the announcement of final end semester examination results, he/she shall be allowed to take up supplementary examinations to be conducted within a reasonable time for the courses of final semester alone, so that he/she gets a chance to complete the programme.

#### **15. AWARD OF LETTER GRADES:**

Marks / Examination Status	Letter Grade	Grade Point
	O (Outstanding)	10
	A+ (Excellent)	9
Based on the relative	A (Very Good)	8
grading	B+ (Good)	7
	B (Average)	6
	C (Satisfactory)	5
Less than 50	U (Reappearance)	0
Successfully Completed	SC	0
Withdrawal	W	-
Absent	AB	-
Shortage of Attendance in a course	SA	-

For all the passed candidates, the relative grading principle is applied to assign the letter grades.

The Grade Point Average (GPA) is calculated using the formula:

$$GPA = \frac{\sum [(course credits) \times (grade points)] \text{ for all courses in the specific semester}}{\sum (course credits) \text{ for all courses in the specific semester}}$$

The Cumulative Grade Point Average (CGPA) is calculated from first semester (third semester for lateral entry candidates) to final semester using the formula

$$CGPA = \frac{\sum [(course credits) \times (grade points)] \text{ for all courses in all the semesters so far}}{\sum (course credits) \text{ for all courses in all the semesters so far}}$$

The GPA and CGPA are computed only for the candidates with a pass in all the courses.

The GPA and CGPA indicate the academic performance of a candidate at the end of a semester and at the end of successive semesters respectively.

A grade sheet for each semester shall be issued containing Grade obtained in each course, GPA and CGPA.

A duplicate copy, if required can be obtained on payment of a prescribed fee and satisfying other procedure requirements.

Withholding of Grades: The grades of a candidate may be withheld if he/she has not cleared his/her dues or if there is a disciplinary case pending against him/her or for any other reason.

#### 16. ELIGIBILITY FOR THE AWARD OF DEGREE

A candidate shall be declared to be eligible for the award of the BE / BTech Degree provided the candidate has

- i. Successfully completed all the courses under the different categories, as specified in the regulations.
- ii. Successfully gained the required number of total credits as specified in the curriculum corresponding to the candidate's programme within the stipulated time (vide clause 5).
- iii. Successfully passed any additional courses prescribed by the respective Board of Studies whenever readmitted under regulations other than R-2022 (vide clause 11.3)
- iv. No disciplinary action pending against him / her.

#### 17. CLASSIFICATION OF THE DEGREE AWARDED

#### **17.1** First Class with Distinction:

- **17.1.1.** A candidate who qualifies for the award of the degree (vide clause 16) and who satisfies the following conditions shall be declared to have passed the examination in First class with Distinction:
  - Should have passed the examination in all the courses of all the eight semesters (six semesters for lateral entry candidates) in the **First Appearance** within eight consecutive semesters (six consecutive semesters for lateral entry candidates) excluding the authorized break of study (vide clause 11) after the commencement of his / her study.
  - Withdrawal from examination (vide clause 10) shall not be considered as an appearance.
  - Should have secured a CGPA of not less than 8.50

#### (OR)

- 17.1.2 A candidate who joins from other institutions on transfer or a candidate who gets readmitted and has to move from one regulations to another regulations and who qualifies for the award of the degree (vide clause 16) and satisfies the following conditions shall be declared to have passed the examination in First class with Distinction:
  - Should have passed the examination in all the courses of all the eight semesters (six semesters for lateral entry candidates) in the **First Appearance** within eight consecutive semesters (six consecutive semesters for lateral entry candidates) excluding the authorized break of study (vide clause 11) after the commencement of his / her study.
  - Submission of equivalent course list approved by the respective Board of studies.
  - Withdrawal from examination (vide clause 10) shall not be considered as an appearance.
  - Should have secured a CGPA of not less than 9.00

#### 17.2 First Class:

A candidate who qualifies for the award of the degree (vide clause 16) and who satisfies the following conditions shall be declared to have passed the examination in First class:

• Should have passed the examination in all the courses of all eight semesters (six semesters for lateral entry candidates) within ten consecutive semesters (eight consecutive semesters for lateral entry candidates) excluding authorized break of study (vide clause 11) after the commencement of his / her study.

- Withdrawal from the examination (vide clause 10) shall not be considered as an appearance.
- Should have secured a CGPA of not less than 6.50

#### 17.3 Second Class:

All other candidates (not covered in clauses 17.1 and 17.2) who qualify for the award of the degree (vide clause 16) shall be declared to have passed the examination in Second Class.

17.4 A candidate who is absent for end semester examination in a course / project work after having registered for the same shall be considered to have appeared for that examination for the purpose of classification.

#### 17.5 Honors Degree:

A candidate who qualifies for the award of the degree (vide clause 16) and who satisfies the following conditions shall be declared to have earned the BE/BTech degree with Honours (vide clause 16 and clause 4.2.2):

- Should have passed the examination in all the courses of all the eight semesters (six semesters for lateral entry candidates) in the **First Appearance** within eight consecutive semesters (six consecutive semesters for lateral entry candidates) excluding the authorized break of study (vide clause 11) after the commencement of his / her study.
- Withdrawal from examination (vide clause 10) shall not be considered as an appearance.
- Should have secured a CGPA of not less than 7.50

#### 18. MALPRACTICES IN TESTS AND EXAMINATIONS

If a candidate indulges in malpractice in any of the tests or end semester examinations, he/she shall be liable for punitive action as per the examination rules prescribed by the college from time to time.

#### **19. AMENDMENTS**

Notwithstanding anything contained in this manual, the Kongu Engineering College through the Academic council of the College, reserves the right to modify/amend without notice, the Regulations, Curricula, Syllabi, Scheme of Examinations, procedures, requirements, and rules pertaining to its BE / BTech programme.

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Summary of C	redit Dis	tributio	on						·	
Category				Seme	ester				Total number of credits	Curriculum Content (% of total number of credits of the program)
	I	Ш	ш	IV	v	VI	VII	VIII		
HS	4	4	2			2	3		15	8.93
BS	8	8	4						20	11.91
ES	8	8	4	4					24	14.29
PC	3	4	16	12	15	8			58	34.52
PE					3	3	9	3	18	10.71
OE					4	4	3	3	14	8.33
EC				2	2	6	5	4	19	11.31
MC									0	0
Semester wise Total	23	24	26	18	24	23	20	11	168	100.00
				C	Categor	у				Abbreviation
_ecture hours p										L
Tutorial hours p										Т
Practical, Project	ct work, I	nternsh	ip, Profe	essional	Skill Tra	aining, Ir	ndustrial	Trainin	g hours per wee	
redits			ip, i ioic	200101101		annig, n		- running		C

		CATEGORISATION OF COURS	SES								
HUM	HUMANITIES AND SOCIAL SCIENCE INCLUDING MANAGEMENT (HS)										
S. No.	Course Code	Course Name	L	т	Ρ	С	Sem				
1.	22EGT11	Communication Skills - I	3	0	0	3	Ι				
2.	22VEC11	Yoga and Values for Holistic Development	1	0	1	1	I				
3.	22EGT21	Communication Skills - II	3	0	0	3	П				
4.	22TAM01	Heritage of Tamils	1	0	0	1	П				
5.	22TAM02	Tamils and Technology	1	0	0	1	III				
6.	22EGL31	Communication Skills Development Laboratory	0	0	2	1	111				
7.	22GET31	Universal Human Values	2	0	0	2	VI				
8.	22GCT71	Engineering Economics and Management	3	0	0	3	VII				
	Total	Credits to be earned				15					

	BASIC SCIENCE (BS)										
S. No.	Course Code	Course Name	L	т	Р	С	Sem				
1.	22MAC11	Matrices and Ordinary Differential Equations	3	1	2	4	I				
2.	22PHT16	Physics for Electronics and Instrumentation Engineering	3	0	0	3	I				
3.	22PHL16	Physics Laboratory for Electronics And Instrumentation Engineering	0	0	2	1	Ι				
4.	22MAC21	Multivariable Calculus and Complex Analysis	3	1	2	4	II				
5.	22CYT25	Chemistry for Electronics and Instrumentation Engineering	3	0	0	3	II				
6.	22CYL11	Chemistry Laboratory for Electrical Systems	0	0	2	1	II				
7.	22MAT42	Transforms and Partial Differential Equations	3	1	0	4	IV				
		Total Credits to be earned				20					

	ENGINEERING SCIENCE (ES)										
S. No.	Course Code	Course Name	L	т	Р	С	Sem				
1.	22CSC11	Problem Solving and Programming in C	3	0	2	4	I				
2.	22MET11	Engineering Drawing	3	0	0	3	I				
3.	22MEL11	Engineering Practices Laboratory	0	0	2	1	I				
4.	22CSC22	Data Structures using C	3	0	2	4	II				
5.	22EIT22	Electrical Machines	3	0	0	3	II				
6.	22EIL21	Devices and Machines Laboratory	0	0	2	1	11				
7.	22ITC31	Java Programming	3	0	2	4	III				
8.	22ITC41	Programming in Python	3	0	2	4	IV				
		Total Credits to be earned				24					

	EMPLO	YABILITY ENHANCEMENT COU	JRS	SES	(EC)		
S. No.	Course Code	Course Name	L	Т	Ρ	С	Sem
1.	22GEL41	Professional Skills Training - I				2	IV
2.	22GEL51	Professional Skills Training II		-		2	V
3.	22EIP61	Project Work I	0	0	8	4	VI
4.	22GEP61	Comprehensive Test and Viva				2	VI
5.	22EIP71	Project Work II Phase - I	0	0	10	5	VII
6.	22EIP81	Project Work II Phase - II	0	0	8	4	VIII
		Total Credits to be earned				19	

	MANDATORY COURSES (MC)										
S. No.	Course Code	Course Name	L	т	Р	С	Sem				
1.	22MNT11	Student Induction Program				0	I				
2.	22MNT31	Environmental Science	2	0	0	0	111				
	Т	otal Credits to be earned				00					

		PROFESSIONAL COR	E (P	C)				
S. No.	Course Code	Course Name	L	т	Ρ	с	Sem	Domain/ Stream
1.	22EIT11	Electron Devices and Circuits	3	0	0	3	Ι	EL
2.	22EIC21	Electric Circuit Analysis	3	0	2	4	II	EL
3.	22EIT31	Transducers Engineering	3	0	0	3	111	IN
4.	22EIT32	Analog Integrated Circuits	3	0	0	3	111	EL
5.	22EIT33	Digital Logic Circuits	3	1	0	4	111	EL
6.	22EIT34	Electrical Measurements and Instrumentation	3	1	0	4	111	EL
7.	22EIL31	Transducers and Measurements Laboratory	0	0	2	1		IN
8.	22EIL32	Analog and Digital Integrated Circuits Laboratory	0	0	2	1		EL
9.	22EIT41	Microcontroller and its Applications	3	0	0	3	IV	EL
10.	22EIT42	Control Systems	3	1	0	4	IV	EL
11	22EIT43	Industrial Instrumentation I	3	0	0	3	IV	IN
12.	22EIL41	Microcontroller and Interfacing Laboratory	0	0	2	1	IV	EL
13.	22EIL42	Instrumentation Design and Control Systems Laboratory	0	0	2	1	IV	EL
14.	22EIT51	Industrial Instrumentation - II	3	0	0	3	V	IN
15.	22EIT52	Process Control	3	0	0	3	V	IN
17.	22EIT53	Digital Signal Processing	3	1	0	4	V	EL
18.	22EIT54	VLSI Systems	3	0	0	3	V	EL
19.	22EIL51	Industrial Instrumentation Laboratory	0	0	2	1	V	IN
20.	22EIL52	Process Control Laboratory	0	0	2	1	V	IN
21.	22EIT61	Industrial Automation using PLC, SCADA and DCS	3	0	0	3	VI	IN
22.	22EIT62	Industry 4.0 with Industrial IoT	3	0	0	3	VI	IN
23.	22EIL61	PLC and DCS Laboratory	0	0	2	1	VI	IN
24	22EIL62	Virtual Instrumentation and Industrial IoT Laboratory	0	0	2	1	VI	IN
	т	otal Credits to be earned				58		

	PROFESSIONAL ELECTIVES (PEs)										
S. No.	Course Code	Course Name	L	Т	Ρ	С	Domain/ Stream				
	l	Semester - V				1	1				
Elect	ive – I										
1.	22EIE01	Biomedical Instrumentation	3	0	0	3	AI				
2.	22EIE02	Instrumentation System Design	3	0	0	3	EEA				
3.	22EIE03	Soft Computing Techniques	3	0	0	3	EEA				
4.	22EIE04	Analytical Instrumentation	3	0	0	3	AI				
5.	22EIE05	Industrial Electronics and Drives	3	0	0	3	EL				
6.	22EIE06	Advanced Control Techniques	3	0	0	3	CS				
		Semester - VI									
Elect	ive – II										
7.	22EIE07	SCADA and its Applications	3	0	0	3	EEA				
8.	22EIE08	Virtual Instrumentation	3	0	0	3	AI				
9.	22EIE09	Digital Image Processing	3	0	0	3	EEA				
10.	22EIE10	Power Plant Instrumentation	3	0	0	3	IA				
11.	22EIE11	Embedded Systems	3	0	0	3	AE				
12.	22EIE12	Control System Components	3	0	0	3	CS				
		Semester - VII									
Elect	ive - III										
13.	22EIE13	Fiber Optics and Laser Instruments	3	0	0	3	AI				
14.	22EIE14	Wireless Instrumentation	3	0	0	3	AE				
15.	22EIE15	Instrumentation Techniques in Agriculture	3	0	0	3	IA				
16.	22EIE16	Safety in Process Industries	3	0	0	3	AI				
17.	22EIE17	Instrumentation and Control in Process Industries	3	0	0	3	IA				
18.	22EIE18	Total Quality Management	3	0	0	3	GE				
Elect	ive – IV			•	•		•				
19.	22EIE19	Instrumentation in Aircraft Navigation and Control	3	0	0	3	IA				

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20.	22EIE20	Industrial Data Communication	3	0	0	3	AI				
21.	22EIE21	MEMS and Nano Technology	3	0	0	3	AE				
22.	22EIE22	Optimal and Adaptive Control	3	0	0	3	CS				
23.	22EIE23	Wearable Technology	3	0	0	3	AE				
24.	22GEE01	Fundamentals of Research	3	0	0	3	GE				
Elective – V											
25.	22EIE24	Instrumentation in Building Automation	3	0	0	3	IA				
26.	22EIE25	Electronic Instrumentation	3	0	0	3	AL				
27.	22EIE26	Piping and Instrumentation Diagrams	3	0	0	3	IA				
28.	22EIE27	Machine Learning and its Applications	3	0	0	3	EEA				
29.	22EIE28	Model Predictive Control	3	0	0	3	CS				
30.	22EIE29	Multi Sensor Data Fusion	3	0	0	3	EEA				
Semester - VIII											
Elective - VI											
31.	22EIE30	Diagnostic and Therapeutic Instruments	3	0	0	3	AI				
32.	22EIE31	Instrumentation and Control in Paper Industries	3	0	0	3	IA				
33.	22EIE32	Instrumentation and Control in Petro Chemical Industries	3	0	0	3	IA				
34.	22EIE33	VHDL Programming and Its Applications	3	0	0	3	AE				
35.	22EIE34	Computer Control of Processes	3	0	0	3	CS				
36.	22EIE35	Digital Twins	3	0	0	3	EL				
Total Credits to be earned						18					

\* Domain/Stream Abbreviations: IN-Instrumentation, EL-Electronics, AI-Applied Instrumentation, AE-Applied Electronics and Industry 4.0, EEA-Experimental Engineering and Analysis, IA-Industry Automation, CS-Control Systems, GE – General Engineering.

OPEN ELECTIVE COURSES OFFERED TO OTHER DEPARTMENTS (OEs)										
S. No.	Course Code	Course Name	L	Т	Ρ	С	Sem			
1.	22EIO01	Measurements and Instrumentation	3	1	0	4	V			
2.	22EIO02	Biomedical Instrumentation and Applications	3	1	0	4	V			
3.	22EIO03	Industrial Automation	3	1	0	4	V			
4.	22EIO04	PLC Programming with High Level Languages	3	1	0	4	VI			
5.	22EIO05	Virtual Instrumentation	3	1	0	4	VI			
6.	22EIO06	Introduction to Distributed Control Systems	3	0	0	3	VII			
7.	22EIO07	Instrumentation in Aircraft Navigation and Control	3	0	0	3	VII			
8.	22EIO08	Industry 4.0 with Industrial IoT	3	0	0	3	VII			
9.	22EIO09	Industrial Data Communication	3	0	0	3	VII			
10.	22EIO10	Wireless Instrumentation	3	0	0	3	VII			
11.	22EIO11	Instrumentation Techniques in Agriculture	3	0	0	3	VII			
12.	22EIO12	Environmental Sensors	3	0	0	3	VIII			
13.	22EIO13	Pollution Control and Management	3	0	0	3	VIII			

S. No.	Course	Course Name	L	т	Р	с	OFFERED BY
	Code		-				
		SEMESTER V					
1.	22CEX01	Remote Sensing and its Applications	3	0	2	4	CIVIL
2.	22MEX01	Renewable Energy Sources	3	0	2	4	MECH
3.	22MTO01	Design of Mechatronics Systems	3	1	0	4	MTS
4.	22MTX01	Data Acquisition and Virtual Instrumentation	3	0	2	4	MTS
5.	22MTX02	Factory Automation	3	0	2	4	MTS
6.	22AUX01	Automotive Engineering	3	0	2	4	AUTO
7.	22ECX01	Basics of Electronics in Automation Appliances	3	0	2	4	ECE
8.	22ECX02	Image Processing	3	0	2	4	ECE
9.	22EEO01	Solar and Wind Energy Systems	3	1	0	4	EEE
10.	22EEO02	Electrical Wiring and Lighting	3	1	0	4	EEE
11.	22EEO03	Programmable Logic Controller and SCADA	3	1	0	4	EEE
12.	22EEO04	Analog and Digital Electronics	3	1	0	4	EEE
13.	22EEO05	Power Electronics and Drives	3	1	0	4	EEE
14.	22EEO06	Sensors and Actuators	3	1	0	4	EEE
15.	22EIO01	Measurements and Instrumentation	3	1	0	4	EIE
16.	22EIO02	Biomedical Instrumentation and Applications	3	1	0	4	EIE
17.	22EIO03	Industrial Automation	3	1	0	4	EIE
18.	22CSX01	Fundamentals of Databases	3	0	2	4	CSE
19.	22CSX02	Data science for Engineers	3	0	2	4	CSE
20.	22CSX03	Enterprise Application Development Using Java	3	0	2	4	CSE
21.	22CSO01	Computational science for Engineers	3	1	0	4	CSE
22.	22CSO02	Formal Languages and Automata Theory	3	1	0	4	CSE
23.	22ITO01	Artificial Intelligence	3	1	0	4	IT

24.	22ITX01	Next Generation Databases	3	0	2	4	IT
25.	22GEX02	NCC Studies (Air Wing) - 1	3	0	2	4	IT
26.	22CDO01	Fundamentals of User Experience Design	3	1	0	4	CSD
27.	22ADO01	Data Warehousing and Data Mining	3	1	0	4	AIDS
28.	22ALO01	Business Intelligence	3	1	0	4	AIML
29.	22CHO01	Industrial Enzymology	3	1	0	4	CHEM
30.	22CHO02	Waste to Energy Conversion	3	1	0	4	CHEM
31.	22CHO03	Applied Nanotechnology	3	1	0	4	CHEM
32.	22FTX01	Baking Technology	3	0	2	4	FT
33.	22FTO01	Food Processing Technology	3	1	0	4	FT
34.	22MAO01	Mathematical Foundations for Machine Learning	3	1	0	4	MATHS
35.	22MAO02	Numerical Computing	3	1	0	4	MATHS
36.	22MAO03	Stochastic Processes and Queuing Theory	3	1	0	4	MATHS
37.	22MAO04	Statistics for Engineers	3	1	0	4	MATHS
38.	22PHO01	Thin Film Technology	3	1	0	4	PHYSICS
39.	22PHO02	High Energy Storage Devices	3	1	0	4	PHYSICS
40.	22PHO03	Structural and Optical Characterization of Materials	3	1	0	4	PHYSICS
41.	22CYO01	Instrumental Methods of Analysis	3	1	0	4	CHEMISTRY
42.	22CYO02	Chemistry Concepts for Competitive Examinations	3	1	0	4	CHEMISTRY
43.	22CYO03	Organic Chemistry for Industry	3	1	0	4	CHEMISTRY
		SEMESTER VI					
44.	22CEO01	Disaster Management	3	1	0	4	CIVIL
45.	22MEX02	Design of Experiments	3	0	2	4	MECH
46.	22MTO02	Robotics	3	1	0	4	MTS
47.	22MTO03	3D Printing and Design	3	1	0	4	MTS
48.	22AUO01	Automotive Electronics	3	1	0	4	ECE
49.	22ECX03	PCB Design and Fabrication	3	0	2	4	ECE

50.	22EEO07	Energy Conservation and Management	3	1	0	4	EEE
		Microprocessors and Microcontrollers				-	
51.	22EEO08	Interfacing	3	1	0	4	EEE
52.	22EEO09	Electrical Safety	3	1	0	4	EEE
53.	22EEO10	VLSI System Design	3	1	0	4	EEE
54.	22EEO11	Automation for Industrial Applications	3	1	0	4	EEE
55.	22EIO04	PLC Programming with High Level Languages	3	1	0	4	EIE
56.	22EIO05	Virtual Instrumentation	3	1	0	4	EIE
57.	22CSX04	Foundations of Machine Learning	3	0	2	4	CSE
58.	22CSX05	Web Engineering	3	0	2	4	CSE
59.	22ITX02	Advanced Java Programming	3	0	2	4	IT
60.	22ITO02	Internet of Things	3	1	0	4	IT
61.	22ITO03	Fundamentals of Software Development	3	1	0	4	IT
62.	22ITO04	Mobile Application Development	3	1	0	4	IT
63.	22CDX01	Fundamentals of User Interactive Design	3	0	2	4	CSD
64.	22ADX01	Data Visualization	3	0	2	4	AIDS
65.	22ALX01	Data Exploration and Visualization Techniques	3	0	2	4	AIML
66.	22CHO04	Air Pollution Monitoring and Control	3	1	0	4	CHEM
67.	22CHO05	Paints and Coatings	3	1	0	4	CHEM
68.	22CHO06	Powder Technology	3	1	0	4	CHEM
	22FTX02	Processing of milk and milk products	3	0	2	4	FT
	22FTX03	Processing of Fruits and Vegetables	3	0	2	4	FT
69.	22MAO05	Graph Theory and its Applications	3	1	0	4	MATHS
70.	22MAX01	Data Analytics using R Programming	3	0	2	4	MATHS
71.	22MAO06	Operations Research	3	1	0	4	MATHS
72.	22MAO07	Number Theory and Cryptography	3	1	0	4	MATHS
73.	22PHO04	Synthesis, Characterization and Biological Applications of Nanomaterials	3	1	0	4	PHYSICS
74.	22PHO05	Techniques of Crystal Growth	3	1	0	4	PHYSICS

BE– Electronics and Instrumentation Engineering, Regulation, Curriculum and Syllabus – R2022

75.	22CYO04	Corrosion Science and Engineering	3	1	0	4	CHEMISTRY
76.	22CYO05	Chemistry of Cosmetics in Daily Life	3	1	0	4	CHEMISTRY
77.	22CYO06	Nanocomposite Materials	3	1	0	4	CHEMISTRY
		SEMESTER VII					
78.	22CEO02	Introduction to Smart Cities	3	0	0	3	CIVIL
79.	22CEO03	Environmental Health and Safety	3	0	0	3	CIVIL
80.	22MEO01	Fundamentals of Ergonomics	3	0	0	3	MECH
81.	22MEO02	Principles of Management and Industrial Psychology	3	0	0	3	MECH
82.	22MEO03	Waste Heat Recovery System and Storage	3	0	0	3	MECH
83.	22MTO04	Drone System Technology	3	0	0	3	MTS
84.	22AUO02	Vehicle Maintenance	3	0	0	3	AUTO
85.	22ECO01	Wearable Devices	3	0	0	3	ECE
86.	22ECX04	Electronic Hardware and Troubleshooting	2	0	2	3	ECE
87.	22EEO12	Electric Vehicle	3	0	0	3	EEE
88.	22EEO13	E-Waste Management	3	0	0	3	EEE
89.	22EEO14	Embedded System Design	3	0	0	3	EEE
90.	22EEO15	Energy Storage Systems and Controllers	3	0	0	3	EEE
91.	22EEO16	AI Techniques for Engineering Applications	3	0	0	3	EEE
92.	22EIO06	Introduction to Distributed Control Systems	3	0	0	3	EIE
93.	22EIO07	Instrumentation in Aircraft Navigation and Control	3	0	0	3	EIE
94.	22EIO08	Industry 4.0 with Industrial IoT	3	0	0	3	EIE
95.	22EIO09	Industrial Data Communication	3	0	0	3	EIE
96.	22EIO10	Wireless Instrumentation	3	0	0	3	EIE
97.	22EIO11	Instrumentation Techniques in Agriculture	3	0	0	3	EIE
98.	22CSO03	Nature Inspired optimization techniques	3	0	0	3	CSE
99.	22ITO05	Fundamentals of Cloud Computing	3	0	0	3	IT

100.	22CDO02	Introduction to Mobile Game Design	3	0	0	3	CSD
101.	22CDO03	Introduction to Graphics Design	3	0	0	3	CSD
102.	22ADO02	Neural Networks and Deep Learning	3	0	0	3	AIDS
103.	22ALO02	Industrial Machine Learning	3	0	0	3	AIML
104.	22CHO07	Hydrogen Energy	3	0	0	3	CHEM
105.	22CHO08	Rubber Technology	3	0	0	3	CHEM
106.	22FTO02	Principles of Food safety	3	0	0	3	FT
107.	22FTO03	Fundamentals of Food Packaging and Storage	3	0	0	3	FT
108.	22MAO08	Non-Linear Optimization	3	0	0	3	MATHS
109.	22MAO09	Optimization for Engineers	3	0	0	3	MATHS
110.	22CYO07	Waste and Hazardous Waste Management	3	0	0	3	CHEMISTRY
111.	22CYO08	Chemistry in Every day Life	3	0	0	3	CHEMISTRY
		SEMESTER VIII					
112.	22CEO04	Infrastructure Planning and Management	3	0	0	3	CIVIL
113.	22CEO05	Environmental Laws and Policy	3	0	0	3	CIVIL
114.	22MEO04	Safety Measures for Engineers	3	0	0	3	MECH
115.	22MEO05	Energy Conservation in Thermal Equipments	3	0	0	3	MECH
116.	22MEO06	Climate Change and New Energy Technology	3	0	0	3	MECH
117.	22MTO05	Micro and Nano Electromechanical Systems	3	0	0	3	MTS
118.	22AUO03	Public Transport Management	3	0	0	3	ECE
119.	22AUO04	Autonomous Vehicles	3	0	0	3	ECE
120.	22ECO02	Optical Engineering	3	0	0	3	EEE
121.	22EEO17	Smart Grid Technologies	3	0	0	3	EEE
122.	22EEO18	Biomass Energy Systems	3	0	0	3	EEE
123.	22EIO12	Environmental Sensors	3	0	0	3	EIE
124.	22EIO13	Pollution Control and Management	3	0	0	3	EIE
125.	22CSO04	Machine Translation	3	0	0	3	CSE

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126.	22CSO05	Fundamentals of Blockchain	3	0	0	3	CSE
127.	22ITO06	Introduction to Ethical Hacking	3	0	0	3	IT
128.	22ITO07	Business Continuity Planning	3	0	0	3	IT
129.	22CDX02	Virtual Reality and Augmented Reality	3	0	0	3	CSD
130.	22ADO03	Business Analytics	3	0	0	3	AIDS
131.	22ALO03	Machine Learning for Smart Cities	3	0	0	3	AIML
132.	22CHO09	Industrial Accident Prevention and Management	3	0	0	3	CHEM
133.	22CHO10	Electrochemical Engineering	3	0	0	3	CHEM
134.	22CHO11	Smart and Functional Materials	3	0	0	3	CHEM
135.	22FTO04	Food Ingredients	3	0	0	3	FT
136.	36. 22FTO05 Food and Nutrition		3	0	0	3	FT
137.	22CYO09	Chemistry of Nutrition for Women Health	3	0	0	3	CHEMISTRY

SNo	Course Code	(Common to All BE/BTe Course Title	L	Т	P	C	Offering Department	Semester
1.	22GEO01	German Language Level 1	4	0	0	4	ECE	ALL
2.	22GEO02	Japanese Language Level 1	4	0	0	4	ECE	ALL
3.	22GEO03	Design Thinking for Engineers	3	1	0	4	CSE	5
4.	22GEO04	Innovation and Business Model Development	3	1	0	4	MTS	6
5.	22GEO05	German Language Level 2	4	0	0	4	ECE	ALL
6.	22GEO06	German Language Level 3	3	0	0	3	ECE	ALL
7.	22GEO07	German Language Level 4	3	0	0	3	ECE	ALL
8.	22GEO08	Japanese Language Level 2	4	0	0	4	ECE	ALL
9.	22GEO09	Japanese Language Level 3	3	0	0	3	ECE	ALL
10.	22GEO10	Japanese Language Level 4	3	0	0	3	ECE	ALL
11.	22GEO11	French Language Level 1	4	0	0	4	ECE	ALL
12.	22GEO12	French Language Level 2	4	0	0	4	ECE	ALL
13.	22GEO13	French Language Level 3	3	0	0	3	ECE	ALL
14.	22GEO14	Spanish Language Level 1	4	0	0	4	ECE	ALL
15.	22GEO15	Spanish Language Level 2	4	0	0	4	ECE	ALL
16.	22GEO16	Spanish Language Level 3	3	0	0	3	ECE	ALL
17.	22GEO17	Entrepreneurship Development	3	0	0	3	MTS	7
18.	22GEX01	NCC Studies (Army Wing) - I	3	0	2	4	EEE	5/6
19.	22GEX02	NCC Studies (Air Wing) - 1	3	0	2	4	IT	5/6
20.	22MBO01	Cost Accounting for Engineers	3	1	0	4	MBA	5
21.	22MBO02	Economic Analysis for Decision Making	3	1	0	4	MBA	6
22.	22MBO03	Marketing Analytics	3	1	0	4	MBA	7

#### GENERAL OPEN ELECTIVE (Common to All BE/BTech branches)

# KEC R2022: SCHEDULING OF COURSES – BE (Electronics and Instrumentation Engineering) Total Credits: 168

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Sem	Course1	Course2	Course3	Course4	Course5	Course6	Course7	Course8	Course9	Course10	СН
I	22EGT11 Communication Skills – I (3-0-0-3)	22MAC11 Matrices and Ordinary Differential Equations (3-1-2-4)	22PHT16 Physics for Electronics and Instrumentation Engineering (3-0-0-3)	22EIT11 Electron Devices and Circuits (3-0-0-3)	22CSC11 Problem Solving and Programming in C (3-0-2-4)	22MET11 Engineering Drawing (2-1-0-3)	22PHL16 Physics Laboratory for Electronics and Instrumentation Engineering (0-0-2-1)	22MEL11 Engineering Practices Laboratory (0-0-2-1)	22VEC11 Yoga and Values for Holistic Development (1-0-1-1)	22MNT11 Student Induction Program (0-0-0-0)	23
11	22EGT21 Communication Skills - II (3-0-0-3)	22MAC21 Multivariable Calculus and Complex Analysis (3-1-2-4)	22CYT25 Chemistry for Electronics And Instrumentation Engineering (3-0-0-3)	22EIC21 Electric Circuit Analysis (3-0-2-4)	22CSC22 Data Structures using C (3-0-2-4)	22EIT21 Electrical Machines (3-0-0-3)	22TAM01 Heritage of Tamils (1-0-0-1)	22CYL11 Chemistry Laboratory for Electrical Systems (0-0-2-1)	22EIL21 Devices and Machines Laboratory (0-0-2-1)		24
111	22ITC31 Java Programming (3-0-2-4)	22EIT31 Transducers Engineering (3-0-0-3)	22EIT32 Analog Integrated Circuits (3-0-0-3)	22EIT33 Digital Logic Circuits (3-1-0-4)	22EIT34 Electrical Measurements and Instrumentation (3-1-0-4)	22MNT31 Environmental Science (2-0-0-0)	22TAM02 Tamils and Technology (1-0-0-1)	22EIL31 Transducers and Measurements Laboratory (0-0-2-1)	22EIL32 Analog and Digital Integrated Circuits Laboratory (0-0-2-1)	22EGL31 Communication Skills Development Laboratory (0-0-2-1)	22
IV	22MAT42 Transforms and Partial Differential Equations (3-1-0-4)	22ITC41 Programming in Python (3-0-2-4)	22EIT41 Microcontroller and its Applications (3-0-0-3)	22EIT42 Control Systems (3-1-0-4)	22EIT43 Industrial Instrumentation I (3-0-0-3)	22EIL41 Microcontroller and Interfacing Laboratory (0-0-2-1)	22EIL42 Instrumentation Design and Control Systems Laboratory (0-0-2-1)	22GEL41 Professional Skills Training I (0-0-0-2)			22
v	22EIT51 Industrial Instrumentation- II (3-0-0-3)	22EIT52 Process Control (3-0-0-3)	22EIT53 Digital Signal Processing (3-1-0-4)	22EIT54 VLSI Systems (3-0-0-3)	Professional Elective - I (3-0-0-3)	Open Elective – I (3-1-0-4)/ (3-0-2-4)	22EIL51 Industrial Instrumentation Laboratory (0-0-2-1)	22EIL52 Process Control Laboratory (0-0-2-1)	22GEL51 Professional Skills Training II (0-0-0-2)		24
VI	22EIT61 Industrial Automation using PLC,SCADA and DCS (3-0-0-3)	22EIT62 Industry 4.0 with Industrial IoT (3-0-0-3)	Professional Elective - II (3-0-0-3)	Open Elective – II (3-1-0-4)/ (3-0-2-4)	22EIL61 PLC and DCS Laboratory (0-0-2-1)	22EIL62 Virtual Instrumentatio n and Industrial IoT Laboratory (0-0-2-1)	22EIP61 Project Work I (0-0-8-4)	22GET31 Universal Human Values (2-0-0-2)	22GEP61 Comprehensive Test and Viva (0-0-0-2)		23
VII	22GCT71 Engineering Economics and Management (3-0-0-3)	Professional Elective – III (3-0-0-3)	Professional Elective – IV (3-0-0-3)	Professional Elective – V (3-0-0-3)	Open Elective - III (3-0-0-3)	22EIP71 Project Work II Phase I (0-0-10-5)					20
VIII	Professional Elective - VI (3-0-0-3)	Open Elective - IV (3-0-0-3)	22EIP81 Project Work II Phase II (0-0-8-4)								10

## MAPPING OF COURSES WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

Sem.	Course Code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	P011	PO12	PSO1	PSO2
1	22EGT11	Communication Skills - I						1			✓	1	1	1		
1	22MAC11	Matrices and Ordinary Differential Equations	✓	✓	1		~									
1	22PHT16	Physics for Electronics and Instrumentation Engineering	~	1	~						~	1		~	~	
1	22EIT11	Electron Devices and Circuits	~	1	1	✓	1								✓	✓
1	22CSC11	Problem Solving and Programming in C	~	1	1	1	1				1	1		✓		
1	22MET11	Engineering Drawing	1	1	1		1					~		1		
1	22PHL16	Physics Laboratory for Electronics And Instrumentation Engineering	~	~	~	~					~	~		~	~	
1	22MEL11	Engineering Practices Laboratory	1		1	1	1	1			1	~		✓	1	✓
1	22VEC11	Yoga and Values for Holistic Development						1		~	✓					
2	22EGT21	Communication Skills - II						✓			~	~	✓	✓		
2	22MAC21	Multivariable Calculus and Complex Analysis	1	~	~		~									
2	22CYT25	Chemistry for Electronics And Instrumentation Engineering	~	1	~	~			~						~	~
2	22EIC21	Electric Circuit Analysis	1	1	1	1	1	~		~	1	1		~	~	✓
2	22CSC22	Data Structures using C	1	~	~	~										
2	22EIT21	Electrical Machines	✓	~	~	~	~								~	✓
2	22TAM01	Heritage of Tamils						✓		~	~	~		✓		
2	22CYL11	Chemistry Laboratory for Electrical Systems	~	~	~	~			~							
2	22EIL21	Devices and Machines Laboratory	1	~	~	~	~	~		✓	✓	~		✓	~	✓
3	22ITC31	Java Programming	1	~	~	✓										
3	22EIT31	Transducer Engineering	1	~	~	~	~			✓				~	~	✓
3	22EIT32	Analog Integrated Circuits	1	1	~	~	~								✓	✓
3	22EIT33	Digital Logic Circuits	~	~	~	~	~								1	✓
3	22EIT34	Electrical Measurements and Instrumentation	1	1	1	~	1								1	✓
3	22MNT31	Environmental Science	1	1	~				✓							
3	22TAM02	Tamils and Technology						1		✓	1	✓		✓		

Sem.	Course Code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	P011	PO12	PSO1	PSO2
3	22EIL31	Transducers and Measurements Laboratory	1	1	✓	1	✓	~		✓	1	✓		✓	✓	✓
3	22EIL32	Analog and Digital Integrated Circuits Laboratory	✓	1	1	✓	~	1		✓	✓	✓		✓	✓	✓
3	22EGL31	Communication Skills Development Laboratory									~	✓		✓		
4	22MAT42	Transforms and Partial Differential Equations	✓	1	1										✓	
4	22ITC41	Python Programming	✓	~	1	~										
4	22EIT41	Microcontroller and its Applications	✓	✓	1	~	✓					✓		✓	✓	✓
4	22EIT42	Control Systems	✓	✓	1	~	~			✓		~		✓	✓	✓
4	22EIT43	Industrial Instrumentation I	1	1	~	~	~			~				✓	~	~
4	22EIL41	Microcontroller and Interfacing Laboratory	✓	1	✓	✓	✓	✓		✓	~	✓		✓	✓	✓
4	22EIL42	Instrumentation Design and Control Systems Laboratory	~	1	1	~	~	4		~	~	~		~	~	1
4	22GEL41	Professional Skills Training I	✓	1				1	1		✓	✓	✓	✓		
5	22EIT51	Industrial Instrumentation- II	~	~	1	~	~			✓				~	1	1
5	22EIT52	Process Control	✓	~	✓	1	✓			~				✓	✓	✓
5	22EIT53	Digital Signal Processing	~	~	✓	✓	~					✓		✓	✓	✓
5	22EIT54	VLSI Systems	~	~	~	✓	~					✓			✓	✓
5	22EIL51	Industrial Instrumentation Laboratory	~	~	~	✓	~	~	<ul> <li>✓</li> </ul>		~	~			✓	1
5	22EIL52	Process Control Laboratory	~	~	~	~	~	~		~	~	~		~	<ul> <li>✓</li> </ul>	1
5	22GEL51	Professional Skills Training II	~	~	~	~	~	~	✓	✓	~	~	✓	✓		
6	22EIT61	Industrial Automation using PLC,SCADA and DCS	~	~	~	✓	~			✓		✓			✓	✓
6	22EIT62	Industry 4.0 with Industrial IoT	~	~	~	✓	~			✓					<ul> <li>✓</li> </ul>	1
6	22EIL61	PLC and DCS Laboratory	~	1	~	~	~	~		~	~	~		✓	✓	<ul> <li>✓</li> </ul>
6	22EIL62	Virtual Instrumentation and Industrial IoT Laboratory	✓	✓	✓	~	~	✓		~	~	✓		~	~	1
6	22EIP61	Project Work I	✓	1	1	~	~	1	~	~	~	✓	~	~	~	*
6	22GET31	Universal Human Values	~	~	1	~										
6	22GEP61	Comprehensive Test and Viva	~	1	~	✓					✓	✓	✓	✓	✓	✓

Sem.	Course Code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	P011	PO12	PSO1	PSO2
7	22GCT71	Engineering Economics and Management	1	~	~			~	~	1	1	✓	✓	✓		
7	22EIP71	Project Work II Phase I	✓	1	1	✓	~	1	✓	~	✓	✓	✓	✓	✓	✓
8	22EIP81	Project Work II Phase II	1	~	1	~	~	1	~	✓	✓	✓	~	✓	✓	✓
		Professional Elective Courses														
5	22EIE01	Biomedical Instrumentation	~	~	<b>√</b>	~	~	<b>√</b>		1					~	<ul> <li>✓</li> </ul>
5	22EIE02	Instrumentation System Design	1	~	1	~	~								~	1
5	22EIE03	Soft Computing Techniques	1	~	~	✓	~								✓	✓
5	22EI E04	Analytical Instrumentation	1	✓	~	✓	✓								✓	<ul> <li>✓</li> </ul>
5	22EIE05	Industrial Electronics and Drives	1	✓	1	✓	~								✓	<ul> <li>✓</li> </ul>
5	22EIE06	Advanced Control Techniques	1	✓	1	✓	✓					✓			✓	<ul> <li>✓</li> </ul>
6	22EIE07	SCADA and its Applications	1	✓	1	✓	✓								✓	<ul> <li>✓</li> </ul>
6	22EIE08	Virtual Instrumentation	1	✓	✓	✓	✓								✓	✓
6	22EIE09	Digital Image Processing	1	✓	✓	✓	✓			✓		✓			✓	✓
6	22EIE10	Power Plant Instrumentation	1	✓	✓	✓	✓		✓			✓			✓	<ul> <li>✓</li> </ul>
6	22EIE11	Embedded Systems	1	✓	✓	✓	✓			✓		✓			✓	<ul> <li>✓</li> </ul>
6	22EIE12	Control System Components	<ul> <li>✓</li> </ul>	✓	✓	✓	✓					✓			✓	<ul> <li>✓</li> </ul>
7	22EIE13	Fiber Optics and Laser Instruments	1	~	✓	✓	~								✓	✓
7	22EIE14	Wireless Instrumentation	1	~	<ul> <li>✓</li> </ul>	~	~								~	<ul> <li>✓</li> </ul>
7	22EIE15	Instrumentation Techniques in Agriculture	1	~	~	~	~								✓	✓
7	22EIE16	Safety in Process Industries	1	~	<ul> <li>✓</li> </ul>	✓	✓	✓		✓					~	<ul> <li>✓</li> </ul>
7	22EIE17	Instrumentation and Control in Process Industries	1	~	1	~	~								~	<ul> <li>✓</li> </ul>
7	22EIE18	Total Quality Management	1	✓				✓						✓		1
7	22EIE19	Instrumentation in Aircraft Navigation and Control	✓	~	1	~	~								1	<b>~</b>
7	22EIE20	Industrial Data Communication	~	~	~	~	~	✓							~	✓

Sem.	Course Code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	P011	PO12	PSO1	PSO2
7	22EIE21	MEMS and Nano Technology	~	~	✓	~	~								✓	✓
7	22EIE22	Optimal and Adaptive Control	1	~	~	~	~								~	✓
7	22EIE23	Wearable Technology	1	~	~	~	✓								~	✓
7	22GEE02	Fundamentals of Research	1	~	~	~	1	~	~	~	~	1	~	✓	1	1
7	22EIE24	Instrumentation in Building Automation	1	~	1	1	1			~		~			1	1
7	22EIE25	Electronic Instrumentation	✓	1	1	1	1			~					~	1
7	22EIE26	Piping and Instrumentation Diagrams	1	1	1	1	1			~		~			~	1
7	22EIE27	Machine Learning and its Applications	~	1	1	1	1								~	1
7	22EIE28	Model Predictive Control	1	1	1	1	1								~	1
7	22EIE29	Multi Sensor Data Fusion	~	1	~	1	1			✓		~			~	1
8	22EIE30	Diagnostic and Therapeutic Instruments	~	1	1	1	1	~							~	1
8	22EIE31	Instrumentation and Control in Paper Industries	~	~	✓	1	1			✓		~			~	✓
8	22EIE32	Instrumentation and Control in Petro Chemical Industries	~	~	~	1	1								~	✓
8	22EIE33	VHDL Programming and Its Applications	~	1	~	1	1					~			~	1
8	22EIE34	Computer Control of Processes	•	~	✓	1	1								~	✓
8	22EIE35	Digital Twins	~	1	1	1	1		~	~	~		~		~	1
		Open Elective Courses														
5	22EIO01	Measurements and Instrumentation	1	~	~	1	~								1	1
5	22EIO02	Biomedical Instrumentation and Applications	1	~	1	~	1	~		~					1	1
5	22EIO03	Industrial Automation	<b>√</b>	~	1	1	1								~	1
6	22EIO04	PLC Programming with High Level Languages	~	1	1	1	1								~	1
6	22EIO05	Virtual Instrumentation	~	~	~	~	1								~	1



Sem.	Course Code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
7	22EIO06	Introduction to Distributed Control Systems	✓	1	1	~	√			~		~			1	~
7	22EIO07	Instrumentation in Aircraft Navigation and Control	1	1	1	~	1								1	1
7	22EIO08	Industry 4.0 with Industrial IoT	1	~	~	~	~			✓					1	1
7	22EIO09	Industrial Data Communication	1	1	1	~	1	~							1	~
7	22EIO10	Wireless Instrumentation	1	1	1	✓	√								~	~
7	22EIO11	Instrumentation Techniques in Agriculture	✓	✓	~	1	✓								~	~
8	22EIO12	Environmental Sensors	1	1	1	1	✓		~						~	~
8	22EIO13	Pollution Control and Management	1	~	~	1	~	~		~					✓	✓

Sem.	Course Code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
5	22CEX01	Remote Sensing and its Applications	1	✓	✓	✓		✓			✓			✓		
5	22MEX01	Renewable Energy Sources	1		✓	✓	✓	✓	✓	✓	✓					
5	22MTO01	Design of Mechatronics Systems	1	✓	✓	✓	✓							✓		
5	22MTX01	Data Acquisition and Virtual Instrumentation	1	~	~	✓	~							✓		
5	22MTX02	Factory Automation	✓	~	✓	~	✓				~	✓		~		
5	22AUX01	Automotive Engineering	✓	✓	✓			✓	✓		1	✓		✓		
5	22ECX01	Basics of Electronics in Automation Appliances	✓	~	~	~		~	~	~			~	~		
5	22ECX02	Image Processing	✓	✓	✓	✓	✓				✓	✓		✓		
5	22EEO01	Solar and Wind Energy Systems	1	~	~			~	~					~		
5	22EEO02	Electrical Wiring and Lighting	1	✓	✓	✓	✓							✓		
5	22EEO03	Programmable Logic Controller and SCADA	~	~	~	✓		✓			✓			~		
5	22EEO04	Analog and Digital Electronics	✓	~	✓	~	✓							~		
5	22EEO05	Power Electronics and Drives	1	✓	✓	✓	✓	✓			1					
5	22EEO06	Sensors and Actuators	1	✓	✓			✓						✓		
5	22EIO01	Measurements and Instrumentation	1	✓	✓	✓	✓									
5	22EIO02	Biomedical Instrumentation and Applications	✓	~	~	~	~	~		~						
5	22EIO03	Industrial Automation	1	1	1	✓	1									
5	22CSX01	Fundamentals of Databases	1	~	✓											
5	22CSX02	Data science for Engineers	1	✓	✓	✓	✓									
5	22CSX03	Enterprise Application Development Using Java	~	~	~	1	~	~	1	1	~	~	~	~		
5	22CSO01	Computational science for Engineers	✓	✓	✓											
5	22CSO02	Formal Languages and Automata Theory	~	~	~											
5	22ITO01	Artificial Intelligence	1	✓	✓	✓		✓	✓	✓	✓	✓	✓			
5	22ITX01	Next Generation Databases	1	✓	~	✓	✓	✓	~	✓	✓	✓	✓			
5	22CDO01	Fundamentals of User Experience Design	~	~	~	~	~				~	~	~			



Sem.	Course Code	Course Title	P01	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	P011	PO12	PSO1	PSO2
5	22ADO01	Data Warehousing and Data Mining	✓	✓	~											
5	22ALO01	Business Intelligence	✓	✓	✓											
5	22CHO01	Industrial Enzymology	✓	✓	✓							✓	✓	✓		
5	22CHO02	Waste to Energy Conversion	✓	✓												
5	22CHO03	Applied Nanotechnology	✓	✓	✓	✓	✓	✓	✓	✓				✓		
5	22FTX01	Baking Technology	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓		
5	22FTO01	Food Processing Technology	✓	✓	✓	~		~				✓		✓		
5	22MAO01	Mathematical Foundations for Machine Learning	1	~	✓	✓	~									
5	22MAO02	Numerical Computing	✓	~	1											
5	22MAO03	Stochastic Processes and Queuing Theory	~	~	~											
5	22MAO04	Statistics for Engineers	1	✓	1											
5	22PHO01	Thin Film Technology	✓	✓	✓						✓	✓		✓		
5	22PHO02	High Energy Storage Devices	✓	✓	~						✓	✓		✓		
5	22PHO03	Structural and Optical Characterization of Materials	~	~	~						~	~		~		
5	22CYO01	Instrumental Methods of Analysis	1	1	1	1										
5	22CYO02	Chemistry Concepts for Competitive Examinations	~	~	~											
5	22CYO03	Organic Chemistry for Industry	✓	✓	✓	✓										
5	22MBO01	Cost Accounting for Engineers										✓	✓	✓		
6	22CEO01	Disaster Management	~	~	1			✓	~					1		
6	22MEX02	Design of Experiments	✓	✓	~	~	✓				✓					
6	22GEO04	Innovation and Business Model Development	~	~	~	~	~	~	~	1	~	~	~	~		
6	22MTO02	Robotics	✓	✓	✓	~	✓							✓		
6	22MTO03	3D Printing and Design	~	~			~							✓		
6	22AUO01	Automotive Electronics	~	✓	~	~								✓		
6	22ECX03	PCB Design and Fabrication	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓		



Sem.	Course Code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
6	22EEO07	Energy Conservation and Management	✓	~	✓		~		~	~	~			~		
6	22EEO08	Microprocessors and Microcontrollers Interfacing	~	~	*	~	~	~	~	~		~	*	~		
6	22EEO09	Electrical Safety	✓	1	✓				1	1			✓	✓		
6	22EEO10	VLSI System Design	✓	✓	✓	✓	✓				✓		✓	✓		
6	22EEO11	Automation for Industrial Applications	1	1	✓	1			✓		✓			✓		
6	22EIO04	PLC Programming with High Level Languages	~	~	~	~	~									
6	22EIO05	Virtual Instrumentation	✓	1	~	1	✓									
6	22CSX04	Foundations of Machine Learning	1	✓	~											
6	22CSX05	Web Engineering	✓	✓	✓											
6	22ITX02	Advanced Java Programming	✓	✓	✓	✓	~	✓	✓	✓	✓	✓	✓			
6	22ITO02	Internet of Things	1	~	✓	1		~	~	✓	~	✓	✓			
6	22ITO03	Fundamentals of Software Development	~	~	~	~		~	~	~	~	~	~			
6	22ITO04	Mobile Application Development	✓	1	✓	1	1	1	1	1	1	✓	✓			
6	22CDX01	Fundamentals of User Interactive Design	1	~	✓	~										
6	22ADX01	Data Visualization	✓	1	✓											
6	22ALX01	Data Exploration and Visualization Techniques	✓	~	✓											
6	22CHO04	Air Pollution Monitoring and Control	✓	✓	✓			✓	✓							
6	22CHO05	Paints and Coatings	1	1	✓				1							
6	22CHO06	Powder Technology	✓	✓	✓			✓	✓					✓		
6	22FTX02	Processing of milk and milk products	✓	✓	~		✓	✓		✓	✓	✓		✓		
6	22FTX03	Processing of Fruits and Vegetables	1	1	~		~	~		✓	✓	1		1		
6	22MAO05	Graph Theory and its Applications	✓	✓	~											
6	22MAX01	Data Analytics using R Programming	~	✓	~	~	✓									
6	22MAO06	Operations Research	✓	✓	✓											



Sem.	Course Code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	P011	PO12	PSO1	PSO2
6	22MAO07	Number Theory and Cryptography	✓	✓	1		✓									
6	22PHO04	Synthesis, Characterization and Biological Applications of Nanomaterials	~	~	~						~	~		~		
6	22PHO05	Techniques of Crystal Growth	✓	✓	1						✓	1		1		
6	22CYO04	Corrosion Science and Engineering	~	~	~	✓										
6	22CYO05	Chemistry of Cosmetics in Daily Life	✓	✓	~											
6	22CYO06	Nanocomposite Materials	✓	✓	✓	✓										
6	22MBO02	Economic Analysis for Decision Making					✓					~	~			
7	22CEO02	Introduction to Smart Cities	~	~	~	✓	~									
7	22CEO03	Environmental Health and Safety	1	1	~			1	1							
7	22MEO01	Fundamentals of Ergonomics	1	✓	✓	✓	✓	~	✓					✓		
7	22MEO02	Principles of Management and Industrial Psychology	1					✓				~	~			
7	22MEO03	Waste Heat Recovery System and Storage	~	~	~	~			✓							
7	22GEO05	Entrepreneurship Development	✓	✓	✓	✓	✓	~	✓	✓	✓	✓	✓	✓		
7	22MTO04	Drone System Technology	✓	1	✓	1	✓							✓		
7	22AUO02	Vehicle Maintenance	~	~			~		✓					~		
7	22ECO01	Wearable Devices	✓	✓	~	✓	1	✓	1		✓	✓	✓	✓		
7	22ECX04	Electronic Hardware and Troubleshooting	~	✓	~	~	✓	~	✓	1	~	~		~		
7	22EEO12	Electric Vehicle	✓	✓	✓	✓		✓	✓		✓			✓		
7	22EEO13	E-Waste Management	1	1	~	✓		1	1					✓		
7	22EEO14	Embedded System Design	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓		
7	22EEO15	Energy Storage Systems and Controllers	1	~	~			~			~		~	~		
7	22EEO16	AI Techniques for Engineering Applications	1	~	✓	1										
7	22EIO06	Introduction to Distributed Control Systems	~	✓	~	~	✓			~		~				
7	22EIO07	Instrumentation in Aircraft Navigation and Control	1	~	✓	✓	~									



Sem.	Course Code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
7	22EIO08	Industry 4.0 with Industrial IoT	1	1	1	1	1			✓						
7	22EIO09	Industrial Data Communication	✓	✓	✓	✓	✓	✓								
7	22EIO10	Wireless Instrumentation	✓	✓	✓	✓	✓		✓							
7	22EIO11	Instrumentation Techniques in Agriculture	✓	~	~	~	~									
7	22CSO03	Nature Inspired optimization techniques	✓	*	✓											
7	22ITO05	Fundamentals of Cloud Computing	1	✓	✓	✓	✓	✓	1	✓	✓	✓	✓			
7	22ITO06	Introduction to Ethical Hacking	✓	✓	✓	✓	✓	✓	✓	1	1	✓	✓			
7	22CDO02	Introduction to Mobile Game Design	1	✓	✓	✓										
7	22CDO03	Introduction to Graphics Design	1	✓	✓	✓										
7	22ADO02	Neural Networks and Deep Learning	✓	✓	✓	✓										
7	22ALO02	Industrial Machine Learning	✓	✓	✓											
7	22CHO07	Hydrogen Energy	✓	✓										1		
7	22CHO08	Rubber Technology	✓	✓				✓	✓					✓		
7	22FTO02	Principles of Food safety	✓	✓	~			✓	✓	✓		✓		✓		
7	22FTO03	Fundamentals of Food Packaging and Storage	✓	~	~	~	~	~		~		~		~		
7	22MAO08	Non-Linear Optimization	✓	1	1											
7	22MAO09	Optimization for Engineers	1	✓	~											
7	22CYO07	Waste and Hazardous Waste Management	1	~	~	~			✓							
7	22CYO08	Chemistry in Every day Life	1	1	✓	~										
7	22MBO03	Marketing Analytics										✓	✓	✓		
8	22CEO04	Infrastructure Planning and Management	1	~	~		~									
8	22CEO05	Environmental Laws and Policy	~	~			~									
8	22MEO04	Safety Measures for Engineers	1					✓	1	✓						
8	22MEO05	Energy Conservation in Thermal Equipments	~		~		~	~	~					1		
8	22MEO06	Climate Change and New Energy Technology	✓		1			~	~	1						



Sem.	Course Code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	P011	PO12	PSO1	PSO2
8	22MTO05	Micro and Nano Electromechanical Systems	✓	✓	~	~								~		
8	22AUO03	Public Transport Management	1	~				~	~	1				✓		
8	22AUO04	Autonomous Vehicles	1	1	✓	✓	✓	1	1					✓		
8	22ECO02	Optical Engineering	1	1	✓	✓		~	✓	✓	~			✓		
8	22EEO17	Smart Grid Technologies	1	✓	✓	✓	✓			✓				✓		
8	22EEO18	Biomass Energy Systems	1	✓	1			~	✓				✓	✓		
8	22EIO12	Environmental Sensors	✓	✓	✓	✓	✓		✓							
8	22EIO13	Pollution Control and Management	~	✓	✓	✓	✓	✓		✓						
8	22CSO04	Machine Translation	1	✓	✓											
8	22CSO05	Fundamentals of Blockchain	1	✓	✓											
8	22ITO07	Business Continuity Planning	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓			
8	22CDX02	Virtual Reality and Augmented Reality	1	✓	✓	✓										
8	22ADO03	Business Analytics	✓	✓	✓	✓										
8	22ALO03	Machine Learning for Smart Cities	1	✓	✓	✓										
8	22CHO09	Industrial Accident Prevention and Management	✓		~	~		~	✓	1	✓	1	~	1		
8	22CHO10	Electrochemical Engineering	1	~	~											
8	22CHO11	Smart and Functional Materials	1	1					1	~	~			✓		
8	22FTO04	Food Ingredients	1	1	✓			✓		✓		✓		✓		
8	22FTO05	Food and Nutrition	1	✓	✓			✓				✓		✓		
8	22CYO09	Chemistry of Nutrition for Women Health	~	~	~											
		General Open Elective Courses														
ALL	22GEO01	German Language Level 1								1	1	1		1		
ALL	22GEO02	Japanese Language Level 1								~	1	1		✓		
5	22GEO03	Design Thinking for Engineers	✓	1	~	✓										
6	22GEO04	Innovation and Business Model Development	✓	~	~	~	~	~	1	~	~	~	~	~		



Sem.	Course Code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
ALL	22GEO05	German Language Level 2								~	~	1		~		
ALL	22GEO06	German Language Level 3								~	~	✓		✓		
ALL	22GEO07	German Language Level 4								~	~	✓		✓		
ALL	22GEO08	Japanese Language Level 2								1	1	~		✓		
ALL	22GEO09	Japanese Language Level 3								~	~	✓		✓		
ALL	22GEO10	Japanese Language Level 4								~	~	✓		~		
ALL	22GEO11	French Language Level 1								~	1	✓		✓		
ALL	22GEO12	French Language Level 2								~	~	✓		✓		
ALL	22GEO13	French Language Level 3								~	~	✓		✓		
ALL	22GEO14	Spanish Language Level 1								~	~	✓		~		
ALL	22GEO15	Spanish Language Level 2								✓	~	✓		✓		
ALL	22GEO16	Spanish Language Level 3								~	1	~		✓		
7	22GEO17	Entrepreneurship Development	✓	~	1	~	~	~	~	~	~	✓	~	~		
5/6	22GEX01	NCC Studies (Army Wing) - I	✓	1	1	1	~	~	✓	~	~	✓				
5/6	22GEX02	NCC Studies (Air Wing) - 1	~	1	1	~	~	~	~	~	~	✓				
5	22MBO01	Cost Accounting for Engineers										✓	~	✓		
6	22MBO02	Economic Analysis for Decision Making					~					~	~			
7	22MBO03	Marketing Analytics										~	1	1		

SEMESTER	2 <b>– 1</b>								
Course Code	Course Title	Hou	rs / W	eek	Credit	Maxir	num N	/larks	Category
Course Coue	Course Title	L	Т	Ρ	Credit	CA	ESE	Total	Category
Theory/Theory	y with Practical								
22EGT11	Communication Skills - I	3	0	0	3	40	60	100	HS
22MAC11	Matrices and Ordinary Differential Equations	3	1	2	4	50	50	100	BS
22PHT16	Physics for Electronics and Instrumentation Engineering	3	0	0	3	40	60	100	BS
22EIT11	Electron Devices and Circuits	3	0	0	3	40	60	100	PC
22CSC11	Problem Solving and Programming in C	3	0	2	4	50	50	100	ES
22MET11	Engineering Drawing	2	1	0	3	40	60	100	ES
Practical / Em	ployability Enhancement								
22PHL16	Physics Laboratory for Electronics And Instrumentation Engineering	0	0	2	1	60	40	100	BS
22MEL11	Engineering Practices Laboratory	0	0	2	1	60	40	100	ES
22VEC11	Yoga and Values for Holistic Development	1	0	1	1	100	0	100	HS
22MNT11	Student Induction Program				0	100	0	100	MC
Total Credits t	o be earned				23				

SEMESTER	- 11								
Course	Course Title	Hou	rs / W	eek	Credit	Махії	mum N	/larks	Cate
Code		L	Т	Ρ	oroun	CA	ESE	Total	gory
Theory/Theor	ry with Practical								
22EGT21	Communication Skills - II	3	0	0	3	40	60	100	HS
22MAC21	Multivariable Calculus and Complex Analysis	3	1	2	4	50	50	100	BS
22CYT25	Chemistry for Electronics and Instrumentation Engineering	3	0	0	3	40	60	100	BS
22EIC21	Electric Circuit Analysis	3	0	2	4	50	50	100	PC
22CSC22	Data Structures using C	3	0	2	4	50	50	100	ES
22EIT21	Electrical Machines	3	0	0	3	40	60	100	ES
22TAM01	Heritage of Tamils	1	0	0	1	100	0	100	HS
Practical / En	ployability Enhancement								
22CYL11	Chemistry Laboratory for Electrical Systems	0	0	2	1	60	40	100	BS
22EIL21	Devices and Machines Laboratory	0	0	2	1	60	40	100	ES
Total Credits	to be earned				24				

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SEMESTER	- 111					-			
Course Code	Course Title	Ηοι	irs / W	eek	Credit	Maxii	mum N	/larks	Cate
Code		L	Т	Ρ		CA	ESE	Total	gory
Theory/Theo	ory with Practical								
22ITC31	Java Programming	3	0	2	4	50	50	100	ES
22EIT31	Transducers Engineering	3	0	0	3	40	60	100	PC
22EIT32	Analog Integrated Circuits	3	0	0	3	40	60	100	PC
22EIT33	Digital Logic Circuits	3	1	0	4	40	60	100	PC
22EIT34	Electrical Measurements and Instrumentation	3	1	0	4	40	60	100	PC
22MNT31	Environmental Science	2	0	0	0	100	0	100	MC
22TAM02	Tamils and Technology	1	0	0	1	100	0	100	HS
Practical / E	mployability Enhancement								
22EIL31	Transducers and Measurements Laboratory	0	0	2	1	60	40	100	PC
22EIL32	Analog and Digital Integrated Circuits Laboratory	0	0	2	1	60	40	100	PC
22EGL31	Communication Skills Development Laboratory	0	0	2	1	60	40	100	HS
Total Credits	s to be earned				22				

SEMESTER	– IV								
Course		Hou	irs / W	eek	One all't	Maxir	mum N	/larks	Cate
Code	Course Title	L	Т	Ρ	Credit	CA	ESE	Total	gory
Theory/Theo	ry with Practical								
22MAT42	Transforms and Partial Differential Equations	3	1	0	4	40	60	100	BS
22ITC41	Programming in Python	3	0	2	4	50	50	100	ES
22EIT41	Microcontroller and its Applications	3	0	0	3	40	60	100	PC
22EIT42	Control Systems	3	1	0	4	40	60	100	PC
22EIT43	Industrial Instrumentation I	3	0	0	3	40	60	100	PC
Practical / Er	nployability Enhancement								
22EIL41	Microcontroller and Interfacing Laboratory	0	0	2	1	60	40	100	PC
22EIL42	Instrumentation Design and Control Systems Laboratory	0	0	2	1	60	40	100	PC
22GEL41	Professional Skills Training - I				2	100	0	100	EC
Total Credits	to be earned				22				

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SEMESTE	R – V								
Course	Course Title	Hou	rs / W	eek	Credit	Maxii	Cate		
Code		L	Т	Р		CA	ESE	Total	gory
Theory/The	eory with Practical								
22EIT51	Industrial Instrumentation - II	3	0	0	3	40	60	100	PC
22EIT52	Process Control	3	0	0	3	40	60	100	PC
22EIT53	Digital Signal Processing	3	1	0	4	40	60	100	PC
22EIT54	VLSI Systems	3	0	0	3	40	60	100	PC
	Professional Elective - I	3	0	0	3	40	60	100	PE
	Open Elective – I	3	1/0	0/2	4	40	60	100	OE
Practical /	Employability Enhancement								
22EIL51	Industrial Instrumentation Laboratory	0	0	2	1	60	40	100	PC
22EIL52	Process Control Laboratory	0	0	2	1	60	40	100	PC
22GCL51	Professional Skills Training II				2	100	0	100	EC
Total Cred	its to be earned	•	-	•	24			•	•

SEMESTE	R – VI								
Course	Course Title	Hou	rs / W	eek	Credit	Maxir	/larks	Cate	
Code		L	Т	Ρ		CA	ESE	Total	gory
Theory/The	eory with Practical								
22EIT61	Industrial Automation using PLC, SCADA and DCS	3	0	0	3	40	60	100	PC
22EIT62	Industry 4.0 with Industrial IoT	3	0	0	3	40	60	100	PC
	Professional Elective - II	3	0	0	3	40	60	100	PE
	Open Elective – II	3	1/0	0/2	4	40	60	100	OE
Practical /	Employability Enhancement								
22EIL61	PLC and DCS Laboratory	0	0	2	1	60	40	100	PC
22EIL62	Virtual Instrumentation and Industrial IoT Laboratory	0	0	2	1	60	40	100	PC
22EIP61	Project Work I	0	0	8	4	50	50	100	EC
22GET31	Universal Human Values	2	0	0	2	100	0	100	HS
22GEP61	Comprehensive Test and Viva				2	100	0	100	EC
Total Cred	its to be earned				23				

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SEMESTE	ER – VII								
Course Code	Course Title	Hour	s/We	ek	Credit	Maxi	/larks	Cate	
Code		L	Т	Ρ		CA	ESE	Total	gory
Theory/Th	eory with Practical								
22GCT71	Engineering Economics and Management	3	0	0	3	40	60	100	HS
	Professional Elective – III	3	0	0	3	40	60	100	PE
	Professional Elective – IV	3	0	0	3	40	60	100	PE
	Professional Elective – V	3	0	0	3	40	60	100	PE
	Open Elective – III	3	0	0	3	40	60	100	OE
Practical /	Employability Enhancement								
22EIP71	Project Work II Phase - I	0	0	10	5	50	50	100	EC
Total Crec	lits to be earned				20				

SEMEST	ER – VIII								
Course	Course Title	Hours / Week			Credit	Maxi	mum N	/larks	Cate
Code		L	Т	Ρ		CA	ESE	Total	gory
Theory/Th	eory with Practical								
	Professional Elective - VI	3	0	0	3	40	60	100	PE
	Open Elective – IV	3	0	0	3	40	60	100	OE
Practical /	Employability Enhancement								
22EIP81	Project Work II Phase - II	0	0	8	4	50	50	100	EC
Total Cred	lits to be earned	•	-	•	10		-		

**Total Credits: 168** 

		LIST OF PROFESSIONAL ELEC	TIVE	ES (I	PEs)	)	
S. No.	Course Code	Course Name	L	Т	Ρ	С	Domain/ Stream
	•	Semester - V				1	
Elect	ive – I						
1.	22EIE01	Biomedical Instrumentation	3	0	0	3	AI
2.	22EIE02	Instrumentation System Design	3	0	0	3	EEA
3.	22EIE03	Soft Computing Techniques	3	0	0	3	EEA
4.	22EIE04	Analytical Instrumentation	3	0	0	3	AI
5.	22EIE05	Industrial Electronics and Drives	3	0	0	3	EL
6.	22EIE06	Advanced Control Techniques	3	0	0	3	CS
	·	Semester - VI		•			·
Elect	ive – II						
7.	22EIE07	SCADA and its Applications	3	0	0	3	EEA
8.	22EIE08	Virtual Instrumentation	3	0	0	3	AI
9.	22EIE09	Digital Image Processing	3	0	0	3	EEA
10.	22EIE10	Power Plant Instrumentation	3	0	0	3	IA
11.	22EIE11	Embedded Systems	3	0	0	3	AE
12.	22EIE12	Control System Components	3	0	0	3	CS
		Semester - VII					
Elect	ive - III						
13.	22EIE13	Fiber Optics and Laser Instruments	3	0	0	3	AI
14.	22EIE14	Wireless Instrumentation	3	0	0	3	AE
15.	22EIE15	Instrumentation Techniques in Agriculture	3	0	0	3	IA
16.	22EIE16	Safety in Process Industries	3	0	0	3	AI
17.	22EIE17	Instrumentation and Control in Process Industries	3	0	0	3	IA
18.	22GEE02	Total Quality Management	3	0	0	3	GE

Electi	ive – IV						
19.	22EIE18	Instrumentation in Aircraft Navigation and Control	3	0	0	3	IA
20.	22EIE19	Industrial Data Communication	3	0	0	3	AI
21.	22EIE20	MEMS and Nano Technology	3	0	0	3	AE
22.	22EIE21	Optimal and Adaptive Control	3	0	0	3	CS
23.	22EIE22	Wearable Technology	3	0	0	3	AE
24.	22GEE01	Fundamentals of Research	3	0	0	3	GE
Electi	ive – V						
25.	22EIE23	Instrumentation in Building Automation	3	0	0	3	IA
26.	22EIE24	Electronic Instrumentation	3	0	0	3	AL
27.	22EIE25	Piping and Instrumentation Diagrams	3	0	0	3	IA
28.	22EIE26	Machine Learning and its Applications	3	0	0	3	EEA
29.	22EIE27	Model Predictive Control	3	0	0	3	CS
30.	22EIE28	Multi Sensor Data Fusion	3	0	0	3	EEA
		Semester - VIII					
Electi	ive - VI						
31.	22EIE29	Diagnostic and Therapeutic Instruments	3	0	0	3	AI
32.	22EIE30	Instrumentation and Control in Paper Industries	3	0	0	3	IA
33.	22EIE31	Instrumentation and Control in Petro Chemical Industries	3	0	0	3	IA
34.	22EIE32	VHDL Programming and Its Applications	3	0	0	3	AE
35.	22EIE33	Computer Control of Processes	3	0	0	3	CS
36.	22EIE34	Digital Twins	3	0	0	3	EL
Total	Credits to be	e earned				18	

\* Domain/Stream Abbreviations: IN-Instrumentation, EL-Electronics, AI-Applied Instrumentation, AE-Applied Electronics and Industry 4.0, EEA-Experimental Engineering and Analysis, IA-Industry Automation, CS-Control Systems, GE – General Engineering.

SEMESTER	-1								
Course Code	Course Title	Но	Hours / Week			Мах	Cate		
Code		L	Т	Р		CA	ESE	Total	gory
Theory/Theo	ory with Practical								
22EGT11	Communication Skills - I	3	0	0	3	40	60	100	HS
22MAC11	Matrices and Ordinary Differential Equations	3	0	2	4	50	50	100	BS
22PHT16	Physics for Electronics and Instrumentation Engineering	3	0	0	3	40	60	100	BS
22CSC11	Problem Solving and Programming in C	3	0	2	4	50	50	100	ES
22MET11	Engineering Drawing	2	1	0	3	40	60	100	ES
22TAM01	Heritage of Tamils	1	0	0	1	100	0	100	HS
Practical / E	mployability Enhancement								
22PHL16	Physics Laboratory for Electronics and Instrumentation Engineering	0	0	2	1	60	40	100	BS
22GCL12	Foundation Engineering Laboratory – II	0	0	6	3	100	0	100	ES
22VEC11	Yoga and Values for Holistic Education				1	100	0	100	HS
22MNT11	Student Induction Program				0	100	0	100	MC
	Total Credits to be earned	•			23				

SEMESTER	- 11					_			
Course Code	Course Title	Но	urs / V	Veek	Credit	Мах	imum	Cate	
Code		L	Т	Ρ		CA	ESE	Total	gory
Theory/Theo	ory with Practical								
22EGT21	Communication Skills - II	3	0	0	3	40	60	100	HS
22MAC21	Multivariable Calculus and Complex Analysis	3	0	2	4	50	50	100	BS
22CYT25	Chemistry for Electronics And Instrumentation Engineering	3	0	0	3	40	60	100	BS
22CSC22	Data Structures using C	3	0	2	4	50	50	100	ES
22EIT11	Electron Devices and Circuits	3	0	0	3	40	60	100	PC
22TAM02	Tamils and Technology	1	0	0	1	100	0	100	HS
Practical / E	mployability Enhancement								
22CYL11	Chemistry Laboratory for Electrical Systems	0	0	2	1	60	40	100	BS
22GCL11	Foundation Engineering Laboratory – I	0	0	6	3	100	0	100	ES
	Total Credits to be earned				22				

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SEMESTER	- 111								
Course	Course Title	Но	urs/V	Veek	Credit	Max	Cate		
Code		L	Т	Р		СА	ESE	Total	gory
Theory/The	ory with Practical								
22ITC31	Java Programming	3	0	2	4	50	50	100	ES
22EIT36	Sensors and Transducers	3	0	0	3	40	60	100	PC
22EIC31	Networks, Signals and Systems	3	0	2	4	50	50	100	PC
22EIT33	Digital Logic Circuits	3	1	0	4	40	60	100	PC
22EIT37	Electrical and Electronic Measurements and Instrumentation	3	0	0	3	40	60	100	PC
Practical / E	Employability Enhancement								
22EIL31	Transducers and Measurements Laboratory	0	0	2	1	60	40	100	PC
22EIL33	Devices and Circuits Laboratory	0	0	2	1	60	40	100	PC
22MNT31	Environmental Science	2	0	0	0	100	0	100	MC
22EGL31	Communication Skills Development Laboratory	0	0	2	1	60	40	100	HS
	Total Credits to be earned				21				

SEMESTER	– IV								
Course Code	Course Title	Hours / Week			Credit	Мах	Cate gory		
Code		L	Т	Р		CA ES		CA ESE Total	
Theory/Theory	ory with Practical								
22MAT42	Transforms and Partial Differential Equations	3	1	0	4	50	50	100	BS
22ITC41	Programming in Python	3	0	2	4	50	50	100	ES
22EIC41	Linear Control Systems	3	0	2	4	50	50	100	PC
22EIT32	Analog Integrated Circuits	3	0	0	3	40	60	100	PC
22EIT44	Industrial Instrumentation	3	0	0	3	40	60	100	PC
Practical / E	mployability Enhancement								
22EIL32	Analog and Digital Integrated Circuits Laboratory	0	0	2	1	60	40	100	PC
22EIL51	Industrial Instrumentation Laboratory	0	0	2	1	60	40	100	PC
22GEL41	Professional Skills Training I				2	100	0	100	EC
	Total Credits to be earned				22				

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SEMESTE	R – V								
Course	Course Title	Но	urs / V	Credit	Мах	Cate			
Code		L	Т	Р	Credit	CA	ESE	Total	gory
Theory/Th	eory with Practical								
22EIT55	Industrial Process Control	3	1	0	4	40	60	100	PC
22EIT56	Microprocessor and Microcontroller	3	1	0	4	40	60	100	PC
22EIT21	Electrical Machines	3	0	0	3	40	60	100	PC
22EIT54	VLSI Design	3	0	0	3	40	60	100	PC
	Professional Elective – I	3	0	0	3	40	60	100	PE
	Open Elective – I	3	0/1	2/0	4	50/ 40	50/ 60	100	OE
Practical /	Employability Enhancement								
22EIL53	Process Control and Machines Laboratory	0	0	2	1	60	40	100	PC
22EIL41	Microcontroller and Interfacing Laboratory	0	0	2	1	60	40	100	PC
22GCL51	Professional Skills Training II				2	100	0	100	EC
	Total Credits to be earned				25				

SEMESTE	R – VI								
Course	Course Title	Hours / Week			Credit	Мах	Cate		
Code		L	Т	Р		CA	ESE	Total	gory
Theory/Th	eory with Practical								
22EIT61	Industrial Automation using PLC, SCADA and DCS	3	0	0	3	40	60	100	PC
22EIT62	Industry 4.0 with Industrial IoT	3	0	0	3	40	60	100	PC
	Professional Elective – II	3	0	0	3	40	60	100	PE
	Open Elective – II	3	0/1	2/0	4	40	60	100	OE
Practical /	Employability Enhancement								
22EIL61	PLC and DCS Laboratory	0	0	2	1	60	40	100	PC
22EIL62	Virtual Instrumentation and Industrial IoT Laboratory	0	0	2	1	60	40	100	PC
22EIP62	Project Work I	0	0	10	5	50	50	100	EC
22GET31	Universal Human Values	2	0	0	2	100	0	100	HS
22GEP61	Comprehensive Test and Viva				2	100	0	100	EC
	Total Credits to be earned				24				

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Course Code	Course Title	Но	urs/V	Veek	Credit	Мах	Cate		
Code		L	Т	Р		CA	ESE	Total	gory
Theory/Th	eory with Practical								
22GCT71	Engineering Economics and Management	3	0	0	3	40	60	100	HS
22EIT71	Digital Signal Processing and its Applications	3	0	0	3	40	60	100	PC
	Professional Elective – III	3	0	0	3	40	60	100	PE
	Professional Elective – IV	3	0	0	3	40	60	100	PE
	Open Elective – III	3	0	0	3	40	60	100	OE
Practical /	Employability Enhancement								
22EIP72	Project Work II Phase I	0	0	12	6	50	50	100	EC
	Total Credits to be earned		1		21		1	II	

SEMESTE	R – VIII								
Course	Course Title	Hours / Week			Credit	Мах	Cate		
Code		L	Т	Р		CA	CA ESE		gory
Theory/Th	eory with Practical								
	Professional Elective – V	3	0	0	3	40	60	100	PE
	Open Elective – IV	3	0	0	3	40	40 60		OE
Practical /	/ Employability Enhancement								
22EIP81	Project Work II Phase II			8	4	50	50	100	EC
	Total Credits to be earned		•	•	10				

**Total Credits: 168** 

	LIST OF PROFESSIONAL ELECTIVES (PEs)												
S. No.	Course Code	Course Name	L	Т	Ρ	С	Domain/ Stream						
		Semester - V											
Elect	ive – I												
1.	22EIE01	Biomedical Instrumentation	3	0	0	3	AI						
2.	22EIE02	Instrumentation System Design	3	0	0	3	EEA						
3.	22EIE03	Soft Computing Techniques	3	0	0	3	EEA						
4.	22EIE04	Analytical Instrumentation	3	0	0	3	AI						
5.	22EIE05	Industrial Electronics and Drives	3	0	0	3	EL						
6.	22EIE06	Advanced Control Techniques	3	0	0	3	CS						
	Semester - VI												
Elect	ive – II	-											
7.	22EIE07	SCADA and its Applications	3	0	0	3	EEA						
8.	22EIE08	Virtual Instrumentation	3	0	0	3	AI						
9.	22EIE09	Digital Image Processing	3	0	0	3	EEA						
10.	22EIE10	Power Plant Instrumentation	3	0	0	3	IA						
11.	22EIE11	Embedded Systems	3	0	0	3	AE						
12.	22EIE12	Control System Components	3	0	0	3	CS						
		Semester - VII											
Elect	ive - III												
13.	22EIE13	Fiber Optics and Laser Instruments	3	0	0	3	AI						
14.	22EIE14	Wireless Instrumentation	3	0	0	3	AE						
15.	22EIE15	Instrumentation Techniques in Agriculture	3	0	0	3	IA						
16.	22EIE16	Safety in Process Industries	3	0	0	3	AI						
17.	22EIE17	Instrumentation and Control in Process Industries	3	0	0	3	IA						

				1	1		1
18.	22GEE02	Total Quality Management	3	0	0	3	GE
Electi	ive – IV						
19.	22EIE18	Instrumentation in Aircraft Navigation and Control	3	0	0	3	IA
20.	22EIE19	Industrial Data Communication	3	0	0	3	AI
21.	22EIE20	MEMS and Nano Technology	3	0	0	3	AE
22.	22EIE21	Optimal and Adaptive Control	3	0	0	3	CS
23.	22EIE22	Wearable Technology	3	0	0	3	AE
24.	22GEE01	Fundamentals of Research	3	0	0	3	GE
25.	22EIE23	Instrumentation in Building Automation	3	0	0	3	IA
26.	22EIE24	Electronic Instrumentation	3	0	0	3	AL
27.	22EIE25	Piping and Instrumentation Diagrams	3	0	0	3	IA
28.	22EIE26	Machine Learning and its Applications	3	0	0	3	EEA
29.	22EIE27	Model Predictive Control	3	0	0	3	CS
30.	22EIE28	Multi Sensor Data Fusion	3	0	0	3	EEA
		Semester - VIII					
Electi	ive - VI						
31.	22EIE29	Diagnostic and Therapeutic Instruments	3	0	0	3	AI
32.	22EIE30	Instrumentation and Control in Paper Industries	3	0	0	3	IA
33.	22EIE31	Instrumentation and Control in Petro Chemical Industries	3	0	0	3	IA
34.	22EIE32	VHDL Programming and Its Applications	3	0	0	3	AE
35.	22EIE33	Computer Control of Processes	3	0	0	3	CS
36.	22EIE34	Digital Twins	3	0	0	3	EL
Total	Credits to be	e earned				18	

\* Domain/Stream Abbreviations: IN-Instrumentation, EL-Electronics, AI-Applied Instrumentation, AE-Applied Electronics and Industry 4.0, EEA-Experimental Engineering and Analysis, IA-Industry Automation, CS-Control Systems, GE – General Engineering.

LIS		NELECTIVE COURSES OFFERED TO OT	HER	DE	PAR	TMEN	TS (OEs)
S. No.	Course Code	Course Name	L	Т	Р	С	Sem
1.	22EIO01	Measurements and Instrumentation	3	1	0	4	V
2.	22EIO02	Biomedical Instrumentation and Applications	3	1	0	4	V
3.	22EIO03	Industrial Automation	3	1	0	4	V
4.	22EIO04	PLC Programming with High Level Languages	3	1	0	4	VI
5.	22EIO05	Virtual Instrumentation	3	1	0	4	VI
6.	22EIO06	Introduction to Distributed Control Systems	3	0	0	3	VII
7.	22EIO07	Instrumentation in Aircraft Navigation and Control	3	0	0	3	VII
8.	22EIO08	Industry 4.0 with Industrial IoT	3	0	0	3	VII
9.	22EIO09	Industrial Data Communication	3	0	0	3	VII
10.	22EIO10	Wireless Instrumentation	3	0	0	3	VII
11.	22EIO11	Instrumentation Techniques in Agriculture	3	0	0	3	VII
12.	22EIO12	Environmental Sensors	3	0	0	3	VIII
13.	22EIO13	Pollution Control and Management	3	0	0	3	VIII

	(Common to All Engineering and Te	ochnology Branchos)					
Programme &		echnology Branches)					
Branch	All B.E./B.Tech. Branches	Sem.	Category	L	Т	Ρ	Credi
Prerequisites	Nil	I	HS	3	0	0	3
Preamble	This course is designed to impart required levels of C necessary for different professional contexts.	communication Skills	and Proficiend	cy in E	nglish	lan	guage
Unit – I	Grammar, Vocabulary, Listening, Speaking, Readi	ing & Writing					9
- Listening to sho Types of Reading Unit – II Grammar: Voice	ds & Infinitives - Vocabulary: Affixes - Synonyms & Anto- ort talks - TV shows - Speaking: Verbal & Non-verbal or g – Intensive: scanning, word by word, survey - Writing Grammar, Vocabulary, Listening, Speaking, Readi es - Impersonal passives - Vocabulary: Homonymetric Product to approximate a read-	communication - Pair : Dialogue writing, Int ing & Writing Homophones & Hor	formal Letters	- Rol - Para	e play Igrapi	/ <b>- F</b> h wri mpoi	Reading ting 9 rtance o
	ening to announcements & radio broadcasts - <b>Speaki</b> ng comprehension - Articles from Newspapers/Magazin						
Grammar: Prepo Introduction - Re - Formal letters: Unit – IV	Grammar, Vocabulary, Listening, Speaking, Readi ositions - Vocabulary: Compound Nouns - Listening: eading: Extensive: speed, skimming - Identifying lexical Seeking permission for Industrial visits & Inviting guests Grammar, Vocabulary, Listening, Speaking, Readi les & Determiners - Vocabulary: Technical Vocabula	Listening to TED T & contextual meaning ing & Writing	ngs - Writing:	Instru	ctions	eak 8 & V	Varning 9
Grammar: Prepo Introduction - Re - Formal letters: Unit – IV Grammar: Articl Listening: Lister Paraphrasing & S	<ul> <li>bitions - Vocabulary: Compound Nouns - Listening:</li> <li>ading: Extensive: speed, skimming - Identifying lexical</li> <li>Seeking permission for Industrial visits &amp; Inviting guests</li> </ul>	Listening to TED T & contextual meaning ing & Writing ry - Analogy - Unsci Skill Sharing - N	ngs - Writing: rambling word lote-taking - I	lnstru ds - L Readir	ctions ogica	eak s & V Il rea ote	ing: Se Warning 9 asoning making
Introduction - Re - Formal letters: Unit – IV Grammar: Articl Listening: Lister	<ul> <li>bitions - Vocabulary: Compound Nouns - Listening:</li> <li>bading: Extensive: speed, skimming - Identifying lexical Seeking permission for Industrial visits &amp; Inviting guests</li> <li>Grammar, Vocabulary, Listening, Speaking, Readiles &amp; Determiners - Vocabulary: Technical Vocabulaning to conversations - Speaking: Tongue twisters - Summarizing - Writing: Recommendations &amp; Sugges</li> </ul>	Listening to TED T & contextual meaning ing & Writing ry - Analogy - Unsci Skill Sharing - N tions - Business lett	ngs - Writing: rambling word lote-taking - I	lnstru ds - L Readir	ctions ogica	eak s & V al rea ote quot	ing: Se Warning 9 asoning making
Grammar: Prepo Introduction - Re - Formal letters: Unit – IV Grammar: Articl Listening: Lister Paraphrasing & S placing orders Unit – V Grammar: Caus personalities - S	<ul> <li>bisitions - Vocabulary: Compound Nouns - Listening:</li> <li>bading: Extensive: speed, skimming - Identifying lexical Seeking permission for Industrial visits &amp; Inviting guests</li> <li>Grammar, Vocabulary, Listening, Speaking, Readiales &amp; Determiners - Vocabulary: Technical Vocabulaning to conversations - Speaking: Tongue twisters - S</li> </ul>	Listening to TED To contextual meaning wing & Writing ry - Analogy - Unsca Skill Sharing - N tions - Business lett ling & Writing & acronyms, Definitional address, Chief guest	rambling word lote-taking - I ers: Enquiry, tions <b>Listenii</b> address & Vo	s Instru ds - L Readir Calling ng: Lis ote of t	ctions ogica ng: N g for	eak s & V al rea ote quot	9 making tations 9 making tations 9 eminer
Grammar: Prepo Introduction - Re - Formal letters: Unit – IV Grammar: Articl Listening: Lister Paraphrasing & S placing orders Unit – V Grammar: Caus personalities - S	bitions - Vocabulary: Compound Nouns - Listening:         bading: Extensive: speed, skimming - Identifying lexical         Seeking permission for Industrial visits & Inviting guests         Grammar, Vocabulary, Listening, Speaking, Readi         les & Determiners - Vocabulary: Technical Vocabula         ning to conversations - Speaking: Tongue twisters - S         Summarizing - Writing: Recommendations & Sugges         Grammar, Vocabulary, Listening, Speaking, Readi         e and effect expressions - Vocabulary: Abbreviations         Speaking: Commonly mispronounced words - Welcome	Listening to TED To contextual meaning wing & Writing ry - Analogy - Unsca Skill Sharing - N tions - Business lett ling & Writing & acronyms, Definitional address, Chief guest	rambling word lote-taking - I ers: Enquiry, tions <b>Listenii</b> address & Vo	s Instru ds - L Readir Calling ng: Lis ote of t	ctions ogica ng: N g for	g to	9 making tations a eminer Reading
Grammar: Prepo Introduction - Re - Formal letters: Unit – IV Grammar: Articl Listening: Lister Paraphrasing & S placing orders Unit – V Grammar: Caus personalities - S	bitions - Vocabulary: Compound Nouns - Listening:         bading: Extensive: speed, skimming - Identifying lexical         Seeking permission for Industrial visits & Inviting guests         Grammar, Vocabulary, Listening, Speaking, Readi         les & Determiners - Vocabulary: Technical Vocabula         ning to conversations - Speaking: Tongue twisters - S         Summarizing - Writing: Recommendations & Sugges         Grammar, Vocabulary, Listening, Speaking, Readi         e and effect expressions - Vocabulary: Abbreviations         Speaking: Commonly mispronounced words - Welcome	Listening to TED To contextual meaning wing & Writing ry - Analogy - Unsca Skill Sharing - N tions - Business lett ling & Writing & acronyms, Definitional address, Chief guest	rambling word lote-taking - I ers: Enquiry, tions <b>Listenii</b> address & Vo	s Instru ds - L Readir Calling ng: Lis ote of t	ctions ogica ng: N g for	g to	9 making tations a eminer
Grammar: Prepo Introduction - Re - Formal letters: Unit – IV Grammar: Articl Listening: Lister Paraphrasing & S placing orders Unit – V Grammar: Caus personalities - S - IELTS type pass	bitions - Vocabulary: Compound Nouns - Listening:         bading: Extensive: speed, skimming - Identifying lexical         Seeking permission for Industrial visits & Inviting guests         Grammar, Vocabulary, Listening, Speaking, Readi         les & Determiners - Vocabulary: Technical Vocabula         ning to conversations - Speaking: Tongue twisters - S         Summarizing - Writing: Recommendations & Sugges         Grammar, Vocabulary, Listening, Speaking, Readi         e and effect expressions - Vocabulary: Abbreviations         Speaking: Commonly mispronounced words - Welcome	Listening to TED To & contextual meaning ing & Writing ry - Analogy - Unscr Skill Sharing - N tions - Business lett ling & Writing & acronyms, Defining address, Chief guest preting news articles	ngs - Writing: rambling word lote-taking - I ers: Enquiry, tions Listenin address & Vo & advertisem	ts - L Readir Calling ng: Lis ote of t eents	ctions ogica <b>ng:</b> N g for stenin hanks	g to	9 asoning making tations of 9 eminer Readin
Grammar: Prepor         Introduction - Re         - Formal letters:         Unit - IV         Grammar: Articl         Listening: Lister         Paraphrasing & S         placing orders         Unit - V         Grammar: Caus         personalities - S         - IELTS type pass         TEXT BOOK:         1.       Sanjay K	<ul> <li>bisitions - Vocabulary: Compound Nouns - Listening:</li> <li>bading: Extensive: speed, skimming - Identifying lexical Seeking permission for Industrial visits &amp; Inviting guests</li> <li>Grammar, Vocabulary, Listening, Speaking, Readiates &amp; Determiners - Vocabulary: Technical Vocabulaning to conversations - Speaking: Tongue twisters - Summarizing - Writing: Recommendations &amp; Sugges</li> <li>Grammar, Vocabulary, Listening, Speaking, Readiates and effect expressions - Vocabulary: Abbreviations</li> <li>Speaking: Commonly mispronounced words - Welcome sages - Writing: Preparing transcript for a speech - Inter</li> </ul>	Listening to TED To & contextual meaning ing & Writing ry - Analogy - Unscr Skill Sharing - N tions - Business lett ling & Writing & acronyms, Defining address, Chief guest preting news articles	ngs - Writing: rambling word lote-taking - I ers: Enquiry, tions Listenin address & Vo & advertisem	ts - L Readir Calling ng: Lis ote of t eents	ctions ogica <b>ng:</b> N g for stenin hanks	g to	9 asoning making tations of 9 eminer Readin
Grammar: Prepor         Introduction - Re         - Formal letters:         Unit - IV         Grammar: Articl         Listening: Lister         Paraphrasing & S         placing orders         Unit - V         Grammar: Caus         personalities - S         - IELTS type pass         TEXT BOOK:         1.       Sanjay K         REFERENCES:	<ul> <li>bisitions - Vocabulary: Compound Nouns - Listening:</li> <li>bading: Extensive: speed, skimming - Identifying lexical Seeking permission for Industrial visits &amp; Inviting guests</li> <li>Grammar, Vocabulary, Listening, Speaking, Readiates &amp; Determiners - Vocabulary: Technical Vocabulaning to conversations - Speaking: Tongue twisters - Summarizing - Writing: Recommendations &amp; Sugges</li> <li>Grammar, Vocabulary, Listening, Speaking, Readiates and effect expressions - Vocabulary: Abbreviations</li> <li>Speaking: Commonly mispronounced words - Welcome sages - Writing: Preparing transcript for a speech - Inter</li> </ul>	Listening to TED T. & contextual meaning ing & Writing ry - Analogy - Unsci Skill Sharing - N tions - Business lett ling & Writing & acronyms, Defining address, Chief guest preting news articles	ngs - Writing: rambling word lote-taking - I ers: Enquiry, tions Listenin address & Vo & advertisem	ts - L Readir Calling ng: Lis ote of t eents	ctions ogica <b>ng:</b> N g for stenin hanks	g to	9 asoning making tations of 9 eminer Readin
Grammar: Prepor         Introduction - Re         - Formal letters:         Unit – IV         Grammar: Articl         Listening: Lister         Paraphrasing & S         placing orders         Unit – V         Grammar: Caus         personalities - S         - IELTS type pass         TEXT BOOK:         1.       Sanjay K         REFERENCES:         1.       Ashraf Ri	Desitions - Vocabulary: Compound Nouns - Listening:         Deading: Extensive: speed, skimming - Identifying lexical         Seeking permission for Industrial visits & Inviting guests         Grammar, Vocabulary, Listening, Speaking, Readi         les & Determiners - Vocabulary: Technical Vocabula         ning to conversations - Speaking: Tongue twisters - S         Summarizing - Writing: Recommendations & Sugges         Grammar, Vocabulary, Listening, Speaking, Readi         e and effect expressions - Vocabulary: Abbreviations         Speaking: Commonly mispronounced words - Welcome         sages - Writing: Preparing transcript for a speech - Inter         fumar & Pushp Lata, "Communication Skills", 2 <sup>nd</sup> Edition, M         anavel, "English and Communication Skills for Students of	Listening to TED To & contextual meaning ing & Writing ry - Analogy - Unsch Skill Sharing - N tions - Business lett Iing & Writing & acronyms, Defining address, Chief guest preting news articles	ngs - Writing: rambling word lote-taking - I ers: Enquiry, tions Listenin address & Vo & advertisem ress, New Del 7.	ts - L Readir Calling ng: Lis ote of t ents hi, 201	ctions ogica ogic N g for ttenin hanks 8.	eak s & V ll rea ote   quot g to s -	9 asoning making tations 9 eminer Readin

		UTCON tion of t		the stu	dents will b	e able t	to					T Mappe ghest Le			
CO1	use language effectively by acquiring vocabulary and syntax in context										Applying (K3)				
CO2	D2 listen and comprehend different spoken discourses from a variety of situations										Applying (K3)				
CO3	spe	ak confi	dently in diff	erent pr	ofessional co	ontexts	and with pee	rs			С	Creating (K6)			
CO4	com	nprehen	d different ge	enres of	texts by add	opting v	arious readin	g strategie	S		Unde	erstanding	g (K2)		
CO5			v and flawles id structures		aried profess	ional co	ontexts profic	iently with a	approp	iate choice	С	reating (k	(6)		
					Мар	ping of	COs with P	Os and PS	Os						
COs/P	Os	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO	PO9	PO10	PO11	PO12		
CO1	1						2			1	3	1	1		
CO2	2									2	3		1		
COS	3									2	3		2		
CO4	4						1				3	1	1		
COS	5										3		2		
1 – Sli	ght, 2	– Mode	erate, 3 – Su	bstantia	l, BT- Bloom	i's Taxo	onomy								
					ASS	ESSME		N – THEOI	۲Y						
	/ Bloo tegor		Remembe (K1) %	•	Understand (K2) %	ling	Applying (K3) %	Analyzir (K4) %		Evaluating (K5) %	Creating (K6) %		otal %		
(	CAT1				37		30				33		100		
(	CAT2				30		30				40		100		
(	САТЗ				33		34				33				
	ESE				17		63				20		100		

	(Common to all Engineering an	d Technology branch	es)				
Programme & Branch	All BE/BTech Branches	Sem.	Category	L	т	Ρ	Credit
Prerequisites	Nil	1	BS	3	1*	<b>2</b> *	4
Preamble	To provide the skills to the students for solv ordinary differential equations.	ing different real tim	e problems l	oy ap	oplyir	ng m	atrices and
Unit – I	Matrices:						9
Eigen vectors (v Orthogonal trans Reduction of qu	haracteristic equation – Eigen values and Eigen vithout proof) – Cayley – Hamilton theorem (S sformation of a symmetric matrix to diagonal adratic form to canonical form by orthogonal t ing of an elastic membrane.	tatement and applic form – Quadratic f	ations only) form – Natu	- Or re o	thog f Qu	onal Iadra	matrices - tic forms
Unit – II	Ordinary Differential Equations:						9
	olutions of First order differential equations: Ex ion –Clairaut's equation - Applications: Law of na			nitz'	s Lir	near	Equation ·
Unit – III	Ordinary Differential Equations of Higher	•					9
	I equations of second and higher order with cor		Particular Inte	aral	s for	the	
cosax / sinax -	$x^n - e^{ax}x^n$ , $e^{ax}$ sinbx and $e^{ax}$ cosbx - $x^n$ si						
Unit – IV	er-Cauchy's equation – Legendre's equation. Applications of Ordinary Differential Equa	4 <b>.</b>					9
	ion of parameters – Simultaneous first order lin		constant coef	ficie	nts -	- Apr	
	tions: Simple harmonic motion – Electric circuits						
Unit – V	Laplace Transform:						9
integrals of trans functions. Invers	rm: Conditions for existence – Transform of el sforms –Transforms of derivatives and integrals se Laplace transform: Inverse Laplace transfo prem (Statement only) – Applications: Solution of	- Transform of unit rm of elementary fu	step function	n – T Partia	rans I fra	form ction	of periodic method -
LIST OF EXPER	IMENTS / EXERCISES:						
1. Introduct	ion to MATLAB						
2. Computa	ation of eigen values and eigen vectors						
3. Plotting a	and visualizing single variable functions						
4. Solving f	irst and second order ordinary differential equation	ons					
5. Solution	of Simultaneous first order ODEs						
6. Solving	second order ODE by variation of parameters						
7. Determir	ning Laplace and inverse Laplace transform of ba	asic functions					
8. Solution	of Second order ODE by employing Laplace tran	nsforms					
I		Lecture:45,	Tutorials ar	d Pi	acti	cal:1	5, Total:6
TEXT BOOK:							
. Ramana	B V, "Higher Engineering Mathematics", 1st Edi	tion, Tata McGraw-H	lill Publishing	g Co	mpa	ny Li	mited, Nev
1. Delhi, 20							

BE– Electronics and Instrumentation Engineering, Regulation, Curriculum and Syllabus – R2022

1.	Krey	/szig E	i, "Adva	anced Er	nginee	ering Math	nematics	s ", 10 <sup>th</sup>	Editio	n, John W	′iley, N	lew Delhi, I	ndia, 20	16.	
2.	Edit	ion 20	14, S.C	hand an	d Čo.	, New De	lhi.		-	-		s For First			
3.						S., Arun Delhi, 201		sh K. a	nd Su	resh M.,	'Engin	eering Mat	hematic	s - I", 2'	<sup>nd</sup> Edition
4.	Gre	wal B.	S., "Hig	her Engi	neeri	ng Mathe	matics"	44thEd	ition, K	(hanna Ρι	ıblishe	rs, New De	elhi, 2018	3.	
5.	MA	ΓLAB -	- Labor	atory Ma	inual										
		UTCO		ourse, th	e stu	Idents wi	ll be ab	le to					(	BT Maj Highest	•
CO1						ich needs			ations					Applying	
CO2	iden	tify the	e appro	priate m	ethod	for solvin	ng first o	rder ord	dinary	differentia	l equa	tions.		Applyin	g (K3)
CO3	solv	e high	er orde	r linear c	liffere	ntial equa	ations wi	th cons	tant ar	nd variable	e coef	icients.		Applying	g (K3)
CO4			concep g probl		nary	differentia	al equati	ons for	mode	ling and t	inding	solutions	to	Applyin	g (K3)
CO5	app	ly Lapl	ace Tra	ansform	to find	d solutions	s of Line	ar Ordi	nary D	oifferential	Equat	ions		Applying	g (K3)
CO6				basics ons using			olve ordi	nary d	ifferen	tial equat	ions a	ind compu		Applying anipulati	
						Маррі	ing of C	Os wit	h POs	and PSC	s				
COs/F	Os	P01	PO2	PO3	PO4	4 PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO	1	3	3	2											
CO		3	3	2											
CO		3	3	2											
CO4		3	3	2											
CO: CO		3	3	3		3									
		– Moo	derate,	3 – Subs	stantia	al, BT- Blo	oom's Ta	axonom	ıy						
						ASSE	SSMEN		TERN	- THEOR	Y				
	/ Blo atego	om's ry*		nember (K1) %	ing	Understa (K2)	anding	Apply (K3)	ying	Analyzin (K4) %	g	Evaluating (K5) %		eating (6) %	Total %
	CAT			10		20	)	70	)	-		-		-	100
	CAT2	2		10		20	)	70	)	-		-		-	100
	CAT			10		20		70		-		-		-	100
	ESE			10		20	)	70	)	-		-		-	100

		22PHT16 – PHYSICS FOR ELECTRONICS AND INSTRUM	ENTATIO		ERIN	G		
Progra Brancł	imme & 1	BE- Electronics & Instrumentation Engineering	Sem.	Category	L	т	Ρ	Credit
Prereq	uisites	Nil	1	BS	3	0	0	3
Preaml	ble	This course aims to impart the knowledge on oscillations and conductors, superconductors, semiconductors and diele aforementioned topics in instrumentation engineering.						
Unit –	I	Oscillations and Waves:						9
Dampe Waves	ed oscillation	Oscillations – Simple harmonic motion – Differential equation on s – Application of simple harmonic motion in torsional pend of plane progressive wave – Types of progressive waves – Re gy transport of progressive waves.	dulum, ca	ntilever and	LC o	circui	t – R	esonance –
Unit –	II	Acoustics and Ultrasonics:						9
formula remedi	a for reverbe es – Ultras	und – Characteristics of sound – Reverberation and reverberat ration time – Determination of sound absorption coefficient – onics – Properties of ultrasonic waves – Generation of ultr ator – Non-destructive testing – Flaw detection.	- Factors	affecting acc	ustic	s of	buildiı	ngs and the
Unit –		Quantum physics:						9
principl	le (qualitativ	<ul> <li>Planck's theory – Compton scattering – Matter waves – Proget – Schrodinger's time-independent and time-dependent with a one-dimensional box.</li> </ul>						
Unit –	IV							
		Conducting and Superconducting materials:						9
Tempe	rature deper	Conducting and Superconducting materials: ron theory of metals – Electrical conductivity – Drawbacks of ualitative) – Fermi distribution function – Effect of tempera- indence of resistivity – Critical field – Meissner effect – Critica ctors and Type-II superconductors – Cryotron.	ature on	Fermi funct	ion -	- Su	perco	uantum free nductivity –
Tempe Type-I Unit –	rature deper superconduc V	ron theory of metals – Electrical conductivity – Drawbacks or ualitative) – Fermi distribution function – Effect of tempera- ndence of resistivity – Critical field – Meissner effect – Critica etors and Type-II superconductors – Cryotron. Semiconducting and Dielectric materials:	ature on al current	Fermi funct – Persistent	ion - : curi	- Su rent -	perco - Isoto	uantum free nductivity – ope effect – 9
Tempe Type-I Unit – Intrinsio (qualita	rature deper <u>superconduc</u> V c semicondu ative) – Diele	ron theory of metals – Electrical conductivity – Drawbacks of ualitative) – Fermi distribution function – Effect of tempera indence of resistivity – Critical field – Meissner effect – Critica ptors and Type-II superconductors – Cryotron.	ature on al current	Fermi funct - Persistent d band gap	ion - curi – Ex	- Su ent -	perco - Isoto c sem	uantum free nductivity – ope effect – <b>9</b> iconductors
Tempe Type-I Unit – Intrinsio (qualita	rature deper <u>superconduc</u> V c semicondu ative) – Diele	ron theory of metals – Electrical conductivity – Drawbacks of ualitative) – Fermi distribution function – Effect of tempera- indence of resistivity – Critical field – Meissner effect – Critica ctors and Type-II superconductors – Cryotron. <b>Semiconducting and Dielectric materials:</b> ctor – Carrier concentration – Fermi level – Electrical conduc ctric constant – Types of polarization mechanisms: Electronic,	ature on al current	Fermi funct - Persistent d band gap	ion - curi – Ex	- Su ent -	perco - Isoto c sem	uantum free nductivity – ope effect – <b>9</b> iconductors
Tempe Type-I Unit – Intrinsio (qualita	rature deper superconduc V c semicondu titve) – Diele Dielectric bre	ron theory of metals – Electrical conductivity – Drawbacks of ualitative) – Fermi distribution function – Effect of tempera- indence of resistivity – Critical field – Meissner effect – Critica ctors and Type-II superconductors – Cryotron. <b>Semiconducting and Dielectric materials:</b> ctor – Carrier concentration – Fermi level – Electrical conduc ctric constant – Types of polarization mechanisms: Electronic,	ature on al current	Fermi funct - Persistent d band gap	ion - curi – Ex	- Su ent -	perco - Isoto c sem	uantum free nductivity – ope effect – <b>9</b> niconductors – Dielectric
Tempe Type-I <b>Unit –</b> Intrinsio (qualita loss – I	rature deper superconduc V c semicondu ative) – Diele Dielectric bre BOOK: Avadhanulu	ron theory of metals – Electrical conductivity – Drawbacks of ualitative) – Fermi distribution function – Effect of tempera- indence of resistivity – Critical field – Meissner effect – Critica ctors and Type-II superconductors – Cryotron. <b>Semiconducting and Dielectric materials:</b> ctor – Carrier concentration – Fermi level – Electrical conduc ctric constant – Types of polarization mechanisms: Electronic,	ature on al current ctivity an ionic, ori	Fermi funct - Persistent d band gap entational an	ion - curr – Ex d spa	- Su rent - trinsia	perco - Isoto c sem harge	uantum free nductivity – ope effect – 9 niconductors – Dielectric Total:45
Tempe Type-I Unit – Intrinsia (qualita loss – I TEXT I 1.	rature deper superconduc V c semicondu ative) – Diele Dielectric bre BOOK: Avadhanulu	ron theory of metals – Electrical conductivity – Drawbacks of Jalitative) – Fermi distribution function – Effect of tempera- indence of resistivity – Critical field – Meissner effect – Critical stors and Type-II superconductors – Cryotron. <b>Semiconducting and Dielectric materials:</b> ctor – Carrier concentration – Fermi level – Electrical conduc ctric constant – Types of polarization mechanisms: Electronic, akdown – Applications of dielectric materials in capacitor.	ature on al current ctivity an ionic, ori	Fermi funct - Persistent d band gap entational an	ion - curr – Ex d spa	- Su rent - trinsia	perco - Isoto c sem harge	uantum free nductivity – ope effect – 9 niconductors – Dielectric Total:45

## 3. Tamilarasan K. and Prabu K., "Materials Science", 1<sup>st</sup> Edition, McGraw Hill Education Pvt. Ltd., New Delhi, 2019.

Charles Kittel, "Introduction to Solid State Physics", 8th Edition, John Wiley & Sons, New Jersey, 2004.

2.

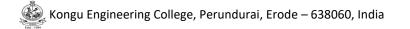
		UTCON		rse, the s	studen	ts will be	able to	)						BT Map (Highest	
CO1				concepts agation of			ind wav	ve motio	on to (	compreh	end the	phenomer	na	Applying	g (K3)
CO2	and	to rec	ognize i		rement	s of aco	ustically	good	buildin	gs and	also to	ine's formu describe th		Applying	g (K3)
CO3	use solv	the co /ing Sch	ncepts o rodinge	of quantu r's wave	im mec equatio	hanics to ns.	o descri	be the	behavi	or of ele	ectrons i	n a metal l	·	Applying	g (K3)
CO4	eleo to a	ctrical c	onductiv e conce	ity and to	o compi	ehend th	e effect	t of tem	peratu	re on Fe	rmi func	compute th tion and als application	so	Applying	g (K3)
CO5	ban	d gap o	f intrinsi		nductor	. To use	concept	ts of ele	ectric p	olarizatio		conductivit		Applying	g (K3)
						Маррі	ing of C	os with	n POs	and PSC	Ds				
Cos/F	POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO	1	3	2	2						2	2		2	1	
CO	2	3	2	2						2	2		2	1	
CO	3	3	2	2						2	2		2	1	
CO	4	3	2	2						2	2		2	1	
CO	5	3	2	2						2	2		2	1	
1 – Sli	ight, 2	– Mode	erate, 3	<ul> <li>Substar</li> </ul>	ntial, B	Γ- Bloom'	s Taxor	nomy							
						ASSE	SSMEN	Τ ΡΑΤΊ	ERN -	- THEOF	۲Y				
	st / Bl Catego	oom's ory*	Re	member (K1) %	ing	Understa (K2)		Apply (K3)		Analyz (K4) 9		Evaluating (K5) %		reating K6) %	Total %
	CAT	1		15		35		50	)						100
	CAT	2		15		35		50	)						100
	CAI												1		1
	CAT	3		15		35		50	)						100

## 22EIT11 - ELECTRON DEVICES AND CIRCUITS

Program Branch	mme & I	B.E. & Electronics and Instrumentation Engineering	Sem.	Category	L	т	Ρ	Credit
Prerequ	uisites	Nil	1/2	PC	3	0	0	3
Preamb	ble	Electron Devices and circuits deals with diodes and special of BJT Biasing, working of FET, different types of amplifiers, feed				ns. It	also f	ocus or
Unit – I		Diode Applications and Special Devices:				tors. cteristics, Appli – LDR - Surfac mal runaway – figuration. ations. MOSFE	9	
Clippers		PN junction Diode: Volt-Ampere Characteristics, Effect of tem and Voltage multipliers. Special Devices: Varactor diode – Tunne						
Unit – I		BJT Biasing and Stabilization:						9
		JT – Current gains in CB, CE and CC Configuration– Load line a Transistor Biasing: Fixed bias circuits and Voltage - divider bias					vay –	Stability
Unit – I	11	FET, MOSFET and UJT:						9
		cteristics and Applications of JFET – JFET parameters – FET in cs – UJT as relaxation oscillator.	CS, CD and	CG configura	ation	s. M0	DSFE	Т Турез
Unit – I	V	Differential Amplifier, Large Signal Amplifier and Tuned Ar	nplifier:					9
		using BJT – Differential and common mode gain, CMRR. Powe d amplifiers: Single Tuned Amplifier and Double Tuned Amplifier.	r Amplifiers:	Class A, Clas	ss B	Ampli	fier a	nd Push
Unit – \		Feedback Amplifiers and Oscillators:						9
	nt, series/shu	<ul> <li>Basic Concept of Feedback - Effects of negative feedback – T nt feedback amplifiers. Oscillators: Classification of Oscillators -</li> </ul>						
							•	Fotal:45
TEXT B	BOOK:							
<b>TEXT B</b> 1.		, "A Text Book of Applied Electronics", Revised Second Edition, S	Chand & Co	Ltd, New De	lhi, 2	022		
1.		"A Text Book of Applied Electronics", Revised Second Edition, S	Chand & Co	Ltd, New De	elhi, 2	022		
1.	R.S.Sedha	n, Suresh Kumar, "Electronic Devices and Circuits", 4 <sup>th</sup> Edition					ivate	Limited

		UTCON		se, the s	tudents	will be a	able to							BT Map (Highest L	
CO1	des	cribe th	e diode	and spec	ial elect	ronic dev	ices for	various	applica	ations			l	Jnderstand	ing(K2)
CO2	dete	ermine t	he stabil	ity factor	of BJT									Applying	(K3)
CO3	illus	strate the	e constru	uction, op	eration a	and appli	ication o	f FET, N	/IOSFE	T and U	JT		ι	Inderstandi	ng (K2)
CO4	exp	lain the	construc	ction and	operatio	on of diffe	erential,	tuned ar	nd pow	er amplif	iers		ι ι	Inderstandi	ing (K2)
CO5	con	struct fe	edback	and oscil	ator circ	cuits usin	g transis	stors						Applying	(K3)
						Марр	ing of C	Os witl	n POs a	and PSC	Ds				
COs/F	POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO	1	3	2											2	2
CO	2	3	3	1	1	1								3	3
CO	3	3	2											2	2
CO	4	3	2											2	2
CO	5	3	3	1	1	1								3	3
1 – Slig	ght, 2	– Mode	erate, 3 -	Substan	tial, BT-	Bloom's	Taxono	my					I		
						ASSE	ESSMEN		FERN -	THEOR	Y				
	t / Blo atego	oom's ory*	Re	memberi (K1) %	ng l	Jndersta (K2)	•	Apply (K3)		Analyz (K4) <sup>o</sup>	•	Evaluating (K5) %	g Crea	ating (K6) %	Total %
	CAT	1		10		55		35	5	-		-		-	100
	CAT	2		10		55		35	5	-		-		-	100
	CAT	3		10		55		35	5	-		-		-	100
								1							

	(Co	mmon to All Engineering and Technology branches exc	ept CSE, IT	, CSD, AIDS	& A	ML)		
Prog Bran	ramme & ch	All BE/BTech Engineering & Technology branches , except CSE, IT, CSD, AIDS & AIML	Sem.	Category	L	т	Р	Credit
Prere	quisites	Nil	1	ES	3	0	2	4
Prear	nble	The course aims to provide exposure to problem-sol- fundamental concepts of C Programming. This course pro C						
Unit -	-1	Introduction to C and Operators:						9
		⊥ C program – Compiling and executing C program – C Toke Variables – constants – Input / Output statements – Operato		cter set in C	– Ke	eywoi	rds –	identifiers
Unit -	- 11	Control Statements and Arrays:						9
		nd looping statements, Arrays: Declaring, initializing and and their operations.	accessing a	arrays – oper	atior	ns on	arra	ys – Two
Unit -		Functions:						9
		I on the second seco		return statem	ent -	- pas	sing p	aramete
Unit -		Strings and Pointers:	,					9
manip		n – operations on strings: finding length, concatenation, ns, Arrays of strings. Pointers : declaring pointer variables –						
Unit -		User-defined Data Types and File Handling:						9
enum	erated data ty	types: Structure: Introduction – nested structures– arrays pe. File Handling : Introduction - opening and closing files - seek(), ftell() and rewind()						
		ENTS / EXERCISES:						
1.	Programs f	or demonstrating the use of different types of format Specifie	ers					
2.	Programs for	or demonstrating the use of different types of operators like a	arithmetic, log	gical, relationa	al, ar	nd ter	nary c	perators
3.	Programs for	or demonstrating the use of using decision making statements	S					
4.	Programs for	or demonstrating the use of repetitive structures						
5.	Programs for	or demonstrating one-dimensional arrays						
6.	Programs for	or demonstrating two-dimensional arrays						
7.	Programs t	o demonstrate modular programming concepts using func	tions					
8.	Programs to	o demonstrate recursive functions.						
9.	Programs t	o demonstrate strings (Using built-in and user-definedfund	ctions)					
10.	Programs to	o illustrate the use of pointers						
10.	Programs to	o illustrate the use of structures and unions						
	Programs to	o implement file Handling						
11.				Lecture:4	5. P	racti	cal:30	Total·7
11.				Lecture.4	•, ·	aon	canot	, i otai. <i>i</i>
11. 12.	BOOK:			Lecture.4	•, •	laon	ounoe	, 10tal.1



1.	Yasł	navant	Kanetka	r, "Let us	C", 16	th Edition	, BPB F	Publicati	ons, 20	018.					
2.	Sum	itabha	Das, "Co	omputer F	undan	nentals ar	nd C Pro	ogramm	ning", 1	st Editio	n, McGr	aw Hill, 201	8.		
3.	Bala	gurusa	imy E., "	Programr	ning in	ANSI C",	7th Edi	ition, Mo	cGraw	Hill Edu	cation, 2	017.			
4.		ouz A. gage,2		an & Rich	ard F.G	Gilberg, "C	Compute	er Scier	ice A S	tructure	d Progra	amming App	oroach U	sing C", 3	<sup>rd</sup> Edition,
5.	https	://www	.cprogra	amming.c	om/tuto	orial/c-tuto	orial.htm	าไ							
COUR: On cor			-	rse, the s	tudent	s will be	able to	)						BT Map (Highest	
CO1	deve	lop sin	nple pro	grams usi	ng inpu	ut/output :	stateme	nts and	opera	tors			Арр	lying (K3) (S3)	, Precision )
CO2		tify the e state		riate loop	ing and	d control	stateme	ents in	C and	develop	applica	tions using	Арр	lying (K3) (S3	, Precision )
CO3	deve	lop sin	nple C p	rograms (	using th	ne concep	ots of ar	rays an	d modu	ular prog	rammin	g	Арр	lying (K3) (S3	, Precision
CO4	appl	y the c	oncepts	of pointer	s and o	develop C	c progra	ms usir	ng strin	gs and p	ointers		Арр		, Precision
CO5	mak	e use c	of user-d	efined da	ta type:	s and file	concep	ts to so	lve give	en proble	ems		Арр		, Precision
															/
						Марріі	ng of C	Os with	n POs a	and PSC	)s				
COs/P	Os	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO	1	3	2	2	2	1				1	1		1		
CO2	2	3	2	2	2	1				1	1		1		
COS	3	3	2	2	2	1				1	1		1		
CO4	1	3	2	2	2	1				1	1		1		
COS	5	3	2	2	2	1				1	1		1		
1 – Slię	ght, 2 -	– Mode	erate, 3 -	- Substar	itial, BT	- Bloom's	s Taxon	omy							
						ASSE	SSMEN	Τ ΡΑΤΤ	ERN -	THEOR	Y				
	t / Blo atego		Re	memberi (K1) %	ng	Understa (K2)		Apply (K3)		Analyz (K4) 9		Evaluating (K5) %		reating K6) %	Total %
	CAT1			10		30		60	)						100
	CAT2	2		10		30		60	)						100
	CAT			10		30		60	)						100
	ESE			10		30		60	)						100
* ±3% I	may b	e varie	d (CAT	1,2,3 – 50	) marks	& ESE -	- 100 ma	arks)							

	(Common to All Engineering	and Technology	Branches)				
Programme & Branch	All BE/BTech Branches	Sem.	Category	L	Т	Р	Credit
Prerequisites	Nil	1/2	ES	2	1	0	3
Preamble	To impart knowledge on orthographic, isome solving different application oriented problems.	tric projections, s	ectional views	and deve	elopmen	t of su	rfaces by
Unit – I	General Principles of Orthographic Projection	on:					6+3
Located in the Fi Surface and Circ	jection - First Angle Projection - Layout of Views rst Quadrant - Determination of True Lengths and ular Lamina Inclined to both Reference Planes.						Polygona
Unit – II	Projections of Solid:	d Cana when th					6+3
Change of Positi	imple Solids Like Prisms, Pyramids, Cylinder ar	id Cone when th	e Axis is inclir	ned to O	ne Refe	erence	Plane by
Unit – III	Sectioning of Solids:						<b>C</b> . <b>D</b>
							0+3
Sectioning of Sol	ids - Prisms, Pyramids, Cylinder and Cone in Sin ndicular to the other - Obtaining True Shape of Sec		ion by Cutting I	Planes in	clined to	o One F	
Sectioning of Sol	ids - Prisms, Pyramids, Cylinder and Cone in Sin		ion by Cutting I	Planes in	clined to	o One F	Reference
Sectioning of Sol Plane and Perper <b>Unit – IV</b> Development of	ids - Prisms, Pyramids, Cylinder and Cone in Sin ndicular to the other - Obtaining True Shape of Sec	tion.					Reference
Sectioning of Sol Plane and Perper <b>Unit – IV</b> Development of	ids - Prisms, Pyramids, Cylinder and Cone in Sin ndicular to the other - Obtaining True Shape of Sec <b>Development of Surfaces:</b> Lateral Surfaces of Simple Solids Like Prisms, P Prisms, Pyramids, Cylinders and Cones.	rtion. yramids, Cylinders					6+3
Sectioning of Sol Plane and Perper <b>Unit – IV</b> Development of Solids Involving F <b>Unit – V</b> Principles of Ison	ids - Prisms, Pyramids, Cylinder and Cone in Sin ndicular to the other - Obtaining True Shape of Sec <b>Development of Surfaces:</b> Lateral Surfaces of Simple Solids Like Prisms, P	rtion. yramids, Cylinders o <b>cAD:</b> ojections of Simp	s and Cones -E	Developm ed Solids	ent of S	Simple <sup>-</sup>	Reference 6+3 Truncated 6+3
Sectioning of Sol Plane and Perper <b>Unit – IV</b> Development of Solids Involving F <b>Unit – V</b> Principles of Ison	ids - Prisms, Pyramids, Cylinder and Cone in Sin indicular to the other - Obtaining True Shape of Sec Development of Surfaces: Lateral Surfaces of Simple Solids Like Prisms, Pyrisms, Pyramids, Cylinders and Cones. Isometric Projection and Introduction to Aut metric Projection - Isometric Scale - Isometric Pr	rtion. yramids, Cylinders o <b>cAD:</b> ojections of Simp	s and Cones -E le and Truncate - Introduction to	Developm ed Solids	ent of S Like P D.	Simple <sup>-</sup> risms, 1	Reference 6+3 Truncated 6+3 Pyramids
Sectioning of Sol Plane and Perper <b>Unit – IV</b> Development of Solids Involving F <b>Unit – V</b> Principles of Ison	ids - Prisms, Pyramids, Cylinder and Cone in Sin indicular to the other - Obtaining True Shape of Sec Development of Surfaces: Lateral Surfaces of Simple Solids Like Prisms, Pyrisms, Pyramids, Cylinders and Cones. Isometric Projection and Introduction to Aut metric Projection - Isometric Scale - Isometric Pr	rtion. yramids, Cylinders o <b>cAD:</b> ojections of Simp	s and Cones -E le and Truncate - Introduction to	Developm ed Solids o AutoCA	ent of S Like P D.	Simple <sup>-</sup> risms, 1	Reference 6+3 Truncated 6+3 Pyramids
Sectioning of Sol Plane and Perper Unit – IV Development of Solids Involving F Unit – V Principles of Ison Cylinders and Col TEXT BOOK:	ids - Prisms, Pyramids, Cylinder and Cone in Sin indicular to the other - Obtaining True Shape of Sec Development of Surfaces: Lateral Surfaces of Simple Solids Like Prisms, Pyrisms, Pyramids, Cylinders and Cones. Isometric Projection and Introduction to Aut metric Projection - Isometric Scale - Isometric Pr	rtion. yramids, Cylinders o <b>cCAD:</b> ojections of Simp graphic Projection	s and Cones -E le and Truncati - Introduction to	Developm ed Solids o AutoCA Lecture: 3	ent of S Like P D. <b>30, Tutc</b>	Simple <sup>-</sup> risms, I prial:15	Reference 6+3 Truncated 6+3 Pyramids
Sectioning of Sol Plane and Perper Unit – IV Development of Solids Involving F Unit – V Principles of Ison Cylinders and Col TEXT BOOK: 1. Natara	ids - Prisms, Pyramids, Cylinder and Cone in Sin Indicular to the other - Obtaining True Shape of Sec Development of Surfaces: Lateral Surfaces of Simple Solids Like Prisms, Pr Prisms, Pyramids, Cylinders and Cones. Isometric Projection and Introduction to Aut metric Projection - Isometric Scale - Isometric Pr nes - Conversion of Isometric Projection into Ortho	rtion. yramids, Cylinders o <b>cCAD:</b> ojections of Simp graphic Projection	s and Cones -E le and Truncati - Introduction to	Developm ed Solids o AutoCA Lecture: 3	ent of S Like P D. <b>30, Tutc</b>	Simple <sup>-</sup> risms, I prial:15	Reference 6+3 Truncate 6+3 Pyramids
Sectioning of Sol Plane and Perper Unit – IV Development of Solids Involving F Unit – V Principles of Isor Cylinders and Col TEXT BOOK: 1. Natara REFERENCES:	ids - Prisms, Pyramids, Cylinder and Cone in Sin Indicular to the other - Obtaining True Shape of Sec Development of Surfaces: Lateral Surfaces of Simple Solids Like Prisms, Pr Prisms, Pyramids, Cylinders and Cones. Isometric Projection and Introduction to Aut metric Projection - Isometric Scale - Isometric Pr nes - Conversion of Isometric Projection into Ortho	rtion. yramids, Cylinders o <b>CAD:</b> ojections of Simp graphic Projection	s and Cones -E le and Truncat - Introduction to kshmi Publisher	Developm ed Solids o AutoCA .ecture: :	ent of S 5 Like P D. <b>30, Tuto</b> nai, 2022	Simple <sup>-</sup> risms, 1 prial:15	Reference 6+3 Truncate 6+3 Pyramids , Total:4
Sectioning of Sol Plane and Perper Unit – IV Development of Solids Involving F Unit – V Principles of Isor Cylinders and Col TEXT BOOK: 1. Natara REFERENCES: 1. Venug	ids - Prisms, Pyramids, Cylinder and Cone in Sin Indicular to the other - Obtaining True Shape of Sec Development of Surfaces: Lateral Surfaces of Simple Solids Like Prisms, Pr Prisms, Pyramids, Cylinders and Cones. Isometric Projection and Introduction to Aut metric Projection - Isometric Scale - Isometric Pr nes - Conversion of Isometric Projection into Ortho ajan.K.V. "A Textbook of Engineering Graphics",35	rtion. yramids, Cylinders o <b>cAD:</b> ojections of Simp graphic Projection <sup>h</sup> Edition, Dhanala s", 16 <sup>th</sup> Edition, Ne	s and Cones - E le and Truncate - Introduction to kshmi Publisher	Developm ed Solids D AutoCA Lecture: S rs, Chenn onal Publ	ent of S 5 Like P D. <b>30, Tuto</b> nai, 2022	Simple <sup>-</sup> risms, 1 prial:15	Reference 6+3 Truncate 6+3 Pyramids , Total:4

COURSE On comp			: course, th	e studer	nts will k	be able	to							Mapped lest Leve	
CO1	interp plane		rnational s	tandards	s of draw	ings an	d sketch	the pro	jections	of point	s, lines an	d	Арр	lying (K3	)
CO2	draw	the pro	jections of	3D primi	itive obje	ects like	prisms,	pyramio	ds, cylind	ders and	cones		Арр	lying (K3	)
CO3	const	ruct the	e various se	ectional	views of	solids li	ke prism	ns, pyrai	mids, cy	linders a	ind cones		Арр	lying (K3	)
CO4	devel	op the	lateral surf	aces of s	simple ar	nd trunc	ated sol	ids					Арр Арр Арр	lying (K3	)
CO5			sometric p orthograp			nple and	d trunca	ted soli	ds and	convert	isometric			lying (K3	)
					Ма	apping	of COs	with PC	)s and F	PSOs					
COs/P	os	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO	1	3	2			2					3		2		
CO	2	3	2	1		2					3		2		
CO	3	3	2	1		2					3		2		
CO	4	3	2	1		2					3		2		
CO	5	3	2	1		2					3		2		
1 – Slight	t, 2 – Mo	oderate	e, 3 – Subs	tantial, E	T- Bloor	n's Tax	onomy								
					AS	SESSI		ATTER	N – THE	ORY					
Test / Bl Catego			embering K1) %		rstandi K2) %	ng /	Applying (K3) %		Analyziı (K4) %		Evaluat (K5) %		Creatin (K6) %		otal %
CAT	1		6		9		85								100
CAT	2		6		9		85								100
CAT	3		6		9		85								100
ESE	Ξ		10		10		80								100
* ±3% ma	ay be va	aried (C	AT 1,2,3 –	50 mark	s & ESE	E – 100	marks)	1		1		1			

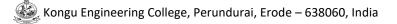
	22TAM01 - தமிழர் மரபு						
	(Common to All Engineering and Techno	logy Bra	anches)		1		ſ
Programme & Branch	All BE / BTech Branches	Sem.	Category	L	т	Р	Credit
Prerequisites	Nil	1/2	HS	1	0	0	1
Preamble	தமிழர்களின் மொழி, இலக்கியம், ஓவியர் கலைகள், வீர விளையாட்டுக்கள், திணைக் ே தமிழர்களின் பங்களிப்பைப் பற்றிய அறின நோக்கமாகும்.	காட்பா	டுகள், இந்த	திய	பண்	י זנותנ	•
அலகு –।	பொழி மற்றும் இலக்கியம்						3
சிற்றிலக்கியா பாரதியார் மற் அலகு – II நடுகல் முதல்	பங்களின் தாக்கம் - பக்தி இலக்கியம், ஆ வகள் - தமிழில் நவீன இலக்கியத்தின் வளர் றும் பாரதிதாசன் ஆகியோரின் பங்களிப்பு. மரபு - பாறை ஓவியங்கள் முதல் நவீன ஓவிய ல நவீன சிற்பங்கள் வரை - ஐம்பொன் சிலைக	ச்சி - ாங்கள் எ ள் - பழ	தமிழ் இல வரை – சிற்ட	க்கிட பக் சு	പ റ ഞെ	ນளர் ບ	ச்சியில் 3
நாட்டுப்புறத்	கைவினைப் பொருட்கள், பொம்மைகள் - தேர் ெ தெய்வங்கள் - குமரிமுனையில் திருவள்ளு பறை, வீணை, யாழ், நாதஸ்வரம் - தமிழர்க	வர் சீ	ിതல -  இ	കെ	க்க	கரு ெ	<u></u> விகள் –
நாட்டுப்புறத்	தெய்வங்கள் - குமரிமுனையில் திருவள்ளு பறை, வீணை, யாழ், நாதஸ்வரம் - தமிழர்க	வர் சீ	ിതல -  இ	കെ	க்க	கரு ெ	பிகள் – பாழ்வில்
நாட்டுப்புறத் மிருதங்கம், ப	தெய்வங்கள் - குமரிமுனையில் திருவள்ளு பறை, வீணை, யாழ், நாதஸ்வரம் - தமிழர்க	,வா் ச ளின் ச	)லை - இ சமூக பொ	കെ	க்க	கரு ெ	<u></u> விகள் –
நாட்டுப்புறத் மிருதங்கம், ட கோவில்களின அலகு – III தெருக்கூத்து, சிலம்பாட்டம்	தெய்வங்கள் - குமரிமுனையில் திருவள்ளு பறை, வீணை, யாழ், நாதஸ்வரம் - தமிழர்க எபங்கு. நாட்டுப்புறக் கலைகள் மற்றும் வீர விளையாட் கரகாட்டம், வில்லுப்பாட்டு, கணியான் கூத்து, வளரி, புலியாட்டம், தமிழர்களின் விளையாட்டு	,வர் சி ளின் ச _டுக்கவ் ஒயில	ிலை - இ சமூக பொ( п	சை ருள	க் க ாதா	கரு ஏவ	விகள் – பாழ்வில் 3
நாட்டுப்புறத் மிருதங்கம், ட கோவில்களின அலகு – III தெருக்கூத்து, சிலம்பாட்டம் அலகு – IV தமிழகத்தின் த மற்றும் புறக் எழுத்தறிவும்	தெய்வங்கள் - குமரிமுனையில் திருவள்ளு பறை, வீணை, யாழ், நாதஸ்வரம் - தமிழர்க எபங்கு. நாட்டுப்புறக் கலைகள் மற்றும் வீர விளையாட கரகாட்டம், வில்லுப்பாட்டு, கணியான் கூத்து,	,வர் சி ளின் ச -டுக்கவ் ஒயில )கள். ப்பாடு- கங்களு மற்றி.	ிலை - இ சமூக பொ( றாட்டம், சே றம் சங்க இ சங்க கால நம் - சங்கச	நால் நால் லக் த	க் ப ாதா பான கிய ந்த்தில்	கரு வ ர வ வைச் த்திடி தமிழ	பிகள் - பாழ்வில் 3 6 கூத்து 3 ல் அகப் 9கத்தில்

1.	ஆ	, பூபா	்லன், த	தமிழர்	மரபு	, VRB Pu	ublisher	s Pvt L	td, 202	22.					
REFE	REN	ICES:													
1.	-	•		0		ரும் பல 1)கள் கழ	•	èഥ- C	ස  සෙ	ചിണ്	ഞണ (	வெளியீடு	தமிழ்	நாடு ப	ாடநூல்
2.	ቆ6	னினி	த்தமிழ்	ەص - ي	തൽ	வர் இல	). சுந்த	ரம் (வ	ിക്പം	ன் பிரச	ரம்)				
3.	கீழ	ല്പ്പ - ഒ	വെടെ	<b>ந</b> திக்	கரை	யில் சா	ங்ககா	ல நகர	ர நாக	ரிகம்.(	தொ	்லியல் து	றை ெ	ນຄຳເມໍ(ເ	<b>}</b> )
4.	ରା	ாருல	றட - ஆ	ற்றங்க	ரை	நாகரிக	ம் ( தெ	தால்லி	ியல்	துறை	ഖെണ്	រាកូមិ)			
COUF	RSE	OUTC	OMES:										BT		Mapped
படிப்ச	വെ	முடித்	ந்தவுட	ன், மா	ഞ്ഞവ	ர்கள்							(Hig	hest Lev	
CO1		ிழ் ெ ஷயும்	-	மற்றும்	) இର	<b>்க்கிய</b> த்	தில் ப	மதிப்பு	மிக்க	கருத்	துக்கஎ	ளை விளக்	க் Und	lerstand	ng (K2)
CO2	தப		ளின்	சிற்பம்	் மர	ற்றும் ,	அவர்ச	ளின்	<u></u> ஓഖി	யங்க	ள் பர்	றி விளக்	க் Unc	lerstand	ng (K2)
CO3				நாட்( கூற மு		ற மற் ம்.	றும்	தற்க	ாப்புக்	ይወ	ាលភត	ளப் பற்	றி <sub>Unc</sub>	lerstand	ng (K2)
CO4	தப	<u> ம</u> ிழர்க	ளின் த	நிணை	க் கே	ாட்பாடு	களை	ப்பற்	றி வி	ளக்க (	மடியு	ம்.	Unc	lerstand	ng (K2)
CO5						மற்று மடியும்		திய ப	பண்ப	ாட்டிற்	ල අ ල	தமிழர்களில	ले Unc	lerstand	ng (K2)
						Марі	ping of	COs wi	th POs	and PS	iOs				
COs/P	os	PO1	PO2	PO3	PO4		PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	l						3		3	2	2		3		
CO2	2						3		3	2	2		3		
CO3	3						3		3	2	2		3		
CO4							3		3	2	2		3		
COS				0.1.1			3		3	2	2		3		
1 – Sli	ght, 2	2 – Moc	lerate, 3	- Substa	intial,	BT- Bloor	n's laxo	nomy							
						ASS	ESSME	NT PAT	TERN	– THEC	RY				
	t / Bl ateg	oom's ory*	Rei	member (K1) %	ing	Understa (K2)		Apply (K3)		Analyz (K4) 9		valuating (K %		eating K6) %	Total %
	CAT	1		40		60									100
	CAT	2		40		60									100
	CAT			40		60									100
	ESE	E								NA					

	22TAM01 - HERITAGE C	OF TAMILS					
	(Common to All Engineering and Te	chnology Branch	es)				
Programme & Branch	All BE / BTech Branches	Sem.	Category	L	т	Ρ	Credit
Prerequisites	Nil	1/2	HS	1	0	0	1
Preamble	The objective of this course is to impart knowledge al arts, heroic games, doctrines, contribution of Tamils to		ge, literature	, pain	tings	sculp	otures, folk
UNIT I	Language and Literature						3
buddhism & jain	e – distributive justice in sangam literature - manager ism in tamil land - bakthi literature azhwars and nayar - contribution of bharathiyar and bharathidhasan.	nmars - forms of					
	Heritage - Rock Art Paintings to Modern Art – Scu odern sculpture - bronze icons - tribes and their hand	-					
sculptures, villag	e deities, thiruvalluvar statue at kanyakumari, making c	of musical instrum	ents - mridha	angar	n, pa	rai, ve	eenai, yazl
and nadhaswara	<ul> <li>role of temples in social and economic life of tamils.</li> <li>Folk and Martial Arts</li> </ul>						3
and nadhaswara	m - role of temples in social and economic life of tamils. <b>Folk and Martial Arts</b> aragattam - villu pattu - kaniyan koothu – oyillattam - lea						3
and nadhaswara UNIT III Therukoothu – ka and games of tar UNIT IV	m - role of temples in social and economic life of tamils. Folk and Martial Arts aragattam - villu pattu - kaniyan koothu – oyillattam - lea nils. Thinai Concept of Tamils	ther puppetry – s	ilambattam –	valar	i - tig	er dar	3 nce - sports 3
and nadhaswara <b>UNIT III</b> Therukoothu – ka and games of tar <b>UNIT IV</b> Flora and fauna	<ul> <li>m - role of temples in social and economic life of tamils.</li> <li>Folk and Martial Arts</li> <li>aragattam - villu pattu - kaniyan koothu – oyillattam - lea nils.</li> <li>Thinai Concept of Tamils</li> <li>of tamils &amp; aham and puram concept from tholkapp teracy during sangam age - ancient cities and ports of tamiles</li> </ul>	ther puppetry – s	ilambattam – n literature -	valar	i - tig	er dar	3 nce - sports 3 of tamils
and nadhaswara <b>UNIT III</b> Therukoothu – ka and games of tar <b>UNIT IV</b> Flora and fauna education and lit	<ul> <li>m - role of temples in social and economic life of tamils.</li> <li>Folk and Martial Arts</li> <li>aragattam - villu pattu - kaniyan koothu – oyillattam - lea nils.</li> <li>Thinai Concept of Tamils</li> <li>of tamils &amp; aham and puram concept from tholkapp teracy during sangam age - ancient cities and ports of tamiles</li> </ul>	ther puppetry – s iyam and sangar f sangam age - e	lambattam – n literature - export and in	valar	i - tig	er dar	3 nce - sports 3 of tamils
and nadhaswara UNIT III Therukoothu – ka and games of tar UNIT IV Flora and fauna education and lit overseas conque UNIT V Contribution of t	<ul> <li>m - role of temples in social and economic life of tamils.</li> <li>Folk and Martial Arts</li> <li>aragattam - villu pattu - kaniyan koothu – oyillattam - lea nils.</li> <li>Thinai Concept of Tamils</li> <li>of tamils &amp; aham and puram concept from tholkapp teracy during sangam age - ancient cities and ports of est of cholas.</li> </ul>	ther puppetry – s iyam and sangar f sangam age - e ent and Indian Cu ce of tamils over	lambattam – n literature - export and in <b>Ilture</b> the other pa	valar arar	i - tig n cor durin	er dar ncept g sar	3 nce - sports of tamils ngam age 3 self-respec
and nadhaswara UNIT III Therukoothu – ka and games of tar UNIT IV Flora and fauna education and lit overseas conque UNIT V Contribution of t movement - role	<ul> <li>m - role of temples in social and economic life of tamils.</li> <li>Folk and Martial Arts</li> <li>aragattam - villu pattu - kaniyan koothu – oyillattam - lea nils.</li> <li>Thinai Concept of Tamils</li> <li>of tamils &amp; aham and puram concept from tholkapp teracy during sangam age - ancient cities and ports of the st of cholas.</li> <li>Contribution of Tamils to Indian National Movement amils to indian freedom struggle - the cultural influence</li> </ul>	ther puppetry – s iyam and sangar f sangam age - e ent and Indian Cu ce of tamils over	lambattam – n literature - export and in <b>Ilture</b> the other pa	valar arar	i - tig n cor durin	er dar ncept g sar	3 of tamils agam age 3 self-respec nil books.
and nadhaswara UNIT III Therukoothu – ka and games of tar UNIT IV Flora and fauna education and lit overseas conque UNIT V Contribution of t movement - role TEXT BOOK:	<ul> <li>m - role of temples in social and economic life of tamils.</li> <li>Folk and Martial Arts         aragattam - villu pattu - kaniyan koothu – oyillattam - lea nils.     </li> <li>Thinai Concept of Tamils         of tamils &amp; aham and puram concept from tholkapp teracy during sangam age - ancient cities and ports of est of cholas.     </li> <li>Contribution of Tamils to Indian National Movement         amils to indian freedom struggle - the cultural influence of siddha medicine in indigenous systems of medicine –     </li> </ul>	ther puppetry – s iyam and sangar f sangam age - e ent and Indian Cu ce of tamils over inscriptions & ma	ilambattam – m literature - export and in <b>Ilture</b> the other pa nuscripts – p	valar arar	i - tig n cor durin	er dar ncept g sar	3 nce - sports of tamils ngam age 3 self-respec
and nadhaswara UNIT III Therukoothu – ka and games of tar UNIT IV Flora and fauna education and lit overseas conque UNIT V Contribution of t movement - role TEXT BOOK: 1. S.Muthu	<ul> <li>m - role of temples in social and economic life of tamils.</li> <li>Folk and Martial Arts</li> <li>aragattam - villu pattu - kaniyan koothu – oyillattam - lea nils.</li> <li>Thinai Concept of Tamils</li> <li>of tamils &amp; aham and puram concept from tholkapp teracy during sangam age - ancient cities and ports of the st of cholas.</li> <li>Contribution of Tamils to Indian National Movement amils to indian freedom struggle - the cultural influence</li> </ul>	ther puppetry – s iyam and sangar f sangam age - e ent and Indian Cu ce of tamils over inscriptions & ma	ilambattam – m literature - export and in <b>Ilture</b> the other pa nuscripts – p	valar arar	i - tig n cor durin	er dar ncept g sar	3 nce - sport 3 of tamils ngam age 3 self-respec nil books.
and nadhaswara UNIT III Therukoothu – ka and games of tar UNIT IV Flora and fauna education and lit overseas conque UNIT V Contribution of t movement - role TEXT BOOK: 1. S.Muthu REFERENCES:	<ul> <li>m - role of temples in social and economic life of tamils.</li> <li>Folk and Martial Arts</li> <li>aragattam - villu pattu - kaniyan koothu – oyillattam - lea nils.</li> <li>Thinai Concept of Tamils</li> <li>of tamils &amp; aham and puram concept from tholkapp teracy during sangam age - ancient cities and ports of est of cholas.</li> <li>Contribution of Tamils to Indian National Movement amils to indian freedom struggle - the cultural influence of siddha medicine in indigenous systems of medicine –</li> </ul>	ther puppetry – s iyam and sangar f sangam age - e ent and Indian Cu ce of tamils over inscriptions & ma Dee Publishing F	lambattam – n literature - export and in <b>liture</b> the other pa nuscripts – p	valar arar nport	i - tig n cor durin of ind story	er dar ncept g sar ia – s of tar	3 nce - sport 3 of tamils ngam age 3 self-respec nil books. Total: 1
and nadhaswara UNIT III Therukoothu – ka and games of tar UNIT IV Flora and fauna education and lit overseas conque UNIT V Contribution of t movement - role TEXT BOOK: 1. S.Muthu REFERENCES: 1. Historica Tamil Str	m - role of temples in social and economic life of tamils.           Folk and Martial Arts           aragattam - villu pattu - kaniyan koothu – oyillattam - lea           nils.           Thinai Concept of Tamils           of tamils & aham and puram concept from tholkapp           eracy during sangam age - ancient cities and ports of           est of cholas.           Contribution of Tamils to Indian National Movement           amils to indian freedom struggle - the cultural influence           of siddha medicine in indigenous systems of medicine –           ramalingam, M.Saravanakumar, Heritage of Tamils, Yes           Il Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D.           udies).	ther puppetry – s iyam and sangar f sangam age - e ent and Indian Cu ce of tamils over inscriptions & ma Dee Publishing F Thirunavukarasu	lambattam – n literature - export and in <b>liture</b> the other pa nuscripts – p Pvt Ltd, 2023.	valar arar arar arts c rint hi yy : In	i - tig n cor durin of ind story	er dar ncept g sar ia – s of tar	3 nce - sports of tamils ngam age 3 self-respec nil books. Total: 15
and nadhaswara UNIT III Therukoothu – ka and games of tar UNIT IV Flora and fauna education and life overseas conque UNIT V Contribution of t movement - role TEXT BOOK: 1. S.Muthu REFERENCES: 1. Historica Tamil Str 2. The Cor Studies)	m - role of temples in social and economic life of tamils.           Folk and Martial Arts           aragattam - villu pattu - kaniyan koothu – oyillattam - lea           nils.           Thinai Concept of Tamils           of tamils & aham and puram concept from tholkapp           teracy during sangam age - ancient cities and ports of           to f cholas.           Contribution of Tamils to Indian National Movement           amils to indian freedom struggle - the cultural influence           of siddha medicine in indigenous systems of medicine –           ramalingam, M.Saravanakumar, Heritage of Tamils, Yes           Il Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D.           udies).           ntribution of Tamils to Indian Culture(Dr.M	ther puppetry – s iyam and sangar f sangam age - e ent and Indian Cu ce of tamils over inscriptions & ma Dee Publishing F Thirunavukarasu Valarmathi)(Pupl	lambattam – n literature - export and in <b>ulture</b> the other pa nuscripts – p Pvt Ltd, 2023.	valar arar aport arts c rint hi	i - tig n cor durin of ind story	er dar ncept g sar ia – s of tar tional	3 nce - sports of tamils ngam age 3 self-respect nil books. Total: 15 Institute o te of Tami

		OUTCO		urse, the	student	s will be	able to	)						BT Map (Highest	
CO1	exp	olain val	uable c	concepts ir	langu	age and	literature	e of tam	ils.				Und	erstanding	g (K2)
CO2	illu	strate al	bout the	e tamils sc	ulpture	and their	painting	gs.					Und	erstanding	g (K2)
CO3	sur	nmarize	e about	the tamils	folk and	d martial	arts.						Und	erstanding	g (K2)
CO4	exp	plain the	thinai	concept of	tamils.								Und	erstanding	g (K2)
CO5	exp	plain the	contril	oution of T	amils to	the India	an Natio	nal Mov	vement	t and Ind	lian cultu	ire.	Und	erstanding	g (K2)
						Маррі	ing of C	Os with	h POs	and PS	Os				
COs/P	os	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1						3		3	2	2		3		
CO2	2						3		3	2	2		3		
COS	3						3		3	2	2		3		
CO4	4						3		3	2	2		3		
COS	5						3		3	2	2		3		
1 – Sli	ght, 2	2 – Mod	erate, 3	3 – Substa	ntial, B	- Bloom	's Taxor	nomy							
						ASSE	SSMEN	Τ ΡΑΤΊ	ERN -	- THEOF	RY				
	st / B Categ	loom's  ory*	R	emember (K1) %	ing (	Jndersta (K2)		Apply (K3)		Analyz (K4) 9		Evaluating (K5) %		eating K6) %	Total %
	CA	T1		40		60									100
	CA	Т2		40		60									100
	CA	ТЗ		40		60									100
	ES	E								NA			1		
* ±3%	may	be varie	ed (CA	Г1,2&3-	- 50 ma	rks)									

	22TAM02 - தமிழரும் தொழில் (Common to All Engineering and Took	-						
Programme &	(Common to All Engineering and Tech		-		_			
Branch	All BE/BTech Branches	Sem.	Category	L	Т	P	Cr	edit
Prerequisites	Nil	2/3	HS	1	0	0		1
முன்னுரை	தமிழ் கலாச்சாரத்தோடு ஒன்றிய தொழில்	நட்பங்	களை பற்றி	ப் எ	Թ	த்து	லரத்த	່ນ
அலகு – I	நெசவு மற்றும் பானை தொழில்நுட்பம்						3	
சங்க காலத்தி	ல் நெசவு தொழில் – பானைத் தொழில்ந	துட்பம்	கருப்பு சி	வப்	Ц	⊔пб	ன்டங்க	ടണ്
பாண்டகளில் கீ	றல் குறியீடுகள்	-						
அலகு – II	வடிவமைப்பு மற்றும் கட்டிடத் தொழில்நு	ட்பம்					3	
 சங்க காலத்தில	ல் வடிவமைப்பு மற்றும் கட்டுமானங்கள் 8	க் சங்க க	காலத்தில்	ഖീ	՟Ռ	ப்பெ	பாருட்க	ടണി
	சங்க காலத்தில் கட்டுமான பொருட்களும்				-		-	
	)ய விவரங்கள் – மாமல்லபுரச்சிற்பங்களு	-	-					
	ு கள் மற்றும் பிற வழிபாட்டுத் தலங்க							_
் மாதிரிகட்டமை	ப்புகள் பற்றி அறிதல், மதுரை மீனாட்சி அம்	மன் ஆல	லாம் மற்று	ம் தி	уш	ഫര	ல நாய	பக்க
•	ட்டிநாட்டு வீடுகள் – பிரிட்டிஷ் காலத்தில் (	•		-	-		•	
, ക്തെ.								
அலகு – III	உற்பத்தித் தொழில்நுட்பம்						3	
		ற்சாலை	– இரும்ன	ย 2	_(П	, க்கு		்கு
கப்பல் கட்டும்	கலை – உலோகவியல் – இரும்புத் தொழிற				-	-	தல், எ	-
கப்பல் கட்டும் வரலாற்றுச்சால		கள் – நா	னயங்கள்	அ	ġ9	டித்	தல், எ தல் –	ഥൽ
கப்பல் கட்டும் வரலாற்றுச்சால உருவாக்கும் ெ	கலை – உலோகவியல் – இரும்புத் தொழி ற்றுகளாக செம்பு மற்றும் தங்க நாணயங்	கள் – நா டி மணி	ாணயங்கள் கள் – சுடுப	அ ைண்	ġ 9 ГЦ	டித்த ஹி	 தல், எ தல் கள்	பண சங்
கப்பல் கட்டும் வரலாற்றுச்சால உருவாக்கும் ெ	கலை – உலோகவியல் – இரும்புத் தொழிற ன்றுகளாக செம்பு மற்றும் தங்க நாணயங்க தாழிற்சாலைகள் – கல்மணிகள் – கண்ணா ம்புத்துண்டுகள் – தொல்லியல் சான்றுகள் – க	கள் – நா டி மணி சிலப்பதில	ாணயங்கள் கள் – சுடுப காரத்தில் ம	அ ைண்	ġ 9 ГЦ	டித்த ஹி	 தல், எ தல் கள்	பண சங்
கப்பல் கட்டும் வரலாற்றுச்சால உருவாக்கும் ெ மணிகள் – எலு அலகு – IV	கலை – உலோகவியல் – இரும்புத் தொழிற ன்றுகளாக செம்பு மற்றும் தங்க நாணயங்க தாழிற்சாலைகள் – கல்மணிகள் – கண்ணா ம்புத்துண்டுகள் – தொல்லியல் சான்றுகள் – க வேளாண்மை மற்றும் நீர்ப்பாசனத் தொழி	கள் – நா டி மணி சிலப்பதில ல்நுட்பம்	ாணயங்கள் கள் – சுடுப காரத்தில் ம	அ மண் மணி	ச்ச ப )க	டித்த வனி ளின்	தல், எ தல் – கள் – வகை 3	மன சங்கு கள்.
கப்பல் கட்டும் வரலாற்றுச்சால உருவாக்கும் ெ மணிகள் – எலு அலகு – IV அணை, ஏரி, கு	கலை – உலோகவியல் – இரும்புத் தொழி ன்றுகளாக செம்பு மற்றும் தங்க நாணயங்க தாழிற்சாலைகள் – கல்மணிகள் – கண்ணா ம்புத்துண்டுகள் – தொல்லியல் சான்றுகள் – க	கள் — நா டி மணி சிலப்பதில் ல்நுட்பம் ன் முக்கி	ாணயங்கள் கள் – சுடுப காரத்தில் ம ப யத்துவம் -	அ மண் மணி - கா	ச்ச ப )க ல	டித்த வணி ளின் நடை	 தல் 	மன் சங்ஞ கள். மரிப்
கப்பல் கட்டும் வரலாற்றுச்சால உருவாக்கும் ெ மணிகள் – எலு அலகு – IV அனை, ஏரி, கு – கால்நடைகஞ	கலை – உலோகவியல் – இரும்புத் தொழி ர்றுகளாக செம்பு மற்றும் தங்க நாணயங்க தாழிற்சாலைகள் – கல்மணிகள் – கண்ணா ம்புத்துண்டுகள் – தொல்லியல் சான்றுகள் – க வேளாண்மை மற்றும் நீர்ப்பாசனத் தொழி ளங்கள், மதகு – சோழர்கால குமிழித் தூம்பில நக்காக வடிவமைக்கப்பட்ட கிணறுகள் – வே	கள் – நா டி மணி சிலப்பதில ல்நுட்பம் ன் முக்கி பளாண்ன	ாணயங்கள் கள் – சுடுப காரத்தில் ம ப யத்துவம் - மை மற்றும்	அ ைண் ஹணி - கா வே	ச்ச ப ]க ஸ் பள	டித்த வணி ளின் நடை பாண்	 தல் கள் வகை  பராப பராப படை ச	மன சங்ஞ கள். மரிப் ார்ந்
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கப்பல் கட்டும் வரலாற்றுச்சால உருவாக்கும் ெ வணிகள் – எலு அலகு – IV அணை, ஏரி, கு – கால்நடைகஞ செயல்பாடுகள் குறித்த பண்டை அலகு – V	கலை – உலோகவியல் – இரும்புத் தொழி ர்றுகளாக செம்பு மற்றும் தங்க நாணயங்க தாழிற்சாலைகள் – கல்மணிகள் – கண்ணா ம்புத்துண்டுகள் – தொல்லியல் சான்றுகள் – க வேளாண்மை மற்றும் நீர்ப்பாசனத் தொழி ளங்கள், மதகு – சோழர்கால குமிழித் தூம்பில நக்காக வடிவமைக்கப்பட்ட கிணறுகள் – வே தக்காக வடிவமைக்கப்பட்ட கிணறுகள் – வே – கடல்சார் அறிவு – மீன்வளம் – முத்து ப _ய அறிவு – அறிவுசார் சமூகம்.	கள் — நா ்டி மணி சிலப்பதில ல்நுட்பம் ன் முக்கி பளாண்ன மற்றும் (	ாணயங்கள் கள் – சுடுப காரத்தில் ம ப பத்துவம் - பை மற்றும் மத்துக்குள	அ ிண் ிணி - கா வே ித்த	ச்ச ப ப ப ப ப ப ப ப ப ப ப ப ப ப	டித்த வணி ளின் நடை பாண் ற — (	 தல், எ தல் – கள் – வகை 3 _ பராப மை ச பெருங் 3	மன சங் கள். மரிப் ார்ந் கடல
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REF	ERENCES:
1.	கீழடி-வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம்.(தொல்லியல் துறை வெளியீடு)
2.	பொருநை-ஆற்றங்கரை நாகரிகம் (தொல்லியல் துறை வெளியீடு)
3.	Social Life of Tamils (Dr.K.K.Pillay) A joint Publication of TNTB & ESC and RMRL – (in print)
4.	Social Life of the Tamils – The Classical Period (Dr.S.Sigaravelu) (Published by: International Institute of Tamil Studies).
5.	Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukarasu) (Published by : International Institute of Tamil Studies)
6.	The Contribution of the Tamil to Indian Culture (Dr.M.Valarmathi) (Puplished by International Institute of Tamil Studies).
7.	Keeladi – 'Sangam City Civilzation on the banks of river Vaigai; (Jointly Published by: Department of Archaeology & Tamilnadu Text Book and Educational Services Corporation, Tamilnadu)
8.	Studies in the History of India with Special Reference to Tamilnadu (Dr.K.K.Pillay) (Published by: The Author)
9.	Porunai Civilization (Jointly Published by: Department of Archaeology & Tamilnadu Textbook and Educational Services Corporation, Tamilnadu)
10.	Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

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CO2	தமிழர் விளக்		•	மைப்பு	மற்ற	றம் க	ட்டிட	த் தொ	ழில்	நட்ப ச	ஆற்ற	ல் பற்	றி Und (K2	derstan ?)	ding
CO3			-	தித் தெ	ாழில்	நுட்பம்	் பற்ற	றி சுருக்	கமா	சுடி சூட்	ற முடி	யும்.	Uno (K2	derstan !)	ding
CO4	தமிழர் விளக்க			ாண்டை	ப ம	ற்றும்	நீர்ப்	பாசனத்	5 G	தாழில்	நுட்பட	் பற்	ற Und (K2	derstan ?)	ding
CO5	தமிழர் முடியு		அறி	வியல்	தமிழ்	மற்	றும்	கணின	ரித்த	மிழ் ப	ற்றி	விளக்	о <b>љ</b> Uno (K2	derstan ?)	ding
					Маррі	ing of (	COs w	vith POs	and F	PSOs					
	s/POs	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
	CO1						3		3	2	2		3		
	02						3		3	2	2		3		
	03						3		3	2	2		3		
C	CO4						3		3	2	2		3		
C	005						3		3	2	2		3		
1 – Slię	ght, 2 – Mo	oderate,	3 – Subs	tantial, BT	- Bloom	ı's Taxo	nomy								
					ASS	ESSME	NT PA	TTERN –	THEC	DRY					
Test /	Bloom's (	Category	<u>^</u>	nembering (K1) %	g Uno	derstan (K2) %		Applying (K3) %		nalyzing (K4) %		luating (5) %	Crea (K6		Total %
	CAT1			40		60									100
	CAT2			40		60									100
	CAT3			40		60									100
	ESE								NA	٨					

		(Common to All Engineering and Technology	LOGY	hes)				
Progra	amme &		_	•		-	Р	Cradit
Branch		All BE/BTech Branches	Sem.	Category	L	Т	P	Credit
Prereq	uisites	Nil	2/3	HS	1	0	0	1
Pream	ble	This course aims to impart the essential knowledge on the tamil of	culture and	I related techno	logy			
JNIT –	-1	WEAVING AND CERAMIC TECHNOLOGY						3
Neavir	ng Industry	y during Sangam Age – Ceramic technology – Black and Red War	e Potteries	(BRW) – Graff	iti on	Potte	eries.	
UNIT –		DESIGN AND CONSTRUCTION TECHNOLOGY						3
stones Femple Nayaka	of Sanga es of Chol ar Mahal -	Structural construction House & Designs in household materials am age – Details of Stage Constructions in Silappathikaram – las and other worship places – Temples of Nayaka Period – Typ - Chetti Nadu Houses, Indo – Saracenic architecture at Madras du	Sculptures pe study (	and Temples Madurai Meena	of Ma	amal	lapura	am – Grea Thirumal
JNIT –		MANUFACTURING TECHNOLOGY ling – Metallurgical studies – Iron industry – Iron smelting, steel	_					3
videno JNIT –	ces – Gen <b>- IV</b>	<ul> <li>Beads making – industries Stone beads – Glass beads –Terrace n stone types described in Silappathikaram.</li> <li>AGRICULTURE AND IRRIGATION TECHNOLOGY</li> </ul>						3
Agricul		ds, Sluice, Significance of Kumizhi Thoompu of Chola Period, A Agro Processing – Knowledge of Sea – Fisheries – Pearl – Conche						
JNIT –		SCIENTIFIC TAMIL & TAMIL COMPUTING						3
		Scientific Tamil - Tamil computing - Digitalization of Tamil Book	ks – Deve	opment of Tan	nil So	ftwar	e – T	amil Virtu
Acader	my – Tami	il Digital Library – Online Tamil Dictionaries – Sorkuvai Project.						
								Total:1
EXT E	BOOK:							Total:1
		of Tamils (Dr.K.K.Pillay) A joint Publication of TNTB & ESC and R	:MRL – (in	print)				Total:1
l. S	Social Life				of Ta	mil S	Studie	
1. S 2. S	Social Life	of Tamils (Dr.K.K.Pillay) A joint Publication of TNTB & ESC and R			of Ta	mil S	Studies	
1. S 2. S REFER	Social Life Social Life <b>RENCES</b> :	of Tamils (Dr.K.K.Pillay) A joint Publication of TNTB & ESC and R of the Tamils – The Classical Period (Dr.S.Sigaravelu) (Published	by: Interna	ational Institute				5).
1. S 2. S REFER	Social Life Social Life RENCES: தமிழக (	of Tamils (Dr.K.K.Pillay) A joint Publication of TNTB & ESC and R of the Tamils – The Classical Period (Dr.S.Sigaravelu) (Published வரலாறு - மக்களும் பண்பாடும் - கே கே பிள்ளை	by: Interna (ബെണി।	ational Institute பீடு தமிழ்நா				5).
1. S 2. S REFER 1. d	Social Life Social Life RENCES: தமிழக கல்வியி	of Tamils (Dr.K.K.Pillay) A joint Publication of TNTB & ESC and R of the Tamils – The Classical Period (Dr.S.Sigaravelu) (Published வரலாறு - மக்களும் பண்பாடும் - கே கே பிள்ளை ல் பணிகள் கழகம்), உலகத் தமிழாராய்ச்சி நிறுவல	by: Interna (வெளிட எம், செ6	ational Institute பீடு தமிழ்நா				5).
1. S 2. S REFER 1. <mark>5</mark> 8 2. 8	Social Life Social Life RENCES: தமிழக கல்வியி கணினில்	of Tamils (Dr.K.K.Pillay) A joint Publication of TNTB & ESC and R of the Tamils – The Classical Period (Dr.S.Sigaravelu) (Published வரலாறு - மக்களும் பண்பாடும் - கே கே பிள்ளை 1ல் பணிகள் கழகம்), உலகத் தமிழாராய்ச்சி நிறுவன த்தமிழ் முனைவர் இல. சுந்தரம், விகடன் பிரசுரம், 2	by: Interna (வெளி၊ எம், செல 2016	ational Institute பீடு தமிழ்நா ர்னை, 2002	ւԹ ւ	JΠL		5).
1. S 2. S <b>REFER</b> 1. <b>5</b> 4 2. <b>6</b> 3. <b>6</b>	Social Life Social Life RENCES: தமிழக தமிழக கல்வியி கணினிஷ கீழடி லை	of Tamils (Dr.K.K.Pillay) A joint Publication of TNTB & ESC and R of the Tamils – The Classical Period (Dr.S.Sigaravelu) (Published வரலாறு - மக்களும் பண்பாடும் - கே கே பிள்ளை 1ல் பணிகள் கழகம்), உலகத் தமிழாராய்ச்சி நிறுவன த்தமிழ் முனைவர் இல. சுந்தரம், விகடன் பிரசுரம், 2 வகை நதிக்கரையில் சங்ககால நகர நாகரிகம்.(தொ	by: Interna (வெளி। எம், செல 2016 ால்லியல	ational Institute பீடு தமிழ்நா ர்னை, 2002	ւԹ ւ	JΠL		
1. S 2. S REFER 1. g 2. d 3. d 4. G 5. H	Social Life Social Life RENCES: தமிழக கல்வியி கணினி கணினி கீழடி வை பொருன Historical	of Tamils (Dr.K.K.Pillay) A joint Publication of TNTB & ESC and R of the Tamils – The Classical Period (Dr.S.Sigaravelu) (Published வரலாறு - மக்களும் பண்பாடும் - கே கே பிள்ளை ல் பணிகள் கழகம்), உலகத் தமிழாராய்ச்சி நிறுவன த்தமிழ் முனைவர் இல. சுந்தரம், விகடன் பிரசுரம், 2 வகை நதிக்கரையில் சங்ககால நகர நாகரிகம்.(தொ ந ஆற்றங்கரை நாகரிகம் (தொல்லியல் துறை வெ Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. T	by: Interna (வெளிட எம், செல 2016 ால்லியல்	ational Institute பீடு தமிழ்நா ள்னை, 2002 ல் துறை வெ	ாடு ட பளிய	பாட 1ந	நூல்	<sub>3</sub> ). 9 மற்றுப
1.     S       2.     S       REFER     8       1.     8       2.     8       3.     8       4.     6       5.     1	Social Life Social Life RENCES: தமிழக கல்வியி கணினில கணினில கணினில கணினில பாருன Historical nstitute o	of Tamils (Dr.K.K.Pillay) A joint Publication of TNTB & ESC and R of the Tamils – The Classical Period (Dr.S.Sigaravelu) (Published வரலாறு - மக்களும் பண்பாடும் - கே கே பிள்ளை ல் பணிகள் கழகம்), உலகத் தமிழாராய்ச்சி நிறுவன த்தமிழ் முனைவர் இல. சுந்தரம், விகடன் பிரசுரம், 2 வகை நதிக்கரையில் சங்ககால நகர நாகரிகம்.(தொ நை ஆற்றங்கரை நாகரிகம் (தொல்லியல் துறை வெ	by: Interna (வெளிட எம், செ 2016 ால்லியல மியீடு Thirunavu	ational Institute பீடு தமிழ்நா ன்னை, 2002 ல் துறை வெ karasu) (Publ	រក្រ L រតាំាំំ	<b>лп</b> ட 9(С) 1 by	நூல் : In	s). பற்றுட ternationa
1.     S       2.     S       REFER       1.     g       2.     d       3.     d       4.     G       5.     H       10.     T       7.     K	Social Life Social Life RENCES: தமிழக கல்வியி கணினின் கணினின் கீழடி வை பொருன Historical nstitute o The Contri Keeladi – '	of Tamils (Dr.K.K.Pillay) A joint Publication of TNTB & ESC and R of the Tamils – The Classical Period (Dr.S.Sigaravelu) (Published வரலாறு - மக்களும் பண்பாடும் - கே கே பிள்ளை ல் பணிகள் கழகம்), உலகத் தமிழாராய்ச்சி நிறுவன த்தமிழ் முனைவர் இல. சுந்தரம், விகடன் பிரசுரம், 2 வகை நதிக்கரையில் சங்ககால நகர நாகரிகம்.(தொ ந ஆற்றங்கரை நாகரிகம் (தொல்லியல் துறை வெ Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. T f Tamil Studies)	by: Interna (வெளிட எம், செ 2016 ால்லியல பளியீடு Thirunavu by Interna	ational Institute பீடு தமிழ்நா ள்னை, 2002 ல் துறை வெ karasu) (Publ tional Institute o	រក្រ L រតាាំំំ ishec	ןער וון St	நூல் : In	s). மற்றுட ternationa ).
1.     S       2.     S <b>REFER</b> 1. <b>B</b> 2. <b>B</b> 3. <b>B</b> 4. <b>Q</b> 5.     H       10.     T       7.     T	Social Life Social Life RENCES: தமிழக கல்வியி கணினில கணினில கணினில கணினில கணினில குட்டு பாருன Historical nstitute o The Contri Keeladi – ' Fext Book	of Tamils (Dr.K.K.Pillay) A joint Publication of TNTB & ESC and R of the Tamils – The Classical Period (Dr.S.Sigaravelu) (Published வரலாறு - மக்களும் பண்பாடும் - கே கே பிள்ளை ல் பணிகள் கழகம்), உலகத் தமிழாராய்ச்சி நிறுவன த்தமிழ் முனைவர் இல. சுந்தரம், விகடன் பிரசுரம், 2 வகை நதிக்கரையில் சங்ககால நகர நாகரிகம்.(தொ ந ஆற்றங்கரை நாகரிகம் (தொல்லியல் துறை வெ Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. T f Tamil Studies) bution of the Tamils to Indian Culture (Dr.M.Valarmathi)(Puplished Sangam City Civilzation on the banks of river Vaigai; (Jointly Publis	by: Interna (வெளி၊ எம், செ 2016 Tல்லிய னியீடு Thirunavu by Interna shed by: D	ational Institute பீடு தமிழ்நா ன்னை, 2002 ல் துறை வெ karasu) (Publ tional Institute of A	រក្រ L Jតាាំំំំំំំំំំំំំំំំំំំំំំំំំំំំំំំំំំំ	וו Si eolog	நூல் : In	s). மற்றுட ternationa ).
.     .     .     .       .     .     .     .       .     .     .     .       .     .     .     .       .     .     .     .       .     .     .     .       .     .     .     .       .     .     .     .       .     .     .     .       .     .     .     .       .     .     .     .       .     .     .     .       .     .     .     .       .     .     .     .       .     .     .     .	Social Life Social Life RENCES: தமிழக கல்வியி கணினில கைகை கைக்கை கணினில கைக்கை கைகை கைக்கை கைக்கை கைக்கை கைக்கை கைக்கை கைக்கை கைக்கை கைக்கை கைக்கை கைக்கை கைக்கை கைக்கை கைக்கை கைக்கை கைக்கை கைகை கைக்கை கைக்கை கை கை கைக்கை கைக்கை கைக்கை கைக்கை கைக்கை கைக்கை கைக்கை கைக்கை கைக்கை கைக்கை கைக்கை கைக்கை கை கைக்கை கை கைக்கை கைக்கை கைக்கை கைக்கை கைக்கை கைக்கை கைக்கை கைக்கை கைக்கை கைக்கை கை கை கை கை கை கை கை கை கை கை கை கை க	of Tamils (Dr.K.K.Pillay) A joint Publication of TNTB & ESC and R of the Tamils – The Classical Period (Dr.S.Sigaravelu) (Published வரலாறு - மக்களும் பண்பாடும் - கே கே பிள்ளை ல் பணிகள் கழகம்), உலகத் தமிழாராய்ச்சி நிறுவன த்தமிழ் முனைவர் இல. சுந்தரம், விகடன் பிரசுரம், 2 வகை நதிக்கரையில் சங்ககால நகர நாகரிகம்.(தொ ந ஆற்றங்கரை நாகரிகம் (தொல்லியல் துறை வெ Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. T f Tamil Studies) bution of the Tamils to Indian Culture (Dr.M.Valarmathi)(Puplished Sangam City Civilzation on the banks of river Vaigai; (Jointly Publia and Educational Services Corporation, Tamilnadu)	by: Interna (வெளிட எம், செ 2016 ால்லிய ளியீடு Thirunavu by Interna shed by: D illay) (Publ	ational Institute பீடு தமிழ்நா ள்னை, 2002 ல் துறை வெ karasu) (Publ tional Institute of epartment of A ished by : The	I (G) L Jafilu iishec of Tar Archae Autho	IIT∟ Î() I by nil St eolog r)	நூல் : In tudies y & T	s). p மற்று ternation ). amilnadu

COUR On co			MES: the cours	se, the st	udents v	vill be ab	le to						()	BT Map Highest I	
CO1	ехр	lain we	aving and	ceramic	technolog	gy in tamil	culture	and tamil	society.				Un	derstand	ing (K2)
CO2	Illus	strate a	bout the d	esign and	d construc	ction tech	nology.						Un	derstand	ing (K2)
CO3	sum	nmarize	about the	e manufa	cturing te	chnology.							Un	derstand	ing (K2)
CO4	exp	lain the	agricultur	e and irri	gation teo	chnology.							Un	derstand	ing (K2)
CO5	exp	lain the	significar	ice of tan	nil in scier	ntific and	computir	ng.					Un	derstand	ing (K2)
						Mappin	g of CO:	s with PC	)s and P	SOs					
COs/P	Os	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1							3		3	2	2		3		
CO2	2						3		3	2	2		3		
CO3	3						3		3	2	2		3		
CO4	ļ						3		3	2	2		3		
CO5	5						3		3	2	2		3		
1 – Slię	ght, 2	2 – Mod	erate, 3 –	Substant	tial, BT- B	Bloom's Ta	axonomy	,		·				·	
							SMENT	PATTER	N – THEO	ORY			-	1	
Test / Cate	Bloo egory		Rememt (K1)			standing 2) %		plying (3) %		alyzing (4) %		uating 5) %	Crea (K6)		Total %
С	AT1		40		6	60									100
С	AT2		40		6	60									100
С	AT3		40		(	60									100
E	SE			I					NA				•		
* ±3%	mav	be var	ed (CAT	1.2.3 – 50	) marks)										

Progra Branc	amme h	&	BE- E	lectron	ics and	l Instru	mentat	ion Eng	gineerir	ng	Sem.	Category	L	т	Р	Credit			
	quisite	s	Nil								1	BS	0	0	2	1			
Pream			modu therm and L requir	lus, AC al cond JJT, and ement.	freque uctivity, d also te	ncy, ve band g	elocity c ap, Hal	of ultras I coeffic	onic wa ient and	ave, co d knowle	mpressik edge on	tion of par vility of a liv the working project / p	quid, ∶ ⊢of LC	speci R cir	fic res cuit, p	sistance.			
	1			<b>EXER</b>		ulus of t	the aive	n metal	lic wire	usina ta	orsional r	endulum /	Studvi	na th	e vari	ation of			
1.					eries LO			innotai		doing to			oraayi	ng a	o van				
2.	Dete	ermina	tion of t	he frequ	uency o	falterna	ating cu	rrent us	ing elec	trically	vibrating	tuning fork	(Meld	e's a	ppara	tus).			
3.		ermina ferom		he velo	city of u	ltrasoni	c waves	s in a lic	luid and	I the coi	mpressib	ility of the li	quid u	sing	ultras	onic			
4.	Dete	ermina	tion of t	he spec	cific resi	stance	of the g	iven me	etallic wi	re usiną	g Carey-l	Foster's bri	dge.						
5.	Dete	ermina	tion of t	he therr	mal con	ductivity	y of a ba	ad cond	uctor us	sing Lee	e's disc.								
6.	Dete	ermina	tion of t	he band	d gap of	a giver	n semic	onductir	ng mate	rial usir	ng post-o	ffice box.							
7.	Obse	ervatio	on of the	e I-V cha	aracteris	stics of	a p-n ju	nction c	liode.										
8.				e I-V cha rrangen		stics of	a uni ju	nction ti	ransisto	r / Dete	rminatior	n of Hall co	efficier	nt of a	a mate	erial			
9.	Dete	ermina	tion of t	he thick	ness of	a thin v	wire usi	ng air-w	edge m	ethod.									
10.	Writi	ing co	ding for	any one	e of the	above	experim	nents / d	levelopi	ng a pro	oject / a p	product.							
																Total:30			
				/SOFT						st 🗖 alitica	- 2020								
1.	-			y Manu	al / Rec	ora, De	ерапте	nt of Ph	IYSICS, 1		on, 2020.								
	SE OL			urse, th	e stude	ents wil	ll be ab	le to							Γ Map hest ∣	ped Level)			
CO1	deter serie	rmine es LCF	the rigion	dity moo t. To de	dulus of	a wire e AC fre	using the	he conc y and tl	epts of ne velo	twisting city of ι	couple ultrasoun	or to study d in a liqui	a d	Арр	olying	(K3),			
CO2	deter cond deter resis	rmine ductivit rmine stance	the spe y of a b the ba with ter	cific res ad cono nd gap nperatu	sistance ductor u of ser ire and t	using the sing the nicondu to obtain	the prin e conce uctor m n the I-\	ciple of ept of he aterials / charae	eat cond using cteristic	luction t the cor s of a p	hrough r ncept of -n junctio	I the therman materials. T variation of the diode.	o of		olying				
CO3	nega Hall	ative r effect	esistano . To det	ce or to ermine	determ	ine the ckness	Hall co of a thin	oefficien n film us	t of a m	naterial	using th	region wit e concept o rference an	of		olying				
						Маррі	ing of C	Cos witl	h POs a	and PS	Os								
COs/P	POs	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	P012	2 F	<b>SO</b> 1	PSO			
	1	3	2	2	3					2	2		2		1				
CO										1	1	1							
CO CO2 CO3	2	3 3	2 2	2 2	3 3					2	2		2		1				

		(Common to	all BE/BTech branches)					
Prog Bran	amme& ch	All BE/BTech branches	Ser	n. Category	L	т	Р	Credit
Prere	quisites	Nil	1 /	2 ES	0	0	6	3
Prear	nble	This course is designed to provide a on the house wiring, Internet of Thir			ith ha	ands-	on ex	perience
LIST	OF EXPERI	MENTS / EXERCISES:						
		PART A – Electr	ical Installation (30 Hours	6)				
1.	Develop	wiring diagrams using software tools.						
2.	Identify a	and select suitable components for Ene	rgy Measurement and Circ	uit Protection				
3.	Design a	wiring circuit integrating Energy Meter	MCB and RCCB					
4.	Develop	a wiring circuit for incandescent lamp a	nd fluorescent lamp					
5.	Develop	and Investigate Simple and Staircase V	Viring for Residential Applic	cations				
6.	Design th	ne Wiring Circuits for Calling Bell Syste	m and Dimmable Light					
7.	Create w	iring circuits for power loads						
8.	Measure	ment of Earth Resistance and its conne	ections.					
		PART B – Inte	rnet of Things (30 Hours)					
1.	Design a	Single layer PCB layout designing						
2.	Fabricate	e Single layer PCB printing						
3.	Assembli	ing, soldering and desoldering practice	on single layer PCB					
4.	GPIO pro	ogramming in ESP8266						
5.	Sensor a	nd actuator interfacing with internet en	abled microcontroller device	е				
6.	Sensor a	nd actuator calibration						
7.	Integratio	on of microcontroller based system with	Cloud platform					
		PART C – Web	Technologies (30 Hours)					
1.	Design a	website for an application using HTML	and CSS.					
2.	Convert t	the designed website into responsive w	ebsite using Bootstrap.					
3.	Add dyna	amism to the website by using JavaScr	pt and embed the Social M	ledia componen	ts to	the w	ebsite	ə.
4.	Incorpora	ate database interaction to the website.						
т.		ne developed website in the server.						

1.	Lal	ooratory	/ Manua	al											
2.		c T.Fre Reilly , 2		lisabeth	Robso	n, "Hea	d First J	JavaScr	ipt Prog	grammir	ng A Brair	n-Friendly	Guide", 1	st Editio	٦,
3.	Eri	c T.Fre	eman,E	lisabeth	Robso	n, "Hea	d First H	HTML a	nd CSS	5",2nd E	dition, O'	Reilly , 20	12		
4.	Lyr	nn Beig	hley,"He	ead Firs	t SQL",	1st Edit	in, O'Re	eilly,200	)7.						
		OUTCO		urse, th	e stude	ents wil	l be ab	le to					()	BT Map lighest L	
CO1	de	sign ele	ctrical v	viring ci	cuits fo	r buildir	ngs bas	ed on tł	neir requ	uiremer	ıt			Applying( Precision	
CO2	dev	velop lo	T base	d solutio	ons and	PCB fo	r real w	orld use	e cases					Applying Precision	
CO3	de	sign and	d host a	n intera	ctive dy	namic v	vebsite.							Applying( Precision	
						Маррі	ng of C	Os wit	h POs a	and PS	Os				
COs/P	Os	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO	1	3	2	2	1					1					
CO2	2	3	2	2	1					1					
CO	3	3	2	2	1					1					
1 – Sli	ght, 2	2 – Mod	erate, 3	- Subs	tantial,	BT- Blo	om's Ta	axonom	iy						

			2							BORAT					
Programm	۵&					II Engin	eering	and Teo	chnolog	y Branch					
Branch	eu	All B	E/BTec	h Bran	ches					Sem.	Category	L	Т	Ρ	Credit
Prerequisi	tes	Nil								1	ES	0	0	2	1
Preamble			course eering p			o provi	de a h	ands-or	n exper	ience in	basic of	mecha	anical	and	electrical
LIST OF E	XPERI														
										NEERIN					
1.	Таррі	ng, and	Assem	bling Ta	asks fro	m the g	iven Sq	uare / F	Rectang	ular MS	t for Mating Plates usin	g Mod	lern Po	ower	Tools.
2.	Powe	r Tools.			•						k / Tray out	-			
3.		rm the <sup>-</sup> Proof.	Thread	Format	ion on a	a GI/PV	/C Pipe	and P	repare a	a Water	Line from t	he Ov	verhea	id Tai	nk that is
4.	Make	a Butt /	′Lap/T	ee Join	t of MS	Plate u	sing Ar	c Weldi	ng Proc	ess and	Welding Si	mulato	or.		
5.			epare a dern Po			lodel w	ith the	Knowle	edge fro	om Fittin	g / Carper	itry /	Plumb	oing /	Welding
						– ELEC	TRICA	L AND	ELECT	RONICS	ENGINEE	RING			
6.			for fluo					-							
7.			t of Inca			using I	mpulse	Relay							
8.			t of Ear												
9.		•	Simple (				•								
10.	Imple	mentatio	on of ha	If wave	and ful	l wave l	Rectifie	r using (	diodes						
REFEREN		A NI 1 A I	ISOET												Total:30
1.		-	Practice			lanual									
COURSE O	OUTCO	MES:					ole to							۲ Map hest	ped Level)
-	1		-					ompleti	on of th	ne plann	ed models	/		iting (	
CO1	innov	ative ar	ticles	•				•		•		Ν	/lanipu	ulation	n (Ś2)
CO2	accur	•	use app	oropriate	e mode	m powe	er toois	and co	mpiete	the exer	cises/mode		Appı Nanipu	ying ( ulatior	
CO3	perfor	m hous	e wiring	and re	alize the	e impor	tance o	f earthir	ng					olying oulatio	(K3), on (S2)
CO4	solde	ring with	n simple	electro	nics cir	cuits							App	blying	( )
CO5	troubl	e shoot	the ele	ctrical a	nd elec	tronic c	ircuits						App	blying	(K3),
								th POs	and PS	SOs			Mani	pulatio	on (S2)
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO1	2 P	SO1	PSO2
CO1	3		3	1	3	1			3	3		3			
CO2	3		3	1	3				3	3		3			
CO3	3		3	2	1				2	2		3		3	2
CO4	3		2	1	1				2	3		3		3	2
CO5	3		3	2	1				2	2		3		3	2
1 – Slight, 2	2 – Mod	lerate, 3	3 – Sub	stantial,	BT- Blo	oom's T	axonon	ny		•	·				

	(Common to All Engineering	and Technology Brand	ches)				
Programme & Branch	All B.E./B.Tech. Branches	Sem.	Category	L	т	Р	Credit
Prerequisites	Nil	1/2	HS	1	0	1	1
Preamble	Yoga or yogasanas are considered as art and s harmony of body and mind for general wellbein Indians for healthy living. Students in particular	ng. Yoga is considered	as one of the				
Unit – I	Introduction:		0,0				2
Asanas – Class	Yoga – Definitions - Concepts - Aims and objectives affications of Yogasanas – Patanjali's Ashtanga Yo ams of Yoga – Modern Trends in yoga.						
Unit – II	Yoga and Mind:						2
	find - Five Elements and the Mind - Meditation and I Disorders, Major Depressive Disorder, Cyclothymic		of the Mind - F	ole of	Yoga	a in P	sychologica
Unit – III	Yoga and Values, Diet:						2
Human Values -	<ul> <li>Social Values – Role of Yoga in Personality Integ</li> </ul>	ration - Concepts of N	latural Diet - N	aturon	athy	Diet -	- Eliminativ
	<ul> <li>Social Values – Role of Yoga in Personality Integ</li> <li>Diet – Constructive Diet.</li> <li>Asanas:</li> </ul>	ration - Concepts of N	latural Diet - N	aturop	athy	Diet -	- Eliminativo
Diet – Soothing <b>Unit – IV</b> Prayer - Startin	Diet – Constructive Diet.	g Practices – Meanin	g, Definitions	·	-		2
Diet – Soothing <b>Unit – IV</b> Prayer - Startin	Diet – Constructive Diet. Asanas: g & Closing - Preparatory practices – Loosening	g Practices – Meanin	g, Definitions	·	-		2
Diet – Soothing <b>Unit – IV</b> Prayer - Startin Principles of Pra <b>Unit – V</b> Breathing Practi	Diet – Constructive Diet. Asanas: g & Closing - Preparatory practices – Loosening acticing Asanas. Asanas: Standing – Sitting – Prone	g Practices – Meanin e – Supine – Suryanam f Pranayama - Princip	g, Definitions naskar. bles of Practici	and C	bject	tives	2 of Asanas 2
Diet – Soothing <b>Unit – IV</b> Prayer - Startin Principles of Pra <b>Unit – V</b> Breathing Practi	Diet – Constructive Diet.  Asanas:  g & Closing - Preparatory practices – Loosening acticing Asanas. Asanas: Standing – Sitting – Prone  Pranayama and Meditation:  ices for awareness - Definitions and Objectives of	g Practices – Meanin e – Supine – Suryanam f Pranayama - Princip	g, Definitions haskar. bles of Practici – Meditation.	and C	Dbject	tives ama.	2 of Asanas 2
Diet – Soothing <b>Unit – IV</b> Prayer - Startin Principles of Pra <b>Unit – V</b> Breathing Practi	Diet – Constructive Diet.  Asanas:  g & Closing - Preparatory practices – Loosening acticing Asanas. Asanas: Standing – Sitting – Prone  Pranayama and Meditation:  ices for awareness - Definitions and Objectives of	g Practices – Meanin e – Supine – Suryanam f Pranayama - Princip	g, Definitions haskar. bles of Practici – Meditation.	and C	Dbject	tives ama.	2 of Asanas 2 Pranayama
Diet – Soothing Unit – IV Prayer - Startin Principles of Pra Unit – V Breathing Practi Nadi Shuddhi - TEXT BOOK:	Diet – Constructive Diet.  Asanas:  g & Closing - Preparatory practices – Loosening acticing Asanas. Asanas: Standing – Sitting – Prone  Pranayama and Meditation:  ices for awareness - Definitions and Objectives of	g Practices – Meanin – Supine – Suryanam f Pranayama - Princip Relaxation Techniques	g, Definitions haskar. bles of Practic – Meditation. Lecture	and C ing Pr <b>: 10,</b> I	Dbject anaya	ama.	2 of Asanas 2 Pranayama
Diet – Soothing Unit – IV Prayer - Startin Principles of Pra Unit – V Breathing Practi Nadi Shuddhi - TEXT BOOK: 1. Swami s	Diet – Constructive Diet. Asanas: g & Closing - Preparatory practices – Loosening acticing Asanas. Asanas: Standing – Sitting – Prone Pranayama and Meditation: ices for awareness - Definitions and Objectives of Kapalabathi – Sitali – Sitkari – Bhranari – Ujjayi – R	g Practices – Meanin – Supine – Suryanam f Pranayama - Princip Relaxation Techniques bandha", Bihar school	g, Definitions haskar. bles of Practic – Meditation. <b>Lecture</b> of yoga, 4 <sup>th</sup> Ec	and C ing Pr <b>: 10,</b> I	Dbject anaya	ama.	2 of Asanas 2 Pranayama
Diet – Soothing Unit – IV Prayer - Startin Principles of Pra Unit – V Breathing Practi Nadi Shuddhi - TEXT BOOK: 1. Swami s	Diet – Constructive Diet. Asanas: g & Closing - Preparatory practices – Loosening acticing Asanas. Asanas: Standing – Sitting – Prone Pranayama and Meditation: ices for awareness - Definitions and Objectives of Kapalabathi – Sitali – Sitkari – Bhranari – Ujjayi – R satyananda saraswathi, "Asana pranayama mudra mukthi Bodhanandha, "Hatha yoga pradipika", Biha	g Practices – Meanin – Supine – Suryanam f Pranayama - Princip Relaxation Techniques bandha", Bihar school	g, Definitions haskar. bles of Practic – Meditation. <b>Lecture</b> of yoga, 4 <sup>th</sup> Ec	and C ing Pr <b>: 10,</b> I	Dbject anaya	ama.	2 of Asanas 2 Pranayama
Diet – Soothing Unit – IV Prayer - Startin Principles of Pra Unit – V Breathing Practi Nadi Shuddhi - TEXT BOOK: 1. Swami s 2. Swami n REFERENCES:	Diet – Constructive Diet. Asanas: g & Closing - Preparatory practices – Loosening acticing Asanas. Asanas: Standing – Sitting – Prone Pranayama and Meditation: ices for awareness - Definitions and Objectives of Kapalabathi – Sitali – Sitkari – Bhranari – Ujjayi – R satyananda saraswathi, "Asana pranayama mudra mukthi Bodhanandha, "Hatha yoga pradipika", Biha	g Practices – Meanin – Supine – Suryanam f Pranayama - Princip Relaxation Techniques bandha", Bihar school	g, Definitions haskar. bles of Practic – Meditation. <b>Lecture</b> of yoga, 4 <sup>th</sup> Ec	and C ing Pr <b>: 10,</b> I	Dbject anaya	ama.	2 of Asanas 2 Pranayama

		COMES	-	the stude	ents will	be able t	0							lapped st Level)
CO1	reali	ze the im	portance	e of yoga	in physic	al health.							(Highe:       Applyi       Applyi       Applyi       Applyi       Applyi       Applyi	ing (K3)
CO2	reali	ze the im	portance	e of yoga	in menta	l health.							Apply	ing (K3)
CO3	reali	ze the ro	le of yog	a in perso	onality de	evelopmer	nt and diet						Apply	ing (K3)
CO4	do tl	he looser	ning pract	tices, Asa	anas and	realize its	s benefits.						Apply	ing (K3)
CO5	do ti	he practio	ce of Pra	nayama,	meditatio	on and rea	alize its ber	nefits					Apply	ing (K3)
					Ма	pping of	COs with	POs	and I	PSOs				
COs/P	Os	PO1	PO2	PO3	PO4	PO5	PO6	P	07	PO8	PO9	PO10	PO11	PO12
CO1							3			2	1			
CO2	2						3			2				
CO3	5						3			3				
CO4	ŀ						3			2	3			
CO5	;						3			3				
1 – Sligh	ıt, 2 –	Moderate	e, 3 – Sul	bstantial,	BT- Bloc	om's Taxo	nomy							
Test	,				AS	SESSME	NT PATTI	ERN -	- 186	ORY				
Bloom	ı's		embering (1) %	g U	nderstar (K2) %		Applyii (K3) %			nalyzing (K4) %		luating (5) %	Creating (K6) %	Total %
CAT1			-		-		-			-		-	-	-
CAT2	2		-		-		-			-		-	-	-
CAT	3		20		30		50			-		-	-	100
ESE			-		-		_			-		-	-	-

			-)				
Programme &	(Common to All Engineering ar	nd Technology Branche	,				
Branch	All B.E./B.Tech. Branches	Sem.	Category	L	Т	Р	Credi
Prerequisites	Communication Skills I	2	HS	3	0	0	3
Preamble	This course is designed to equip students with t develop their linguistic and communicative com		sten, read, w	rite a	and s	peak s	o as to
Unit – I	Grammar, Vocabulary, Listening, Speaking,	Reading & Writing					9
substitution - Lis Reading: Readir Unit – II	ence Patterns - Simple, Compound & Complex stening: Speeches from company CEOs - TV of ng for Gist - Writing: Job application letter with res Grammar, Vocabulary, Listening, Speaking,	debates <b>Speaking:</b> Ju sume – Transcoding <b>Reading &amp; Writing</b>	st-a-minute ta	alk •	Gro	up dis	cussion 9
Talking about co	ord - Vocabulary: Phrasal verbs - Idioms & Ph elebrities - Practicing Pronunciation through we nciples of a machine - Writing: Description: Persor	eb tools - Reading:	Company c	orres			
Unit – III	Grammar, Vocabulary, Listening, Speaking,	, Reading & Writing					9
	Business Plans - Writing: a dream job/company						Checklist
Unit – IV Grammar: Degra Listening: Liste commentaries - I	Grammar, Vocabulary, Listening, Speaking, ees of Comparison - Punctuations – Fragments & r ening to global accents - listening to motivational s Movie Enactment - Reading: Narrative passages	- Letter to the Editor – E Reading & Writing run-ons - Vocabulary: I speeches - Speaking: I	Biography & A British & Ame Narrating pers	vutok ericai sona	biogra	pelling	Checklist 9 & words s - Sport
Unit – IV Grammar: Degre Listening: Liste commentaries - Technical reports	Grammar, Vocabulary, Listening, Speaking, ees of Comparison - Punctuations – Fragments & r ening to global accents - listening to motivational s Movie Enactment - Reading: Narrative passages	- Letter to the Editor – E Reading & Writing run-ons - Vocabulary: I speeches - Speaking: I s - Writing: E mail - Age	Biography & A British & Ame Narrating pers	vutok ericai sona	biogra	pelling	9 & words s - Sport Special
Unit – IV Grammar: Degre Listening: Liste commentaries - Technical reports Unit – V Grammar: Purpe Listening to sam speeches/conver	Grammar, Vocabulary, Listening, Speaking, ees of Comparison - Punctuations – Fragments & r ening to global accents - listening to motivational s Movie Enactment - Reading: Narrative passages Grammar, Vocabulary, Listening, Speaking, ose and Function - If clause - Error detection - Vo uple HR Interviews - Speaking: Introduction to ph rsations - Giving feedback – Debate - Reading: Ko	- Letter to the Editor – E Reading & Writing run-ons - Vocabulary: I speeches - Speaking: I s - Writing: E mail - Age Reading & Writing ocabulary: Coding & I honetics - Stress, rhyth tey Note speeches - Ne	Biography & A British & Ame Narrating persenda & Minut Decoding - Al m & Intonati wspaper repo	vutok ericai sona es o lphal on -	biogra	est - L ded &	9 & words s - Sport Special o 9 istening unguide
Unit – IV Grammar: Degre Listening: Liste commentaries - Technical reports Unit – V Grammar: Purpe Listening to sam speeches/conver	Grammar, Vocabulary, Listening, Speaking, ees of Comparison - Punctuations – Fragments & r ening to global accents - listening to motivational s Movie Enactment - Reading: Narrative passages Grammar, Vocabulary, Listening, Speaking, ose and Function - If clause - Error detection - Vo uple HR Interviews - Speaking: Introduction to ph	- Letter to the Editor – E Reading & Writing run-ons - Vocabulary: I speeches - Speaking: I s - Writing: E mail - Age Reading & Writing ocabulary: Coding & I honetics - Stress, rhyth tey Note speeches - Ne	Biography & A British & Ame Narrating persenda & Minut Decoding - Al m & Intonati wspaper repo	vutok ericai sona es o lphal on -	biogra	est - L ded &	9 & words s - Sport Special & 9 istening unguide
Unit – IV Grammar: Degre Listening: Liste commentaries - Technical reports Unit – V Grammar: Purpe Listening to sam speeches/conver	Grammar, Vocabulary, Listening, Speaking, ees of Comparison - Punctuations – Fragments & r ening to global accents - listening to motivational s Movie Enactment - Reading: Narrative passages Grammar, Vocabulary, Listening, Speaking, ose and Function - If clause - Error detection - Vo uple HR Interviews - Speaking: Introduction to ph rsations - Giving feedback – Debate - Reading: Ko	- Letter to the Editor – E Reading & Writing run-ons - Vocabulary: I speeches - Speaking: I s - Writing: E mail - Age Reading & Writing ocabulary: Coding & I honetics - Stress, rhyth tey Note speeches - Ne	Biography & A British & Ame Narrating persenda & Minut Decoding - Al m & Intonati wspaper repo	vutok ericai sona es o lphal on -	biogra	est - L ded &	9 & words s - Sport Special & 9 istening unguide nical text
Unit – IV Grammar: Degre Listening: Liste commentaries - Technical reports Unit – V Grammar: Purpo Listening to sam speeches/conver from journals Wr	Grammar, Vocabulary, Listening, Speaking, ees of Comparison - Punctuations – Fragments & r ening to global accents - listening to motivational s Movie Enactment - Reading: Narrative passages Grammar, Vocabulary, Listening, Speaking, ose and Function - If clause - Error detection - Vo uple HR Interviews - Speaking: Introduction to ph rsations - Giving feedback – Debate - Reading: Ko	- Letter to the Editor – E Reading & Writing run-ons - Vocabulary: I speeches - Speaking: I s - Writing: E mail - Age Reading & Writing ocabulary: Coding & I honetics - Stress, rhyth tey Note speeches - Ne ailed text - Technical pro-	Biography & A British & Ame Narrating per- enda & Minut Decoding - Al m & Intonati wspaper repo pposals	iricai sona es o lphal on -	biogra	pelling estones eting - est - L ded & rt tech	9 & words s - Sport Special 9 istening unguide nical text
Unit – IV Grammar: Degre Listening: Liste commentaries - Technical reports Unit – V Grammar: Purpo Listening to sam speeches/conver from journals Wr TEXT BOOK: 1. Sanjay k	Grammar, Vocabulary, Listening, Speaking, ees of Comparison - Punctuations – Fragments & r ming to global accents - listening to motivational s Movie Enactment - Reading: Narrative passages Grammar, Vocabulary, Listening, Speaking, pose and Function - If clause - Error detection - Vo uple HR Interviews - Speaking: Introduction to ph sations - Giving feedback – Debate - Reading: Ka iting: Circulars - Critical Appreciation of a non-deta	- Letter to the Editor – E Reading & Writing run-ons - Vocabulary: I speeches - Speaking: I s - Writing: E mail - Age Reading & Writing ocabulary: Coding & I honetics - Stress, rhyth tey Note speeches - Ne ailed text - Technical pro-	Biography & A British & Ame Narrating per- enda & Minut Decoding - Al m & Intonati wspaper repo pposals	iricai sona es o lphal on -	biogra	pelling estones eting - est - L ded & rt tech	9 & words s - Sport Special 6 9 istening unguide nical text
Unit – IV         Grammar: Degre         Listening: Lister         commentaries -         Technical reports         Unit – V         Grammar: Purpor         Listening to sam         speeches/conver         from journals Wr         TEXT BOOK:         1.       Sanjay F         REFERENCES:         1.       Meena         University	Grammar, Vocabulary, Listening, Speaking, ees of Comparison - Punctuations – Fragments & r ening to global accents - listening to motivational s Movie Enactment - Reading: Narrative passages Grammar, Vocabulary, Listening, Speaking, ose and Function - If clause - Error detection - Vo ple HR Interviews - Speaking: Introduction to ph rsations - Giving feedback – Debate - Reading: Ko iting: Circulars - Critical Appreciation of a non-deta Kumar & Pushp Lata, "Communication Skills", 2 <sup>nd</sup> E kshi Raman and Sangeeta Sharma. "Technical Co sity Press, New Delhi, 2022.	- Letter to the Editor – E Reading & Writing run-ons - Vocabulary: I speeches - Speaking: I s - Writing: E mail - Age Reading & Writing ocabulary: Coding & I honetics - Stress, rhyth tey Note speeches - Ne ailed text - Technical pro- Edition, Oxford Universit	Biography & A British & Ame Narrating persenda & Minut Decoding - Al m & Intonati wspaper repo oposals y Press, New	vutok erican sona es o lphal on - prts -	hiogra	pelling estones eting - est - L ded & rt techn 18.	9 & words s - Sport Special d 9 istening unguide nical text Total:4
Unit – IV         Grammar: Degre         Listening: Lister         commentaries -         Technical reports         Unit – V         Grammar: Purpor         Listening to sam         speeches/conver         from journals Wr         TEXT BOOK:         1.       Sanjay F         REFERENCES:         1.       Meena         University	Grammar, Vocabulary, Listening, Speaking, ees of Comparison - Punctuations – Fragments & r ening to global accents - listening to motivational s Movie Enactment - Reading: Narrative passages Grammar, Vocabulary, Listening, Speaking, ose and Function - If clause - Error detection - Vo uple HR Interviews - Speaking: Introduction to ph rsations - Giving feedback – Debate - Reading: Ko iting: Circulars - Critical Appreciation of a non-deta	- Letter to the Editor – E Reading & Writing run-ons - Vocabulary: I speeches - Speaking: I s - Writing: E mail - Age Reading & Writing ocabulary: Coding & I honetics - Stress, rhyth tey Note speeches - Ne ailed text - Technical pro- Edition, Oxford Universit	Biography & A British & Ame Narrating persenda & Minut Decoding - Al m & Intonati wspaper repo oposals y Press, New	vutok erican sona es o lphal on - prts -	hiogra	pelling estones eting - est - L ded & rt techn 18.	9 & words s - Sport Special d 9 istening unguide nical text Total:4

COUR On co				, the stu	dents will be	able to						lapped est Level	I)
CO1	u	se func	ctional gramn	nar for im	proving comr	nunicatio	n skills				Apply	ing (K3)	
CO2	lis	sten an	d compreher	nd differe	nt accents ar	nd infer ir	nplied me	anings			Apply	ing (K3)	
CO3			clearly, initia		sustain a di	scussion	and neg	gotiate usi	ng appro	opriate	Creat	ing (K6)	
CO4	re		ferent genre	0	tts, infer imp	olied mea	anings ai	nd criticall	y analyz	e and	Understa	anding (k	(2)
CO5					narrative, de d evaluative v		exposito	ry texts a	nd unde	rstand	Creat	ing (K6)	
					Mappir	ng of COs	s with PC	)s and PS	Os				
COs/P	Os	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1						2			1	3	1	1
CO2	2									2	3		1
CO3	3									2	3		2
CO4	1						1				3	1	1
CO5	5										3		2
1 – Slię	ght, 2	2 – Mo	derate, 3 – S	ubstantia	I, BT- Bloom	s Taxono	my				·		
					ASSES	SMENT	PATTER	N - THEOF	RY				
Test / Cate	Bloo egory		Remember (K1) %	ing Ur	derstanding (K2) %		lying 3) %	Analyzin (K4) %		aluating K5) %	Creating (K6) %	Тс	otal %
C	AT1				37	3	30				33		100
C	AT2				7	5	50				43		100
C	AT3				17	5	50				33		100
E	SE				15	4	45				40		100

	(Common to CIVIL, MECH, MTS, ECE, EEE, EIE	& FT bra	nches)				
Programme & Branch	B.E & Civil, Mech, MTS, ECE, EEE, EIE & FT branches	Sem.	Category	L	т	Ρ	Credit
Prerequisites	Nil	2	BS	3	1*	<b>2</b> *	4
		4	1	1			
Preamble	To impart the knowledge of partial derivatives, evaluation and analytic functions to the students for solving the disciplines.						
Unit – I	Functions of Several Variables:						9
	o or more variables – Partial derivatives – Total differential – axima and minima – Constrained maxima and minima – Lagra				ns of	two	variables
Unit – II	Multiple Integrals:						9
Double integrat	ion in cartesian coordinates – Change of order of integratic n in cartesian coordinates – Volume as triple integrals.	on – App	lication: Are	a be	twee	n two	o curves -
Unit – III	Vector Calculus:			-			9
Solenoidal and	vative – Gradient of a scalar point function – Divergence of Irrotational vectors – Vector Integration: Introduction – Gree - Verification of the above theorems and evaluation of integral	en's, Stok	e's and Gau				
Unit – IV	Analytic Functions:						9
		icient co	nditions (exc	ludir	ng pr	oof) -	
Functions of a Riemann equat of analytic function	complex variable – Analytic functions – Necessary and suff ions (Statement only) – Properties of analytic function (Stater ion – Applications: Fluid flow – Conformal mapping: w = z + a	ment only	/) – Harmoni	c fur	nctior	) – Ć	<ul> <li>Cauchy- onstruction</li> </ul>
Functions of a Riemann equat of analytic func <b>Unit – V</b>	complex variable – Analytic functions – Necessary and suff ions (Statement only) – Properties of analytic function (Stater ion – Applications: Fluid flow – Conformal mapping: w = z + a Complex Integration:	nent only , az, 1/z -	/) – Harmoni – Bilinear tra	c fur nsfo	nctior rmati	n – Ĉe on.	- Cauchy- onstruction <b>9</b>
Functions of a Riemann equat of analytic funct <b>Unit – V</b> Introduction – C Classification –	complex variable – Analytic functions – Necessary and suff ions (Statement only) – Properties of analytic function (Stater ion – Applications: Fluid flow – Conformal mapping: w = z + a	ment only , az, 1/z - – Taylor'	/) – Harmoni – Bilinear tra s and Laurei	c fur nsfo nt se	rmati rmati	n – Ćo on. - Sing	- Cauchy- onstruction <b>9</b> gularities -
Functions of a Riemann equat of analytic func <b>Unit – V</b> Introduction – C Classification – cosine function	<ul> <li>complex variable – Analytic functions – Necessary and suffions (Statement only) – Properties of analytic function (Statemion – Applications: Fluid flow – Conformal mapping: w = z + a</li> <li>Complex Integration:</li> <li>Cauchy's theorem (without proof) – Cauchy's integral formula Cauchy's residue theorem (without proof) – Applications: Evaluation</li> </ul>	ment only , az, 1/z - – Taylor'	/) – Harmoni – Bilinear tra s and Laurei	c fur nsfo nt se	rmati rmati	n – Ćo on. - Sing	- Cauchy- onstruction 9 gularities -
Functions of a Riemann equat of analytic funct Unit – V Introduction – C Classification – cosine functions	<ul> <li>complex variable – Analytic functions – Necessary and suffions (Statement only) – Properties of analytic function (Stater ion – Applications: Fluid flow – Conformal mapping: w = z + a</li> <li>Complex Integration:</li> <li>Cauchy's theorem (without proof) – Cauchy's integral formula Cauchy's residue theorem (without proof) – Applications: Evaluations over the circular contour.</li> </ul>	ment only , az, 1/z - – Taylor'	/) – Harmoni – Bilinear tra s and Laurei	c fur nsfo nt se	rmati rmati	n – Ćo on. - Sing	- Cauchy- onstruction <b>9</b> gularities -
Functions of a         Riemann equat         of analytic funct         Unit – V         Introduction – C         Classification –         cosine functions         LIST OF EXPE         1.       Finding	<ul> <li>complex variable – Analytic functions – Necessary and suff ions (Statement only) – Properties of analytic function (Stater ion – Applications: Fluid flow – Conformal mapping: w = z + a Complex Integration:</li> <li>Cauchy's theorem (without proof) – Cauchy's integral formula Cauchy's residue theorem (without proof) – Applications: Evaluations over the circular contour.</li> </ul>	ment only , az, 1/z - – Taylor'	/) – Harmoni – Bilinear tra s and Laurei	c fur nsfo nt se	rmati rmati	n – Ćo on. - Sing	- Cauchy- onstruction 9 gularities -
Functions of a Riemann equat of analytic funct Unit – V Introduction – C Classification – cosine functions LIST OF EXPE 1. Finding 2. Compu	<pre>complex variable – Analytic functions – Necessary and suff ions (Statement only) – Properties of analytic function (Stater ion – Applications: Fluid flow – Conformal mapping: w = z + a</pre>	ment only , az, 1/z - – Taylor'	/) – Harmoni – Bilinear tra s and Laurei	c fur nsfo nt se	rmati rmati	n – Ćo on. - Sing	- Cauchy- onstruction 9 gularities -
Functions of a         Riemann equat         of analytic funct         Unit – V         Introduction – C         Classification –         cosine functions         LIST OF EXPE         1.       Finding         2.       Comput         3.       Evaluat	<pre>complex variable – Analytic functions – Necessary and suff ions (Statement only) – Properties of analytic function (Stater ion – Applications: Fluid flow – Conformal mapping: w = z + a</pre>	ment only , az, 1/z - – Taylor'	/) – Harmoni – Bilinear tra s and Laurei	c fur nsfo nt se	rmati rmati	n – Ćo on. - Sing	- Cauchy- onstruction 9 gularities -
Functions of a         Riemann equat         of analytic funct         Unit – V         Introduction – C         Classification –         cosine functions         LIST OF EXPE         1.       Finding         2.       Compu         3.       Evaluat         4.       Finding	<pre>complex variable – Analytic functions – Necessary and suff ions (Statement only) – Properties of analytic function (Stater ion – Applications: Fluid flow – Conformal mapping: w = z + a</pre>	ment only , az, 1/z - – Taylor'	/) – Harmoni – Bilinear tra s and Laurei	c fur nsfo nt se	rmati rmati	n – Ćo on. - Sing	- Cauchy onstructio <b>9</b> gularities
Functions of a         Riemann equat         of analytic funct         Unit – V         Introduction – C         Classification –         cosine functions         LIST OF EXPE         1.       Finding         2.       Compu         3.       Evaluat         4.       Finding         5.       Compu	complex variable – Analytic functions – Necessary and suff         ions (Statement only) – Properties of analytic function (Stater         ion – Applications: Fluid flow – Conformal mapping: w = z + a         Complex Integration:         cauchy's theorem (without proof) – Cauchy's integral formula         Cauchy's residue theorem (without proof) – Applications: Eva         cover the circular contour.         RIMENTS / EXERCISES:         ordinary and partial derivatives         ting extreme values of function of two variables         ing double and triple integrals         the area between two curves	ment only , az, 1/z - – Taylor'	/) – Harmoni – Bilinear tra s and Laurei	c fur nsfo nt se	rmati rmati	n – Ćo on. - Sing	- Cauchy onstructio <b>9</b> gularities
Functions of a         Riemann equat         of analytic funct         Unit – V         Introduction – C         Classification –         cosine functions         LIST OF EXPE         1.       Finding         2.       Compu         3.       Evaluat         4.       Finding         5.       Compu         6.       Applyin	complex variable – Analytic functions – Necessary and suff         ions (Statement only) – Properties of analytic function (Stater         ion – Applications: Fluid flow – Conformal mapping: w = z + a         Complex Integration:         cauchy's theorem (without proof) – Cauchy's integral formula         Cauchy's residue theorem (without proof) – Applications: Eva         cover the circular contour.         RIMENTS / EXERCISES:         ordinary and partial derivatives         ting extreme values of function of two variables         ing double and triple integrals         the area between two curves         ting gradient, divergence and curl of point functions	ment only , az, 1/z - – Taylor'	/) – Harmoni – Bilinear tra s and Laurei	c fur nsfo nt se	rmati rmati	n – Ćo on. - Sing	- Cauchy onstructio <b>9</b> gularities
Functions of a Riemann equat of analytic functUnit – VUnit – VIntroduction – C Classification – cosine functionsLIST OF EXPE 1.1.Finding 2.2.Comput 3.3.Evaluat 4.4.Finding 5.5.Comput 6.6.Applyin 7.	complex variable – Analytic functions – Necessary and suff ions (Statement only) – Properties of analytic function (Stater ion – Applications: Fluid flow – Conformal mapping: w = z + a <b>Complex Integration:</b> Cauchy's theorem (without proof) – Cauchy's integral formula Cauchy's residue theorem (without proof) – Applications: Eva s over the circular contour. <b>RIMENTS / EXERCISES:</b> ordinary and partial derivatives ting extreme values of function of two variables ing double and triple integrals the area between two curves ting gradient, divergence and curl of point functions g Milne-Thomson method for constructing analytic function	ment only , az, 1/z - – Taylor'	/) – Harmoni – Bilinear tra s and Laurei	c fur nsfo nt se	rmati rmati	n – Ćo on. - Sing	- Cauchy onstructio <b>9</b> gularities
Functions of a Riemann equat of analytic functof analytic functUnit – VIntroduction – C Classification – cosine functionsLIST OF EXPE1.7.Comput Comput6.Applyin T.7.Determ	complex variable – Analytic functions – Necessary and suff ions (Statement only) – Properties of analytic function (Stater ion – Applications: Fluid flow – Conformal mapping: w = z + a <b>Complex Integration:</b> Cauchy's theorem (without proof) – Cauchy's integral formula Cauchy's residue theorem (without proof) – Applications: Eva s over the circular contour. <b>RIMENTS / EXERCISES:</b> ordinary and partial derivatives ting extreme values of function of two variables ing double and triple integrals the area between two curves ting gradient, divergence and curl of point functions g Milne-Thomson method for constructing analytic function ination of Mobius transformation for the given set of points poles and residues of an analytic function	nent only , az, 1/z - – Taylor' aluation o	/) – Harmoni – Bilinear tra s and Laurei	c fur nsfo egra	ries - Is inv	n – Ćo on. - Siny volvin	- Cauchy onstructio 9 gularities g sine and
Functions of a Riemann equat of analytic functof analytic functUnit – VIntroduction – C Classification – cosine functionsLIST OF EXPE1.7.Comput Comput6.Applyin T.7.Determ	complex variable – Analytic functions – Necessary and suff ions (Statement only) – Properties of analytic function (Stater ion – Applications: Fluid flow – Conformal mapping: w = z + a <b>Complex Integration:</b> Cauchy's theorem (without proof) – Cauchy's integral formula Cauchy's residue theorem (without proof) – Applications: Eva s over the circular contour. <b>RIMENTS / EXERCISES:</b> ordinary and partial derivatives ting extreme values of function of two variables ing double and triple integrals the area between two curves ting gradient, divergence and curl of point functions g Milne-Thomson method for constructing analytic function ination of Mobius transformation for the given set of points poles and residues of an analytic function	nent only , az, 1/z - – Taylor' aluation o	r) – Harmoni – Bilinear tra s and Laurer of definite int	c fur nsfo egra	ries - Is inv	n – Ćo on. - Siny volvin	- Cauchy onstructio 9 gularities g sine an

1.	Kreys	szig E,	"Adva	nced Er	ngineeri	ng Math	ematics	s ", 10 <sup>th</sup>	Editio	n, John \	Niley, N	lew Delhi, I	ndia, 20 <sup>-</sup>	16.	
2.	Editio	on 201	4, S.Cl	hand an	d Čo., N	lew Del	hi		-	•		s For First			
3.	Durai: Pears	isamy son Ine	C., V∉ dia Edu	engataas ucation,	salam S New De	S., Arun elhi, 201	Prakas 8.	h K. ai	nd Su	resh M.,	"Engin	eering Mat	hematic	s - I", 2 <sup>n</sup>	d Edition,
4.	Grew	al B.S	, "High	er Engir	neering	Mathem	natics" 4	4thEdit	ion, Kl	nanna P	ublishei	s, New Del	hi, 2018		
5.	MATL	LAB –	Labora	atory Ma	inual										
				urse, th	e stud	ents wil	l be abl	e to					(	BT Map Highest	
CO1	-								tivaria	ble funct	ions.			Applying	
CO2	-											the regions	5.	Applying	(K3)
CO3	apply proble		concep	ts of d	erivativ	es and	line inte	egrals (	of vec	tor func	tions in	engineerin	ig	Applying	(K3)
CO4	const	truct a		function given co				nations	and d	etermine	e the im	age of give	n	Applying	(K3)
CO5	apply	the t		ues of c				evaluat	e real	and cor	nplex ii	ntegrals ove	ər	Applying	(K3)
CO6				TLAB p							of func	tions of tw		Applying anipulati	
						Маррі	na of C	Os witł	n POs	and PS	Os				
COs/P	Os P	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	1	PO10	PO11	PO12	PSO1	PSO2
CO1		-	•	2											
		3	3	2											
CO2		3	3	2											
	2														
CO2	2	3 3 3	3 3 3	2											
CO2 CO3 CO4 CO5	2 3 4 5	3 3	3 3												
CO2 CO3 CO4 CO5 CO6	23 345555	3 3 3 3	3 3 3 3	2		3									
CO2 CO3 CO4 CO5 CO6	23 345555	3 3 3 3	3 3 3 3	2	stantial,	-	om's Ta	axonom	У						
CO2 CO3 CO4 CO5 CO6	23 345555	3 3 3 3	3 3 3 3	2	stantial,	BT- Blo			-	- THEOI					
CO2 CO3 CO4 CO5 CO6 1 – Sliq	23 345555	3 3 3 3 - Mode	3 3 3 erate, 3	2		BT- Blo ASSE: ndersta	SSMEN Inding	T PAT Apply	FERN /ing	Analyzi	ing	Evaluating		eating	Total %
CO2 CO3 CO4 CO5 CO6 1 – Slig Test Ca	2 3 4 5 5 9 9 9 7 <b>Bloo</b> ategory	3 3 3 - Mode	3 3 3 erate, 3	2 3 3 – Subs nember (K1) %		BT- Blo ASSES ndersta (K2)	SSMEN Inding %	T PAT Apply (K3)	FERN /ing %		ing	Evaluating (K5) %		eating (6) %	Total %
CO2 CO3 CO4 CO5 CO6 1 – Slig Test Ca	2 3 4 5 5 ght, 2 – / <b>Bloo</b> ategory CAT1	3 3 3 - Mode	3 3 3 erate, 3	2 3 3 – Subs nember (K1) % 10		BT- Blo ASSE: ndersta (K2) 30	SSMEN Inding %	T PAT Apply (K3)	FERN /ing %	Analyzi (K4) % -	ing	(K5) %		(6) % -	100
CO2 CO3 CO4 CO5 CO6 1 – Slig <b>Test</b> Ca	2 3 4 5 5 6 7 Bloo ategory CAT1 CAT2	3 3 3 - Mode	3 3 3 erate, 3	2 3 3 – Subs nember (K1) % 10 10		BT- Blo ASSES ndersta (K2) 30 30	SSMEN Inding %	T PAT Apply (K3) 60	rern /ing % )	Analyzi (K4) % -	ing	(K5) % - -		(6) % - -	100 100
CO2 CO3 CO4 CO5 CO6 1 – Slig Test Ca	2 3 4 5 5 ght, 2 – 7 <b>Bloo</b> ategory CAT1 CAT2 CAT3	3 3 3 - Mode	3 3 3 erate, 3	2 3 3 – Subs nember (K1) % 10 10 10		BT- Blo ASSE: ndersta (K2) 30 30 30	SSMEN Inding %	T PAT Apply (K3) 60 60 60	FERN /ing % )	Analyzi (K4) % - - -	ing	(K5) %		(6) % - - -	100 100 100
CO2 CO4 CO5 CO6 1 – Slig	2 3 4 5 5 7 Bloo ategory CAT1 CAT2 CAT3 ESE	3 3 3 - Mode	3 3 3 erate, 3 <b>Ren</b>	2 3 3 – Subs nember (K1) % 10 10	ing U	BT- Blo ASSE ndersta (K2) 30 30 30 30	SSMEN Inding %	T PAT Apply (K3) 60 60 60	<b>ΓERN</b> /ing %	Analyzi (K4) % -	ing	(K5) % - -		(6) % - -	100 100

22CYT25 - CHEMISTRY FOR ELECTRONICS AND INSTRUMENTATION ENGINEERING	ì
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Branch	B.E & Electronics and Instrumentation Engineering	Sem.	Category	L	т	F	<b>&gt;</b>	Credit
Prerequisites	Nil	2	BS	3	0	(	)	3
Preamble	This course aims to equip the engineering students to rea metal finishing, electrochemical storage devices, fuel & com							
Jnit – I	ELECTROCHEMISTRY AND CORROSION							9
cell EMF) – calcu standard hydroge strong base. <b>Co</b> galvanic corrosic measurement of	y: Introduction – cells – types – representation of galvanic cell- ulation of cell EMF from single electrode potential – reference en electrode – potentiometric titrations (redox) – conductomet <b>rrosion:</b> Introduction – chemical corrosion – Pilling – Bedwo on – differential aeration corrosion with examples- galvani corrosion (wt. loss method only).	electrode: tric titration rth rule –	construction ns – mixture electrochem	, wo of w ical o	rkin veal corr	g ar k ar osic	nd a nd st on a	pplications trong acid nd it's type corrosion
Jnit – II	INDUSTRIAL METAL FINISHING hnological importance of metal finishing- methods of metal finis		essentials of					9
of electrodeposit electroless nicke	<ul> <li>btential and overpotential – surface preparation – electroplating – electroplating of chromium and silver-electroless plating: prod l plating process-advantages of electroless plating- distinctio electronic component-printed circuit board (PCB) fabrication.</li> <li>ELECTROCHEMICAL STORAGE DEVICES</li> </ul>	cess – var	ious steps in	volve	ed ir	n ele	ectro	less plating
ests on battery naintenance of	<ul> <li>uction- types of batteries – discharging and charging of battery</li> <li>primary battery: silver button cell – secondary battery: Ni batteries – choice of batteries for electric vehicle applications of cells – description, principle, components and applications of the cells – description, principle, components and applications of the cells – description, principle, components and applications of the cells – description, principle, components and applications of the cells – description, principle, components and applications of the cells – description, principle, components and applications of the cells – description, principle, components and applications of the cells – description, principle, components and applications of the cells – description, principle, components and applications of the cells – description, principle, components and applications of the cells – description, principle, components and applications of the cells – description, principle, components and applications of the cells – description, principle, components and applications of the cells – description, principle, components and applications of the cells – description, principle, components and applications of the cells – description, principle, components and principle, cells – description, principle, cells – descriptis – descriptis – description, principle, c</li></ul>	-Cd batte cations.	ry –modern Fuel Cells:	batte Intro	ery: oduc	lithi tion	ium- i-Imp	ion battery ortance ar
	Il and direct methanol fuel cell.		S: H <sub>2</sub> -O <sub>2</sub> fuel	ceii,	ак	alin	e fue	el cell, molte
carbonate fuel ce Unit – IV	Il and direct methanol fuel cell. FUELS AND COMBUSTION							9
carbonate fuel ce Jnit – IV ntroduction – cla heoretical calcul varieties – proxir petroleum – man number, compres Bharat Stage Em	Il and direct methanol fuel cell. FUELS AND COMBUSTION ssification of fuels – characteristics of a good fuel – combustion ation of calorific value by Dulong's formula – flue gas analy nate analysis – significance – metallurgical coke – Otto-Hol ufacture of synthetic petrol – hydrogenation of coal – bergius ssion ignition engine – cetane number – power alcohol and bic ission Standard (BSES) system.	n – calorifi sis by Or ffman byp process -	c values – gr sat's method roduct metho · knocking: s	oss – s od – oark	and olid liqi	net fue uid	t calo els – fuel n eng	9 orific values - coal and i - refining gine – octar ntroduction
carbonate fuel ce <b>Unit – IV</b> Introduction – cla cheoretical calcul varieties – proxin betroleum – man number, compres Bharat Stage Em <b>Unit – V</b>	Il and direct methanol fuel cell. FUELS AND COMBUSTION ssification of fuels – characteristics of a good fuel – combustion ation of calorific value by Dulong's formula – flue gas analy nate analysis – significance – metallurgical coke – Otto-Hol ufacture of synthetic petrol – hydrogenation of coal – bergius ssion ignition engine – cetane number – power alcohol and bic ission Standard (BSES) system. E-WASTE AND ITS MANAGEMENT	n – calorifi sis by Or ffman byp process – odiesel – (	c values – gr sat's method roduct metho knocking: s gaseous fuel	oss ; – s od – oark – wa	and olid liqu ign ater	net fue uid ition gas	t cald els – fuel n eng s – il	9 orific values - coal and i - refining gine – octar ntroduction 9
carbonate fuel ce Jnit – IV ntroduction – cla heoretical calcul varieties – proxir betroleum – man number, compres Bharat Stage Em Jnit – V ntroduction-E- W numan health- no recycling of e-wa	Il and direct methanol fuel cell. FUELS AND COMBUSTION ssification of fuels – characteristics of a good fuel – combustion ation of calorific value by Dulong's formula – flue gas analy nate analysis – significance – metallurgical coke – Otto-Hol ufacture of synthetic petrol – hydrogenation of coal – bergius ssion ignition engine – cetane number – power alcohol and bic ission Standard (BSES) system.	n – calorifi sis by Or ffman byp process – odiesel – ( in e-wast te minimiz	c values – gr sat's method roduct metho knocking: s gaseous fuel e – effects of ation techniq	oss – s od – oark – wa e-wa	and olid ign ater aste for	net fue uid ition gas e on mai	t calo els – fuel n eno s – in env nagi	9 orific values - coal and i - refining gine – octar ntroduction 9 <i>v</i> ironment ar ing e-waste
carbonate fuel ce Jnit – IV ntroduction – cla heoretical calcul varieties – proxir betroleum – man number, compres Bharat Stage Em Jnit – V ntroduction-E- W numan health- no recycling of e-wa	Il and direct methanol fuel cell. FUELS AND COMBUSTION ssification of fuels – characteristics of a good fuel – combustion ation of calorific value by Dulong's formula – flue gas analy nate analysis – significance – metallurgical coke – Otto-Hot ufacture of synthetic petrol – hydrogenation of coal – bergius ssion ignition engine – cetane number – power alcohol and bic ission Standard (BSES) system. E-WASTE AND ITS MANAGEMENT 'aste – definition – sources of e-waste – hazardous substances eed for e-waste management– e-waste handling rules – wast ste – disposal treatment methods of e- waste- mechanism of e	n – calorifi sis by Or ffman byp process – odiesel – ( in e-wast te minimiz	c values – gr sat's method roduct metho knocking: s gaseous fuel e – effects of ation techniq	oss – s od – oark – wa e-wa	and olid ign ater aste for	net fue uid ition gas e on mai	t calo els – fuel n eno s – in env nagi	9 orific values - coal and i - refining gine – octar ntroduction 9 <i>v</i> ironment ar ing e-waste
carbonate fuel ce Jnit – IV ntroduction – cla heoretical calcul varieties – proxir betroleum – man number, compres Bharat Stage Em Jnit – V ntroduction-E- W numan health- no recycling of e-wa	Il and direct methanol fuel cell. FUELS AND COMBUSTION ssification of fuels – characteristics of a good fuel – combustion ation of calorific value by Dulong's formula – flue gas analy nate analysis – significance – metallurgical coke – Otto-Hot ufacture of synthetic petrol – hydrogenation of coal – bergius ssion ignition engine – cetane number – power alcohol and bic ission Standard (BSES) system. E-WASTE AND ITS MANAGEMENT 'aste – definition – sources of e-waste – hazardous substances eed for e-waste management– e-waste handling rules – wast ste – disposal treatment methods of e- waste- mechanism of e	n – calorifi sis by Or ffman byp process – odiesel – ( in e-wast te minimiz	c values – gr sat's method roduct metho knocking: s gaseous fuel e – effects of ation techniq	oss – s od – oark – wa e-wa	and olid ign ater aste for	net fue uid ition gas e on mai	t calo els – fuel n eno s – in env nagi	9 orific values - coal and i - refining gine – octar ntroduction 9 <i>v</i> ironment ar ing e-waste ing solution
carbonate fuel ce         Jnit – IV         ntroduction – cla         heoretical calcul         varieties – proxir         betroleum – man         number, compress         Bharat Stage Em         Jnit – V         ntroduction-E- W         numan health- ne         ecycling of e-wa         global scenario of         FEXT BOOK:         I.       Wiley Edi         III, IV.	Il and direct methanol fuel cell. FUELS AND COMBUSTION ssification of fuels – characteristics of a good fuel – combustion ation of calorific value by Dulong's formula – flue gas analy nate analysis – significance – metallurgical coke – Otto-Hol ufacture of synthetic petrol – hydrogenation of coal – bergius ssion ignition engine – cetane number – power alcohol and bio ission Standard (BSES) system. E-WASTE AND ITS MANAGEMENT 'aste – definition – sources of e-waste– hazardous substances bed for e-waste management– e-waste handling rules – waste ste – disposal treatment methods of e- waste- mechanism of e f E-waste – E-waste in India- case studies. torial Board," Wiley Engineering Chemistry", 2 <sup>nd</sup> Edition, Wiley I	n – calorifi sis by Ora ffman byp process – odiesel – g in e-wast te minimiz extraction	c values – gr sat's method roduct metho · knocking: s gaseous fuel e – effects of ation techniq of precious n	oss ; – s od – oark – wa e-wa netal	and olid ign ater for froi	I net fue uid ition gas e on main m le	t cald els – fuel a enq env env env each	9 orific values - coal and i - refining gine – octar ntroduction 9 vironment ar ing e-waste ing solution Total:4
carbonate fuel ce         Jnit – IV         ntroduction – cla         heoretical calcul         varieties – proxin         petroleum – man         number, compress         Bharat Stage Em         Jnit – V         ntroduction-E- W         numan health- me         ecycling of e-wa         global scenario of         FEXT BOOK:         I.       Wiley Edi         III, IV.         Palanisar	Il and direct methanol fuel cell. FUELS AND COMBUSTION ssification of fuels – characteristics of a good fuel – combustion ation of calorific value by Dulong's formula – flue gas analy nate analysis – significance – metallurgical coke – Otto-Hol ufacture of synthetic petrol – hydrogenation of coal – bergius ssion ignition engine – cetane number – power alcohol and bic ission Standard (BSES) system. E-WASTE AND ITS MANAGEMENT 'aste – definition – sources of e-waste – hazardous substances bed for e-waste management– e-waste handling rules – waste ste – disposal treatment methods of e- waste- mechanism of e f E-waste – E-waste in India- case studies.	n – calorifi sis by Ora ffman byp process – odiesel – g in e-wast te minimiz extraction	c values – gr sat's method roduct metho · knocking: s gaseous fuel e – effects of ation techniq of precious n	oss ; – s od – oark – wa e-wa netal	and olid ign ater for froi	I net fue uid ition gas e on main m le	t cald els – fuel a enq env env env each	9 orific values - coal and i - refining gine – octar ntroduction 9 vironment ar ing e-waste ing solution Total:4
carbonate fuel ce         Jnit – IV         ntroduction – cla         heoretical calcul         /arieties – proxin         betroleum – man         number, compress         Bharat Stage Em         Jnit – V         ntroduction-E- W         numan health- ne         recycling of e-wa         global scenario of         FEXT BOOK:         I.       Wiley Edi         III, IV.         Palanisar         Pearson	Il and direct methanol fuel cell. FUELS AND COMBUSTION ssification of fuels – characteristics of a good fuel – combustion ation of calorific value by Dulong's formula – flue gas analy nate analysis – significance – metallurgical coke – Otto-Hol ufacture of synthetic petrol – hydrogenation of coal – bergius ssion ignition engine – cetane number – power alcohol and bio ission Standard (BSES) system. E-WASTE AND ITS MANAGEMENT 'aste – definition – sources of e-waste– hazardous substances eed for e-waste management– e-waste handling rules – waste ste – disposal treatment methods of e- waste- mechanism of e f E-waste – E-waste in India- case studies. torial Board," Wiley Engineering Chemistry", 2 <sup>nd</sup> Edition, Wiley I ny P.N., Manikandan P., Geetha A., Manjula Rani K.& Kowshal	n – calorifi sis by Ora ffman byp process – odiesel – g in e-wast te minimiz extraction	c values – gr sat's method roduct metho · knocking: s gaseous fuel e – effects of ation techniq of precious n	oss ; – s od – oark – wa e-wa netal	and olid ign ater for froi	I net fue uid ition gas on main m le	t cald els – fuel a enq env env env each	9 orific values - coal and i - refining gine – octar ntroduction 9 vironment ar ing e-waste ing solution Total:4
carbonate fuel ce         Jnit – IV         ntroduction – cla         heoretical calcul         /arieties – proxin         betroleum – man         number, compress         Bharat Stage Em         Jnit – V         ntroduction-E- W         numan health- mercycling of e-wa         global scenario of         TEXT BOOK:         1.       III, IV.         2.       Palanisar         Pearson         REFERENCES:         1       Palanisar	Il and direct methanol fuel cell. FUELS AND COMBUSTION ssification of fuels – characteristics of a good fuel – combustion ation of calorific value by Dulong's formula – flue gas analy nate analysis – significance – metallurgical coke – Otto-Hol ufacture of synthetic petrol – hydrogenation of coal – bergius ssion ignition engine – cetane number – power alcohol and bio ission Standard (BSES) system. E-WASTE AND ITS MANAGEMENT 'aste – definition – sources of e-waste– hazardous substances eed for e-waste management– e-waste handling rules – waste ste – disposal treatment methods of e- waste- mechanism of e f E-waste – E-waste in India- case studies. torial Board," Wiley Engineering Chemistry", 2 <sup>nd</sup> Edition, Wiley I ny P.N., Manikandan P., Geetha A., Manjula Rani K.& Kowshal	n – calorifi sis by Or: ffman byp process – odiesel – ( in e-wast te minimiz extraction	c values – gr sat's method roduct metho knocking: s gaseous fuel e – effects of ation techniq of precious n	oss : – s od – oark – wa e-wa netal ni, Re	and olid ign ign ater for froi epri	net fue uid gas on mai m le	cald cald fuel n eng s – ii env nagi cach 019.	9 orific values - coal and i – refining gine – octar ntroduction 9 <i>i</i> ronment ar ing e-waste ing solution <b>Total:</b> for Unit-I, II ised Edition
carbonate fuel ce         Jnit – IV         ntroduction – cla         heoretical calcul         /arieties – proxin         betroleum – man         number, compressible         Bharat Stage Em         Jnit – V         ntroduction-E- W         numan health- no         recycling of e-wa         global scenario of         III, IV.         Palanisar         Pearson         REFERENCES:         I.       Palanisar         Private Li	Il and direct methanol fuel cell. FUELS AND COMBUSTION ssification of fuels – characteristics of a good fuel – combustion ation of calorific value by Dulong's formula – flue gas analy nate analysis – significance – metallurgical coke – Otto-Hol ufacture of synthetic petrol – hydrogenation of coal – bergius ssion ignition engine – cetane number – power alcohol and bio ission Standard (BSES) system. E-WASTE AND ITS MANAGEMENT 'aste – definition – sources of e-waste– hazardous substances beed for e-waste management– e-waste handling rules – wast ste – disposal treatment methods of e- waste- mechanism of e f E-waste – E-waste in India- case studies. torial Board," Wiley Engineering Chemistry", 2 <sup>nd</sup> Edition, Wiley I ny P.N., Manikandan P., Geetha A., Manjula Rani K.& Kowshal Education, New Delhi, 2019, for Unit-V.	n – calorifi sis by Or ffman byp process – odiesel – g in e-wast te minimiz extraction	c values – gr sat's method roduct method knocking: s jaseous fuel e – effects of ation techniq of precious n	oss : - s od - oark - wa e-wa ues netal ni, Ra 	and olid ign ater for froi epri ienc	net fue uid gas on mai m le	cald cald fuel n eng s – ii env nagi cach 019.	9 orific values - coal and – refining gine – octai ntroduction 9 /ironment at ing e-waste ing solution Total:/

COURSE On comp			irse, the	e stude	nts will	be able	to						BT Map (Highest L	
CO1	apply the	e princip	le of ele	ctroche	mistry a	nd corro	sion for	variou	s applica	ations			Applying	(K3)
CO2	apply the	e concep	ot of plat	ing tech	niques i	n indust	rial met	al finisł	ning				Applying	(K3)
CO3	use the o	concepts	s of batte	eries, fu	el cells a	and thei	r applica	ations i	n various	s fields.			Applying	(K3)
CO4	apply the	e concep	ots of fue	els and	combust	tion for e	enginee	ring ap	olication	s			Applying	(K3)
CO5	utilize the	e knowle	edge to l	handle t	he e-wa	ste and	reduce	its imp	acts on e	environm	ent		Applying	(K3)
					Ма	pping c	of Cos v	vith PC	)s and F	SOs				
Cos/Pos	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	1										
CO2	3	2	1	1										
CO3	3	2	1	1										
CO4	3	2	1	1										
CO5	3	2	1	1			3							
1 – Slight	, 2 – Mod	erate, 3	- Subs	tantial, E	3T- Bloo	m's Tax	onomy							
					AS	SESSM	ENT PA	TTER	N – THE	ORY				
	Bloom's gory*		nember (K1) %		Indersta (K2)		Apply (K3)		Analyzi (K4) %		valuating (K5) %	Cre	ating (K6) %	Total %
CA	AT1		25		35		40	)						100
CA	T2		25		35		40	)						100
CA	AT3		25		35		40	)						100
E	SE		25		35		40	)						100

Progra Branc	amme &	B.E. & Electronic	s and Instrumentation En	gineering	Sem.	Category	L	т	Р	Credit
	n quisites	Nil			2	PC	3	0	2	4
	1						-		_	_
Pream	nble		irm understanding of ba sight into the techniques for				orks	, and	l to	provide a
Unit –		DC Circuits:								9
			d Kirchhoff's Laws-Depen onship in R,L and C- Stead					hort	circuit	ts- Source
Unit –		Network Theore								9
	analysis-No r transfer the		Delta transformation -Supe	erposition theoren	n – Theve	enin's and No	orton'	s the	orem	-Maximum
Unit –		Network Synthes								9
			tz polynomials-Positive Re sive networks synthesize ir		RC netwo	ork using Cau	ier m	ethoo	ls, LC	C networks
Unit –	- IV	Single phase and	Three phase AC Circuits	5:						9
power curren	factor. Thre	e phase AC circuits in three phase star a	on in resistor, inductor, cap Interconnection of three p ad delta connected balance	hase sources and	loads –lir	e and phase	quan	tities-	volta	ge,
Unit –			cy domain analysis;							9
										esonance
			RC and RLC series circui width-Q factor- Magnification		nalysis: lo	leal RLC serie	es an	d par		
Imped	lance and cu OF EXPERII	rrent variations- Banc	width-Q factor- Magnificati	on factor.		leal RLC serie	es an	d par		
Imped	DF EXPERIN	rrent variations- Banc	width-Q factor- Magnification	on factor.		leal RLC serie	es an	d par		
Imped	DF EXPERII Measurem	rrent variations- Bance IENTS / EXERCISES ent of current, voltage nt response analysis	width-Q factor- Magnification	on factor.		leal RLC serie	es an	d par		
Imped	DF EXPERIN Measurem RC transie Frequency	rrent variations- Banc IENTS / EXERCISES ent of current, voltage nt response analysis Response analysis o	width-Q factor- Magnification	on factor. n single phase loa		leal RLC serie	es an	d par		
Imped LIST ( 1. 2. 3.	DF EXPERIN Measurem RC transie Frequency	rrent variations- Banc IENTS / EXERCISES ent of current, voltage nt response analysis Response analysis o	width-Q factor- Magnification	on factor. n single phase loa		leal RLC serie	es an	d par		
Imped           LIST (           1.           2.           3.           4.	Ance and cu <b>OF EXPERI</b> Measurem RC transie Frequency Experimer	rrent variations- Banc IENTS / EXERCISES ent of current, voltage nt response analysis Response analysis o tal verification of Max	width-Q factor- Magnification	on factor. n single phase loa orem		leal RLC serie	es an	d par		
LIST ( 1. 2. 3. 4. 5.	Ance and cu <b>OF EXPERI</b> Measurem RC transie Frequency Experimer Three pha	rrent variations- Banc IENTS / EXERCISES ent of current, voltage nt response analysis Response analysis o tal verification of Max	width-Q factor- Magnification ; , power and power factor in f RLC circuits mum Power Transfer theorem int using two wattmeter met	on factor. n single phase loa orem		leal RLC serie	es an	d par		
LIST ( 1. 2. 3. 4. 5. 6.	Ance and cu <b>OF EXPERI</b> Measurem RC transie Frequency Experimer Three pha Verification	rrent variations- Bance <b>IENTS / EXERCISES</b> ent of current, voltage nt response analysis Response analysis o tal verification of Max se power measureme of superposition theo	width-Q factor- Magnification ; , power and power factor in f RLC circuits mum Power Transfer theorem int using two wattmeter met	on factor. n single phase loa orem hod	d	leal RLC serie		d par		
LIST ( 1. 2. 3. 4. 5. 6.	Ance and cu <b>OF EXPERI</b> Measurem RC transie Frequency Experimer Three pha Verification	rrent variations- Bance <b>IENTS / EXERCISES</b> ent of current, voltage nt response analysis Response analysis o tal verification of Max se power measureme of superposition theo	width-Q factor- Magnification ; , power and power factor in f RLC circuits mum Power Transfer theorem int using two wattmeter met prem in DC circuits	on factor. n single phase loa orem hod	d					), Total:75
Imped           LIST (           1.           2.           3.           4.           5.           6.           7.	Ance and cu <b>OF EXPERI</b> Measurem RC transie Frequency Experimer Three pha Verification Determina BOOK:	rrent variations- Banc <b>IENTS / EXERCISES</b> ent of current, voltage nt response analysis Response analysis o tal verification of Max se power measureme of superposition the tion of effective resista	width-Q factor- Magnification ; , power and power factor in f RLC circuits mum Power Transfer theorem int using two wattmeter met prem in DC circuits ance in DC circuit using Sta	on factor.	ation	Lecture:4	45, P	ractio		), Total:75
Imped           LIST (           1.           2.           3.           4.           5.           6.           7.           TEXT	Ance and cu <b>OF EXPERI</b> Measurem RC transie Frequency Experimer Three pha Verification Determina BOOK:	rrent variations- Bance <b>IENTS / EXERCISES</b> ent of current, voltage nt response analysis Response analysis of tal verification of Max se power measureme of superposition the tion of effective resistance of and Shyammohan	width-Q factor- Magnification ; , power and power factor in f RLC circuits mum Power Transfer theorem int using two wattmeter met prem in DC circuits	on factor.	ation	Lecture:4	45, P	ractio		), Total:7
LIST ( 1. 2. 3. 4. 5. 6. 7. <b>TEXT</b> 1.	Ance and cu <b>OF EXPERI</b> Measurem RC transie Frequency Experimer Three pha Verification Determina <b>BOOK:</b> Sudhaka	rrent variations- Bance <b>IENTS / EXERCISES</b> ent of current, voltage nt response analysis Response analysis of tal verification of Max se power measureme of superposition the tion of effective resistance of and Shyammohan	width-Q factor- Magnification ; , power and power factor in f RLC circuits mum Power Transfer theorem int using two wattmeter met prem in DC circuits ance in DC circuit using Sta	on factor.	ation	Lecture:4	45, P	ractio		), Total:7
LIST ( 1. 2. 3. 4. 5. 6. 7. <b>TEXT</b> 1.	Ance and cu <b>DF EXPERII</b> Measurem RC transie Frequency Experimer Three pha Verification Determina <b>BOOK:</b> Sudhaka Delhi, 20 <b>RENCES:</b>	rrent variations- Bance <b>IENTS / EXERCISES</b> ent of current, voltage nt response analysis Response analysis of tal verification of Max se power measureme of superposition theory tion of effective resistance of and Shyammohan 10.	width-Q factor- Magnification ; , power and power factor in f RLC circuits mum Power Transfer theorem int using two wattmeter met prem in DC circuits ance in DC circuit using Sta	on factor. h single phase loa orem hod ar Delta transforma vorks Analysis and	ation d Synthes	Lecture:4	<b>45, P</b>	ractio		), Total:7
LIST ( 1. 2. 3. 4. 5. 6. 7. <b>TEXT</b> 1. <b>REFE</b>	Ance and cu <b>DF EXPERI</b> Measurem RC transie Frequency Experimer Three pha Verification Determina <b>BOOK:</b> Sudhaka Delhi, 20 <b>RENCES:</b> Ravish R William F	rrent variations- Bance <b>IENTS / EXERCISES</b> ent of current, voltage int response analysis Response analysis of tal verification of Max se power measureme of superposition theory tion of effective resistant r A and Shyammohan 10.	width-Q factor- Magnification ; , power and power factor in f RLC circuits mum Power Transfer theorem in DC circuits ance in DC circuit using Stance S Palli , "Circuits and Netwong Stance S Palli , "Circuits and Netwong Stance	on factor. n single phase loa prem hod ar Delta transforma vorks Analysis and Edition, Tata McGi	ation d Synthes	Lecture: is", 4 <sup>th</sup> Edition ew Delhi, 201	45, P , Ta 3.	ta Mc	cal:30	), Total:7

		UTCOM		se, the s	tudents	will be a	able to						(	BT Mapı Highest L	
CO1	det	termine	the elec	trical para	ameters	in the fur	ndament	al DC ci	rcuit					Applying	(K3)
CO2	inte	erpret th	e behav	ior of DC	resistiv	e circuits	using ne	etwork th	neorem	S				Analyzing	(K4)
CO3	ide	ntify sui	table ne	etwork fro	m the g	iven trans	sfer func	tion						Applying	(K3)
CO4	det	termine	the elec	trical para	ameters	in single	and thre	e phase	e AC cir	cuits				Applying	(K3)
CO5	as	sess the	charact	eristics o	f RLC ci	rcuits in t	ime and	frequer	ncy dom	ain				Analyzing	(K4)
						Маррі	ng of C	Os with	POs a	nd PSOs	6				
COs/P	Os	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO	1	3	3	1	1	1								3	3
CO2	2	3	3	2	2	2								3	3
COS	3	3	2	1	3	1	1		1	2	3		1	3	3
CO4	4	3	3	1	3	1	1		1	2	3		1	3	3
COS	5	3	3	1	3	1	1		1	2	3		1	3	3
1 – Slig	ght, 2	– Mode	rate, 3 -	- Substan	tial, BT-	Bloom's	Taxono	my							
						ASSE	SSMEN	Γ ΡΑΤΤ	ERN - 1	HEORY	,				
	t / Bl ateg	oom's ory*	Re	emember (K1) %	ing	Understa (K2)		Apply (K3)		Analyz (K4)		Evaluating (K5) %		eating K6) %	Total %
	CAT	1		5		30		65	5						100
	CAT	2		5		30		65	5						100
	CAT	3		5		30		65	5						100
	ES	E		5		30		65	5						100

	(Common to ECE, EEE, EIE and	d MTS Branches)					
Programme & Branch	BE - ECE, EEE, EIE and MTS Branches	Sem.	Category	L	т	Р	Credit
Prerequisites	Programming in C	2	ES	3	0	2	4
Preamble	This course is indented to introduce the concept of e novice learner from cross disciplines in Engineering		ructures and n	otio	n of a	lgorith	
	List: Abstract Data Types (ADT) - List ADT and Array Implication : Polynomial Addition	plementation - Link	ked List - Dou	bly l	Linke	d List	9 - Circula
Unit – II	Stack and Queues:						9
Stack ADT – Arra	ay and Linked List implementation of Stacks - Applicat n Evaluation - Queue ADT – Array and Linked List imple				Post	fix Co	-
Unit – III	Trees:						9
	es – Binary Trees –Binary Tree Traversals - The Sepplication: Expression Tree	arch Tree ADT –	Binary Searc	h Tr	ees–	Priorit	y Queue
(Binary Heap)- Ap	Graphs:						9
Graphs - Definiti	ions – Elementary Graph Operations- Traversals – S m – Minimum Spanning Tree: Prim"s Algorithm- Kruska						-
Unit – V	Sorting and Hashing:	-					9
Sorting - Prelimina	aries – Insertion Sort – Quicksort – Merge sort – Heaps	ort – Hashing – Ge	eneral Idea – H	lash	Fund	ction -	- Separat
	ntation of singly linked list and its operations						
	ntation of doubly linked list and its operations						
4. Implemer	ntation of doubly linked list and its operations ntation of Stack and its operations						
•	· · · ·						
5. Implemer	ntation of Stack and its operations						
5. Implemer 6. Implemer	ntation of Stack and its operations ntation of Queue and its operations	Stack ADT					
5. Implemen 6. Implemen 7. Convert a	ntation of Stack and its operations ntation of Queue and its operations ntation of Stack and Queue using Singly Linked List	Stack ADT					
5. Implemen 6. Implemen 7. Convert a 8. Evaluate	ntation of Stack and its operations ntation of Queue and its operations ntation of Stack and Queue using Singly Linked List a given In-fix Expression into Post-fix Expression using S	Stack ADT					
5. Implemen 6. Implemen 7. Convert a 8. Evaluate 9. Implemen	ntation of Stack and its operations ntation of Queue and its operations ntation of Stack and Queue using Singly Linked List a given In-fix Expression into Post-fix Expression using S the Post-fix Expression using Stack ADT	Stack ADT					
<ol> <li>Implement</li> <li>Implement</li> <li>Implement</li> <li>Convert at</li> <li>Evaluate</li> <li>Implement</li> <li>Implement</li> <li>Implement</li> </ol>	ntation of Stack and its operations Intation of Queue and its operations Intation of Stack and Queue using Singly Linked List a given In-fix Expression into Post-fix Expression using S the Post-fix Expression using Stack ADT Intation of Binary Search Tree traversals	Stack ADT	Lecture:4	5, P	ractio	cal:30	), Total:7
<ol> <li>Implement</li> <li>Implement</li> <li>Implement</li> <li>Convert at</li> <li>Evaluate</li> <li>Implement</li> <li>Implement</li> <li>Implement</li> </ol>	ntation of Stack and its operations Intation of Queue and its operations Intation of Stack and Queue using Singly Linked List a given In-fix Expression into Post-fix Expression using S the Post-fix Expression using Stack ADT Intation of Binary Search Tree traversals						
5.Implement6.Implement7.Convert at8.Evaluate9.Implement10.ImplementTEXT BOOK:1.Weiss M.	ntation of Stack and its operations ntation of Queue and its operations ntation of Stack and Queue using Singly Linked List a given In-fix Expression into Post-fix Expression using S the Post-fix Expression using Stack ADT ntation of Binary Search Tree traversals ntation of sorting algorithms: Insertion and Quick sort						
5. Implemen 6. Implemen 7. Convert a 8. Evaluate 9. Implemen 10. Implemen <b>TEXT BOOK:</b> 1. Weiss M. <b>REFERENCES/ M</b>	A., "Data Structures and Algorithm Analysis in C", 2nd I	Edition, Pearson E	ducation Asia,	Nev	w Del	hi, 20	16.

	SE OUTCOMES: npletion of the course, the students will be able to	BT Mapped (Highest Level)
CO1	apply List ADT for solving the given problems	Applying (K3)
CO2	make use of arrays and linked lists to create Stack and Queue ADTs.	Applying (K3)
CO3	utilize Tree ADT to develop simple application	Applying (K3)
CO4	make use of Graph ADT for standard problems	Applying (K3)
CO5	illustrate the use of standard sorting and Hashing Techniques	Applying (K3)

					Mappin	g of CO	s with	POs an	d PSOs	6				
COs/POs	P01	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	1										
CO2	3	2	1	1										
CO3	3	2	1	1										
CO4	3	2	1	1										
CO5	3	2	1	1										
1 – Slight, 2	- Mode	erate, 3 –	Substant	ial, BT-	Bloom's	Taxono	my							

ASSESSMENT PATTERN - THEORY											
Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %				
CAT1	10	40	50				100				
CAT2	5	35	60				100				
CAT3	5	35	60				100				
ESE	5	35	60				100				
* ±3% may be varied (	CAT 1,2,3 – 50 mark	s & ESE – 100 mar	·ks)								

	22EIT21 - ELECTRICAL MACHIN	IES	T		r	-	
Programme & Branch	B.E. & Electronics and Instrumentation Engineering	Sem.	Category	L	т	Ρ	Credit
Prerequisites	Nil	2/5	ES/PC	3	0	0	3
Preamble	This course discusses the construction, operation and beha applications.	vior of vario	us electrical m	achir	nes u	sed ir	real time
Unit – I	DC Machines:						9
Principle of Oper	Principle of working – construction –classification – EMF equa ation–Back EMF –Torque Equation, Characteristics of Series a rmature and Field Control- Applications.						
Unit – II	Transformer:						9
Equivalent Circui	Insformer: Construction of a Transformer – Types– E.M.F. Equated to a Loaded Transformer. Open-circuit Test – Short-circuit Test Principle of Operation and Applications.						
	1 1 11						
Three-phase Ind Characteristics.	Induction Motors: uction Motors: Construction –Squirrel Cage and Slip-Ring rot Methods of Starting of 3-Phase Induction Motors –Speed Co	ntrol. Single	-Phase Induc	tion	Moto	rs: Ty	pes-Self
Characteristics. Starting –Split-P Applications. <b>Unit – IV</b>	Induction Motors: uction Motors: Construction –Squirrel Cage and Slip-Ring rot Methods of Starting of 3-Phase Induction Motors –Speed Co hase Induction Motor – Capacitor-Start Motor – Capacitor-S Synchronous Machines:	ntrol. Single tart Capaci	-Phase Induc tor-Run Moto	tion r — S	Moto Shad	rs: Ty ed-Po	orque-Slip pes–Self le Motor <b>9</b>
Three-phase Ind Characteristics. Starting –Split-P Applications. <b>Unit – IV</b> Construction-Prir	Induction Motors: uction Motors: Construction –Squirrel Cage and Slip-Ring rot Methods of Starting of 3-Phase Induction Motors –Speed Co hase Induction Motor – Capacitor-Start Motor – Capacitor-S	ntrol. Single tart Capaci	-Phase Induc tor-Run Moto	tion r — S	Moto Shad	rs: Ty ed-Po	orque-Slip pes–Self le Motor <b>9</b>
Three-phase Ind Characteristics. Starting –Split-P Applications. <b>Unit – IV</b> Construction-Prir	Induction Motors: uction Motors: Construction –Squirrel Cage and Slip-Ring rot Methods of Starting of 3-Phase Induction Motors –Speed Co hase Induction Motor – Capacitor-Start Motor – Capacitor-S Synchronous Machines: uciple of Operation of generator and Motor– Types of rotors–	ntrol. Single tart Capaci	-Phase Induc tor-Run Moto	tion r — S	Moto Shad	rs: Ty ed-Po	orque-Slip pes–Self le Motor <b>9</b>
Three-phase Ind Characteristics. Starting –Split-P Applications. <b>Unit – IV</b> Construction-Prir Synchronous Mo <b>Unit – V</b> Construction, Prir	Induction Motors: uction Motors: Construction –Squirrel Cage and Slip-Ring rot Methods of Starting of 3-Phase Induction Motors –Speed Co hase Induction Motor – Capacitor-Start Motor – Capacitor-S Synchronous Machines: Inciple of Operation of generator and Motor– Types of rotors– tor-V Curves and Inverted V curves – Applications.	ntrol. Single tart Capaci EMF Equa	tor-Run Moto	tion r – S ator–	Moto Shad Starti	rs: Ty ed-Po ng M	prque-Slip pes–Self le Motor 9 ethods o 9
Three-phase Ind Characteristics. Starting –Split-P Applications. <b>Unit – IV</b> Construction-Prir Synchronous Mo <b>Unit – V</b> Construction, Prir	Induction Motors: uction Motors: Construction –Squirrel Cage and Slip-Ring rot Methods of Starting of 3-Phase Induction Motors –Speed Co hase Induction Motor – Capacitor-Start Motor – Capacitor-S Synchronous Machines: inciple of Operation of generator and Motor– Types of rotors– tor-V Curves and Inverted V curves – Applications. Special Machines: inciple of Operation and Applications: Universal Motor – Brushle	ntrol. Single tart Capaci EMF Equa	tor-Run Moto	tion r – S ator–	Moto Shad Starti	rs: Ty ed-Po ng M	prque-Slip pes–Self le Motor 9 ethods o 9
Three-phase Ind Characteristics. Starting –Split-P Applications. <b>Unit – IV</b> Construction-Prir Synchronous Mo <b>Unit – V</b> Construction, Prir	Induction Motors: uction Motors: Construction –Squirrel Cage and Slip-Ring rot Methods of Starting of 3-Phase Induction Motors –Speed Co hase Induction Motor – Capacitor-Start Motor – Capacitor-S Synchronous Machines: inciple of Operation of generator and Motor– Types of rotors– tor-V Curves and Inverted V curves – Applications. Special Machines: inciple of Operation and Applications: Universal Motor – Brushle	ntrol. Single tart Capaci EMF Equa	tor-Run Moto	tion r – S ator–	Moto Shad Starti	rs: Ty ed-Po ng M	prque-Slip pes–Self le Motor 9 ethods o 9 t Magnet
Three-phase Ind Characteristics. Starting –Split-P Applications. Unit – IV Construction-Prir Synchronous Mo Unit – V Construction, Pri Variable Reluctar	Induction Motors: uction Motors: Construction –Squirrel Cage and Slip-Ring rot Methods of Starting of 3-Phase Induction Motors –Speed Co hase Induction Motor – Capacitor-Start Motor – Capacitor-S Synchronous Machines: inciple of Operation of generator and Motor– Types of rotors– tor-V Curves and Inverted V curves – Applications. Special Machines: inciple of Operation and Applications: Universal Motor – Brushle	ntrol. Single tart Capaci EMF Equa ss D.C. Mot	-Phase Inductor-Run Moto	ator-	Moto Shad Starti Pern	rs: Ty ed-Po ng M	prque-Slip pes–Self le Motor 9 ethods c 9 t Magnet Total:4
Three-phase Ind         Characteristics.         Starting -Split-P         Applications.         Unit - IV         Construction-Prir         Synchronous Mo         Unit - V         Construction, Prin         Variable Reluctar         TEXT BOOK:         1.       Mehta V	Induction Motors:         uction Motors: Construction –Squirrel Cage and Slip-Ring rot         Methods of Starting of 3-Phase Induction Motors –Speed Co         hase Induction Motor – Capacitor-Start Motor – Capacitor-S         Synchronous Machines:         nciple of Operation of generator and Motor– Types of rotors–         tor-V Curves and Inverted V curves – Applications.         Special Machines:         nciple of Operation and Applications: Universal Motor – Brushle         nciple of Operation and Applications: Universal Motor – Brushle	ntrol. Single tart Capaci EMF Equa ss D.C. Mot	-Phase Inductor-Run Moto	ator-	Moto Shad Starti Pern	rs: Ty ed-Po ng M	prque-Slip pes–Self le Motor 9 ethods c 9 t Magnet Total:4
Three-phase Ind         Characteristics.         Starting -Split-P         Applications.         Unit - IV         Construction-Prir         Synchronous Mo         Unit - V         Construction, Prir         Variable Reluctar         TEXT BOOK:         1.       Mehta V         REFERENCES:	Induction Motors:         uction Motors: Construction –Squirrel Cage and Slip-Ring rot         Methods of Starting of 3-Phase Induction Motors –Speed Co         hase Induction Motor – Capacitor-Start Motor – Capacitor-S         Synchronous Machines:         nciple of Operation of generator and Motor– Types of rotors–         tor-V Curves and Inverted V curves – Applications.         Special Machines:         nciple of Operation and Applications: Universal Motor – Brushle         nciple of Operation and Applications: Universal Motor – Brushle	ntrol. Single tart Capaci EMF Equa ss D.C. Mot	-Phase Inductor-Run Moto	ator-	Moto Shad Starti Pern	rs: Ty ed-Po ng M	prque-Slip pes–Self le Motor 9 ethods c 9 t Magnet Total:4
Three-phase Ind         Characteristics.         Starting -Split-P         Applications.         Unit - IV         Construction-Prir         Synchronous Mo         Unit - V         Construction, Prir         Variable Reluctar         TEXT BOOK:         1.       Mehta V         REFERENCES:         1.       Rajput F	Induction Motors: uction Motors: Construction –Squirrel Cage and Slip-Ring rot Methods of Starting of 3-Phase Induction Motors –Speed Co hase Induction Motor – Capacitor-Start Motor – Capacitor-S Synchronous Machines: Inciple of Operation of generator and Motor– Types of rotors– tor-V Curves and Inverted V curves – Applications. Special Machines: Inciple of Operation and Applications: Universal Motor – Brushle Ince –Hybrid. D.C. Servomotor – A.C. Servomotor.	ntrol. Single tart Capaci EMF Equa ss D.C. Mot ion, S.Chan Delhi, 2018	d & Co. Ltd., I	ator-	Moto Shad Starti Pern	rs: Ty ed-Po ng M	prque-Sli pes-Self le Motor 9 ethods c 9 t Magnet Total:4

		UTCON tion of t		se, the s	tudents	s will be	able to						(1	BT Mapp lighest L			
CO1	D1 describe the construction and operation of DC Machines												Un	Understanding (K2)			
CO2	assess the performance characteristics of machines													Applying (K3)			
CO3	outline the starting and speed control techniques of DC and AC Motors												Un	Understanding (K2)			
CO4	identify suitable electrical machine for various applications												Un	Understanding (K2)			
CO5	CO5 describe the construction and operation of special machines											Un	Understanding (K2)				
						Марріі	ng of CC	Ds with	POs a	nd PSOs	6						
COs/POs PO1 PO		PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	O10 PO11		PSO1	PSO2			
CO1		3	1											2	2		
CO2		3	2	1	1	1								3	3		
CO3		3	1											2	2		
CO4		3	1											2	2		
CO5	5	3	1											2	2		
1 – Slig	ght, 2	– Mode	erate, 3 -	- Substar	itial, BT·	Bloom's	Taxono	my				L	1				
						ASSE	SSMENT		ERN - 1	HEORY	,						
Test / Bloom's Category*			Re	Remembering (K1) %		Understanding (K2) %		Apply (K3)				Evaluating (K5) %		Creating (K6) %			
CAT1			20		60		20	20			<u> </u>			100			
CAT		2	20			60		20							100		
CAT		-3	20			60		20							100		
ESE 20			60		20							100					

			2201							ranches		10		
Program	nme &	DE			•		202, 2			-	<u>.</u>		тр	Credit
Branch			ECE, E		IC					Sem.	Category	L	TP	
Prerequ	isites	Nil								1/2	BS	0	0 2	1
Preambl	e	spect	rophotoi tical skil	metric a	and pH i	metry e	xperime	ents for	the esti	imation o	of given sam	ples a	nd there	netric, viscometr by, to improve th d Cr <sup>6+</sup> in electric
LIST OF	EXPERIME	ENTS / E	EXERCI	SES:										
1.	lodometrie	c analys	is of cop	oper cor	ntent fro	om disca	arded P	CBs.						
2.	Volumetri	c analys	is of chr	omium	prepare	ed from	electro	plating s	sludge.					
3.	Find the a	mount c	of minera	al acids	presen	t in the	given s	olution I	oy cond	uctomet	ric based se	nsor el	ectrode	
4.	Determina	ation of o	concenti	ration of	f H+ ion	in a sol	lution us	sing H <sup>+</sup>	sensing	electro	le.			
5.	Potentiom	etric ap	proach (	using a	Pt elect	trode fo	r the es	timatior	n of iron	in the gi	ven sample			
6.	Determina	ation of r	nolecula	ar weigł	nt of a p	olymer	/ liquid	by Ostv	ald viso	cometer.				
7.	Spectroph	otometr	ic meth	od for th	ne deter	minatio	n of Iro	n in stee	əl.					
8.	Assessme magnesiu							ability o	of drink	ing / ind	lustrial purp	ose b	y estim	ating the calciur
9.	Estimation							cted fro	m differ	ent place	es.			
10.	Determina	ation of o	dissolve	d oxyge	n in the	given	wastewa	ater sar	nple.					
11.	Electropla	ting pro	cess (D	emonst	ration).									
12.	Proximate coal (Dem	-		al- detei	rmines i	moistur	e, volati	le matte	er and a	sh conte	ent of a giver	n samp	le of	
	coal (Dell	Ionstrati	011).											Total:
REFERE	NCES/ MA	NUAL /	SOFTW	ARE:										
1.	Palanisan Rajagana						A. and	Manju	la Ran	i K., "C	Chemistry L	aborat	ory Ma	nual", 1 <sup>st</sup> Editio
	EOUTCOM	ES:											В	F Mapped
On com	pletion of t	he cour	se, the	studen	ts will I	be able	to							hest Level)
CO1	estimate t	he amo	unt of ha	ardness	, alkalin	ity, DO	, Cu an	d Cr pre	esent in	the give	n sample.			olying (K3), ecision (S3)
CO2	analyze th	ie amou	nt of aci	ids pres	ent in th	he giver	n sampl	e using	condu	ctivity an	d pH meter.			olying (K3), ecision (S3)
CO3	demonstra and Visco										ion of Fe		Ap	olying (K3), ecision (S3)
							•		Ds and					
COs/PC	Ds PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO	1 PSO2
CO1	3	2	1	3			3							
	3	2	1	3			3							
CO2	U	-		-										

		(Common to all BE	/BTech branches)					
Progr Branc	amme&	All BE/BTech branches	Sem.	Category	L	т	Р	Credit
	quisites	Nil	1/2	ES	0	0	6	3
Pream	nble	This course is designed to provide found on developing a prototype model with the Processes, 3D Printing Technology, Robo	e basic knowledge of Co	mputer-aideo				
LIST	OF EXPERI	MENTS / EXERCISES:						
		PART A – Manufac	turing (30 Hours)					
1.	Selection	n of product, free hand sketching and detailing	]					
2.	Construc	tion of model using Arc/TIG/MIG/Gas/Spot w	elding operations					
3.	Enhancii	ng the model with sheet metal						
4.	Creating	the parts of the model using lathe						
5.	Creating	the parts of the model using milling and drilling	ng machines					
		PART B – Product Design a	nd Development (30 Ho	ours)				
1.	Free har	nd sketching and detailing of the component						
2.	3D part r	modelling of the component using CAD softwa	are					
3.	Enginee	ring Analysis of the component model						
4.	Generate	e the component using 3D printer						
5.	Value ac	ddition to the produced component using C	NC milling machine, C	NC laser cut	tting	macl	nine a	and CNC
		PART C – Robot	ics (30 Hours)					
1.	Design c	of electronic circuit and its debugging						
2.	Interfacir	ng of sensors, actuators and wireless commu	nion modules with micro	controller				
3.	Assembl	y of Tracker Robot with accessories						
4.	Develop	ment of control strategies for motion control,	oath planning and obsta	cle avoidance	;			
5.	Demons	tration and testing of Robot in static environm	ent					
								Total:90
1.	Laborato	ry Manual						

		OUTCO etion of		urse, th	e stude	ents wil	l be ab	le to					()	BT Map lighest L	
CO1			he prot proces	21	model (	using n	nechani	cal ope	erations	like w	elding, f	orming ar		Applying Precision	· /·
CO2				and enl CNC La			21	0	dern ma	achines	like 3D p	orinter, CN		Applying Precision	
CO3	de	sign an	d develo	op the a	utonom	ous rob	ot for re	eal-time	applica	ations				Applying Precision	
						Маррі	ing of C	COs wit	h POs a	and PS	Os				
COs/P	Os	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO	1	3	3	3		2				3	2		2		
CO2	2	3	3	3		3				3	2		2		
CO	3	3	3	3		2				3	2		2		
1 – Sli	ght, 2	2 – Mod	erate, 3	s – Subs	stantial,	BT- Blo	om's Ta	axonom	iy						

Program Branch		В	.E. &	Electr	onics a	nd Instr	rumenta	ation En	gineeri	ng	Sem.	Category	L	т	Ρ	Credit
Prerequ		N	il								2	ES	0	0	2	1
Preamb	le							nderstar of AC ar				f electronic	circuits	and	give	practica
LIST OF	FEXPER	IMENT	S/E	XERCI	SES:											
1.	Clippe	r and cl	ampe	er circui	ts using	diodes										
2.	Detern	nination	of h	iybrid p	aramete	ers in CE	E configu	uration								
3.	Detern	nination	of F	ET para	ameters.											
4.	BJT ba	ased RC	C Pha	ase shif	t oscillat	or										
5.	Verific	ation of	UJT	as rela	xation o	scillator										
6.	Load t	est on [	DC se	eries mo	otor											
7.	Speed	control	of D	C shun	t motor											
8.	Load t	est on s	quirr	el cage	inductio	on moto	r									
9.	Predet	ermina	tion c	of efficie	ncy and	l regulat	ion on s	ingle ph	ase trar	sformer						
10.	Load t	est on t	hree	phase a	alternato	or										
																Total:30
REFER	ENCES/	MANU	AL /S	OFTW	ARE:											
1.	Device	s and (	Circui	ts Lab I	Manual											
001100		0.450														
	E OUTC			se, the	student	s will b	e able t	0							「Map hest L	pea _evel)
CO1	Detern	nine the	cha	racteris	tics and	parame	eters of t	ransisto	rs						olying cision	
CO2	Gener	ate wav	eforr	ns usin	g PN jur	nction di	ode and	BJT						App	olying cision	(K3),
CO3	demor	strate t	he pe	erforma	nce cha	racterist	tics of D	C and A	C mach	ines				Арр	olying cision	(K3),
																(00)
COs/P	Os PO		02	PO3	PO4	Map PO5	PO6	Cos wit PO7	h POs a PO8	and PSC PO9	Ds PO10	P011	PO12	, n	SO1	PSO2
CO3/F			2	1	3	1	1	107	1	2	3	1011	1	-   "	3	3
CO2			3	1	3	1	1		1	2	3		1		3	3
CO3	3		3	1	3	1	1		1	2	3		1		3	3

			1				
Dreasemme	(Common to ECE,EEE,EIE,MTS En	gineering Brand	:hes)				
Programme& Branch	ECE,EEE,EIE,MTS	Sem.	Category	L	т	Ρ	Credit
Prerequisites	Problem Solving and Programming in C	3	ES	3	0	2	4
Preamble	This course provides the fundamental object-oriented exception handling, multithreading, Generics, and Col		a programminą	g incluc	ling inf	neritano	ce,
Unit – I	Classes and Objects						9
	volution of Java – An Overview of Java–Data Types, Variat nentals-objects – Assigning Object Reference Variables – Int						
Unit – II	Inheritance, Packages, and Interfaces						9
and Inner Cla Hierarchy-Met	Methods – Objects as Parameters –Argument Passing – Return asses–Command–Line Arguments – Variable Length Argun hod Overriding–Dynamic Method Dispatch –Abstract Cla Member Access- Importing Packages – Interfaces.	nents. Inheritan	ce – Basics-	- Supe	r keyw	ord -	Multileve
Exception Har Multithreaded	Exception Handling and Multithreading adling basics – Multiple catch Clauses – Nested try Stateme Programming: Java Thread Model - Creating a Thread an unication- Suspending – Resuming, and Stopping Threads –	nd Multiple Thre					xceptior
Unit – IV	I/O and Generics	-					9
Files. Generics	<ul> <li>Wrappers – Auto boxing – Annotation Basics. I/O Basics – s: Introduction – Generic Classes &amp; Methods - Example–Para</li> </ul>				eading	) and V	Vriting
Files. Generics Unit – V String Handling		ameters, Constru String Compariso	ictors and Inte	erfaces			9
Files. Generics Unit – V String Handling Strings – String	s: Introduction – Generic Classes & Methods - Example–Para String Handling and Collections g: String constructors – operations – Character Extraction – S	ameters, Constru String Compariso	ictors and Inte	erfaces			9
Files. Generics Unit – V String Handling Strings – String LIST OF EXPE	s: Introduction – Generic Člasses & Methods - Example–Para String Handling and Collections g: String constructors – operations – Character Extraction – S g Buffer. Collection Framework: Overview – Collection Interfa	ameters, Constru String Compariso Ices – Collection	ictors and Inte	erfaces			9
Files. Generics Unit – V String Handling Strings – String LIST OF EXPE 1. Write J	s: Introduction – Generic Člasses & Methods - Example–Para String Handling and Collections g: String constructors – operations – Character Extraction – S g Buffer. Collection Framework: Overview – Collection Interfa RIMENTS / EXERCISES:	String Compariso cces – Collection	ictors and Inte	erfaces			9
Files. Generics         Unit – V         String Handling         Strings – String         LIST OF EXPE         1.       Write J         2.       Develop	s: Introduction – Generic Člasses & Methods - Example–Para String Handling and Collections g: String constructors – operations – Character Extraction – S g Buffer. Collection Framework: Overview – Collection Interfa RIMENTS / EXERCISES: Java programs using operators, arrays, and control statemen	String Compariso cces – Collection	ictors and Inte	erfaces			9
Files. Generics         Unit – V         String Handling         Strings – String         LIST OF EXPE         1.       Write J         2.       Develo         3.       Progra	s: Introduction – Generic Člasses & Methods - Example–Para String Handling and Collections g: String constructors – operations – Character Extraction – S g Buffer. Collection Framework: Overview – Collection Interfa RIMENTS / EXERCISES: Java programs using operators, arrays, and control statemen op a stack and queue data structures using classes and object	String Comparison Ices – Collection	on – Searching Classes.	erfaces			9
Files. Generics         Unit – V         String Handling         Strings – String         LIST OF EXPE         1.       Write J         2.       Develo         3.       Progra         4.       Develo	s: Introduction – Generic Člasses & Methods - Example–Para String Handling and Collections g: String constructors – operations – Character Extraction – S g Buffer. Collection Framework: Overview – Collection Interfa RIMENTS / EXERCISES: Java programs using operators, arrays, and control statemen op a stack and queue data structures using classes and object am to demonstrate inheritance & polymorphism	String Comparison Ices – Collection	on – Searching Classes.	erfaces			9
Files. Generics Unit – V String Handling Strings – String LIST OF EXPE 1. Write J 2. Develo 3. Progra 4. Develo 5. Develo	s: Introduction – Generic Člasses & Methods - Example–Para String Handling and Collections g: String constructors – operations – Character Extraction – S g Buffer. Collection Framework: Overview – Collection Interfa <b>RIMENTS / EXERCISES:</b> Java programs using operators, arrays, and control statemen op a stack and queue data structures using classes and object am to demonstrate inheritance & polymorphism op an application using interfaces by accessing superclass co	String Comparison Ices – Collection	on – Searching Classes.	erfaces			9
Files. Generics         Unit – V         String Handling         Strings – String         LIST OF EXPE         1.       Write J         2.       Develor         3.       Progra         4.       Develor         5.       Develor         6.       Progra	s: Introduction – Generic Člasses & Methods - Example–Para String Handling and Collections g: String constructors – operations – Character Extraction – S g Buffer. Collection Framework: Overview – Collection Interfa <b>RIMENTS / EXERCISES:</b> Java programs using operators, arrays, and control statemen op a stack and queue data structures using classes and object am to demonstrate inheritance & polymorphism op an application using interfaces by accessing superclass co op applications using packages and exception handling	String Comparison Ices – Collection	on – Searching Classes.	erfaces			9
Files. Generics         Unit – V         String Handling         Strings – String         LIST OF EXPE         1.       Write J         2.       Develor         3.       Progra         4.       Develor         5.       Develor         6.       Progra         7.       Write J	s: Introduction – Generic Člasses & Methods - Example–Para String Handling and Collections g: String constructors – operations – Character Extraction – S g Buffer. Collection Framework: Overview – Collection Interfa <b>RIMENTS / EXERCISES:</b> Java programs using operators, arrays, and control statemen op a stack and queue data structures using classes and object am to demonstrate inheritance & polymorphism op an application using interfaces by accessing superclass co op applications using packages and exception handling am to demonstrate thread concepts	String Comparison Ices – Collection	on – Searching Classes.	erfaces			9
Files. Generics         Unit – V         String Handling         Strings – String         LIST OF EXPE         1.       Write J         2.       Develor         3.       Progra         4.       Develor         5.       Develor         6.       Progra         7.       Write J	s: Introduction – Generic Člasses & Methods - Example–Para String Handling and Collections g: String constructors – operations – Character Extraction – S g Buffer. Collection Framework: Overview – Collection Interfa <b>RIMENTS / EXERCISES:</b> Java programs using operators, arrays, and control statemen op a stack and queue data structures using classes and object am to demonstrate inheritance & polymorphism op an application using interfaces by accessing superclass co op applications using packages and exception handling am to demonstrate thread concepts Java program to illustrate file and string manipulations	String Comparison Ices – Collection	nethods	g String	is – Ma	bdifying	9
Files. Generics         Unit – V         String Handling         Strings – String         LIST OF EXPE         1.       Write J         2.       Develo         3.       Progra         4.       Develo         5.       Develo         6.       Progra         7.       Write J         8.       Implem	s: Introduction – Generic Člasses & Methods - Example–Para String Handling and Collections g: String constructors – operations – Character Extraction – S g Buffer. Collection Framework: Overview – Collection Interfa <b>RIMENTS / EXERCISES:</b> Java programs using operators, arrays, and control statemen op a stack and queue data structures using classes and object am to demonstrate inheritance & polymorphism op an application using interfaces by accessing superclass co op applications using packages and exception handling am to demonstrate thread concepts Java program to illustrate file and string manipulations	String Comparison Ices – Collection	nethods	g String	is – Ma	bdifying	9
Files. Generics Unit – V String Handling Strings – String LIST OF EXPE 1. Write J 2. Develo 3. Progra 4. Develo 6. Progra 7. Write J 8. Implem TEXT BOOK:	s: Introduction – Generic Člasses & Methods - Example–Para String Handling and Collections g: String constructors – operations – Character Extraction – S g Buffer. Collection Framework: Overview – Collection Interfa <b>RIMENTS / EXERCISES:</b> Java programs using operators, arrays, and control statemen op a stack and queue data structures using classes and object am to demonstrate inheritance & polymorphism op an application using interfaces by accessing superclass co op applications using packages and exception handling am to demonstrate thread concepts Java program to illustrate file and string manipulations	String Comparison Interest Constru- String Comparison Interest Collection Interest Collection Interest Construction Interest Construction Interest Construction Interest Construction Interest Construction	nethods	g String	ıs – Mo	cal:30	9 9 , Total:7
Files. Generics         Unit – V         String Handling         Strings – String         LIST OF EXPE         1.       Write J         2.       Develo         3.       Progra         4.       Develo         5.       Develo         6.       Progra         7.       Write J         8.       Implem         TEXT BOOK:         1.       Herber	s: Introduction – Generic Člasses & Methods - Example–Para String Handling and Collections g: String constructors – operations – Character Extraction – S g Buffer. Collection Framework: Overview – Collection Interfa <b>RIMENTS / EXERCISES:</b> Java programs using operators, arrays, and control statemen op a stack and queue data structures using classes and object arm to demonstrate inheritance & polymorphism op an application using interfaces by accessing superclass co op applications using packages and exception handling arm to demonstrate thread concepts Java program to illustrate file and string manipulations nent Java program to illustrate collection frameworks	String Comparison Interest Constru- String Comparison Interest Collection Interest Collection Interest Construction Interest Construction Interest Construction Interest Construction Interest Construction	nethods	g String	ıs – Mo	cal:30	9 9 , Total:7

		UTCON ion of t		se, the st	udents	will be a	able to						(	BT Mapped Highest Lev	
CO1	app	ly the co	oncepts o	of classes	and obj	jects to s	olve sin	nple pro	blems					Applying (K	3)
CO2	dev	elop pro	ograms u	sing inhei	itance,	package	s, and ii	nterface	S					Applying (K	3)
CO3		ke use o blems	f excepti	on-handli	ng mecł	nanisms	and mu	ltithread	ded mo	dels to s	olve rea	l-world		Applying (K	3)
CO4	dev	elop Jav	a applic	ations wit	h I/O pa	ckages a	and gen	erics co	ncepts	i				Applying (K3	3)
CO5	app	ly string	handling	function	s and co	ollection	classes	and inte	erfaces	5				Applying (K	3)
						Марр	ing of (	COs wit	h POs	and PS	Os				
COs/	POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO	)1	3	2	1	1										
CO	2	3	2	1	1										
CO	3	3	2	1	1										
CO	)4	3	2	1	1										
CO	95	3	2	1	1										
1 – Sli	ght, 2	– Mode	erate, 3 –	Substant	ial, BT-	Bloom's	Taxono	omy							
						ASSE	SSME		TERN	- THEO	RY				
	st / Blo Catego	oom's ory*	Re	memberi (K1) %	ng l	Jndersta (K2)	•	Appl (K3)		Analyz (K4) 9		Evaluating (K5) %	Creat	ing (K6) %	Tota %
	CAT	1		20		40		4(	)						100
	CAT	2		10		20		70	)						100
	CAT	3		10		20		70	)						100
	ESE	=		10		20		70	)						100

Programme & Branch	B.E. & Electronics and Instrumentation Engineering	Sem.	Category	L	т	Р	С
Prerequisites	Nil	3	PC	3	0	0	3
Preamble	This course explains the concepts of measurement syste practical aspects of resistive, inductive, capacitive and oth					rts theore	etical an
Unit – I	Measurements and Instrumentation of Transducers:						9
analysis, Statistica	a Measurement system. Fundamental and Derived units –S al methods, Odds and uncertainty. Classification of transduce					on of Err	
Unit – II	Characteristics of Transducers:		· · · · ·		<b>`</b>		9
	tics: Accuracy, Precision, Resolution, Threshold, Sensitiv npulse and random response of Zero order transducer.						
	Variable Resistance Transducers:						9
Resistive Transdu type strain gauge Anemometer – me	cers: Resistance Potentiometer: Loading effect on Potentior s. Applications: Temperature Measurement using RTD an easurement of moisture in solids and wood – level measurem	nd Therm	istor – Gas	flow r			d Bonde hot-wir
Resistive Transdu type strain gauge Anemometer – me <b>Unit – IV</b>	cers: Resistance Potentiometer: Loading effect on Potentior s. Applications: Temperature Measurement using RTD an easurement of moisture in solids and wood – level measurem Variable Inductance Transducers:	nd Therm nent using	istor – Gas resistive tap	flow r es.	neasureme	ent using	d Bonde hot-wir
Resistive Transdu type strain gauge Anemometer – me <b>Unit – IV</b> Inductive Transdu Transformers – V	cers: Resistance Potentiometer: Loading effect on Potentior s. Applications: Temperature Measurement using RTD an easurement of moisture in solids and wood – level measurem	nd Therm nent using s – Induct	istor – Gas resistive tap ion Potentior	flow r es. meters	neasureme	ent using ariable D	d Bonde hot-wir 9
Resistive Transdu type strain gauge Anemometer – me <b>Unit – IV</b> Inductive Transdu Transformers – V	cers: Resistance Potentiometer: Loading effect on Potentior s. Applications: Temperature Measurement using RTD an easurement of moisture in solids and wood – level measurem <b>Variable Inductance Transducers:</b> cers: Simple inductance and Mutual inductance Transducers ariable reluctance transducers – Eddy current transducers	nd Therm nent using s – Induct . Applicat	istor – Gas resistive tap ion Potentior	flow r es. meters	neasureme	ent using ariable D	d Bonde hot-wir 9
type strain gauge Anemometer – me Unit – IV Inductive Transdu Transformers – V Measurement – P Unit – V Capacitive Transdu Transducers–Cap	cers: Resistance Potentiometer: Loading effect on Potention s. Applications: Temperature Measurement using RTD an easurement of moisture in solids and wood – level measurem <b>Variable Inductance Transducers:</b> cers: Simple inductance and Mutual inductance Transducers ariable reluctance transducers – Eddy current transducers osition Measurement.	nd Therm nent using s – Induct . Applicat cers: riable dist ucer. Oth	istor – Gas resistive tap ion Potentior ions: Displac ance type. A er Transduc	flow r es. meters cemer	tions: Cap	ariable D ment - 1 pacitive 1	Bonde     hot-wir
Resistive Transdu type strain gauge Anemometer – me <b>Unit – IV</b> Inductive Transdu Transformers – V Measurement – P <b>Unit – V</b> Capacitive Transdu Transducers–Cap Magnetostrictive T	<ul> <li>cers: Resistance Potentiometer: Loading effect on Potentior</li> <li>s. Applications: Temperature Measurement using RTD and easurement of moisture in solids and wood – level measurem</li> <li>Variable Inductance Transducers:</li> <li>cers: Simple inductance and Mutual inductance Transducers ariable reluctance transducers – Eddy current transducers osition Measurement.</li> <li>Variable Capacitance Transducers and Other Transducers:</li> <li>ducers: Variable area type – Variable dielectric type – Variable dielectrictric type – Variable dielectric type – Variable dielectric typ</li></ul>	nd Therm nent using s – Induct . Applicat cers: riable dist ucer. Oth	istor – Gas resistive tap ion Potentior ions: Displac ance type. A er Transduc	flow r es. meters cemer	tions: Cap	ariable D ment - 1 pacitive 1	9 hot-wir ifferentia 'hicknes Dicknes ducers
Resistive Transdu type strain gauge Anemometer – me <b>Unit – IV</b> Inductive Transdu Transformers – V Measurement – P <b>Unit – V</b> Capacitive Transo Transducers–Cap	<ul> <li>cers: Resistance Potentiometer: Loading effect on Potentior</li> <li>s. Applications: Temperature Measurement using RTD and easurement of moisture in solids and wood – level measurem</li> <li>Variable Inductance Transducers:</li> <li>cers: Simple inductance and Mutual inductance Transducers ariable reluctance transducers – Eddy current transducers osition Measurement.</li> <li>Variable Capacitance Transducers and Other Transducers:</li> <li>ducers: Variable area type – Variable dielectric type – Variable dielectrictric type – Variable dielectric type – Variable dielectric typ</li></ul>	nd Therm nent using s – Induct . Applicat cers: riable dist ucer. Oth	istor – Gas resistive tap ion Potentior ions: Displac ance type. A er Transduc	flow r es. meters cemer	tions: Cap	ariable D ment - 1 pacitive 1	9 hot-wir ifferentia hicknes 9
Resistive Transdu type strain gauge Anemometer – me <b>Unit – IV</b> Inductive Transdu Transformers – V Measurement – P <b>Unit – V</b> Capacitive Transo Transducers–Cap Magnetostrictive T	<ul> <li>cers: Resistance Potentiometer: Loading effect on Potentior</li> <li>s. Applications: Temperature Measurement using RTD and easurement of moisture in solids and wood – level measurem</li> <li>Variable Inductance Transducers:</li> <li>cers: Simple inductance and Mutual inductance Transducers ariable reluctance transducers – Eddy current transducers osition Measurement.</li> <li>Variable Capacitance Transducers and Other Transducers:</li> <li>ducers: Variable area type – Variable dielectric type – Variable dielectrictric type – Variable dielectric type – Variable dielectric typ</li></ul>	nd Therm nent using s – Induct . Applicat cers: riable dist ucer. Oth Im sensor	istor – Gas resistive tap ion Potentior ions: Displac ance type. A er Transduc s – Smart se	flow r es. meters cemer	tions: Cap	ariable D ment - 1 pacitive 1	9 hot-wir ifferentia 'hicknes Dicknes ducers
Resistive Transdutype strain gauge         type strain gauge         Anemometer – me         Unit – IV         Inductive Transdu         Transformers – V         Measurement – P         Unit – V         Capacitive Transco         Transducers–Cap         Magnetostrictive T         TEXT BOOK:         1.       Vijayachit	<ul> <li>cers: Resistance Potentiometer: Loading effect on Potention</li> <li>s. Applications: Temperature Measurement using RTD are easurement of moisture in solids and wood – level measurement</li> <li>Variable Inductance Transducers:</li> <li>cers: Simple inductance and Mutual inductance Transducers ariable reluctance transducers – Eddy current transducers osition Measurement.</li> <li>Variable Capacitance Transducers and Other Transducers:</li> <li>Variable area type – Variable dielectric type – Variable area type – Variable dielectric type – Variable area type – Nariable dielectric type – Variable area type – Variable area type – Variable dielectric type – Variable area type – Variable area type – Variable dielectric type – Variable area type – Variable area type – Variable dielectric type – Variable area type – Variable ar</li></ul>	nd Therm nent using s – Induct . Applicat cers: riable dist ucer. Oth Im sensor	istor – Gas resistive tap ion Potentior ions: Displac ance type. A er Transduc s – Smart se	flow r es. meters cemer	tions: Cap	ariable D ment - 1 pacitive 1	9 hot-wir ifferentia 'hicknes Dicknes chicknes
Resistive Transdu         type strain gauge         Anemometer – me         Unit – IV         Inductive Transdu         Transformers – V         Measurement – P         Unit – V         Capacitive Transdu         Transducers–Cap         Magnetostrictive T         TEXT BOOK:         1.       Vijayachit         REFERENCES:	<ul> <li>cers: Resistance Potentiometer: Loading effect on Potention</li> <li>s. Applications: Temperature Measurement using RTD are easurement of moisture in solids and wood – level measurement</li> <li>Variable Inductance Transducers:</li> <li>cers: Simple inductance and Mutual inductance Transducers ariable reluctance transducers – Eddy current transducers osition Measurement.</li> <li>Variable Capacitance Transducers and Other Transducers:</li> <li>Variable area type – Variable dielectric type – Variable area type – Variable dielectric type – Variable area type – Nariable dielectric type – Variable area type – Variable area type – Variable dielectric type – Variable area type – Variable area type – Variable dielectric type – Variable area type – Variable area type – Variable dielectric type – Variable area type – Variable ar</li></ul>	nd Therm nent using s – Induct . Applicat cers: riable dist ucer. Oth Im sensor	istor – Gas resistive tap ion Potentior ions: Displac ance type. A er Transduc s – Smart se w Delhi,2016	flow r es. meters cemer	tions: Cap	ariable D ment - 1 pacitive 1	9 hot-win ifferenti 'hicknes Dicknes chicknes

		OUTCO tion of	-	urse, th	e stud	ents will	be able	e to							Mapped hest Lev	
CO1	ex	xplain th	ne meas	suremen	t of ph	ysical qua	antities,	conver	sion ar	nd classif	fication of	of transducers	S	Unde	rstanding	j (K2)
CO2	รเ	ummari	ze the c	oncepts	of vari	ous char	acteristi	cs of Tr	ansdu	cers				Unde	rstanding	(K2)
CO3	a	oply the	selecte	ed types	of resi	stive tran	sducers	for var	ious ap	plication	าร			Ар	olying (K	3)
CO4	a	oply the	selecte	ed types	of indu	ictive trar	nsducer	s for va	rious a	pplicatio	ns			Ар	olying (Ka	3)
CO5	a	oply var	ious typ	pes of ca	pacitiv	e transdu	icers an	d other	transd	ucers fo	r selecte	d application	S	Ар	olying (K	3)
						М	apping	of COs	s with l	POs and	I PSOs					
COs/P	Os	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PC	D12	PSO1	PSO2
CO1		3	2						1					1	2	2
CO2		3	2						1					1	2	2
CO3		3	3	1	1	1			2					1	3	3
CO4		3	3	1	1	1			2					1	3	3
CO5		3	3	1	1	1			2					1	3	3
1 – Slig	ght, 2	2 – Mod	erate, 3	8 – Subs	tantial,	BT- Bloc	om's Tax	konomy							I	
						A	SSESS	MENTI	PATTE	RN - TH	IEORY					
	/ Blo itego	oom's ory*	Rer	nember (K1) %	ing l	Jndersta (K2)	•	Apply (K3)		Analyzi (K4) %	-	valuating (K %		Creating (K6) %	Tot	al %
	CAT	1		30		70									1	00
	CAT	2		20		50		30	)						1	00
	CAT	3		20		50		30	)						1	00
	ESE	:		20		50		30	)						1	00

Programme & Branch	BE & Electronics and Instrumentation Engineering	Sem.	Category	L	т	Р	С
Prerequisites	Nil	3	PC	3	0	0	3
Preamble	This course explains the concepts of measurement syst practical aspects of resistive, inductive, capacitive and oth					arts theore	etical an
Unit – I	Measurements and Instrumentation of Transducers:						
	a Measurement system. Fundamental and Derived units -					ion of Err	ors: Erro
analysis, Statistic Unit – II	al methods, Odds and uncertainty. Classification of transduc	ers – Sele	ction of trans	ducer	S.		9
	Characteristics of Transducers: stics: Accuracy, Precision, Resolution, Threshold, Sensiti	vity Linos			Pongo on	d Spop	•
	mpulse and random response of Zero order transducer.						
Unit – III	Variable Resistance Transducers:						9
	ucers: Resistance Potentiometer: Loading effect on Potentio s – Load Cells, Applications: Temperature Measurement u						
type strain gauge hot-wire Anemorr <b>Unit – IV</b> Inductive Transdu	<ul> <li>as – Load Cells. Applications: Temperature Measurement undeter – measurement of moisture in solids and wood – level r</li> <li>Variable Inductance Transducers:</li> <li>ucers: Simple inductance and Mutual inductance Transduce</li> </ul>	sing RTD a measureme rs – Induct	and Thermist ent using resi ion Potentior	or – C istive	Bas flow n tapes.	heasurem Ariable D	ent usin 9 ifferentia
type strain gauge hot-wire Anemore <b>Unit – IV</b> Inductive Transde Transformers – V	es – Load Cells. Applications: Temperature Measurement un neter – measurement of moisture in solids and wood – level r Variable Inductance Transducers:	sing RTD a measureme rs – Induct	and Thermist ent using resi ion Potentior	or – C istive	Bas flow n tapes.	heasurem Ariable D	ent usin 9 ifferentia
type strain gauge hot-wire Anemore <b>Unit – IV</b> Inductive Transde Transformers – V	<ul> <li>as – Load Cells. Applications: Temperature Measurement undeter – measurement of moisture in solids and wood – level r</li> <li>Variable Inductance Transducers:</li> <li>ucers: Simple inductance and Mutual inductance Transducer/ariable reluctance transducers – Eddy current transducers</li> </ul>	sing RTD a measureme rs – Induct s. Applicat	and Thermist ent using resi ion Potentior	or – C istive	Bas flow n tapes.	heasurem Ariable D	ent usin 9 ifferentia
type strain gauge hot-wire Anemore Unit – IV Inductive Transde Transformers – V Measurement – F Unit – V Capacitive Trans Transducers–Cap Magnetostrictive	<ul> <li>as – Load Cells. Applications: Temperature Measurement uneter – measurement of moisture in solids and wood – level restricted variable Inductance Transducers:</li> <li>aucers: Simple inductance and Mutual inductance Transducer Variable reluctance transducers – Eddy current transducers</li> <li>Position Measurement.</li> </ul>	sing RTD a measureme rs – Induct s. Applicat ucers: miable dista ducer. Oth	and Thermist ent using resi ion Potentior ions: Displac ance type. A er Transduc	or – C istive meters cemen .pplica ers: 1	Bas flow n tapes. Linear V t measure ttions: Ca Piezoelect	heasurem /ariable D ement - 1 pacitive 1 tric Trans	ent usin 9 ifferentia hicknes 9 hicknes
type strain gauge hot-wire Anemore Unit – IV Inductive Transde Transformers – V Measurement – F Unit – V Capacitive Trans Transducers–Cap Magnetostrictive	<ul> <li>as – Load Cells. Applications: Temperature Measurement uneter – measurement of moisture in solids and wood – level reserve to the solid solution of the solid solution of the solid solution and the solution of the solution of</li></ul>	sing RTD a measureme rs – Induct s. Applicat ucers: miable dista ducer. Oth	and Thermist ent using resi ion Potentior ions: Displac ance type. A er Transduc	or – C istive meters cemen .pplica ers: 1	Bas flow n tapes. Linear V t measure ttions: Ca Piezoelect	heasurem /ariable D ement - 1 pacitive 1 tric Trans	9 ifferentia hicknes 9 hicknes ducers ors. Sel
type strain gauge hot-wire Anemom Unit – IV Inductive Transdu Transformers – V Measurement – F Unit – V Capacitive Trans Transducers–Cap Magnetostrictive Generating Sense TEXT BOOK:	<ul> <li>as – Load Cells. Applications: Temperature Measurement uneter – measurement of moisture in solids and wood – level reserve to the solid solution of the solid solution of the solid solution and the solution of the solution of</li></ul>	sing RTD a measureme rs – Induct s. Applicat ucers: uriable dista ducer. Oth ilm sensor	and Thermist ent using resi ion Potentior ions: Displac ance type. A er Transduc s – Vibration	or – C istive meters cemen pplica ers: I Trans	Bas flow n tapes. Linear V t measure ttions: Ca Piezoelect	heasurem /ariable D ement - 1 pacitive 1 tric Trans	9 ifferenti hicknes 9 hicknes ducers ors. Se
type strain gauge hot-wire Anemorr Unit – IV Inductive Transdu Transformers – V Measurement – F Unit – V Capacitive Trans Transducers–Cap Magnetostrictive Generating Sense TEXT BOOK: 1. Vijayach	<ul> <li>as – Load Cells. Applications: Temperature Measurement uneter – measurement of moisture in solids and wood – level restricted variable Inductance Transducers:</li> <li>acers: Simple inductance and Mutual inductance Transducer Variable reluctance transducers – Eddy current transducers Position Measurement.</li> <li>Variable Capacitance Transducers and Other Transducers: Variable area type – Variable dielectric type – Vapacitive Moisture Transducers - Capacitive Level Transducers – Hall Effect Transducers – SQUID Sensors – Fors: Pyroelectric Sensors.</li> </ul>	sing RTD a measureme rs – Induct s. Applicat ucers: uriable dista ducer. Oth ilm sensor	and Thermist ent using resi ion Potentior ions: Displac ance type. A er Transduc s – Vibration	or – C istive meters cemen pplica ers: I Trans	Bas flow n tapes. Linear V t measure ttions: Ca Piezoelect	heasurem /ariable D ement - 1 pacitive 1 tric Trans	9 ifferenti hicknes 9 hicknes ducers ors. Se
type strain gauge hot-wire Anemorr Unit – IV Inductive Transdu Transformers – M Measurement – F Unit – V Capacitive Trans Transducers–Cap Magnetostrictive Generating Sense TEXT BOOK: 1. Vijayach REFERENCES:	<ul> <li>as – Load Cells. Applications: Temperature Measurement uneter – measurement of moisture in solids and wood – level restricted variable Inductance Transducers:</li> <li>acers: Simple inductance and Mutual inductance Transducer Variable reluctance transducers – Eddy current transducers Position Measurement.</li> <li>Variable Capacitance Transducers and Other Transducers: Variable area type – Variable dielectric type – Vapacitive Moisture Transducers - Capacitive Level Transducers – Hall Effect Transducers – SQUID Sensors – Fors: Pyroelectric Sensors.</li> </ul>	sing RTD a measureme rs – Induct s. Applicat ucers: ducers: ducer. Oth film sensor	and Thermist ent using resi ion Potentior ions: Displac ance type. A er Transduc s – Vibration w Delhi,2016	or – C istive meters cemen	Bas flow n tapes. E. Linear V t measure tions: Ca Piezoelect sducer - S	heasurem /ariable D ement - 1 pacitive 1 tric Trans	9 ifferenti hicknes 9 hicknes ducers ors. Se

		OUTCO tion of	-	urse, th	e stud	ents will	be able	e to							Mapped hest Lev	
CO1	ex	xplain th	ne meas	suremen	t of ph	ysical qua	antities,	conver	sion ar	nd classif	fication of	of transducers	S	Unde	rstanding	g (K2)
CO2	รเ	ummari	ze the c	oncepts	of vari	ous char	acteristi	cs of Tr	ansdu	cers				Unde	rstanding	J (K2)
CO3	ap	oply the	selecte	ed types	of resi	stive tran	sducers	for var	ious ap	plicatior	าร			Ар	olying (K	3)
CO4	ap	oply the	selecte	ed types	of indu	ictive trar	nsducer	s for va	rious a	pplicatio	ns			Ар	olying (Ka	3)
CO5	ap	oply var	ious typ	pes of ca	pacitiv	e transdu	icers an	d other	transd	lucers fo	r selecte	d application	IS	Ар	olying (K	3)
						М	apping	of COs	s with l	POs and	I PSOs					
COs/P	Os	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	F	PO12	PSO1	PSO2
CO1		3	2						1					1	2	2
CO2		3	2						1					1	2	2
CO3		3	3	1	1	1			2					1	3	3
CO4		3	3	1	1	1			2					1	3	3
CO5		3	3	1	1	1			2					1	3	3
1 – Slig	ght, 2	2 – Mod	erate, 3	8 – Subs	tantial,	BT- Bloc	m's Tax	konomy		-	L					
						A	SSESS	MENTI	PATTE	RN - TH	IEORY					
	/ Blo itego	oom's ory*	Rer	nember (K1) %	ing	Jndersta (K2)	•	Apply (K3)		Analyz (K4) 9	-	valuating (K %	(5)	Creating (K6) %	Tot	al %
(	CAT	1		30		70									1	00
(	CAT	2		20		50		30	)						1	00
(	CAT	3		20		50		30	)						1	00
	ESE	-		20		50		30	)						1	00

Programme & Branch	B.E. & Electronics and Instrumentation Engineering	Sem.	Category	L	т	Ρ	Credit
Prerequisites	Nil	3/4	PC	3	0	0	3
Preamble	Analog Integrated Circuits course dealt with circuits of s voltage. The contents in this course make use of integrate special function ICs.						
Unit – I	Basics and Characteristics of OPAMP:						9
Amplifier-Trans characteristics <b>Unit – II</b>	asics information of operational amplifier -Ideal operational ampli sfer Characteristics. DC Characteristics: Input bias current-Input Frequency response-Frequency Compensation -Slew Rate. Applications of Operational Amplifier: verting, Non inverting, Voltage follower, Summing Amplifier, Sub	offset curr	ent-Input offse	et vo	ltage	-Ther	mal drift. A
	hmitt trigger, Astable and Monostable Multivibrator - RC phase						
Unit – III	D-A and A-D Converters:						9
	: Resolution, Quantization, Range, Settling time. Digital to Analo to Digital Converter: Types: Flash type, Dual slope, and Successi					R-2R	and Inverte
Unit – IV	Special ICs:						9
Timor (IC SEE)	Introduction- Description of Functional block diagram - Monostak						
oscillator (IC 5	66) – Monolithic Phase locked loop (IC 565).Voltage regulator I (SMPS).	C. Genes U	p unp roguu				
oscillator (IC 5 Power Supply		C. Genes C		.01 (1			9
oscillator (IC 5 Power Supply Unit – V Introduction- A to Voltage cor	(SMPS).	earization,	conversions,	Signa	al tra		9 sion: Currer
oscillator (IC 5 Power Supply Unit – V Introduction- A to Voltage cor	(SMPS). Analog Signal Conditioning: nalog Data Representation- Signal Level and Bias Changes, Lin verter. Differential Instrumentation Amplifier –Common mode re	earization,	conversions,	Signa	al tra		9 sion: Currer
oscillator (IC 5 Power Supply Unit – V Introduction- A to Voltage cor	(SMPS). Analog Signal Conditioning: nalog Data Representation- Signal Level and Bias Changes, Lin verter. Differential Instrumentation Amplifier –Common mode re	earization,	conversions,	Signa	al tra		<b>9</b> sion: Currer gain. Analo
oscillator (IC 5 Power Supply Unit – V Introduction- A to Voltage cor Controllers: Pr TEXT BOOK: 1 Roy C	(SMPS). Analog Signal Conditioning: nalog Data Representation- Signal Level and Bias Changes, Lin verter. Differential Instrumentation Amplifier –Common mode re	earization, jection, Diff	conversions, a	Signa	al trainnon l	Mode	9 sion: Currer gain. Analo Total:4
oscillator (IC 5 Power Supply Unit – V Introduction- A to Voltage cor Controllers: Pr TEXT BOOK: 1 Roy C	(SMPS). Analog Signal Conditioning: nalog Data Representation- Signal Level and Bias Changes, Lin verter. Differential Instrumentation Amplifier –Common mode re oportional, Integral and Derivative mode Controllers. houdhury D. and Shail Bala Jain," Linear Integrated Circuits", 5 <sup>th</sup> Delhi, 2018.	earization, jection, Diff	conversions, a	Signa	al trainnon l	Mode	9 sion: Currer gain. Analo Total:4
oscillator (IC 5 Power Supply Unit – V Introduction- A to Voltage cor Controllers: Pr TEXT BOOK: 1. Roy C New E REFERENCES	(SMPS). Analog Signal Conditioning: nalog Data Representation- Signal Level and Bias Changes, Lin verter. Differential Instrumentation Amplifier –Common mode re oportional, Integral and Derivative mode Controllers. houdhury D. and Shail Bala Jain," Linear Integrated Circuits", 5 <sup>th</sup> Delhi, 2018.	earization, jection, Diff Edition, Re	conversions, a erential and C print, New Ag	Signa Comr	al trainnon f	Mode onal F	9 sion: Currer gain. Analo <b>Total:4</b> Publishers,

	SE OUTCOMES: mpletion of the course, the students will be able to	BT Mapped (Highest Level)
CO1	interpret the basics and characteristics of opamp	Understanding (K2)
CO2	apply the circuit of opamp for mathematical operation, waveform generation and filter.	Applying (K3)
CO3	implement A/D and D/A converters for real time application	Applying (K3)
CO4	summarize the functional blocks of special ICs.	Applying (K3)
CO5	develop analog signal conditioning circuits using opamp circuits	Applying (K3)

					Марр	ing of (	COs wit	h POs	and PS	Os				
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2											2	2
CO2	3	3	1	1	1								3	3
CO3	3	3	1	1	1								3	3
CO4	3	3	1	1	1								3	3
CO5	3	3	1	1	1								3	3
1 Slight 2	Mod	orato 2	Substar	tial BT	Bloom'	a Tayon	omv							

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT	<b>PATTERN - THEORY</b>
//OOLOOMENT	

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	10	50	40				100
CAT2	10	20	70				100
CAT3	10	20	70				100
ESE	10	20	70				100

valleu (CAI 1,2,0 100 marks) 070 may 00

	22EIT33 - DIGITAL LOGIC CIRCI	JITS					
Programme & Branch	B.E. & Electronics and Instrumentation Engineering	Sem.	Category	L	т	Р	Credit
Prerequisites	Nil	3	PC	3	1	0	4
Preamble	To impart the acquaintance about Boolean algebra, logic families, memory and programmable logic devices	c gates, c	ombinational	and	sequ	iential	logic, logi
Unit – I	Boolean Algebra and Minimization Techniques:						9+3
Products and Prod	and conversions – Boolean logic operations – Basic laws of E luct of Sums – Karnaugh Map (Two-variable, Three variable, F logic functions -Don't care condition– Logic gates.						
Unit – II	Combinational Circuits:						9+3
and 8-to-1 Multi Demultiplexers – I BCD-to-Binary cor	Design of Combinational circuits – Half adder – Full adder – H plexers, Implementation of Boolean expressions using m Decoders: 3-to-8 and 4-to-16 Decoders. Encoders: Octal-to-Bir overters, Binary-to-Gray code converters – Magnitude Compara	ultiplexers ary Encoc	<ul> <li>– Demultip</li> <li>ler – Parity Cł</li> </ul>	olexe necke	rs: 1 ers–	-to-4 Code	and 1-to-8 Converters
Unit – III	Synchronous Sequential Circuits: flops: Latches – Flip-Flops – S-R, D, J-K and T Flip-flops – Triggeri						9+3
model – Design	ealization of one Flip-flop using other Flip-flops - Synchrond of synchronous sequential circuits - State reduction and a	ssignmen	t - Analysis (	of sy	nchr		
le l	f synchronous counters: Design of MOD-3 counter -Shift Re	gisters: U	niversal shift	regis	sters.		•
Unit – IV	Asynchronous Sequential Circuits:	·		Ŭ			9+3
Unit – IV Design of Fundar	Asynchronous Sequential Circuits: nental mode asynchronous sequential circuits-primitive state Hazards –Design of hazard free switching circuits: Static	e / flow ta	ble- Problem	s in a	asyn	chron	9+3 ous circuits
Unit – IV Design of Fundar Cycles, Races, H Asynchronous co Unit – V	Asynchronous Sequential Circuits: nental mode asynchronous sequential circuits-primitive state lazards –Design of hazard free switching circuits: Static unter. Logic Families and Memory:	e / flow ta , Dynamio	ble- Problems c and Essen	s in a tial I	asyno naza	chrono rds el	9+3 ous circuits limination - 9+3
Unit – IV Design of Fundar Cycles, Races, H Asynchronous co Unit – V Logic Families: In immunity or noise Inverter. Memory Read Only Memo	Asynchronous Sequential Circuits: nental mode asynchronous sequential circuits-primitive state Hazards –Design of hazard free switching circuits: Static unter.	e / flow ta , Dynamic ation, Pov TL NAND cation of	ble- Problems c and Essen wer dissipatio Gate – Emi memories – - Types of R	s in a tial I on, F tter Basi	asyno naza an-ir Coup ic mo Stat	chrono rds el n, Far bled L emory ic RAI	9+3 ous circuits limination - 9+3 n-out, Noise ogic (ECL) v structure M, Dynamid
Unit – IV Design of Fundar Cycles, Races, H Asynchronous co Unit – V Logic Families: In immunity or noise Inverter. Memory Read Only Memo	Asynchronous Sequential Circuits:           nental mode asynchronous sequential circuits-primitive state           Hazards –Design of hazard free switching circuits: Static           unter.           Logic Families and Memory:           ntroduction – Characteristics of Digital ICs: Speed of oper           e margin - Transistor Transistor Logic (TTL): Two input T           and Programmable Logic Devices: Introduction – Classifior           ory (ROM) : Architecture and types – Random Access Memory	e / flow ta , Dynamic ation, Pov TL NAND cation of	ble- Problems c and Essen wer dissipatio Gate – Emi memories – - Types of R	s in a tial I on, F tter Basi	asyno naza an-ir Coup ic mo Stat	chrono rds el n, Far bled L emory ic RAI	9+3 ous circuits limination 9+3 n-out, Noise ogic (ECL)
Unit – IV Design of Fundar Cycles, Races, H Asynchronous co Unit – V Logic Families: In immunity or noise Inverter. Memory Read Only Memo	Asynchronous Sequential Circuits:           nental mode asynchronous sequential circuits-primitive state           Hazards –Design of hazard free switching circuits: Static           unter.           Logic Families and Memory:           ntroduction – Characteristics of Digital ICs: Speed of oper           e margin - Transistor Transistor Logic (TTL): Two input T           and Programmable Logic Devices: Introduction – Classifior           ory (ROM) : Architecture and types – Random Access Memory	e / flow ta , Dynamic ation, Pov TL NAND cation of	ble- Problems c and Essen wer dissipatio Gate – Emi memories – - Types of R	s in a tial I on, F tter Basi	asyno naza an-ir Coup ic mo Stat	chrono rds el n, Far bled L emory ic RAI	9+3 ous circuits limination 9+3 n-out, Noise ogic (ECL) v structure M, Dynami
Unit – IV Design of Fundar Cycles, Races, H Asynchronous co Unit – V Logic Families: In immunity or nois Inverter. Memory Read Only Memo RAM - Introductio	Asynchronous Sequential Circuits:           nental mode asynchronous sequential circuits-primitive state           Hazards –Design of hazard free switching circuits: Static           unter.           Logic Families and Memory:           ntroduction – Characteristics of Digital ICs: Speed of oper           e margin - Transistor Transistor Logic (TTL): Two input T           and Programmable Logic Devices: Introduction – Classifi           bry (ROM) : Architecture and types – Random Access Memory	e / flow ta , Dynamic ation, Pov TL NAND cation of ory (RAM)	ble- Problems c and Essen wer dissipatic Gate – Emi memories – - Types of R Lectu	s in a tial I on, F tter Basi RAM: <b>re:45</b>	asyno naza Coup ic mo Stat 5, Tut	chrono rds el pled L emory ic RAI	9+3 ous circuits limination 9+3 n-out, Nois ogic (ECL) v structure M, Dynami 15, Total:6
Unit – IV         Design of Fundar         Cycles, Races, H         Asynchronous co         Unit – V         Logic Families: H         immunity or nois         Inverter. Memory         Read Only Memory         RAM - Introduction         TEXT BOOK:         1.       Salivahan	Asynchronous Sequential Circuits:         nental mode asynchronous sequential circuits-primitive state         Hazards –Design of hazard free switching circuits: Static         unter.         Logic Families and Memory:         ntroduction – Characteristics of Digital ICs: Speed of oper         e margin - Transistor Transistor Logic (TTL): Two input T         and Programmable Logic Devices: Introduction – Classifi         bry (ROM) : Architecture and types – Random Access Memory         n to PLA, PAL and FPGA.	e / flow ta , Dynamic ation, Pov TL NAND cation of ory (RAM)	ble- Problems c and Essen wer dissipatic Gate – Emi memories – - Types of R Lectu	s in a tial I on, F tter Basi RAM: <b>re:45</b>	asyno naza Coup ic mo Stat 5, Tut	chrono rds el pled L emory ic RAI	9+3 ous circuits limination 9+3 n-out, Noise ogic (ECL) v structure M, Dynamic 15, Total:60
Unit – IV         Design of Fundar         Cycles, Races, I         Asynchronous co         Unit – V         Logic Families: In         immunity or noise         Inverter. Memory         Read Only Memory         RAM - Introduction         TEXT BOOK:         1.       Salivahan         REFERENCES:         1       M. Morris	Asynchronous Sequential Circuits:         nental mode asynchronous sequential circuits-primitive state         Hazards –Design of hazard free switching circuits: Static         unter.         Logic Families and Memory:         ntroduction – Characteristics of Digital ICs: Speed of oper         e margin - Transistor Transistor Logic (TTL): Two input T         and Programmable Logic Devices: Introduction – Classifi         bry (ROM) : Architecture and types – Random Access Memory         n to PLA, PAL and FPGA.	e / flow ta , Dynamic ation, Pov TL NAND cation of ory (RAM) ition, Oxfo	ble- Problems c and Essen wer dissipatio Gate – Emi memories – - Types of R Lectu rd University F	s in a tial I on, F Basi AM: <b>re:4</b> Press	asynn naza Gan-ir Coup ic mo Stat 5, Tut	chrono rds el oled L emory ic RAI corial:	9+3 ous circuits limination 9+3 n-out, Nois ogic (ECL) o structure M, Dynami 15, Total:6

		UTCON ion of t		se, the s	tudent	s will be	able to						(	BT Mapp Highest Le	
CO1	sim	plify the	boolear	n express	ions									Applying (	K3)
CO2	imp	lement	the com	oinational	logic c	ircuits								Applying (	K3)
CO3	app	ly synch	nronous	sequentia	al logic	for imple	menting	digital	circuits					Applying (	K3)
CO4	imp	lement	digital ci	rcuits usir	ng asyr	chronous	s seque	ntial log	ics					Applying (	K3)
CO5	ider	ntify the	role of lo	ogic famil	ies anc	memory	devices	3					Ur	nderstandin	g (K2)
						Марр	ing of C	COs wit	h POs	and PS	Os				
COs/F	POs	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO	1	3	3	1	1	1								3	3
CO	2	3	3	1	1	1								3	3
CO	3	3	3	1	1	1								3	3
CO	4	3	3	1	1	1								3	3
CO	5	3	2											3	3
1 – Slię	ght, 2	– Mode	erate, 3 -	Substan	tial, BT	- Bloom's	s Taxon	omy							
						ASSE	SSMEN		TERN -	THEOF	RY				
	t / Blo atego	oom's ory*	Re	memberi (K1) %	ng	Understa (K2)		Apply (K3)		Analyz (K4) 9		Evaluating (K5) %		eating K6) %	Total %
	CAT	1		10		30		60	)						100
	CAT	2		10		30		60	)						100
	CAT	3		10		40		50	)						
	ESE			5		25		70	)						100
* ±3%	may b	e varie	d (CAT 1	,2,3 – 50	marks	& ESE –	100 ma	arks)			·				

## 22EIT34 - ELECTRICAL MEASUREMENTS AND INSTRUMENTATION

																																	_							
Program Branch		E	B.E.	&Ele	ectr	oni	cs	an	۱d	Ins	str	run	me	ent	tati	ior	n E	Enę	gin	ee	rir	ng	J				Se	m.		Ca	teg	ory	L	Г	-	Ρ		C	Credit	t
Prerequ	uisites	1	Nil																								4	3			РС		3	1		0			4	
																																	_							
Preamb	ble	n F	Mea pow	surin er en	g Ir ergy	istru / wi	um th	en Ins	its. stru	. It um	t di nen	lisc nts,	cus , Po	sse Pote	es ent	the tio	ie ( me	co	mp	rel	he	ns	siv	/e	te														ctroni oltage	
Unit – I				sure																																			9+3	
Coil (P	ction to esse MMC): Cons ents: Genera ents.	nstr	ructi	on o	fΡ	MM	С	Ins	stru	um	ner	nts	5 -	• Т	Ford	qu	le.	Ec	qua	atio	n-	· A	An	nm	net	ter	SĬ	hun	ts-	Vc	ltm	eter	Mu	ıltipl	ier	s.	Мo	vin	g Iro	'n
Unit – I				sure																																			9+3	
Errors.	ction to Elect Single Phase g of Energy N	se l	Indu	ction	Тур	be N	Viet	ter	s:																															
Unit – I	II	F	Pote	ntio	met	ers	ar	۱d	Ins	str	run	me	ent	t Tı	rar	nsf	for	rm	ers	s:																			9+3	
Applica Instrum Potentia <b>Unit – I</b> Classific Resista Measur Bridge - <b>Unit – N</b>	ent Transform al Transforme V cation of Res nce- Kelvin I ement of Sel - Wien's Brid V	ormo ners esis Do elf I dge	ners: <u>s (P</u> Mea stanc ouble Indu e- Sc <b>Digi</b>	use T). D sure ses- N e Bric ctance ource tal In	of li <u>ner</u> /lea: lge. s of stru	nstr renc nt o sure Hiç Ca Err	of R of R of R of R of R of R of R of R	her bei Res cita s in <b>ati</b>	nt f two sis it o esis and n B ion	tra teel of N sta ce: Brid	anst en C nce Mec anc anc e: M dge	sfor <u>C.T</u> ediu ce - /lax e C ocl	rme T <u>a</u> and um – M Xwe Circ	ners and d I n R Me vell' cui Dia	rs-   d P Imp Resi egg I's   its. <b>agr</b>	Ra P.T. pe sist gar Inc <b>rar</b>	atic 2. M 2. M 2. M 2. M 2. M 2. M 2. M 2. M	os- <u>dea</u> nce Ea cta <b>Ap</b>	-Bu asu ce v e - V arth ance	urde ure wit Wh te: e E	en. me th nea ste Bric <b>ch</b>	. [ en Bi at : er) dg	De nt c ric St ). /	esi of dg tor A.( - (	ign Pc les ne C. Ca	Br Br	idg idg idg	e - les:	s c g li Lim Int e B	of C nstr nitat rod rido	.T um tion uct ge -	Curr ent s of on And	ent Γrar Wh So Iers	Tra sfor eat s urce on's	nst me Sto s Bi	forn ers. one and ridg	ner Bri I D e -	idg ete Sc	C.T) 9+3 e. Lov ectors cherin 9+3	w - g
	Multimeter, C Time, Period																																						Digita	al
																														L	.ec	ure	:45,	Tut	or	ial:	15,	To	otal:6	0
TEXT B																																								
1.	Sawhney A. Delhi ,2015.		ζ. "A	Cour	se i	n El	lec	tro	nic	c N	Nea	ası	ure	em	nen	nts	an	nd	Ins	stru	Im	er	nta	atio	on'	",2	nd E	Editi	on	, DI	nan	patF	Rai 8	& Co	). F	vt.	Lto	л , k	lew	
REFER	ENCES:																																							
1.	Robert B. N	Nor	rthro	p, "In	trod	luct	ion	n to	) In	nsti	trur	me	enta	tati	ion	ı ar	nd	M	eas	sur	en	ne	ent	ts"	", 3	3 <sup>rd</sup>	Edi	itior	, C	RC	; Pr	ess	20 <sup>-</sup>	17.						
2.	Kalsi, H.S.	S., "	"Eleo	troni	c In	stru	ime	ent	tati	ion	n", :	3 <sup>rd</sup>	ded	ditio	ion,	ı, Т	Tata	аN	Mc(	Gra	aw	Η	lill	ΙP	ub	olis	hin	g C	om	par	۱y,	New	De	lhi, 2	20	12.				

		JTCOM ion of t		se, the st	udents	s will be a	able to							BT Mapp ghest L	
CO1	utiliz	e the w	orking p	rinciple of	meters	s for mea	suremer	nt of Vol	tage a	nd Curre	ent		A	pplying (	K3)
CO2	utiliz	e the w	orking p	rinciple of	meters	s for mea	suremer	nt of Po	wer an	d Energy	/		A	pplying (	K3)
CO3	appl	y poten	tiometer	s and inst	rument	transforr	ners for	measu	rement	of electi	rical para	ameters.	A	pplying (	K3)
CO4	mea	sure the	e unknov	wn impeda	ance us	sing AC b	ridges						A	pplying (	K3)
CO5	expl	ore the	recent d	evelopme	nts in I	Digital Me	asurem	ents an	d Instru	uments			Unde	erstandir	ng (K2)
						Mappin	g of CO	s with	POs ai	nd PSOs	5				
COs/F	POs	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	P011	PO12	PSO 1	PSO2
CO	1	3	2	1	1	1								3	3
CO	2	3	2	1	1	1								3	3
CO	3	3	2	1	1	1								3	3
CO	4	3	2	1	1	1								3	3
CO	5	3	1											2	2
1 – Sli	ght, 2	– Mode	rate, 3 -	Substant	ial, BT∙	- Bloom's	Taxono	my							
						ASSES	SMENT	PATTE	ERN - 1	HEORY	,				
	st / Blo Catego	oom's ory*	Re	ememberi (K1) %	ng	Understa (K2)		Apply (K3)		Analyz (K4) 9	•	Evaluating (K5) %		ating 6) %	Tota %
	CAT	1		10		60	)	30	)						100
	CAT	2		10		60		30	)						100
	CAT	3		10		75	;	15	5						100
	ESE			10		60		30	)						100

Programme & Branch	BE & Electronics and Instrumentation Engineering	Sem.	Category	L	т	Р	С
Prerequisites	Nil	3	PC	3	0	0	3
Preamble	The course imparts the knowledge on Principles, Constr Instruments. It discusses the comprehensive techniques Instruments, Potentiometers and Bridges.						
Unit – I	Measurement of Voltage and Current:						
(PMMC): Constr General Torque <b>Unit – II</b> Introduction to E	ssential requirements of instruments- Three operating forces uction of PMMC Instruments - Torque Equation- Ammeter Equation - Classification – Construction - Comparison betwee Measurement of Power and Energy: Electrodynamometer type instruments- Electrodynamometer hase Induction Type Meters: Construction –Theory and O	Shunts- Nen Attraction	oltmeter Mu on and Repute er: Construc	Itiplier sion ty tion –	s. Moving pes of Ins	y Iron Instr struments.	ruments
	y Meters: Phantom loading.				_		
Unit – III	Potentiometers and Instrument Transformers:					9	9
(Ċ.T) – Potential <b>Unit – IV</b>	trument Transformers: use of Instrument transformers- Ratio Transformers (P.T). Difference between C.T and P.T. Measu Measurement of Resistance and Impedance with Brid Resistances- Measurement of Medium Resistance - Wheat	urement of <b>Iges:</b> t Stone Bri	Power using dge - Limitat	Instru	ment Trar	nsformers.	<b>)</b> ge. Lov
		r) A.C. Br	idaes: Introd	liction	- Source	s and De	tectors
Resistance- Kelv Measurement of	vin Double Bridge. High Resistance – Meggar (Earth teste Self Inductance & Capacitance: Maxwell's Inductance Brid	r). A.C. Br ge - Capa	idges: Introd citance Bridg	je - A	nderson's	es and De Bridge - S	tectors Scherin
Resistance- Kelv Measurement of	rin Double Bridge. High Resistance – Meggar (Earth teste	r). A.C. Br ge - Capa	idges: Introd citance Bridg	je - A	nderson's	Bridge - S	tectors Schering
Resistance- Kelv Measurement of Bridge - Wien's E Unit – V Digital Multimete	vin Double Bridge. High Resistance – Meggar (Earth teste Self Inductance & Capacitance: Maxwell's Inductance Brid Bridge- Sources of Errors in Bridge Circuits.	ge - Capa	citance Bridg	je - A ement	nderson's	Bridge - \$	Scherin 9 . Digita
Resistance- Kelv Measurement of Bridge - Wien's E <b>Unit – V</b> Digital Multimete meters: Time, Pe	rin Double Bridge. High Resistance – Meggar (Earth teste Self Inductance & Capacitance: Maxwell's Inductance Brid Bridge- Sources of Errors in Bridge Circuits. Digital Instrumentation (Block Diagram Approach): rr, Cathode Ray Oscilloscope. Impedance Measurement: C	ge - Capa	citance Bridg	je - A ement	nderson's	Bridge - \$	Scherin 9
Resistance- Kelv Measurement of Bridge - Wien's E Unit – V Digital Multimete meters: Time, Pe TEXT BOOK:	rin Double Bridge. High Resistance – Meggar (Earth teste Self Inductance & Capacitance: Maxwell's Inductance Brid Bridge- Sources of Errors in Bridge Circuits. Digital Instrumentation (Block Diagram Approach): rr, Cathode Ray Oscilloscope. Impedance Measurement: C	ge - Capa Q meter. R p type Volt	citance Bridg MS Measure meters. Shie	je - A ement Iding a	nderson's : True RI and Grour	Bridge - \$	Scherin 9 5. Digita Fotal:4
Resistance- Kelv Measurement of Bridge - Wien's E Unit – V Digital Multimete meters: Time, Pe TEXT BOOK:	vin Double Bridge. High Resistance – Meggar (Earth teste Self Inductance & Capacitance: Maxwell's Inductance Brid Bridge- Sources of Errors in Bridge Circuits. Digital Instrumentation (Block Diagram Approach): Ir, Cathode Ray Oscilloscope. Impedance Measurement: C priod and Frequency measurements. Digital Voltmeters: Ram	ge - Capa Q meter. R p type Volt	citance Bridg MS Measure meters. Shie	je - A ement Iding a	nderson's : True RI and Grour	Bridge - \$	Scherin 9 5. Digita Fotal:4
Resistance- Kelv Measurement of Bridge - Wien's E Unit – V Digital Multimete meters: Time, Pe TEXT BOOK: 1. Sawhne ,2015. REFERENCES:	vin Double Bridge. High Resistance – Meggar (Earth teste Self Inductance & Capacitance: Maxwell's Inductance Brid Bridge- Sources of Errors in Bridge Circuits. Digital Instrumentation (Block Diagram Approach): Ir, Cathode Ray Oscilloscope. Impedance Measurement: C priod and Frequency measurements. Digital Voltmeters: Ram	ge - Capa Q meter. R p type Volt tation",2nd	Citance Bridg MS Measure meters. Shie Edition, Dha	je - A ement Iding a npatR	nderson's : True RN and Grour	Bridge - \$	Scherin 9 Digita Fotal:4

COUR On cor				ourse, th	e stud	ents will	be able	e to							「Mapped hest Leve	
CO1	ut	ilize the	e worki	ng princi	ole of n	neters for	measu	rement	of Volt	tage and (	Curr	ent		Ap	plying (K	3)
CO2	ut	ilize the	e worki	ng princi	ole of n	neters for	measu	rement	of Pov	ver and E	nerg	IУ		Ap	plying (K	3)
CO3	ap	oply po	tentiom	eters and	d instru	ment trai	nsforme	rs for m	neasur	ement of	elect	trical pa	rameters	Ар	olying (K3	5)
CO4	m	easure	the un	known in	npedar	ice using	AC brid	lges						Ар	olying (K3	5)
CO5	ex	kplore t	he rece	ent devel	opmen	ts in Digit	al Meas	ureme	nts and	d Instrume	ents			Under	standing	(K2)
						м	apping	of COs	s with	POs and	PSC	)s				
COs/P	Os	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	Ρ	O10	PO11	PO12	PSO1	PSO2
CO1		3	2	1	1	1			2					1	3	3
CO2		3	2	1	1	1			2					1	3	3
CO3		3	2	1	1	1			2					1	3	3
CO4		3	1	1	1	1			1					1	3	3
CO5		3	1						2					1	2	2
1 – Slig	ght, 2	2 – Mod	lerate,	3 – Subs	tantial,	BT- Bloc	om's Tax	konomy	1							
						A	SSESS	MENT	PATTE	ERN - THI	EOR	Y				
	/ Blo atego	oom's ory*	Re	member (K1) %	ing l	Jndersta (K2)	-	Apply (K3)		Analyzii (K4) %	-	Evalu	ating (K5) %	Creating (K6) %	Tota	al %
	CAT	1		10		60		30	0						10	00
	CAT	2		10		60		30	0						10	00
	CAT	3		10		60		30	0						10	00
	ESE			10		60		30	)						1(	00

Programme & Branch	BE & Electronics and Instrumentation Engineering	Sem.	Category	L	т	Ρ	Credit
Prerequisites	Nil	3	PC	3	0	2	4
Preamble	To impart knowledge on electric circuit analysis and to discrete signals and systems.	provide fund	damental con	cepts	s of (	contin	uous and
Unit – I	Steady State Analysis:						9
Source transform AC Circuit: Sin factor. Three ph	iew of electric circuit elements and Kirchhoff's Laws-Dependent nation-Voltage and current relationship in R,L and C. gle phase: Phase relation in resistor, inductor, capacitor-Phas nase: Interconnection of three phase sources and loads –line a circuits: Two wattmeter method.	sor diagram	-Series RLC	circui	ts-po	wer a	ind powe
Unit – II	Network Theorems:						9
Mesh analysis-N	odal Analysis – Source transformation - Star-Delta transformatior m Power transfer theorem.	n -Superposi	tion theorem -	- The	evenir	i's an	-
Unit – III	Time and Frequency Domain Analysis:						9
DC Transient re	esponse analysis: - Steady state analysis of RL, RC and RLC	C series circ	uits. R <b>esona</b>	nce	analy	sis:	-
series and parall	el resonance-Impedance and current variations- Bandwidth-Q fac	tor- Magnific	ation factor.		_		
Unit – IV	Continuous and Discrete Time Signals:						9
exponential. Peri	nalog to Digital conversion- Sampling – Aliasing - Signal rep odical signals-Odd and Even signals-Energy and Power signals -			parat	oolic,	sinus	oidal an
Unit – V	Continuous and Discrete Time Systems:						9
causal-recursive and step input in	systems: static and dynamic -time variant and invariant – linear a and non recursive. Relation between Laplace and Z transform- continuous and discrete domain using Laplace and Z transform.						
causal-recursive and step input in LIST OF EXPER	systems: static and dynamic -time variant and invariant – linear a and non recursive. Relation between Laplace and Z transform	-Response a					
causal-recursive and step input in LIST OF EXPER 1. Determin 2. Verificati	systems: static and dynamic -time variant and invariant – linear a and non recursive. Relation between Laplace and Z transform- continuous and discrete domain using Laplace and Z transform. IMENTS / EXERCISES: nation of effective resistance in DC circuit using Star -Delta transform on of Superposition theorem in DC circuits	-Response a					
causal-recursive and step input in       LIST OF EXPER       1.     Determin       2.     Verificati       3.     Experime	systems: static and dynamic -time variant and invariant – linear a and non recursive. Relation between Laplace and Z transform- continuous and discrete domain using Laplace and Z transform. IMENTS / EXERCISES: nation of effective resistance in DC circuit using Star -Delta transfor on of Superposition theorem in DC circuits ental verification of Maximum Power Transfer theorem	Response a					
causal-recursive         and step input in         LIST OF EXPER         1.       Determin         2.       Verificati         3.       Experime         4.       Measure         5.       RC trans	systems: static and dynamic -time variant and invariant – linear a and non recursive. Relation between Laplace and Z transform- continuous and discrete domain using Laplace and Z transform. IMENTS / EXERCISES: nation of effective resistance in DC circuit using Star -Delta transfor on of Superposition theorem in DC circuits ental verification of Maximum Power Transfer theorem ment of current, voltage, power and power factor in single phase I ient response analysis	Response a					
causal-recursive and step input inLIST OF EXPER1.Determin2.Verificati3.Experime4.Measure5.RC trans6.Frequence	systems: static and dynamic -time variant and invariant – linear a and non recursive. Relation between Laplace and Z transform- continuous and discrete domain using Laplace and Z transform. IMENTS / EXERCISES: nation of effective resistance in DC circuit using Star -Delta transfor on of Superposition theorem in DC circuits ental verification of Maximum Power Transfer theorem ment of current, voltage, power and power factor in single phase I ient response analysis cy response analysis of RLC circuits	Response a					
causal-recursive and step input inLIST OF EXPER1.Determin2.Verificati3.Experime4.Measure5.RC trans6.Frequence7.Verificati	systems: static and dynamic -time variant and invariant – linear a and non recursive. Relation between Laplace and Z transform- continuous and discrete domain using Laplace and Z transform. <b>IMENTS / EXERCISES:</b> ation of effective resistance in DC circuit using Star -Delta transfor on of Superposition theorem in DC circuits ental verification of Maximum Power Transfer theorem ment of current, voltage, power and power factor in single phase I ient response analysis cy response analysis of RLC circuits on of periodicity in analog signals using MATLAB	Response a					
causal-recursive and step input inLIST OF EXPER1.Determin2.Verificati3.Experime4.Measure5.RC trans6.Frequend7.Verificati8.Verificati	systems: static and dynamic -time variant and invariant – linear a and non recursive. Relation between Laplace and Z transform- continuous and discrete domain using Laplace and Z transform. <b>IMENTS / EXERCISES:</b> ation of effective resistance in DC circuit using Star -Delta transfor on of Superposition theorem in DC circuits ental verification of Maximum Power Transfer theorem ment of current, voltage, power and power factor in single phase I ient response analysis cy response analysis of RLC circuits on of periodicity in analog signals using MATLAB on of periodicity in digital signals using MATLAB	Response a					
causal-recursive and step input inLIST OF EXPER1.Determin2.Verificati3.Experime4.Measure5.RC trans6.Frequence7.Verificati8.Verificati9.Stability	systems: static and dynamic -time variant and invariant – linear a and non recursive. Relation between Laplace and Z transform- continuous and discrete domain using Laplace and Z transform. IMENTS / EXERCISES: nation of effective resistance in DC circuit using Star -Delta transfor on of Superposition theorem in DC circuits ental verification of Maximum Power Transfer theorem ment of current, voltage, power and power factor in single phase I ient response analysis cy response analysis of RLC circuits on of periodicity in analog signals using MATLAB on of periodicity in digital signals using MATLAB analysis of continuous -time systems using MATLAB	Response a					
causal-recursive and step input inLIST OF EXPER1.Determin2.Verificati3.Experime4.Measure5.RC trans6.Frequence7.Verificati8.Verificati9.Stability	systems: static and dynamic -time variant and invariant – linear a and non recursive. Relation between Laplace and Z transform- continuous and discrete domain using Laplace and Z transform. <b>IMENTS / EXERCISES:</b> ation of effective resistance in DC circuit using Star -Delta transfor on of Superposition theorem in DC circuits ental verification of Maximum Power Transfer theorem ment of current, voltage, power and power factor in single phase I ient response analysis cy response analysis of RLC circuits on of periodicity in analog signals using MATLAB on of periodicity in digital signals using MATLAB	Response a	analysis of line	ear s	ysten	ns wit	h impulse
causal-recursive and step input in LIST OF EXPER 1. Determin 2. Verificati 3. Experime 4. Measure 5. RC trans 6. Frequent 7. Verificati 8. Verificati 9. Stability a	systems: static and dynamic -time variant and invariant – linear a and non recursive. Relation between Laplace and Z transform- continuous and discrete domain using Laplace and Z transform. IMENTS / EXERCISES: nation of effective resistance in DC circuit using Star -Delta transfor on of Superposition theorem in DC circuits ental verification of Maximum Power Transfer theorem ment of current, voltage, power and power factor in single phase I ient response analysis cy response analysis of RLC circuits on of periodicity in analog signals using MATLAB on of periodicity in digital signals using MATLAB analysis of continuous -time systems using MATLAB	Response a		ear s	ysten	ns wit	h impulse
causal-recursive and step input inLIST OF EXPER1.Determin2.Verificati3.Experime4.Measure5.RC trans6.Frequend7.Verificati8.Verificati9.Stability a10.Stability a	systems: static and dynamic -time variant and invariant – linear a and non recursive. Relation between Laplace and Z transform- continuous and discrete domain using Laplace and Z transform. <b>IMENTS / EXERCISES:</b> vation of effective resistance in DC circuit using Star -Delta transfor on of Superposition theorem in DC circuits ental verification of Maximum Power Transfer theorem ment of current, voltage, power and power factor in single phase I ient response analysis cy response analysis of RLC circuits on of periodicity in analog signals using MATLAB on of periodicity in digital signals using MATLAB analysis of continuous -time systems using MATLAB	-Response a	Lecture:4	ear s	ractic	al:30	h impuls
causal-recursive         and step input in         LIST OF EXPER         1.       Determin         2.       Verificati         3.       Experime         4.       Measure         5.       RC trans         6.       Frequend         7.       Verificati         8.       Verificati         9.       Stability a         10.       Stability a	systems: static and dynamic -time variant and invariant – linear a and non recursive. Relation between Laplace and Z transform- continuous and discrete domain using Laplace and Z transform. IMENTS / EXERCISES: nation of effective resistance in DC circuit using Star -Delta transfor on of Superposition theorem in DC circuits ental verification of Maximum Power Transfer theorem ment of current, voltage, power and power factor in single phase I ient response analysis cy response analysis of RLC circuits on of periodicity in analog signals using MATLAB on of periodicity in digital signals using MATLAB analysis of continuous -time systems using MATLAB	-Response a	Lecture:4	ear s	ractic	al:30	h impuls
causal-recursive and step input in         LIST OF EXPER         1.       Determin         2.       Verificati         3.       Experime         4.       Measure         5.       RC trans         6.       Frequend         7.       Verificati         8.       Verificati         9.       Stability at a stability	systems: static and dynamic -time variant and invariant – linear a and non recursive. Relation between Laplace and Z transform- continuous and discrete domain using Laplace and Z transform. <b>IMENTS / EXERCISES:</b> ation of effective resistance in DC circuit using Star -Delta transfor on of Superposition theorem in DC circuits ental verification of Maximum Power Transfer theorem ment of current, voltage, power and power factor in single phase I ient response analysis cy response analysis of RLC circuits on of periodicity in analog signals using MATLAB on of periodicity in digital signals using MATLAB analysis of continuous -time systems using MATLAB analysis of discrete-time systems using MATLAB analysis of discrete-time systems using MATLAB	Presponse a prmation	Lecture:4	<b>15, P</b>	ysten	sal:30	h impuls
causal-recursive and step input in         LIST OF EXPER         1.       Determin         2.       Verificati         3.       Experime         4.       Measure         5.       RC trans         6.       Frequend         7.       Verificati         8.       Verificati         9.       Stability at         10.       Stability at         TEXT BOOK:       Sudhak         1.       Sudhak         2.       Nagoor	systems: static and dynamic -time variant and invariant – linear a and non recursive. Relation between Laplace and Z transform- continuous and discrete domain using Laplace and Z transform. IMENTS / EXERCISES: nation of effective resistance in DC circuit using Star -Delta transfor on of Superposition theorem in DC circuits ental verification of Maximum Power Transfer theorem ment of current, voltage, power and power factor in single phase I ient response analysis cy response analysis of RLC circuits on of periodicity in analog signals using MATLAB on of periodicity in digital signals using MATLAB analysis of continuous -time systems using MATLAB analysis of discrete-time systems using MATLAB	Presponse a prmation	Lecture:4	<b>15, P</b>	ysten	sal:30	h impuls
causal-recursive         and step input in         LIST OF EXPER         1.       Determin         2.       Verificati         3.       Experime         4.       Measure         5.       RC trans         6.       Frequend         7.       Verificati         8.       Verificati         9.       Stability at         10.       Stability at         TEXT BOOK:       1.         2.       Nagoor         REFERENCES:       1.         1.       Ravish	systems: static and dynamic -time variant and invariant – linear a and non recursive. Relation between Laplace and Z transform- continuous and discrete domain using Laplace and Z transform. <b>IMENTS / EXERCISES:</b> nation of effective resistance in DC circuit using Star -Delta transfor on of Superposition theorem in DC circuits ental verification of Maximum Power Transfer theorem ment of current, voltage, power and power factor in single phase I ient response analysis cy response analysis of RLC circuits on of periodicity in analog signals using MATLAB on of periodicity in digital signals using MATLAB analysis of continuous -time systems using MATLAB analysis of discrete-time systems using MATLAB	-Response a ormation oad and Synthes t. Ltd., New I aw Hill Educ	Lecture:4 is", 4 <sup>th</sup> Edition Delhi, 2010 for ation (India) P	<b>IS, P</b>	ractic ractic	sal:30 Graw-	h impuls , <b>Total:7</b> Hill, New
causal-recursive and step input in         LIST OF EXPER         1.       Determin         2.       Verificati         3.       Experime         4.       Measure         5.       RC trans         6.       Frequend         7.       Verificati         8.       Verificati         9.       Stability a         10.       Stability a         11.       Stability a         12.       Nagoor         REFERENCES:       1.         11.       Ravish         2.       William	systems: static and dynamic -time variant and invariant – linear a and non recursive. Relation between Laplace and Z transform. continuous and discrete domain using Laplace and Z transform. IMENTS / EXERCISES: nation of effective resistance in DC circuit using Star -Delta transfor on of Superposition theorem in DC circuits ental verification of Maximum Power Transfer theorem ment of current, voltage, power and power factor in single phase I ient response analysis cy response analysis of RLC circuits on of periodicity in analog signals using MATLAB on of periodicity in digital signals using MATLAB analysis of continuous -time systems using MATLAB analysis of discrete-time systems using MATLAB	-Response a ormation oad and Synthes t. Ltd., New I aw Hill Educ	Lecture:4 is", 4 <sup>th</sup> Edition Delhi, 2010 for ation (India) P	<b>IS, P</b>	ractic ractic	sal:30 Graw-	h impuls , <b>Total:7</b> Hill, New

		UTCOM		se, the s	tudents	will be a	able to						(	BT Mapı Highest L	
CO1	de	termine	the stea	dy state a	analysis	in DC ai	nd AC ci	rcuits						Applying Precision	
CO2	inte	erpret th	e behav	ior of DC	resistiv	e circuits	using ne	etwork th	neorem	S			ŀ	Analyzing Precision	(K4),
CO3	ass	sess the	charac	eristics o	f RLC ci	rcuits in t	time and	frequer	ncy dom	ain				Applying Precision	
CO4	an	alyze co	ntinuou	s- time sig	gnals in	time and	frequen	cy doma	ain					Analyzing Precision	
CO5	ana	alyze di	screte- t	me syste	ms in tir	me and fr	equency	' domair	1					Analyzing Precision	
						Маррі	ng of C	Os with	POs a	nd PSOs	5				
COs/F	POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO	1	3	3	1	1	1								3	3
CO	2	3	3	2	2	2								3	3
CO	3	3	2	1	3	1	1		1	2	3		1	3	3
CO4	4	3	3	1	3	1	1		1	2	3		1	3	3
CO	5	3	3	1	3	1	1		1	2	3		1	3	3
1 – Slię	ght, 2	– Mode	rate, 3 -	- Substan	tial, BT-	Bloom's	Taxono	my							
						ASSE	SSMEN	T PATT	ERN - 1	HEORY	,				
	st / Bl Categ	oom's ory*	Re	emember (K1) %	ing	Understa (K2)		Apply (K3)		Analyz (K4)		Evaluating (K5) %		reating K6) %	Tota %
	CAT	Г1		5		20		65	5	10					100
	CAT	Г2		5		20		65	5	10					100
	CAT	ГЗ		5		20		65	5	10					100
	ES	F		5		20	)	65	5	10					100

	22MNT31 - ENVIRONMENTA (Common to All BE/BTech b						
Programme &		branches)					
Branch	All B.E/B.Tech Branches	Sem.	Category	L	Т	Ρ	Credit
Prerequisites	Nil	3/6	MC	2	0	0	0
Preamble	This course provides an approach to understand the pollution control & monitoring methods for sustainate awareness for engineering students on biological science.	able life and also					
Unit – I	Environmental Studies and Natural Resources						5
Introduction to E resources-case	nvironmental Science – uses, over-exploitation and conse studies	ervation of forest,	water, miner	al, fo	ood, e	energ	y and lan
Unit – II	Ecosystem and Biodiversity						5
Food web only).	ncept and components of an ecosystem -structural and fur Biodiversity: Introduction – Classification – Bio geographic n of biodiversity - case studies.						
Unit – III	Environmental Pollution						5
Environmental P acid rain, ozone	ollution: Definition – causes, effects and control measure layer depletion (b)Water pollution (c) Soil pollution - Role c	s of: (a) Air pollut of an individual in	tion - Climate	cha pollu	nge, ition ·	globa · case	l warming studies.
Unit – IV	Environmental Monitoring			-			5
Sustainability -th - Introduction to	Environmental Monitoring ree pillars of sustainability- factors affecting environmenta EIA - objectives of EIA - environment protection act - control of pollution) act.	al sustainability-ap – air (prevention	proaches for	sust of p	ainat ollutio	ole de on) a	5 velopmen
Sustainability -th - Introduction to	ree pillars of sustainability- factors affecting environmenta EIA - objectives of EIA - environment protection act - control of pollution) act.	al sustainability-ap – air (prevention	proaches for	sust of p	ainat ollutio	ole de on) a	5 velopmer
Sustainability -th - Introduction to (prevention and o <b>Unit – V</b> Functions of Ca nucleus- Heredit	ree pillars of sustainability- factors affecting environmenta EIA - objectives of EIA - environment protection act -	<ul> <li>air (prevention</li> <li>d its organelles -</li> </ul>	proaches for and control plasma mem	of p	ollutio	on) a	5 velopmer ct – wate 5 ondria and
Sustainability -th - Introduction to (prevention and o <b>Unit – V</b> Functions of Ca nucleus- Heredit	ree pillars of sustainability- factors affecting environmenta EIA - objectives of EIA - environment protection act - control of pollution) act. Introduction to Biological Science rbohydrates, lipids, proteins and nucleic acids - Cells and y and DNA - organization of DNA in cells - Genes and chi	<ul> <li>air (prevention</li> <li>d its organelles -</li> </ul>	proaches for and control plasma mem	of p	ollutio	on) a	5 velopmer ct – wate 5 ondria an
Sustainability -th - Introduction to (prevention and on <b>Unit – V</b> Functions of Ca nucleus- Heredit & meiosis - Cell of	ree pillars of sustainability- factors affecting environmenta EIA - objectives of EIA - environment protection act - control of pollution) act. Introduction to Biological Science rbohydrates, lipids, proteins and nucleic acids - Cells and y and DNA - organization of DNA in cells - Genes and chi	<ul> <li>air (prevention</li> <li>d its organelles -</li> </ul>	proaches for and control plasma mem	of p	ollutio	on) a	5 velopmer ct – wate 5 ondria an on- mitosi
Sustainability -th         - Introduction to         (prevention and or the second seco	<ul> <li>ree pillars of sustainability- factors affecting environmenta EIA - objectives of EIA - environment protection act - control of pollution) act.</li> <li>Introduction to Biological Science rbohydrates, lipids, proteins and nucleic acids - Cells and y and DNA - organization of DNA in cells - Genes and chi cycle and molecules that control cell cycle.</li> <li>Kaushik, and Kaushik C.P., "Environmental Science onal Pvt. Ltd., New Delhi, 2018, for Unit-I, II, III, IV.</li> </ul>	<ul> <li>air (prevention</li> <li>d its organelles - romosomes- Cell</li> <li>and Engineering</li> </ul>	pproaches for and control plasma mem division -Type ", 6th Multic	of p abrar es of	ollutione, m f cell r Edi	itocho divisio	5 velopmer ct – wate ondria an on- mitosi Total:2 New Ag
Sustainability -th         - Introduction to         (prevention and or the second or t	<ul> <li>ree pillars of sustainability- factors affecting environmenta EIA - objectives of EIA - environment protection act - control of pollution) act.</li> <li>Introduction to Biological Science rbohydrates, lipids, proteins and nucleic acids - Cells and y and DNA - organization of DNA in cells - Genes and chi cycle and molecules that control cell cycle.</li> <li>Kaushik, and Kaushik C.P., "Environmental Science onal Pvt. Ltd., New Delhi, 2018, for Unit-I, II, III, IV. SC, "Cells and Molecular Biology", 2<sup>nd</sup> Edition, reprint, Net</li> </ul>	<ul> <li>air (prevention</li> <li>d its organelles - romosomes- Cell</li> <li>and Engineering</li> </ul>	pproaches for and control plasma mem division -Type ", 6th Multic	of p abrar es of	ollutione, m f cell r Edi	itocho divisio	5 velopmer ct – wate ondria an on- mitosi Total:2 New Ag
Sustainability -th - Introduction to (prevention and on Unit – V Functions of Can nucleus- Heredit & meiosis - Cell of TEXT BOOK: 1. Anubha Internati 2. Rastogi.	<ul> <li>ree pillars of sustainability- factors affecting environmenta EIA - objectives of EIA - environment protection act - control of pollution) act.</li> <li>Introduction to Biological Science rbohydrates, lipids, proteins and nucleic acids - Cells and y and DNA - organization of DNA in cells - Genes and chi cycle and molecules that control cell cycle.</li> <li>Kaushik, and Kaushik C.P., "Environmental Science onal Pvt. Ltd., New Delhi, 2018, for Unit-I, II, III, IV. SC, "Cells and Molecular Biology", 2<sup>nd</sup> Edition, reprint, Net</li> </ul>	<ul> <li>air (prevention</li> <li>d its organelles - romosomes- Cell</li> <li>and Engineering</li> </ul>	pproaches for and control plasma mem division -Type ", 6th Multic	of p abrar es of	ollutione, m f cell r Edi	itocho divisio	5 velopmer ct – wate ondria an on- mitosi Total:2 New Ag
Sustainability -th - Introduction to (prevention and on Unit – V Functions of Can nucleus- Heredit & meiosis - Cell of TEXT BOOK: 1. Anubha Internati 2. Rastogi. 2008, fo REFERENCES: 1 Palanisa	<ul> <li>ree pillars of sustainability- factors affecting environmenta EIA - objectives of EIA - environment protection act - control of pollution) act.</li> <li>Introduction to Biological Science rbohydrates, lipids, proteins and nucleic acids - Cells and y and DNA - organization of DNA in cells - Genes and chi cycle and molecules that control cell cycle.</li> <li>Kaushik, and Kaushik C.P., "Environmental Science onal Pvt. Ltd., New Delhi, 2018, for Unit-I, II, III, IV. SC, "Cells and Molecular Biology", 2<sup>nd</sup> Edition, reprint, Net</li> </ul>	<ul> <li>air (prevention</li> <li>d its organelles - romosomes- Cell</li> <li>and Engineering</li> <li>ew Age Internation</li> </ul>	pproaches for and control plasma mem division -Type ", 6th Multic nal (P) Limite	of p Ibrar es of olou	ollutio ne, m f cell r Edi	itocho divisio tion, ers, f	5 velopmer ct – wate 5 ondria an on- mitosi Total:2 New Ag

	SE OUTCOMES: mpletion of the course, the students will be able to	BT Mapped (Highest Level)
CO1	illustrate the various natural resources and role of individual for its conservation	Understanding (K2)
CO2	elaborate the features of ecosystem and biodiversity to find the need for conservation.	Understanding (K2)
CO3	manipulate the sources, effects and control methods of various environmental pollution.	Applying (K3)
CO4	make use of the knowledge of EIA and environmental legislation laws towards sustainability.	Applying (K3)
CO5	explain the functions of carbohydrates, lipids, proteins, nucleic acids, Cells and its organelles	Understanding (K2)

					Mappin	g of CO	s with	POs an	d PSOs	6				
COs/POs	P01	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1					3							
CO2	2	1					3							
CO3	3	2	1				3							
CO4	3	2	1				3							
CO5	3	1												
1 – Slight, 2	– Mode	erate, 3 –	Substant	ial, BT- I	Bloom's	Taxono	my			· · · · ·				

	ASSESSMENT	PATTERN -	THEORY			
Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
25	35	40				100
25	35	40				100
NA						
NA						
	(K1) % 25 25 NA	Remembering (K1) %Understanding (K2) %25352535NA	Remembering (K1) %Understanding (K2) %Applying (K3) %253540253540NA	(K1) %         (K2) %         (K3) %         (K4) %           25         35         40           25         35         40           NA	Remembering (K1) %Understanding (K2) %Applying (K3) %Analyzing (K4) %Evaluating (K5) %253540253540NA	Remembering (K1) %Understanding (K2) %Applying (K3) %Analyzing (K4) %Evaluating (K5) %Creating (K6) %253540253540NA

Progr Branc	amme	&	B.E. 8	& Elect	ronics	and Ins	trumer	ntation	Engine	ering	Sem.	Category	L	т	Р	Credit
	quisite	5	Nil								3	PC	0	0	2	1
Pream	nble OF EXP		Instru	ments a	and Bric	lges.	of vario	ous trans	sducers	and Pe	erform v	arious elect	trical m	neas	ureme	nts using
1.		N	leasure	ment o	f tempe	erature	using t	hermoc	ouple, t	hermist	or and	resistance	tempe	ratur	e dete	ector and
2.		N		ment o			strain	gauge a	and loa	id cell	and infe	er their cha	racter	istics	as r	esistance
3.	(a) (b)	N		ment of							d test its ansduce	characteris r	tics			
4.		N	leasure	ment of	speed	using p	hotoele	ctric tac	homete	r and p	roximity	sensor				
5.	(a) (b)							ransduc ic transc								
6.		R	ange ex	xtensior	n for DC	amme	ter and	Voltmet	ter.							
7.			alibratio		ngle pha	ase Ene	ergy me	ter and	LPF W	attmete	r using	Phantom loa	ading a	and \	/erifica	ation with
8.		N	leasure	ment of	Curren	t and V	oltage u	using C	F and P	т						
9.		N	leasure	ment of	Resista	ance us	ing Wh	eatstone	e bridge	and Ke	elvin dou	ıble bridge				
10.		N	leasure	ment of	Inducta	ance an	d Capa	citance	using A	nderso	n's bridg	e and Sche	ering bi	idge		
																Total:30
REFE	RENCE	S/ M	ANUAL	./SOFT	WARE	:										
1.	Labo	ratory	/ Manua	al												
	RSE OU	on of	the co							ramata		transducer	-	(Hig	T Map ghest	Level)
CO1			e the ch			ments		ent phy	sical pa	liamete	rs using	transducer	5	Pred	cision	(S3)
CO2	follov	v the	measur	ement	of variou	us elect	rical qu	antities	using ir	strume	nts				lying(l cision	
CO3			the ur oficiently		resista	ince, ca	apacitar	nce and	induc	tance u	ising va	rious bridg	e		lying(l cision	
						Марр	ing of	Cos wit	h POs	and PS	Os					
COs/F	POs F	<b>PO</b> 1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	P011	P012	2 F	PSO1	PSO2
CO		3	2	1	3	1	2		1	2	3		1		3	3
		0	2	- 1	3	1	2	1	1	2	3		1		3	3
CO CO		3 3	2 2	1	3	1	2		1	2	3		1		3	

## 22EIL32 - ANALOG AND DIGITAL INTEGRATED CIRCUITS LABORATORY

Program Branch	nme &	B.E. 8	Electr	onics a	nd Instr	umenta	tion En	gineerin	ng	Sem.	Category	L	ТР	Credit
Prerequ	lisites	Nil								3/4	PC	0	0 2	1
Preamb	le									uits desigion softwa	gn for given are.	specifica	ation. It e	nables t
LIST OF		MENTS / E	EXERCI	SES:										
1.	Design a	and Verific	cation of	Full add	der and	Full Sub	otractor of	circuits,	JK Flip f	lop, D Flij	o flop,			
2.	Design a	and imple	mentatio	on of Bin	ary to G	Gray and	Gray to	Binary	code co	nverters				
3.	Design a	and imple	mentatio	on of En	coder, D	ecoder	and Mul	tiplexers	8					
4.	Design a	and imple	mentatio	on of 4 –	bit mod	lulo cou	nters							
5.	Design a	and imple	mentatio	on of 4-b	it shift r	egisters								
6.	Design a	and imple	mentatio	on of inv	erting a	nd non-i	nverting	amplifie	ers using	operatio	nal amplifier			
7.	Design a	and imple	mentatio	on of Ad	der & Co	omparat	or circuit	ts using	operatio	onal ampli	fier			
8.	Design a	and imple	mentatio	on of Inte	egrator a	and Diffe	erentiato	r circuits	s using c	perationa	al amplifier			
9.	Impleme	ntation of	NE/SE	555 tim	er in Ast	table an	d Monos	table m	odes					
10.	Simulati	on of opai	mp base	ed circuit	s Anadi	gam an	id Implei	mentatic	on in FP	٩A				
														Total:3
REFERI	ENCES/ M	ANUAL /	SOFTW	ARE:										
1.	Lab Mar													
2.	Software	: Anadigr	n tool											
COURS	E OUTCO	MES:											BT Map	ped
	pletion of											(	Highest Applying	-
CO1	Design (	Combinati	onal an	d Seque	ntial dig	ital circu	uits using	g ICs.					Precision	(S3)
CO2	Design I	inear, nor	i linear,	data cor	verters	and way	ve shapi	ng circu	its using	operatio	nal amplifier		Applying Precision	(S3)
CO3	Design o	circuits wit	h IC555	5 timer a	nd perfo	orm simu	ulation w	ith CAD	tools				Applying Precision	
					Man	ning of	Cos wit		and PS(	)e				
COs/PC	Ds PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	PSO1	PSO
CO1	3	2	1	3	1	2		1	2	3		1	3	3
CO2	3	2	1	3	1	2		1	2	3		1	3	3
CO3	3	2	1	3	1	2	1	1	2	3		1	3	3

Program Branch	mme &	BE &	Electro	nics an	d Instru	umentat	ion Eng	ineerin	g	Sem.	Category	L	ТР	Credit
Prerequ	uisites	Nil								3	PC	0	0 2	1
Preamb	le										a better und erating and			
LIST O	FEXPERIM	ENTS / E	EXERCI	SES:										
1.	Zener dio	de as vo	ltage re	gulator										
2.	Clipper ar	nd clamp	er circui	ts using	diodes									
3	Determina	ation of	hybrid p	aramete	ers in CE	E configu	uration							
4.	Determina	ation of F	ET para	ameters										
5.	UJT as re	laxation	oscillato	or										
6.	BJT as Di	fferentia	l Amplifi	er										
7.	Frequenc	y respon	se of B.	IT ampli	fier									
8.	BJT base													
9.	BJT base	d Astable	e Multivi	brator										
10.	BJT base				or									
10.	Do'i base				.01									Total:30
														Tetunet
REFER	ENCES/ MA	NUAL /	SOFTW	ARE:										
1.	Devices a	nd Circu	iits Lab	Manual										
													BT Map	
	npletion of t												(Highest Applying	-
CO1	Determine	e the cha	aracteris	tics and	parame	eters of t	ransisto	rs					Precisio	n (S3)
CO2	Generate	wavefor	ms usin	g diodes	and tra	ansistors	5						Applying Precisio	n (S3)
CO3	Analyzing	the freq	uency re	esponse	of BJT								Applying Precisio	
		•	1		Мар	ping of	Cos wit	h POs a	nd PSC	)s				
		PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
	3	2	1	3	1	1		1	2 2	3 3		1	3	3
COs/Po CO1 CO2		3	1	3	1	1		1				1	3	3

			(C	ommon to	All Engine	eering and	Technolog	y Branche	es)				
Progran Branch	nme &	All B.E	./B.Tech Br	anches			Se	m.	Category	L	т	Р	Credi
Prerequ	isites	Nil					3 /	/ 4	HS	0	0	2	1
Preambl	е		urse is desig ional comm			sary skills	to listen, s	peak, rea	d and write	in ordei	r to ob	tain be	tter
LIST OF		ENTS / E	XERCISES										
1.	Self I	ntroductio	n & Mock In	terview									
2.	Job	Applicatio	n letter with	Resume									
3.	Pres	entation: A	A Technical 1	opic / Pro	ect report	& a Case s	study						
4.	Situa	tional Dial	logues / Tele	ephonic C	onversatio	ns							
5.	Grou	p Discuss	ion										
6.	Read	ling Aloud											
7.	Liste	ning Com	prehension										
8.	Writir	ng Compa	ny Profiles										
9.	Prepa	aring revi	ews of a boo	ok/product	/movie								
10.	Pron	unciation <sup>-</sup>	Test										
1. 2.		oratory Ma	anual anguage La	b Softwar	9								
	E OUTCOI	-									BT Ma	apped	
2001/01	pletion of	the cours	se, the stud	ents will I	be able to					(⊦	lighes	st Leve	
	anka											nding (ł on (S1)	
	enna	nce effect	ive listening		ng skills								
On com			ive listening sional skills i	and readi	-	ce/higher e	ducation			A Nat		ation (S	S5)
On com CO1	acqu	re profess	-	and readi equired fo	r workplac	-				A Nat A	turaliz Applyir		85)
On com CO1 CO2	acqu	re profess	sional skills	and readi equired fo	r workplac	-	8	60s		A Nat A	turaliz Applyir	ation (Sing (K3)	\$5)
On com CO1 CO2	acqu	re profess	sional skills	and readi equired fo	r workplac	s situations	8	60s P08	PO9	A Nat A	turaliz Applyir rticula	ation (Sing (K3)	85)
On com CO1 CO2 CO3 COs/	acqu use E	ire profess English lar	sional skills i nguage skills	and readi required fo effectivel Map	y in variou	s situations	S Os and PS		P09 2	A Nat A	turaliz Applyir rticula	ation (S ng (K3) tion (S4	\$5) ; 4)
On com CO1 CO2 CO3 COs/ POs	acqu use E	ire profess English lar	sional skills i nguage skills	and readi required fo effectivel Map	y in variou	s situations	S Os and PS			P <b>O1</b> (	turaliz Applyir rticula	ation (S ng (K3) tion (S4	\$5) 4) <b>PO1</b>

(0	Common te	D Electrical and Electronics Engineering& Electronics and Ir	nstrumer	tation Engine	eering	g Bra	inche	s)
Program Branch		BE - Electrical and Electronics Engineering& Electronics and Instrumentation Engineering Branches	Sem.	Category	L	т	Р	Credit
Prerequ	uisites	Nil	4	BS	3	1	0	4
Preamb	le	To provide the skills for handling discrete and continuous tin Transform and impart knowledge in partial differential equat series.						
Unit – I		Fourier Series:						9+3
		ns – General Fourier series – Change of interval – Odd and e s – Harmonic analysis.	even fund	ctions – Half r	ange	Sine	serie	es – Hali
Unit – II		Fourier Transform:						9+3
Fourier		eorem (without proof) – Fourier transform pair – Properties (wit Cosine transforms – Properties (without proof) – Convolution th						
Unit – II		Z –Transform:						9+3
		form of some basic functions – Elementary properties – Inverse ion theorem – Applications of Z-transforms: Solution of difference			action	meth	nod –	Residue
			o oquuno	/13.				
Unit – ľ	V	Partial Differential Equations:	•					9+3
Formati	<b>V</b> on of partia		arbitrary	functions – La	agranç	ge's I	inear	
Formati	V on of partia on of homo	Partial Differential Equations: I differential equations by elimination of arbitrary constants and	arbitrary	functions – La	igranę	ge's I	inear	
Formation – Solution <b>Unit – V</b> Classific	V on of partia on of homo / cation of se	Partial Differential Equations: I differential equations by elimination of arbitrary constants and geneous linear partial differential equations of higher order with	arbitrary constant ons of or	functions – La coefficients. ne dimensiona	al way	/e ec		equatior 9+3
Formatio – Solutio <b>Unit – V</b> Classific	V on of partia on of homo / cation of se	Partial Differential Equations:         I differential equations by elimination of arbitrary constants and geneous linear partial differential equations of higher order with a second order quasi linear partial differential Equations:         Example 2         Becond order quasi linear partial differential equations – Solution	arbitrary constant ons of or	functions – La coefficients. ne dimensiona	al way	/e ec ).	luatio	equatior 9+3 n – One
Formatio – Solutio <b>Unit – V</b> Classific	V on of partia on of homo / cation of se onal heat e	Partial Differential Equations:         I differential equations by elimination of arbitrary constants and geneous linear partial differential equations of higher order with a second order quasi linear partial differential Equations:         Example 2         Becond order quasi linear partial differential equations – Solution	arbitrary constant ons of or	functions – La coefficients. ne dimensiona ing insulated e	al way	/e ec ).	luatio	equatior 9+3 n – One
Formation – Solution <b>Unit – V</b> Classific dimension	V on of partia on of homo / cation of se onal heat e	Partial Differential Equations:         I differential equations by elimination of arbitrary constants and geneous linear partial differential equations of higher order with a second order quasi linear partial differential Equations:         Example 2         Becond order quasi linear partial differential equations – Solution	arbitrary constant ons of or n (excludi	functions – La coefficients. ne dimensiona ing insulated e Lecture:4	al way edgesj <b>15, T</b> u	/e ec ). Itoria	juation	equatior 9+3 n – One Total:60
Formation – Solution Unit – V Classific dimension TEXT B	V on of partia on of homo / cation of se onal heat e OOK: Ramana E	Partial Differential Equations:         I differential equations by elimination of arbitrary constants and geneous linear partial differential equations of higher order with a second order quasi linear partial differential Equations:         econd order quasi linear partial differential equations – Solution quation – Steady state solution of two dimensional heat equations	arbitrary constant ons of or n (excludi	functions – La coefficients. ne dimensiona ing insulated e Lecture:4	al way edgesj <b>15, T</b> u	/e ec ). Itoria	juation	equatior 9+3 n – One Total:60
Formation – Solution Unit – V Classific dimension TEXT B	V on of partia on of homo / cation of se onal heat e cook: Ramana E 2018. ENCES:	Partial Differential Equations:         I differential equations by elimination of arbitrary constants and geneous linear partial differential equations of higher order with a second order quasi linear partial differential Equations:         econd order quasi linear partial differential equations – Solution quation – Steady state solution of two dimensional heat equations         8 V, "Higher Engineering Mathematics", 1 <sup>st</sup> Edition, Tata McGra         n T., "Transforms and Partial Differential Equations", 3 <sup>rd</sup> Edition	arbitrary constant ons of or n (excludi w-Hill Pu	functions – La coefficients. ne dimensiona ing insulated e <b>Lecture:</b> 4 blishing Comp	al way edgesj <b>15, Tu</b> bany I	/e ec ). <b>itoria</b> _imite	quation II:15, ed, Ne	equatior 9+3 n – One Total:60
Formatie – Solutie Unit – V Classific dimensie TEXT B 1. REFER	V on of partia on of homo / cation of se onal heat e cook: Ramana E 2018. ENCES: Veerarajai Delhi, 201	Partial Differential Equations:         I differential equations by elimination of arbitrary constants and geneous linear partial differential equations of higher order with a second order quasi linear partial differential Equations:         econd order quasi linear partial differential equations – Solution quation – Steady state solution of two dimensional heat equations         8 V, "Higher Engineering Mathematics", 1 <sup>st</sup> Edition, Tata McGra         n T., "Transforms and Partial Differential Equations", 3 <sup>rd</sup> Edition	arbitrary constant ons of or n (excludi w-Hill Pu n, Tata M	functions – La coefficients. ne dimensiona ing insulated e <b>Lecture:</b> 4 blishing Comp	al way edges <b>15, Tu</b> bany I	/e ec ). <b>itoria</b> _imite	quation II:15, ed, Ne	equation 9+3 n – One Total:60

		UTCOM		se, the s	tudents	s will be a	able to						(	BT Map Highest L	
CO1	exp	ress the	e given fu	unction o	r data in	terms of	Fourier s	series.						Applying	(K3)
CO2						transform		proper	ties wh	ich will p	provide t	he ability	to Ur	derstandi	ng (K2)
CO3	pos	sess kn	owledge	of Z trai	nsform t	to analyze	e linear ti	me inva	riant sy	stems.				Applying	(K3)
CO4	forn	nulate a	nd solve	higher o	rder pa	rtial differe	ential equ	uations.						Applying	(K3)
CO5				s techniq quations		solving or	ie and tw	vo dime	nsional	heat flow	w proble	ms and or	ne	Applying	(K3)
						Марріі	ng of CC	s with l	POs an	d PSOs					
COs/F	POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO	1	3	2	1										2	
CO	2	3	3	2										3	
CO	3	3	3	2											
CO	4	3	2	1										1	
CO	5	3	3	2										1	
1 – Slig	ght, 2	– Mode	rate, 3 –	Substan	tial, BT·	Bloom's	Taxonor	ny	L	1				1	1
						ASSES	SMENT	PATTE	RN - T	HEORY					
	st / Blo Catego	oom's ory*	Re	memberi (K1) %	ng	Understa (K2)		Apply (K3)		Analyzi (K4) %		Evaluating (K5) %		eating (6) %	Total %
	CAT	1		10		30		60	)	-		-		-	100
	CAT	2		10		30		60	)			-		-	100
	CAT	3		10		30		60	)	-		-		-	100
	ESE			10		35		55	5	-		-		-	100

	22ITC41 – PROGRAMMING IN (Common to ECE, EEE, EIE, MTS En	_	has )				
Programme&		igineering branc	nes )				
Branch	ECE,EEE,EIE,MTS	Sem.	Category	L	Т	Ρ	Credit
Prerequisites	ProblemSolvingandProgramming in C	4	ES	3	0	2	4
Preamble	This course introduces the core Python programming. It	emphasizes dev	eloning Pytho	n nro	aram	s with	
Treamble	alldatatypes,functions, classes,objects,and NumPy		eloping r ytho	n pio	gram	S WILLI	
Unit – I	Introduction:						9
datatypes-inp	ngstrategies-programdesigntools-Typesoferrors-Testing utoperation-comments-reservedwords-indentation-Ope nents:Introduction-conditionalstatement-iterativestatemen	ratorsandExpres	sions–Decisio	on			
Unit – II	Lists,TuplesandDictionary:						9
operations, ass	odate, nested, cloning, operations, methods, comprehens signments, returning multiple values, nested tuples, in elete,sort,looping,nested,built-inmethods—listvstuplevs diction	dex, and count					
Unit – III	StringsandRegularExpressions:						9
Strings: Conca sliceoperation-finditerfunctions	tenation, append, multiply on strings-Immutable-forma functions-operators-comparing -iterating -string module flagoptions.	tting operator– e–Regular Expre	Built-in string ssions – ma	g me tch, s	ethod searc	s and h, sul	d functions b,findall an
Unit – IV	<b>FunctionsandModules:</b> duction-definition-call-variable scope and life time-retu						9
function redefini		dules: Modules	<ul> <li>packages</li> </ul>	-star	dard	libra	-
Unit – V	ObjectOrientation:						9
	ects: Class and objects– class methods and self– const nber. <b>NumPy:</b> NumPy Arrays–Computation on NumPyArray					ructor	-public an
	<b>,</b> , <b>,</b> , <b>,</b> , <b>,</b> , <b>,</b> ,						
LIST OF EXPER	RIMENTS / EXERCISES:						
1. Program	nsusingconditionalandloopingstatements						
2. Implem	entationoflistandtupleoperations						
3. Implem	entationofdictionaryoperations						
4. Perform	n variousstringoperations						
5. Usereg	ularexpressionsforvalidatinginputs						
6. Demon	strationof differenttypesoffunctionsandparameter passing						
7. Develoj	oprogramsusingclasses andobjects						
8. Perform	ncomputationon NumPyarrays						
9. Drawdif	ferenttypes ofplotsusing Matplotlib						
			Lectu	re:45	Pra	ctical	:30, Total:7
TEXT BOOK:       1.     Reema <sup>-</sup>	Thareja.,"PythonProgrammingusingproblemsolvingapproach	" ardimaraceia:	Netoral Initian	it. /D			
	MANUAL / SOFTWARE:	,o. mpression, C	Jaiordonivers	ityPre	55.,N	iewDe	sinii,∠U17.
	waraRao, "Core PythonProgramming", 2 <sup>nd</sup> Edition, DreamTe	chPress NewDo	lhi 2018				
				aliat	ra A <sup>S</sup>	بریانہ – <sup>ا</sup>	n 2010
2. JakeV	anderPlas,"Python Data ScienceHandbookEssentialToolsfo	rvvorking with Da	ta",O'Reillypul	olishe	rs,1	⊨ditio	n, 2016.
	and Instrumentation Engineering Regulation Curriculum a						

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		OUTCO etion of	-	irse, the s	student	s will be	able to							BT Ma (Highest	Level)
CO1	u	se basi	c Python	construct	ts to bui	ld simple	program	IS						Applyin Precision	
CO2	a	pply list	, tuple, a	and dictior	ary to h	andle a v	ariety of	data.						Applyin Precision	ig(K3),
CO3	a	pply str	ings and	regular e	xpressio	ons for se	arching	and retrie	eval					Applyin Precision	
CO4	S	olve the	problem	ns using fu	unctions	and mod	lules.							Applyin Precision	
CO5	a	pply obj	ject-orier	nted conce	epts and	d perform	basic da	ata scien	ce opei	ations u	ising Pytł	non		Applyin Precision	
						Мар	oing of (	COs with	n POs a	and PSC	Ds				
COs/P	Os	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO	1	3	2	1	1										
CO2	2	3	2	1	1										
COS	3	3	2	1	1										
CO4	4	3	2	1	1										
COS	5	3	2	1	1										
1 – Sli	ght, 2	2 – Moc	lerate, 3	<ul> <li>Substar</li> </ul>	ntial, BT	- Bloom's	Taxono	omy							
						ASS	ESSMEI		ERN -	THEOR	Y				
	/ Blo atego	oom's ory*	Re	memberi (K1) %	ng	Understa (K2)	•	Apply (K3)		Analyz (K4)	•	Evaluating (K5) %		eating (6) %	Total %
	CAT	1		10		1	5	7	5			-			100
	CAT	2		10		1	5	7	5						100
	CAT	3		10		1	5	7	5						100
	ESE			10		1	5	7	5						100

\* ±3% may be varied (CAT 1, 2 & 3 – 50 marks & ESE – 100 marks)

	22EIT41 - MICROCONTROLLER AND ITS /	APPLICATI	UNS				
Programme & Branch	B.E. & Electronics and Instrumentation Engineering	Sem.	Category	L	т	Ρ	Credit
Prerequisites	Digital Logic Circuits	4	PC	3	0	0	3
Preamble	To get acquaintance with the architecture of 8085 proces programming concepts for interfacing peripherals with th microcontrollers.						
Unit – I	8085 Microprocessor:						9
	85 Microprocessor-Architecture-Pin configuration-Interrupts-Insig –Simple Assembly Language Programs for arithmetic operation		t –Addressing	) Moc	des–T	iming	Diagrams
Unit – II	8051 Microcontroller:						9
	D51 Microcontroller- Architecture- Memory Organization- Spe nstruction set-Addressing modes.	cial functio	n registers –	Pro	gram	Coun	ter – PSV
Unit – III	8051 Programming:						9
C: I/O port progra	(Mode 1) / Counter– Serial Communication - Interrupt (Timer, mming- Timer programming-Counter programming-Serial port p	Serial comr rogramming	nunication) – g-Interrupt pro	Prog gram	ramm ming	ing in	
C: I/O port progra Unit – IV	(Mode 1) / Counter– Serial Communication - Interrupt (Timer, mming- Timer programming-Counter programming-Serial port p Peripheral Interfacing with 8051:	rogramming	g-Interrupt pro	gram	ming	-	9
C: I/O port progra Unit – IV Programming in E	(Mode 1) / Counter– Serial Communication - Interrupt (Timer, mming- Timer programming-Counter programming-Serial port p Peripheral Interfacing with 8051: mbedded C: Keypad- LCD – Sensors- A/D and D/A converters-	rogramming DC Motor -	g-Interrupt pro	gram	ming	-	9
C: I/O port progra Unit – IV Programming in E Unit – V	(Mode 1) / Counter– Serial Communication - Interrupt (Timer, mming- Timer programming-Counter programming-Serial port p Peripheral Interfacing with 8051: Embedded C: Keypad- LCD – Sensors- A/D and D/A converters- Applications of Microcontrollers(Block Diagram Approa	rogramming DC Motor · <b>ch):</b>	-Interrupt pro	gram r – S	ming ervo	motor	9
C: I/O port progra Unit – IV Programming in E Unit – V Smart Card read	(Mode 1) / Counter– Serial Communication - Interrupt (Timer, mming- Timer programming-Counter programming-Serial port p Peripheral Interfacing with 8051: mbedded C: Keypad- LCD – Sensors- A/D and D/A converters-	rogramming DC Motor · <b>ch):</b>	-Interrupt pro	gram r – S	ming ervo	motor	9
C: I/O port progra Unit – IV Programming in E Unit – V Smart Card read	(Mode 1) / Counter– Serial Communication - Interrupt (Timer, mming- Timer programming-Counter programming-Serial port p Peripheral Interfacing with 8051: mbedded C: Keypad- LCD – Sensors- A/D and D/A converters- Applications of Microcontrollers(Block Diagram Approa ler, Automated Meter Reading System, Washing machine,	rogramming DC Motor · <b>ch):</b>	-Interrupt pro	gram r – S	ming ervo	motor	9
C: I/O port progra Unit – IV Programming in E Unit – V Smart Card read	(Mode 1) / Counter– Serial Communication - Interrupt (Timer, mming- Timer programming-Counter programming-Serial port p Peripheral Interfacing with 8051: mbedded C: Keypad- LCD – Sensors- A/D and D/A converters- Applications of Microcontrollers(Block Diagram Approa ler, Automated Meter Reading System, Washing machine,	rogramming DC Motor · <b>ch):</b>	-Interrupt pro	gram r – S	ming ervo	motor	9 9 ystems, 31
C: I/O port progra Unit – IV Programming in E Unit – V Smart Card read Printers, Smart Ho TEXT BOOK: 1 Senthil K	(Mode 1) / Counter– Serial Communication - Interrupt (Timer, mming- Timer programming-Counter programming-Serial port p Peripheral Interfacing with 8051: mbedded C: Keypad- LCD – Sensors- A/D and D/A converters- Applications of Microcontrollers(Block Diagram Approa ler, Automated Meter Reading System, Washing machine,	rogrammin <u>e</u> DC Motor - <b>ch):</b> Speedomet	g-Interrupt pro Stepper moto er, Healthcar	gram r – S e mo	ervo onitor	motor.	9 9 ystems, 31 Total:4
C: I/O port progra Unit – IV Programming in E Unit – V Smart Card read Printers, Smart Ho TEXT BOOK: 1. Senthil K Press, Ne	(Mode 1) / Counter– Serial Communication - Interrupt (Timer, mming- Timer programming-Counter programming-Serial port p Peripheral Interfacing with 8051: mbedded C: Keypad- LCD – Sensors- A/D and D/A converters- Applications of Microcontrollers(Block Diagram Approa ler, Automated Meter Reading System, Washing machine, ome automation system.	rogrammin <u>e</u> DC Motor - <b>ch):</b> Speedomet	g-Interrupt pro Stepper moto er, Healthcar	gram r – S e mo	ming ervo onitor	motor.	9 9 ystems, 31 Total:4
C: I/O port progra Unit – IV Programming in E Unit – V Smart Card reac Printers, Smart Ho TEXT BOOK: 1. Senthil K Press, Ne REFERENCES: 1. Gaonkar New Delf	(Mode 1) / Counter– Serial Communication - Interrupt (Timer, mming- Timer programming-Counter programming-Serial port p Peripheral Interfacing with 8051: imbedded C: Keypad- LCD – Sensors- A/D and D/A converters- Applications of Microcontrollers(Block Diagram Approa ler, Automated Meter Reading System, Washing machine, ome automation system. iumar N., Saravanan M., Jeevananthan S., "Microprocessors a ew Delhi, 2016. R.S, "Microprocessor Architecture, Programming, and Applicationi, 2013.	rogramming DC Motor - <b>ch):</b> Speedomet and Microco ons with the	g-Interrupt pro Stepper moto er, Healthcar pontrollers", 2 <sup>nd</sup> e 8085", 6 <sup>th</sup> Ec	gram r – S e mo	tion, Prei	motor. ing sy Oxfore	9 ystems, 31 Total:4 d Universit
C: I/O port progra Unit – IV Programming in E Unit – V Smart Card reac Printers, Smart Ho TEXT BOOK: 1. Senthil K Press, Ne REFERENCES: 1. Gaonkar New Delf 2. Soumitra and 8051	(Mode 1) / Counter– Serial Communication - Interrupt (Timer, mming- Timer programming-Counter programming-Serial port p Peripheral Interfacing with 8051: imbedded C: Keypad- LCD – Sensors- A/D and D/A converters- Applications of Microcontrollers(Block Diagram Approa ler, Automated Meter Reading System, Washing machine, ome automation system. iumar N., Saravanan M., Jeevananthan S., "Microprocessors are be Delhi, 2016. R.S, "Microprocessor Architecture, Programming, and Application	nogramming DC Motor - ch): Speedomet and Microco ons with the ecture Prog i,2013.	g-Interrupt pro Stepper moto er, Healthcar ontrollers", 2 <sup>nd</sup> e 8085", 6 <sup>th</sup> Ec ramming and	gram r – S e mo dition Syst	ming ervo onitor tion, , Prei	Oxford	9 ystems, 3 Total:4 d Universit fall of India 8085,808

		UTCON		rse, the s	tudents	s will be	able to							BT Map (Highest			
CO1	in	fer the	basic co	ncepts of	8085 m	nicroproc	essor						U	Understanding(K2)			
CO2	summarize the basic concepts of 8051 microcontroller													Understanding(K2)			
CO3	write embedded c programs for 8051													Applying(K3)			
CO4	interface peripheral devices with 8051 microcontroller														J(K3)		
CO5	CO5 interpret the applications of microcontroller													Understanding(K2)			
						Марр	ing of C	Os wit	h POs	and PSC	)s						
COs/P	Os	P01	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	P011	PO12	PSO1	PSO2		
CO1		3	2								2		1	2	2		
CO2	2	3	2								2		1	2	2		
CO3	3	3	3	1	1	1					2		1	3	3		
CO4	1	3	3	1	1	1					2		1	3	3		
CO5	5	3	2								2		1	2	2		
1 – Slig	ght, 2	2 – Mode	erate, 3 -	- Substan	tial, BT	- Bloom's	Taxono	omy			1	I			1		
						ASSE	SSMEN		TERN -	THEOR	Y						
	t / Bl ateg	oom's ory*	Re	Remembering (K1) %		Understanding (K2) %		Apply (K3)	ying	Analyzing (K4) %		Evaluating (K5) %		Creating (K6) %			
	CAT			20		40		40	)				<b>`</b>		100		
	CAT	[2		20		30		50	)						100		
	CAT	3		20		30		50	)						100		
	ES	E		10		40		50	)						100		
* ±3% I	mav	be varie	d (CAT	1,2,3 – 50	) marks	& ESE –	100 ma	rks)			I						

	22EIT42 - CONTROL SYSTEI	MS												
Programme & BranchB.E. & Electronics and Instrumentation EngineeringSem.CategoryLTPProgramme & BranchAPC310														
Prerequisites	Nil	4	PC	3	1	0	4							
Preamble	This course provides the concepts of the mathematical mode in time and frequency domain	ling, respons	e and stability	ana	lysis	of line	ar systems							
Unit – I	- I Mathematical Modeling:													
	systems with single and two degree of freedom, Electromechani- Electrical Analogy of Mechanical Systems. Transfer function de Time Response of Systems:													
	d System Response-Type and Order of System -Significa irst order system and second order under damped System. Ste				stant	-Stat								
	in solutions of state models of second order systems with impul			sforr	n me	thod.								
	in solutions of state models of second order systems with impul			sforr	n me	thod.	9+3							
Matrix- time doma Unit – III Concepts of Stat		se input using	g Laplace tran											
Matrix- time doma Unit – III Concepts of Stat magnitude criterio Unit – IV	<ul> <li>solutions of state models of second order systems with impulsion stability Analysis in Time Domain:</li> <li>Stability Analysis in Time Domain:</li> <li>bility - Pole Locations and Stability - Routh Hurwitz Criterion</li> <li>n – root locus construction –design of control loop gain.</li> <li>Frequency Response of Systems:</li> </ul>	se input using - Root Loo	g Laplace tran cus Techniqu	e: co	onditi	ons –	- angle an 9+3							
Matrix- time doma Unit – III Concepts of Stat magnitude criterio Unit – IV Concept of Frequ	in solutions of state models of second order systems with impul Stability Analysis in Time Domain: bility - Pole Locations and Stability - Routh Hurwitz Criterion n – root locus construction –design of control loop gain.	- Root Loo d Polar Plot	g Laplace tran cus Techniqu gain margin a	e: co	onditi	ons –	- angle an 9+3							
Matrix- time doma Unit – III Concepts of Stat magnitude criterio Unit – IV Concept of Frequ transfer function n Unit – V	Stability Analysis in Time Domain:         Stability Analysis in Time Domain:         Dility - Pole Locations and Stability - Routh Hurwitz Criterion         n - root locus construction -design of control loop gain.         Frequency Response of Systems:         nency Response, Frequency Response Analysis: Bode Plot an         nodel from bode plot-Stability analysis in Frequency Domain: Ny         Compensators and Controllers in Time Domain:	- Root Loo d Polar Plot quist Stability	g Laplace tran cus Techniqu gain margin a / Criterion.	e: co and	onditi phas	ons - e mar	- angle an 9+3 gin-derivin 9+3							
Matrix- time doma Unit – III Concepts of State magnitude criterio Unit – IV Concept of Freque transfer function n Unit – V Effect of addition	In solutions of state models of second order systems with impulsion         Stability Analysis in Time Domain:         Dility - Pole Locations and Stability - Routh Hurwitz Criterion         In - root locus construction –design of control loop gain.         Frequency Response of Systems:         Tency Response, Frequency Response Analysis: Bode Plot an         In odel from bode plot-Stability analysis in Frequency Domain: Ny	- Root Loo d Polar Plot quist Stability	g Laplace tran cus Techniqu gain margin a criterion.	e: co and I for	phas Con	ons – e mar	9+3 gin-derivin 9+3 ator - Idea							
Matrix- time doma Unit – III Concepts of State magnitude criterio Unit – IV Concept of Freque transfer function n Unit – V Effect of addition	Stability Analysis in Time Domain:         Stability Analysis in Time Domain:         Dility - Pole Locations and Stability - Routh Hurwitz Criterion         n - root locus construction -design of control loop gain.         Frequency Response of Systems:         nency Response, Frequency Response Analysis: Bode Plot an         nodel from bode plot-Stability analysis in Frequency Domain: Ny         Compensators and Controllers in Time Domain:         n of poles and zeros on second order system response and	- Root Loo d Polar Plot quist Stability	g Laplace tran cus Techniqu gain margin / Criterion. ability - Neec I Lead Compe	e: co and I for	phas Com or via	ons – e mar npens a Root	- angle an 9+3 gin-derivin 9+3 ator - Idea Locus.							
Matrix- time doma Unit – III Concepts of State magnitude criterio Unit – IV Concept of Freque transfer function n Unit – V Effect of addition	Stability Analysis in Time Domain:         Stability Analysis in Time Domain:         Dility - Pole Locations and Stability - Routh Hurwitz Criterion         n - root locus construction -design of control loop gain.         Frequency Response of Systems:         nency Response, Frequency Response Analysis: Bode Plot an         nodel from bode plot-Stability analysis in Frequency Domain: Ny         Compensators and Controllers in Time Domain:         n of poles and zeros on second order system response and	- Root Loo d Polar Plot quist Stability	g Laplace tran cus Techniqu gain margin / Criterion. ability - Neec I Lead Compe	e: co and I for	phas Com or via	ons – e mar npens a Root	9+3 gin-derivin 9+3 ator - Idea							
Matrix- time doma Unit – III Concepts of Stat magnitude criterio Unit – IV Concept of Frequ transfer function n Unit – V Effect of addition Compensation on TEXT BOOK:	Stability Analysis in Time Domain:         Stability Analysis in Time Domain:         Dility - Pole Locations and Stability - Routh Hurwitz Criterion         n - root locus construction -design of control loop gain.         Frequency Response of Systems:         nency Response, Frequency Response Analysis: Bode Plot an         nodel from bode plot-Stability analysis in Frequency Domain: Ny         Compensators and Controllers in Time Domain:         n of poles and zeros on second order system response and	- Root Loo d Polar Plot quist Stability d system sta re of Lag and	g Laplace tran cus Techniqu gain margin / Criterion. ability - Neec Lead Compe	e: co and I for nsate e:45,	phas Com or via	ons – e mar npens a Root orial:1	- angle ar 9+3 gin-derivir 9+3 ator - Ide Locus.							
Matrix- time doma Unit – III Concepts of Stat magnitude criterio Unit – IV Concept of Frequ transfer function n Unit – V Effect of addition Compensation on TEXT BOOK: 1. Norman	Stability Analysis in Time Domain:         Stability Analysis in Time Domain:         Dility - Pole Locations and Stability - Routh Hurwitz Criterion         n - root locus construction –design of control loop gain.         Frequency Response of Systems:         nency Response, Frequency Response Analysis: Bode Plot an         nodel from bode plot-Stability analysis in Frequency Domain: Ny         Compensators and Controllers in Time Domain:         n of poles and zeros on second order system response and         Time Response: P, PI, PD and PID controller - Design procedu	- Root Loo d Polar Plot quist Stability d system sta re of Lag and	g Laplace tran cus Techniqu gain margin / Criterion. ability - Neec Lead Compe	e: co and I for nsate e:45,	phas Com or via	ons – e mar npens a Root orial:1	- angle ar 9+3 gin-derivir 9+3 ator - Ide Locus.							
Matrix- time doma Unit – III Concepts of Stat magnitude criterio Unit – IV Concept of Frequ transfer function n Unit – V Effect of addition Compensation on TEXT BOOK: 1. Norman REFERENCES:	Stability Analysis in Time Domain:         Stability Analysis in Time Domain:         Dility - Pole Locations and Stability - Routh Hurwitz Criterion         n - root locus construction –design of control loop gain.         Frequency Response of Systems:         nency Response, Frequency Response Analysis: Bode Plot an         nodel from bode plot-Stability analysis in Frequency Domain: Ny         Compensators and Controllers in Time Domain:         n of poles and zeros on second order system response and         Time Response: P, PI, PD and PID controller - Design procedu	se input using - Root Loo d Polar Plot quist Stability d system sta re of Lag and ey-India Publ	g Laplace tran cus Techniqu gain margin (Criterion. ability - Neec Lead Compe Lectur	e: co and I for nsat e:45, relhi,	phas Con or via , <b>Tut</b>	ons – e mar npens a Root orial:1	- angle ar 9+3 gin-derivir 9+3 ator - Ide Locus. 15, Total:6							

	UTCOM	-	e, the stu	dents	will be ab	le to						(	BT Mapı Highest L			
der	rive matl	hematical	models b	y identi	fying varie	ous com	ponents	s of the	control	system			Applying	(K3)		
ana	alyze tra	insient and	d steady s	state re	sponse of	first and	d secon	d ordei	system	S			Analyzing	ig (K4)		
exa	amine th	e stability	of the sys	stems i	n time dor	nain.							Analyzing	ng (K4)		
ana	halyze the frequency response of the systems. Analyzing (K4)											(K4)				
examine the performance of Compensators													Analyzing (K4)			
					Mappin	g of CC	s with	POs ar	nd PSOs	6						
Os	P01	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2		
1	3	2	1	1	1			1		2		1	3	3		
2	3	3	2	2	2			1		2		1	3	3		
3	3	3	2	2	2			1		2		1	3	3		
4	3	3	2	2	2			1		2		1	3	3		
5	3	3	2	2	2			1		2		1	3	3		
ght, 2	– Mode	rate, 3 – S	Substantia	I, BT- I	Bloom's T	axonom	у									
					ASSES	SMENT	PATTE	ERN - 1	HEORY	,						
		Re	member (K1) %	ing		•				•	Evaluating (K5) %		•	Total %		
CA	T1		5		25		35	5	35					100		
CA	T2		5		25		35	5	35					100		
CA	Т3		5		25		35	5	35					100		
ESE 5				25		35	:	35					100			
	nplet der ana exa ana exa ana exa 0s 1 2 3 4 5 5 9ht, 2 3 4 5 5 2 at c A CA	npletion of tderive mathanalyze traexamine thanalyze theexamine thanalyze theexamine thanalyze theanalyze thea	npletion of the course         derive mathematical         analyze transient and         examine the stability         analyze the frequence         examine the perform         Os       PO1         PO2         3       2         2       3         3       3         4       3         5       3         3       3         4       3         5       3         9       3         9       3         9       3         9       3         9       3         9       3         9       3         9       3         9       3         9       3         9       3         9       3         9       3         9       3         9       3         9       3         9       3         9       8         10       1         10       1         10       1         10       1	npletion of the course, the studerive mathematical models byanalyze transient and steady sexamine the stability of the systemanalyze the frequency responseexamine the performance of COsPO1PO2PO3321322332333324335339ht, 2 – Moderate, 3 – Substantiast / Bloom'sRememberi (K1) %CAT15CAT25CAT35	npletion of the course, the students of derive mathematical models by idential analyze transient and steady state relevamine the stability of the systems is analyze the frequency response of the examine the performance of Competent of Competent and Steady State relevance of Competent analyze the frequency response of the examine the performance of Competent and Steady State relevance of Competent analyze analyze the frequency response of the examine the performance of Competent and Steady State relevance of Competent analyze analyze the frequency response of the examine the performance of Competent and Steady State relevance analyze a	npletion of the course, the students will be abderive mathematical models by identifying variaanalyze transient and steady state response ofexamine the stability of the systems in time doranalyze the frequency response of the systemsexamine the performance of CompensatorsMappinOSPO1PO2PO3PO4PO5a3222Aa322a322aAAA	mpletion of the course, the students will be able toderive mathematical models by identifying various comanalyze transient and steady state response of first andexamine the stability of the systems in time domain.analyze the frequency response of the systems.examine the performance of CompensatorsMapping of COOSPO1PO2PO3PO4PO5PO61321112332223322224332225332224332225332226332229332229332229332229332229332229332229332229332229332229332229332229332229332229<	mpletion of the course, the students will be able toderive mathematical models by identifying various componentsanalyze transient and steady state response of first and secondexamine the stability of the systems in time domain.analyze the frequency response of the systems.examine the performance of CompensatorsMapping of COs withOsPO1PO2PO3PO4PO5PO6PO7a2111a3222a33222a33222a33222a33222a33222a33222b33222a33222a33222a33222b33222a33222b33223b7111c7333a2233a3223b33223b33223b33223	mpletion of the course, the students will be able toderive mathematical models by identifying various components of the analyze transient and steady state response of first and second order examine the stability of the systems in time domain.analyze the frequency response of the systems. examine the performance of CompensatorsMapping of COs with POs ar OSMapping of COs with POs ar OSMapping of COs with POs ar OSOSPO1PO2PO3PO4PO5PO6PO7PO813222112332221332221143322214332221ASSESSMENT PATTERN - Tst / Bloom's CAT1Remembering (K1) %Understanding (K2) %Applying (K3) %CAT252535CAT352535	mpletion of the course, the students will be able to         derive mathematical models by identifying various components of the control analyze transient and steady state response of first and second order system:         examine the stability of the systems in time domain.         analyze transient and steady state response of first and second order system:         examine the stability of the systems in time domain.         analyze the frequency response of the systems.         examine the performance of Compensators         Mapping of COs with POs and PSOs         Mapping of COs with POs and PSOs         OS         Mapping of COs with POs and PSOs         Source of Compensators         Source of PO6       PO7       PO8       PO9         3       2       2       2       1	Mapping of the course, the students will be able to           derive mathematical models by identifying various components of the control system           analyze transient and steady state response of first and second order systems           examine the stability of the systems in time domain.           analyze the frequency response of the systems.           examine the performance of Compensators           Mapping of COs with POs and PSOs           Os PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10           1         3         2         1         1         2           3         3         2         2         1         1         2           3         3         2         2         1         2         2         1         2           3         3         2         2         2         1         2         2         2         1         2         2         2         1         2         2         2         1         2         2         2         1         2         2         2         1         2         2         2         1         2         2         1         2         2         1         2         2         1         2         2         1	mpletion of the course, the students will be able to           derive mathematical models by identifying various components of the control system           analyze transient and steady state response of first and second order systems           examine the stability of the systems in time domain.           analyze the frequency response of the systems.           examine the performance of Compensators           Mapping of COs with POs and PSOs           OS         PO1         PO2         PO3         PO4         PO5         PO6         PO7         PO8         PO9         PO10         PO11           1         3         2         1         1         2         2         2         1         2         2         2         1         2         2         2         2         2         2         1         2         2         2         2         2         2         1         2         2         2         2         2         2         2         1         2         2         2         2         2         2         2         1         2         2         2         2         2         2         1         2         2         2         2	Main         Point         Point	(Highest L           (Highest L           derive mathematical models by identifying various components of the control system         Applying           analyze transient and steady state response of first and second order systems         Analyzing           examine the stability of the systems in time domain.         Analyzing           analyze the frequency response of the systems.         Analyzing           examine the performance of Compensators         Analyzing           Mapping of COs with POs and PSOs           Stressen of the systems.           Stressen of the systems.           Stressen of the systems.           Mapping of COs with POs and PSOs           Stressen of the system of the system.           Stressen of the system.           Mapping of COs with POs and PSOs           Stressen of the system of the system of the system of the system of the system.           Stressen of the system.           Mapping of COs with POs and PSOs           Os PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO1 PO10 PO11 PO12 PSO1           Analyzing the system of the system.           Stressen of the system of the sy		

Programme Branch	& BE & Electronics and Instrumentation Engineering	Sem.	Category	L	т	Ρ	Credit
Prerequisite	s Nil	4	PC	3	0	2	4
Preamble	This course provides the concepts of the mathematical modelin in time and frequency domain	g, respons	e and stability	ana	lysis	of line	ar systems
Unit – I	Mathematical Modeling:						9
and Mechani	nd closed loop systems-Derivation of transfer function models and state ical Systems with single and two degree of freedom, Electromechanica tion- Electrical Analogy of Mechanical Systems. Transfer function deriv	I Systems:	DC Motor - c	onve	rsion	of sta	ate model t
Unit – II	Time Response of Systems:						9
specification	s and System Response-Type and Order of System -Significand s of first order system and second order under damped System. Stead domain solutions of state models of second order systems with impulse	dy State Er	ror and Error	Cons	stant	-Stat	
Unit – III	Stability Analysis in Time Domain:						9
	Stability - Pole Locations and Stability - Routh Hurwitz Criterion - riterion - root locus construction - design of control loop gain.	Root Lo	cus Lechniqu	e: co	onditi	ons -	- angle an
Unit – IV	Frequency Response of Systems:						9
	Frequency Response, Frequency Response Analysis: Bode Plot and tion model from bode plot-Stability analysis in Frequency Domain: Nyq			and	phas	e mar	gin-derivin
Unit – V	Compensators and Controllers in Time Domain:						9
	dition of poles and zeros on second order system response and		ability - Need	t tor	Con	npens	ator - Idea
Compensatio	on on Time Response: P, PI, PD and PID controller - Design procedure	of Lag and		ensat			
	on on Time Response: P, PI, PD and PID controller - Design procedure PERIMENTS / EXERCISES:	of Lag and		ensat			
		of Lag and		ensat			
LIST OF EXI	PERIMENTS / EXERCISES:	of Lag and		ensat			
LIST OF EXI 1. Tra 2. Tin	PERIMENTS / EXERCISES:	of Lag and		ensat			
LIST OF EXI 1. Tra 2. Tin 3. Sta	PERIMENTS / EXERCISES: Insfer function of Armature controlled DC motor ne response analysis of second order systems using MATLAB	of Lag and		ensat			
LIST OF EXI 1. Tra 2. Tim 3. Sta 4. Ana	PERIMENTS / EXERCISES: Insfer function of Armature controlled DC motor the response analysis of second order systems using MATLAB Ite space analysis of second order systems using MATLAB	of Lag and		ensat			
LIST OF EXI 1. Tra 2. Tim 3. Sta 4. Ana 5. Effe	PERIMENTS / EXERCISES: Insfer function of Armature controlled DC motor the response analysis of second order systems using MATLAB Ite space analysis of second order systems using MATLAB alysis of the stability via Root Locus using MATLAB	of Lag and		ensat			
LIST OF EXI 1. Tra 2. Tim 3. Sta 4. Ana 5. Effe 6. Effe	PERIMENTS / EXERCISES: Insfer function of Armature controlled DC motor the response analysis of second order systems using MATLAB Ite space analysis of second order systems using MATLAB alysis of the stability via Root Locus using MATLAB ect of addition of poles and zeros on system response using MATLAB	of Lag and					
LIST OF EXI 1. Tra 2. Tim 3. Sta 4. Ana 5. Effe 6. Effe 7. Fre	PERIMENTS / EXERCISES: Insfer function of Armature controlled DC motor the response analysis of second order systems using MATLAB ite space analysis of second order systems using MATLAB alysis of the stability via Root Locus using MATLAB ect of addition of poles and zeros on system response using MATLAB ect of addition of poles and zeros on stability using MATLAB	of Lag and		ensat			
LIST OF EXI 1. Tra 2. Tim 3. Sta 4. Ana 5. Effe 6. Effe 7. Fre 8. Effe	PERIMENTS / EXERCISES: Insfer function of Armature controlled DC motor the response analysis of second order systems using MATLAB its space analysis of second order systems using MATLAB alysis of the stability via Root Locus using MATLAB ect of addition of poles and zeros on system response using MATLAB ect of addition of poles and zeros on stability using MATLAB equency domain analysis via Bode plot using MATLAB	of Lag and					
LIST OF EXI         1.       Tra         2.       Tim         3.       Sta         4.       Ana         5.       Effe         6.       Effe         7.       Free         8.       Effe         9.       Dest	PERIMENTS / EXERCISES: Insfer function of Armature controlled DC motor the response analysis of second order systems using MATLAB Its space analysis of second order systems using MATLAB alysis of the stability via Root Locus using MATLAB ect of addition of poles and zeros on system response using MATLAB ect of addition of poles and zeros on stability using MATLAB equency domain analysis via Bode plot using MATLAB ect of P,PI,PID controllers on time response of system using MATLAB	of Lag and	Lead Compe				ELOCUS.
LIST OF EXI         1.       Tra         2.       Tim         3.       Sta         4.       Ana         5.       Effe         6.       Effe         7.       Free         8.       Effe         9.       Dea         10.       Dea	PERIMENTS / EXERCISES: Insfer function of Armature controlled DC motor the response analysis of second order systems using MATLAB atte space analysis of second order systems using MATLAB alysis of the stability via Root Locus using MATLAB ect of addition of poles and zeros on system response using MATLAB ect of addition of poles and zeros on stability using MATLAB ect of addition of poles and zeros on stability using MATLAB ect of Addition of poles and zeros on stability using MATLAB ect of P,PI,PID controllers on time response of system using MATLAB sign of Lead compensator using MATLAB	of Lag and	Lead Compe				ELOCUS.
LIST OF EXI         1.       Tra         2.       Tim         3.       Sta         4.       Ana         5.       Effu         6.       Effu         7.       Free         8.       Effu         9.       Dea         10.       Dea	PERIMENTS / EXERCISES: Insfer function of Armature controlled DC motor the response analysis of second order systems using MATLAB atte space analysis of second order systems using MATLAB alysis of the stability via Root Locus using MATLAB ect of addition of poles and zeros on system response using MATLAB ect of addition of poles and zeros on stability using MATLAB equency domain analysis via Bode plot using MATLAB ect of P,PI,PID controllers on time response of system using MATLAB sign of Lead compensator using MATLAB sign of Lag compensator using MATLAB		Lecture	:45,	Prac	tical:	ELOCUS.
LIST OF EXI         1.       Tra         2.       Tim         3.       Sta         4.       Ana         5.       Effe         6.       Effe         7.       Free         8.       Effe         9.       Dea         10.       Dea         1.       Nor	PERIMENTS / EXERCISES: Insfer function of Armature controlled DC motor the response analysis of second order systems using MATLAB Ite space analysis of second order systems using MATLAB alysis of the stability via Root Locus using MATLAB ect of addition of poles and zeros on system response using MATLAB ect of addition of poles and zeros on stability using MATLAB ect of addition of poles and zeros on stability using MATLAB ect of P,PI,PID controllers on time response of system using MATLAB sign of Lead compensator using MATLAB sign of Lag compensator using MATLAB Sign of Lag compensator using MATLAB and S. Nise, " Control Systems Engineering", 7 <sup>th</sup> Edition, Reprint, Wiley		Lecture	:45,	Prac	tical:	
LIST OF EXI         1.       Tra         2.       Tim         3.       Sta         4.       Ana         5.       Effu         6.       Effu         7.       Free         8.       Effu         9.       Dea         10.       Dea         1.       Nor         REFERENCE       Nor	PERIMENTS / EXERCISES: Insfer function of Armature controlled DC motor the response analysis of second order systems using MATLAB Ite space analysis of second order systems using MATLAB alysis of the stability via Root Locus using MATLAB ect of addition of poles and zeros on system response using MATLAB ect of addition of poles and zeros on stability using MATLAB ect of addition of poles and zeros on stability using MATLAB ect of P,PI,PID controllers on time response of system using MATLAB sign of Lead compensator using MATLAB sign of Lag compensator using MATLAB Sign of Lag compensator using MATLAB and S. Nise, " Control Systems Engineering", 7 <sup>th</sup> Edition, Reprint, Wiley	-India Publ	Lecture	: <b>45</b> , Pelhi,	Prac	tical:	: Locus. 30, Total:7
LIST OF EXI 1. Tra 2. Tim 3. Sta 4. Ana 5. Effu 6. Effu 7. Fre 8. Effu 9. Dea 10. Dea 10. Dea TEXT BOOK 1. Nor REFERENCI 1. Nag	PERIMENTS / EXERCISES: Insfer function of Armature controlled DC motor the response analysis of second order systems using MATLAB ate space analysis of second order systems using MATLAB alysis of the stability via Root Locus using MATLAB ect of addition of poles and zeros on system response using MATLAB ect of addition of poles and zeros on stability using MATLAB ect of addition of poles and zeros on stability using MATLAB equency domain analysis via Bode plot using MATLAB ect of P,PI,PID controllers on time response of system using MATLAB sign of Lead compensator using MATLAB sign of Lag compensator using MATLAB External S. Nise," Control Systems Engineering", 7 <sup>th</sup> Edition, Reprint, Wiley ES:	-India Publ	Lecture Shers, New D onal Pvt. Ltd.	: <b>45</b> , Pelhi,	Prac	tical:	: Locus. 30, Total:7

	SE OUTCOMES: npletion of the course, the students will be able to	BT Mapped (Highest Level)
CO1	derive mathematical models by identifying various components of the control system	Applying (K3), Precision (S3)
CO2	analyze transient and steady state response of first and second order systems	Analyzing (K4), Precision (S3)
CO3	examine the stability of the systems in time domain.	Analyzing (K4), Precision (S3)
CO4	analyze the frequency response of the systems.	Analyzing (K4), Precision (S3)
CO5	examine the performance of Compensators	Analyzing (K4), Precision (S3)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	1	1			1		2		1	3	3
CO2	3	3	2	2	2			1		2		1	3	3
CO3	3	3	2	2	2			1		2		1	3	3
CO4	3	3	2	2	2			1		2		1	3	3
CO5	3	3	2	2	2			1		2		1	3	3

1 - Slight, 2 - Moderate, 3 - Substantial, BT- Bloom's Taxonomy

		ASSESSMENT	PATTERN -	THEORY			
Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	5	25	35	35			100
CAT2	5	25	35	35			100
CAT3	5	25	35	35			100
ESE	5	25	35	35			100

\* ±3% may be varied (CAT 1,2,3 - 50 marks & ESE - 100 marks)

Programme & Branch	B.E. & Electronics and Instrumentation Engineering	Sem.	Category	L	т	Ρ	Credit
Prerequisites	Nil	4	PC	3	0	0	3
Preamble	This course imparts the knowledge of instruments us their principles. It will also provide the methods for th Vibration.						
Unit – I	Temperature Measurement I:						9
	s utilized to measure Temperature – Temperature Scales –						
	nsion Thermometers – Special Temperature Indicating Devi	ces – Bulb Installat	ons- Solid st	ate te	empe	rature	
Unit – II	Temperature Measurement II:			_			9
	mometers: Resistance Thermometers – Thermistors – Thern neasurement systems – Ultrasonic Thermometers –Tempera		ion Pyromete	rs. ⊦	iber-c	ptic	
Unit – III	Pressure Measurement I:						9
	ire – Mechanical Pressure Measurement: Manometers – Ela	stic type pressure (	auges: Bour	ton t	vne_	Metal	-
	Capsule – Bellows. Electrical Methods of Pressure Measurem						
Resonant Wire	– Piezoelectric – Magnetic– Optical.						
Unit – IV	Pressure Measurement II:	-	•				9
<b>Unit – IV</b> Vacuum senso	Pressure Measurement II: rs: Mechanical Vacuum Gauges: McLeod gauge – Therm		es: Knudsen	gau	ge –	Pira	<b>9</b> ni gauge
Unit – IV Vacuum senso Thermocouple	Pressure Measurement II: rs: Mechanical Vacuum Gauges: McLeod gauge – Therm vacuum gauge – Ionisation Vacuum Gauges – Testing an		es: Knudsen	gau	ge –	Pira	<b>9</b> ni gauge
Unit – IV Vacuum senso Thermocouple Pressure Switc	Pressure Measurement II: prs: Mechanical Vacuum Gauges: McLeod gauge – Therm vacuum gauge – Ionisation Vacuum Gauges – Testing an hes.	d Calibration of Pr	es: Knudsen	gau	ge –	Pira	<b>9</b> ni gauge ght tester
Unit – IV Vacuum senso Thermocouple Pressure Switc Unit – V	Pressure Measurement II: brs: Mechanical Vacuum Gauges: McLeod gauge – Therm vacuum gauge – Ionisation Vacuum Gauges – Testing an hes. Force, Torque, Speed, Acceleration and Vibration	d Calibration of Pr	es: Knudsen essure Detec	gau tors:	ge – Dead	Pira d weig	9 ni gauge ght tester 9
Unit – IV Vacuum senso Thermocouple Pressure Switc Unit – V Force(Weight)	Pressure Measurement II:           ors: Mechanical Vacuum Gauges: McLeod gauge – Therm           vacuum gauge – Ionisation Vacuum Gauges – Testing an           hes.           Force, Torque, Speed, Acceleration and Vibration           Measurement: Mechanical Load Cells – Elastic deflection	d Calibration of Pr : force transducers	es: Knudsen essure Detec – Torque Me	gau tors:	ge – Dead	Pira d weig nt: Ro	9 ni gauge ght tester 9 tary torqu
Unit – IV Vacuum senso Thermocouple Pressure Switc Unit – V Force(Weight) sensors – Stat AC tachomete	Pressure Measurement II:           ors: Mechanical Vacuum Gauges: McLeod gauge – Therm           vacuum gauge – Ionisation Vacuum Gauges – Testing an           hes.           Force, Torque, Speed, Acceleration and Vibration           Measurement: Mechanical Load Cells – Elastic deflection           ionary Sensors – Torque measurement using proximity sen           r generator – DC tachometer generator – Eddy current dr	d Calibration of Pr : force transducers sors – Speed Mea ag-cup tachometer	es: Knudsen essure Detec – Torque Me surements: S	gau tors: easu trobo	ge – Dead remer oscop Ieasu	Pira d weig nt: Ro ic tacl	9 ni gauge ght tester 9 tary torqu nometers
Unit – IV Vacuum senso Thermocouple Pressure Switc Unit – V Force(Weight) sensors – Stat AC tachomete	Pressure Measurement II:           ors: Mechanical Vacuum Gauges: McLeod gauge – Therm           vacuum gauge – Ionisation Vacuum Gauges – Testing an           hes.           Force, Torque, Speed, Acceleration and Vibration           Measurement: Mechanical Load Cells – Elastic deflection           ionary Sensors – Torque measurement using proximity sen	d Calibration of Pr : force transducers sors – Speed Mea ag-cup tachometer	es: Knudsen essure Detec – Torque Me surements: S	gau tors: easu trobo	ge – Dead remer oscop Ieasu	Pira d weig nt: Ro ic tacl	9 ni gauge ght tester 9 tary torqu nometers
Unit – IV Vacuum senso Thermocouple Pressure Switc Unit – V Force(Weight) sensors – Stat AC tachomete	Pressure Measurement II:           ors: Mechanical Vacuum Gauges: McLeod gauge – Therm           vacuum gauge – Ionisation Vacuum Gauges – Testing an           hes.           Force, Torque, Speed, Acceleration and Vibration           Measurement: Mechanical Load Cells – Elastic deflection           ionary Sensors – Torque measurement using proximity sen           r generator – DC tachometer generator – Eddy current dr	d Calibration of Pr : force transducers sors – Speed Mea ag-cup tachometer	es: Knudsen essure Detec – Torque Me surements: S	gau tors: easu trobo	ge – Dead remer oscop Ieasu	Pira d weig nt: Ro ic tacl	9 ni gauge ght tester 9 tary torqu nometers
Unit – IV Vacuum senso Thermocouple Pressure Switc Unit – V Force(Weight) sensors – Stat AC tachomete	Pressure Measurement II:           ors: Mechanical Vacuum Gauges: McLeod gauge – Therm           vacuum gauge – Ionisation Vacuum Gauges – Testing an           hes.           Force, Torque, Speed, Acceleration and Vibration           Measurement: Mechanical Load Cells – Elastic deflection           ionary Sensors – Torque measurement using proximity sen           r generator – DC tachometer generator – Eddy current dr	d Calibration of Pr : force transducers sors – Speed Mea ag-cup tachometer	es: Knudsen essure Detec – Torque Me surements: S	gau tors: easu trobo	ge – Dead remer oscop Ieasu	Pira d weig nt: Ro ic tacl	9 ni gauge ght tester 9 tary torqu hometers nt: Seism
Unit – IV Vacuum senso Thermocouple Pressure Swito Unit – V Force(Weight) sensors – Stat AC tachomete acceleration pic	Pressure Measurement II:           brs: Mechanical Vacuum Gauges: McLeod gauge – Therm           vacuum gauge – Ionisation Vacuum Gauges – Testing an           hes.           Force, Torque, Speed, Acceleration and Vibration           Measurement: Mechanical Load Cells – Elastic deflection           ionary Sensors – Torque measurement using proximity sen           r generator – DC tachometer generator – Eddy current dr           ckups – variable reluctance accelerometers – Vibration measuremeter	d Calibration of Pr : force transducers sors – Speed Mea ag-cup tachometer surement: Mechanio	es: Knudsen essure Detec – Torque Ma surements: S – Accelerati cal vibration s	gau tors: easu trobc on M enso	ge – Dead remer oscop leasu ors.	Pira d weig nt: Ro ic tacl ireme	9 ni gauge ght tester 9 tary torqu hometers nt: Seism Total:4
Unit – IV Vacuum senso Thermocouple Pressure Swito Unit – V Force(Weight) sensors – Stat AC tachomete acceleration pic	Pressure Measurement II:           ors: Mechanical Vacuum Gauges: McLeod gauge – Therm           vacuum gauge – Ionisation Vacuum Gauges – Testing an           hes.           Force, Torque, Speed, Acceleration and Vibration           Measurement: Mechanical Load Cells – Elastic deflection           ionary Sensors – Torque measurement using proximity sen           r generator – DC tachometer generator – Eddy current dr	d Calibration of Pr : force transducers sors – Speed Mea ag-cup tachometer surement: Mechanio	es: Knudsen essure Detec – Torque Ma surements: S – Accelerati cal vibration s	gau tors: easu trobc on M enso	ge – Dead remer oscop leasu ors.	Pira d weig nt: Ro ic tacl ireme	9 ni gauge ght tester 9 tary torqu hometers nt: Seismi Total:4
Unit – IV Vacuum senso Thermocouple Pressure Switc Unit – V Force(Weight) sensors – Stat AC tachomete acceleration pic TEXT BOOK:	Pressure Measurement II:         brs: Mechanical Vacuum Gauges: McLeod gauge – Therm         vacuum gauge – Ionisation Vacuum Gauges – Testing an         hes.         Force, Torque, Speed, Acceleration and Vibration         Measurement: Mechanical Load Cells – Elastic deflection         ionary Sensors – Torque measurement using proximity sen         r generator – DC tachometer generator – Eddy current dr         ckups – variable reluctance accelerometers – Vibration measurement         aswamy K. & Vijayachitra S. "Industrial Instrumentation", 2	d Calibration of Pr : force transducers sors – Speed Mea ag-cup tachometer surement: Mechanio	es: Knudsen essure Detec – Torque Ma surements: S – Accelerati cal vibration s	gau tors: easu trobc on M enso	ge – Dead remer oscop leasu ors.	Pira d weig nt: Ro ic tacl ireme	9 ni gauge ght tester 9 tary torqu hometers nt: Seism Total:4
Unit – IV         Vacuum senso         Thermocouple         Pressure Switc         Unit – V         Force(Weight)         sensors – Stat         AC tachomete         acceleration pic         TEXT BOOK:         1.         Krishn         2019         REFERENCES	Pressure Measurement II:         brs: Mechanical Vacuum Gauges: McLeod gauge – Therm         vacuum gauge – Ionisation Vacuum Gauges – Testing an         hes.         Force, Torque, Speed, Acceleration and Vibration         Measurement: Mechanical Load Cells – Elastic deflection         ionary Sensors – Torque measurement using proximity sen         r generator – DC tachometer generator – Eddy current dr         ckups – variable reluctance accelerometers – Vibration measurement         aswamy K. & Vijayachitra S. "Industrial Instrumentation", 2	d Calibration of Pr force transducers sors – Speed Mea ag-cup tachometer surement: Mechanie	es: Knudsen essure Detec – Torque Me surements: S – Accelerati cal vibration s ge Internatio	gau tors: easui trobc on M ensc	ge – Dead remer oscop Measu rrs.	Pira d weig nt: Ro ic tacl uremen hers,	9 ni gauge ght tester 9 tary torqu hometers nt: Seism Total:4
Unit – IV         Vacuum senso         Thermocouple         Pressure Switc         Unit – V         Force(Weight)         sensors – Stat         AC tachomete         acceleration pin         TEXT BOOK:         1.         Krishn         2019         REFERENCES         1.       Singh	Pressure Measurement II:         brs: Mechanical Vacuum Gauges: McLeod gauge – Therm         vacuum gauge – Ionisation Vacuum Gauges – Testing an         hes.         Force, Torque, Speed, Acceleration and Vibration         Measurement: Mechanical Load Cells – Elastic deflection         ionary Sensors – Torque measurement using proximity sen         r generator – DC tachometer generator – Eddy current dr         ckups – variable reluctance accelerometers – Vibration measurement         aswamy K. & Vijayachitra S. "Industrial Instrumentation", 2	d Calibration of Pr force transducers sors – Speed Mea ag-cup tachometer surement: Mechanic and Edition, New A	es: Knudsen essure Detec – Torque Me surements: S – Accelerati cal vibration s ge Internatio	gau tors: easu trobc on M ensc nal F	ge – Dear remer oscop Measu rrs.	Pira d weig nt: Ro ic tacl uremen hers, 7.	9 ni gauge ght tester 9 tary torq hometers nt: Seism Total:

		UTCOM		e, the stu	dents	vill be ab	le to							BT Map (Highest	
CO1	expl	lain the	theory ar	nd working	behind	temperat	ure mea	asureme	ent and	d mechar	nical the	ermometers		Understand	ling (K2)
CO2		rpret the		g of vario	ous typ	es of ele	ectrical	thermor	meters	and de	etermin	e the unkn	iown	Applying	J (K3)
CO3	inte	rpret the	e theory a	and workin	g of pre	ssure me	asuring	instrum	ents fo	or various	s indus	rial applicat	tions	Applying	j (K3)
CO4	expl	lain the	construct	tion and w	orking	of vacuum	measu	ring inst	rumen	ts				Understandi	ng (K2)
CO5				ous meas al applicati		paramete	rs such	as for	ce, to	rque, sp	beed, a	cceleration	and	Understand	ling (K2)
						Mapping	g of CO	s with I	POs ai	nd PSOs	5				
COs/I	POs	P01	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	2 PSO1	PSO2
CO	1	3	2						2				1	2	2
CO	2	3	3	1	1	1			2				1	3	3
CO	3	3	3	1	1	1			2				1	3	3
CO	4	3	2						2				1	2	2
CO	5	3	2						2				1	2	2
1 – Sli	ght, 2	– Mode	rate, 3 –	Substantia	al, BT- E	Bloom's T	axonom	у						·	
						ASSES	SMENT	PATTE	RN - 1	HEORY					
	st / Blo Catego	oom's ory*	Re	ememberi (K1) %	ng	Understa (K2)		Apply (K3)		Analyz (K4) 9		Evaluating %	(K5)	Creating (K6) %	Tota %
	CAT	1		20		50		30	)						100
	CAT	2		20		50		30	)						100
	CAT	3		20		50		30	)						100
	ESE	Ξ		20		50		30	)						100

Programme & Branch	BE & Electronics and Instrumentation Engineering	Sem.	Category	L	т	Р	Credit
Prerequisites	Transducer Engineering	4	PC	3	0	0	3
Preamble	This Course enhances the students to understand all operations and be able to apply control schemes specifications.						
Unit – I	Pressure Measurement:						9
	ninologies; Measurement: U Tube manometer, Elastic ty piezo resistive; Vacuum measuring type: McLeod, Ioniz er						
Unit – II	Temperature Measurement						9
	inologies; Measurement: Bimetallic and mercury filled theri pe and optical type; Temperature switches.	mometers, RTD,	Thermistor,	thern	nocol	uples;	pyrometers
Unit – III	Flow Measurement:						9
	inologies; Measurement: Orifice, Venturi; Positive Displac , Ultrasonic; Vortex Shedding, Flow Meter Selection, Calibra			bine	Туре	e; Eleo	ctrical Type
Unit – IV	Level Measurement:		0 0				9
	nologies; sight glass, float level switch, displacer type, air-pu type, radar type, ultrasonic type.	urge, boiler drum	level measur	emei	nt; El	ectrica	l: resistance
Unit – V	Viscosity, Density, Humidity and Moisture Measure	ement:					9
	nologies; capillary and efflux cup viscometers; Density r						
Viscosity Term	Dew cell; Electrolytic hygrometer; Moisture measurement		· •				Total:4
Viscosity Termi Psychrometers;	Dew ceii; Electrolytic nygrometer; Moisture measurement						Total:4
Viscosity Term Psychrometers; gauges. TEXT BOOK:	Dew cell; Electrolytic hygrometer; Moisture measurement swamy K., & Vijayachitra S., "Industrial Instrumentation", 2 <sup>nd</sup>			al Pu	blishe	ers, Ne	
Viscosity Termi Psychrometers; gauges. TEXT BOOK: 1. Krishna 2019.	swamy K., & Vijayachitra S., "Industrial Instrumentation", 2 <sup>nd</sup>			al Pu	blishe	ers, Ne	
Viscosity Termi Psychrometers; gauges. TEXT BOOK: 1. Krishna 2019. REFERENCES	swamy K., & Vijayachitra S., "Industrial Instrumentation", 2 <sup>nd</sup>	<sup>d</sup> Edition, New Ag	e Internationa				ew Delhi,

	SE OUTCOMES: mpletion of the course, the students will be able to	BT Mapped (Highest Level)
CO1	demonstrate the construction and working of various pressure measuring instruments for industrial applications	Applying (K3)
CO2	demonstrate the working of various types of temperature sensing devices and determine the unknown temperature	Understanding (K2)
CO3	determine the flow rate using various types of mechanical flow meters and identify suitable flow meters for various applications	Applying (K3)
CO4	determine the fluid level using various types of level measuring instruments and identify suitable level gauges for various applications	Understanding (K2)
CO5	illustrate the construction and working of viscosity, density, Humidity and Moisture measuring instruments	Understanding (K2)

					Mappir	ng of CC	Os with	POs ar	nd PSO	S				
COs/POs	P01	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	1	1			2				1	3	3
CO2	3	2	1	1	1			2				1	3	3
CO3	3	2	1	1	1			2				1	3	3
CO4	3	1						1					2	2
CO5	3	2						2				1	2	2

1 - Slight, 2 - Moderate, 3 - Substantial, BT- Bloom's Taxonomy

		ASSESSMENT	PATTERN -	THEORY			
Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	10	50	40				100
CAT2	10	50	40				100
CAT3	10	50	40				100
ESE	10	50	40				100

\* ±3% may be varied (CAT 1,2,3–50 marks & ESE– 100 marks)

Progra Branch	mme & N	B.E. 8	& Electr	onics a	nd Instr	umenta	ation En	gineeriı	ng	Sem.	Category	L	т	Р	Credit
Prereq		Nil								4	PC	0	0	2	1
Preamb	ble			e practio ogrammi				nming a	ind inter	facing co	oncepts in pro	cesso	r and	d contr	oller and
LIST O	F EXPERI					g vonio	gribe								
1.	Arithmet	ic operatio	ons usin	g 8085 r	nicropro	cessor									
2.	Code co	nversion (	using 80	85 micro	oproces	sor									
Interfac	ing of Peri	oherals wi	th 8051	microco	ntroller:										
3.	Interfaci	ng of swite	ches and	d relays											
4.	Interfaci	ng of LED	and Se	ven segi	ment dis	play									
5.	Interfaci	ng of Key	bad and	LCD											
6.	Interfaci	ng of ADC	and DA	AC											
7.	Interfaci	ng of DC i	notor												
8.	Interfaci	ng of step	per moto	or											
9.	Design a	and Simula	ation of (	Combina	ational a	nd Sequ	uential C	ircuits u	sing Ve	rilog HDL	-				
10.	Design a	and Impler	nentatio	n of Dig	ital circu	iits in FF	PGA usir	ng Verilo	g HDL						
															Total:30
REFER	ENCES/ N	IANUAL /	SOFTW	ARE:											
1.	Laborate	ory Manua	l												
2.	V- RIDE	Software													
3.	Xilinx So	oftware													
COURS		MES:											B	Т Мар	ped
	npletion o		se, the	student	s will b	e able t	0						(Hig	hest	Level)
CO1	build pro	grams us	ing emb	edded C	;									plying ecision	
CO2	design i	nterfacing	circuits	with 805	51 micro	controlle	er							plying ecision	
CO3	develop	Verilog H	DL prog	ramming	g for digi	tal circu	iits and i	mpleme	nt in FP	GA			Ana	alyzing	g(K4),
		-	5										F16	501310[	(00)
COs/P		PO2	PO3	PO4	Map PO5	oing of PO6	Cos wit PO7	h POs a PO8		1	P011	DO11	) г	PS01	PSO
		2	1	3	1	2	PU/	1	<b>PO9</b>	PO10 3	PUT	<b>PO1</b> 2		3	3
CO1			1	5		~		•	-						
CO1 CO2	2 3	2	1	3	1	2		1	2	3		1		3	3

BE– Electronics and Instrumentation Engineering, Regulation, Curriculum and Syllabus – R2022

Branch	amme & h	B.E. 8	Electro	onics aı	nd Instr	umenta	tion En	gineerir	ng	Sem.	Category	L	т	Ρ	Credit
Prereq	uisites	Nil								4	PC	0	0	2	1
Preaml	ble						for varic ency don		umentat	ion syste	ms and also t	o anal	yze t	he res	ponse o
LIST O	F EXPERIM	ENTS / E	XERCI	SES:											
1.	Design of	instrume	ntation	amplifie	ſS										
2.	Design of	PWM ge	nerator	circuits	for V to	F conve	erter.								
3.	Design of	signal co	onditioni	ng circu	it for RT	D and T	hermist	or							
4.	Design of	signal co	onditioni	ng circu	it for opt	ical sen	sors								
5.	Preparatio	n of Pipi	ng and	Instrume	entation	diagram	n, docur	nentatio	n of inst	rumentat	on project an	d proje	ect so	cheduli	ing
6.	Derivation	s of Trar	nsfer fun	ction of	DC mot	or.									
7.	Time resp	onse ana	alysis of	first and	l second	d order s	systems								
8.	State space	e analys	sis of se	cond or	der syste	ems usir	ng MATL	AB.							
9.	Stability a	nalysis ir	n time ar	nd frequ	ency do	main us	ing MAT	LAB.							
10.	Effect of P	, PI and	PID cor	ntroller o	n time r	esponse	).								
															Total:30
DEEEE															
	RENCES/ MA			ARE:											
1.	Laboratory MATLAB														
2	WATLAD		luai												
2.														T Map hest L	
COUR	SE OUTCOM		se, the s	student	s will be	e able te	D							ing(K3	
COUR	mpletion of t Develop s	<b>he cour</b> s ignal cor	ditionin					d Instru	mentatic	on diagrar	n for various				
COUR: On cor CO1	Develop s process a	he cours ignal cor oplicatior	nditionin ns	g circuit	s and pr	epare P	iping an				n for various	F	recis	sion S3 ing(K3	3) ),
COURS On cor CO1 CO2	mpletion of t Develop s process a derive the	he cours ignal cor oplicatior transfer	nditionin ns function	g circuits	s and pr	epare P using th	iping an ne meas	ured pai			n for various	F A F	Precis Apply Precis	sion S3 ing(K3 sion S3	3) ), 3)
COUR: On cor CO1	Develop s process a	he cours ignal cor oplicatior transfer	nditionin ns function	g circuits	s and pr	epare P using th	iping an ne meas	ured pai			n for various	F A F	Precis Apply Precis Analy	sion S3 ing(K3	3) ), 3) 4),
COURS On cor CO1 CO2	mpletion of t Develop s process a derive the	he cours ignal cor oplicatior transfer	nditionin ns function	g circuits	s and pr systems r in time	epare P using th and free	iping an ne meas quency o	ured pai	rameters	5	n for various	F A F	Precis Apply Precis Analy	sion S3 ing(K3 sion S3 zing(K	3) ), 3) 4),
COURS On cor CO1 CO2 CO3	mpletion of t Develop s process a derive the analyze th	he cours ignal cor oplicatior transfer	nditionin ns function	g circuits	s and pr systems r in time	epare P using th and free	iping an ne meas quency o	ured pai domain.	rameters	0s PO10	n for various	F A F	Precis Apply Precis Analy Precis	sion S3 ing(K3 sion S3 zing(K	3) ), 3) 4), 3)
COURS On cor CO1 CO2	Impletion of t       Develop s       process al       derive the       analyze th       POs       PO1       1     3	he cours ignal corr oplication transfer e respor	function ns function	g circuits of the s stability	s and pr systems r in time <b>Map</b> r	epare P using th and free <b>bing of</b> (	iping an ne meas quency o <b>Cos wit</b> l	ured par domain. <b>h POs a</b>	rameters nd PSC	5 5 0s		F P P	Precis Apply Precis Analy Precis	sion S3 ing(K3 sion S3 zing(K sion S3	3) ), 3) 4),

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									ABORA					
Progr Branc	amme& ch	BE &	Electroni	ics and	Instrument	ation En	ngineeri	ing	Sem.	Category	L	Т	Р	Credit
Prere	quisites	Indus	trial Instr	ument	ation I				4/5	PC	0	0	2	1
Pream	nble	To me	easure var	rious in	dustrial parar	neters s	uch as f	flow, lev	vel, temp	erature, an	d infei	the	charac	teristics
LIST	OF EXPERII	MENTS /	EXERCIS	SES:										
1.	Orifice an	d Electro	Magnetic	c flow m	neters and co	mpariso	n their c	characte	eristics					
2.	Measurer	nent of fl	ow rate us	sing Tu	rbine Flow M	eter and	Ultraso	nic flow	/ meter o	omparison	their (	chara	acterist	ics
3.					using Deadw ure using McI									
4.	a) Measu	rement o	f torque a	nd ang	le of the give y, Turbidity a	n cantile	ver bea		sample	5				
5.	a)Measur	ement of	level in L	inear T	anks using U lear Tanks us	Iltrasonic	c level T	ransmit	tter					
6.	a) Calibra	tion of S	afety Relie	ef Valve	es and DPT v Saybolt Visc	with HAR								
7.					e in linear tar		optical	sensor						
8.	b) Contro	l of drum	pressure	using I	ing Tempera Pressure swit Ising Flow sw	ch	ch							
9.	Measurer	nent of n	on-electric	cal para	ameters of a	person								
10.	Measurer	nent of B	io-potenti	al para	meters of a p	erson								
													٦	Fotal:3
REFE	RENCES/ N	IANUAL	/SOFTW	ARE:										
1.	Industrial	instrume	entation La	aborato	ry Manual									
		MES										B.	Т Мар	ned
COUR			urse, the s	studen	ts will be ab	le to							hest L	
					ess paramet				nsina me	eters			ng (K3 ion (S3	
	measure	the vario	us industr	iai proc	ess paramet	er using	approp	riate se			- P			3)
On co	measure calibrate t			-	-	er using	approp	riate se			A	pplyi	ng (K3	),
<b>On co</b> CO1	calibrate t	he vario	us industri	ial instr	-						A P A	pplyi recis pplyi		), 3) ),
On co CO1 CO2	calibrate t	he vario	us industri	ial instr	uments ctrical huma	n physiol	logical p	paramet	ters		A P A	pplyi recis pplyi	ng (K3 ion (S3 ng (K3	), 3) ),
On co CO1 CO2 CO3	calibrate t	he vario	us industri	ial instr non elec	uments	n physiol	logical p	paramet	ters	P011	A P A	pplyi recis pplyi recis	ng (K3 ion (S3 ng (K3	), 3) ), 3)
On co CO1 CO2 CO3	calibrate t measure POs PO1	he variou	us industri	ial instr non elec	uments ctrical human	n physiol Cos with	logical p POs a	baramet nd PSC	ters Ds		A P A P	pplyi recis pplyi recis	ng (K3 ion (S3 ng (K3 ion (S3	), 3) ), 3)
On co CO1 CO2 CO3 COs/F	calibrate t       measure       POs     PO1       11     3	the variou	us industri rical and r PO3 I	ial instr non elec PO4	uments ctrical human Mapping of ( PO5 PO6	n physiol Cos with	logical p POs a	oaramet nd PSC PO9	ters Ds PO10		A P A P	pplyi recis pplyi recis	ng (K3 ion (S3 ion (S3 ion (S3	), 3) ), 3) PSO2

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

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	(Common to All BE/ BTech Engineering and Tecl	nnology b	ranches)				
Programme & Branch	All BE/ BTech Engineering and Technology branches	Sem.	Category	L	т	Ρ	Credi
Prerequisites	Nil	4	EC	0	0	80	2
Preamble	This subject is to enhance the employability skills and to dev	elop care	er competen	су			
Unit – I	Soft Skills – I :		•	-			20
etiquette- Body La Unit – II	Quantitative Aptitude and Logical Reasoning – I:						30
Unit – II Problem solving							ions an
					SODID	n. ⊢am	
	al connectives-Binary logic Linear arrangements- Circular and c			rea	sonin	g: ⊦an	illy tree
Deductions-Logica		omplex a	rrangement				30
Deductions-Logica Unit – III Writing Skills: Wri Professional e-ma (Transcoding) Wr Phrases Paired w Spotting Errors Se	al connectives-Binary logic Linear arrangements- Circular and c Written Communication & Verbal Aptitude	Cover le cover le al Report s Homon orms usir Transform	tter -Respon writing Inter yms One wo g appropriat nation : Active	ding preta ord si e arti e-Pas	to Job tion c ubstitu cles a ssive a	o Adver If Techr ution Id and pre & Direct	30 tisement nical Dat ioms an positions
Deductions-Logica Unit – III Writing Skills: Wri Professional e-ma (Transcoding) Wr Phrases Paired w Spotting Errors Se	al connectives-Binary logic Linear arrangements- Circular and c Written Communication & Verbal Aptitude ting strategies and formats Importance of Résumés Writing a all Writing Responding to e-mails and business letters Technic iting One-page Essays. Verbal Aptitude Synonyms Antonym yords Analogies Spelling test Cloze test using suitable verb for entence Correction and Formation Grammar Based questions (	Cover le cover le al Report s Homon orms usir Transform	tter -Respon writing Inter yms One wo g appropriat nation : Active	ding preta ord si e arti e-Pas	to Job tion c ubstitu cles a ssive a	o Adver If Techr ution Id and pre & Direct	30 tisement nical Dat ioms an positions
Deductions-Logica Unit – III Writing Skills: Wri Professional e-ma (Transcoding) Wr Phrases Paired w Spotting Errors Se Rearranging Jumb	al connectives-Binary logic Linear arrangements- Circular and c Written Communication & Verbal Aptitude ting strategies and formats Importance of Résumés Writing a all Writing Responding to e-mails and business letters Technic iting One-page Essays. Verbal Aptitude Synonyms Antonym yords Analogies Spelling test Cloze test using suitable verb for entence Correction and Formation Grammar Based questions (	Cover le cover le al Report s Homon orms usir Transform	tter -Respon writing Inter yms One wo g appropriat nation : Active	ding preta ord si e arti e-Pas	to Job tion c ubstitu cles a ssive a	o Adver If Techr ution Id and pre & Direct	30 tisement tical Dat tioms an positions -Indirect
Deductions-Logica	al connectives-Binary logic Linear arrangements- Circular and c Written Communication & Verbal Aptitude ting strategies and formats Importance of Résumés Writing a all Writing Responding to e-mails and business letters Technic iting One-page Essays. Verbal Aptitude Synonyms Antonym yords Analogies Spelling test Cloze test using suitable verb for entence Correction and Formation Grammar Based questions (	Cover le cal Report s Homon orms usir Transform nces and	tter -Respon- writing Inter yms One wo g appropriat hation : Active Judgements	ding preta ord si e arti e-Pas state	to Job tion c ubstitu cles a ssive a ment	o Adver If Techr ution Id and pre & Direct s	30 tisement nical Dat ioms an positions -Indirect Total:4
Deductions-Logica Unit – III Writing Skills: Wri Professional e-ma (Transcoding) Wr Phrases Paired w Spotting Errors Se Rearranging Jumb TEXT BOOK: 1. Edgar The Services I	Al connectives-Binary logic Linear arrangements- Circular and connectives-Binary logic Linear arrangements- Circular and content of the second strategies and formats Importance of Résumés Writing a bill Writing Responding to e-mails and business letters Technic iting One-page Essays. Verbal Aptitude Synonyms Antonym vords Analogies Spelling test Cloze test using suitable verb from tence Correction and Formation Grammar Based questions (bled Sentences & Jumbled paragraphs, Identifying Facts, Inference Corport and Showick Thorpe, "Objective English for Competitive E	Cover le cal Report s Homon orms usir Transform nces and	tter -Respon- writing Inter yms One wo g appropriat hation : Active Judgements	ding preta ord si e arti e-Pas state	to Job tion c ubstitu cles a ssive a ment	o Adver If Techr ution Id and pre & Direct s	30 tisement nical Dat ioms an positions -Indirect Total:4
Deductions-Logica Unit – III Writing Skills: Wri Professional e-ma (Transcoding) Wr Phrases Paired w Spotting Errors Se Rearranging Jumb TEXT BOOK: 1. Edgar The Services I REFERENCES:	Al connectives-Binary logic Linear arrangements- Circular and connectives-Binary logic Linear arrangements- Circular and content of the second strategies and formats Importance of Résumés Writing a bill Writing Responding to e-mails and business letters Technic iting One-page Essays. Verbal Aptitude Synonyms Antonym vords Analogies Spelling test Cloze test using suitable verb from tence Correction and Formation Grammar Based questions (bled Sentences & Jumbled paragraphs, Identifying Facts, Inference Corport and Showick Thorpe, "Objective English for Competitive E	Cover le cal Report s Homon orms usir Transform nces and xaminatio	rrangement tter -Respon- writing Inter yms One wo g appropriat hation : Active Judgements n", 6th Editio	ding preta ord si e arti e-Pas state	to Job tion c ubstitu cles a ssive a ment	o Adver If Techr ution Id and pre & Direct s	30 tisement nical Dat ioms an positions -Indirect Total:4

		UTCON tion of		rse, the s	student	s will be	e able to	D						BT Mapped lighest Lev	
CO1			e soft sk nd as a t		arners to	o suppoi	t them	work ef	ficiently	/ in an c	organiza	tion as an		Applying (K3 Precision (S3	
CO2	solv	ve real t	ime prot	olems usi	ng num	erical ab	ility and	logical	reason	ing				Applying (K3 Precision (S	
CO3				on skills ( grammati				and de	eliver in	formatio	n in var	ious		Applying (K3 Precision (S3	
						Марр	ing of C	Os wit	h POs	and PS	Os				
COs/F	POs	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
СО	1	3	2				3	3		3		3	2		
CO	2	3	2				3	3		3		3	2		
CO	3		2				3	3		3	3	3	2		
1 – Sli	ght, 2	2 – Mode	erate, 3	- Substa	ntial, BT	- Bloom	's Taxoi	nomy							
						ASSE	SSMEN		TERN		RY				
	t / Bl ateg	oom's ory*	Re	member (K1) %	ing L	Indersta (K2)	0	Apply (K3)		Analyz (K4) 9		Evaluating (K5) %	Creat	ing (K6) %	Total %
	CAT	1		2	D	50		30							100
	CAT	2				50		50							100
	CAT	3				50		50							100
	ESE	E							NA	۹					100
* ±3%		_	ed (CAT	1,2,3 - 50	) marks	)			147	۰					'

Programme & Branch	B.E. & Electronics and Instrumentation Engineering	Sem.	Category	L	т	Р	Credit
Prerequisites	Industrial Instrumentation I	5	PC	3	0	0	3
Preamble	To impart the knowledge of instruments used for the measuralso to provide the methods for the measurement of density						ciples and
Unit – I	Flow Measurement I:	· · ·					9
	Meters – Orifice Flow Meter – Venturi Tubes – Flow Nozzle – D al Pressure Transmitters - Quantity Meters -Inferential Flow Meter		Installation of	of He	ad Fl	ow Me	eters – Pito
Unit – II	Flow Measurement II:						9
	rs – Electrical Flow Meters: Electromagnetic Flow meter –Ultra Flow Meter – Cross correlation flow meter. Solid flow Measuren tion.						
				-			a avetam
Electrical Metho Sensors – Level							-Ultrasoni
Electrical Metho Sensors – Level Unit – IV	ds: Resistance Tapes – Capacitance Probes – Radiometric Switches. Density and Viscosity:	: Level Do	etection and	Mea	asure	ment	–Ultrasoni 9
Electrical Methor Sensors – Level Unit – IV Measurement of densitometers –	ds: Resistance Tapes – Capacitance Probes – Radiometric Switches. <b>Density and Viscosity:</b> Density: Displacement and Float Type Densitometers – H Radiation densitometers – Thermal Conductivity Density	Level De	etection and Densitomete	Mea er –	asure Ultra	ment	-Ultrasoni 9 and soni
Electrical Method Sensors – Level Unit – IV Measurement of densitometers – Viscometers – Ef	ds: Resistance Tapes – Capacitance Probes – Radiometric Switches. <b>Density and Viscosity:</b> Density: Displacement and Float Type Densitometers – H	Level De	etection and Densitomete	Mea er –	asure Ultra	ment	-Ultrasoni 9 and soni
Electrical Method Sensors – Level Unit – IV Measurement of densitometers – Viscometers – Ef Unit – V Measurement of Hygrometers. Method	ds: Resistance Tapes – Capacitance Probes – Radiometric Switches. Density and Viscosity: Density: Displacement and Float Type Densitometers – H Radiation densitometers – Thermal Conductivity Density flux Cup Viscometers – Float Viscometers.	Level Do lydrostatic Gauges. meters –	Densitomete Measureme Dew point H	Mea er – nt c Hygro	Ultra Ultra of Vis	ment asonic scosity ers –	-Ultrasoni 9 and soni y: Capillar 9 Electrolyti
Electrical Methor Sensors – Level Unit – IV Measurement of densitometers – Viscometers – Ef Unit – V Measurement of Hygrometers. Method	ds: Resistance Tapes – Capacitance Probes – Radiometric Switches. Density and Viscosity: Density: Displacement and Float Type Densitometers – H Radiation densitometers – Thermal Conductivity Density flux Cup Viscometers – Float Viscometers. Humidity and Moisture: Humidity: Dry and Wet bulb Psychrometers - Hair Hygrometers asurement of Moisture in Gases and Liquids: Capacitance H	Level Do lydrostatic Gauges. meters –	Densitomete Measureme Dew point H	Mea er – nt c Hygro	Ultra Ultra of Vis	ment asonic scosity ers –	–Ultrasoni 9 and soni y: Capillar 9 Electrolyti er - Infrare
Electrical Methor Sensors – Level Unit – IV Measurement of densitometers – Viscometers – Ef Unit – V Measurement of Hygrometers. Method	ds: Resistance Tapes – Capacitance Probes – Radiometric Switches. Density and Viscosity: Density: Displacement and Float Type Densitometers – H Radiation densitometers – Thermal Conductivity Density flux Cup Viscometers – Float Viscometers. Humidity and Moisture: Humidity: Dry and Wet bulb Psychrometers - Hair Hygrometers asurement of Moisture in Gases and Liquids: Capacitance H	Level Do lydrostatic Gauges. meters –	Densitomete Measureme Dew point H	Mea er – nt c Hygro	Ultra Ultra of Vis	ment asonic scosity ers –	-Ultrasoni 9 and soni y: Capillar 9 Electrolyti
Electrical Methor Sensors – Level Unit – IV Measurement of densitometers – Viscometers – Ef Unit – V Measurement of Hygrometers. Me Absorption Hygro	ds: Resistance Tapes – Capacitance Probes – Radiometric Switches. Density and Viscosity: Density: Displacement and Float Type Densitometers – H Radiation densitometers – Thermal Conductivity Density flux Cup Viscometers – Float Viscometers. Humidity and Moisture: Humidity: Dry and Wet bulb Psychrometers - Hair Hygrone easurement of Moisture in Gases and Liquids: Capacitance H meter – Measurement of Moisture in Solids. wamy K., & Vijayachitra S., "Industrial Instrumentation", 2 <sup>nd</sup>	: Level Do lydrostatic Gauges. meters – Hygromete	Densitomete Measureme Dew point H r - Piezoeleo	Mea er – nt c Hygro	Ultra of Vis	asonic scosity ers – omete	-Uİtrason 9 : and son y: Capillar 9 Electrolyt er - Infrare Total:4
Electrical Methor Sensors – Level Unit – IV Measurement of densitometers – Viscometers – Ef Unit – V Measurement of Hygrometers. Me Absorption Hygro	ds: Resistance Tapes – Capacitance Probes – Radiometric Switches. Density and Viscosity: Density: Displacement and Float Type Densitometers – H Radiation densitometers – Thermal Conductivity Density flux Cup Viscometers – Float Viscometers. Humidity and Moisture: Humidity: Dry and Wet bulb Psychrometers - Hair Hygrone easurement of Moisture in Gases and Liquids: Capacitance H meter – Measurement of Moisture in Solids. wamy K., & Vijayachitra S., "Industrial Instrumentation", 2 <sup>nd</sup>	: Level Do lydrostatic Gauges. meters – Hygromete	Densitomete Measureme Dew point H r - Piezoeleo	Mea er – nt c Hygro	Ultra of Vis	asonic scosity ers – omete	-Uİtrason 9 : and son y: Capillar 9 Electrolyt er - Infrare Total:4
Electrical Methor Sensors – Level Unit – IV Measurement of densitometers – Viscometers – Ef Unit – V Measurement of Hygrometers. Me Absorption Hygro TEXT BOOK: 1. Krishnas Delhi, 20	ds: Resistance Tapes – Capacitance Probes – Radiometric Switches. Density and Viscosity: Density: Displacement and Float Type Densitometers – H Radiation densitometers – Thermal Conductivity Density flux Cup Viscometers – Float Viscometers. Humidity and Moisture: Humidity: Dry and Wet bulb Psychrometers - Hair Hygrone easurement of Moisture in Gases and Liquids: Capacitance H meter – Measurement of Moisture in Solids. wamy K., & Vijayachitra S., "Industrial Instrumentation", 2 <sup>nd</sup>	Edition, N	Densitomete Measureme Dew point H or - Piezoeleo	Mea er – nt c Hygro ctric	Ultra of Vis omete Hygr	ers – omete	-Ultrason 9 : and son y: Capillar 9 Electrolyt er - Infrare Total:4 shers, Ne

	SE OUTCOMES: mpletion of the course, the students will be able to	BT Mapped (Highest Level)
CO1	determine the flow rate using various types of mechanical flow meters	Applying (K3)
CO2	examine the flow through mass type flow meter, electrical type flow meter and infer about calibration and selection of flow meter.	Applying(K3)
CO3	determine the fluid level using various types of level measuring instruments	Applying(K3)
CO4	illustrate the construction and working of density and viscosity measuring instruments	Understanding(K2)
CO5	interpret the construction and working of humidity and moisture measuring instruments	Understanding(K2)

Mapping of COs with POs and PSOs														
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	1	1			2				1	3	3
CO2	3	2	1	1	1			2				1	3	3
CO3	3	2	1	1	1			2				1	3	3
CO4	3	1						1					2	2
CO5	3	1						1					2	2
1 – Slight, 2	– Mode	erate, 3 -	- Substar	tial, BT	- Bloom'	's Taxon	iomy							

	ASSESSMENT PATTERN - THEORY								
Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %		
CAT1	20	50	30				100		
CAT2	20	50	30				100		
CAT3	20	50	30				100		
ESE	20	50	30				100		
* ±3% may be varied	(CAT 1, 2 & 3 – 50 r	narks & ESE – 100	marks)	·		·			

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	22EIT52 - PROCESS CONTROL	-					
Programme & Branch	B.E. & Electronics and Instrumentation Engineering	Sem.	Category	L	т	Р	Credi
Prerequisites	Control Systems	5	PC	3	0	0	3
Preamble	This Course enhances the students to apply the concepts and empirical approach. The controller designs, tuning a discussed.						
Unit – I	Process Modeling and Characteristics:						9
Boiler drum level and Regulatory o <b>Unit – II</b>	<ul> <li>S - Second order interacting and non-interacting systems: Liqu control. Process Characteristics: Continuous and Batch procest perations.</li> <li>Empirical Modeling:</li> <li>ent using Linear or non-linear regression: Model building</li> </ul>	ss - Self r	egulation: CS	STR	with coo	oling jack	et - Servo
Graphical fitting	of first-order and second-order models using step tests: Graphi e data- Approximation of Higher-Order Systems.						
Unit – III	Controller Characteristics and Tuning:						9
Electronic PID c	s: Two position mode, Floating mode, proportional, integral ontroller- Evaluation criteria-Controller Tuning: Process reacti d-Frequency response method of tuning.						
Unit – IV	Final Control Elements:						9
	ns: I/P converter - Actuators: Electric and Pneumatic type -V ontrol valve sizing - Cavitations and Flashing - Selection of cont			aracte	eristics	of contro	l valves
Unit – V	Multi-loop Control:						9
	ontrol - Cascade control - Ratio control - Selective control sultivariable control. Case studies: Boiler, Reactor, Distillation Co		- Split-Range	e cor	ntrol - I	nferential	control
							Total:4
TEXT BOOK:							
<sup>1.</sup> Unit 1,3,							
<b>–</b> • –	Seborg, Duncan A. Mellichamp, Thomas F. Edgar, and Frai	ncis J. D	oyle, "Proces	ss D	ynamics	s and Co	ntrol", 4 <sup>t</sup>
	John Wiley and Sons, USA, 2016 for Unit 2.						
Z. Edition,							
Z.     Edition,       REFERENCES:     1.	John Wiley and Sons, USA, 2016 for Unit 2. Bhanot, "Process Control: Principles and Applications", 4 <sup>th</sup> Edit		•			•	
Z.     Edition,       REFERENCES:       1.     Surekha       2.     Wayne E       2013.	John Wiley and Sons, USA, 2016 for Unit 2.	n",2 <sup>nd</sup> Ed	lition, Prentic	e Ha	ll of Ind	ia, New D	Delhi

		UTCON		rse, the	stude	nts will k	e able	to						BT Mappe	
CO1	dev	elop ma	themat	ical mod	eling fo	or various	proces	ses					A	pplying (K	3)
CO2	dete	ermine t	he real	time mo	dels us	ing empi	rical mo	deling					A	pplying (K	3)
CO3	dete	letermine the controller gains and tuning methods for various applications Applying (K3)							3)						
CO4	expl	lain the		Unde	erstanding	(K2)									
CO5														pplying (K	3)
						Мар	ping of	COs w	vith PO	s and P	SOs				
COs/	POs	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO1	0 PO11	PO12	PSO1	PSO2
CO	)1	3	2	1	1	1			2				1	3	3
CO	)2	3	2	1	1	1			2				1	3	3
CO	)3	3	2	1	1	1			2				1	3	3
CO	)4	3	1						2				1	2	2
CO	)5	3	2	1	1	1			2				1	3	3
1 – Sli	ght, 2	– Mode	erate, 3	– Substa	antial, E	3T- Bloor	n's Taxo	onomy							
						ASS	SESSME	ENT PA	TTER	N - THEC	DRY				
	st / Blo Catego	oom's ory*	Re	member (K1) %	ing (	Understa (K2)		Apply (K3)		Analyzi (K4) %		Evaluating (K5) %	Creatii (K6) %		Fotal %
	CAT	1		10		30		60	)						100
	CAT	2		10		30		60	)						100
	CAT	3		10		40		50	)						100
	ESE			10		30		60	)						100
* ±3%	may b	oe varie	d (CAT	1,2&3	– 50 m	narks & E	SE – 10	)0 mark	s)						

					2	2E1153	DIGIT		GNAL	PROCE	SSING						
Programme Branch	e &	B.E	& Ele	ctronic	cs and	d Instru	mentati	ion Ei	nginee	ring	Sem.	Cat	egory	L	т	Ρ	Credit
Prerequisite	es	Nil									5		PC	3	1	0	4
Preamble		To i	nnart t	he fun	damer	ntal know	vledae a	and a	nnlicati	ons of F	igital Sigr	al Pr	ressin	n			
Unit – I						ete Tim	•		ppiloud		igital Olgi			<b>y</b> .			9+3
Introduction- sinusoidal a Trigonometr continuous a	and exp ic	xponen fo	tial-Pei m	riodical o	l sign	als-Odd		Even				wer			ignal		formation
Unit – II		Cor	tinuou	is and	Discr	ete Tim	e Syste	ems:									9+3
Classificatio non causal- impulse and	recursiv	ive and	non r	ecursi	ve. Re	elation b	etween	Lapl	ace an	d Z tra	nsform-Re	spon	se anal	ysis (	of lin	ear s	ystems wi
Unit – III			sform														9+3
Fourier trans Discrete Fou	urier Tra																
<ul> <li>IDFT using</li> </ul>	g FFT.		iii i ac			anstorm	– Decim	nation	in Tim	еггіа	0		mation		•	- ,	raigonti
Unit – IV FIR Filter :N	veed, ac	<b>FIR</b> advant	<b>and III</b> ages a	R Filte nd disa	<b>rs:</b> advan	tages o	f digital	filters	s- Desi	ign of F	IR filter (	_ow F	Pass Fil	ter o	nly)	using	9+3 windowir
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CO1	exa	mine co	ontinuou	s and dis	crete ti	me signa	ls							Applying	(K3)
CO2 examine continuous and discrete time systems Applying (K														(K3)	
CO3	арр	ly Fourie	er transfo	orm to de	etermine	e the free	quency	respons	e of LT	I discret	e system	ı		Applying	(K3)
													Applying	(K3)	
CO5	exa	mine the	e effect o	of word le	ength ar	nd role c	of DSP F	Process	or					Applying	(K3)
						Маррі	ng of C	Os wit	h POs a	and PS	Ds				
COs/F	POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO	1	3	2	1	1	1					2		1	3	3
CO	2	3	2	1	1	1					2		1	3	3
CO	3	3	2	1	1	1					2		1	3	3
CO	4	3	2	1	1	1					2		1	3	3
CO	5	3	2	1	1	1					2		1	3	3
1 – Slig	ght, 2	– Mode	rate, 3 -	Substan	itial, BT	- Bloom'	s Taxor	nomy							
						ASSE	SSMEN	IT PAT	TERN -	THEOF	RY				
	st / Blo Catego	oom's ory*	Re	memberi (K1) %	ng	Understa (K2)		Apply (K3)		Analyzi (K4) 9		Evaluating (K5) %	Crea	ating (K6) %	Total %
	CAT	1		5		20		75	5						100
	CAT	2		5		20		75	5						100
	CAT	3		5		20		75	5						100
	ESE	Ξ		5		15		80	)						100

	22EIT54- VLSI SYSTEMS						
gramme &	B.E. & Electronics and Instrumentation Engineering	Sem.	Category	L	т	Р	Credit
requisites	Digital Logic Circuits	5	PC	3	0	0	3
amble	To impart the knowledge on MOS transistor characteristic Description Language and testing of ICs.	s, fabrica	ition, prograr	nmin	g in \	/erilo	g Hardware
t – I	MOS Transistor Theory:						9
sistor switche	Theory: NMOS enhancement transistor – PMOS enhancemen s. Basic D.C. equations – Second order effects: Threshold volt n – Mobility variation – Fowler- Nordheim tunneling – Drain pun	tage – Bo	ody effect - S	Sub t	hresh	old re	
t – II	CMOS Logic and Circuit Design:						9
isters. Comple e time – Dela out design rule	erter – Combinational logic – NAND gate – NOR gate – Comp ementary CMOS inverter - DC characteristics – $\beta n/\beta p$ ratio, N by time. Power dissipation for CMOS logic: Static dissipation es and Stick diagram for inverter, NAND and NOR.	Noise ma	rgin. Switchi	ng c	harad	cterist	ics: Fall time cuit dissipatio
t — III	CMOS Fabrication Technology:						9
in of latchup – grammable Lc /. <b>t – IV</b>	hnology: N-Well CMOS process – P-Well process – Twin tub - Latchup triggering – Latchup prevention – Internal latchup pre ogic – Programmable Logic structures – Programmable Interco Verilog HDL:	evention to onnect – 2	techniques – Kilinx Progra	-I/O la mma	atchu ble G	p pre Gate A	vention. FPG arrays – Desi <b>9</b>
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in of latchup – grammable Lo <i>i</i> . <b>t – IV</b> ical design fli- deling: Continu S switches – ple Carry Adde <b>t – V</b> oduction: Logi ntrollability , Re it in Self Test ( <b>KT BOOK:</b> <b>KT BOOK:</b> <b></b>	Annology: N-Well CMOS process – P-Well process – Twin tub         Latchup triggering – Latchup prevention – Internal latchup prevention – Internal latchup prevention         bgic – Programmable Logic structures – Programmable Interco         Verilog HDL:         ow, Basic concepts: Lexical conventions – Data types, Ma         uous assignment, Behavioral modeling: Structured procedure         CMOS switches – Bidirectional switches. Implementation of         er, Multiplexer, D-Flip-Flop.         CMOS Testing and Verification:         ic Verification, Debugging, Manufacturing Test- Manufacturi         epeatability , Survivability , Fault Coverage Automatic Test Pa         BIST).	evention f onnect – 2 odules a – Proce f logic us ing test ittern Ger sis", 2 <sup>nd</sup> E on, PHI L CDR Edi	techniques – Kilinx Progra nd Ports, G dural assign sing Verilog principles: heration (ATF ective", 4 <sup>th</sup> E dition, Pears tion, New De	I/O Ia mma ate ment HDL Fault Fault Fault on E	atchu ble C level s. Sv : Hal : Moo Desig : Moo Desig duca	p pre Sate A mode vitch f f Add dels , gn stra earsor tion, N	vention. FPG vention. FPG vrays – Desi <b>9</b> eling, Datafle evel modelir er, Full Add <b>9</b> Observabili ategies for te <b>Total:</b> n education, New Delhi,

	E OUTCOMES: pletion of the course, the students will be able to	BT Mapped (Highest Level)
CO1	examine the characteristics and the second order effects in designing MOSFET	Applying (K3)
CO2	discuss the CMOS logics and its characteristic for different logics	Applying (K3)
CO3	discuss the various fabrication techniques for chip development	Applying (K3)
CO4	develop programming for VLSI systems using Verilog Hardware Description Language	Applying (K3)
CO5	explain the testing process involved in chip design.	Understanding (K2)

Mapping of COs with POs and PSOs													
PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
3	2	1	1	1					1			3	3
3	2	1	1	1					1			3	3
3	2	1	1	1					1			3	3
3	2	1	1	1					1			3	3
3	1								1			2	2
	3 3 3 3	3     2       3     2       3     2       3     2       3     2	3     2     1       3     2     1       3     2     1       3     2     1       3     2     1	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	PO1PO2PO3PO4PO532111321113211132111	PO1         PO2         PO3         PO4         PO5         PO6           3         2         1         1         1         1           3         2         1         1         1         1           3         2         1         1         1         1           3         2         1         1         1         1           3         2         1         1         1         1           3         2         1         1         1         1	PO1         PO2         PO3         PO4         PO5         PO6         PO7           3         2         1         1         1         1         1           3         2         1         1         1         1         1           3         2         1         1         1         1         1           3         2         1         1         1         1         1           3         2         1         1         1         1         1           3         2         1         1         1         1         1	PO1         PO2         PO3         PO4         PO5         PO6         PO7         PO8           3         2         1         1         1	PO1         PO2         PO3         PO4         PO5         PO6         PO7         PO8         PO9           3         2         1         1         1	PO1         PO2         PO3         PO4         PO5         PO6         PO7         PO8         PO9         PO10           3         2         1         1         1           1         1           3         2         1         1         1            1         1           3         2         1         1         1            1         1           3         2         1         1         1            1         1           3         2         1         1         1            1<	PO1         PO2         PO3         PO4         PO5         PO6         PO7         PO8         PO9         PO10         PO11           3         2         1 <td>PO1         PO2         PO3         PO4         PO5         PO6         PO7         PO8         PO9         PO10         PO11         PO12           3         2         1         1         1            1            1             1</td> <td>PO1         PO2         PO3         PO4         PO5         PO6         PO7         PO8         PO9         PO10         PO11         PO12         PS01           3         2         1         1         1           1         1         3           3         2         1         1         1            1         3           3         2         1         1         1            1         3           3         2         1         1         1            3         3           3         2         1         1         1            3         3         3         3         3         3         3         3         3         3         3         3         3         3         1         1            3</td>	PO1         PO2         PO3         PO4         PO5         PO6         PO7         PO8         PO9         PO10         PO11         PO12           3         2         1         1         1            1            1             1	PO1         PO2         PO3         PO4         PO5         PO6         PO7         PO8         PO9         PO10         PO11         PO12         PS01           3         2         1         1         1           1         1         3           3         2         1         1         1            1         3           3         2         1         1         1            1         3           3         2         1         1         1            3         3           3         2         1         1         1            3         3         3         3         3         3         3         3         3         3         3         3         3         3         1         1            3

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's	Taxonomy
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		ASSESS		ERN - THEOR	Y		
Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	30	20	50				100
CAT2	10	45	45				100
CAT3	10	45	45				100
ESE	10	40	50				100
* ±3% may be vari	ed (CAT 1, 2 & 3 –	50 marks & ESE -	- 100 marks)				

Program Branch		BE & Electronics and Instrumentation Engineering	Sem.	Category	L	т	Р	Credit
Prerequ	uisites	Control Systems	5	PC	3	1	0	4
Preamb	le	This Course enhances the students to apply the concepts and empirical approach. The controller designs, tuning a discussed.						
Unit – I		Process Modeling and Characteristics:						9+3
pressure Boiler d	e process rum level c gulatory op	c process Control - Process control terminology - Mathematic - Second order interacting and non-interacting systems: Lique control. Process Characteristics: Continuous and Batch proce erations. Empirical Modeling:	uid level p	process - Pro	cess	es with	inverse	response
Model of Graphic	developme al fitting of	nt using Linear or non-linear regression: Model building first-order and second-order models using step tests: Graph data- Approximation of Higher-Order Systems.						egression
Unit – I		Controller Characteristics and Tuning:						9+3
		Two position mode, Floating mode, proportional, integra		rivative mod	es. F	P+I, P+	D, P+I+[	D modes
		htroller- Evaluation criteria-Controller Tuning: Process react Frequency response method of tuning.	ion curve			Nichols		
oscillatio Unit – I	on method· V	Frequency response method of tuning. Final Control Elements:		method- Zie	egler-		method	- Dampeo 9+3
oscillation Unit – I Signal o	on method- V conversion:	Frequency response method of tuning.	/alve pos	method- Zie	egler-		method	- Dampeo 9+3
oscillation Unit – I Signal of Valve bo Unit – V	on method- V conversions odies - Cor /	Frequency response method of tuning.     Final Control Elements:     I/P converter - Actuators: Electric and Pneumatic type -\     htrol valve sizing - Cavitations and Flashing - Selection of con     Multi-loop Control:	/alve pos trol valves	method- Zie itioner – Cha	egler-	eristics	of contro	- Dampeo 9+3 ol valves 9+3
oscillation Unit – I Signal of Valve bo Unit – V Feed Fo	on method V conversions odies - Cor / orward cor	Frequency response method of tuning.     Final Control Elements:     S: I/P converter - Actuators: Electric and Pneumatic type -     htrol valve sizing - Cavitations and Flashing - Selection of con	/alve pos itrol valves	method- Zie itioner – Cha	egler-	eristics	of contro	- Dampeo 9+3 ol valves 9+3
oscillation Unit – I Signal of Valve bo Unit – V Feed Fo	on method V conversions odies - Cor / orward cor	Frequency response method of tuning.     Final Control Elements:     I/P converter - Actuators: Electric and Pneumatic type -     trol valve sizing - Cavitations and Flashing - Selection of con     Multi-loop Control:     htrol - Cascade control - Ratio control - Selective control	/alve pos itrol valves	method- Zie itioner – Cha s. - Split-Range	egler- aracte	eristics htrol - I	of contro	- Damped 9+3 ol valves 9+3
oscillation Unit – I Signal of Valve bo Unit – V Feed Fo	on method- V conversions odies - Cor / orward cor ction to mul	Frequency response method of tuning.     Final Control Elements:     I/P converter - Actuators: Electric and Pneumatic type -     trol valve sizing - Cavitations and Flashing - Selection of con     Multi-loop Control:     htrol - Cascade control - Ratio control - Selective control	/alve pos itrol valves	method- Zie itioner – Cha s. - Split-Range	egler- aracte	eristics htrol - I	of contro	- Damped 9+3 valves 9+3 I control
oscillatio Unit – I Signal o Valve bo Unit – V Feed Fo Introduc	on method- V conversions odies - Cor / orward cor ction to mul COOK: Krishnasw Unit 1,3,4	Frequency response method of tuning.     Final Control Elements:     S: I/P converter - Actuators: Electric and Pneumatic type - Antrol valve sizing - Cavitations and Flashing - Selection of con     Multi-loop Control:     Introl - Cascade control - Ratio control - Selective control     tivariable control. Case studies: Boiler, Reactor, Distillation C  /amy K.," Process Control", 2 <sup>nd</sup> Edition(Reprint), New Age Intro and 5.	/alve pos trol valves systems olumn.	method- Zie itioner – Cha s. - Split-Range Le	egler- aracte e cor ecture	eristics htrol - I e:45, Tu	of contro nferential utorial:11	- Damped 9+3 01 valves 9+3 1 control 5,Total:60
oscillatio Unit – I' Signal o Valve bo Unit – V Feed Fo Introduc	on method- V conversions odies - Cor / orward cor ction to mul COOK: Krishnasw Unit 1,3,4 Dale E. S	Frequency response method of tuning.     Final Control Elements:     S: I/P converter - Actuators: Electric and Pneumatic type - Antrol valve sizing - Cavitations and Flashing - Selection of con     Multi-loop Control:     Introl - Cascade control - Ratio control - Selective control     tivariable control. Case studies: Boiler, Reactor, Distillation C	/alve pos trol valves systems olumn.	method- Zie itioner – Cha s. - Split-Range Le	egler- aracte e cor ecture	eristics htrol - I e:45, Tu	of contro nferential utorial:11	- Damped 9+3 01 valves 9+3 1 control 5,Total:60
oscillatio Unit – I' Signal o Valve bo Unit – V Feed Fo Introduc TEXT B 1.	on method- V conversions odies - Cor / orward cor ction to mul COOK: Krishnasw Unit 1,3,4 Dale E. S	Frequency response method of tuning.     Final Control Elements:     S: I/P converter - Actuators: Electric and Pneumatic type - Antrol valve sizing - Cavitations and Flashing - Selection of con     Multi-loop Control:     Introl - Cascade control - Ratio control - Selective control     tivariable control. Case studies: Boiler, Reactor, Distillation C      //amy K.," Process Control", 2 <sup>nd</sup> Edition(Reprint), New Age Intro     and 5.     Beborg, Duncan A. Mellichamp, Thomas F. Edgar, and Fra	/alve pos trol valves systems olumn.	method- Zie itioner – Cha s. - Split-Range Le	egler- aracte e cor ecture	eristics htrol - I e:45, Tu	of contro nferential utorial:11	- Damped 9+3 01 valves 9+3 1 control 5,Total:60
oscillatio Unit – I' Signal c Valve bo Unit – V Feed Fo Introduc TEXT B 1. 2. REFER	on method- V conversions odies - Cor / orward cor ction to mul COOK: Krishnasw Unit 1,3,4 Dale E. S Edition, Jo ENCES: Surekha E	Frequency response method of tuning.     Final Control Elements:     S: I/P converter - Actuators: Electric and Pneumatic type -     http://water.com/control:     Multi-loop Control:     Multi-loop Control:     final control - Ratio control - Selective control     tivariable control. Case studies: Boiler, Reactor, Distillation C      //amy K.," Process Control", 2 <sup>nd</sup> Edition(Reprint), New Age Int     and 5.     seborg, Duncan A. Mellichamp, Thomas F. Edgar, and Fra     bhn Wiley and Sons, USA, 2016 for Unit 2.  Bhanot, "Process Control: Principles and Applications", 4 <sup>th</sup> Edition	/alve pos itrol valves systems olumn. ternationa ncis J. D	method- Zie itioner – Cha s. · Split-Range I (P) Ltd., Pu oyle, "Proces rd University	egler- aracte e cor cture blishe sss D	eristics htrol - I e:45, Tu ers, New ynamics	s method of contro nferential utorial:11 w Delhi, 2 s and Co ed Kingdo	- Damped 9+3 0 valves 1 control 5,Total:60 2015 for pontrol", 4 <sup>t</sup>
oscillatio Unit – I' Signal o Valve bo Unit – V Feed Fo Introduc TEXT B 1.	on method- V conversions odies - Cor / orward cor ction to mul COOK: Krishnasw Unit 1,3,4 Dale E. S Edition, Jo ENCES: Surekha E Wayne Be 2013.	Frequency response method of tuning.     Final Control Elements:     S: I/P converter - Actuators: Electric and Pneumatic type -     http://wateria.com/control/and/control.     Multi-loop Control:     Multi-loop Control - Ratio control - Selective control     tivariable control. Case studies: Boiler, Reactor, Distillation C     ramy K.," Process Control", 2 <sup>nd</sup> Edition(Reprint), New Age Int     and 5.     Beborg, Duncan A. Mellichamp, Thomas F. Edgar, and Fra     phn Wiley and Sons, USA, 2016 for Unit 2.	/alve pos itrol valves systems olumn. ternationa ncis J. D ition, Oxfo on",2 <sup>nd</sup> Ec	method- Zie itioner – Cha s. Split-Range Le I (P) Ltd., Pu oyle, "Proces rd University lition, Prentic	egler- aracte e cor cture blishe sss Dy Pres e Ha	eristics htrol - I e:45, Tu ers, New ynamics ss, Unite Il of Ind	of contro nferential utorial:1! w Delhi, 2 s and Co ed Kingdo ia, New I	- Damped 9+3 01 valves 9+3 1 control 5,Total:60 2015 for 2015 for 2015 for 2015 for 2015 for 2017 Delhi

npion	on of t	IES: he cou	rse, the	studen	ts will b	e able	to						BT Mappe ghest Le		
deve	lop ma	themati	ical mod	eling fo	r various	proces	ses					A	pplying (k	(3)	
deter	rmine t	he real	time mo	dels usi	ng empi	rical mo	deling					A	pplying (k	(3)	
deter	rmine tl	he cont	roller ga	ins and	tuning r	nethods	for var	ious ap	plicatior	าร		A	pplying (k	(3)	
expla	ain the	control	valve ac	cessori	es and it	s opera	tional cl	haracte	eristics			Unde	erstanding	g (K2)	
apply	y the co	oncepts	of multi-	-loop co	ntrol to	various	applicat	ions				A	pplying (k	(3)	
					Мар	ping of	COs w	ith PO	s and P	SOs					
Os	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	
	3	2	1	1	1			2				1	3	3	
2	3	2	1	1	1			2				1	3	3	
3	3	2	1	1	1			2				1	3	3	
ł	3	1						2				1	2	2	
5	3	2	1	1	1			2				1	3	3	
ht, 2 -	- Mode	rate, 3	– Substa	antial, B	T- Bloor	n's Taxo	onomy								
					ASS	SESSME	ENT PA	TTER	I - THEC	ORY					
		Rer	nember (K1) %	ing U							Evaluating (K5) %			Total %	
CAT1			10		30		60	)						100	
CAT2			10		30		60	)						100	
CAT3			10		40		50	)						100	
ESE			10		30		60	)						100	
	deter deter expla apply Os Cos ht, 2 - ht, 2 - Ategor CAT1 CAT2 CAT3 ESE	determine ti determine ti explain the apply the co 0s PO1 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	determine the realdetermine the controlexplain the conceptsapply the concepts $0s$ PO1PO232323232323232324353637Bloom's ategory*CAT1CAT2CAT3ESE11	determine the real time modeldetermine the controller gaexplain the control valve actionapply the concepts of multiplicationOsPO1PO2PO3a32123213321431153214311532143115321ht, 2 - Moderate, 3 - Substance10/ Bloom's ategory*Remember (K1) %CAT110CAT210CAT310ESE10	determine the real time models usi         determine the controller gains and         explain the control valve accessorie         apply the concepts of multi-loop co         Os       PO1       PO2       PO3       PO4         3       2       1       1         2       3       2       1       1         3       2       1       1       1         3       2       1       1       1         3       2       1       1       1         3       2       1       1       1         3       2       1       1       1         3       2       1       1       1         4       3       1       1       1         5       3       2       1       1         ht, 2 – Moderate, 3 – Substantial, B       1       1       1         / Bloom's       Remembering (K1) %       U       1         CAT1       10       1       1         CAT2       10       1       1       1         ESE       10       10       1       1	determine the real time models using empidetermine the controller gains and tuning rexplain the control valve accessories and itapply the concepts of multi-loop control to vMapOsPO1PO2PO3PO4PO532111232111332111332111431-115321116321116321116321116321317Hoderate, 3 – Substantial, BT- BloorASS7Bloom's ategory*Remembering (K1) %Understa (K2)CAT11030CAT21030CAT31040ESE1030	determine the real time models using empirical modelsdetermine the controller gains and tuning methodsexplain the control valve accessories and its operaapply the concepts of multi-loop control to various aMapping ofOsPO1PO2PO3PO4PO5PO632111232111332111332111431532111-43153211143153211143153211143153211163211163211178888788887888878888788887888878888788878 </td <td>determine the real time models using empirical modeling         determine the controller gains and tuning methods for var         explain the control valve accessories and its operational cl         apply the concepts of multi-loop control to various applicat         Mapping of COs w         Os PO1 PO2 PO3 PO4 PO5 PO6 PO7         3       2       1       1         2       3       2       1       1         3       2       1       1       1         3       2       1       1       1         3       2       1       1       1         3       2       1       1       1         3       2       1       1       1         3       2       1       1       1         4       3       1       1       1         5       3       2       1       1       1         6       3       2       1       1       1         10       3       2       1       1       1         11       1       1       1       1       1         12       1       1       <t< td=""><td>determine the real time models using empirical modeling         determine the controller gains and tuning methods for various applications         explain the control valve accessories and its operational character         apply the concepts of multi-loop control to various applications         Mapping of COs with PO         Os       PO1       PO2       PO3       PO4       PO5       PO6       PO7       PO8         3       2       1       1       1       2         3       2       1       1       1       2         3       2       1       1       1       2         3       2       1       1       1       2         3       2       1       1       1       2         3       3       2       1       1       2         3       3       1       1       2       2         4       3       1       2       2       2       2       2         4       3       1       2       2       2       2       2       2       2         5       3       2       1       1       1       2       2       2       3</td><td>determine the real time models using empirical modeling         determine the controller gains and tuning methods for various application         explain the control valve accessories and its operational characteristics         apply the concepts of multi-loop control to various applications         Mapping of COs with POs and P         Os PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9         3       2       1       1       2         3       2       1       1       2       2         3       2       1       1       1       2       2         3       2       1       1       1       2       2         3       2       1       1       1       2       2         3       3       2       1       1       2       2         3       3       2       1       1       2       2         4       3       1      </td><td>determine the real time models using empirical modeling         determine the controller gains and tuning methods for various applications         explain the control valve accessories and its operational characteristics         apply the concepts of multi-loop control to various applications         Mapping of COs with POs and PSOs         Mapping of COs with POs and PSOs         Os PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10         3       2       1       1       2       1         2       3       2       1       1       2       1         3       2       1       1       1       2       1         3       3       2       1       1       1       2       1         3       3       2       1       1       1       2       1       1         3       3       2       1       1       1       2       1       1       1       2       1       1       1       2       1       1       1       2       1       1       1       2       1       1       1       1       2       1       1       1       1       2       1       1</td><td>determine the real time models using empirical modeling         determine the controller gains and tuning methods for various applications         explain the control valve accessories and its operational characteristics         apply the concepts of multi-loop control to various applications         Mapping of COs with POs and PSOs         Os PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11         3       2       1       1       2      </td><td>determine the real time models using empirical modeling       A         determine the controller gains and tuning methods for various applications       A         explain the control valve accessories and its operational characteristics       Undetermine the control valve accessories and its operational characteristics       Undetermine the control valve accessories and its operational characteristics         apply the concepts of multi-loop control to various applications       A         Mapping of COs with POs and PSOs         Sos         Os         A         3         2         1         2         1         3         2         1         2         1         2         1         2         1         1         2         1         1         2         1         1         2         1         1</td><td>Applying (K           determine the real time models using empirical modeling         Applying (K           determine the controller gains and tuning methods for various applications         Applying (K           explain the control valve accessories and its operational characteristics         Understanding           apply the concepts of multi-loop control to various applications         Applying (K           Mapping of COs with POs and PSOs           Os         PO1         PO11         PO12         PS01           3         2         1         1         3           Os         PO1         PO11         PO12         PS01           3         2         1         3           S         PO6         PO7         PO8         PO10         PO11         PO12         PS01           3         2         1         1           A PO4         PO5           <th colsp<="" td=""></th></td></t<></td>	determine the real time models using empirical modeling         determine the controller gains and tuning methods for var         explain the control valve accessories and its operational cl         apply the concepts of multi-loop control to various applicat         Mapping of COs w         Os PO1 PO2 PO3 PO4 PO5 PO6 PO7         3       2       1       1         2       3       2       1       1         3       2       1       1       1         3       2       1       1       1         3       2       1       1       1         3       2       1       1       1         3       2       1       1       1         3       2       1       1       1         4       3       1       1       1         5       3       2       1       1       1         6       3       2       1       1       1         10       3       2       1       1       1         11       1       1       1       1       1         12       1       1 <t< td=""><td>determine the real time models using empirical modeling         determine the controller gains and tuning methods for various applications         explain the control valve accessories and its operational character         apply the concepts of multi-loop control to various applications         Mapping of COs with PO         Os       PO1       PO2       PO3       PO4       PO5       PO6       PO7       PO8         3       2       1       1       1       2         3       2       1       1       1       2         3       2       1       1       1       2         3       2       1       1       1       2         3       2       1       1       1       2         3       3       2       1       1       2         3       3       1       1       2       2         4       3       1       2       2       2       2       2         4       3       1       2       2       2       2       2       2       2         5       3       2       1       1       1       2       2       2       3</td><td>determine the real time models using empirical modeling         determine the controller gains and tuning methods for various application         explain the control valve accessories and its operational characteristics         apply the concepts of multi-loop control to various applications         Mapping of COs with POs and P         Os PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9         3       2       1       1       2         3       2       1       1       2       2         3       2       1       1       1       2       2         3       2       1       1       1       2       2         3       2       1       1       1       2       2         3       3       2       1       1       2       2         3       3       2       1       1       2       2         4       3       1      </td><td>determine the real time models using empirical modeling         determine the controller gains and tuning methods for various applications         explain the control valve accessories and its operational characteristics         apply the concepts of multi-loop control to various applications         Mapping of COs with POs and PSOs         Mapping of COs with POs and PSOs         Os PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10         3       2       1       1       2       1         2       3       2       1       1       2       1         3       2       1       1       1       2       1         3       3       2       1       1       1       2       1         3       3       2       1       1       1       2       1       1         3       3       2       1       1       1       2       1       1       1       2       1       1       1       2       1       1       1       2       1       1       1       2       1       1       1       1       2       1       1       1       1       2       1       1</td><td>determine the real time models using empirical modeling         determine the controller gains and tuning methods for various applications         explain the control valve accessories and its operational characteristics         apply the concepts of multi-loop control to various applications         Mapping of COs with POs and PSOs         Os PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11         3       2       1       1       2      </td><td>determine the real time models using empirical modeling       A         determine the controller gains and tuning methods for various applications       A         explain the control valve accessories and its operational characteristics       Undetermine the control valve accessories and its operational characteristics       Undetermine the control valve accessories and its operational characteristics         apply the concepts of multi-loop control to various applications       A         Mapping of COs with POs and PSOs         Sos         Os         A         3         2         1         2         1         3         2         1         2         1         2         1         2         1         1         2         1         1         2         1         1         2         1         1</td><td>Applying (K           determine the real time models using empirical modeling         Applying (K           determine the controller gains and tuning methods for various applications         Applying (K           explain the control valve accessories and its operational characteristics         Understanding           apply the concepts of multi-loop control to various applications         Applying (K           Mapping of COs with POs and PSOs           Os         PO1         PO11         PO12         PS01           3         2         1         1         3           Os         PO1         PO11         PO12         PS01           3         2         1         3           S         PO6         PO7         PO8         PO10         PO11         PO12         PS01           3         2         1         1           A PO4         PO5           <th colsp<="" td=""></th></td></t<>	determine the real time models using empirical modeling         determine the controller gains and tuning methods for various applications         explain the control valve accessories and its operational character         apply the concepts of multi-loop control to various applications         Mapping of COs with PO         Os       PO1       PO2       PO3       PO4       PO5       PO6       PO7       PO8         3       2       1       1       1       2         3       2       1       1       1       2         3       2       1       1       1       2         3       2       1       1       1       2         3       2       1       1       1       2         3       3       2       1       1       2         3       3       1       1       2       2         4       3       1       2       2       2       2       2         4       3       1       2       2       2       2       2       2       2         5       3       2       1       1       1       2       2       2       3	determine the real time models using empirical modeling         determine the controller gains and tuning methods for various application         explain the control valve accessories and its operational characteristics         apply the concepts of multi-loop control to various applications         Mapping of COs with POs and P         Os PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9         3       2       1       1       2         3       2       1       1       2       2         3       2       1       1       1       2       2         3       2       1       1       1       2       2         3       2       1       1       1       2       2         3       3       2       1       1       2       2         3       3       2       1       1       2       2         4       3       1	determine the real time models using empirical modeling         determine the controller gains and tuning methods for various applications         explain the control valve accessories and its operational characteristics         apply the concepts of multi-loop control to various applications         Mapping of COs with POs and PSOs         Mapping of COs with POs and PSOs         Os PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10         3       2       1       1       2       1         2       3       2       1       1       2       1         3       2       1       1       1       2       1         3       3       2       1       1       1       2       1         3       3       2       1       1       1       2       1       1         3       3       2       1       1       1       2       1       1       1       2       1       1       1       2       1       1       1       2       1       1       1       2       1       1       1       1       2       1       1       1       1       2       1       1	determine the real time models using empirical modeling         determine the controller gains and tuning methods for various applications         explain the control valve accessories and its operational characteristics         apply the concepts of multi-loop control to various applications         Mapping of COs with POs and PSOs         Os PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11         3       2       1       1       2	determine the real time models using empirical modeling       A         determine the controller gains and tuning methods for various applications       A         explain the control valve accessories and its operational characteristics       Undetermine the control valve accessories and its operational characteristics       Undetermine the control valve accessories and its operational characteristics         apply the concepts of multi-loop control to various applications       A         Mapping of COs with POs and PSOs         Sos         Os         A         3         2         1         2         1         3         2         1         2         1         2         1         2         1         1         2         1         1         2         1         1         2         1         1	Applying (K           determine the real time models using empirical modeling         Applying (K           determine the controller gains and tuning methods for various applications         Applying (K           explain the control valve accessories and its operational characteristics         Understanding           apply the concepts of multi-loop control to various applications         Applying (K           Mapping of COs with POs and PSOs           Os         PO1         PO11         PO12         PS01           3         2         1         1         3           Os         PO1         PO11         PO12         PS01           3         2         1         3           S         PO6         PO7         PO8         PO10         PO11         PO12         PS01           3         2         1         1           A PO4         PO5 <th colsp<="" td=""></th>	

Programme & Branch	BE & Electronics and Instrumentation Engineering	Sem.	Category	L	т	Р	с
Prerequisites	Digital Logic Circuits	5	PC	3	1	0	4
Preamble	To get acquaintance with the architecture of 8085 pro programming concepts for interfacing peripherals with microcontrollers.						
Unit – I	8085 Microprocessor:					9-	⊦3
	085 Microprocessor-Architecture-Pin configuration-Interrupts ng –Simple Assembly Language Programs for arithmetic ope		on Set –Addr	ressin	g Modes-	Timing Dia	agrams
Unit – II	8051 Microcontroller:					9-	⊦3
	51 Microcontroller- Architecture- Memory Organization- Spe on set-Addressing modes.	cial function	on registers -	- Prog	ram Cour	iter – PSW	registe
Unit – III	8051 Programming:					9-	⊦3
	(Mode 1) / Counter- Serial Communication - Interrupt (Time					ng in Embe	dded C
1/O nort program							
¥	ning- Timer programming-Counter programming-Serial port	orogrammi	ng-Interrupt p	orogra	mming.		
Unit – IV	Peripheral Interfacing with 8051:					-	⊦3
Unit – IV						-	⊦3
Unit – IV Programming in I	Peripheral Interfacing with 8051:	ers- DC M				motor.	+3
Unit – IV Programming in I Unit – V	Peripheral Interfacing with 8051: Embedded C: Keypad- LCD – Sensors- A/D and D/A convert Applications of Microcontrollers(Block Diagram Appr er, Automated Meter Reading System, Washing machine, Sp	ers- DC M oach):	otor -Stepper	r moto	r – Servo	motor.	+3
Unit – IV Programming in I Unit – V Smart Card read	Peripheral Interfacing with 8051: Embedded C: Keypad- LCD – Sensors- A/D and D/A convert Applications of Microcontrollers(Block Diagram Appr er, Automated Meter Reading System, Washing machine, Sp	ers- DC M oach):	otor -Stepper	r moto e mon	r – Servo itoring sys	motor.	<b>⊦3</b> Printers
Unit – IV Programming in I Unit – V Smart Card read	Peripheral Interfacing with 8051: Embedded C: Keypad- LCD – Sensors- A/D and D/A convert Applications of Microcontrollers(Block Diagram Appr er, Automated Meter Reading System, Washing machine, Sp	ers- DC M oach):	otor -Stepper	r moto e mon	r – Servo itoring sys	motor. 9- stems, 3D	<b>⊦3</b> Printers
Unit – IV Programming in I Unit – V Smart Card read Smart Home auto TEXT BOOK:	Peripheral Interfacing with 8051: Embedded C: Keypad- LCD – Sensors- A/D and D/A convert Applications of Microcontrollers(Block Diagram Appr er, Automated Meter Reading System, Washing machine, Sp	ers- DC M oach): peedomete	otor -Stepper	e mon	r – Servo itoring sys ure:45, Tu	motor. 9- stems, 3D utorial:15,	<b>⊦3</b> Printers Total:6
Unit – IV Programming in I Unit – V Smart Card read Smart Home auto TEXT BOOK:	Peripheral Interfacing with 8051: Embedded C: Keypad- LCD – Sensors- A/D and D/A convert Applications of Microcontrollers(Block Diagram Appr er, Automated Meter Reading System, Washing machine, Sp omation system.	ers- DC M oach): peedomete	otor -Stepper	e mon	r – Servo itoring sys ure:45, Tu	motor. 9- stems, 3D utorial:15,	<b>⊦3</b> Printers Total:6
Unit – IV Programming in I Unit – V Smart Card read Smart Home auto TEXT BOOK: 1. Senthil I Press, N REFERENCES: Gaonkai	Peripheral Interfacing with 8051: Embedded C: Keypad- LCD – Sensors- A/D and D/A convert Applications of Microcontrollers(Block Diagram Appr er, Automated Meter Reading System, Washing machine, Sp pomation system. Kumar N., Saravanan M., Jeevananthan S., "Microprocesso ew Delhi, 2016. R.S, "Microprocessor Architecture, Programming, and Applic	ers- DC M oach): peedomete	otor -Stepper	r moto e mon Lect	r – Servo itoring sys ure:45, Tu d Edition,	motor. 9- stems, 3D utorial:15, Oxford U	+3 Printers Total:6
Unit – IV Programming in I Unit – V Smart Card read Smart Home auto TEXT BOOK: 1. Senthil I Press, N REFERENCES: 1. Gaonkar New Del 2 Soumitra	Peripheral Interfacing with 8051: Embedded C: Keypad- LCD – Sensors- A/D and D/A convert Applications of Microcontrollers(Block Diagram Appr er, Automated Meter Reading System, Washing machine, Sp pomation system. Kumar N., Saravanan M., Jeevananthan S., "Microprocesso ew Delhi, 2016. R.S, "Microprocessor Architecture, Programming, and Applic	ers- DC M oach): peedomete prs and M cations wit	otor -Stepper er, Healthcare icrocontroller h the 8085",	e mon Lect s", 2n 6th Ec	r – Servo itoring sys ure:45, Tu d Edition, lition, Pre	motor. 9- stems, 3D utorial:15, Oxford U ntice Hall c	<b>⊦3</b> Printers <b>Total:6</b> niversit

COURSE On comp			urse, th	e stuc	dents will	be able	e to						Г Mapped hest Leve	
CO1	apply as	sembly	languag	e prog	gram of 80	85 micr	oproces	sor				Ap	oplying (K	3)
CO2	summari	ze the b	asic cor	ncepts	of 8051 m	nicrocor	ntroller					Unde	rstanding	(K2)
CO3	write em	bedded	c progra	ams fo	or 8051							Ар	plying (K3	5)
CO4	interface	periphe	eral devi	ces wi	ith 8051 m	icrocon	troller					Ap	plying (K3	5)
CO5	interpret	the app	lications	of mi	crocontroll	er						Under	standing	(K2)
					M	apping	of COs	s with F	POs and	PSOs				
COs/POs	PO1	PO2	PO3	PO4		PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2								2		1	2	2
CO2	3	2								2		1	2	2
CO3	3	3	1	1	1					2		1	3	3
CO4	3	3	1	1	1					2		1	3	3
CO5	3	2								2		1	2	2
1 – Slight	2 – Moo	lerate, 3	8 – Subs	tantial	l, BT- Bloo	m's Tax	konomy							
					A	SSESS	MENTI	PATTE	RN - THE	EORY				
Test / E Cate		Rer	nember (K1) %	ing	Understa (K2)		Apply (K3)		Analyziı (K4) %	•	uating (K5) %	Creating (K6) %	Tota	al %
CA	.T1		20		40		40	)					10	00
CA	T2		20		30		50	)					1(	00
CA	Т3		20		30		50	)					1(	00
E	SE		10		40		50	)					1(	00
* ±3% ma	y be vari	ed (CAT	Г 1,2,3 —	50 m	arks & ES	E – 100	marks	)						

Branc	amme & ch	B.E.	& Electr	onics a	nd Instru	umentation	Enginee	ering	Sem.	Category	L	т	Р	Credit
Preree	quisites	Nil							5	PC	0	0	2	1
Pream	nble OF EXPEI	temp contre	erature, ol valve a	pressure are expe		tical exposu w processe d.								
1.	Empiric	al modelin	g of non	-interac	ting and i	interacting s	econd or	der sys	tem					
2.	Closed	loop analy	sis of flo	w proce	ess with s	servo and re	gulatory	control						
3.	Closed	loop analy	sis of te	mperatu	ire proces	ss with serv	o and reg	gulatory	control					
4.	Closed	loop analy	sis of pr	essure p	orocess v	with servo a	nd regula	tory cor	ntrol					
5.	Tuning	of controll	er param	neters fo	or tempera	ature proces	S							
6.	Respor	se of ratio	control	for the p	pressure p	process								
7.	Respor	se of feed	forward	control	of liquid l	level system								
8.	Respor	se of Cas	cade cor	ntrol of C	ontinuo	o Stirrod To		tor						
						is Suneu ra	nk Reac	101						
9.	Charac	eristics of	control			ening valve,			ual perc	entage valv	e)			
9. 10.		eristics of al modelin		valves (0	Quick ope	ening valve,			qual perc	entage valv	e)			
-				valves (0	Quick ope	ening valve,			qual perc	entage valv	e)			Total:30
10.		al modelin	g of sing	valves (( gle conic	Quick ope	ening valve,			qual perc	entage valv	re)			Total:30
10.	Empiric	al modelin	g of sing	valves (( gle conic	Quick ope	ening valve,			qual perc	entage valv	e)		•	Total:30
10. REFE 1. COUR	Empiric RENCES	Al modelin MANUAL ory Manua COMES:	g of sing . <b>/SOFT\</b> al	valves (( gle conic WARE:	Quick ope	ening valve, ystem			qual perc	entage valv	re)		Т Мар	ped
10. REFE 1. COUR On co	Empiric RENCES/ Laborat RSE OUT( ompletion	MANUAL MANUAL ory Manua OMES: of the co	g of sing . /SOFT\ al urse, the	valves (( yle conic WARE: e stude	Quick ope cal tank s nts will k	ening valve, ystem	Linear va	alve, Ec	· · ·	entage valv	re)	(Hig Ana	T Map Jhest I	L <b>evel)</b> (K4),
10. <b>REFE</b> 1. <b>COUR</b> <b>On co</b> CO1	Empiric RENCES/ Laborat RSE OUT( ompletion analyze	MANUAL ory Manua OMES: of the co the respo	g of sing . <b>/SOFT</b> al <b>urse, th</b> nse of d	valves (( gle conic WARE: e stude	Quick ope cal tank s nts will t control so	ening valve, ystem <b>be able to</b> chemes in p	Linear va	alve, Ec	ons	entage valv	re)	(Hig Ana Pre Ana	T Map Jhest I alyzing acision alyzing	ped Level) (K4), (S3) (K4),
10. <b>REFE</b> 1. <b>COUR</b> <b>On co</b> CO1 CO2	Empiric RENCES/ Laborat SE OUT( ompletion analyze analyze	al modelin MANUAL ory Manua COMES: of the co the respo the contro	g of sing /SOFT\ al urse, the nse of d oller para	valves (( gle conic WARE: e stude ifferent ( ameters	Quick ope cal tank s nts will t control so for optim	ening valve, ystem <b>be able to</b> chemes in p nal control o	Linear va	alve, Ec	ons	entage valv	e)	(Hig Ana Pre Ana Pre Ana	T Map Jhest I alyzing ecision alyzing alyzing	ped Level) (K4), (S3) (K4), (S3) (K4),
10. <b>REFE</b> 1. <b>COUR</b> <b>On co</b> CO1 CO2	Empiric RENCES/ Laborat SE OUT( ompletion analyze analyze	al modelin MANUAL ory Manua COMES: of the co the respo the contro	g of sing /SOFT\ al urse, the nse of d oller para	valves (( gle conic WARE: e stude ifferent ( ameters	Quick ope cal tank s nts will k control so for optim	ening valve, ystem <b>be able to</b> chemes in p nal control o	Linear va	oplicatic	ons	entage valv	e)	(Hig Ana Pre Ana Pre Ana	T Map Ihest I alyzing ecision alyzing ecision	ped Level) (K4), (S3) (K4), (S3) (K4),
10. <b>REFE</b> 1. <b>COUR</b> <b>On co</b> CO1 CO2 CO3	Empiric RENCES Laborat SE OUTO mpletion analyze analyze demons	MANUAL ory Manua OMES: of the co the respond the contro trate the co	g of sing /SOFT\ al urse, the nse of d oller para	valves (( gle conic WARE: e stude ifferent of ameters ristics of	Quick ope cal tank s nts will t control sc for optim f pneuma Mapping	ening valve, ystem be able to chemes in p hal control o ttic control v g of Cos wi	Linear va rocess ap tempera alve	alve, Ec	ons ocess <b>Ds</b>			(Hig Ana Pre Ana Pre Ana Pre	T Map phest I alyzing ecision alyzing ecision alyzing ecision	ped Level) (K4), (S3) (K4), (S3) (K4), (S3)
10. <b>REFE</b> 1. <b>COUR</b> <b>On co</b> <b>CO</b> CO2 CO3 <b>CO</b> <b>CO</b> <b>CO</b> <b>CO</b> <b>CO</b> <b>CO</b> <b>CO</b>	Empiric         RENCES/         Laborat         SE OUT(         ompletion         analyze         demons         POs	Al modelin MANUAL ory Manua of the co the respond the control trate the co 1 PO2	g of sing /SOFT\ al urse, the nse of d oller para	valves (( gle conic WARE: e stude ifferent ( ameters	Quick ope cal tank s nts will k control sc for optim f pneuma Mapping	ening valve, ystem <b>De able to</b> chemes in p hal control o ttic control v <b>g of Cos wi</b> <b>PO6 PO7</b>	Linear va rocess ap tempera alve	oplicatic	ons	entage valv	re)	(Hig Ana Pre Ana Pre Ana Pre	T Map Jhest I alyzing ecision alyzing alyzing	ped Level) (K4), (S3) (K4), (S3) (K4), (S3) PSO2
10. REFE 1. COUR On co CO1	Empiric       RENCES/       Laborat       RSE OUT( ompletion)       analyze       analyze       demons       POs       POs       1	MANUAL ory Manua OMES: of the co the respond the contro trate the co	g of sing /SOFT/ al urse, the nse of d oller para character PO3	valves (( gle conic WARE: e stude ifferent ( ameters ristics of PO4	Quick operations of the second	ening valve, ystem be able to chemes in p hal control o ttic control v g of Cos wi	Linear va rocess ap tempera alve th POs a PO8	pplicatic ature pro nd PSC PO9	ons ocess Os PO10		P012	(Hig Ana Pre Ana Pre Ana Pre	T Map Jhest I alyzing ecision alyzing ecision alyzing ecision	ped Level) (K4), (S3) (K4), (S3) (K4), (S3)

Progra Branc	amme & h	E	BE & I	Electro	nics an	d Instr	umenta	ation Er	ngineer	ing	Sem.	Category	L	т	Р	Credit
Prerec	quisites	1	Nil								5	PC	0	0	2	1
Pream		t C	empe contro DC ma	rature, I valve achines	pressur are exp	e and f	low pro	cesses.	Select	ed multi	i-loop co	nalyze the introl system learn the c	ms an	d ch	aracte	ristics o
LIST C						ting on	dintoro	otina oo		dorovo	1000					
1.	Empin	cai mo	aeiing	) or non	-interac	and and	a interac	cting se	cona or	der syst	tem					
2.	Closed	l loop a	analys	sis of flo	w proce	ess with	servo a	and reg	ulatory	control						
3.	Tuning	and c	losed	loop ar	nalysis o	of tempe	erature	process	s with se	ervo and	l regulate	ory control				
4.	Respo	nse of	ratio	control	for the p	oressure	e proces	ss and r	espons	e of fee	d forwar	d control of	liquid	leve	l syste	m
5.	Chara	cteristi	cs of c	control	valves (	Quick o	pening	valve, L	inear v	alve, Eq	lual perc	entage valv	/e)			
6.	Load to	est on	DC se	eries mo	otor											
7.	Speed	contro	ol of D	C shun	t motor											
8.	Load to	est on	squirr	el cage	induction	on moto	or									
9.	Predet	ermina	ation c	of efficie	ency and	d regula	ition on	single p	hase tr	ansform	ner					
10.	Load to	est on	three	phase a	alternate	or										
															•	Total:3
REFE	RENCES	/ MAN	UAL	/SOFT\	NARE:											
1.	Labora	tory N	lanual													
	SE OUT			_	_			-							Т Мар	
	mpletio								oraturo	tuning	in proce	20			<b>Jhest</b> I alyzing	Level)
CO1	applica		espoi		merent	CONTION	Scheme	es temp	erature	uning	in proces	55			ecision	
CO2	demor	strate	the cł	naracter	ristics of	f pneum	natic co	ntrol va	ve						alyzing ecision	
CO3	demor	strate	the pe	erforma	nce cha	aracteris	stics of I	DC and	AC ma	chines				Ana	alyzing	(K4),
						Маррі	ng of C	cos with	n POs a	nd PSC	Ds					()
COs/F	POs P	D1 F	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO1	2 F	<b>PSO1</b>	PSO
CO	1 :	3	3	2	3	1	2		1	2	3		1		3	3
CO	2 3	3	3	2	3	1	2		1	2	3		1		3	3
00												1				

	(Common to All BE/ BTech Engineering and Tech	nnology bra	anches)				
Programme & Branch	All BE/ BTech Engineering and Technology branches	Sem.	Category	L	т	Р	Credi
Prerequisites	Nil	5	EC	0	0	80	2
Preamble	This subject is to enhance the employability skills and to deve	elop caree	r competency	1			
Unit – I	Soft Skills – II :	-					20
Facing an interv Communication interviews.	team-Elements of leadership, disadvantages of a team, stages iew: Foundation in core subject- industry orientation / knowledg skills-Activities before Interview, upon entering interview roo	ge about tl	he company-	prof	essio	nal per	sonality nd Moc
Unit – II	Quantitative Aptitude and Logical Reasoning – II: level II: Money related problems-Mixtures-Symbol base proble						30
	t based reasoning-Flaw detection- Puzzles-Cryptarithms.			55- V C	enn ai	agram	
Unit – III Reading: Readi Identifying and comprehension of an argument Reading notices Sharing of Rea Presentation on Speaking; Pair I	Reading & Speaking Skills ng comprehension– Effective Reading strategies – Descriptive, locating factual information within a text – global reading/sl / scanning for specific information – detailed comprehension / int – identifying the writer's attitude and opinions – Reading news and book reviews –Interpreting graphic data & Advertisements I Time Experience; Conversational Practices –Role Play – S Various Topics – Technical / Non-Technical Topics – Project Re Discussion – Group Discussion – The process of Group Discussion	kimming f tensive rea s articles s. Speaking Short Talks eview Pres	, & Argumen or general u ading – under in business r g: Mock Inter s / TED Tal sentation – O	tative Inder rstan maga views ks – rator	e reac stand ding t zines s –Se Exten y and	ling pas ling – he devo , newsj elf-Introo npore; Effectiv	30 ssages selective elopmer oapers duction Giving ve Publi
Unit – III Reading: Readi Identifying and comprehension of an argument Reading notices Sharing of Rea Presentation on Speaking; Pair I	<b>Reading &amp; Speaking Skills</b> ng comprehension– Effective Reading strategies – Descriptive, locating factual information within a text – global reading/sl / scanning for specific information – detailed comprehension / int – identifying the writer's attitude and opinions – Reading news and book reviews –Interpreting graphic data & Advertisements I Time Experience; Conversational Practices –Role Play – S Various Topics – Technical / Non-Technical Topics – Project Re	kimming f tensive rea s articles s. Speaking Short Talks eview Pres	, & Argumen or general u ading – under in business r g: Mock Inter s / TED Tal sentation – O	tative Inder rstan maga views ks – rator	e reac stand ding t zines s –Se Exten y and	ling pas ling – he devo , newsj elf-Introo npore; Effectiv	30 ssages selective elopmer oapers duction Giving ve Publi
Unit – III Reading: Readi Identifying and comprehension of an argument Reading notices Sharing of Rea Presentation on Speaking; Pair I Telephonic Con	Reading & Speaking Skills ng comprehension– Effective Reading strategies – Descriptive, locating factual information within a text – global reading/sl / scanning for specific information – detailed comprehension / int – identifying the writer's attitude and opinions – Reading news and book reviews –Interpreting graphic data & Advertisements I Time Experience; Conversational Practices –Role Play – S Various Topics – Technical / Non-Technical Topics – Project Re Discussion – Group Discussion – The process of Group Discussion	kimming f tensive rea s articles s. Speaking Short Talks eview Pres	, & Argumen or general u ading – under in business r g: Mock Inter s / TED Tal sentation – O	tative Inder rstan maga views ks – rator	e reac stand ding t zines s –Se Exten y and	ling pas ling – he devo , newsj elf-Introo npore; Effectiv	30 ssages selective elopmer oapers duction Giving ve Publi
Unit – III Reading: Readi Identifying and comprehension of an argument Reading notices Sharing of Rea Presentation on Speaking; Pair I Telephonic Con	Reading & Speaking Skills ng comprehension– Effective Reading strategies – Descriptive, locating factual information within a text – global reading/sl / scanning for specific information – detailed comprehension / int – identifying the writer's attitude and opinions – Reading news and book reviews –Interpreting graphic data & Advertisements I Time Experience; Conversational Practices –Role Play – S Various Topics – Technical / Non-Technical Topics – Project Re Discussion – Group Discussion – The process of Group Discussio /ersations & Skills – Negotiating Skills.	kimming f tensive rea s articles s. Speaking Short Talks eview Pres on – Strate	, & Argumen or general u ading – unde in business r g: Mock Inter s / TED Tal sentation – O egies to be ac	tative Inder rstan naga views ks – rator lopte	e reac stand ding t zines s –Se Exten y and d – S	ling pas ling – he devi, news lf-Introd npore; Effectiv kills As	30 ssages selectiv elopmer papers duction Giving ve Publi sessed Total:4
Unit – III Reading: Readi Identifying and comprehension of an argument Reading notices Sharing of Rea Presentation on Speaking; Pair I Telephonic Con	Reading & Speaking Skills ng comprehension– Effective Reading strategies – Descriptive, locating factual information within a text – global reading/sl / scanning for specific information – detailed comprehension / int – identifying the writer's attitude and opinions – Reading news and book reviews –Interpreting graphic data & Advertisements I Time Experience; Conversational Practices –Role Play – S Various Topics – Technical / Non-Technical Topics – Project Re Discussion – Group Discussion – The process of Group Discussion	kimming f tensive rea s articles s. Speaking Short Talks eview Pres on – Strate	, & Argumen or general u ading – unde in business r g: Mock Inter s / TED Tal sentation – O egies to be ac	tative Inder rstan naga views ks – rator lopte	e reac stand ding t zines s –Se Exten y and d – S	ling pas ling – he devi, news lf-Introd npore; Effectiv kills As	30 ssages selective elopmer papers duction Giving ve Publi sessed Total:4
Unit – III Reading: Readi Identifying and comprehension of an argument Reading notices Sharing of Rea Presentation on Speaking; Pair I Telephonic Con	Reading & Speaking Skills ng comprehension– Effective Reading strategies – Descriptive, locating factual information within a text – global reading/sl / scanning for specific information – detailed comprehension / int – identifying the writer's attitude and opinions – Reading news and book reviews –Interpreting graphic data & Advertisements I Time Experience; Conversational Practices –Role Play – S Various Topics – Technical / Non-Technical Topics – Project Re Discussion – Group Discussion – The process of Group Discussion versations & Skills – Negotiating Skills.	kimming f tensive rea s articles s. Speaking Short Talks eview Pres on – Strate	, & Argumen or general u ading – unde in business r g: Mock Inter s / TED Tal sentation – O egies to be ac	tative Inder rstan naga views ks – rator lopte	e reac stand ding t zines s –Se Exten y and d – S	ling pas ling – he devi, news lf-Introd npore; Effectiv kills As	30 ssages selectiv elopmer papers duction Giving ve Publi sessed Total:4
Unit – III         Reading: Readi         Identifying and         comprehension         of an argument         Reading notices         Sharing of Rea         Presentation on         Speaking; Pair I         Telephonic Con         TEXT BOOK:         1.         Edgar T         Services	Reading & Speaking Skills ng comprehension– Effective Reading strategies – Descriptive, locating factual information within a text – global reading/sl / scanning for specific information – detailed comprehension / int – identifying the writer's attitude and opinions – Reading news and book reviews –Interpreting graphic data & Advertisements I Time Experience; Conversational Practices –Role Play – S Various Topics – Technical / Non-Technical Topics – Project Re Discussion – Group Discussion – The process of Group Discussion versations & Skills – Negotiating Skills.	kimming f tensive rea s articles s. Speaking Short Talks eview Pres on – Strate	, & Argumen or general u ading – under in business r g: Mock Inter s / TED Tal centation – O egies to be ac	tative Inder rstan naga views ks – rator lopte	e reac stand ding t zines s –Se Exten y and d – S	ling pas ling – he devi, news lf-Introd npore; Effectiv kills As	30 ssages selective bopmer papers duction Giving ve Publi sessed Total:4
Unit – III         Reading: Readi         Identifying and         comprehension         of an argument         Reading notices         Sharing of Rea         Presentation on         Speaking; Pair I         Telephonic Con         TEXT BOOK:         1.         Edgar T         Services         REFERENCES:         1.         Aruna K	Reading & Speaking Skills         ng comprehension– Effective Reading strategies – Descriptive, locating factual information within a text – global reading/sl/         / scanning for specific information – detailed comprehension / int – identifying the writer's attitude and opinions – Reading news and book reviews –Interpreting graphic data & Advertisements I Time Experience; Conversational Practices –Role Play – S         / various Topics – Technical / Non-Technical Topics – Project Replications & Skills – Negotiating Skills.         / orppe and Showick Thorpe, "Objective English for Competitive Experience: Pvt Ltd, 2017.	kimming f tensive rea s articles s. Speaking Short Talks eview Pres on – Strate xamination dia, New D	, & Argumen or general u ading – under in business r g: Mock Inter s / TED Tal centation – O egies to be ac ", 6th Edition	tative inder rstan naga views ks – rator lopte	e reac stand ding t izines s –Se Exten y and d – S	ling pas ling – he devi, news lf-Introd npore; Effectiv kills As	30 ssages selective bopmer papers duction Giving ve Publi sessed Total:4

	SE OUTCOMES: mpletion of the course, the students will be able to	BT Mapped (Highest Level)
CO1	develop the soft skills of learners to support them work efficiently in an organization as an individual and as a team	Applying (K3), Precision (S3)
CO2	solve real time problems using numerical ability and logical reasoning	Applying (K3), Precision (S3)
CO3	apply reading and speaking skills effectively for various academic and professional purposes	Applying (K3), Precision (S3)

					Mappin	g of CC	)s with	POs an	d PSO	s				
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	0	0	0	3	3	0	3	0	3	2		
CO2	3	2	0	0	0	3	3	0	3	0	3	2		
CO3		2	0	0	0	3	3	0	3	3	3	3		

1 - Slight, 2 - Moderate, 3 - Substantial, BT- Bloom's Taxonomy

		ASSESSMENT	PATTERN	THEORY			
Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	20	40	40				100
CAT2		50	50				100
CAT3		50	50				100
ESE				NA			
* ±3% may be varied	(CAT 1,2 & 3 – 50 m	arks)					

## 22EIT61 - INDUSTRIAL AUTOMATION USING PLC, SCADA AND DCS

Programme & Branch	BE & Electronics and Instrumentation Engineering	Sem.	Category	L	т	Р	Credit
Prerequisites	Process Control	6	PC	3	0	0	3
Preamble	Industrial automation is the use of control devices such as F without manual intervention. This course discusses the software modules for implementing monitoring and control s	logic and					
Unit – I	Programmable Logic Controllers (PLCs):						9
Analog I/O mode languages. Progr	ogic Controllers - Parts of a PLC - Principles of operation - F ules – Human Machine Interfaces(HMIs). Basics of PLC F amming timers: On-Delay timer instruction – Off-Delay timer inst	rogrammi	ng: Program	n sca			rogrammin
Unit – II	PLC Programming and Applications:						9
functions - Prog manipulation inst Acquisition system	unters: Counter instructions – Up counter – Down counter – C ram control instructions: Master control reset instruction – tructions: Data manipulation – Data compare instructions. S ms: Closed loop container filling process - ON/OFF liquid heating	Jump ir equencer	struction - Instructions	Subr . Pro	outine cess	Func	tions. Data I and Data
Unit – III	Distributed Control Systems:						9
	ibuted Control Systems: Emergence of the Distributed Control						
Basic elements o unit: Redundant o <b>Unit – IV</b> Operator interfac	f a microprocessor based controller – Functional blocks: An intro- controller designs.    DCS Operator Interfaces and Applications: es: Introduction – Low level operator interface – High level operator	rator inter	Security designation	gn is:	sues fo	or the native:	local contro 9 s, Hardward
Basic elements o unit: Redundant o <b>Unit – IV</b> Operator interfac elements in the o	f a microprocessor based controller – Functional blocks: An intre- controller designs. DCS Operator Interfaces and Applications: es: Introduction – Low level operator interface – High level operator interface, Operator displays. DCS applications: Power P	rator inter	Security designation	gn is:	sues fo	or the native:	local contro 9 s, Hardwar plants
Basic elements o unit: Redundant o Unit – IV Operator interfac elements in the o Unit – V Introduction – Ele	f a microprocessor based controller – Functional blocks: An intre- controller designs.	rator inter ants- Cer	Security designation face: Archite nent plants – e terminal u	gn is: ctura Pulp nit (R	l alter and F	or the natives Paper p – Mas	9 s, Hardwar blants 9 ster termina
Basic elements o unit: Redundant o Unit – IV Operator interfac elements in the o Unit – V Introduction – Ele	f a microprocessor based controller – Functional blocks: An intre- controller designs. DCS Operator Interfaces and Applications: es: Introduction – Low level operator interface – High level operator interface, Operator displays. DCS applications: Power P SCADA:	rator inter ants- Cer	Security designation face: Archite nent plants – e terminal u	gn is: ctura Pulp nit (R	l alter and F	or the natives Paper p – Mas	local contro 9 s, Hardwar blants 9 ster termina htrol system
Basic elements o unit: Redundant o Unit – IV Operator interfac elements in the o Unit – V Introduction – Ele	f a microprocessor based controller – Functional blocks: An intre- controller designs.	rator inter ants- Cer	Security designation face: Archite nent plants – e terminal u	gn is: ctura Pulp nit (R	l alter and F	or the natives Paper p – Mas	9 s, Hardwar blants 9 ster termina
Basic elements o unit: Redundant o Unit – IV Operator interfac elements in the o Unit – V Introduction – Ele units (MTUs). App	f a microprocessor based controller – Functional blocks: An intre- controller designs.	rator inter lants- Cer – Remo Stamping	Security designation face: Archite nent plants – e terminal u System – No	gn is: ctura Pulp nit (R pnline	I alter and F TUs)	or the natives Paper p – Mas	local contro 9 s, Hardwar blants 9 ster termina htrol system
Basic elements o unit: Redundant o Unit – IV Operator interfac elements in the o Unit – V Introduction – Ele units (MTUs). App TEXT BOOK: 1. Frank D.	f a microprocessor based controller – Functional blocks: An intro- controller designs.	rator inter lants- Cer – Remo Stamping	Security designation face: Archite nent plants – e terminal u System – No	gn is: ctura Pulp nit (R pnline	I alter and F TUs)	or the natives Paper p – Mas	local contro 9 s, Hardwar blants 9 ster termina htrol system
Basic elements o unit: Redundant o Unit – IV Operator interfac elements in the o Unit – V Introduction – Ele units (MTUs). App TEXT BOOK: 1. Frank D. REFERENCES:	f a microprocessor based controller – Functional blocks: An intro- controller designs.	rator inter lants- Cer - Remot Stamping McGraw	Security designation face: Archite nent plants – e terminal u System – No Hill, New Del	gn is: ctura Pulp nit (R pnline	I alter and F TUs)	or the natives Paper p – Mas	local contro 9 s, Hardwar blants 9 ster termina htrol system
Basic elements o unit: Redundant o Unit – IV Operator interfac elements in the o Unit – V Introduction – Ele units (MTUs). Ap TEXT BOOK: 1. Frank D. REFERENCES: 1. Michael F John W.V	f a microprocessor based controller – Functional blocks: An intro- controller designs.	nator inter lants- Cer – Remot Stamping McGraw	Security designation face: Archite nent plants – re terminal un System – No Hill, New Del	gn iss cctura Pulp nit (F pnline hi, 20	al alter and F RTUs) ear Lev	or the natives Paper p – Mas vel cor	local contro 9 s, Hardwar blants 9 ster termina trol systen Total:4

	SE OUTCOMES: mpletion of the course, the students will be able to	BT Mapped (Highest Level)				
CO1	explain the hardware components and I/O modules and operation of Programmable Logic Controllers	Applying (K3)				
CO2	apply PLC counter, control and data manipulation instructions and develop applications	Applying (K3)				
CO3	describe the architecture of Distributed Control Systems	Understanding (K2)				
CO4	choose the operator Interfaces and displays in DCS and develop applications	Applying (K3)				
CO5	apply SCADA for select applications	Applying (K3)				

					Марр	ing of C	COs wit	h POs a	and PS	Os				
COs/POs	P01	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	1	1			1		1			3	3
CO2	3	2	1	1	1			1		1			3	3
CO3	3	1						1		1			2	2
CO4	3	2	1	1	1			1		1			3	3
CO5	3	2	1	1	1			1		1			3	3
1 – Slight, 2	2 – Mode	erate, 3 -	- Substar	tial, BT	- Bloom'	s Taxon	omy							

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy
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		ASSESSMEN	NT PATTERN	I - THEORY			
Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	10	60	30				100
CAT2	10	60	30				100
CAT3	10	20	70				100
ESE	10	40	50				100
* ±3% may be varied	(CAT 1, 2 & 3 – 50 r	narks & ESE – 100	marks)	·			

	22EIT62 - INDUSTRY 4.0 WITH INDUST						
Programme & Branch	B.E. & Electronics and Instrumentation Engineering	Sem.	Category	L	т	Ρ	Credit
Prerequisites	Nil	6	PC	3	0	0	3
Preamble	To transform the industrial processes through the integration communication, and computational processing	n of moderr	technologies	s suc	h as	senso	ors,
Unit – I	Introduction to Industrial IoT and Industry 4.0:						9
IIoT – Intelligent 4.0: Characteristi	Background and History, IIoT key technologies, IoT and IIoT s devices – Key opportunities and benefits: Digital and human we cs and design principles.						- Industr
Unit – II	IIoT Architectures:						9
topology – Con communication la	Architecture – Industrial Internet Architecture Framework – Fin nectivity: Key system characteristics, Connectivity security yer – Overview of Predictive Maintenance Architecture.						nctions o
Unit – III	IIoT WAN Technologies and Protocols:						9
	s – Legacy Industrial protocols – Modern Communication proto						
	et. IIoT device Low-Power WAN optimized technologies for M2 er Wi-Fi, LTE Category-M, Weightless, Millimeter Radio.	2M: SigFox	, LoRaWAN,	nWa	ave, I	Dash7	7, Ingenu
RPMA, Low Pow	er Wi-Fi, LTE Category-M, Weightless, Millimeter Radio. Industrial IoT Security and Governance:						9
RPMA, Low Pow Unit – IV Introduction – Se solutions – Strate	er Wi-Fi, LTE Category-M, Weightless, Millimeter Radio.	– Evolutio	n of Cyber a	ttack	s: cy	ber at	9 ttacks and
RPMA, Low Pow Unit – IV Introduction – Se solutions – Strate	er Wi-Fi, LTE Category-M, Weightless, Millimeter Radio. Industrial IoT Security and Governance: curity threats and vulnerabilities of IoT – Industrial challenges gic principles of cyber security – cyber security measures - Inc er IIoT security model- Management risks with IIoT.	– Evolutio	n of Cyber a	ttack	s: cy	ber at	9 ttacks and
RPMA, Low Pow Unit – IV Introduction – Se solutions – Strate patterns – four Ti Unit – V Software Defined Technological co	er Wi-Fi, LTE Category-M, Weightless, Millimeter Radio. Industrial IoT Security and Governance: curity threats and vulnerabilities of IoT – Industrial challenges gic principles of cyber security – cyber security measures - Inc er IIoT security model- Management risks with IIoT. Industrial IoT Analytics and Applications: Networks: Difference between SDN and NFV – Cloud and mponents of Robots: Industrial Robotic applications – Indus	– Evolutio dustrial IoT	n of Cyber a security arch g Data and <i>i</i>	ttack itect	s: cy ure: I	ber at loT at in Ilo	9 ttacks and rchitecture 9 T. Recer
RPMA, Low Pow Unit – IV Introduction – Se solutions – Strate patterns – four Ti Unit – V Software Defined	er Wi-Fi, LTE Category-M, Weightless, Millimeter Radio. Industrial IoT Security and Governance: curity threats and vulnerabilities of IoT – Industrial challenges gic principles of cyber security – cyber security measures - Inc er IIoT security model- Management risks with IIoT. Industrial IoT Analytics and Applications: Networks: Difference between SDN and NFV – Cloud and mponents of Robots: Industrial Robotic applications – Indus	– Evolutio dustrial IoT	n of Cyber a security arch g Data and <i>i</i>	ttack itect	s: cy ure: I	ber at loT at in Ilo	9 ttacks an rchitectur 9 T. Recer
RPMA, Low Pow Unit – IV Introduction – Se solutions – Strate patterns – four Ti Unit – V Software Defined Technological co	er Wi-Fi, LTE Category-M, Weightless, Millimeter Radio. Industrial IoT Security and Governance: curity threats and vulnerabilities of IoT – Industrial challenges gic principles of cyber security – cyber security measures - Inc er IIoT security model- Management risks with IIoT. Industrial IoT Analytics and Applications: Networks: Difference between SDN and NFV – Cloud and mponents of Robots: Industrial Robotic applications – Indus	– Evolutio dustrial IoT	n of Cyber a security arch g Data and <i>i</i>	ttack itect	s: cy ure: I	ber at loT at in Ilo	9 ttacks an rchitectur 9 T. Recer assembly
RPMA, Low Pow Unit – IV Introduction – Se solutions – Strate patterns – four Ti Unit – V Software Defined Technological cc operation and tra TEXT BOOK:	er Wi-Fi, LTE Category-M, Weightless, Millimeter Radio. Industrial IoT Security and Governance: curity threats and vulnerabilities of IoT – Industrial challenges gic principles of cyber security – cyber security measures - Inc er IIoT security model- Management risks with IIoT. Industrial IoT Analytics and Applications: Networks: Difference between SDN and NFV – Cloud and mponents of Robots: Industrial Robotic applications – Indus	– Evolutio dustrial IoT Fog - Big trial applica	n of Cyber a security arch g Data and <i>r</i> ation of AR:	ttack itect	s: cy ure: I rtics	ber at loT at in Ilo nce,	9 ttacks an rchitectur 9 T. Recer assembly
RPMA, Low Pow Unit – IV Introduction – Se solutions – Strate patterns – four Ti Unit – V Software Defined Technological cc operation and tra TEXT BOOK:	er Wi-Fi, LTE Category-M, Weightless, Millimeter Radio. Industrial IoT Security and Governance: curity threats and vulnerabilities of IoT – Industrial challenges egic principles of cyber security – cyber security measures - Inc er IIoT security model- Management risks with IIoT. Industrial IoT Analytics and Applications: Networks: Difference between SDN and NFV – Cloud and mponents of Robots: Industrial Robotic applications – Indus ning.	– Evolutio dustrial IoT Fog - Big trial applica	n of Cyber a security arch g Data and <i>r</i> ation of AR:	ttack itect	s: cy ure: I rtics	ber at loT at in Ilo nce,	9 ttacks an rchitectur 9 T. Recer assembly
RPMA, Low Pow         Unit – IV         Introduction – Se         solutions – Strate         patterns – four Ti         Unit – V         Software Defined         Technological cc         operation and tra         TEXT BOOK:         1.       Alasdair         REFERENCES:         1       Alp Ustu	er Wi-Fi, LTE Category-M, Weightless, Millimeter Radio. Industrial IoT Security and Governance: curity threats and vulnerabilities of IoT – Industrial challenges egic principles of cyber security – cyber security measures - Inc er IIoT security model- Management risks with IIoT. Industrial IoT Analytics and Applications: Networks: Difference between SDN and NFV – Cloud and mponents of Robots: Industrial Robotic applications – Indus ning.	<ul> <li>– Evolutio</li> <li>dustrial IoT</li> <li>Fog - Big</li> <li>trial application</li> <li>tion, Aprese</li> </ul>	n of Cyber a security arch g Data and / ation of AR: s Media, New	ttack itect Analy Main	s: cy ure: I rtics ntena	ber at loT at in Ilo nce, 6.	9 ttacks an rchitectur 9 T. Recer assembly Total:4

	SE OUTCOMES: mpletion of the course, the students will be able to	BT Mapped (Highest Level)
CO1	explore the basics of industrial internet of things	Understanding (K2)
CO2	interpret the concepts of various architectures and components	Understanding (K2)
CO3	design and implement protocols and sensors for IIoT	Applying (K3)
CO4	impart the knowledge of IIoT security layers	Understanding (K2)
CO5	apply IIoT in real time Industrial applications	Applying (K3)
	Mapping of COs with POs and PSOs	·

					mappin	y or co	5 WILLI	rus all	u F30	>				
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3							1					1	1
CO2	3	1						1					2	2
CO3	3	2	1	1	1			1					3	3
CO4	3	1						1					2	2
CO5	3	2	1	1	1			1					3	3
1 - Slight 2	_ Mode	arata 3_	Substanti	ial BT_	Bloom's	Tayono	mv							

		ASSESSMENT	PATTERN -	THEORY			
Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	15	85					100
CAT2	10	50	40				100
CAT3	5	35	60				100
ESE	10	50	40				100
* ±3% may be varied (0	CAT 1, 2 & 3 – 50 ma	arks & ESE – 100 n	narks)				

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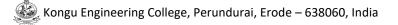
					22	2EIL61	- PLC	AND D	CS LAE	BORAT	ORY					
Progra Brancl		&	B.E. 8	& Electr	onics a	Ind Inst	rumen	tation E	Inginee	ering	Sem.	Category	L	т	Р	Credit
Prereq	quisite	es	Indus	strial Au	Itomatio	on usin	g PLC	and DC	S		6	PC	0	0	2	1
Pream	ble		implei (PLCs progra	mentations) and E	on, and Distribute ulate ar	mainter ed Con	nance c trol Sys	of indus stems ([	trial con DCS). T	trol sys	tems us hands-c	students ar ing Progran on experien m for caree	nmabl ce, st	e Lo uden	gic Co ts will	ontrollers learn to
LIST C	OF EX	PERIN		EXER(												
1.	Imple	ement	ation of	a simpl	e on/off	control	of a tra	uffic ligh	t systen	n using	PLC.					
2.	Control of speed and direction of a motor using PLC and SCADA															
3.	Counting and sorting objects on a conveyor belt using PLC and HMI															
4.	Control of the timing of a filling process operation using PLC.															
5.	Implementation of a sequential control of a process using PLC.															
6.	Implementation of pressure and flow control system using DCS.															
7.	Implementation of an alarm and notification system for a process using DCS.															
8.	Imple	ement	ation of	a casca	ade con	trol leve	l syster	n using	DCS.							
9.	Imple	ement	ation of	Packag	ging Line	e Contro	ol using	Factory	/ I/O sof	ftware						
10.	Deve	elopme	ent of si	mple log	gic circu	its with	digital i	nputs a	nd outp	uts usin	ig Phoer	nix Contact	PLC.			
																Total:30
REFE	RENCI	ES/ M	ANUAL	/SOFT	WARE:											
1.	Labo	oratory	Manua	ıl												
2.	Next	t-Gen	PLC Tra	aining -	Factory	I/O (fac	toryio.c	om)								
3.	PLC	next T	echnolo	ogy   PH	IOENIX	CONT	https://v	www.ph	oenixco	ntact.co	om/en-po	/industries/	plcnex	kt-teo	chnolo	gy ACT
COUR					o otudo	nto will									T Map	
CO1	_			u <b>rse, th</b> automa										Ар	plying	
															ecisior plying	, ,
CO2		•		automa			•							Pre	cisior	(S3)
CO3	deve	elop ac	lvanced	lindustr	ial auto	mation a	applicat	ion usir	ig factor	ry I/O ai	nd Phoe	nix Contact			ecisior	
							_ <u> </u>	1		nd PSC	1					
COs/P		PO1	PO2	<b>PO3</b>	PO4	<b>PO5</b>	<b>PO6</b>	PO7	PO8	<b>PO9</b>	PO10	PO11	PO1:	2 F	2 2	PSO2
CO1 CO2		3	3	2	3	2	2		1	2	3		1 1		3	3
	3	3	3	2	3	2	2	1	1	2	3		1		3	3

 $\mathsf{BE-Electronics} \text{ and } \mathsf{Instrumentation} \ \mathsf{Engineering}, \ \mathsf{Regulation}, \ \mathsf{Curriculum} \ \mathsf{and} \ \mathsf{Syllabus} - \mathsf{R2022}$ 

Progr Branc		8	B.E. 8	Electr	onics a	Ind Inst	trumen	tation E	Inginee	ering	Sem.	Category	L	т	Ρ	Credit
Preree		es	Nil								6	PC	0	0	2	1
Pream	nble		To im	part the	practica	al know	ledge o	n LabVI	EW pro	grammi	ing and i	ndustrial Int	ernet	of Thi	ings c	oncept.
LIST	OF EX		IENTS /	EXER	CISES:											
1.	Pro	gramm	ing with	basic fu	unctions	6										
2.	Pro	gramm	ing with	FOR L	oop, Wł	nile Loo	p, Loca	I and GI	obal va	riables						
3.	Pro	gramm	ing with	Array,	Cluster	and Str	uctures									
4.	Data acquisition and analysis using DAQ.															
5.	Data acquisition and analysis using NI-ELVIS.															
6.	Monitoring data from Wireless Temperature Transmitter using LoRA and IoT 2040															
7.	Monitoring and Controlling of PLC from cloud platform through IoT 2040															
8.	Interfacing and transfer of data from LoRa nodes to LoRa Gateway															
9.	Interfacing Factory I/O and PLCnext with LoRa Gateway using MQTT															
10.	Eme	ergenc	y Start /	Stop of	Industr	ial Mac	hines u	sing Lol	Ra loT s	sensors						
															1	Total:30
REFE	RENC	ES/ M	ANUAL	/SOFT	WARE:											
1.	Lab	VIEW	Software	e user N	lanual.											
2.	Sier	mens S	57 1200	PLC an	d loT 2	040 Use	er Manu	ıal								
3.	PLC	Cnext L	lser Mar	nual												
		UTCO	MES: the cou	irse. th	e stude	ents wil	l be abl	le to							<sup>-</sup> Map hest L	ped _evel)
CO1	T		VIEW p												olying	-
CO2	dev	elop In	dustrial	automa	tion app	olication	s usina	PLC ar	nd loT a	latewav				Apr	olying	(K3)
CO3		•										nix PLCnex			olying	. ,
003	uev	elop at	Ivanceu	muusu			••		•	,				Αр	Jying	(N3)
COs/F	2 <u>0s</u>	PO1	PO2	PO3	PO4	Mappi PO5	ng of C PO6	os with PO7	POs a PO8	nd PSC	Ds PO10	P011	PO12	P	SO1	PSO2
CO		3	3	2	3	2	2		1	2	3		1		3	3
CO	2	3	3	2	3	2	2		1	2	3		1		3	3
CO	_	3	3	2	3	2	2	1	1	2	3		1	1	3	3

Programme & Branch	B.E. & Electronics and Instrumentation Engineering	Sem.	Category	L	т	Ρ	Credit
Prerequisites	Nil	6	EC	0	0	8	4

		TCOME		the stud	ents will	be able	to						(ዞ	BT Mappe lighest Le			
CO1	CO1 formulate a problem with proper objectives to meet the need of the Society and Industry after detailed literature review												Cha	Creating (K6) Characterization (A5) Articulation (S4)			
CO2	design the Model considering all mathematical calculations meeting required standards prescribe by professional bodies											Cha	Creating (K6) Characterization (A5) Articulation (S4)				
CO3 select proper instruments for the designed model and develop the model with proper project and finance management and demonstrate the proper working of the model												Cha	valuating racterization	on (A5)			
CO4	cO4 articulate the project report and presentations with neat presentation incorporating all parameters											Cha	Evaluating (K5) Characterization (A5) Articulation (S4)				
CO5	cont	ribute ind	dividuall	y and in	team fo	r the de	velopme	ent and f	inal worl	king of th	ne project		Cha	valuating racterization	on (A5)		
						Марр	oing of (	COs with	n POs a	nd PSO	s						
COs/	POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2		
CO	)1	3	3	3	3	3	3	3	3	3	3	3	3	3	3		
CO	)2	3	3	3	3	3	3	3	3	3	3	3	3	3	3		
CO	)3	3	3	3	3	2	3	3	3	3	3	3	3	3	3		
CO	)4	3	3	3	3	2	3	3	3	3	3	3	3	3	3		
CO	)5	3	3	3	3	2	3	3	3	3	3	3	3	3	3		
<ul> <li>Slig</li> </ul>	jht, 2 -	- Moder	ate, 3 -	- Substa	antial, B	T- Bloo	m's Ta	konomy									



	22EIP62 - PROJECT WOF	RKI					
Programme & Branch	B.E. & Electronics and Instrumentation Engineering	Sem.	Category	L	т	Р	Credit
Prerequisites	Nil	6	EC	0	0	10	5

		TCOME		the stud	ents will	be able	e to						(۲	BT Mappe lighest Le			
CO1	formulate a problem with proper objectives to meet the need of the Society and Industry after detailed literature review													Creating (K6) Characterization (A5) Articulation (S4)			
CO2	design the Model considering all mathematical calculations meeting required standards prescribe by professional bodies												Cha	Creating (K6) Characterization (A5) Articulation (S4)			
CO3	CO3 select proper instruments for the designed model and develop the model with proper project and finance management and demonstrate the proper working of the model												Cha	valuating racterization	on (A5)		
CO4	articulate the project report and presentations with neat presentation incorporating all parameters											Cha	Evaluating (K5) Characterization (A5) Articulation (S4)				
CO5	cont	ribute in	dividuall	y and in	team fo	r the de	velopme	ent and f	inal work	king of th	ne project		Cha	valuating racterization	on (A5)		
						Марр	oing of C	COs witl	n POs a	nd PSO	s						
COs/I	POs	P01	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2		
CO	)1	3	3	3	3	3	3	3	3	3	3	3	3	3	3		
CO	)2	3	3	3	3	3	3	3	3	3	3	3	3	3	3		
CO	)3	3	3	3	3	2	3	3	3	3	3	3	3	3	3		
CO	)4	3	3	3	3	2	3	3	3	3	3	3	3	3	3		
CO	-	3	3	3	3	2	3	3	3	3	3	3	3	3	3		
<ul> <li>Slig</li> </ul>	ht, 2 -	<ul> <li>Moder</li> </ul>	ate, 3 -	- Substa	antial, B	T- Bloo	m's Ta	xonomy									

	(Common to All Engineering and	UMAN VALUES	.)				
Programme &			ĺ		-	-	0
Branch	All BE/BTech Branches	Sem.	Category	L	Т	Р	Credit
Prerequisites	Nil	3/6	HS	2	0	0	2
Preamble	To make the student to know what they 'really meaning of happiness and prosperity for a huma harmony at all the levels of human living, and live	an being. Also to faci					
Unit – I	Introduction:						6
Aspirations – Con Human Aspiratior	ntent and Process of Self exploration – Natural Acc tinuous Happiness and Prosperity – Exploring Happ as – Relationships – Physical Facilities – Right Under	iness and Prosperity					
Unit – II	Harmony in the Self and Body: Body – Understanding Myself as Co–existence of S						6
	, Self ('I') as the Conscious Entity, the Body as the M inderstanding Myself – Harmony with Body.	,	,				
	Harmony in the Family and Society: Amily – Justice – Feelings (Values) in Human Relatio Five dimensions of Human Endeavour.	nships – Relationship	from Family	to S	ociety	/ – Ide	6 entificatio
of Human Goal – I	· · · ·	nships – Relationship	from Family	to S	ociety	/ – Ide	-
of Human Goal – I Unit – IV Order of Nature –	amily – Justice – Feelings (Values) in Human Relation Five dimensions of Human Endeavour. Harmony in Nature and Existence: Interconnectedness – Understanding the Four ord Introduction to Space – Co–existence of units of S xistence.	er – Innateness – Na pace – Limited and	atural Charac unlimited –	teris Activ	tic – re an	Basic	entificatio
of Human Goal – I Unit – IV Order of Nature – Conformance – In Existence is Co–e Unit – V	amily – Justice – Feelings (Values) in Human Relation         Five dimensions of Human Endeavour.         Harmony in Nature and Existence:         Interconnectedness – Understanding the Four ord         htroduction to Space – Co–existence of units of Statence.         Implications of the above Holistic Understand	er – Innateness – Na pace – Limited and ing of Harmony on F	atural Charac unlimited – Professional	teris Activ <b>Ethi</b> e	tic – re an	Basic d No	entificatio 6 Activity activity 6
of Human Goal – I Unit – IV Order of Nature – Conformance – In Existence is Co–e Unit – V Values in different	amily – Justice – Feelings (Values) in Human Relation         Five dimensions of Human Endeavour.         Harmony in Nature and Existence:         Interconnectedness – Understanding the Four ord         httroduction to Space – Co–existence of units of Sistence.         Implications of the above Holistic Understand         idmensions of Human Living – Definitiveness of Ethom         omprehensive Human Goal – Humanistic Education	er – Innateness – Na pace – Limited and <b>ing of Harmony on F</b> nical Human Conduct	atural Charac unlimited – Professional –Implications	terist Activ Ethics of V	tic – re an <b>cs:</b> /alue	Basic d No-	6 Activity activity 6 d Living
of Human Goal – I Unit – IV Order of Nature – Conformance – In Existence is Co–e Unit – V Values in different Identification of C Professional Ethic	amily – Justice – Feelings (Values) in Human Relation         Five dimensions of Human Endeavour.         Harmony in Nature and Existence:         Interconnectedness – Understanding the Four ord         httroduction to Space – Co–existence of units of Sistence.         Implications of the above Holistic Understand         idmensions of Human Living – Definitiveness of Ethom         omprehensive Human Goal – Humanistic Education	er – Innateness – Na pace – Limited and <b>ing of Harmony on F</b> nical Human Conduct	atural Charac unlimited – Professional –Implications	terist Activ Ethics of V	tic – re an <b>cs:</b> /alue	Basic d No-	Activity -activity 6 d Living Issues i
of Human Goal – I Unit – IV Order of Nature – Conformance – In Existence is Co–e Unit – V Values in different Identification of C Professional Ethic TEXT BOOK:	amily – Justice – Feelings (Values) in Human Relation         Five dimensions of Human Endeavour.         Harmony in Nature and Existence:         Interconnectedness – Understanding the Four ord         htroduction to Space – Co–existence of units of Sixistence.         Implications of the above Holistic Understand         c dimensions of Human Living – Definitiveness of Etto         omprehensive Human Goal – Humanistic Educations.	er – Innateness – Na pace – Limited and <b>ing of Harmony on F</b> nical Human Conduct n – Universal Humar	atural Charac unlimited – Professional –Implications n Order – Co	terist Activ Ethics of V	tic – re an <b>cs:</b> /alue	Basic d No- e base e and	Activity Activity Activity Activity Activity Activity 6 Activity A
of Human Goal – I Unit – IV Order of Nature – Conformance – In Existence is Co–e Unit – V Values in different Identification of C Professional Ethic TEXT BOOK: 1 Gaur R.R	amily – Justice – Feelings (Values) in Human Relation         Five dimensions of Human Endeavour.         Harmony in Nature and Existence:         Interconnectedness – Understanding the Four ord         httroduction to Space – Co–existence of units of Sistence.         Implications of the above Holistic Understand         idmensions of Human Living – Definitiveness of Ethom         omprehensive Human Goal – Humanistic Education	er – Innateness – Na pace – Limited and <b>ing of Harmony on F</b> nical Human Conduct n – Universal Humar	atural Charac unlimited – Professional –Implications n Order – Co	terist Activ Ethics of V	tic – re an <b>cs:</b> /alue	Basic d No- e base e and	Activity Activity Activity Activity Activity 6 Activity 6 Activity
of Human Goal – I Unit – IV Order of Nature – Conformance – Ir Existence is Co–e Unit – V Values in different Identification of C Professional Ethic TEXT BOOK: 1. Gaur R.R Books Pvi	amily – Justice – Feelings (Values) in Human Relation Five dimensions of Human Endeavour. Harmony in Nature and Existence: Interconnectedness – Understanding the Four ord netroduction to Space – Co–existence of units of Sxistence. Implications of the above Holistic Understand cimensions of Human Living – Definitiveness of Ett omprehensive Human Goal – Humanistic Educations, Sangal R., Bagaria G.P., "A Foundation Course in Intercember 2019."	er – Innateness – Na pace – Limited and <b>ing of Harmony on F</b> nical Human Conduct n – Universal Humar	atural Charac unlimited – Professional –Implications n Order – Co	terist Activ Ethics of V	tic – re an <b>cs:</b> /alue	Basic d No- e base e and	Activity Activity Activity Activity Activity 6 Activity 6 Activity
of Human Goal – I Unit – IV Order of Nature – Conformance – Ir Existence is Co–e Unit – V Values in different Identification of C Professional Ethic TEXT BOOK: 1. Gaur R.R Books Pv: REFERENCES: 1. Ivan Illich,	amily – Justice – Feelings (Values) in Human Relation Five dimensions of Human Endeavour. Harmony in Nature and Existence: Interconnectedness – Understanding the Four ord netroduction to Space – Co–existence of units of Sxistence. Implications of the above Holistic Understand cimensions of Human Living – Definitiveness of Ett omprehensive Human Goal – Humanistic Educations, Sangal R., Bagaria G.P., "A Foundation Course in Intercember 2019."	er – Innateness – Na pace – Limited and <b>ing of Harmony on F</b> nical Human Conduct n – Universal Humar Human Values and Pr	atural Charac unlimited – Professional –Implications n Order – Co rofessional Et	terist Activ Ethics of V	tic – re an <b>cs:</b> /alue	Basic d No- e base e and	Activity -activity d Living Issues Total:3

		UTCOM ion of t		se, the st	udents	s will be a	able to							BT Mapp Highest L	
CO1			meanin the socie		oiness	and pros	sperity a	and do	a cor	rect app	raisal o	f the currer	nt	Applying	(K3)
CO2 distinguish between the Self and the Body, understand the meaning of Harmony in the Self, the Co–existence of Self and Body											е	Applying (K3)			
CO3 infer the value of harmonious relationship based on trust, respect and other naturally acceptable feelings in human–human relationships and explore their role in ensuring a harmonious society												Applying (K3)			
CO4       transform themselves to co-exist with nature by realising interconnectedness and four order of nature         CO5       distinguish between ethical and unethical practices, and extend ethical and moral practices for a												Applying	(K3)		
CO5		nguish l er living		ethical a	nd une	thical pra	ctices, a	and exte	end eth	nical and	moral p	ractices for	а	Applying	(K3)
						Mappin	g of CC	s with	POs a	nd PSOs	6				
COs/I	POs	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO	1	3	2	1	1										
CO	2	3	2	1	1										
CO	3	3	2	1	1										
CO	4	3	2	1	1										
CO	5	3	2	1	1										
1 – Sli	ght, 2	– Mode	rate, 3 -	- Substant	ial, BT·			,	DN -	THEORY	,				
	Test / Bloom's Remembering Category* (K1) %			ng	Understa (K2)	anding	Apply (K3)	ying	Analyzi (K4) %	ing	Evaluating (K5) %		reating (K6) %	Tota %	
	CAT	1		25		75									100
	CAT	2		25		75									100
	ESE	1		NA											100

	(Common to All BE/B	Tech branches)					
Programme Branch	All BE/BTech branches	Sem.	Category	L	т	Ρ	Credit
Prerequisites	s Nil	7	HS	3	0	0	3
Preamble	The aim of the course is to create fundamental kn economics, national income, marketing, operation					epts lil	ke
Unit – I	Micro Economics						9
	Basics Concepts and Principles – Demand and Supply Circular Flow of Economic Activities and Income.	- Law of demand and S	Supply – Dete	ermin	ants	– Ma	rket
Unit – II	Macro Economics, Business Ownership and M	lanagement concepts					9
Business – O	ne and its Measurement Techniques. Inflation - Causes wnership Types. Management concepts: Taylor and Fa of Management - Roles of Manager.						
Unit – III	Marketing Management						9
	ore Concepts of Marketing - Four P's of Marketing - Ne Cycle - Pricing Strategies and Decisions.	w Product Developmen	t – Intellectua	l Pro	perty	Righ	ts (IPR),
Unit – IV	Operations Management						9
	anagement - Resources - Types of Production System Inventory - EOQ Determination.	- Site Selection, Plant L	ayout, Steps.	in Pr	oduc	tion F	Planning
Unit – V	Financial Management						9
	inciples – Financial Statements and its Uses – Depreci – Capital Budgeting - Significance –Traditional and Di			Bala	nce l	Vetho	od – Brea
							Total:4
TEXT BOOK							
	oiled by Department of Management Studies, Kongu Er eers", 1 <sup>st</sup> Edition, McGraw Hill Education, Noida, 2013.		pnomics and I	Mana	igem	ent fo	r
REFERENCE	S:						
	ka, Piyali Ghosh and Purba Roy Choudhury, "Manager	rial Economics", 3 <sup>rd</sup> Editi	ion, McGraw-	Hill, I	New	Delhi,	2018.
1. Geet	no. I. Otavara and "On anoticana Managara ant" 44th Estitic	n McGraw-Hill Education	on, 2021.				
	m J. Stevenson, "Operations Management", 14 <sup>th</sup> Editio						

		UTCON on of th		e, the stud	lents w	ill be able	to							Mapped jhest Lev	vel)
CO1	iden	tify mai	ket equi	ilibrium ar	nd inter	pret natio	nal incor	me calc	ulations	s and inf	lation iss	sues		Applying	(K3)
CO2	choo	ose a si	uitable b	usiness o	wnersh	nip for the	ir enterp	rise and	l illustra	ate mana	agerial fu	unctions		Applying	(K3)
CO3	infer	r marke	ting mar	nagement	decisio	ons							Ur	nderstand	ing (K2)
CO4	appl	ly appro	priate o	peration r	nanage	ement con	ncept in b	ousines	s situat	ions				Applying	(K3)
CO5	inter	rpret fin	ancial a	nd accour	nting sta	atements	and eva	luate ne	ew prop	osals				Applying	(K3)
						Mappin	ng of CC	)s with	POs ai	nd PSO:	6				
COs/P	Os	PO1	PO2	PO3	PO4		PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
СО	1	1	1	2			3		2	2	2	3	2		
CO	2		1	2			2	2	2	2	2	3	2		
CO	3	1	2	1			2		2	2	2	3	2		
CO	4	1	2	1			2		2	2	2	3	2		
CO	5	2	2				2		2	2	2	3	2		
1 – Slig	ght, 2	– Mode	erate, 3 -	- Substan	tial, BT	- Bloom's	Taxono	my							
						<b>V66E6</b>	SMENT	. рудте	- DN _ 1	THEORY	,				
	t / Blo atego	oom's ory*	R	emember (K1) %	ing	Understa (K2)	anding	Apply (K3)	ying	Analyzi (K4) %	ing	Evaluating (K5) %		eating (6) %	Total %
	CAT	1		20		40	)	40	)						100
	CAT	2		20		40	)	40	)						100
	CAT	3		20		40	)	40	)						100
				20		40		40							100

Programme & Branch	BE & Electronics and Instrumentation Engineering	Sem.	Category	L	т	Ρ	Credit
Prerequisites	Nil	7	PC	3	0	0	3
Preamble	To impart the fundamental knowledge and applications of	Digital Sigr	al Processing	g.			
Unit – I	Discrete Time Signals and Systems:						9
Exponential and	mpling and Quantization of signal – Discrete time (DT) seque Sine – Operations on DT sequence: Shifting, Scaling and F tability – Linear and circular convolution - Correlation.						
Unit – II	Fourier transform:						9
and Its Significa theorem.	ourier Transform – Discrete Fourier Transform – Relationship nce – Decimation in Time FFT algorithm – Decimation in Frequ						
Unit – III	FIR Filters:						9
Unit – IV IIR Filter: Design Theoretical Des	<ul> <li>Rabiner Method – Linear Phase Characteristics – Stabilities.</li> <li>IIR Filters:</li> <li>IIR filter – Mapping techniques from s domain to z d gn of IIR filter: Butterworth Filter Design of digital IIR filter – Che</li> <li>Comparison of FIR and IIR filters – Stabilities.</li> </ul>						
Unit – V	Digital Signal Processor:						9
Digital Signal Pr	<ul> <li>Decessor: Architecture of Digital Signal Processor – Selection of – TMS320C6748 DSP development kit – Integrated development</li> </ul>			r – A	ddres	sing I	nodes – O
							Total:4
TEXT BOOK:							
1. Esakkir Delhi,20	ijan S., Veerakumar T., and Badri N Subudhi, "Digital Signal Pro 21	ocessing",1	<sup>st</sup> Edition, Ta	ta Mo	Grav	v hill,	New
DEFEDENCES							
REFERENCES:	Proakis & Dimitris G. Manolakis., "Digital Signal Processing: Pr Prentice Hall, New Delhi, 2014.	inciples, Al	gorithms and	Арр	licatio	ons", 4	<sup>th</sup> Edition,
1. John G. Pearsor		ontinuous a	nd Discrete"	4 <sup>th</sup>	Editio	on, Pe	earson, Nev
Pearsor	Ziemer, William Tranter& D. Fannin, "Signals and Systems: Co 998.						

		UTCON on of th		, the stuc	dents w	ill be abl	e to							BT Mapp (Highest L	
CO1	sum	nmarize	discrete	time sigr	nals and	d discrete	e time s	ystems						Understand	d (K2)
CO2	app	ly Fouri	er transf	orm to de	etermine	e the free	quency	respons	se of LT	l discret	te systen	า		Applying	(K3)
CO3	des	cribe the	e design	procedu	res of F	IR filter								Understand	d (K2)
CO4	exp	lain the	design p	procedure	s of IIF	R filter								Understand	d (K2)
CO5	elab	oorate th	ne DSP I	Processo	r used i	in signal	process	sing app	licatior	าร				Understand	d (K2)
						Manni	ng of C	Os wit	h POs :	and PS	<b>)</b> e				
COs/F	POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
СО	1	3	2	1	1	1					2		1	3	3
CO	2	3	2	1	1	1					2		1	3	3
CO	3	3	2	1	1	1					2		1	3	3
CO	4	3	2	1	1	1					2		1	3	3
CO	5	3	2	1	1	1					2		1	3	3
1 – Sli	ght, 2	– Mode	erate, 3 -	- Substar	itial, BT	- Bloom'	s Taxor	nomy							
						ASSE	SSMEN	T PAT	FERN -	THEOF	۲Y				
	st / Ble Catege	oom's ory*	Re	memberi (K1) %	ng	Understa (K2)	0	Apply (K3)		Analyzi (K4) 9		Evaluating (K5) %	Crea	ating (K6) %	Total %
	CAT	1		30		60		10	)	· · ·		· · ·			100
	CAT	2		30		40		30	)						100
	CAT	3		40		60									100
	ESE	=		20		64		16	3						100

	22EIP71 - PROJECT WORK II P	HASE I					
Programme & Branch	B.E. & Electronics and Instrumentation Engineering	Sem.	Category	L	т	Р	Credit
Prerequisites	Nil	7	EC	0	0	10	5

		TCOME	-	the stud	ents will	be able	to							BT Mappelighest Le	
CO1		ulate a p iled litera			per obje	ctives to	o meet tl	ne need	of the S	ociety a	nd Industi	ry after		Creating (F	
CO2		gn the M cribe by				hematic	al calcu	lations n	neeting	equired	standard	S		Creating (F	
CO3		ct propei nce mana				•			•		n proper p	roject and		valuating rticulation	. ,
CO4		ulate the meters	project	report a	ind pres	entation	s with ne	eat pres	entation	incorpo	rating all			valuating rticulation	. ,
CO5	cont	ribute ind	dividuall	y and in	team fo	r the de	velopme	ent and f	inal worł	king of th	ne project			valuating rticulation	
						Марр	oing of C	COs witl	n POs a	nd PSO	s				
COs/	POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	P011	PO12	PSO1	PSO2
CC	01	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CC	)2	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CC	)3	3	3	3	3	2	3	3	3	3	3	3	3	3	3
CC	)4	3	3	3	3	2	3	3	3	3	3	3	3	3	3
CC	)5	3	3	3	3	2	3	3	3	3	3	3	3	3	3
- Slig	ht, 2 –	Moderat	e, 3 - S	ubstantia	al, BT- I	Bloom's	Taxono	my							

## 22EIP81 - PROJECT WORK II PHASE II

Programme & Branch	B.E. & Electronics and Instrumentation Engineering	Sem.	Category	L	т	Ρ	Credit
Prerequisites	Nil	8	EC	0	0	8	4

		TCOME		the stud	ents will	be able	to							BT Mapp lighest Le	
CO1		ulate a i iled litera			oper obj	jectives	to meet	the ne	ed of the	e Societ	y and Ind	ustry after		Creating (I rticulation	,
CO2		gn the M cribe by				nathema	tical cal	culation	s meetii	ng requ	ired stand	lards		Creating (I rticulation	,
CO3		ct propei nce mana									h proper p	roject and		valuating rticulation	. ,
CO4		ulate the meters	e projec	t report	and pr	esentati	ons wit	h neat	presenta	ition inc	corporating	g all		valuating rticulation	• •
CO5	cont	ribute ind	dividuall	y and in	team fo	r the de	velopme	ent and f	inal worl	king of t	he project			valuating rticulation	· /
						Марр	ing of (	COs witl	n POs a	nd PSO	S				
COs/I	POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO	)1	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO	)2	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO	3	3	3	3	3	2	3	3	3	3	3	3	3	3	3
CO	)4	3	3	3	3	2	3	3	3	3	3	3	3	3	3
CO	95	3	3	3	3	2	3	3	3	3	3	3	3	3	3
I – Slig	ht, 2 -	- Moder	ate, 3 -	- Substa	antial, B	T- Bloo	m's Ta	konomy							

Programme & Branch	B.E. & Electronics and Instrumentation Engineering	Sem.	Category	L	т	Р	Credit
Prerequisites	Nil	5	PE	3	0	0	3
Preamble	To impart the knowledge of some human anatomy and specific instruments which is most commonly used in ho various biomedical imaging techniques and learn the adva	spitals. A	lso understar	d the	fundan	nental	concept c
Unit – I	Human Physiological Systems:						9
	cture-Resting and action potentials - Skeletal system - Circulate rumentation system. Bio Potential Electrodes: Micro electrode						
Unit – II	Biomedical Electrical Signal Measurement:				2000		9
	en's triangle – 3 lead ECG system, EEG - 10- 20 electrode sys recording methods and typical waveforms.	stem, EMO	G, ERG and E	OG: O	rigin a	nd cha	aracteristic
Unit – III	Biomedical Non-Electrical Signal Measurement:						9
pressure sensor pCO2 - Blood po Unit – IV	ppe - Phonocardiography (PCG) - Blood pressure Measurem , ultrasonic blood pressure monitor – Spirometer – Capnograp 22 measurement - Pulse oximeter - Lung volumes, respiration. Biomedical Imaging Systems:	ohy - Bloo	d pH measure	ement	- Meas	ureme	ent of bloo 9
pressure sensor pCO2 - Blood po <b>Unit – IV</b> X-ray machine Magnetic Particl	, ultrasonic blood pressure monitor – Spirometer – Capnograp 22 measurement - Pulse oximeter - Lung volumes, respiration. Biomedical Imaging Systems: - Computer tomography - Ultrasonic imaging systems - Mag e Imaging.	ohy - Bloo	d pH measure	ement	- Meas	ureme	ent of bloo 9 T -FMRI
pressure sensor pCO2 - Blood po Unit – IV X-ray machine Magnetic Particl Unit – V Ventricular asyr	<ul> <li>, ultrasonic blood pressure monitor – Spirometer – Capnograp D2 measurement - Pulse oximeter - Lung volumes, respiration.</li> <li>Biomedical Imaging Systems:</li> <li>Computer tomography - Ultrasonic imaging systems - Maging Systems - Magi</li></ul>	phy - Bloo	d pH measure	ing - I	- Meas PET -	SPEC	ent of bloo 9 T -FMRI 9
pressure sensor pCO2 - Blood po Unit – IV X-ray machine Magnetic Particl Unit – V Ventricular asyr	<ul> <li>, ultrasonic blood pressure monitor – Spirometer – Capnograp 22 measurement - Pulse oximeter - Lung volumes, respiration.</li> <li>Biomedical Imaging Systems:</li> <li>Computer tomography - Ultrasonic imaging systems - Mage Imaging.</li> <li>Physiological Assist Devices:</li> <li>nchronous pacemaker - AC Defibrillator- Heart lung machinical in the system in the system in the system in the system in the system in the system in the system in the system in the system in the system in the system in the system in the system is a system in the system in the system is a system in the system in the system is a system in the system in the system is a system in the system in the system is a system in the system in the system is a system in the system is a system in the system is a system in the system is a system in the system is a system in the system is a system in the system is a system in the system is a system in the system is a system in the system is a system in the system is a system is a system in the system in the system is a system in the system is a system in the system is a system in the system is a system in the system is a system in the system in the system is a system in the system in the system in the system is a system in the system in the system in the system in the system in the syste</li></ul>	phy - Bloo	d pH measure	ing - I	- Meas PET -	SPEC	9 T -FMRI 9 thesiometr
pressure sensor pCO2 - Blood po Unit – IV X-ray machine Magnetic Particl Unit – V Ventricular asyr	<ul> <li>, ultrasonic blood pressure monitor – Spirometer – Capnograp 22 measurement - Pulse oximeter - Lung volumes, respiration.</li> <li>Biomedical Imaging Systems:</li> <li>Computer tomography - Ultrasonic imaging systems - Mage Imaging.</li> <li>Physiological Assist Devices:</li> <li>nchronous pacemaker - AC Defibrillator- Heart lung machinical in the system in the system in the system in the system in the system in the system in the system in the system in the system in the system in the system in the system in the system is a system in the system in the system is a system in the system in the system is a system in the system in the system is a system in the system in the system is a system in the system in the system is a system in the system is a system in the system is a system in the system is a system in the system is a system in the system is a system in the system is a system in the system is a system in the system is a system in the system is a system in the system is a system is a system in the system in the system is a system in the system is a system in the system is a system in the system is a system in the system is a system in the system in the system is a system in the system in the system in the system is a system in the system in the system in the system in the system in the syste</li></ul>	phy - Bloo	d pH measure	ing - I	- Meas PET -	SPEC	ent of bloo 9 T -FMRI 9
pressure sensor pCO2 - Blood po Unit – IV X-ray machine Magnetic Particl Unit – V Ventricular asyr Vibroscreen - O TEXT BOOK:	<ul> <li>, ultrasonic blood pressure monitor – Spirometer – Capnograp 22 measurement - Pulse oximeter - Lung volumes, respiration.</li> <li>Biomedical Imaging Systems:</li> <li>Computer tomography - Ultrasonic imaging systems - Mage Imaging.</li> <li>Physiological Assist Devices:</li> <li>nchronous pacemaker - AC Defibrillator- Heart lung machinical in the system in the system in the system in the system in the system in the system in the system in the system in the system in the system in the system in the system in the system is a system in the system in the system is a system in the system in the system is a system in the system in the system is a system in the system in the system is a system in the system in the system is a system in the system is a system in the system is a system in the system is a system in the system is a system in the system is a system in the system is a system in the system is a system in the system is a system in the system is a system in the system is a system is a system in the system in the system is a system in the system is a system in the system is a system in the system is a system in the system is a system in the system in the system is a system in the system in the system in the system is a system in the system in the system in the system in the system in the syste</li></ul>	gnetic res	d pH measure sonance imag ey machine -	ing - I	- Meas PET -	SPEC	9 9 T -FMRI 9 thesiometr
pressure sensor pCO2 - Blood po Unit – IV X-ray machine Magnetic Particl Unit – V Ventricular asyr Vibroscreen - O TEXT BOOK: 1. Khan	, ultrasonic blood pressure monitor – Spirometer – Capnograp 22 measurement - Pulse oximeter - Lung volumes, respiration. Biomedical Imaging Systems: - Computer tomography - Ultrasonic imaging systems - Mage Imaging. Physiological Assist Devices: nchronous pacemaker - AC Defibrillator- Heart lung machin- phthalmoscope –Biotelemetry – Telemedicine. dpur R.S," Handbook of Biomedical Instrumentation", 2 <sup>nd</sup> Edition	gnetic res	d pH measure sonance imag ey machine -	ing - I	- Meas PET -	SPEC	9 9 T -FMRI 9 thesiometr
pressure sensor pCO2 - Blood po Unit – IV X-ray machine Magnetic Particl Unit – V Ventricular asyr Vibroscreen - O TEXT BOOK: 1. Khan REFERENCES: 1. John	<ul> <li>, ultrasonic blood pressure monitor – Spirometer – Capnograp 22 measurement - Pulse oximeter - Lung volumes, respiration.</li> <li>Biomedical Imaging Systems: <ul> <li>Computer tomography - Ultrasonic imaging systems - Mage Imaging.</li> <li>Physiological Assist Devices:</li> <li>nchronous pacemaker - AC Defibrillator- Heart lung machine phthalmoscope –Biotelemetry – Telemedicine.</li> </ul> </li> <li>dpur R.S," Handbook of Biomedical Instrumentation", 2<sup>nd</sup> Edition</li> <li>G. Webster, "Medical Instrumentation Application and Design",</li> </ul>	ohy - Bloo gnetic res e - Kidne on, Tata M	d pH measure sonance imag ey machine - <i>M</i> cGraw-Hill ,N	Audion	- Meas PET - meter	DIT7.	ent of bloo 9 T -FMRI 9 thesiometr Total:4
pressure sensor         pCO2 - Blood pd         Unit – IV         X-ray machine         Magnetic Particl         Unit – V         Ventricular asyr         Vibroscreen - O         TEXT BOOK:         1.         Khan         REFERENCES:         1.       John	, ultrasonic blood pressure monitor – Spirometer – Capnograp 22 measurement - Pulse oximeter - Lung volumes, respiration. Biomedical Imaging Systems: - Computer tomography - Ultrasonic imaging systems - Mage Imaging. Physiological Assist Devices: nchronous pacemaker - AC Defibrillator- Heart lung machin- phthalmoscope –Biotelemetry – Telemedicine. dpur R.S," Handbook of Biomedical Instrumentation", 2 <sup>nd</sup> Edition	ohy - Bloo gnetic res e - Kidne on, Tata M	d pH measure sonance imag ey machine - <i>M</i> cGraw-Hill ,N	Audion	- Meas PET - meter	DIT7.	ent of bloo 9 T -FMRI 9 thesiometr Total:4

	E OUTCOMES: pletion of the course, the students will be able to	BT Mapped (Highest Level)
CO1	interpret the basic principles and phenomena of Biomedical Engineering	Understanding (K2)
CO2	record the bioelectric potentials using bio potential electrode through bio signal recording devices	Applying (K3)
CO3	measure biomedical signal parameters through medical instruments	Applying (K3)
CO4	summarize the basic principles in medical imaging techniques	Understanding (K2)
CO5	illustrate the physiological assist devices	Applying (K3)

					Ма	pping o	f COs v	vith PO	s and F	PSOs				
COs/POs	PO1	PO2	PO3	PO4	PO5	P06	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1				2		1					2	2
CO2	3	2	1	1	1	2		1					3	3
CO3	3	2	1	1	1	2		1					3	3
CO4	3	1				2		1					2	2
CO5	3	2	1	1	1	2		1					3	3
1 – Slight, 2	2 – Mod	erate, 3	- Subst	antial, E	BT- Bloo	m's Tax	onomy	•	•	·		·	· · ·	

		ASSESSM	ENT PATTE	RN - THEORY			
Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	20	40	40				100
CAT2	10	40	50				100
CAT3	10	40	50				100
ESE	10	40	50				100
* ±3% may be varied	d (CAT 1, 2 & 3 – 5	0 marks & ESE – 1	00 marks)			1	

## 22EIE02 - INSTRUMENTATION SYSTEM DESIGN

Programme & Branch	B.E. & Electronics and Instrumentation Engineering	Sem.	Category	L	т	Ρ	Credit
Prerequisites	Industrial instrumentation	5	PE	3	0	0	3
Preamble	To design controllers and signal conditioning circuits for inst	trumentatio	on systems.				
Unit - I	Design of Analog Signal Conditioning:						9
	onditioning: Analog Data Representation - Principles Of Analog onditioning Design - Analog Signal Conditioning Design for various				circu	its- Gu	uidelines f
Unit - II	Design Digital Signal Conditioning:						9
Data-Acquisition	onditioning : Introduction – Converters: Comparator, Digital to Systems: Different types of DAS	Analog Co	nverters, Ana	alog	to Di	gital C	
Unit - III	Design Of Final Control Elements:						9
	nal Control Operation - Signal Conversions: Analog Electrical S ors -Control Elements: Electrical, Fluid Valves.	ignals, Dig	ital Electrical	Sigr	nals–	Desigi	n Actuator
Electrical Actuat		ignals, Dig	ital Electrical	Sigr	nals-	Desigi	n Actuator
Electrical Actuat Unit - IV Introduction - co	ors -Control Elements: Electrical, Fluid Valves.			•			9
Electrical Actuat Unit - IV Introduction – co Single Mode, an Unit - V	ors -Control Elements: Electrical, Fluid Valves.  Design Of Analog Controllers:  ontinuous controller modes -General Features of analog controlle d Composite Mode.  Computer-Based Control:	er –Design	of Electronic	Con	trolle	rs: Err	9 or Detecto 9
Electrical Actuat Unit - IV Introduction – co Single Mode, an Unit - V Introduction - D	ors -Control Elements: Electrical, Fluid Valves.    Design Of Analog Controllers:    pontinuous controller modes -General Features of analog controller d Composite Mode.	er –Design ased Cont	of Electronic	Con <sup>-</sup>	trolle	rs: Err guratic	9 or Detecto 9 ons, - Other eristics,
Electrical Actuat Unit - IV Introduction – co Single Mode, an Unit - V Introduction - D Computer Applic	ors -Control Elements: Electrical, Fluid Valves.	er –Design ased Cont	of Electronic	Con <sup>-</sup>	trolle	rs: Err guratic	9 or Detecto 9 ons, - Oth eristics,
Electrical Actuat Unit - IV Introduction – co Single Mode, an Unit - V Introduction - D Computer Applie TEXT BOOK:	ors -Control Elements: Electrical, Fluid Valves.	er –Design ased Cont works: De	of Electronic roller: Hardwa velopment, G	Con <sup>-</sup> are ( ener	trolle Confiț al Ch	rs: Err guratic aracte	9 or Detecto 9 ons, - Oth eristics, Total:4
Electrical Actuat Unit - IV Introduction – co Single Mode, an Unit - V Introduction - D Computer Applic	ors -Control Elements: Electrical, Fluid Valves.           Design Of Analog Controllers:           ontinuous controller modes -General Features of analog controlled           d Composite Mode.           Computer-Based Control:           igital Applications: Alarms, Two-Position Control - Computer-Based control - Control System Networks:           Data Logging, Supervisory Control - Control System Networks:           0. Johnson, "Process Control Instrumentation Technology", 8 <sup>th</sup> Education	er –Design ased Cont works: De	of Electronic roller: Hardwa velopment, G	Con <sup>-</sup> are ( ener	trolle Confiț al Ch	rs: Err guratic aracte	9 or Detecto 9 ons, - Oth eristics, Total:4
Electrical Actuat Unit - IV Introduction – cc Single Mode, an Unit - V Introduction - D Computer Applic TEXT BOOK: 1. Curtis D REFERENCES:	ors -Control Elements: Electrical, Fluid Valves.           Design Of Analog Controllers:           ontinuous controller modes -General Features of analog controlled           d Composite Mode.           Computer-Based Control:           igital Applications: Alarms, Two-Position Control - Computer-Based control - Control System Networks:           Data Logging, Supervisory Control - Control System Networks:           0. Johnson, "Process Control Instrumentation Technology", 8 <sup>th</sup> Education	er –Design ased Cont works: De lition, Pear	of Electronic roller: Hardw velopment, G son Educatio	Con <sup>-</sup> are ( ener	trolle Confiț al Ch	rs: Err guratic aracte	9 or Detecto 9 ons, - Othe eristics, Total:4
Electrical Actuat Unit - IV Introduction – co Single Mode, an Unit - V Introduction - D Computer Applic TEXT BOOK: 1. Curtis D REFERENCES: 1. Dale E	ors -Control Elements: Electrical, Fluid Valves.           Design Of Analog Controllers:           ontinuous controller modes -General Features of analog controlled           d Composite Mode.           Computer-Based Control:           igital Applications: Alarms, Two-Position Control - Computer-Based control - Control System Networks:           Data Logging, Supervisory Control - Control System Networks:           0. Johnson, "Process Control Instrumentation Technology", 8 <sup>th</sup> Education	er –Design ased Cont works: De lition, Pear	of Electronic roller: Hardwa velopment, G son Educatio hi, 2016.	Con are ( ener	trolle Confi al Ch	rs: Err guratic aracte	9 or Detecto 9 ons, - Oth eristics, Total:4

	SE OUTCOMES: mpletion of the course, the students will be able to	BT Mapped (Highest Level)
CO1	narrate the role of signal conditioning circuits in instrumentation	Understanding (K2)
CO2	develop signal transmitter circuits for various process parameter	Applying (K3)
CO3	design final control elements and actuators	Applying (K3)
CO4	design controllers for various applications	Applying (K3)
CO5	describe the role of computer based control systems	Understanding (K2)

					Маррі	ng of C	Os with	n POs a	nd PSC	Ds				
COs/POs	P01	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1											2	2
CO2	3	2	1	1	1								3	3
CO3	3	2	1	1	1								3	3
CO4	3	2	1	1	1								3	3
CO5	3	1											2	2
1 – Slight, 2	– Mode	erate, 3 -	- Substan	tial, BT-	Bloom	s Taxon	omy							

		ASSESSMEN	T PATTERN	- THEORY			
Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	5	25	70				100
CAT2	5	25	70				100
CAT3	5	25	70				100
ESE	5	25	70				100
* ±3% may be varied	(CAT 1, 2 & 3 – 50 n	narks & ESE – 100	marks)	11			1

BE– Electronics and Instrumentation Engineering, Regulation, Curriculum and Syllabus – R2022 Page 189

	22EIE03 - SOFT COMPUTING TECH	NIQUES					
Programme & Branch	B.E. & Electronics and Instrumentation Engineering	Sem.	Category	L	Т	Р	Credit
Prerequisites	Nil	5	PE	3	0	0	3
Preamble	Emphasis of this course will be on Artificial Neural Netw Genetic Algorithms and Neuro fuzzy Systems and their app						
Unit – I	Introduction to Optimization Techniques:						9
	d Computing – Soft computing – Hybrid Computing. Optimiza aditional methods of Optimization. Overview of Non-Tradition timization.						
Unit – II	Fundamentals of Neural Networks :						9
	al Networks – Basic models of Artificial Neural Network- Impo rks – Adaptive Linear Neuron – Supervised Learning Network:						
1.1. %		tome ·					9
Learning Networks	Unsupervised Learning Networks and Fuzzy Logic Systematics earning Networks: Associative Memory Network: Hopfield Networks: Kohonen Self Organizing Map. tems: Introduction to fuzzy logic –Classical sets (Crisp sets) -	etworks – E Fuzzy sets	·				•
Unsupervised Le Learning Networks Fuzzy Logic Syst Introduction – Men Unit – IV Fuzzification – Me	earning Networks: Associative Memory Network: Hopfield Networks: Kohonen Self Organizing Map. tems: Introduction to fuzzy logic –Classical sets (Crisp sets) - hership functions: Introduction – Features of the Membership Fuzzy Inference Systems: ethods of Membership Value Assignments. Defuzzification: Inter-	tworks – E Fuzzy sets Functions. troduction	S. Classical R	elatio	on an	d Fuz	zy Relatio 9 s and fuzz
Unsupervised Le Learning Networks Fuzzy Logic Syst Introduction – Men Unit – IV Fuzzification – Me relations, Defuzzif	<ul> <li>Barning Networks: Associative Memory Network: Hopfield Networks: Kohonen Self Organizing Map.</li> <li>Introduction to fuzzy logic –Classical sets (Crisp sets) - nbership functions: Introduction – Features of the Membership</li> <li>Fuzzy Inference Systems:</li> </ul>	tworks – E Fuzzy sets Functions. troduction	S. Classical R	elatio	on an	d Fuz	zy Relatio 9 s and fuzz
Unsupervised Le Learning Networks Fuzzy Logic Syst Introduction – Men Unit – IV Fuzzification – Me relations, Defuzzif – Fuzzy Inference Unit – V	<ul> <li>Barning Networks: Associative Memory Network: Hopfield Networks: Kohonen Self Organizing Map.</li> <li>Introduction to fuzzy logic –Classical sets (Crisp sets) - nbership functions: Introduction – Features of the Membership</li> <li>Fuzzy Inference Systems:</li> <li>Ethods of Membership Value Assignments. Defuzzification: Introduction methods. Fuzzy Rule Base and Approximate Reasonin systems (FIS): – Methods of FIS.</li> <li>Neuro-Fuzzy System and Genetic Algorithm:</li> </ul>	tworks – E Fuzzy sets Functions. troduction Ig: Aggreg	s. Classical R - Lambda-Cu ation of Fuzz	elatio uts fo y Rul	on an or fuz les –	d Fuz zy set Fuzzy	zy Relatio 9 s and fuzz
Unsupervised Le Learning Networks Fuzzy Logic Syst Introduction – Men Unit – IV Fuzzification – Me relations, Defuzzif – Fuzzy Inference Unit – V Neuro-Fuzzy Syst Genetic Algorithm	earning Networks: Associative Memory Network: Hopfield Networks: Kohonen Self Organizing Map.         tems: Introduction to fuzzy logic –Classical sets (Crisp sets) -         nbership functions: Introduction – Features of the Membership         Fuzzy Inference Systems:         ethods of Membership Value Assignments. Defuzzification: Introduction methods. Fuzzy Rule Base and Approximate Reasonin systems (FIS): – Methods of FIS.	tworks – E Fuzzy sets Functions. troduction g: Aggreg: - Fuzzy In on and Sea	Classical R     Lambda-Cu     tation of Fuzzy ference Syste	elatio uts fo y Rul em (/	on an or fuz. les –	d Fuz zy set Fuzzy S).	zy Relatio 9 s and fuzz Reasonir 9
Unsupervised Le Learning Networks Fuzzy Logic Syst Introduction – Men Unit – IV Fuzzification – Me relations, Defuzzif – Fuzzy Inference Unit – V Neuro-Fuzzy Syst Genetic Algorithm	<ul> <li>Barning Networks: Associative Memory Network: Hopfield Networks: Kohonen Self Organizing Map.</li> <li>Introduction to fuzzy logic –Classical sets (Crisp sets) - Inbership functions: Introduction – Features of the Membership functions: Introduction – Features of the Membership functions of Membership Value Assignments. Defuzzification: Introduction methods. Fuzzy Rule Base and Approximate Reasonin systems (FIS): – Methods of FIS.</li> <li>Neuro-Fuzzy System and Genetic Algorithm:</li> <li>em: Characteristics of Neuro–Fuzzy Hybrids – Adaptive Neuro : Introduction – Biological Background – Traditional Optimization</li> </ul>	tworks – E Fuzzy sets Functions. troduction g: Aggreg: - Fuzzy In on and Sea	Classical R     Lambda-Cu     tation of Fuzzy ference Syste	elatio uts fo y Rul em (/	on an or fuz. les –	d Fuz zy set Fuzzy S).	zy Relatio 9 s and fuzz Reasonir 9
Unsupervised Le Learning Networks Fuzzy Logic Syst Introduction – Men Unit – IV Fuzzification – Me relations, Defuzzif – Fuzzy Inference Unit – V Neuro-Fuzzy Syst Genetic Algorithm	<ul> <li>Barning Networks: Associative Memory Network: Hopfield Networks: Kohonen Self Organizing Map.</li> <li>Introduction to fuzzy logic –Classical sets (Crisp sets) - Inbership functions: Introduction – Features of the Membership functions: Introduction – Features of the Membership functions of Membership Value Assignments. Defuzzification: Introduction methods. Fuzzy Rule Base and Approximate Reasonin systems (FIS): – Methods of FIS.</li> <li>Neuro-Fuzzy System and Genetic Algorithm:</li> <li>em: Characteristics of Neuro–Fuzzy Hybrids – Adaptive Neuro : Introduction – Biological Background – Traditional Optimization</li> </ul>	tworks – E Fuzzy sets Functions. troduction g: Aggreg: - Fuzzy In on and Sea	Classical R     Lambda-Cu     tation of Fuzzy ference Syste	elatio uts fo y Rul em (/	on an or fuz. les –	d Fuz zy set Fuzzy S).	zy Relatio 9 s and fuzz Reasonir 9 ninologies
Unsupervised Le Learning Networks Fuzzy Logic Syst Introduction – Men Unit – IV Fuzzification – Me relations, Defuzzif – Fuzzy Inference Unit – V Neuro-Fuzzy Syst Genetic Algorithm GA – Operators in	<ul> <li>Barning Networks: Associative Memory Network: Hopfield Networks: Kohonen Self Organizing Map.</li> <li>Introduction to fuzzy logic –Classical sets (Crisp sets) - Inbership functions: Introduction – Features of the Membership functions: Introduction – Features of the Membership functions of Membership Value Assignments. Defuzzification: Introduction methods. Fuzzy Rule Base and Approximate Reasonin systems (FIS): – Methods of FIS.</li> <li>Neuro-Fuzzy System and Genetic Algorithm:</li> <li>em: Characteristics of Neuro–Fuzzy Hybrids – Adaptive Neuro : Introduction – Biological Background – Traditional Optimization</li> </ul>	tworks – E Fuzzy sets Functions. troduction ng: Aggreg: - Fuzzy In on and Sea Function.	- Lambda-Cu ation of Fuzz ference Syste	elatio uts fc y Rul eem ( <i>A</i> ues -	on an or fuz les – ANFIS Basio	d Fuz zy set Fuzzy S). c Term	zy Relatio 9 s and fuzz Reasonir 9 ninologies
Unsupervised Le Learning Networks Fuzzy Logic Syst Introduction – Men Unit – IV Fuzzification – Me relations, Defuzzif – Fuzzy Inference Unit – V Neuro-Fuzzy Syst Genetic Algorithm GA – Operators in	<ul> <li>Barning Networks: Associative Memory Network: Hopfield Networks: Kohonen Self Organizing Map.</li> <li>Introduction to fuzzy logic –Classical sets (Crisp sets) - Inbership functions: Introduction – Features of the Membership Fuzzy Inference Systems:</li> <li>Ethods of Membership Value Assignments. Defuzzification: Intrication methods. Fuzzy Rule Base and Approximate Reasonin systems (FIS): – Methods of FIS.</li> <li>Neuro-Fuzzy System and Genetic Algorithm:</li> <li>em: Characteristics of Neuro–Fuzzy Hybrids – Adaptive Neuro : Introduction – Biological Background – Traditional Optimization GA – Problem solving using Genetic Algorithm: Maximizing a</li> </ul>	tworks – E Fuzzy sets Functions. troduction ng: Aggreg: - Fuzzy In on and Sea Function.	- Lambda-Cu ation of Fuzz ference Syste	elatio uts fc y Rul eem ( <i>A</i> ues -	on an or fuz les – ANFIS Basio	d Fuz zy set Fuzzy S). c Term	zy Relatio 9 s and fuzz Reasonir 9 ninologies
Unsupervised Learning Networks         Fuzzy Logic System         Fuzzy Logic System         Introduction – Men         Unit – IV         Fuzzification – Men         Unit – IV         Fuzzification – Men         Unit – IV         Fuzzy Inference         Unit – V         Neuro-Fuzzy System         Genetic Algorithm         GA – Operators in         TEXT BOOK:         1.       Dr.S.N.Sir         REFERENCES:	<ul> <li>Barning Networks: Associative Memory Network: Hopfield Networks: Kohonen Self Organizing Map.</li> <li>Introduction to fuzzy logic –Classical sets (Crisp sets) - Inbership functions: Introduction – Features of the Membership Fuzzy Inference Systems:</li> <li>Ethods of Membership Value Assignments. Defuzzification: Intrication methods. Fuzzy Rule Base and Approximate Reasonin systems (FIS): – Methods of FIS.</li> <li>Neuro-Fuzzy System and Genetic Algorithm:</li> <li>em: Characteristics of Neuro–Fuzzy Hybrids – Adaptive Neuro : Introduction – Biological Background – Traditional Optimization GA – Problem solving using Genetic Algorithm: Maximizing a</li> </ul>	tworks – E Fuzzy sets Functions. troduction g: Aggreg: - Fuzzy In on and Sea Function.	S. Classical R - Lambda-Cu ation of Fuzzy ference Syste arch Techniqu	elatio uts fc y Rul eem ( <i>H</i> ues -	on an or fuz les – ANFIS Basic	d Fuz zy set Fuzzy 3). c Term	zy Relatio 9 s and fuzz Reasonir 9 ninologies
Unsupervised Learning Networks         Fuzzy Logic System         Fuzzy Logic System         Introduction – Men         Unit – IV         Fuzzification – Men         Unit – IV         Fuzzification – Men         Unit – IV         Fuzzification – Men         Unit – IV         Fuzzy Inference         Unit – V         Neuro-Fuzzy System         Genetic Algorithm         GA – Operators in         TEXT BOOK:         1.       Dr.S.N.Sir         REFERENCES:         1.       Dilip K.Pra	Barning Networks: Associative Memory Network: Hopfield Networks: Kohonen Self Organizing Map.         Items: Introduction to fuzzy logic –Classical sets (Crisp sets) -         Inbership functions: Introduction – Features of the Membership         Fuzzy Inference Systems:         Ethods of Membership Value Assignments. Defuzzification: Introduction methods. Fuzzy Rule Base and Approximate Reasonin systems (FIS): – Methods of FIS.         Neuro-Fuzzy System and Genetic Algorithm:         em: Characteristics of Neuro–Fuzzy Hybrids – Adaptive Neuro         : Introduction – Biological Background – Traditional Optimization         GA – Problem solving using Genetic Algorithm: Maximizing a         vanandam & Dr.S.N.Deepa, "Principles of Soft Computing", 3 <sup>rd</sup>	tworks – E Fuzzy sets Functions. troduction g: Aggreg: - Fuzzy In on and Sea Function. Edition, V	S. Classical R - Lambda-Cu ation of Fuzzy ference Syste arch Techniqu Viley, New De J House Pvt.	elatio uts fc y Rul eem (/ ues -	on an or fuz les – ANFIS Basic	d Fuz zy set Fuzzy 3). c Term	zy Relatio 9 s and fuzz Reasonir 9 ninologies

COUR On cor			-	se, the s	tudents	s will be	able to	)						BT Map (Highest I	
CO1	expl	lain the	fundame	entals an	d the co	ncepts c	of optimi	zation t	echniqu	es			U	nderstand	ing(K2)
CO2		elop the tering	e various	neural n	etwork a	algorithm	ns for cla	assificat	ion and	functio	n approxi	mation and	I	Applying	(K3)
CO3	expl	lain the	fundame	ental con	cepts of	fuzzy lo	gic syst	ems					U	nderstand	ing(K2)
CO4	des	ign the	controlle	r using F	uzzy Infe	erence S	System							Applying	(K3)
CO5	app	ly Gene	tic Algor	ithm and	Neuro-I	Fuzzy co	oncepts	for spea	cific app	lication	s			Applying	(K3)
						Маррі	ing of C	Os witl	n POs a	nd PSC	Ds				
COs/P	Os	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	3	1											2	2
CO2	2	3	2	1	1	1								3	3
COS	3	3	1											2	2
CO4	1	3	2	1	1	1								3	3
COS	5	3	2	1	1	1								3	3

1 - Slight, 2 - Moderate, 3 - Substantial, BT- Bloom's Taxonomy

		ASSESSMEN	T PATTERN	- THEORY			
Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	20	40	40				100
CAT2	20	30	50				100
CAT3	10	40	40				100
ESE	20	30	50				100
* ±3% may be varied	(CAT 1. 2 & 3 – 50 r	narks & ESE – 100					

Programme & Branch	B.E. & Electronics and Instrumentation Engineering	Sem.	Category	L	т	Р	Credit
Prerequisites	Transducers Engineering	5	PE	3	0	0	3
Preamble	Analytical Instrumentation provides qualitative and or pharmaceutical, clinical, oil refineries and in pollution manalytical techniques along with their principle, instrumentation	onitoring	and control.	The co	nventi	ional	and mode
Unit – I	Colorimeters and Spectrophotometers:						9
Spectrophotome spectrophotome Absorption Spec		tometers	- Types of I	R Spe	ctroph	notom	eters- FTI ters -Atom
Chromatography	Chromatography and pH Measurement: Chromatography – Liquid chromatography –Types (HPLC). pH Meters: Principle of pH Measurement – Electrode erence electrodes – Combination electrode – Selective-ION El	es for pH	measurement	: Hydro	gen e	electro	des – Glas
Unit – III	Industrial Gas Analyzers:						9
	alyzers – Paramagnetic oxygen analyzer –Electrochemical Me lyzers based on Gas density ——Method based on Ionization o		frared gas an	alyzers	– Th	ermal	conductivi
Unit – IV	Radio Chemical Techniques:	Ŭ					9
Scintillation cour Principle of Op	f radiochemical methods – Radiation detectors: Ionization char nter – Semiconductor detectors – X-ray spectrophotometer eration – Types of Mass Spectrometers: Magnetic deflection MR Spectrometer: Principle and construction details.	<ul> <li>Mass</li> </ul>	Spectrometer	s: Bas	ic Ma	iss S	pectromete
Unit – V	Applications of Analytical Instrumentation:						9
Scanning Electr analyzer, SO2a Turbidity meter.	on Microscope, Scanning Probe Microscopes and Particle size nalyzer, Ozone analyzer. Water Pollution Monitoring Instrume	e analyze ents: Diss	rs. Air Pollutic olved oxygen	on Mon , oxida	itoring tion-re	g Insti educti	uments: C on potentia
							Total:4
TEXT BOOK:							
	pur R.S., "Handbook of Analytical Instruments" 3 <sup>rd</sup> Edition, Mc	Graw-Hill	Education Ind	lia Pvt.	Ltd, N	lew D	elhi , 2015
1. Khano							
1. Khano					7		
REFERENCES:	G.W., "Instrumental Methods of Chemical Analysis", 6th Edition	n, McGrav	V-HIII, NEW YO	ork, 200	<i>.</i>		
REFERENCES: 1. Ewing 2 Dougl	G.W., "Instrumental Methods of Chemical Analysis", 6 <sup>th</sup> Edition as A. Skoog, F. James Holler, Stanley R. Crouh, "Principles o San Francisco, 2020.					Thor	nson Broo

	E OUTCC pletion o		urse, the	e stud	ents will	be able	to						BT Ma (Highest	
CO1	summa	rize on a	inalytical	instru	ments wh	ich utiliz	e elect	romagr	netic spe	ctrum a	s source		Understan	ding (K2)
CO2	explain measur		matogra	phic m	ethods a	nd elect	rodes u	sed in	рН				Understan	ding (K2)
CO3	make u	se of an	alyzers f	or mea	suring ind	dustrial	gases a	ind liqu	ids				Applyin	g (K3)
CO4	interpre	t the sar	nple data	ple data with radiochemical techniques Understanding (K									ding (K2)	
CO5	apply a	nalytical	techniqu	ies for	industrial	require	ments						Applyin	g (K3)
					Ма	pping c	of COs	with P	os and F	PSOs				
COs/Po	s PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	P01	2 PSO1	PSO2
CO1	3	1											2	2
CO2	3	1											2	2
CO3	3	2	1	1	1								3	3
CO4	3	1											2	2
CO5	3	2	1	1	1								3	3
1 – Sligh	t, 2 – Mo	derate, 3	8 – Subs	tantial,	BT- Bloo	m's Tax	onomy							
					AS	SESSM	ENT P	ATTER	N – THE	ORY				
	Bloom's egory*	Re	member (K1) %	ing	Understa (K2)		Apply (K3)		Analyz (K4)		Evaluating %	(K5)	Creating (K6) %	Total %
С	AT1		30		70									100
С	AT2		10		50		4(	C						100
С	AT3		10		50		4(	C						100
E	SE		20		50		30	)						100

\* ±3% may be varied (CAT 1, 2 & 3 – 50 marks & ESE – 100 marks)

Programme & Branch	B.E. & Electronics and Instrumentation Engineering	Sem.	Category	L	т	Р	Credit
Prerequisites	Nil	5	PE	3	0	0	3
Preamble	To impart the knowledge on Power semiconductor devic Choppers, DC drives, Variable Frequency Drives and to drives.						
Unit – I	Introduction to Power semiconductor devices						9
in the design of p – Commutation n <b>Unit – II</b>	power semiconductors – Control characteristics of power device power electronics equipment – Thyristor: Operating principle – E nethods. Controlled rectifiers	Behaviour	under biased	cond	dition	– Ga	te triggering
Principle of phase phase half control	se controlled converter operation– Single phase half controlled led Bridge converter - Three phase fully controlled Bridge Recti – Inverting mode of a converter - Effect of source and load induc	fiers – Thr					r – - Singl
Unit – III							9
Principle of DC	Choppers and Inverters chopper - Step up and Step down Choppers – Classification of						- Switching
Principle of DC mode Regulators inverters. <b>Unit – IV</b> Basic characteris wave and full co	chopper - Step up and Step down Choppers – Classification of - Buck, Boost and Buck-Boost Regulators. Introduction to Inve DC Drives and AC Drives stics of DC motors – Operating modes – Single phase semi con nverter drives – Control modes - Power control, Regenerative	verter and	dual convert	ratior er dr ic bra	ives-	ngle p Three	– Switching hase bridg 9 e phase ha
Principle of DC mode Regulators inverters. <b>Unit – IV</b> Basic characteris wave and full co regenerative and	chopper - Step up and Step down Choppers – Classification of - Buck, Boost and Buck-Boost Regulators. Introduction to Inve- <b>DC Drives and AC Drives</b> stics of DC motors – Operating modes – Single phase semi con- nverter drives – Control modes - Power control, Regenerative rheostatic brake control. Introduction to AC drives: Introduction	verter and	dual convert	ratior er dr ic bra	ives-	ngle p Three	– Switchin hase bridg 9 e phase ha I, Combine
Principle of DC mode Regulators inverters. Unit – IV Basic characteris wave and full co regenerative and Unit – V	Chopper - Step up and Step down Choppers – Classification of Buck, Boost and Buck-Boost Regulators. Introduction to Inve- DC Drives and AC Drives stics of DC motors – Operating modes – Single phase semi con- nverter drives – Control modes - Power control, Regenerative rheostatic brake control. Introduction to AC drives: Introduction Drives for specific applications	verters: Prir verter and prake cont to Variable	dual convert rol, Rheostat Frequency [	ratior er dr ic bra Drives	ives- ake os.	ngle p Three control	- Switching hase bridg 9 e phase ha I, Combine 9
Principle of DC mode Regulators inverters. <b>Unit – IV</b> Basic characteris wave and full co regenerative and <b>Unit – V</b>	chopper - Step up and Step down Choppers – Classification of - Buck, Boost and Buck-Boost Regulators. Introduction to Inve- <b>DC Drives and AC Drives</b> stics of DC motors – Operating modes – Single phase semi con- nverter drives – Control modes - Power control, Regenerative rheostatic brake control. Introduction to AC drives: Introduction	verters: Prir verter and prake cont to Variable	dual convert rol, Rheostat Frequency [	ratior er dr ic bra Drives	ives- ake os.	ngle p Three control	- Switchin hase bridg 9 e phase ha I, Combine 9 mills.
Principle of DC mode Regulators inverters. <b>Unit – IV</b> Basic characteris wave and full co regenerative and <b>Unit – V</b>	Chopper - Step up and Step down Choppers – Classification of Buck, Boost and Buck-Boost Regulators. Introduction to Inve- DC Drives and AC Drives stics of DC motors – Operating modes – Single phase semi con- nverter drives – Control modes - Power control, Regenerative rheostatic brake control. Introduction to AC drives: Introduction Drives for specific applications	verters: Prir verter and prake cont to Variable	dual convert rol, Rheostat Frequency [	ratior er dr ic bra Drives	ives- ake os.	ngle p Three control	- Switchin hase bridg 9 e phase ha I, Combine 9 mills.
Principle of DC of mode Regulators inverters. Unit – IV Basic characteris wave and full co regenerative and Unit – V Drive considerati	A characteristic applications     A	verters: Prir verter and orake cont to Variable s – Cemer	dual convert rol, Rheostat Frequency I nt mills – Sug	ratior er dr ic bra Drives ar mi	ives- ake c s. Ils- P	ngle p Three control	- Switchin hase bridg 9 e phase ha I, Combine 9 mills. Total:4
Principle of DC of mode Regulators inverters.       Unit – IV       Basic characteris wave and full coregenerative and full corregenerative and Unit – V       Drive considerati       TEXT BOOK:       1.     Rashid, Unit 1,2, Vedam S	A characteristic applications     A	verters: Prir verter and orake cont to Variable s – Cemer 4 <sup>th</sup> Edition	dual convert rol, Rheostat Prequency I nt mills – Sug	er dr ic bra Drives ar mi	ives- ake c s. Ils- P	Three control Paper I	- Switchin hase bridg 9 e phase ha I, Combine 9 mills. Total:4 Delhi, 2017
Principle of DC of mode Regulators inverters.       Unit – IV       Basic characteris wave and full coregenerative and full contracteris of the second dunit – V       Drive considerati       TEXT BOOK:       1.     Rashid, Unit 1,2, Vedam S	A Subrahmanyam, "Electric Drives-Concepts and Applications", 2	verters: Prir verter and orake cont to Variable s – Cemer 4 <sup>th</sup> Edition	dual convert rol, Rheostat Prequency I nt mills – Sug	er dr ic bra Drives ar mi	ives- ake c s. Ils- P	Three control Paper I	- Switching hase bridg 9 e phase ha I, Combine 9 mills. Total:4 Delhi, 2017
Principle of DC of mode Regulators inverters.         Unit – IV         Basic characteris wave and full coregenerative and full corregenerative and full corregener	Applications, Step up and Step down Choppers – Classification of a Buck, Boost and Buck-Boost Regulators. Introduction to Inverse of DC motors – Operating modes – Single phase semi connverter drives – Control modes - Power control, Regenerative I rheostatic brake control. Introduction to AC drives: Introduction     Drives for specific applications     ons for textile mills – Steel rolling mills – Cranes and Hoist Drive     M. H., "Power Electronics –Circuits, Devices and Applications", 3 and 4     Subrahmanyam, "Electric Drives-Concepts and Applications", 2     New Delhi, 2017 for Unit 5.	erters: Prir verter and orake cont to Variable s – Cemer 4 <sup>th</sup> Edition	dual convert rol, Rheostat Frequency I nt mills – Sug n, Pearson E	er dr ic bra Drives ar mi duca	ives- ives- ake c s. Ils- P	ngle p Three control Paper r New	– Switchin hase bridg 9 e phase ha I, Combine 9 mills. Total:4 Delhi, 2017

	SE OUTCOMES: mpletion of the course, the students will be able to	BT Mapped (Highest Level)
CO1	interpret the power electronic devices for industrial drives	Understanding(K2)
CO2	describe the various controlled devices	Understanding(K2)
CO3	interpret the different types of choppers, inverters and their working	Understanding(K2)
CO4	develop the operating and control modes of DC drives and learn about variable frequency AC drives	Applying (K3)
CO5	select suitable DC drives and simple AC drives for industrial applications	Applying (K3)

					Маррі	ng of C	Os with	n POs a	nd PSC	Ds				
COs/POs	P01	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1											2	2
CO2	3	1											2	2
CO3	3	1											2	2
CO4	3	2	1	1	1								3	3
CO5	3	2	1	1	1								3	3
1 – Slight, 2	– Mode	erate, 3 -	- Substar	itial, BT-	Bloom's	s Taxon	omy							

		ASSESSMEN	T PATTERN	- THEORY			
Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	15	85					100
CAT2	15	85					100
CAT3	10	45	45				100
ESE	5	70	25				100

BE– Electronics and Instrumentation Engineering, Regulation, Curriculum and Syllabus – R2022 Page 195

Programme & Branch	B.E. & Electronics and Instrumentation Engineering	Sem.	Category	L	т	Р	Credit
Prerequisites	Control Systems	5	PE	3	0	0	3
Preamble	To understand and analyse the performance of linear and n without controllers.	ionlinear s	system in stat	e spa	ce do	main	with and
Unit – I	State Space Analysis in Continuous domain:						9
eigen vectors – S <b>Unit – II</b> Controllability an and observability	<ul> <li>Ice model – Conversion of state space to transfer function-Notate transition matrix and its properties. Solutions of state equation</li> <li>State Feedback Controllers and Observers:</li> <li>d observability – Relation between transfer function and state</li> <li>State feedback controllers. State estimators: Full and react controller- Deadbeat Observers- Dead beat Control.</li> </ul>	itions — F model –	Free and force	ed res	ponso time	es. on co	<b>9</b> ontrollabilit
Unit – III	Phase Plane Analysis:						9
	n-linear systems, jump resonance, sub-harmonic oscillation- s – Construction of phase portraits using isoclines- Limit cycle		oints Phase	plane	ana	lysis:	Linear an
Unit – IV	Describing function Analysis:						9
	rities Describing Function of nonlinearities –Review of Nyquist em–Limit cycle oscillations- Accuracy of Describing Function m		or linear syste	em –N	lyqui	st stal	oility criteria
Unit – V	Lyapunov Stability Analysis:						9
and non linear s	ense of Lyapunov – Second method of Lyapunov – Lyapunov vstem- Krasovski's theorem- Variable gradient method of gene systems.						
non autonomous							Total:4
non autonomous							
TEXT BOOK:							
TEXT BOOK:	M. "Digital Control and State Variable Methods", 4 <sup>th</sup> Edition, Ta	ita McGra	w-Hill, New D	)elhi,2	008 f	or Un	it-1, 2 & 3
TEXT BOOK:     1.   Gopal	M. "Digital Control and State Variable Methods", 4 <sup>th</sup> Edition, Ta	ita McGra	w-Hill, New D	)elhi,2	008 f	or Un	it-1, 2 & 3
TEXT BOOK:     1.   Gopal     REFERENCES:	M. "Digital Control and State Variable Methods", 4 <sup>th</sup> Edition, Ta and Li , "Applied Nonlinear Control", 2 <sup>nd</sup> Edition, Prentice Hall F						it-1, 2 & 3
TEXT BOOK:1.GopalREFERENCES:1.Slotine		Publishers	, USA, 1991				it-1, 2 & 3

	SE OUTCOMES: npletion of the course, the students will be able to	BT Mapped (Highest Level)
CO1	analyse the time domain unctional tics of continuos systems in state space domain	Analyse(K4)
CO2	Design state feedback controllers and observers	Applying (K3)
CO3	Apply the concepts in the design of state feedback controllers and observers	Analyse(K4)
CO4	Analyse the unction of nonlinear systems using describing function method	Analyse(K4)
CO5	Analyse the stability of linear and nonlinear systems using Lyapunov stability method	Analyse(K4)

	Mapping of COs with Pos and PSOs													
COs/Pos	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	2	2					1			3	3
CO2	3	2	1	1	1					1			3	3
CO3	3	3	2	2	2					1			3	3
CO4	3	3	2	2	2					1			3	3
CO5	3	3	2	2	2					1			3	3

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN – THEORY												
Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %					
CAT1	10	40	40	10			100					
CAT2	10	40	40	10			100					
CAT3	10	40	40	10			100					
ESE	10	40	40	10			100					

BE- Electronics and Instrumentation Engineering, Regulation, Curriculum and Syllabus - R2022 Page 197

	22EIE07 - SCADA AND ITS APPL						
Programme Branch	BE & Electronics and Instrumentation Engineering	Sem.	Category	L	т	Ρ	Credit
Prerequisite	Process Control	6	PE	3	0	0	3
Preamble	To develop and implement the SCADA in Industrial Autor	mation					
Unit - I	Introduction to SCADA and Architectures:						9
	mation by Ignition SCADA: Introduction - Basic Architecture - S tures - IIoT Architecture - Redundancy Architecture - Cloud ecture						
Unit - II	Modules in SCADA:						9
	Vision Module - Perspective Module – OPC/UA Module: Drive - Connecting and configuration to S7 1200 devices – Tag Histor					– Mo	dbus – TC
Unit - III	Ignition Platform:						9
	me - status - configuration - Gateway backup and restore - I	gnition excha	ange – Datab	ase	conr	ectior	s: Installir
	nnecting to database MySQL						
Unit - IV	SCADA Security and Tags:						9
	ral security settings – classic authentication security – Identit vser – Types – user defined tags – Alarm – configuring and sch		uthentication	secu	rity -	- servi	ce securit
Unit - V	Applications:	eduling.					9
	ntrols – Lift / Elevator Controls – Water and Sewage Treatmen	t Plants – Bi	uilding Autom	atior	n mai	nagem	
	ilway Application – Manufacturing sorting Systems		and ing reaction				
							Total:4
TEXT BOOK							
1. Ignit	n 8.1 User Manual – Inductive Automation						
REFERENC	S:						
	A. Boyer, "SCADA: Supervisory Control and Data Acquisition",	4th Edition, I	SA Press, US	SA, 2	009		
1. Stua	· · · · · · · · · · · · · · · · · · ·						

		UTCON tion of		rse, the s	studen	ts will be	e able to	)						BT Map (Highest				
CO1	gair	n knowle	edge on	the basic	compo	onents of	SCADA						U	nderstand	ling (K2)			
CO2	inte	rpret va	arious m	odules in	SCADA	Ą								Applying	(K3)			
CO3	dev	elop igr	nition pla	tform gat	eway a	nd conne	ecting to	databa	se					Applying	(K3)			
CO4	imp	art the	knowled	ge of SC/	ADA se	curity an	d tags							Applying (K3)				
CO5 apply SCADA in specified industrial applications														Applying	(K3)			
						Маррі	ing of C	Os witl	n POs	and PS(	Ds							
COs/F	os	PO1	PO2	PO3	PO4	PO5	PO6	PO7	P08	PO9	PO10	PO11	PO12	PSO1	PSO2			
CO	1	3	1											2	2			
CO	2	3	2	1	1	1								3	3			
CO	3	3	2	1	1	1								3	3			
CO	4	3	2	1	1	1								3	3			
CO	5	3	2	1	1	1								3	3			
1 – Slig	ght, 2	– Mode	erate, 3	– Substar	ntial, B	r- Bloom	's Taxor	iomy										
						ASSE	SSMEN	ΤΡΑΤ	FRN-	THEOR	2Y							
	Test / Bloom's Remembering Understanding Category* (K1) % (K2) %		anding	Appl (K3)	ying	Analyz (K4)	ing	Evaluating (K5) %		reating K6) %	Total %							
	CAT	1		10		60		30	)						100			
	CAT	2		10		30		60	)						100			
	CAT	3		10		30		60	)						100			
	ESE	Ξ		10		30		60	)						100			
* ±3%	may l	oe varie	d (CAT	1,2&3-	- 50 ma	irks & ES	SE – 100	marks	)									

Programme & Branch	B.E. & Electronics and Instrumentation Engineering	Sem.	Category	L	т	Р	Credit
Prerequisites	Nil	6	PE	3	0	0	3
		•		•	•	•	•
Preamble	Virtual instrumentation is a powerful concept for control problems. This course aims at giving an adequate expos DAQ system to overcome the limitations of classical method	ure and p					
Unit – I	Introduction to Virtual Instrumentation:						9
Instruments- Adva Graphical Prograr Programming.	ation- Programming Requirements- Drawbacks of Recent App antages of VI- Creating Virtual Instruments Using LabVIEW- Vir nming and Textual Programming- Advantages of LabVIEW- La	rtual Instru	mentation in	the E	Engin	eerin	g Process amming- (
Unit – II	Basic Tools, Loops and Graphs:						9
	d Global Variables – Arrays-Clusters-Waveform Charts-Wave veform Graph-3D Graphs.	eionn Gra	pris-Xr Grap	ns-I	ntens	aty G	raphs an
Unit – III	Programming with Structures:						9
Unit – III Structures: Case		ed Structu	res, Formula	Noc	les, l	Event	•
Unit – III Structures: Case MathScript-String	Programming with Structures: Structure, Sequence Structures, Customizing Structures, Time	ed Structu	res, Formula	Noc	les, l	Event	•
Unit – III Structures: Case MathScript-String: Unit – IV Interface Buses: Techniques-Data	Programming with Structures:         Structure, Sequence Structures, Customizing Structures, Times-File I/O-State Machine.         Data Acquisition:         RS 232, RS422, RS485, GPIB and USB. Hardware Aspects:         Acquisition in LabVIEW-Hardware Installation and Configuration	Signal Gro	ounding-Signa	al Co	onditi	oning	Structure 9 Digital I/C
Unit – III Structures: Case MathScript-String: Unit – IV Interface Buses: Techniques-Data DAQ Assistant-D/	Programming with Structures:         Structure, Sequence Structures, Customizing Structures, Times-File I/O-State Machine.         Data Acquisition:         RS 232, RS422, RS485, GPIB and USB. Hardware Aspects:         Acquisition in LabVIEW-Hardware Installation and Configuration         Q Hardware- DAQ Software.	Signal Gro	ounding-Signa	al Co	onditi	oning	Structure 9 Digital I/0
Unit – III Structures: Case MathScript-String: Unit – IV Interface Buses: Techniques-Data DAQ Assistant-D/ Unit – V Signal processing	Programming with Structures:         Structure, Sequence Structures, Customizing Structures, Times-File I/O-State Machine.         Data Acquisition:         RS 232, RS422, RS485, GPIB and USB. Hardware Aspects:         Acquisition in LabVIEW-Hardware Installation and Configuration	Signal Gro on-Compo Fools-Signa	ounding-Signa nents of DAC al, Voltage al	al Co 2-DA nd C	onditio Q Si Currer	oning gnal <i>i</i>	Structure 9 Digital I/C Accessory 9
Unit – III Structures: Case MathScript-String: Unit – IV Interface Buses: Techniques-Data DAQ Assistant-D/ Unit – V Signal processing	Programming with Structures:         Structure, Sequence Structures, Customizing Structures, Times-File I/O-State Machine.         Data Acquisition:         RS 232, RS422, RS485, GPIB and USB. Hardware Aspects:         Acquisition in LabVIEW-Hardware Installation and Configuration         Q Hardware- DAQ Software.         Tools and Applications:         and Analysis Tools-Control System Design and Simulation Tools	Signal Gro on-Compo Fools-Signa	ounding-Signa nents of DAC al, Voltage al	al Co 2-DA nd C	onditio Q Si Currer	oning gnal <i>i</i>	Structure 9 Digital I/C Accessory 9
Unit – III Structures: Case MathScript-String: Unit – IV Interface Buses: Techniques-Data DAQ Assistant-D/ Unit – V Signal processing using general pur	Programming with Structures:         Structure, Sequence Structures, Customizing Structures, Times-File I/O-State Machine.         Data Acquisition:         RS 232, RS422, RS485, GPIB and USB. Hardware Aspects:         Acquisition in LabVIEW-Hardware Installation and Configuration         Q Hardware- DAQ Software.         Tools and Applications:         and Analysis Tools-Control System Design and Simulation Tools	Signal Gro on-Compo Fools-Signa	ounding-Signa nents of DAC al, Voltage al	al Co 2-DA nd C	onditio Q Si Currer	oning gnal <i>i</i>	Structure 9 Digital I/( Accessory 9 asuremer
Unit – III Structures: Case MathScript-String: Unit – IV Interface Buses: Techniques-Data DAQ Assistant-D/ Unit – V Signal processing using general pur	Programming with Structures:         Structure, Sequence Structures, Customizing Structures, Times-File I/O-State Machine.         Data Acquisition:         RS 232, RS422, RS485, GPIB and USB. Hardware Aspects:         Acquisition in LabVIEW-Hardware Installation and Configuration         Q Hardware- DAQ Software.         Tools and Applications:         and Analysis Tools-Control System Design and Simulation Tools	Signal Gro on-Compo Fools-Signa –Tempera	ounding-Signa nents of DAC al, Voltage at ture Measure	al Co 2-DA nd C men	Q Si Q Si Curren	oning- gnal /	Structure 9 Digital I/0 Accessory 9 asuremer Total:4
Unit – III         Structures: Case         MathScript-String:         Unit – IV         Interface Buses:         Techniques-Data         DAQ Assistant-D/         Unit – V         Signal processing         using general purp         TEXT BOOK:         1	Programming with Structures:         Structure, Sequence Structures, Customizing Structures, Times-File I/O-State Machine.         Data Acquisition:         RS 232, RS422, RS485, GPIB and USB. Hardware Aspects:         Acquisition in LabVIEW-Hardware Installation and Configuration         AQ Hardware- DAQ Software.         Tools and Applications:         I and Analysis Tools-Control System Design and Simulation Toose DAQ Card-Bio-Medical Signal Acquisition using NI-ELVIS	Signal Gro on-Compo Fools-Signa –Tempera	ounding-Signa nents of DAC al, Voltage at ture Measure	al Co 2-DA nd C men	Q Si Q Si Curren	oning- gnal /	Structure 9 Digital I/O Accessory 9 asuremer Total:4

		UTCON		se, the st	udents	s will be	able to						(	BT Mapı Highest L			
CO1	exp	lain the	Virtual In	nstrument	ation co	oncepts								Applying	(K2)		
CO2	арр	ly struct	ured pro	gramming	g conce	epts in de	veloping	g LabVIE	EW pro	grams				Applying	(K3)		
CO3	buil	d LabVI	EW prog	rams usir	ng struc	ctures, no	des and	l state n	nachine	e concep	ots			Applying	(K3)		
CO4	utiliz	ze DAQ	System	to solve r	eal time	e problen	ns						Applying (K3)				
CO5	apply knowledge on various tools in practical works													Applying	(K3)		
						Mappir	ng of CC	)s with	Pos ai	nd PSOs	5						
COs/I	Pos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2		
CO	1	3	2											2	2		
CO	2	3	2	1	1	1								3	3		
CO	3	3	2	1	1	1								3	3		
CO	4	3	2	1	1	1								3	3		
CO	5	3	2	1	1	1								3	3		
1 – Sli	ght, 2	- Mode	rate, 3 -	- Substant	tial, BT	- Bloom's	Taxono	omy									
						ASSES	SMENT	PATTE	RN –	THEOR	(						
	st / Ble Catego	oom's ory*	Re	memberi (K1) %	ng	Understa (K2)		Apply (K3)		Analyz (K4) 9		Evaluating (K5) %		reating K6) %	Tota %		
	CAT	1		20		50	)	30	)						100		
	CAT	2		15		40	)	45	5						100		
	CAT	3		15		60	)	30	)						100		
	ESE	=		20		40	)	40	)						100		

	22EIE09 DIGITAL IMAGE PROCE	SSING					
Programme & Branch	B.E. & Electronics and Instrumentation Engineering	Sem.	Category	L	т	Р	Credit
Prerequisites	Digital Signal Processing	6	PE	3	0	0	3
Preamble	To impart the fundamental knowledge and applications of D	igital Imag	e Processing				
Unit – I	Introduction to Image Processing:						9
Relationships and	Types of Images – Fundamental Steps in Image Process Distance Metrics – Classification of Image Processing Op Image Multiplication, Image Division – Logical Operations: At Image Transform:	erations -	Arithmetic C	Opera	ations	: Imag	ge Additio
	ansforms – 2D Discrete Fourier transform – 2D Discrete Cosin	e Transfor	m – Haar Tra	nsfo	rm –	SVD T	ransforms
Unit – III	Image Enhancement:						9
		– image s	smoothing in	Fieq	uency	/ Dom	
Unit – IV Introduction – Clas	uency Domain. Image Segmentation: sification of Image Segmentation Algorithms – Detection of	Discontin	uities – Edge	Det	ectior	n: Stag	9 ges in Edg
Detection, Types o – Principle of Three	uency Domain. Image Segmentation: sification of Image Segmentation Algorithms – Detection of Edge Detectors –Edge Detectors: Roberts Operator, Prewitt sholding: Histogram and Thresholding, Global Thresholding Al	Discontine Operator,	uities – Edge Sobel Opera	Det tor –	ectior Canr	n: Stag	9 ges in Edg ge Detectio
Unit – IV Introduction – Clas Detection, Types o – Principle of Thres Unit – V	uency Domain.         Image Segmentation:         ssification of Image Segmentation Algorithms – Detection of         Edge Detectors –Edge Detectors: Roberts Operator, Prewitt         sholding: Histogram and Thresholding, Global Thresholding Al         Image Processing Applications:	Discontine Operator, gorithms -	uities – Edge Sobel Opera - Principle of	Det tor – Regi	ectior Canr	n: Stag	<b>9</b> ges in Edg ge Detectio
Unit – IV Introduction – Clas Detection, Types o – Principle of Thres Unit – V	uency Domain. Image Segmentation: sification of Image Segmentation Algorithms – Detection of Edge Detectors –Edge Detectors: Roberts Operator, Prewitt sholding: Histogram and Thresholding, Global Thresholding Al	Discontine Operator, gorithms -	uities – Edge Sobel Opera - Principle of	Det tor – Regi	ectior Canr	n: Stag	9 ges in Edg ge Detectio 9
Unit – IV Introduction – Clas Detection, Types o – Principle of Thres Unit – V	uency Domain.         Image Segmentation:         ssification of Image Segmentation Algorithms – Detection of         Edge Detectors –Edge Detectors: Roberts Operator, Prewitt         sholding: Histogram and Thresholding, Global Thresholding Al         Image Processing Applications:	Discontine Operator, gorithms -	uities – Edge Sobel Opera - Principle of	Det tor – Regi	ectior Canr	n: Stag	9 ges in Edg ge Detectio
Unit – IV Introduction – Clas Detection, Types o – Principle of Thres Unit – V	uency Domain.         Image Segmentation:         ssification of Image Segmentation Algorithms – Detection of         Edge Detectors –Edge Detectors: Roberts Operator, Prewitt         sholding: Histogram and Thresholding, Global Thresholding Al         Image Processing Applications:	Discontine Operator, gorithms -	uities – Edge Sobel Opera - Principle of	Det tor – Regi	ectior Canr	n: Stag	9 ges in Edg ge Detectio 9
Unit – IV Introduction – Clas Detection, Types o – Principle of Thres Unit – V Theory and Case s TEXT BOOK:	uency Domain.         Image Segmentation:         ssification of Image Segmentation Algorithms – Detection of         Edge Detectors –Edge Detectors: Roberts Operator, Prewitt         sholding: Histogram and Thresholding, Global Thresholding Al         Image Processing Applications:	Discontinu Operator, gorithms -	uities – Edge Sobel Opera - Principle of I Natermarking	Det tor – Regi	ectior Canr	n: Stag	9 ges in Edg ge Detectio 9
Unit – IV         Introduction – Class         Detection, Types o         – Principle of Thress         Unit – V         Theory and Case s         TEXT BOOK:         1.         Sridhar S.	Image Segmentation: Sification of Image Segmentation Algorithms – Detection of f Edge Detectors –Edge Detectors: Roberts Operator, Prewitt Sholding: Histogram and Thresholding, Global Thresholding Al Image Processing Applications: tudy: Image Registration – Image Fusion – Image Mosaicking	Discontinu Operator, gorithms -	uities – Edge Sobel Opera - Principle of I Natermarking	Det tor – Regi	ectior Canr	n: Stag	9 ges in Edg ge Detectio 9
Unit – IV         Introduction – Class         Detection, Types o         – Principle of Thress         Unit – V         Theory and Case s         TEXT BOOK:         1.         Sridhar S.         REFERENCES:	Image Segmentation: Sification of Image Segmentation Algorithms – Detection of f Edge Detectors –Edge Detectors: Roberts Operator, Prewitt Sholding: Histogram and Thresholding, Global Thresholding Al Image Processing Applications: tudy: Image Registration – Image Fusion – Image Mosaicking	Discontinu Operator, gorithms - – Digital \ ess, India, 2	uities – Edge Sobel Opera Principle of I Watermarking	Det tor – Regi	ectior - Canr on-gro	n: Staą ny Edg owing.	9 ges in Edg ge Detectio 9 Total:4
Unit – IV         Introduction – Class         Detection, Types o         – Principle of Thress         Unit – V         Theory and Case s         TEXT BOOK:         1.         Sridhar S.         REFERENCES:         1.         Jayaramar	Image Segmentation:         ssification of Image Segmentation Algorithms – Detection of f Edge Detectors –Edge Detectors: Roberts Operator, Prewitt sholding: Histogram and Thresholding, Global Thresholding Al Image Processing Applications:         tudy: Image Registration – Image Fusion – Image Mosaicking         "Digital Image Processing", 2 <sup>nd</sup> Edition, Oxford University Pre	Discontini Operator, gorithms - - Digital \ ess, India, 2	uities – Edge Sobel Opera - Principle of I Watermarking 2016 n, Tata McGr	Det tor – Regi	ectior - Canr on-gro	n: Staą ny Edg owing.	9 ges in Edg ge Detectio 9 Total:4

	SE OUTCOMES: mpletion of the course, the students will be able to	BT Mapped (Highest Level)
CO1	perform the basic operations of image processing	Applying (K3)
CO2	apply various 2D transforms for images	Applying (K3)
CO3	implement image enhancement techniques to improve the image quality	Applying (K3)
CO4	apply various algorithms for image segmentation	Applying (K3)
CO5	construct case study on image processing applications	Understanding (K2)

Mapping of COs with Pos and PSOs														
COs/Pos	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	1	1			1		1			3	3
CO2	3	2	1	1	1			1		1			3	3
CO3	3	2	1	1	1			1		1			3	3
CO4	3	2	1	1	1			1		1			3	3
CO5	3	1						1		1			2	2
1 – Slight, 2	– Mode	erate, 3 -	- Substar	ntial, BT	- Bloom'	's Taxon	omy			· · ·				

		ASSESSMEN	T PATTERN	– THEORY			
Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	10	35	55	-	-	-	100
CAT2	10	35	55	-	-	-	100
CAT3	15	40	45	-	-	-	100
ESE	10	35	55	-	-	-	100

Programme & Branch	B.E. & Electronics and Instrumentation Engineering	Sem.	Category	L	т	Ρ	Credit
Prerequisites	Nil	6	PE	3	0	0	3
Preamble	To provide an overview of various methods of power general of Instrumentation and Control in Thermal Power Plant and			cepts	and	pract	ical aspec
Unit – I	Overview of Power Generation:		ł				9
Geothermal Powe	nventional and non-conventional methods of power generation r – Biomass Power. Conventional: Hydropower – Steam Pow on diagram – Cogeneration of Power – Control rooms						
Unit – II	Instrumentation and Control in Water Circuit:						9
level measuremer	iler Feed water circulation – Measurements in water circuit: W at – Controls in water circuit: Boiler Drum Level Control – Super Impurities in Raw water – Effect of impurities – Measurement of	erheated S	team tempera				
lloit III							
	Instrumentation and Control in Air-Fuel Circuit:						9
Air-Fuel circuit – Analytical Measu	Measurements in air-fuel circuit – Controls in Air- Fuel circu rement: Oxygen measurement in Flue gas – Measurement – Infrared Flue Gas Analysers – Smoke detector – Dust monit	of Carbo or – Chror	n Dioxide in				Iraft contro ombustible
Air-Fuel circuit – Analytical Measu Analyser (CO+H <sub>2</sub> ) <b>Unit – IV</b>	Measurements in air-fuel circuit – Controls in Air- Fuel circu rement: Oxygen measurement in Flue gas – Measurement – Infrared Flue Gas Analysers – Smoke detector – Dust monit Power Plant Management and Turbine Monitoring and C	of Carbo or – Chror Control:	n Dioxide in natography	Flue	e gas	– C	Iraft contro ombustible 9
Analytical Measur Analyser (CO+H <sub>2</sub> ) <b>Unit – IV</b> Master control – E of DCS in Power F Classification of t	Measurements in air-fuel circuit – Controls in Air- Fuel circu rement: Oxygen measurement in Flue gas – Measurement – Infrared Flue Gas Analysers – Smoke detector – Dust monit Power Plant Management and Turbine Monitoring and C Boiler Efficiency – Maintenance of Measuring Instruments – Inte	of Carbon or – Chror Control: erlocks for s: Process	n Dioxide in natography Boiler operat	Flue ion - – T	e gas - SCA urbin	ADA -	Iraft contro ombustible 9 Application
Air-Fuel circuit – Analytical Measur Analyser (CO+H <sub>2</sub> ) <b>Unit – IV</b> Master control – E of DCS in Power F Classification of t	Measurements in air-fuel circuit – Controls in Air- Fuel circu rement: Oxygen measurement in Flue gas – Measurement – Infrared Flue Gas Analysers – Smoke detector – Dust monit <b>Power Plant Management and Turbine Monitoring and C</b> Boiler Efficiency – Maintenance of Measuring Instruments – Inter Plants. urbines–Turbine Steam inlet system – Turbine Measurement	of Carbon or – Chror Control: erlocks for s: Process	n Dioxide in natography Boiler operat	Flue ion - – T	e gas - SCA urbin	ADA -	Iraft contro ombustible 9 Application
Air-Fuel circuit – Analytical Measur Analyser (CO+H <sub>2</sub> ) <b>Unit – IV</b> Master control – E of DCS in Power F Classification of tr Safety control sys <b>Unit – V</b> Nuclear Power PI Boiler Water Rea	Measurements in air-fuel circuit – Controls in Air- Fuel circu rement: Oxygen measurement in Flue gas – Measurement – Infrared Flue Gas Analysers – Smoke detector – Dust monit <b>Power Plant Management and Turbine Monitoring and C</b> Boiler Efficiency – Maintenance of Measuring Instruments – Inter Plants. urbines–Turbine Steam inlet system – Turbine Measurement tems – Process control systems –Lubrication for Turbo-Alterna	of Carbo or – Chror Control: erlocks for s: Process tor – Turbo ctor contro architectur	n Dioxide in natography Boiler operat s parameters p-Alternator C pl: Pressurize res in nuclea	Flue ion - – T Coolir ed W r pov	e gas - SCA urbin ng Sy ater wer p	ADA – a con stem. React lants	raft contro ombustible 9 - Applicatio trol syster 9 or (PWR) – Radiatio
Air-Fuel circuit – Analytical Measur Analyser (CO+H <sub>2</sub> ) <b>Unit – IV</b> Master control – E of DCS in Power F Classification of tr Safety control sys <b>Unit – V</b> Nuclear Power PI Boiler Water Rea	Measurements in air-fuel circuit – Controls in Air- Fuel circuit rement: Oxygen measurement in Flue gas – Measurement – Infrared Flue Gas Analysers – Smoke detector – Dust monit <b>Power Plant Management and Turbine Monitoring and C</b> Boiler Efficiency – Maintenance of Measuring Instruments – Inter Plants. urbines–Turbine Steam inlet system – Turbine Measurement tems – Process control systems –Lubrication for Turbo-Alterna Instrumentation and Control in Nuclear Power Plant: ant components – Sensors and measurement system – Rea ctor (BWR) – Liquid Metal Cooled Reactor (LMCR) – Digital	of Carbo or – Chror Control: erlocks for s: Process tor – Turbo ctor contro architectur	n Dioxide in natography Boiler operat s parameters p-Alternator C pl: Pressurize res in nuclea	Flue ion - – T Coolir ed W r pov	e gas - SCA urbin ng Sy ater wer p	ADA – a con stem. React lants	raft contro ombustible 9 Applicatio trol syster 9 or (PWR) – Radiatio
Air-Fuel circuit – Analytical Measur Analyser (CO+H <sub>2</sub> ) <b>Unit – IV</b> Master control – E of DCS in Power F Classification of tr Safety control sys <b>Unit – V</b> Nuclear Power PI Boiler Water Rea	Measurements in air-fuel circuit – Controls in Air- Fuel circuit rement: Oxygen measurement in Flue gas – Measurement – Infrared Flue Gas Analysers – Smoke detector – Dust monit <b>Power Plant Management and Turbine Monitoring and C</b> Boiler Efficiency – Maintenance of Measuring Instruments – Inter Plants. urbines–Turbine Steam inlet system – Turbine Measurement tems – Process control systems –Lubrication for Turbo-Alterna Instrumentation and Control in Nuclear Power Plant: ant components – Sensors and measurement system – Rea ctor (BWR) – Liquid Metal Cooled Reactor (LMCR) – Digital	of Carbo or – Chror Control: erlocks for s: Process tor – Turbo ctor contro architectur	n Dioxide in natography Boiler operat s parameters p-Alternator C pl: Pressurize res in nuclea	Flue ion - – T Coolir ed W r pov	e gas - SCA urbin ng Sy ater wer p	ADA – a con stem. React lants	raft contro ombustible 9 - Applicatio trol syster 9 or (PWR) – Radiatio
Air-Fuel circuit – Analytical Measur Analyser (CO+H <sub>2</sub> ) <b>Unit – IV</b> Master control – E of DCS in Power F Classification of t Safety control sys <b>Unit – V</b> Nuclear Power Pl Boiler Water Reap protection and mo	Measurements in air-fuel circuit – Controls in Air- Fuel circuit rement: Oxygen measurement in Flue gas – Measurement – Infrared Flue Gas Analysers – Smoke detector – Dust monit <b>Power Plant Management and Turbine Monitoring and C</b> Boiler Efficiency – Maintenance of Measuring Instruments – Inter Plants. urbines–Turbine Steam inlet system – Turbine Measurement tems – Process control systems –Lubrication for Turbo-Alterna Instrumentation and Control in Nuclear Power Plant: ant components – Sensors and measurement system – Rea ctor (BWR) – Liquid Metal Cooled Reactor (LMCR) – Digital	of Carboi or – Chror Control: erlocks for s: Process tor – Turbo ctor contro architectur ower plant	n Dioxide in natography Boiler operat s parameters p-Alternator C pl: Pressurize res in nuclea : – Fukushima	Flue ion - - T coolir ed W r pov a nuc	e gas - SCA urbin ng Sy ater wer p clear	ADA – e con stem. React lants power	raft contro ombustible 9 Applicatio trol syster 9 or (PWR) – Radiatio plant. Total:4
Air-Fuel circuit – Analytical Measur Analyser (CO+H <sub>2</sub> ) <b>Unit – IV</b> Master control – E of DCS in Power F Classification of t Safety control sys <b>Unit – V</b> Nuclear Power Pl Boiler Water Reap protection and mo	Measurements in air-fuel circuit – Controls in Air- Fuel circu- rement: Oxygen measurement in Flue gas – Measurement – Infrared Flue Gas Analysers – Smoke detector – Dust monit <b>Power Plant Management and Turbine Monitoring and C</b> soiler Efficiency – Maintenance of Measuring Instruments – Inte Plants. urbines–Turbine Steam inlet system – Turbine Measurement tems – Process control systems –Lubrication for Turbo-Alterna Instrumentation and Control in Nuclear Power Plant: ant components – Sensors and measurement system – Rea ctor (BWR) – Liquid Metal Cooled Reactor (LMCR) – Digital nitoring – Case study: Three mile island – Chernobyl nuclear p	of Carboi or – Chror Control: erlocks for s: Process tor – Turbo ctor contro architectur ower plant	n Dioxide in natography Boiler operat s parameters p-Alternator C pl: Pressurize res in nuclea : – Fukushima	Flue ion - - T coolir ed W r pov a nuc	e gas - SCA urbin ng Sy ater wer p clear	ADA – e con stem. React lants power	raft contro ombustible 9 Applicatio trol syster 9 or (PWR) – Radiatio plant. Total:4
Air-Fuel circuit – Analytical Measur Analyser (CO+H <sub>2</sub> ) <b>Unit – IV</b> Master control – E of DCS in Power F Classification of tr Safety control sys <b>Unit – V</b> Nuclear Power PI Boiler Water Rea protection and mo <b>TEXT BOOK:</b> 1. Krishnasv <b>REFERENCES:</b> 1 SwapanB	Measurements in air-fuel circuit – Controls in Air- Fuel circu- rement: Oxygen measurement in Flue gas – Measurement – Infrared Flue Gas Analysers – Smoke detector – Dust monit <b>Power Plant Management and Turbine Monitoring and C</b> soiler Efficiency – Maintenance of Measuring Instruments – Inte Plants. urbines–Turbine Steam inlet system – Turbine Measurement tems – Process control systems –Lubrication for Turbo-Alterna Instrumentation and Control in Nuclear Power Plant: ant components – Sensors and measurement system – Rea ctor (BWR) – Liquid Metal Cooled Reactor (LMCR) – Digital nitoring – Case study: Three mile island – Chernobyl nuclear p	of Carbo or – Chror Control: erlocks for s: Process tor – Turbo ctor contro architectur ower plant	n Dioxide in natography Boiler operat s parameters p-Alternator C ol: Pressurize res in nuclea : – Fukushima	Flue ion - - T Coolir ed W r pov a nuc	e gas - SCA urbin ng Sy ater   ver p clear   d, Ne	ADA – e con stem. React lants power	Part contro ombustible 9 Application trol system 9 or (PWR) – Radiation - Radi

	SE OUTCOMES: mpletion of the course, the students will be able to	BT Mapped (Highest Level)
CO1	interpret the knowledge about the basics of power plants and various methods of power generation	Understanding (K2)
CO2	build the instrumentation and control techniques involved in water circuit of thermal power plant	Applying (K3)
CO3	recognize various measurement and control techniques applied to air- fuel circuit of thermal power plant	Understanding (K2)
CO4	apply DCS, SCADA, interlock circuits and turbine controls in thermal power plant	Applying (K3)
CO5	develop the concepts of different reactor controlled methods, safety and radiation measures in nuclear power plants	Applying (K3)
	Mapping of COs with Pos and PSOs	

					mapp		03 111	11030						
COs/Pos	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1					1			1			2	2
CO2	3	2	1	1	1		1			1			3	3
CO3	3	1					1			1			2	2
CO4	3	2	1	1	1		1			1			3	3
CO5	3	2	1	1	1		1			1			3	3
		-	·			_		•			•		•	

1 - Slight, 2 - Moderate, 3 - Substantial, BT- Bloom's Taxonomy

		ASSESSMEN	T PATTERN	– THEORY			
Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	10	50	40				100
CAT2	10	40	50				100
CAT3	10	40	50				100
ESE	10	40	50				100

	22EIE11 - EMBEDDED SYSTEM						
Programme & Branch	B.E. & Electronics and Instrumentation Engineering	Sem.	Category	L	т	Р	Credit
Prerequisites	Microcontroller and its Applications / Microprocessor and Microcontroller	6	PE	3	0	0	3
Preamble	To impart the fundamental knowledge and programming cor	ncepts of	Microcontrolle	er an	d Em	bedde	ed systems
Unit – I	Introduction to PIC18 Microcontrollers:						9
	PIC 18 - Pin Description – Memory Organization: Program M d Reset Circuits – Addressing Modes – Introduction to Instruction				Regis	ster C	Organizatio
Unit – II	PIC 18 Programming:						9
Assembly Lang	uage/ C Programming to Interface I/O Ports - Timers - Counters	– Capture	/Compare Mo	ode -	- PW	M.	ı <u> </u>
Unit – III	Interfacing Peripherals with PIC18 Microcontroller:						9
	Assembly Language/ C Programming of ADC – DAC – Tempera	ature Sen	sor – LCD –	Keył	board	– Mo	otor Contro
DC motor and S	Stepper motor.						
Unit – IV	Embedded Systems and Interfacing with Arduino	– Physica	al device – Ar	duin	o Inte	erfaces	9 s. Hardwa
requirement for	Embedded Systems and Interfacing with Arduino Embedded Systems – Structural units in Embedded processor Arduino, Connecting remotely over the network using VNC, GPIG gramming, APIs / Packages- Quark SOC processor, programming	O Basics,	Controlling G	SPIO	Outp	erface: outs U	s, Hardwai
Unit – IV Classification of requirement for Interface, – Pro Unit – V Introduction to	<b>Embedded Systems and Interfacing with Arduino</b> Embedded Systems – Structural units in Embedded processor Arduino, Connecting remotely over the network using VNC, GPIC	O Basics, g, Arduinc uling – Ta	Controlling C Boards using ask Commun	GPIO g GP	Outp IO on –	outs U Priori	s, Hardwa Ising a We <b>9</b> ty Inversio puts.
Unit – IV Classification of requirement for Interface, – Pro Unit – V Introduction to Problem. Case	Embedded Systems and Interfacing with Arduino           f Embedded Systems – Structural units in Embedded processor           Arduino, Connecting remotely over the network using VNC, GPIG           gramming, APIs / Packages- Quark SOC processor, programming           RTOS Concepts and case study:           RTOS – Types of RTOSs – Tasks – Process – Task schedu	O Basics, g, Arduinc uling – Ta	Controlling C Boards using ask Commun	GPIO g GP	Outp IO on –	outs U Priori	s, Hardwar Ising a We <b>9</b> ty Inversio
Unit – IV Classification of requirement for Interface, – Pro Unit – V Introduction to Problem. Case TEXT BOOK:	Embedded Systems and Interfacing with Arduino           f Embedded Systems – Structural units in Embedded processor           Arduino, Connecting remotely over the network using VNC, GPIG           gramming, APIs / Packages- Quark SOC processor, programming           RTOS Concepts and case study:           RTOS – Types of RTOSs – Tasks – Process – Task schedu	O Basics, g, Arduinc uling – Ta der – Mob	Controlling G Boards using ask Commun ile phone sof	SPIO g GP icatic tware	Outp IO on – e for I	Priori Key in	s, Hardwa Ising a We 9 ty Inversic puts. Total:4
Unit – IV Classification of requirement for Interface, – Pro Unit – V Introduction to Problem. Case TEXT BOOK:	Embedded Systems and Interfacing with Arduino           f Embedded Systems – Structural units in Embedded processor           Arduino, Connecting remotely over the network using VNC, GPIG           gramming, APIs / Packages- Quark SOC processor, programming           RTOS Concepts and case study:           RTOS – Types of RTOSs – Tasks – Process – Task schedu           Study: Automatic Chocolate Vending Machine – Smart Card Read           Causey, Muhammad Ali Mazidi, Rolin McKinlay, "PIC Microcon for PIC 18", 2 <sup>nd</sup> Edition, Pearson Education Micro Digital Ed, 2017.	O Basics, g, Arduinc uling – Ta der – Mob	Controlling G Boards using ask Commun ile phone sof	SPIO g GP icatic tware	Outp IO on – e for I	Priori Key in	s, Hardwar Ising a We 9 ty Inversic puts. Total:4
Unit – IV Classification of requirement for Interface, – Pro Unit – V Introduction to Problem. Case TEXT BOOK: 1. Danny and C f	Embedded Systems and Interfacing with Arduino           f Embedded Systems – Structural units in Embedded processor           Arduino, Connecting remotely over the network using VNC, GPIG           gramming, APIs / Packages- Quark SOC processor, programming           RTOS Concepts and case study:           RTOS – Types of RTOSs – Tasks – Process – Task schedu           Study: Automatic Chocolate Vending Machine – Smart Card Read           Causey, Muhammad Ali Mazidi, Rolin McKinlay, "PIC Microcon for PIC 18", 2 <sup>nd</sup> Edition, Pearson Education Micro Digital Ed, 2017.	O Basics, g, Arduinc Iling – Ta der – Mob troller and	Controlling Controlling Controlling Controlling Controlling Controlling Control Contro	SPIO g GP icatic tware	Outp IO on – e for l	Priori Key in	s, Hardwa Ising a We 9 ty Inversio puts. Total:4
Unit – IV         Classification of requirement for Interface, – Pro         Unit – V         Introduction to Problem. Case         TEXT BOOK:         1.       Danny and C f         REFERENCES         1.       Rajkam	Embedded Systems and Interfacing with Arduino         f Embedded Systems – Structural units in Embedded processor         Arduino, Connecting remotely over the network using VNC, GPIG         gramming, APIs / Packages- Quark SOC processor, programming         RTOS Concepts and case study:         RTOS – Types of RTOSs – Tasks – Process – Task schedu         Study: Automatic Chocolate Vending Machine – Smart Card Read         Causey, Muhammad Ali Mazidi, Rolin McKinlay, "PIC Microcon         or PIC 18", 2 <sup>nd</sup> Edition, Pearson Education Micro Digital Ed, 2017.	O Basics, g, Arduino Iling – Ta der – Mob Itroller and	Controlling Controlling Controlling Controlling Controlling Controlling Controlling Control Co	SPIO g GP icatic tware	Outp IO on – e for l	Priori Key in	s, Hardwa Ising a We 9 ty Inversio puts. Total:4

		UTCOM		rse, the	studen	ts will be	e able t	0						BT Mappe lighest Le	
CO1	und	erstand	I the bas	ic conce	pts of P	IC micro	controlle	ər					Und	lerstanding	g (K2)
CO2	acq	uire ade	equate k	nowledg	e in the	interfaci	ng conc	epts of	PIC M	icrocontr	oller		ŀ	Applying (M	(3)
CO3	app	ly the p	rogramn	ning skills	s to inte	rface pe	ripheral	s with P	IC Mic	rocontro	ller		ŀ	Applying (H	(3)
CO4		r knowl uino	edge in	basics o	f embe	dded sys	stems a	nd Inter	face a	analog/dig	gital ser	nsors with	Unc	lerstandin	g (K2)
CO5	exp	lain the	applicat	ions of e	mbedde	ed syster	m using	RTOS					Und	lerstanding	g (K2)
						Марр	ing of C	Os wit	h POs	and PS	Os				
COs/F	POs	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
СО	1	3							1		1			2	2
CO	2	3	2	1	1	1			1		1			3	3
CO	3	3	2	1	1	1			1		1			3	3
CO	4	3							1		1			2	2
CO	5	3							1		1			2	2
1 – Sli	ght, 2	– Mode	erate, 3 -	- Substa	ntial, B	Г- Bloom	's Taxoi	nomy					L.		
						ASSE	SSMEN	IT PAT	TERN	- THEOF	RY				
	st / Blo Catego	oom's ory*	Rei	member (K1) %	ing l	Jndersta (K2)		Apply (K3)		Analyzi (K4) %	•	valuating (K5) %	Creatin	g (K6) %	Total %
	CAT	1		10		65		25	5						100

CAT2

CAT3

ESE

\* ±3% may be varied (CAT 1, 2 & 3 – 60 marks & ESE – 100 marks)

Programme & Branch	B.E. & Electronics and Instrumentation Engineering	Sem.	Category	L	т	Р	Credit
Prerequisites	Control Systems	6	PE	3	0	0	3
Preamble	To emphasize the engineering principles and fundamental c functions in composite systems	haracteristic	s of compon	ents	and to	explain	their
Unit – I	Mechanical Components:						9
Gears: Types	n parameters- CAM: Components- Classification-CAM profile – Gears for load matching- Backlash in gears-Manufacture velocity of precession-Generalised equations- Application.						
Unit – II	Electromechanical Components:						9
as error detector problems and re							lays – Rela
Unit – III	Actuators: Servomotors:		<b>_</b>		<u> </u>		9
Driver circuits -	ation and transfer function of DC servomotors and AC servomo - Applications. <b>Tachogenerators:</b> Characteristic requirements	- EMF equ	ation – Com	es – ( muta	tion a	nd arma	ture reaction
Driver circuits - problem- AC inc <b>Unit – IV</b>	<ul> <li>Applications. Tachogenerators: Characteristic requirements duction tachogenerators-Working – Sources of errors- Applicati</li> <li>Amplifiers and Modulators:</li> </ul>	– EMF equ ons	ation – Com	muta	tion a	nd arma	ture reaction
Driver circuits – problem- AC inc <b>Unit – IV</b> Rotating amplif Parallel connec characteristics.	<ul> <li>Applications. Tachogenerators: Characteristic requirements duction tachogenerators-Working – Sources of errors- Application Amplifiers and Modulators:</li> <li>Types – Amplidyne generator- Working principle –transced- Magnetic amplifiers with feedback. Servo amplifiers: For Modulators and demodulators: Amplitude modulation theor</li> </ul>	– EMF equ ons sfer function eatures – A	ation – Com n. Magnetic C and DC s	muta ampl servo	ifiers: ampl	nd arma Series	ture reaction 9 connected Performance
Driver circuits – problem- AC inc Unit – IV Rotating amplif Parallel connec characteristics. modulator circu Unit – V	<ul> <li>Applications. Tachogenerators: Characteristic requirements duction tachogenerators-Working – Sources of errors- Applicati</li> <li>Amplifiers and Modulators:</li> <li>iers: Types – Amplidyne generator- Working principle –transted- Magnetic amplifiers with feedback. Servo amplifiers: For Modulators and demodulators: Amplitude modulation theorit.</li> <li>Hydraulic systems:</li> </ul>	– EMF equ ons sfer functior eatures – A y- Half and	ation – Com n. Magnetic C and DC s full wave I	muta ampl servo palan	ifiers: ampl ced n	nd arma Series ifiers – nodulato	ture reaction 9 connected Performand r- Amplitud 9
Driver circuits – problem- AC inc Unit – IV Rotating amplif Parallel connec characteristics. modulator circu Unit – V Components – Nozzle valve- efficiency – Acc	<ul> <li>Applications. Tachogenerators: Characteristic requirements duction tachogenerators-Working – Sources of errors- Applicati</li> <li>Amplifiers and Modulators:</li> <li>Types – Amplidyne generator- Working principle –tran ted- Magnetic amplifiers with feedback. Servo amplifiers: For Modulators and demodulators: Amplitude modulation theor it.</li> </ul>	– EMF equ ons sfer functior eatures – A y- Half and s- Hydraulic <b>tic systems</b>	ation – Com n. Magnetic C and DC s full wave I power supp s: Pneumatic	ampl servo balan y. Hy	ifiers: ampl ced n /drauli	nd arma Series ifiers – I nodulato c valves ipply –	ture reaction 9 connected Performano r- Amplitud 9 Compress ontrol valve
Driver circuits – problem- AC inc Unit – IV Rotating amplif Parallel connec characteristics. modulator circu Unit – V Components – Nozzle valve- efficiency – Acc	<ul> <li>Applications. Tachogenerators: Characteristic requirements duction tachogenerators-Working – Sources of errors- Application tachogenerators-Working – Sources of errors- Application tachogenerators and Modulators:</li> <li>Types – Amplidyne generator- Working principle –transted- Magnetic amplifiers with feedback. Servo amplifiers: For Modulators and demodulators: Amplitude modulation theorit.</li> <li>Hydraulic systems:</li> <li>Classifications- Hydraulic pumps – Hydraulic transmission line Flapper valve- Pulsed operation of control valves. Pneuma cessories for air compressor- Flow control. Pneumatic control values</li> </ul>	– EMF equ ons sfer functior eatures – A y- Half and s- Hydraulic <b>tic systems</b>	ation – Com n. Magnetic C and DC s full wave I power supp s: Pneumatic	ampl servo balan y. Hy	ifiers: ampl ced n /drauli	nd arma Series ifiers – I nodulato c valves ipply –	ture reaction 9 connected Performand r- Amplitud 9 compress
Driver circuits – problem- AC inc Unit – IV Rotating amplif Parallel connec characteristics. modulator circu Unit – V Components – Nozzle valve- efficiency – Acc P,PI and PID pr	<ul> <li>Applications. Tachogenerators: Characteristic requirements duction tachogenerators-Working – Sources of errors- Application tachogenerators-Working – Sources of errors- Application tachogenerators and Modulators:</li> <li>Types – Amplidyne generator- Working principle –transted- Magnetic amplifiers with feedback. Servo amplifiers: For Modulators and demodulators: Amplitude modulation theorit.</li> <li>Hydraulic systems:</li> <li>Classifications- Hydraulic pumps – Hydraulic transmission line Flapper valve- Pulsed operation of control valves. Pneuma cessories for air compressor- Flow control. Pneumatic control values</li> </ul>	– EMF equ ons sfer functior eatures – A y- Half and s- Hydraulic tic systems valves: Oper	ation – Com h. Magnetic C and DC s full wave I power supp s: Pneumation rating mecha	muta ampl servo palan y. Hy ; pov nism	ifiers: ampl ced n /drauli ver su – Dire	nd arma Series ifiers – I nodulato c valves ipply –	ture reaction 9 connected Performano r- Amplitud 9 Compress ontrol valve
Driver circuits – problem- AC inc Unit – IV Rotating amplif Parallel connec characteristics. modulator circu Unit – V Components – Nozzle valve- efficiency – Acc P,PI and PID pr TEXT BOOK: 1.	<ul> <li>Applications. Tachogenerators: Characteristic requirements duction tachogenerators-Working – Sources of errors- Application tachogenerators-Working – Sources of errors- Application (Amplifiers and Modulators:</li> <li>Types – Amplidyne generator- Working principle –transted- Magnetic amplifiers with feedback. Servo amplifiers: For Modulators and demodulators: Amplitude modulation theorit.</li> <li>Hydraulic systems:</li> <li>Classifications- Hydraulic pumps – Hydraulic transmission line Flapper valve- Pulsed operation of control valves. Pneumatic control valves.</li> <li>Desai M.D., "Control System Components", 1<sup>st</sup> Edition, PHI I</li> </ul>	– EMF equ ons sfer functior eatures – A y- Half and s- Hydraulic tic systems valves: Oper	ation – Com h. Magnetic C and DC s full wave I power supp s: Pneumation rating mecha	muta ampl servo palan y. Hy ; pov nism	ifiers: ampl ced n /drauli ver su – Dire	nd arma Series ifiers – I nodulato c valves ipply –	ture reaction 9 connected Performano r- Amplitud 9 Compress ontrol valve
Driver circuits – problem- AC inc Unit – IV Rotating amplif Parallel connec characteristics. modulator circu Unit – V Components – Nozzle valve- efficiency – Acc P,PI and PID pr TEXT BOOK: 1.	<ul> <li>Applications. Tachogenerators: Characteristic requirements duction tachogenerators-Working – Sources of errors- Application tachogenerators-Working – Sources of errors- Application (Amplifiers and Modulators:</li> <li>Types – Amplidyne generator- Working principle –transted- Magnetic amplifiers with feedback. Servo amplifiers: For Modulators and demodulators: Amplitude modulation theorit.</li> <li>Hydraulic systems:</li> <li>Classifications- Hydraulic pumps – Hydraulic transmission line Flapper valve- Pulsed operation of control valves. Pneumatic control valves.</li> <li>Desai M.D., "Control System Components", 1<sup>st</sup> Edition, PHI I</li> </ul>	– EMF equ ons sfer functior eatures – A y- Half and s- Hydraulic tic systems valves: Oper earning Pvt.	ation – Com h. Magnetic C and DC s full wave I power supp s: Pneumation rating mecha Ltd, New De	muta ampl servo palan y. Hy ; pov nism	ifiers: ampl ced n /drauli ver su – Diro	Series ifiers – nodulato c valves ipply – ection co	ture reaction 9 connected Performand r- Amplitud 9 Compress ontrol valve
Driver circuits - problem- AC inc Unit – IV Rotating amplif Parallel connec characteristics. modulator circu Unit – V Components – Nozzle valve- efficiency – Acc P,PI and PID pr TEXT BOOK: 1. REFERENCES	<ul> <li>Applications. Tachogenerators: Characteristic requirements duction tachogenerators-Working – Sources of errors- Application tachogenerators-Working – Sources of errors- Application tachogenerators and Modulators:</li> <li>Types – Amplidyne generator- Working principle –transced- Magnetic amplifiers with feedback. Servo amplifiers: For Modulators and demodulators: Amplitude modulation theorit.</li> <li>Hydraulic systems:</li> <li>Classifications- Hydraulic pumps – Hydraulic transmission line Flapper valve- Pulsed operation of control valves. Pneumatic control valves.</li> <li>Desai M.D., "Control System Components", 1<sup>st</sup> Edition, PHI I</li> </ul>	<ul> <li>EMF equions</li> <li>sfer function</li> <li>eatures – A</li> <li>y- Half and</li> <li>s- Hydraulic</li> <li>tic systems</li> <li>valves: Open</li> <li>earning Pvt.</li> <li>Edition, Monation in th</li> </ul>	ation – Com h. Magnetic C and DC s full wave I power supp s: Pneumation ating mecha Ltd, New De cGraw Hill, N e Process	muta ampl servo palan y. Hy c pov nism	tion a ifiers: ampl ced n /drauli ver su - Dir 2008.	nd arma ifiers – I nodulato c valves ipply – ection cc	ture reaction 9 connected Performand r- Amplitud 9 Spool typ Compress ontrol valve Total:4

CO1			working a gular disp			of mecha	anical cor	nponent	s used f	or		Арр	olying (K3	3)
CO2			working gular disp			of electr	ic mecha	nical co	mponen	ts used fo	or	Арр	olying (K3	3)
CO3	identi	fy the sui	table act	uators u	sed for c	losed loc	p contro	system	applicat	tions		App	olying (Ka	3)
CO4	recog	nize the	working	and appl	ications	of amplif	ers used	for com	posite s	ystems		Ар	olying(K3	3)
CO5		e the wo htrol appl		l applicat	ions of p	oneumati	c and hy	draulic co	ompone	nts used		Арр	olying (K3	3)
				N	/apping	of COs	with Pos	and PS	SOs					
COs/Pos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	P011	PO12	PSO1	PSO2
CO1	3	2	1	1	1					1			3	3
CO2	3	2	1	1	1					1			3	3
CO3	3	2	1	1	1					1			3	3
CO4	3	2	1	1	1					1			3	3
CO5	3	2	1	1	1					1			3	3

		ASSESSI	MENT PATTER	N – THEORY			
Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	30	30	40				100
CAT2	30	30	40				100
CAT3	30	30	40				100
ESE	20	20	60				100
* ±3% may be var	ried (CAT 1, 2 & 3 –	50 marks & ESE – 1	00 marks)	· · ·			

		22EIE13 - FIBER OPTICS AND LASER I	NSTRUM	MENTS				
-	amme &	B.E. & Electronics and Instrumentation Engineering	Sem.	Category	L	т	Р	Credit
Branc							_	
Prerec	luisites	Nil	7	PE	3	0	0	3
Pream	ble	The course will enable the students to learn about basic cor course will provide students with adequate knowledge about holography and medical applications of lasers.						
Unit –		Optical Fibers and their Properties:						9
technic scatter splices	ues – Tran ing losses, l , Fiber conn		erial Abs	orption losse	es in	silica	a glass	s fibers, Linear onnection: Fiber
Unit –		Industrial Applications of Optical Fibers:						9
		r fundamentals – Intensity-modulated sensors – Phase-modulated sensors – Pressure sensors – Magnetic and electric field						
Unit –		Laser Fundamentals:						9
operati	on of lasers	ons: Introduction, The two-level system, The three-level la s: Q-switching, Mode locking – Properties of lasers: Laser ty practices and standards.						
Unit –		Industrial Applications of Lasers:						9
measu	rement – La	ications in material processing: Laser welding, hole drilling, la aser interferometry: Homodyne and heterodyne interferomet scanner – Applications for surface treatment: Hardening, glazi	ry – Vel	ocity measu	reme	nt –	Lasers	
Unit –		Hologram and Medical Applications:						9
hologra mecha	aphy: Holog	graphy: Formation of holograms, The holographic process graphic interferometry – Light and matter: Reflection an dical applications of lasers: Lasers in ophthalmology, Lasers ir ogy.	d refrac	tion, Absorp	otion,	Sca	attering	– Interaction
								Total:45
TEXT	BOOK:							
1.	John.M. Se 2014 for U	enior, "Optical Fibre Communication – Principles and Practice' nit 1.	", 3 <sup>rd</sup> Edi	ition, Pearso	n Edi	ucatio	n India	a, New Delhi,
2.		rohn, Trevor W. MacDougall, & Alexis Mendez, "Fiber Optic S s, Bellingham, 2015 for Unit 2.	ensors: I	Fundamental	s and	d App	licatio	ns", 4 <sup>th</sup> Edition,
3.	Thyagaraja	an K, Ajoy Ghatak, "Lasers: Fundamentals and Applications' 2 2011 for Units 3, 4 & 5.	<sup>nd</sup> Editio	on, Springer	Scier	nce &	Busin	ess Media,
REFE	RENCES:							
1.	John F. Re	ady, "Industrial Applications of Lasers", 2 <sup>nd</sup> Edition, Academic	c Press,	San Diego, 1	997.			
2.		Niemz, "Laser Tissue Interaction: Fundamentals and Applicat itzerland, 2019.	ions", 4 <sup>th</sup>	Edition, Spi	ringe	r Scie	ence ar	nd Business

		UTCO		urse, the	stude	nts will I	be able	to						BT Map (Highest	
CO1	infe	r about	the bas	ics of op	tical fib	res							U	Inderstand	ding(K2)
CO2	use	fibre o	ptic sen	sors for v	various	industria	l applica	ations						Applying	g(K3)
CO3	inte	rpret th	e workii	ng of var	ious typ	es of las	er sour	ces					U	Inderstand	ding(K2)
CO4				sed instru mentatior								es apply the		Applying	g(K3)
CO5				tions of l			•	•						Applying	g(K3)
						Ма	pping o	f COs v	with Po	os and F	SOs				
COs/F	os	P01	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO	1	3	1											2	2
CO2	2	3	2	1	1	1								3	3
CO	3	3	1											2	2
CO4	4	3	2	1	1	1								3	3
CO	5	3	2	1	1	1								3	3
1 – Sli	ght, 2	2 – Mod	erate, 3	– Subst	antial, E	3T- Blooi	m's Tax	onomy							1
						AS	SESSM	ENT PA	TTER	N – THE	ORY				
	t / Blo atego	oom's ory*	Rei	member (K1) %	ing l	Jndersta (K2)		Apply (K3)		Analyz (K4) 9		Evaluating (K5) %		ing (K6) %	Total %
	CAT	1		30		40		30	)						100
	CAT	2		30		40		30	)						100
	CAT	3		30		40		30	)						100
	ESE	=		30		40		30	)						100

Programme &		<b>6</b>	Cata		-	-	0
Branch	B.E. & Electronics and Instrumentation Engineering	Sem.	Category	L	Т	Ρ	Credit
Prerequisites	Nil	7	PE	3	0	0	3
Preamble	To impart knowledge on wireless technology for instrument To provide adequate technical information on power source						
Unit – I	Wireless Instrumentation Technology:						9
communication p	struments and Instrumentation: Measurement systems – Mu rotocols – RF interfaces and examples – Networks of wi stem – Communication subsystem – Power subsystems – Sen	reless ins	truments – S	Wire Sens	eless or no	instru ode c	uments an omponents
Unit – II	Powering Autonomous sensors:						9
instruments – En Thermal energy h values.	sors – Ambient energy sources and transducers – Energy sergy harvesting: Solar and wind energy harvesting, RF ene arvesting – Energy management techniques – Calculation fo	rgy harves	sting, Energy	harv	/estir	g froi	m vibratior SSI and LC
Unit – III	Wireless Systems/Standards for Automation:						9
Scope - Working	Protocol stack – Network components – Addressing control – C group of ISA 100 – Features – Sensor classes – System						troduction
Scope – Working Comparison betwee Unit – IV	group of ISA 100 – Features – Sensor classes – System een ISA100.11a and WHART protocol stacks. Design of Wireless Devices and LoRa:	configura	tion and arch	itect	ure d	of ISA	troduction 100.11a 9
Scope – Working Comparison betw Unit – IV Wireless sensor a Industrial wireless	group of ISA 100 – Features – Sensor classes – System een ISA100.11a and WHART protocol stacks.	configura sensors -	tion and arch	ay se	ure o	of ISA s and	troduction 100.11a 9 networks
Scope – Working Comparison betw Unit – IV Wireless sensor a Industrial wireless Introduction – Cor	group of ISA 100 – Features – Sensor classes – System een ISA100.11a and WHART protocol stacks. <b>Design of Wireless Devices and LoRa:</b> and instrument network design – Wireless integrated network networks and automation. nmunication Methods – Difference between LoRa and LoRaW	configura sensors -	tion and arch	ay se	ure o	of ISA s and	troduction 100.11a 9 networks
Scope – Working Comparison betw Unit – IV Wireless sensor a Industrial wireless Introduction – Cor Unit – V Application specif and instrument ne	group of ISA 100 – Features – Sensor classes – System een ISA100.11a and WHART protocol stacks. Design of Wireless Devices and LoRa: and instrument network design – Wireless integrated network networks and automation.	configura sensors - AN – LoRa msors and tal applica	tion and arch Plug-and-pla aWAN archite instruments - itions – Radio	ay se cture - Ind	ensor ensor	of ISA s and pRaW.	troduction 100.11a 9 networks AN classes 9
Scope – Working Comparison betw Unit – IV Wireless sensor a Industrial wireless Introduction – Cor Unit – V Application specif and instrument ne	group of ISA 100 – Features – Sensor classes – System         een ISA100.11a and WHART protocol stacks.         Design of Wireless Devices and LoRa:         and instrument network design – Wireless integrated network         networks and automation.         nmunication Methods – Difference between LoRa and LoRaW         Wireless Sensor and Instrument Applications:         ic wireless sensors and instruments – Commercial wireless sensors         etworks – Wireless human health monitoring and environment	configura sensors - AN – LoRa msors and tal applica	tion and arch Plug-and-pla aWAN archite instruments - itions – Radio	ay se cture - Ind	ensor ensor	of ISA s and pRaW.	troduction 100.11a 9 networks AN classes 9 eless senso
Scope – Working Comparison betw Unit – IV Wireless sensor a Industrial wireless Introduction – Cor Unit – V Application specif and instrument ne Consumer produc	group of ISA 100 – Features – Sensor classes – System         een ISA100.11a and WHART protocol stacks.         Design of Wireless Devices and LoRa:         and instrument network design – Wireless integrated network         networks and automation.         nmunication Methods – Difference between LoRa and LoRaW         Wireless Sensor and Instrument Applications:         ic wireless sensors and instruments – Commercial wireless sensors         etworks – Wireless human health monitoring and environment	configura sensors - AN – LoRa msors and tal applica	tion and arch Plug-and-pla aWAN archite instruments - itions – Radio	ay se cture - Ind	ensor ensor	of ISA s and pRaW.	troduction 100.11a 9 networks AN classes 9 eless senso ntification
Scope – Working Comparison betw Unit – IV Wireless sensor a Industrial wireless Introduction – Cor Unit – V Application specif and instrument ne Consumer produc	group of ISA 100 – Features – Sensor classes – System         een ISA100.11a and WHART protocol stacks.         Design of Wireless Devices and LoRa:         and instrument network design – Wireless integrated network         networks and automation.         nmunication Methods – Difference between LoRa and LoRaW         Wireless Sensor and Instrument Applications:         ic wireless sensors and instruments – Commercial wireless sensors         etworks – Wireless human health monitoring and environment	configura sensors - AN – LoRa msors and tal applica Agriculture	tion and arch Plug-and-pla aWAN archite instruments - tions – Radio	ay se cture - Ind	ure o ensor e – Lo lustria quen	of ISA s and bRaW. al wire cy ide	troduction 100.11a 9 networks AN classes 9 eless senso ntification Total:4
Scope – Working Comparison betw Unit – IV Wireless sensor a Industrial wireless Introduction – Cor Unit – V Application specif and instrument ne Consumer produc TEXT BOOK: 1. John G. V Francis G	group of ISA 100 – Features – Sensor classes – System         een ISA100.11a and WHART protocol stacks.         Design of Wireless Devices and LoRa:         and instrument network design – Wireless integrated network         networks and automation.         nmunication Methods – Difference between LoRa and LoRaW         Wireless Sensor and Instrument Applications:         ic wireless sensors and instruments – Commercial wireless setworks – Wireless human health monitoring and environments and other applications – Applications in Transportation and Applications and Appl	configura sensors - AN – LoRa msors and tal applica Agriculture	tion and arch Plug-and-pla aWAN archite instruments - tions – Radio	ay se cture - Ind	ure o ensor e – Lo lustria quen	of ISA s and bRaW. al wire cy ide	troduction 100.11a 9 networks AN classes 9 eless senso ntification Total:4
Scope – Working Comparison betw Wireless sensor a Industrial wireless Introduction – Cor Unit – V Application specif and instrument ne Consumer produce TEXT BOOK: 1. John G. V Francis G REFERENCES: 1. Subhas C Business	group of ISA 100 – Features – Sensor classes – System         een ISA100.11a and WHART protocol stacks.         Design of Wireless Devices and LoRa:         and instrument network design – Wireless integrated network         networks and automation.         nmunication Methods – Difference between LoRa and LoRaW         Wireless Sensor and Instrument Applications:         ic wireless sensors and instruments – Commercial wireless setworks – Wireless human health monitoring and environments and other applications – Applications in Transportation and Applications in Transportation and Applications, and Sensoroup, LLC, Boca Raton, Florida, 2017         Chandra Mukhopadhyay, "Smart Sensors, Measurement and In Media, Heidelberg, Germany, 2013	configura sensors - AN – LoRa msors and tal applica Agriculture	tion and arch Plug-and-pla aWAN archite instruments - tions – Radio 	ay sectored at the sectored at	ure ( ensor ) → – Lo lustria quen CRC	of ISA s and oRaW. al wire cy ide	troduction 100.11a 9 networks AN classes 9 eless senso ntification Total:4 s - Taylor Science &
Scope – Working Comparison betw Wireless sensor a Industrial wireless Introduction – Cor Unit – V Application specif and instrument ne Consumer produce TEXT BOOK: 1. John G. V Francis G REFERENCES: 1. Subhas C Business	group of ISA 100 – Features – Sensor classes – System         een ISA100.11a and WHART protocol stacks.         Design of Wireless Devices and LoRa:         and instrument network design – Wireless integrated network         networks and automation.         nmunication Methods – Difference between LoRa and LoRaW         Wireless Sensor and Instrument Applications:         ic wireless sensors and instruments – Commercial wireless setworks – Wireless human health monitoring and environments and other applications – Applications in Transportation and Applications in Transport and Applications in Transpor	configura sensors - AN – LoRa msors and tal applica Agriculture	tion and arch Plug-and-pla aWAN archite instruments - tions – Radio 	ay sectored at the sectored at	ure ( ensor ) → – Lo lustria quen CRC	of ISA s and oRaW. al wire cy ide	troduction 100.11a 9 networks AN classes 9 eless senso ntification Total:4 s - Taylor Science &

		UTCON	-	rse, the s	student	s will b	e able to	0						BT Mapp ighest Le		
CO1	ider	ntify diff	erent ins	trumenta	ation sys	tems ar	nd funda	mentals	s of wire	eless teo	hnology		Und	erstandin	g (K2)	
CO2	indi	cate the	e power :	sources a	and ene	rgy stora	age unit	s used f	for auto	nomous	sensors		Und	erstandin	g (K2)	
CO3	recognize the different wireless protocols and network standards for wireless instruments									ments	Understanding (K2)					
CO4	illus	trate de	esign cor	ncepts ar	nd proce	dure for	· wireles	s devic	es and l	LoRA			Und	Understanding (K2)		
CO5	exp	lore the	various	applicati	ons of v	vireless	sensor a	and inst	rument	system	s and net	works	Und	erstandin	g (K2)	
						Марр	ing of C	COs wit	h POs a	and PS	Os					
COs/F	POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	
		2	0			1	1		1	1	1			0	<u> </u>	

C 4 7	- 4		45		05		1						400
Test / Bl Categ		Re	memberir (K1) %	ng l	Understa (K2)		Applying (K3) %	Analyzi (K4) %		valuating (K5) %	Creatin	g (K6) %	Total %
					ASSE	SSMEN	IT PATTER	N - THEOR	RY .				
1 – Slight, 2	2 – Mode	erate, 3 -	<ul> <li>Substan</li> </ul>	tial, B	T- Bloom	i's Taxor	nomy						
CO5	3	2	1	1	1							2	2
CO4	3	2										2	2
CO3	3	2	1	1	1							2	2
CO2	3	2										2	2
CO1	3	2										2	2

Category*	(K1) %	(K2) %	(K3) %	(K4) %	(K5) %	Creating (K6) %	Total %
CAT1	15	85					100
CAT2	15	85					100
CAT3	15	85					100
ESE	10	90					100
* ±3% may be varied	(CAT 1, 2 & 3 – 50	marks & ESE – 100	) marks)				

	22EIE15 INSTRUMENTATION TECHNIQUES	N AGRICU	LIURE				
Programme & Branch	B.E. & Electronics and Instrumentation Engineering	Sem.	Category	L	т	Р	Credit
Prerequisites	Transducers Engineering/Sensors and Transducers	7	PE	3	0	0	3
Preamble	To discuss the sensing and automation technology associate	d with agric	ulture.				
Unit – I	Necessity of Instrumentation:	Ŭ					9
	umentation & control for agriculture and food processing require ic Review- Areas of Concern. Information, Interpretation and Ins Characteristics.						
Unit – II	Agri Transducers						9
transducer, Silicon	d – Conventional and Silicon transducers, Capacitive gauges, S n Pressure Transducer. Grain Moisture transducers, soil moisture Intelligent Sensors.						
Unit – III	Automation in Agriculture						9
based Soil Nutrier Preparation of sc monitoring.	ased Grain moisture measurement- Introduction, Sensing Me at Estimation Systems- Soil nutrients and their role, collection of s il extract for estimation of N,P,K and S, I/O requirement Anal facing of agri sensors with Microcontroller.	samples, so	il nutrient esti	matio	n, sei	nsing	mechanism.
Unit – IV	Drip Irrigation and Precision Agriculture						9
Precision: Introdu	ors, Hardware block Schematic, system operation, I/O Requirem ction, need for precision agriculture. Subsystem and component ure status – Working Philosophy.					unica	tion System.
Unit – V	Green House cultivation:						9
structures/contain	sification of greenhouse- Orientation of Greenhouse / Poly hers in green house production- Environmental factors influence rigation and fertigation systems greenhouse cultivation- Problem	cing greenł	ouse cultivat	ion- I	Media	n prep	
							Total:45
TEXT BOOK:							
1. Krishna	Kant , "Microprocessor Based Agri Instrumentation", 1 <sup>st</sup> Edition,	PHI Private	Limited, New	Delhi	, 201	0.	
REFERENCES:							

Greenhouse Cultivation, Tamilnadu Agritech Portal. http://agritech.tnau.ac.in/horticulture/horti\_Greenhouse%20cultivation.html

Sidney Walter Reginald Cox, Filby D E, "Instrumentation in Agriculture", Lockwood Publishers, UK, 2011.

1.

2.

COURS On con				se, the s	tudents	will be a	able to							BT Map (Highest				
CO1	ex	plain the	e necess	ity of inst	rumenta	tion for a	gricultur	re					l	Understanding (K2)				
CO2	far	niliarize	with the	Soil para	meters	and trand	ducers ir	n agricul	tural in	strument	tation		l	Jnderstand	ling (K2)			
CO3	Illu	strate th	ne techn	iques of a	igricultui	re using	Micropro	ocessor	and SC	ADA				Applying	g(K3)			
CO4	Ou	Itline the	e fundam	nentals of	Drip Irr	igation a	nd Preci	ision Ag	riculture	Э			l	Jnderstand	ling (K2)			
CO5	Uti	lize the	concept	s of instr	uments i	in Green	house c	cultivatio	n				l	Jnderstand	ling (K2)			
						Марр	oing of (	COs wit	h Pos a	and PSC	Ds							
COs/P	os	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	P010	PO11	P012	PSO1	PSO2			
CO1		3	1											2	2			
CO2		3	1											2	2			
CO3	5	3	2	1	1	1								3	3			
CO4		3	1											2	2			
CO5		3	1											2	2			
1 – Slig	ht, 2	– Mode	erate, 3 -	- Substan	tial, BT-	Bloom's	Taxono	my										
						ASSE	ESSMEN		TERN -		RY							
	: / Blo atego	oom's ory*	Re	memberi (K1) %	ng l	Jndersta (K2)		Apply (K3)		Analyz (K4) 9		Evaluating (I %		Creating (K6) %	Total %			
	CAT	1		30		70									100			
	CAT	2		20		60		20	)						100			
	CAT	3		40		60									100			
	ESE	Ξ		20		60		20	)						100			
* ±3% r	may b	oe varie	d (CAT 1	1,2&3-	50 mark	ks & ESE	E – 100 r	narks)	I									

Branc	amme& h	B.E. & Electronics and Instrumentation Engineering	Sem.	Category	L	т	Р	Credit
Preree	quisites	Nil	7	PE	3	0	0	3
Pream	ble	This course will provide the required information for safeti identification and control. It also discusses the risk analysis designs.						
Unit –	I	Safety Management:						9
Tolera Elimin	nce/Accepta ated from Bi	ty Culture – Individual Risk, Societal Risk and Risk Popula ince and Risk Matrix – Safeguards. Toxicology: How Toxicants ological Organisms –Effects of Toxicants on Biological Organis	s Enter Bio					oxicants ar
Unit –		Fires and Explosions:						9
Deton	ation and D	<ul> <li>Distinction between Fires and Explosions – Ignition Energy eflagration – Confined Explosions. Concepts to Prevent F Ventilation – Sprinkler Systems.</li> </ul>	gy – Autoi ires and I	gnition – Ign Explosions: I	ition nertii	Soui ng: \	ces. /acuu	Explosions m Purging
Unit –	~ ~	Hazards Identification and Evaluation:						9
		zard Identification – Hazards identification and risk assessn - Hazards and Operability Studies – Case study: HAZOP Stud						Checklists
Unit –		Risk Analysis and Assessment:						9
Analys	sis – Relatior	lity Theory – Event Trees– Fault Trees – Bow-Tie Diagrams- ship between Fault Trees and Event Trees.	- Quantita	tive Risk Ana	lysis	– La	iyer o	
Unit –		Solid Waste Management:						9
Electri		ategies – Safe Operating Procedures – Safe Work Practices - Car Loading Explosion – Explosion in a Centrifuge – Duct Sy Filter.						
								Total:4
	BOOK:							
техт		Crowl, & Joseph F Louvar, "Chemical Process Safety (Fundam ).	entals with	Applications	)", 4 <sup>t</sup>	<sup>h</sup> Ed	ition,	Pearson
<b>TEXT</b> 1.	India, 202							
1.	RENCES:							
1.	RENCES:	ota, "Industrial Safety and Environment', 2 <sup>nd</sup> Edition, Laxmi Pu	blication (I	) Ltd., India,	201	5.		

		UTCON		rse, the	student	s will be	e able to	)						BT Map Highest I	
CO1	outl	ine the	fundame	entals of	safety n	nanagem	ent and	toxicol	ogy				Ur	nderstand	ing (K2)
CO2	inte	rpret the	e conce	ots of fire	s and e	xplosion	s and pr	eventin	g fires	and exp	losions		Ur	nderstand	ing (K2)
CO3	sum	nmarize	the met	hods of h	azard i	dentificat	tion/ eva	luation					Ur	nderstand	ing (K2)
CO4	cho	ose sui	table risl	< analysis	s and as	sessme	nt techn	iques						Applying	(K3)
CO5	inte	grate va	arious sa	afety stra	tegies, p	orocedur	es, and	designs	s involv	ed in pro	ocess inc	lustries		Applying	(K3)
						Маррі	ng of C	Os witł	n Pos a	and PSC	Ds				
COs/I	Pos	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO	1	3	1				2		1					2	2
CO	2	3	1				2		1					2	2
CO	3	3	1				2		1					2	2
CO	4	3	2	1	1	1	2		1					3	3
CO	5	3	2	1	1	1	2		1					3	3
1 – Sli	ght, 2	– Mode	erate, 3 ·	<ul> <li>Substa</li> </ul>	ntial, B1	- Bloom	's Taxor	nomy							
						ASSE	SSMEN	Τ ΡΑΤΤ	ERN -		RY				
	t / Blo atego	oom's ory*	Re	member (K1) %	ing l	Jndersta (K2)		Apply (K3)	-	Analyz (K4) 9	•	Evaluating (K5) %		reating K6) %	Total %
	CAT	1		30		70									100
	CAT	2		30		70									100
	CAT	3		20		40		40	)						100

30

100

50

ESE

20

\* ±3% may be varied (CAT 1, 2 & 3 - 50 marks & ESE - 100 marks)

# 22EIE17 - INSTRUMENTATION AND CONTROL IN PROCESS INDUSTRIES

Program Branch		B.E. & Electronics and Instrumentation Engineering	Sem.	Category	L	т	Ρ	Credit
Prerequ	uisites	Industrial Instrumentation, Process Control	7	PE	3	0	0	3
Preamb	le	This course provides the concepts of various processes i products, pharmaceutical and fermentation. This course techniques involved in such units.						
Unit – I		Basics of Process Measurements:						9
uncertai	inty – Meas	crete measurement – Continuous vs. Sampled measuremen surement decision risk –Calibration – Measurement device c muunications – Smart transmitters.						
Unit – I	I	Instrumentation and Control in Steel Industries:						9
Basic C	Dxygen Furr	n in diagrammatic and functional block details – Raw materials nace (BOF) – Electric Furnace (EF) – Open Hearth Furnace old level control system in strand casting operation.						
Unit – I	11	Instrumentation and Control in Glass Industries:						9
		nposition of glass – Glassmaking process – Level measure		ectrical, Pneu				
		surement: Radiation pyrometer – Furnace pressure measurem t glass manufacturing – Control of glass melting furnaces – Ele					matic	inspection
in conta Unit – I	iner and fla V	t glass manufacturing – Control of glass melting furnaces – Ele Instrumentation and Control in Dairy Industries:	ectric boost	er melting co	ntrol	S		9
in conta Unit – I Process Homoge	iiner and fla V s descriptio enizer – Do	t glass manufacturing – Control of glass melting furnaces – Ele Instrumentation and Control in Dairy Industries: n in diagrammatic and functional block details – Plate he oppler ultrasonic flow meter – Control system in HTST pas- aning in Place (CIP) – Refrigeration system – Metal detection s	ectric boost eat exchar steurizer-	er melting co nger – Sing Temperature	ntrol	s tage	and	<b>9</b> Two stage
in conta Unit – I Process Homoge Automa Unit – V	iner and fla V s descriptio enizer – Do tion for Clea /	t glass manufacturing – Control of glass melting furnaces – Elec Instrumentation and Control in Dairy Industries: n in diagrammatic and functional block details – Plate he oppler ultrasonic flow meter – Control system in HTST pas- aning in Place (CIP) – Refrigeration system – Metal detection s Instrumentation and Control in Pharmaceutical and Ferr	ectric boost eat exchar steurizer- system nentation	er melting con nger – Sing Temperature	ntrol le st cor	s tage itrol i	and n spr	9 Two stage ay dryer
in conta Unit – I Process Homoge Automa Unit – V Descrip Temper	tiner and fla V s descriptio enizer – Do tion for Clea / tion of the	t glass manufacturing – Control of glass melting furnaces – Ele Instrumentation and Control in Dairy Industries: In in diagrammatic and functional block details – Plate he oppler ultrasonic flow meter – Control system in HTST pass aning in Place (CIP) – Refrigeration system – Metal detection s Instrumentation and Control in Pharmaceutical and Ferre penicillin production process – Flow measurement – Le surement – Fermentation control system – Continuous ferm	ectric boost eat exchar steurizer- system nentation evel measu	er melting co nger – Sing Temperature Industries: urement – F	ntrol le si cor	s age itrol i	and <sup>*</sup> n spr meas	9 Two stage ay dryer - 9 urement -
in conta Unit – I Process Homoge Automa Unit – V Descrip Temper	tiner and fla V s descriptio enizer – Do tion for Clea / tion of the rature meas	t glass manufacturing – Control of glass melting furnaces – Ele Instrumentation and Control in Dairy Industries: In in diagrammatic and functional block details – Plate he oppler ultrasonic flow meter – Control system in HTST pass aning in Place (CIP) – Refrigeration system – Metal detection s Instrumentation and Control in Pharmaceutical and Ferre penicillin production process – Flow measurement – Le surement – Fermentation control system – Continuous ferm	ectric boost eat exchar steurizer- system nentation evel measu	er melting co nger – Sing Temperature Industries: urement – F	ntrol le si cor	s age itrol i	and <sup>*</sup> n spr meas	9 Two stage ay dryer 9 urement control
in conta Unit – I Process Homoge Automa Unit – V Descrip Temper	iner and fla V s descriptio enizer – Do tion for Clea / tion of the rature meas ige purging BOOK:	t glass manufacturing – Control of glass melting furnaces – Ele Instrumentation and Control in Dairy Industries: In in diagrammatic and functional block details – Plate he oppler ultrasonic flow meter – Control system in HTST pass aning in Place (CIP) – Refrigeration system – Metal detection s Instrumentation and Control in Pharmaceutical and Ferre penicillin production process – Flow measurement – Le surement – Fermentation control system – Continuous ferm control.	ectric boost eat exchar steurizer- system nentation vel measu entation -	er melting con nger – Sing Temperature Industries: urement – F pH control	ntrol cor Press – T	s age trol i sure empe	and n spr meas erature	9 Two stage ay dryer - 9 urement -
in conta Unit – I Process Homoge Automa Unit – V Descrip Temper Centrifu	iner and fla V s descriptio enizer – Do tion for Clea / tion of the rature meas ige purging BOOK:	t glass manufacturing – Control of glass melting furnaces – Ele Instrumentation and Control in Dairy Industries: In in diagrammatic and functional block details – Plate he oppler ultrasonic flow meter – Control system in HTST pas- aning in Place (CIP) – Refrigeration system – Metal detection s Instrumentation and Control in Pharmaceutical and Ferre penicillin production process – Flow measurement – Le surement – Fermentation control system – Continuous ferm control.	ectric boost eat exchar steurizer- system nentation vel measu entation -	er melting con nger – Sing Temperature Industries: urement – F pH control	ntrol cor Press – T	s age trol i sure empe	and n spr meas erature	9 Two stage ay dryer - 9 urement - e control -
in conta Unit – I' Process Homoge Automa Unit – V Descrip Temper Centrifu TEXT B	iner and fla V s descriptio enizer – Do tion for Clea / tion of the ature measure ige purging SOOK: Liptak B.G	t glass manufacturing – Control of glass melting furnaces – Ele Instrumentation and Control in Dairy Industries: In in diagrammatic and functional block details – Plate he oppler ultrasonic flow meter – Control system in HTST pas- aning in Place (CIP) – Refrigeration system – Metal detection s Instrumentation and Control in Pharmaceutical and Ferre penicillin production process – Flow measurement – Le surement – Fermentation control system – Continuous ferm control.	ectric boost eat exchar steurizer- system nentation vel measu entation -	er melting con nger – Sing Temperature Industries: urement – F pH control	ntrol cor Press – T	s age trol i sure empe	and n spr meas erature	9 Two stage ay dryer - 9 urement - e control -
in conta Unit – I Process Homoge Automa Unit – V Descrip Temper Centrifu TEXT B	iner and fla V s descriptio enizer – Do tion for Clea / tion of the rature meas ige purging BOOK: Liptak B.G (Digitized 2 ENCES:	t glass manufacturing – Control of glass melting furnaces – Ele Instrumentation and Control in Dairy Industries: In in diagrammatic and functional block details – Plate he oppler ultrasonic flow meter – Control system in HTST pas- aning in Place (CIP) – Refrigeration system – Metal detection s Instrumentation and Control in Pharmaceutical and Ferre penicillin production process – Flow measurement – Le surement – Fermentation control system – Continuous ferm control.	ectric boost eat exchain steurizer- system nentation evel measurementation -	er melting co nger – Sing Temperature Industries: urement – F pH control Company, Bc	ntrol le si cor Press – T	sure empe	and n spr meas erature	9 Two stage ay dryer - 9 urement - e control -
in conta Unit – I Process Homoge Automa Unit – V Descrip Temper Centrifu TEXT B 1.	iner and fla V s descriptio enizer – Do tion for Clea / tion of the ature measure uge purging BOOK: Liptak B.G (Digitized 2 ENCES: Cecil Smith	t glass manufacturing – Control of glass melting furnaces – Ele Instrumentation and Control in Dairy Industries: In in diagrammatic and functional block details – Plate he oppler ultrasonic flow meter – Control system in HTST pass aning in Place (CIP) – Refrigeration system – Metal detection s Instrumentation and Control in Pharmaceutical and Ferr penicillin production process – Flow measurement – Le surement – Fermentation control system – Continuous ferm control.	ectric boost eat exchar iteurizer- system nentation entation - lton Book ns, New Je	er melting co nger – Sing Temperature Industries: urement – F pH control Company, Bc	ntrol le si cor Press – T	sure sure empe	and n spr meas erature	9 Two stage ay dryer 9 urement control

	mplet	ion of t	IES: he cour	se, the st	udent	s will be	able to							BT Mapp (Highest Lo	
CO1	expl	lain the	basics c	f process	meası	urements	in variou	us indus	tries				L	Inderstandir	ig (K2)
CO2	buile	d the ins	strument	ation and	contro	l techniqu	ies invol	ved in i	ron and	d steel ir	dustry			Applying (	K3)
CO3	dev	elop the	instrum	entation a	nd cor	ntrol syste	ems in gl	ass ind	ustry					Applying (	K3)
CO4	app	ly the va	arious in	strumenta	tion ar	nd control	scheme	es in dai	ry indu	stry				Applying (	K3)
CO5	inte	rpret the	e knowle	dge on in:	strume	nts used	in pharn	naceutio	al and	ferment	ation inc	lustry	ι	Inderstandir	ig (K2)
						Mappir	ng of CC	)s with	Pos a	nd PSO:	S				
COs/F	os	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO	1	3	1											2	2
CO	2	3	2	1	1	1								3	3
CO	3	3	2	1	1	1								3	3
CO	4	3	2	1	1	1								3	3
CO	5	3	1											2	2
1 – Sliç	ght, 2	– Mode	rate, 3 -	- Substant	ial, BT	- Bloom's	Taxonc	omy							
						ASSES	SMENT	PATTE	ERN –	THEOR	Y				
	t / Blo atego	oom's ory*	Re	memberi (K1) %	ng	Understa (K2)		Apply (K3)		Analyz (K4) 9		Evaluating (K5) %	j Cr	eating (K6) %	Total %
	CAT	1		20		50		30	)						100
	CAT	2		10		40		50	)						100
	CAT	3		10		40		50	)						100
	ESE	=		10		40		50	)						100

	(Common to All BE/BTecl	h branches)					
Programme & Branch	All BE/BTech branches	Sem.	Category	L	т	Ρ	Credit
Prerequisites	Nil	7	PE	3	0	0	3
Preamble	This course deals with quality concepts and Total Q quality for customer perspective. It also deals with t ISO standards						
Unit – I	Quality Concepts and Principles						9
Studies - Elemer	ality - Dimensions of Quality - Quality Planning - Quants / Principles of TQM - Historical Review – Leadership ng – Importance - Case Studies - Deming Philosophy lures.	- Qualities / Habits	- Quality Cour	ncil -	Quali	ty Sta	atements
Unit – II	TQM-Principles and Strategies						9
Supplier Rating	- PDSA Cycle - 5S - Kaizen, Supplier Partners - Relationship Development, Performance Measures			- 3u	phile	50	lection
	Control Charts for Process Control					<b>-</b> 1	9
Basic Seven To Dispersion, Popu	Control Charts for Process Control ols of Quality and its Role in Quality Control, Statistic lation and Sample - Normal Curve - Control Charts for V	cal Fundamentals	- Measures o				ency an
Basic Seven To Dispersion, Popu Introduction to Si	Control Charts for Process Control ols of Quality and its Role in Quality Control, Statistic lation and Sample - Normal Curve - Control Charts for V	cal Fundamentals	- Measures o				ency an
Basic Seven To Dispersion, Popu Introduction to Si <b>Unit – IV</b> New Seven Too (HOQ) Construct (DOE), Total Pro	Control Charts for Process Control         ols of Quality and its Role in Quality Control, Statistic         lation and Sample - Normal Curve - Control Charts for V         x Sigma.         TQM-Modern Tools         ols of Quality, Benchmarking - Need - Types and Protection - Case Studies, Introduction to Taguchi's Robust         oductive Maintenance (TPM) - Uptime Enhancement, I	cal Fundamentals 'ariables and Attribu ocess, Quality Fun Design - Quality Lu	- Measures o ites - Process iction Deployn oss Function -	Capa nent Des	bility - Hou ign o	- Cas use c f Exp	ency and se Study 9 of Quality periment
Basic Seven To Dispersion, Popu Introduction to Si <b>Unit – IV</b> New Seven Too (HOQ) Construct (DOE), Total Pro Number (RPN) –	Control Charts for Process Control         ols of Quality and its Role in Quality Control, Statistic         lation and Sample - Normal Curve - Control Charts for V         x Sigma.         TQM-Modern Tools         ols of Quality, Benchmarking - Need - Types and Protection - Case Studies, Introduction to Taguchi's Robust	cal Fundamentals 'ariables and Attribu ocess, Quality Fun Design - Quality Lu	- Measures o ites - Process iction Deployn oss Function -	Capa nent Des	bility - Hou ign o	- Cas use c f Exp	ency and se Study 9 of Quality periments
Basic Seven To Dispersion, Popu Introduction to Si <b>Unit – IV</b> New Seven Too (HOQ) Construct (DOE), Total Pro Number (RPN) – <b>Unit – V</b> Need for ISO 9 System - Docun	Control Charts for Process Control         ols of Quality and its Role in Quality Control, Statistic         lation and Sample - Normal Curve - Control Charts for V         x Sigma.         TQM-Modern Tools         ols of Quality, Benchmarking - Need - Types and Protection - Case Studies, Introduction to Taguchi's Robust         oductive Maintenance (TPM) - Uptime Enhancement, It         Process - Case Studies.	cal Fundamentals 'ariables and Attribu ocess, Quality Fun Design - Quality Lu Failure Mode and Quality System – - IATF 16949 - T	- Measures o Ites - Process Inction Deployn oss Function - Effect Analysis Elements - Im L 9000-IEC 17	Capa nent Des s (FM	bility - Hou ign o 1EA)	- Cas use c f Exp - Ris ion c	ency and se Study of Quality periments k Priority 9 of Quality
Basic Seven To Dispersion, Popu Introduction to Si <b>Unit – IV</b> New Seven Too (HOQ) Construct (DOE), Total Pro Number (RPN) – <b>Unit – V</b> Need for ISO 9 System - Docun	Control Charts for Process Control         ols of Quality and its Role in Quality Control, Statistic         lation and Sample - Normal Curve - Control Charts for V         x Sigma.         TQM-Modern Tools         ols of Quality, Benchmarking - Need - Types and Protection - Case Studies, Introduction to Taguchi's Robust         oductive Maintenance (TPM) - Uptime Enhancement, I         Process - Case Studies.         Quality Systems         000 and Other Quality Systems - ISO 9000: 2015 (Denetation - Quality Auditing, Introduction to ISO 14000)	cal Fundamentals 'ariables and Attribu ocess, Quality Fun Design - Quality Lu Failure Mode and Quality System – - IATF 16949 - T	- Measures o Ites - Process Inction Deployn oss Function - Effect Analysis Elements - Im L 9000-IEC 17	Capa nent Des s (FM	bility - Hou ign o 1EA)	- Cas use c f Exp - Ris ion c	ency an se Study of Quality periments k Priorit 9 of Qualit
Basic Seven To Dispersion, Popu Introduction to Si <b>Unit – IV</b> New Seven Too (HOQ) Construc (DOE), Total Pro Number (RPN) – <b>Unit – V</b> Need for ISO 9 System - Docun 20000 - ISO 220	Control Charts for Process Control         ols of Quality and its Role in Quality Control, Statistic         lation and Sample - Normal Curve - Control Charts for V         x Sigma.         TQM-Modern Tools         ols of Quality, Benchmarking - Need - Types and Protection - Case Studies, Introduction to Taguchi's Robust         oductive Maintenance (TPM) - Uptime Enhancement, I         Process - Case Studies.         Quality Systems         000 and Other Quality Systems - ISO 9000: 2015 (Denetation - Quality Auditing, Introduction to ISO 14000)	cal Fundamentals 'ariables and Attribu ocess, Quality Fun Design - Quality Lu Failure Mode and Quality System – - IATF 16949 - T	- Measures o Ites - Process Inction Deployn oss Function - Effect Analysis Elements - Im L 9000-IEC 17	Capa nent Des s (FM	bility - Hou ign o 1EA)	- Cas use c f Exp - Ris ion c	ency and se Study of Quality periment: k Priority 9 of Quality 000 - ISC
Dispersion, Popu Introduction to Si Unit – IV New Seven Too (HOQ) Construct (DOE), Total Pro Number (RPN) – Unit – V Need for ISO 9 System - Docun 20000 - ISO 220 TEXT BOOK:	Control Charts for Process Control         ols of Quality and its Role in Quality Control, Statistic         lation and Sample - Normal Curve - Control Charts for V         x Sigma.         TQM-Modern Tools         ols of Quality, Benchmarking - Need - Types and Pro-         ottom - Case Studies, Introduction to Taguchi's Robust         oductive Maintenance (TPM) - Uptime Enhancement, I         Process - Case Studies.         Quality Systems         000 and Other Quality Systems - ISO 9000: 2015 (Denentation - Quality Auditing, Introduction to ISO 14000 (D) - ISO21001. Process of Implementing ISO - Barriers in         ield Dale H., Besterfield Carol, Besterfield Glen H., Besterfield Carol, Besterfield Glen H., Besterfield Carol, Besterfield Glen H., Besterfield Carol, Besterfield Glen H., Besterfield Carol, Besterfield Glen H., Besterfield Carol, Besterfield Glen H., Besterfield Carol, Besterfield Glen H., Besterfield Carol, Besterfield Glen H., Besterfield Carol, Besterfield Glen H., Besterfield Carol, Besterfield Glen H., Besterfield Carol, Besterfield Glen H., Besterfield Carol, Besterfield Glen H., Besterfield Carol, Besterfield Glen H., Besterfield Carol, Besterfield Glen H., Besterfield Carol, Besterfield Glen H., Besterfield Carol, Besterfield Glen H., Besterfield Carol, Besterfield Carol, Besterfield Glen H., Besterfield Carol, Besterfiel	cal Fundamentals 'ariables and Attribu ocess, Quality Fun Design - Quality Lu Failure Mode and Quality System – - IATF 16949 - T n ISO Implementation	- Measures o Ites - Process Inction Deployn oss Function - Effect Analysis Elements - In L 9000-IEC 17 on.	Capa nent Des s (FM 7025	- Hou ign o 1EA) eentat	- Cas use of f Exp - Ris ion o ) 180	ency and se Study of Quality periments k Priorit 9 of Qualit 000 - ISC Total:4
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Basic Seven To Dispersion, Popu Introduction to Si Unit – IV New Seven Too (HOQ) Construc (DOE), Total Pro Number (RPN) – Unit – V Need for ISO 9 System - Docun 20000 - ISO 220 TEXT BOOK: 1. Besterf "Total C	Control Charts for Process Control         ols of Quality and its Role in Quality Control, Statistic         lation and Sample - Normal Curve - Control Charts for V         x Sigma.         TQM-Modern Tools         ols of Quality, Benchmarking - Need - Types and Pro-         ottom - Case Studies, Introduction to Taguchi's Robust         oductive Maintenance (TPM) - Uptime Enhancement, I         Process - Case Studies.         Quality Systems         000 and Other Quality Systems - ISO 9000: 2015 (Denentation - Quality Auditing, Introduction to ISO 14000 (D) - ISO21001. Process of Implementing ISO - Barriers in         ield Dale H., Besterfield Carol, Besterfield Glen H., Besterfield Carol, Besterfield Glen H., Besterfield Carol, Besterfield Glen H., Besterfield Carol, Besterfield Glen H., Besterfield Carol, Besterfield Glen H., Besterfield Carol, Besterfield Glen H., Besterfield Carol, Besterfield Glen H., Besterfield Carol, Besterfield Glen H., Besterfield Carol, Besterfield Glen H., Besterfield Carol, Besterfield Glen H., Besterfield Carol, Besterfield Glen H., Besterfield Carol, Besterfield Glen H., Besterfield Carol, Besterfield Glen H., Besterfield Carol, Besterfield Glen H., Besterfield Carol, Besterfield Glen H., Besterfield Carol, Besterfield Glen H., Besterfield Carol, Besterfield Carol, Besterfield Glen H., Besterfield Carol, Besterfiel	cal Fundamentals 'ariables and Attribu ocess, Quality Fun Design - Quality Lu Failure Mode and Quality System – - IATF 16949 - T n ISO Implementation	- Measures o Ites - Process Inction Deployn oss Function - Effect Analysis Elements - In L 9000-IEC 17 on.	Capa nent Des s (FM 7025	- Hou ign o 1EA) eentat	- Cas use of f Exp - Ris ion o ) 180	ency an se Study 9 of Qualit beriment k Priorit 9 of Qualit 000 - IS( Total:4
Basic Seven To Dispersion, Popu Introduction to Si Unit – IV New Seven Too (HOQ) Construc (DOE), Total Pro Number (RPN) – Unit – V Need for ISO 9 System - Docun 20000 - ISO 220 TEXT BOOK: 1. Besterf 1. Besterf	Control Charts for Process Control         ols of Quality and its Role in Quality Control, Statistic         lation and Sample - Normal Curve - Control Charts for V         x Sigma.         TQM-Modern Tools         ols of Quality, Benchmarking - Need - Types and Pro-         ottom - Case Studies, Introduction to Taguchi's Robust         oductive Maintenance (TPM) - Uptime Enhancement, I         Process - Case Studies.         Quality Systems         000 and Other Quality Systems - ISO 9000: 2015 (Denentation - Quality Auditing, Introduction to ISO 14000 (D) - ISO21001. Process of Implementing ISO - Barriers in         ield Dale H., Besterfield Carol, Besterfield Glen H., Besterfield Carol, Besterfield Glen H., Besterfield Carol, Besterfield Glen H., Besterfield Carol, Besterfield Glen H., Besterfield Carol, Besterfield Glen H., Besterfield Carol, Besterfield Glen H., Besterfield Carol, Besterfield Glen H., Besterfield Carol, Besterfield Glen H., Besterfield Carol, Besterfield Glen H., Besterfield Carol, Besterfield Glen H., Besterfield Carol, Besterfield Glen H., Besterfield Carol, Besterfield Glen H., Besterfield Carol, Besterfield Glen H., Besterfield Carol, Besterfield Glen H., Besterfield Carol, Besterfield Glen H., Besterfield Carol, Besterfield Glen H., Besterfield Carol, Besterfield Carol, Besterfield Glen H., Besterfield Carol, Besterfiel	cal Fundamentals 'ariables and Attribu Design - Quality Fun Design - Quality Lu Failure Mode and Quality System – - IATF 16949 - Th n ISO Implementation terfield Mary, Urdhwo Dida, 2018.	- Measures o lites - Process action Deployn oss Function - Effect Analysis Elements - In L 9000-IEC 17 on.	Capa nent Des s (FM 7025	- Hou ign o 1EA) eentat	- Cas use of f Exp - Ris ion o ) 180	ency an se Study 9 of Qualit beriment k Priorit 9 of Qualit 000 - IS( Total:4
Basic Seven To         Dispersion, Population         Introduction to Si         Unit – IV         New Seven Too (HOQ) Construct (DOE), Total Pro Number (RPN) –         Unit – V         Need for ISO 9         System - Docun         20000 - ISO 220         TEXT BOOK:         1.         Besterf         1.         Subbur         1.         Subbur	Control Charts for Process Control         ols of Quality and its Role in Quality Control, Statistic         lation and Sample - Normal Curve - Control Charts for V         x Sigma.         TQM-Modern Tools         ols of Quality, Benchmarking - Need - Types and Process of Quality, Benchmarking - Need - Types and Process - Case Studies, Introduction to Taguchi's Robust         oductive Maintenance (TPM) - Uptime Enhancement, I         Process - Case Studies.         Quality Systems         000 and Other Quality Systems - ISO 9000: 2015 (nentation - Quality Auditing, Introduction to ISO 14000 00 - ISO21001. Process of Implementing ISO - Barriers in         ield Dale H., Besterfield Carol, Besterfield Glen H., Best         Quality Management", 5 <sup>th</sup> Edition, Pearson Education, No	cal Fundamentals 'ariables and Attribu Design - Quality Fun Design - Quality Lu Failure Mode and Quality System – - IATF 16949 - Th n ISO Implementation terfield Mary, Urdhy Dida, 2018.	- Measures o utes - Process action Deployn oss Function - Effect Analysis Elements - Im L 9000-IEC 17 on. wareshe Hema	Capa nent Des s (FN nplem 7025	- Hou ign o IEA) eentat - ISC	- Cas	ency an se Study of Qualit beriment k Priorit <b>9</b> of Qualit 000 - IS0 <b>Total:4</b> eRashm

		TCOME n of the	S: course,	the stude	ents will	be able	to						()	BT Mapp lighest Lo	
CO1	dem	onstrate	the evo	lution of	TQM pr	inciples							Un	derstandin	g (K2)
CO2	illust	rate the	principle	es and st	rategies	s of TQN	1						Un	derstandin	g (K2)
CO3	use	control o	charts ar	nd identif	y proce	ss capal	oility of	a proces	s					Applying (	K3)
CO4	appl	y variou	s quality	tools an	d techn	iques in	both m	anufactu	ring and	l service i	ndustry			Applying (	K3)
CO5	choo	ose appr	opriate o	quality st	andards	s and im	plemen	t them in	the res	pective ir	dustry			Applying (	K3)
						Mann	ing of			Ind PSOs					
COs/	POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	POS a	PO9	PO10	PO11	PO12	PSO1	PSO2
CC		2	2				1						1		3
		2	2				1						1		3
CC	)3	2	2				1						1		3
CC	)4	2	2				1						1		3
CC	)5	1	1				1						1		3
<ul> <li>Slig</li> </ul>	ht, 2 –	Modera	ate, 3 –	Substar	itial, BT										
										THEORY					
	/ Bloo tegory			mbering 1) %	Und	derstand (K2) %	•	Applyin (K3) %	-	nalyzing (K4) %		uating 5) %	Creati (K6)		Total %
(	CAT1		2	5		45		30							100
(	CAT2		2	0		40		40							100
(	CAT3		2	5		45		30							100
	ESE		2	0		40		40			1				100
ٔ ±3% ۱	may be	e varied	(CAT 1,	2&3-	50 mark	s & ESE	E – 100	marks)	[					I	

Programme Branch	& B.E. & Electronics and Instrumentation Engineering	Sem.	Category	L	т	Р	Credit
Prerequisites	s Nil	7	PE	3	0	0	3
Preamble	To discuss the concepts of aircraft instruments and c conventional and advanced flight instruments.	ockpit lay	out in mode	ern ai	rcraft a	and de	als with th
Unit – I	Basics of Aircraft and Aircraft Instruments:						9
Instruments a	<ul> <li>Control Surfaces – Forces – Moments and Angle of Attack – land their Layout – Aircraft Display Types – Quantitative and cass Cockpits of Modern Aircraft.</li> </ul>						
Unit – II	Air Data Instruments and Directional Systems:						9
Instruments -	o Air Data Instruments – Pitot pressure and Pitot tube – Type - Air Speed Indicator, Air Data Computer – International Stand gnetic Compass – Earth Magnetic Field – Flux Detector Unit.						
Únit – III	Gyroscopic and Advanced Flight Instruments:						9
Directional G	<ul> <li>Types of Gyro – Conventional Mechanical, Vibrating Gyros, RL yro and limitations – Gyro Horizon – Turn and Bank Indicator – rection Indicators.</li> </ul>	G, FOG - Turn Coo	- Basic Mech rdinator – Sta	anical andby	Attituc	and its le Direc	Properties ctor Indicate
Unit – IV	Engine Instruments and Indicators:						
							9
Tachometer,	<ul> <li>Engine Speed Measurements – Electrical Tacho Generato Hall Effect Sensor – Torque Measurements – Electronic Torque or. Engine Fuel Indicators: Fuel Quantity Indicator.</li> </ul>						ype, Optica
Tachometer, Ratio Indicato Unit – V	<ul> <li>Engine Speed Measurements – Electrical Tacho Generato Hall Effect Sensor – Torque Measurements – Electronic Torque or. Engine Fuel Indicators: Fuel Quantity Indicator.</li> <li>Aircraft Navigation and Safety Warning Systems:</li> </ul>	e Meter –	Pressure Me	easure	ements	– Eng	ype, Optica ine Pressur <b>9</b>
Tachometer, Ratio Indicato <b>Unit – V</b> Introduction – Distance Mea	<ul> <li>Engine Speed Measurements – Electrical Tacho Generato Hall Effect Sensor – Torque Measurements – Electronic Torque or. Engine Fuel Indicators: Fuel Quantity Indicator.</li> </ul>	Meter –	Pressure Me	easure – Prir	ements	– Eng	ype, Optication ine Pressur 9 operation
Tachometer, Ratio Indicato <b>Unit – V</b> Introduction – Distance Mea	<ul> <li>Engine Speed Measurements – Electrical Tacho Generator</li> <li>Hall Effect Sensor – Torque Measurements – Electronic Torque</li> <li>or. Engine Fuel Indicators: Fuel Quantity Indicator.</li> <li>Aircraft Navigation and Safety Warning Systems:</li> <li>Radio Navigation Aids – VHF Omni Directional Range System</li> <li>asuring Equipment, Instrument Landing Systems –Inertial Navigation</li> </ul>	Meter –	Pressure Me	easure – Prir	ements	– Eng	ype, Optica ine Pressur 9 operation
Tachometer, Ratio Indicato <b>Unit – V</b> Introduction – Distance Mea	<ul> <li>Engine Speed Measurements – Electrical Tacho Generator Hall Effect Sensor – Torque Measurements – Electronic Torque or. Engine Fuel Indicators: Fuel Quantity Indicator.</li> <li>Aircraft Navigation and Safety Warning Systems:</li> <li>Radio Navigation Aids – VHF Omni Directional Range Syste asuring Equipment, Instrument Landing Systems –Inertial Naviga tioning System. Air Data Warning Systems.</li> </ul>	Meter –	Pressure Me	easure – Prir	ements	– Eng	ype, Optication operation p Down IN
Tachometer, Ratio Indicato Unit – V Introduction – Distance Mea – Global Posi TEXT BOOK	<ul> <li>Engine Speed Measurements – Electrical Tacho Generator Hall Effect Sensor – Torque Measurements – Electronic Torque or. Engine Fuel Indicators: Fuel Quantity Indicator.</li> <li>Aircraft Navigation and Safety Warning Systems:</li> <li>Radio Navigation Aids – VHF Omni Directional Range Syste asuring Equipment, Instrument Landing Systems –Inertial Naviga tioning System. Air Data Warning Systems.</li> </ul>	Meter – m DME/IL tion Syste	Pressure Me S/INS/GPS m: Principle,	- Prir Gimb	ements	- Engi of VOR nd Stra	ype, Optic ine Pressur operation op Down IN Total:4
Tachometer, Ratio Indicato Unit – V Introduction – Distance Mea – Global Posi TEXT BOOK 1.	Engine Speed Measurements – Electrical Tacho Generator Hall Effect Sensor – Torque Measurements – Electronic Torque or. Engine Fuel Indicators: Fuel Quantity Indicator. Aircraft Navigation and Safety Warning Systems: Radio Navigation Aids – VHF Omni Directional Range Syste asuring Equipment, Instrument Landing Systems –Inertial Naviga tioning System. Air Data Warning Systems.     Systems – Inertial Naviga Nagabhushana S & Sudha L K. "Aircraft Instrumentation and Sys Pvt. Ltd., New Delhi, 2013.	Meter – m DME/IL tion Syste	Pressure Me S/INS/GPS m: Principle,	- Prir Gimb	ements	- Engi of VOR nd Stra	ype, Optic ine Pressur operation op Down IN Total:4
Tachometer, Ratio Indicato Unit – V Introduction – Distance Mea – Global Posi TEXT BOOK 1. REFERENCE	Engine Speed Measurements – Electrical Tacho Generator Hall Effect Sensor – Torque Measurements – Electronic Torque or. Engine Fuel Indicators: Fuel Quantity Indicator. Aircraft Navigation and Safety Warning Systems: Radio Navigation Aids – VHF Omni Directional Range Syste asuring Equipment, Instrument Landing Systems –Inertial Naviga tioning System. Air Data Warning Systems.     Systems – Inertial Naviga Nagabhushana S & Sudha L K. "Aircraft Instrumentation and Sys Pvt. Ltd., New Delhi, 2013.	e Meter – m DME/II tion Syste	Pressure Me S/INS/GPS m: Principle,	- Prir Gimb	ements aciple of alled a	– Eng of VOR nd Stra	ype, Optic ine Pressur operation op Down IN Total:4

COURSE On comple			urse, th	e stude	ents will	be able	e to							apped st Level)
CO1	infer t	he basio	cs of airc	craft an	d aircraft	instrum	ients						Understa	nding(K2)
CO2	discus	ss about	t air data	a instrui	ments an	d direct	ional sy	stems					Understar	nding (K2)
CO3	make	use of g	gyroscop	bes for	advance	d flight i	nstrume	ents					Applyi	ng(K3)
CO4	outline	e the fur	ndament	als of e	engine in	strumen	its and i	ndicat	ors				Understar	nding (K2)
CO5	utilize	the con	icepts of	aircraf	t navigat	ion safe	ty warn	ing sy	stems				Applyi	ng(K3)
					Ма	apping	of COs	with F	os and	PSOs				
COs/Pos	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1											2	2
CO2	3	1											2	2
CO3	3	2	1	1	1								3	3
CO4	3	1											2	2
CO5	3	1	1	1	1								3	3
1 – Slight,	2 – Moc	lerate, 3	8 – Subs	tantial,	BT- Bloc	om's Tax	konomy							
					AS	SESSN		ATTE	RN – THI	EORY				
Test / Bl Categ			nember (K1) %	ing l	Indersta (K2)		Apply (K3)		Analyzi (K4) %		Evaluating	(K5) %	Creating (K6) %	Total %
CAT	1		30		70									100
CAT	2		30		40		30	)						100
CAT	3		30		40		30	)						100
ES	E		30		40		30	)						100
* ±3% may	be vari	ed (CAT	1,2&	3 – 50 i	marks &	ESE – 1	00 mar	ks)						

Programme & Branch	B.E. & Electronics and Instrumentation Engineering	Sem.	Category	L	т	Р	Credit
Prerequisites	Nil	7	PE	3	0	0	3
Preamble	To educate on the basic concepts of data communication, wireless communication.	different i	ndustrial con	nmun	ication	protoco	ls and
Unit – I	Serial communication:						9
standard) - Half-	cation: OSI reference model – Protocols – RS-232 overview duplex operation of the RS-232 interface – Limitations – RS-4 The 20 mA Current loop.						
Unit – II	Copper Cable and Fiber Optics Cable Communication:						9
	Characteristics – Cable selection – Coaxial cables – Twist ards. Fibre optics Communication: Fiber-optic cable componer nnecting fibers.						
Unit – III	MODBUS, PROFIBUS PA/DP/FMS and TCP/IP:						9
Formatting. PRC application proce (Packet Transpo	us Overview – MODBUS protocol structure – Function codes FIBUS PA/DP/FMS: PROFIBUS protocol stack- The PROF ss and communication – Communication objects. TCP/IP – TC rt) – Host-to-host layer: end to end reliability. TCP/IP troubles blems – Transport layer problems	FIBUS co P/IP over	mmunication view: Introdu	n moo	del- Rel – Interi	lationsh het Laye	ip betwee er Protoco
Formatting. PRC application proce (Packet Transpo network layer pro <b>Unit – IV</b> HART: HART Int Foundation Field	OFIBUS PA/DP/FMS: PROFIBUS protocol stack- The PROFISUS and communication – Communication objects. TCP/IP – TC         rt) – Host-to-host layer: end to end reliability. TCP/IP troubles         blems – Transport layer problems.         HART and Foundation Field Bus:         roduction – HART and smart instrumentation – Physical layer         Bus: Introduction – The Physical layer and Wiring Rules, The	FIBUS cc P/IP over shooting:	mmunication view: Introdu Introduction k and applica	moduction – Co	del- Re – Interi mmon j layer –	lationsh net Laye problem HART (	ip betwee er Protoco is – Typic <b>9</b> Command
Formatting. PRC application proce (Packet Transpo network layer pro <b>Unit – IV</b> HART: HART Int Foundation Field Error detection a	OFIBUS PA/DP/FMS: PROFIBUS protocol stack- The PROFISE         ss and communication – Communication objects. TCP/IP – TC         rt) – Host-to-host layer: end to end reliability. TCP/IP troubles         blems – Transport layer problems.         HART and Foundation Field Bus:         roduction – HART and smart instrumentation – Physical layer         Bus: Introduction – The Physical layer and Wiring Rules, The         nd diagnostics - High-speed Ethernet (HSE)	FIBUS cc P/IP over shooting:	mmunication view: Introdu Introduction k and applica	moduction – Co	del- Re – Interi mmon j layer –	lationsh net Laye problem HART (	ip betwee er Protoco is – Typic <b>9</b> Command User laye
Formatting. PRC application proce (Packet Transpo network layer pro <b>Unit – IV</b> HART: HART Int Foundation Field Error detection a <b>Unit – V</b> Industrial Etherne Wireless commu	OFIBUS PA/DP/FMS: PROFIBUS protocol stack- The PROFISUS and communication – Communication objects. TCP/IP – TC         rt) – Host-to-host layer: end to end reliability. TCP/IP troubles         blems – Transport layer problems.         HART and Foundation Field Bus:         roduction – HART and smart instrumentation – Physical layer         Bus: Introduction – The Physical layer and Wiring Rules, The	FIBUS cc CP/IP over shooting: , Data lin Data link gabit Ethe	mmunication rview: Introdu Introduction k and applica layer, The A rnet – Industi	i moo uction – Co ation pplica	del- Re – Intern mmon p layer – ation lay	lationsh net Laye problem HART ( er, The	ip betwee er Protocco is – Typic <b>9</b> Command User laye <b>9</b>
Formatting. PRC application proce (Packet Transpo network layer pro <b>Unit – IV</b> HART: HART Int Foundation Field Error detection a <b>Unit – V</b> Industrial Etherne Wireless commu	OFIBUS PA/DP/FMS: PROFIBUS protocol stack- The PROFISUS and communication – Communication objects. TCP/IP – TC         rt) – Host-to-host layer: end to end reliability. TCP/IP troubles         blems – Transport layer problems.         HART and Foundation Field Bus:         roduction – HART and smart instrumentation – Physical layer         Bus: Introduction – The Physical layer and Wiring Rules, The         nd diagnostics - High-speed Ethernet (HSE)         Industrial Ethernet and Wireless Communication         et: Introduction – 10 Mbps Ethernet – 100 Mbps Ethernet – Gig         nication: Satellite systems – Wireless LANs- Radio and wireless	FIBUS cc CP/IP over shooting: , Data lin Data link gabit Ethe	mmunication rview: Introdu Introduction k and applica layer, The A rnet – Industi	i moo uction – Co ation pplica	del- Re – Intern mmon p layer – ation lay	lationsh net Laye problem HART ( er, The	ip betwee er Protocco is – Typic <b>9</b> Command User laye <b>9</b>
Formatting. PRC application proce (Packet Transpo network layer pro <b>Unit – IV</b> HART: HART Int Foundation Field Error detection a <b>Unit – V</b> Industrial Etherne Wireless commu	OFIBUS PA/DP/FMS: PROFIBUS protocol stack- The PROFISUS and communication – Communication objects. TCP/IP – TC         rt) – Host-to-host layer: end to end reliability. TCP/IP troubles         blems – Transport layer problems.         HART and Foundation Field Bus:         roduction – HART and smart instrumentation – Physical layer         Bus: Introduction – The Physical layer and Wiring Rules, The         nd diagnostics - High-speed Ethernet (HSE)         Industrial Ethernet and Wireless Communication         et: Introduction – 10 Mbps Ethernet – 100 Mbps Ethernet – Gig         nication: Satellite systems – Wireless LANs- Radio and wireless	FIBUS cc CP/IP over shooting: , Data lin Data link gabit Ethe	mmunication rview: Introdu Introduction k and applica layer, The A rnet – Industi	i moo uction – Co ation pplica	del- Re – Intern mmon p layer – ation lay	lationsh net Laye problem HART ( er, The	ip betwee er Protocco s – Typic 9 Command User laye 9 ents of rad
Formatting. PRC application proce (Packet Transpo network layer pro <b>Unit – IV</b> HART: HART Int Foundation Field Error detection a <b>Unit – V</b> Industrial Etherne Wireless commu link – radio spect	OFIBUS PA/DP/FMS: PROFIBUS protocol stack- The PROFISUS and communication – Communication objects. TCP/IP – TC         rt) – Host-to-host layer: end to end reliability. TCP/IP troubles         blems – Transport layer problems.         HART and Foundation Field Bus:         roduction – HART and smart instrumentation – Physical layer         Bus: Introduction – The Physical layer and Wiring Rules, The         nd diagnostics - High-speed Ethernet (HSE)         Industrial Ethernet and Wireless Communication         et: Introduction – 10 Mbps Ethernet – 100 Mbps Ethernet – Gig         nication: Satellite systems – Wireless LANs- Radio and wireless	FIBUS cc CP/IP over shooting: , Data link Data link gabit Ethe ss commu	mmunication rview: Introdu Introduction k and applica layer, The A rnet – Industi nication : Intr	rial E	del- Re – Intern mmon p layer – tition lay hernet. tion – c	lationsh net Layo problem HART ( er, The ompone	ip betwee er Protocco ns – Typic 9 Command User laye 9 ents of rad Total:4
Formatting. PRC application proce (Packet Transpo network layer pro <b>Unit – IV</b> HART: HART Int Foundation Field Error detection at <b>Unit – V</b> Industrial Etherne Wireless commu link – radio spect <b>TEXT BOOK:</b> 1. Deor	OFIBUS PA/DP/FMS: PROFIBUS protocol stack- The PROFISES and communication – Communication objects. TCP/IP – TC         rt) – Host-to-host layer: end to end reliability. TCP/IP troubles         bblems – Transport layer problems.         HART and Foundation Field Bus:         roduction – HART and smart instrumentation – Physical layer         Bus: Introduction – The Physical layer and Wiring Rules, The         nd diagnostics - High-speed Ethernet (HSE)         Industrial Ethernet and Wireless Communication         et: Introduction – 10 Mbps Ethernet – 100 Mbps Ethernet – Gig         nication: Satellite systems – Wireless LANs- Radio and wireless         rum and frequency allocation – Radio MODEMs.	FIBUS cc CP/IP over shooting: , Data link Data link gabit Ethe ss commu	mmunication rview: Introdu Introduction k and applica layer, The A rnet – Industi nication : Intr	rial E	del- Re – Intern mmon p layer – tition lay hernet. tion – c	lationsh net Layo problem HART ( er, The ompone	ip betwee er Protocco ns – Typic 9 Command User laye 9 ents of rad Total:4
Formatting. PRC application proce (Packet Transpo network layer pro Unit – IV HART: HART Int Foundation Field Error detection at Unit – V Industrial Etherne Wireless commu link – radio spect TEXT BOOK: 1. Deor REFERENCES:	OFIBUS PA/DP/FMS: PROFIBUS protocol stack- The PROFISES and communication – Communication objects. TCP/IP – TC         rt) – Host-to-host layer: end to end reliability. TCP/IP troubles         bblems – Transport layer problems.         HART and Foundation Field Bus:         roduction – HART and smart instrumentation – Physical layer         Bus: Introduction – The Physical layer and Wiring Rules, The         nd diagnostics - High-speed Ethernet (HSE)         Industrial Ethernet and Wireless Communication         et: Introduction – 10 Mbps Ethernet – 100 Mbps Ethernet – Gig         nication: Satellite systems – Wireless LANs- Radio and wireless         rum and frequency allocation – Radio MODEMs.	FIBUS cc CP/IP over shooting: , Data lin Data link gabit Ethe is commu	mmunication rview: Introdu Introduction k and applica layer, The A rnet – Industr nication : Intr munications'	a moo liction – Cc ation pplica rial E <sup>-</sup> oduc	del- Re – Intern mmon   layer – ation lay thernet. tion – co Edition	lationsh net Layo problem HART ( er, The ompone , Elsevio	ip betwee er Protocco s – Typic 9 Command User laye 9 ents of rad Total:4 er, 2005.
Formatting.       PRC         application proce       (Packet Transponetwork layer procession)         Unit – IV       HART: HART Integration Field         HART: HART Integration Field       Error detection and the second	OFIBUS PA/DP/FMS: PROFIBUS protocol stack- The PROFISES and communication – Communication objects. TCP/IP – TC         rt) – Host-to-host layer: end to end reliability. TCP/IP troubles         blems – Transport layer problems.         HART and Foundation Field Bus:         roduction – HART and smart instrumentation – Physical layer         Bus: Introduction – The Physical layer and Wiring Rules, The         Indiagnostics - High-speed Ethernet (HSE)         Industrial Ethernet and Wireless Communication         et: Introduction – 10 Mbps Ethernet – 100 Mbps Ethernet – Gignication: Satellite systems – Wireless LANs- Radio and wireles         rum and frequency allocation – Radio MODEMs.	FIBUS cc CP/IP over shooting: , Data link Data link gabit Ethe ss commu Data Com	mmunication rview: Introdu Introduction k and applica layer, The A rnet – Industi nication : Intr imunications'	a moo liction – Cc ation pplica rial E <sup>-</sup> oduc	del- Re – Intern mmon   layer – ation lay thernet. tion – co Edition	lationsh net Layo problem HART ( er, The ompone , Elsevio	ip betwee er Protocco s – Typic 9 Command User laye 9 ents of rad Total:4 er, 2005.

COURSE On compl			irse, the	stude	ents will	be able	to						BT Mapp (Highest L	
CO1			e essen i interfac		the comr	municat	ion syst	em an	d learn th	ne serial		U	nderstandi	ng(K2)
CO2	Interpr	et knowl	edge ab	out Co	pper cab	le and f	iber opt	ic cabl	e commu	unicatior	I	U	nderstandi	ng(K2)
CO3	Examir	ne the si	uitability	of vari	ous comr	municati	on prot	ocols				U	nderstandi	ng(K2)
CO4	Identify	the arc	hitecture	e and a	application	ns of HA	ART and	d Field	bus				Applying	(K3)
CO5	Examir	ne the co	oncepts	of Indu	istrial Eth	iernet ai	nd wirel	ess co	mmunica	ations		U	nderstandi	ng(K2)
					Ма	pping c	of COs	with P	os and F	PSOs				
COs/Pos	P01	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1				1							2	2
CO2	3	1				1							2	2
CO3	3	1				1							2	2
CO4	3	2	1	1	1	1							3	3
CO5	3	1				1							2	2
1 – Slight,	2 – Mod	erate, 3	– Subst	antial,	BT- Bloo	m's Tax	onomy	1			<u> </u>			1
					AS	SESSM	ENT P	ATTER	N – THE	ORY				
Test / B		Rer	nember (K1) %	ing	Understa (K2)		Appl		Analyz	•	Evaluating	Crea	ting (K6) %	Total %

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	20	80					100
CAT2	20	80					100
CAT3	20	60	20				100
ESE	20	60	20				100
* ±3% may be varied	(CAT 1, 2 & 3 – 50	) marks & ESE – 1	00 marks)	·			

		NOLOGY					
Programme & Branch	B.E. & Electronics and Instrumentation Engineering	Sem.	Category	L	т	Ρ	Credit
Prerequisites	Nil	7	PE	3	0	0	3
Preamble	The course aims to impart the knowledge on different mate fabrication techniques and applications.	erials, princ	iples used for	rece	ent N	EMS	and NEM
Unit – I	Microsystems:						9
Scaling in rigid b Mechanic – Scalii	belectronics manufacture and Microsystems technology– Scali ody dynamics – Scaling in electrostatic and electromagnetic ng in heat transfer – Materials for MEMS and Microsystems.						ing in Flu
Unit – II	Micro sensors and Actuators:						9
	e of Microsystems – Micro actuation techniques – Micro actuato icro pumps – Micro valves – Micro accelerometers – Micro gyro iomedical Field.						
Unit – III	Microsystems Fabrication and Manufacturing:						9
							-
Deposition by ep	gle crystal silicon wafer formation – Photolithography – Ion im itaxy – Etching. Manufacturing process: Bulk Micromanufactu						D – PVD
Deposition by ep Microsystem Des	ple crystal silicon wafer formation - Photolithography - Ion im						D – PVD
Deposition by ep Microsystem Des <b>Unit – IV</b> Carbon Allotropes Structure – Synti	gle crystal silicon wafer formation – Photolithography – Ion im itaxy – Etching. Manufacturing process: Bulk Micromanufactu ign Considerations.	uring – Su erties – CN Optical Pro	rface Microm	achi s – S	ning Synthe	– LIG esis –	D – PVD A –SLIG/ 9 Graphen
Deposition by ep Microsystem Des Unit – IV Carbon Allotropes Structure – Synt Quantum Dots in	gle crystal silicon wafer formation – Photolithography – Ion im itaxy – Etching. Manufacturing process: Bulk Micromanufactu ign Considerations. Introduction to Nanotechnology: s – CNTs: Structure – Mechanical Properties– Electrical Prope- nesis– Electrical Properties. Quantum Dots – Synthesis – C	uring – Su erties – CN Optical Pro	rface Microm	achi s – S	ning Synthe	– LIG esis –	D – PVD A –SLIG/ 9 Graphen
Deposition by ep Microsystem Des Unit – IV Carbon Allotropes Structure – Synti Quantum Dots in Unit – V Scanning Tunneli Flow in Sub mic	ple crystal silicon wafer formation – Photolithography – Ion im itaxy – Etching. Manufacturing process: Bulk Micromanufactu ign Considerations. Introduction to Nanotechnology: s – CNTs: Structure – Mechanical Properties– Electrical Proper hesis– Electrical Properties. Quantum Dots – Synthesis – C Medicine. Nanowires: Metal Nanowires – Semiconductor Nano	erties – CN Detical Pro owires. M. General – Measu	rface Microm IT Electronics perties – Sir Principles of	achi s – S ngle f Nar	ynthe Elect	– LIG esis – ron T abrica	D – PVD A –SLIG Graphen ransistor 9 tion – Flu
Deposition by ep Microsystem Des Unit – IV Carbon Allotropes Structure – Synti Quantum Dots in Unit – V Scanning Tunneli Flow in Sub mic	<ul> <li>gle crystal silicon wafer formation – Photolithography – Ion im itaxy – Etching. Manufacturing process: Bulk Micromanufacturing of Considerations.</li> <li>Introduction to Nanotechnology:</li> <li>s – CNTs: Structure – Mechanical Properties– Electrical Properties.</li> <li>Guantum Dots – Synthesis – Conduction.</li> <li>Nanowires: Metal Nanowires – Semiconductor Nance</li> <li>Fields of Nanotechnology:</li> <li>ng Microscopy – AFM – Scanning Electron Microscopy– TEM</li> <li>prometer and Nanoscales – Heat Conduction at Nanoscale</li> </ul>	erties – CN Detical Pro owires. M. General – Measu	rface Microm IT Electronics perties – Sir Principles of	achi s – S ngle f Nar	ynthe Elect	– LIG esis – ron T abrica	D – PVD A –SLIG Graphen ransistor 9 tion – Flu tivity–Nar
Deposition by ep Microsystem Des <b>Unit – IV</b> Carbon Allotropes Structure – Synt Quantum Dots in <b>Unit – V</b> Scanning Tunneli Flow in Sub mic Products – Applic	<ul> <li>gle crystal silicon wafer formation – Photolithography – Ion im itaxy – Etching. Manufacturing process: Bulk Micromanufacturing of Considerations.</li> <li>Introduction to Nanotechnology:</li> <li>s – CNTs: Structure – Mechanical Properties– Electrical Properties.</li> <li>Guantum Dots – Synthesis – Conduction.</li> <li>Nanowires: Metal Nanowires – Semiconductor Nance</li> <li>Fields of Nanotechnology:</li> <li>ng Microscopy – AFM – Scanning Electron Microscopy– TEM</li> <li>prometer and Nanoscales – Heat Conduction at Nanoscale</li> </ul>	erties – CN Detical Pro owires. M. General – Measu	rface Microm IT Electronics perties – Sir Principles of	achi s – S ngle f Nar	ynthe Elect	– LIG esis – ron T abrica	D – PVD A –SLIG Graphen ransistor 9 tion – Flu
Deposition by ep Microsystem Des Unit – IV Carbon Allotropes Structure – Synti Quantum Dots in Unit – V Scanning Tunneli Flow in Sub mic Products – Applic TEXT BOOK: 1 Tai-Ran H	<ul> <li>gle crystal silicon wafer formation – Photolithography – Ion im itaxy – Etching. Manufacturing process: Bulk Micromanufacturing of Considerations.</li> <li>Introduction to Nanotechnology:</li> <li>s – CNTs: Structure – Mechanical Properties– Electrical Properties.</li> <li>Guantum Dots – Synthesis – Conduction.</li> <li>Nanowires: Metal Nanowires – Semiconductor Nance</li> <li>Fields of Nanotechnology:</li> <li>ng Microscopy – AFM – Scanning Electron Microscopy– TEM</li> <li>prometer and Nanoscales – Heat Conduction at Nanoscale</li> </ul>	uring – Su erties – CN Optical Pro owires. M. General – Measu	rface Microm	achi ngle f Nar nerm	ning Synthe Elect no Fa al Co	– LIG esis – ron T abrica	D – PVD A –SLIG Graphen Transistor <b>9</b> tion – Flu tivity–Nar <b>Total:</b> 4
Deposition by ep Microsystem Des Unit – IV Carbon Allotropes Structure – Synti Quantum Dots in Unit – V Scanning Tunneli Flow in Sub mic Products – Applic TEXT BOOK: 1 Tai-Ran H	Je crystal silicon wafer formation – Photolithography – Ion im itaxy – Etching. Manufacturing process: Bulk Micromanufacturing Considerations. Introduction to Nanotechnology: s – CNTs: Structure – Mechanical Properties– Electrical Proper- hesis– Electrical Properties. Quantum Dots – Synthesis – C Medicine. Nanowires: Metal Nanowires – Semiconductor Nano Fields of Nanotechnology: ng Microscopy – AFM – Scanning Electron Microscopy– TEM rometer and Nanoscales – Heat Conduction at Nanoscale ation of Nanoproducts – Challenges in Nanoscale Engineering Hsu, "MEMS and Microsystems: Design, Manufacture and Nan	uring – Su erties – CN Optical Pro owires. M. General – Measu	rface Microm	achi ngle f Nar nerm	ning Synthe Elect no Fa al Co	– LIG esis – ron T abrica	D – PVD A –SLIG Graphen Transistor <b>9</b> tion – Flu tivity–Nar <b>Total:</b> 4
Deposition by ep Microsystem Des Unit – IV Carbon Allotropes Structure – Synti Quantum Dots in Unit – V Scanning Tunneli Flow in Sub mic Products – Applic TEXT BOOK: 1. Tai-Ran H Sons, Ne REFERENCES: 1. Wesley C 2019.	Je crystal silicon wafer formation – Photolithography – Ion im itaxy – Etching. Manufacturing process: Bulk Micromanufacturing Considerations. Introduction to Nanotechnology: s – CNTs: Structure – Mechanical Properties– Electrical Proper- hesis– Electrical Properties. Quantum Dots – Synthesis – C Medicine. Nanowires: Metal Nanowires – Semiconductor Nano Fields of Nanotechnology: ng Microscopy – AFM – Scanning Electron Microscopy– TEM rometer and Nanoscales – Heat Conduction at Nanoscale ation of Nanoproducts – Challenges in Nanoscale Engineering Hsu, "MEMS and Microsystems: Design, Manufacture and Nan	o Scale Er	rface Microm IT Electronics perties – Sir Principles of rement of Th gineering", 2 ss, Taylor &	achi s – S ngle f Nar herm f Ran	ning yntho Elect no Fa al Co dition	- LIG	D – PVD A –SLIG Graphen Transistor <b>9</b> tion – Flu tivity–Nar <b>Total:</b> New Yor

	SE OUTCOMES: mpletion of the course, the students will be able to	BT Mapped (Highest Level)
CO1	retrieve the concepts of scaling laws	Understand(K2)
CO2	employ sensors and actuators in micro systems	Applying (K3)
CO3	interpret on the rudiments of micro fabrication techniques	Applying (K3)
CO4	interpret the properties of nanostructures and Nano synthesis	Applying (K3)
CO5	use the nano-structured materials for engineering applications	Applying (K3)

					Маррі	ing of C	Os witl	h Pos a	nd PSC	Ds				
COs/Pos	P01	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1											2	2
CO2	3	2	1	1	1								3	3
CO3	3	2	1	1	1								3	3
CO4	3	2	1	1	1								3	3
CO5	3	2	1	1	1								3	3
1 – Slight, 2	2 – Mode	erate, 3 -	- Substar	ntial, BT	- Bloom	's Taxor	nomy							

		ASSESSMEN	T PATTERN	– THEORY			
Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	20	60	20				100
CAT2	30	40	30				100
CAT3	30	40	30				100
ESE	30	40	30				100

	22EIE21 - OPTIMAL AND ADAPTIVE						
Programme Branch	& B.E. & Electronics and Instrumentation Engineering	Sem.	Category	L	т	Р	Credit
Prerequisite	s Control Systems	7	PE	3	0	0	3
Preamble	To provide the knowledge about fundamental concepts of	optimal an	d adaptive co	ontrol	techniq	ues.	
Unit – I	Optimal Control Formulation:						9
Performance control proble <b>Unit – II</b>	undamental concepts – The unctional of a single function- Opti measures for optimal control problems, selecting a performance mems: Necessary conditions for optimal control. Linear Quadratic Optimal Control Systems:	neasure. C	onstraints –	Varia	ational a	pproacł	n to optima 9
	nulation – Linear regulator problem –Infinite time linear quadratica ution of algebraic Riccati equation – Equivalence of open loop and control.						
Unit – III	Dynamic Programming:						9
The Optimal programming	control law –Principle of optimality – Dynamic programming applie – Computational procedure for solving optimal control problems- (	d to routin Characteris	g problem – l stics of dynar	Recu nic p	rrence i rogramr	relation ning so	of dynami olutions.
Unit – IV	Self Tuning Regulators:		· · · · ·		Ŭ		9
	<ul> <li>adaptive control –classification –Pole placement design, Direct a num variance and moving average controllers, stochastic direct an tors</li> </ul>						
Unit – V	Model Reference Adaptive control:						9
The MIT rule	- Lyapunov theory – Design of model reference adaptive control AS and STR. Introduction to Adaptive back stanning.	oller using	MIT rule an	d Ly	apunov	theory	<ul> <li>Relatio</li> </ul>
	AS and STR, Introduction to Adaptive back stepping.						
	AS and STR, Introduction to Adaptive back stepping.						Total:4
between MR							Total:4
between MR.		, Dover pu	blications, US	SA, 2	004 for	<sup>.</sup> Unit -1	
TEXT BOOK	:						, 2 & 3
between MR.       TEXT BOOK       1.     Ki       2.     Ka	: rk, Donald E. "Optimal Control Theory: An Introduction" 1 <sup>st</sup> Edition, arl J Astrom and Bjorn Wittenmark, "Adaptive Control", 2 <sup>nd</sup> Edition, A						, 2 & 3
between MR.       TEXT BOOK       1.     Ki       2.     Ka       REFERENCI	: rk, Donald E. "Optimal Control Theory: An Introduction" 1 <sup>st</sup> Edition, arl J Astrom and Bjorn Wittenmark, "Adaptive Control", 2 <sup>nd</sup> Edition, A	Addison W	/esley, USA,	1995			, 2 & 3

		the cou	irse, the	studer	nts will b	be able	to						BT Map (Highest	
CO1 1	formulat	e optima	al contro	l proble	m							U	nderstand	ing (K2)
CO2 a	apply the	e conce	pts in the	e desigr	of optin	nal cont	roller us	ing LQ	R conce	pts			Applying	(K3)
CO3	determir	ne optim	al contro	ol solutio	on for dis	screte sy	stems	using d	ynamic	programr	ming		Applying	(K3)
CO4 g	gain kno	wledge	about th	ie mode	l referen	nce adap	otive cor	ntrol an	d self-tu	ning con	trol systems	U	nderstand	ing (K2)
CO5 I	know the	e Impler	nentatio	n aspec	ts of ada	aptive co	ontrol ar	nd appli	cations				Applying	(K3)
					Ма	pping o	f COs v	vith Po	s and P	SOs				
COs/Pos	P01	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1											2	2
CO2	3	2	1	1	1								3	3
CO3	3	2	1	1	1								3	3
CO4	3	1											2	2
CO5	3	2	1	1	1								3	3
1 – Slight, 2	2 – Mod	erate, 3	– Subst	antial, E	T- Bloor	n's Taxo	onomy							
					AS	SESSM	ENT PA	TTER	N – THE	ORY				
Test / Bl Categ		Rer	nember (K1) %	ing L	Indersta (K2)		Apply (K3)		Analyz (K4) 9		Evaluating (K5) %		ating 6) %	Total %
CAT			20		40		40							100
CAT	Г2		20		40		40	)						100
CAT	ГЗ		20		40		40	)						100
ES	E		20		40		40	)						100

	22EIE22 – WEARABLE TECHNO	LUGI					
Programme & Branch	B.E. & Electronics and Instrumentation Engineering	Sem.	Category	L	т	Р	Credit
Prerequisites	Nil	7	PE	3	0	0	3
Preamble	A category of electronic devices that discuss the worn ac user's body. The devices are hands-free gadgets with enhanced with the ability to send and receive data via the	practical u					
Unit – I	Introduction to Wearable Technology:						9
Health Care –	wearable technology – Brief history – Applications of wearable Smart Glasses – Conventional Textile Wearable Integration Tech		/- Wearable T	echi	nolog	y in N	
Unit – II	Components and Technologies:						9
connectivity u Technologies Gloves – Myog	components and technologies – Microprocessors and Microcon nit – Battery technology – Displays and other user interface e and Force Myography for Healthcare: Moving Monitoring – Act graphy – Force Myography	elements -	Microphones	and	d Spe	eakers	s. Wearab
Unit – III	Product Development and Design Considerations:						9
	Production development process - Engineering analysis - pr						roduction
Design consid	erations –Various factors and requirements – Operational power	packing an	d material – N	laint	enan	ce.	
Unit – IV	Security Issues and Privacy Concerns:						9
	s – Privacy issues – Potential solutions – Product case examples Body Analysis Scale – Pulse Oximeters – Electrocardiogram.	: Blood Glu	ucose Meters	- Bl	ood I	Pressu	ure Monito
Unit – V	Psychological and Social Impact:						9
absorption rat	effects of wearables – Social implications – Technology accepta e – Thermal effects. Health Issues: Cancers – Fertility – Vis ic intolerance and other risks.						
							Total:4
TEXT BOOK:							
1. Haide	<sup>r</sup> Raad , "The Wearable Technology Handbook" ,1 <sup>st</sup> Edition, Unit	ted Scholar	s Publications	s, US	SA, 20	017	
REFERENCE	3:						
	ond Kai-Yu Tong, "Wearable Technology in Medicine and Health	Care", Aca	ademic Press,	1 <sup>st</sup>	Editi	on, Ur	nited State
2018.	ando Jose Velez and Fardin Derogarian Miyandoab, "Wearable T						

		UTCON	-	se, the s	students	s will be	e able to	D						BT Map (Highest	
CO1	infe	r the re	cent tech	nology u	ised as v	wearable	e device	es in me	dical an	nd healtl	n care		U	nderstand	ling (K2)
CO2	des	cribe th	e functio	ns, opera	ations of	various	compo	nents a	nd techr	nologies	in weara	able device	es U	nderstand	ling (K2)
CO3	ana	alyze the	e develop	oment pro	ocess ar	nd desig	n consid	deration	in wear	rable pr	oducts			Applying	(K3)
CO4	inte	erpret the	e securit	y and pri	vacy iss	ues in w	vearable	techno	logy				U	nderstand	ling (K2)
CO5	exp	lore the	psychol	ogical an	id social	impact,	health	concern	s in wea	arable d	levices		U	nderstand	ling (K2)
						Маррі	ing of C	Os wit	h Pos a	nd PSC	Ds				
COs/F	Pos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO	1	3	1											2	2
CO2	2	3	1											2	2
CO	3	3	2	1	1	1								3	3
CO4	4	3	1											2	2
CO	5	3	1											2	2

1 - Slight, 2 - Moderate, 3 - Substantial, BT- Bloom's Taxonomy

		ASSESSMEN	T PATTERN	– THEORY			
Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	30	70					100
CAT2	10	40	50				100
CAT3	40	60					100
ESE	10	70	20				100
±3% may be varied	(CAT 1, 2 & 3 – 50 r	narks & ESE – 100	marks)	· · · · · · · · · · · · · · · · · · ·			

	(Common to All BE/BT	ech branches)					
Programme & Branch	All BE/BTech branches	Sem.	Category	L	т	Ρ	Credit
Prerequisites	Nil	7	GE	3	0	0	3
Preamble	This course familiarizes the fundamental conce also disseminates the process involved in coller in a presentable form using latest tools.						
Unit – I	Introduction to Research						9
	Research: Types and Process of Research - O of a Good Research Problem - Errors in Selecting a R					arch I	Problem
Unit – II	Literature Review	<b>I</b>		,			9
Literature Revie	w: Literature Collection - Methods - Analysis - Citation	n Study - Gap Analysis	- Problem Fo	rmula	ation	Techr	niques.
Unit – III	Research Methodology						9
	odology: Appropriate Choice of Algorithms/Methodol						Analysis
Experimental M Limitations. <b>Unit – IV</b> Journals and Pa	bodology: Appropriate Choice of Algorithms/Methodolo ethods and Result Analysis - Investigation of So Journals and Papers upers: Journals in Science/Engineering - Indexing and	d Impact factor of Journ	Problem - I	nterp	oretati	on -	Analysis Researc <b>9</b>
Experimental M Limitations. <b>Unit – IV</b> Journals and Pa	bodology: Appropriate Choice of Algorithms/Methodolo ethods and Result Analysis - Investigation of So Journals and Papers	d Impact factor of Journ	Problem - I	nterp	oretati	on -	Analysis Researc <b>9</b>
Experimental M Limitations. Unit – IV Journals and Pa Types of Resear Unit – V How to Write a I	Decomposition       Decomposition         Decomposition       Appropriate Choice of Algorithms/Methodole         Decomposition       Analysis - Investigation of So         Journals and Papers       Journals in Science/Engineering - Indexing and         rch Papers - Original Article/Review Paper/Short Com       Reports and Presentations         Report - Language and Style - Format of Project Rep       Footnotes - Tables and Figures - Appendix - Bibliog	d Impact factor of Journ munication/Case Study ort - Title Page - Abstra	Problem - In mals. Plagiari y. act - Table of	nterp sm a	and R	esear	Analysis Researc 9 rch Ethics 9 adings an
Experimental M Limitations. Unit – IV Journals and Pa Types of Resear Unit – V How to Write a I Sub-Headings -	Decomposition       Decomposition         Decomposition       Appropriate Choice of Algorithms/Methodole         Decomposition       Analysis - Investigation of So         Journals and Papers       Journals in Science/Engineering - Indexing and         rch Papers - Original Article/Review Paper/Short Com       Reports and Presentations         Report - Language and Style - Format of Project Rep       Footnotes - Tables and Figures - Appendix - Bibliog	d Impact factor of Journ munication/Case Study ort - Title Page - Abstra	Problem - In mals. Plagiari y. act - Table of	nterp sm a	and R	esear	Analysis Researc 9 rch Ethics 9 adings an ation usin
Experimental M Limitations. Unit – IV Journals and Pa Types of Reseau Unit – V How to Write a I Sub-Headings - PPTs. Research TEXT BOOK:	Decomposition       Decomposition         Decomposition       Appropriate Choice of Algorithms/Methodole         Decomposition       Analysis - Investigation of So         Journals and Papers       Journals in Science/Engineering - Indexing and         rch Papers - Original Article/Review Paper/Short Com       Reports and Presentations         Report - Language and Style - Format of Project Rep       Footnotes - Tables and Figures - Appendix - Bibliog	d Impact factor of Journ munication/Case Study ort - Title Page - Abstra graphy etc - Different F	Problem - In mals. Plagiari y. act - Table of Reference For	sm a Con rmats	and R tents s. Pre	esear - Hea	Analysis Researc 9 rch Ethics 9 adings an ation usin
Experimental M Limitations. Unit – IV Journals and Pa Types of Reseat Unit – V How to Write a I Sub-Headings - PPTs. Research TEXT BOOK:	n, Nicholas. "Research Methods: The basics". 2 <sup>nd</sup> edi	d Impact factor of Journ munication/Case Study ort - Title Page - Abstra graphy etc - Different F	Problem - In mals. Plagiari y. act - Table of Reference For	sm a Con rmats	and R tents s. Pre	esear - Hea	Analysis Researc 9 rch Ethics 9 adings an ation usin
Experimental M Limitations. Unit – IV Journals and Pa Types of Reseat Unit – V How to Write a I Sub-Headings - PPTs. Research TEXT BOOK: 1. Wallima REFERENCES:	n, Nicholas. "Research Methods: The basics". 2 <sup>nd</sup> edi	d Impact factor of Journ munication/Case Study ort - Title Page - Abstra graphy etc - Different F	Problem - I mals. Plagiari y. act - Table of Reference For for Units I, II,	sm a Con rmats	and R tents s. Pre	esear - Hea	Analysis Researc 9 rch Ethics 9 adings an ation usin
Experimental M Limitations. Unit – IV Journals and Pa Types of Resear Unit – V How to Write a I Sub-Headings - PPTs. Research TEXT BOOK: 1. Wallima REFERENCES: 1. Mishra,	n, Nicholas. "Research Methods: The basics". 2 <sup>nd</sup> edi	d Impact factor of Journ munication/Case Study ort - Title Page - Abstra graphy etc - Different F tion, Routledge, 2017.,	Problem - In nals. Plagiari y. act - Table of Reference For for Units I, II, ing, 2017	Sm a	tents s. Pre	esear - Hea esenta	Analysis Researc 9 rch Ethic: 9 adings an ation usin

		UTCON ion of t		se, the st	udents	s will be a	able to						(	BT Mapp Highest L	
CO1	list t	he vario	ous stage	es in resea	arch ar	nd categoi	rize the	quality o	of jourr	als				Applying	(K3)
CO2	form	nulate a	research	n problem	from p	oublished	literature	e/journa	l pape	ſS			E	Evaluating	(K5)
CO3	write	e, prese	nt a jour	nal paper	<sup>/</sup> projec	ct report ir	n proper	format						Creating	(K6)
CO4	sele	ct suital	ble journ	al and sul	omit a	research p	baper							Applying	(K3)
CO5	com	pile a re	esearch	report and	I the pr	resentatio	n							Applying	(K3)
						Mappin	q of CO	s with	POs ai	nd PSOs	6				
COs/I	POs	PO1	PO2	PO3	PO4		PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO	1	3	3	2	2	2	1	1	3	3	1	1	3	3	3
CO	2	3	3	3	3	2	1	1	3	3	3	3	3	3	3
CO	3	3	3	3	3	3	1	1	3	3	3	1	3	3	3
CO	4	3	2	1	1	2	1	1	3	2	1	1	3	3	3
CO	5	3	3	2	2	3	1	1	3	3	3	1	3	3	3
1 – Sli	ght, 2	– Mode	rate, 3 –	Substant	ial, BT	- Bloom's	Taxono	my	1		1	1	1		1
						ASSES	SMENT	PATTE	ERN - 1	HEORY	•				
	st / Ble Catege	oom's ory*	Re	memberi (K1) %	ng	Understa (K2)		Apply (K3)		Analyzi (K4) 9	•	Evaluating (K5) %		reating (K6) %	Tota %
	CAT	1				40		50	)	10					100
	CAT	2				30		50	)	10		10			100
	CAT	3				20		30	)	30		10		10	100
	ESE	=				40		40	)	10		10			100

Programme& Branch	B.E. & Electronics and Instrumentation Engineering	Sem.	Category	L	Т	Р	Credit
Prerequisites	Nil	7	PE	3	0	0	3
Preamble	Building Management System is computer-based control sy the total MEP (Mechanical – Electrical – Plumbing) and software. This subject will help the students to understand t structured building.	security S	structure. Itcc	nsist	t of bo	oth Ha	rdware and
Unit – I	Introduction and Fire Alarm System:						9
Fire Alarm: Fund	nd its effect on functional efficiency of building automation syste damentals – FAS Components – Fire control panels- Field Co Standards- Concept of IP enabled fire & alarm system, design a Access Control System:	omponents	, Panel Com	pone	ents- F	AS A	
Access Control system, DVM, No Security System	System: Access Components, Access control system Design. etwork design, Storage design. Components of CCTV controlling s Fundamentals: Introduction to Security Systems, Concepts. control with components, Computer system access control – DA	g system. ( Security D	CTV Applica esign: Securi	tions	: CCT	V App	DVR Base
							-
-	HVAC system:	- D	- 11				9
HVAC system Fit Effect of Heat, H & Applications, L	undamentals: Introduction to HVAC, HVAC Fundamentals, Basic umidity, Heat loss. Processes: Heating Process & Applications. Initary Systems.						mfort zones ion Proces
HVAC system Fi Effect of Heat, H & Applications, L Unit – IV	undamentals: Introduction to HVAC, HVAC Fundamentals, Basic umidity, Heat loss. Processes: Heating Process & Applications. Initary Systems. Energy Management System:	Cooling P	rocess & App	licati	ons, V	entilat/	mfort zones ion Proces 9
HVAC system Fit Effect of Heat, H & Applications, L <b>Unit – IV</b> Energy Manage	undamentals: Introduction to HVAC, HVAC Fundamentals, Basic umidity, Heat loss. Processes: Heating Process & Applications. Initary Systems. Energy Management System: ment System: ASHRAE Symbols Energy Management: Ene	Cooling P	rocess & App	licati k me	ons, V thods	/entilat	mfort zones ion Proces 9
HVAC system Fu Effect of Heat, H & Applications, L Unit – IV Energy Manage Building Efficience	undamentals: Introduction to HVAC, HVAC Fundamentals, Basic umidity, Heat loss. Processes: Heating Process & Applications. Initary Systems. Energy Management System: ment System: ASHRAE Symbols Energy Management: Energy improvement, Green Building (LEED) Concept & Examples –I	Cooling P	rocess & App	licati k me	ons, V thods	/entilat	mfort zones ion Proces 9
HVAC system Fu Effect of Heat, H & Applications, L Unit – IV Energy Manage Building Efficient Unit – V Building Manage	undamentals: Introduction to HVAC, HVAC Fundamentals, Basic umidity, Heat loss. Processes: Heating Process & Applications. Initary Systems. Energy Management System: ment System: ASHRAE Symbols Energy Management: Ene	Cooling P rgy Saving Energy cor ect steps E	rocess & App gs concept & sservation an BMS. Vertical:	licati k me d Su	ons, V thods stainal	/entilat , Light bility	mfort zones ion Proces 9 ting contro 9
HVAC system Fu Effect of Heat, H & Applications, L Unit – IV Energy Manage Building Efficient Unit – V Building Manage	undamentals: Introduction to HVAC, HVAC Fundamentals, Basic umidity, Heat loss. Processes: Heating Process & Applications. Initary Systems. Energy Management System: ment System: ASHRAE Symbols Energy Management: Energy improvement, Green Building (LEED) Concept & Examples – Building Management System: ment System: IBMS (HVAC, Fire & Security) project cycle, Project	Cooling P rgy Saving Energy cor ect steps E	rocess & App gs concept & sservation an BMS. Vertical:	licati k me d Su	ons, V thods stainal	/entilat , Light bility	mfort zones ion Proces 9 ting contro 9
Effect of Heat, H & Applications, L Unit – IV Energy Manage Building Efficient Unit – V Building Manage	undamentals: Introduction to HVAC, HVAC Fundamentals, Basic umidity, Heat loss. Processes: Heating Process & Applications. Initary Systems. Energy Management System: ment System: ASHRAE Symbols Energy Management: Energy improvement, Green Building (LEED) Concept & Examples – Building Management System: ment System: IBMS (HVAC, Fire & Security) project cycle, Project	Cooling P rgy Saving Energy cor ect steps E	rocess & App gs concept & sservation an BMS. Vertical:	licati k me d Su	ons, V thods stainal	/entilat , Light bility	mfort zones ion Proces <b>9</b> ting contro <b>9</b> Application
HVAC system Fu Effect of Heat, H & Applications, L Unit – IV Energy Manage Building Efficience Unit – V Building Manage of BMS, Example TEXT BOOK:	undamentals: Introduction to HVAC, HVAC Fundamentals, Basic umidity, Heat loss. Processes: Heating Process & Applications. Initary Systems. Energy Management System: ment System: ASHRAE Symbols Energy Management: Energy improvement, Green Building (LEED) Concept & Examples – Building Management System: ment System: IBMS (HVAC, Fire & Security) project cycle, Project	Cooling P rgy Saving Energy cor ect steps E on. Advanta	rocess & App gs concept & iservation an BMS. Vertical: ages of BMS.	licati k me d Su	ons, V thods stainal	/entilat , Light bility	mfort zones ion Proces <b>9</b> ting contro <b>9</b> Application
HVAC system Fu Effect of Heat, H & Applications, L Unit – IV Energy Manage Building Efficience Unit – V Building Manage of BMS, Example TEXT BOOK:	undamentals: Introduction to HVAC, HVAC Fundamentals, Basic umidity, Heat loss. Processes: Heating Process & Applications. Initary Systems. Energy Management System: ment System: ASHRAE Symbols Energy Management: Energy improvement, Green Building (LEED) Concept & Examples – Building Management System: ment System: IBMS (HVAC, Fire & Security) project cycle, Project Integration: IBMS Architecture, Normal & Emergency operation	Cooling P rgy Saving Energy cor ect steps E on. Advanta	rocess & App gs concept & iservation an BMS. Vertical: ages of BMS.	licati k me d Su	ons, V thods stainal	/entilat , Light bility	mfort zones ion Proces <b>9</b> ting contro <b>9</b> Application
HVAC system Fit Effect of Heat, H & Applications, L Unit – IV Energy Manage Building Efficience Unit – V Building Manage of BMS, Example TEXT BOOK: 1. Jim Since REFERENCES:	undamentals: Introduction to HVAC, HVAC Fundamentals, Basic umidity, Heat loss. Processes: Heating Process & Applications. Initary Systems. Energy Management System: ment System: ASHRAE Symbols Energy Management: Energy improvement, Green Building (LEED) Concept & Examples –I Building Management System: ment System: IBMS (HVAC, Fire & Security) project cycle, Project Integration: IBMS Architecture, Normal & Emergency operation poli, "Smart Buildings", 2 <sup>nd</sup> Edition, Butterworth-Heinemann im ei Wang, "Intelligent Buildings and Building Automation", 1 <sup>st</sup> Ed USA,2010.	Cooling P rgy Saving Energy cor ect steps E on. Advanta print of Els	rocess & App gs concept & iservation an BMS. Verticals ages of BMS. evier , 2010 n Press (an ir	k me d Su s: Ad	ons, V stainal vanta	/entilat , Light bility ges & .	mfort zones ion Proces 9 ting contro 9 Application Total:4
HVAC system Fit         Effect of Heat, H         & Applications, L         Unit – IV         Energy Manage         Building Efficiend         Unit – V         Building Manage         of BMS, Example         TEXT BOOK:         1.       Jim Since         REFERENCES:         1.       Shengw         Group),       NJATC,	undamentals: Introduction to HVAC, HVAC Fundamentals, Basic umidity, Heat loss. Processes: Heating Process & Applications. Initary Systems. Energy Management System: ment System: ASHRAE Symbols Energy Management: Energy improvement, Green Building (LEED) Concept & Examples –I Building Management System: ment System: IBMS (HVAC, Fire & Security) project cycle, Project Integration: IBMS Architecture, Normal & Emergency operation poli, "Smart Buildings", 2 <sup>nd</sup> Edition, Butterworth-Heinemann im ei Wang, "Intelligent Buildings and Building Automation", 1 <sup>st</sup> Ed USA,2010.	Cooling P rgy Saving Energy cor ect steps E on. Advanta print of Els	rocess & App gs concept & aservation an BMS. Verticals ages of BMS. evier , 2010	k me d Su s: Ad	ons, V stainal vantag	/entilat , Light bility ges & .	mfort zones ion Proces 9 ting contro 9 Applicatior Total:4

		UTCON tion of		rse, the s	student	s will be	able to	)						BT Mapp (Highest L	
CO1		alize co omation		hilosoph	y, tech	nology,	termino	ology, a	and p	ractices	used	in building	<sup>g</sup> U	nderstandin	g (K2)
CO2	Inte	erpret di	fferent s	afety and	securit	y standa	rds for b	ouilding	manag	ement s	ystem		U	nderstandin	g (K2)
CO3	Und	derstand	d various	s hardwar	e and s	oftware i	requiren	nent for	given	HVAC sy	/stem		U	nderstandin	g (K2)
CO4	Eva	luate e	nergy m	anageme	nt and o	communi	cation fo	or efficie	ent Bui	lding Ma	nagem	ent System		Applying (	<b>K</b> 3)
CO5	Use	e variou	s tools a	nd techni	ques in	BMS for	<sup>.</sup> Design	of Sec	ure, Sa	ife and G	Green b	uilding		Applying (I	<b>&lt;</b> 3)
						Марр	oing of	COs wi	th Pos	and PS	Os				
COs/I	Pos	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO	1	3	1						1		1			2	2
CO	2	3	1						1		1			2	2
CO	3	3	1						1		1			2	2
CO	4	3	2	1	1	1			1		1			3	3
CO	5	3	2	1	1	1			1		1			3	3
1 – Sli	ght, 2	– Mode	erate, 3	– Substar	ntial, BT	- Bloom	s Taxor	iomy					I		
						ASSE	ESSMEN		TERN	– THEO	RY				
	st / Bl Catego	oom's ory*	Re	memberi (K1) %	ing l	Jndersta (K2)	U U	Apply (K3)		Analyz (K4) 9	U U	Evaluating (K5) %	l Cre	ating (K6) %	Total %
	CAT	1		20		80									100
	CAT	2		20		80									100
	CAT	3				20		80	)						100
	ES	Ξ		15		60		25	5						100
* ±3%	may	be varie	d (CAT	1,2&3-	- 50 ma	rks & ES	E – 100	marks)	)						÷

22EIE24 - ELECTRONIC INSTRUMENTATION
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Programme & Branch	B.E. & Electronics and Instrumentation Engineering	Sem.	Category	L	т	Р	Credit
Prerequisites	Nil	7	PE	3	0	0	3
Preamble	To provide fundamentals of the Electronic Instruments discusses the concepts of digital instruments, signal genera						ineering.
Unit – I	Digital Instruments						9
	Digital Instrument-Digital Voltmeters: Dual slope Integrating t Digital Measurement of Time- Universal counter-Decade co						
Unit – II	Measuring Instruments						9
	eters-Field strength meter-Stroboscope-Phase meter-Vector meter-Rx meters-Automatic Bridges.	Impedanc	e meter: Dir	ect	Read	ling, (	Commercia
Unit – III	Signal Generators						9
			Signal Genera				
Laboratory Signa (Laboratory Type) <b>Unit – IV</b>	I Generator - AF Sine and Square Wave Generator – Fun - Random Noise Generator- Sweep Generator. Display Devices	ction Gei	nerator- Squ	are	and	Pulse	Generato 9
Laboratory Signa (Laboratory Type) <b>Unit – IV</b>	I Generator - AF Sine and Square Wave Generator – Fun - Random Noise Generator- Sweep Generator.	ction Gei	nerator- Squ	are	and	Pulse	Generato
Laboratory Signa (Laboratory Type) Unit – IV Displays-Classific simple CRO. Unit – V	Il Generator - AF Sine and Square Wave Generator – Fun     - Random Noise Generator- Sweep Generator.     Display Devices     ation-LED & LCD-LCOS-Bar graph display-Segmental and Do     Instrument Calibration	ction Gei t matrix d	nerator– Squ splay-Plasma	are a Dis	and	Pulse OLE[	Generato 9 D-FOLED- 9
Laboratory Signa (Laboratory Type) Unit – IV Displays-Classific simple CRO. Unit – V Introduction-Comp	Il Generator - AF Sine and Square Wave Generator – Fun - Random Noise Generator- Sweep Generator. Display Devices ration-LED & LCD-LCOS-Bar graph display-Segmental and Do	ction Ger t matrix d uments-C	splay-Plasma alibration in:	a Dis	and	Pulse OLE[	Generato 9 D-FOLED- 9
Laboratory Signa (Laboratory Type) <b>Unit – IV</b> Displays-Classific simple CRO. <b>Unit – V</b> Introduction-Comp Potentiometer cal	Il Generator - AF Sine and Square Wave Generator – Fun - Random Noise Generator- Sweep Generator. Display Devices ation-LED & LCD-LCOS-Bar graph display-Segmental and Do Instrument Calibration parison methods- Digital multimeters as standard Instru	ction Ger t matrix d uments-C	splay-Plasma alibration in:	a Dis	and	Pulse OLE[	Generato 9 D-FOLED- 9 ntiometers
Laboratory Signa (Laboratory Type) Unit – IV Displays-Classific simple CRO. Unit – V Introduction-Comp Potentiometer cal	Il Generator - AF Sine and Square Wave Generator – Fun - Random Noise Generator- Sweep Generator. Display Devices ation-LED & LCD-LCOS-Bar graph display-Segmental and Do Instrument Calibration parison methods- Digital multimeters as standard Instru	ction Ger t matrix d uments-C ors-Auton	splay-Plasma alibration in: nated calibrat	a Dis strur	and splay- nents	Pulse OLE[	Generato 9 D-FOLED- 9 ntiometers
Laboratory Signa (Laboratory Type) Unit – IV Displays-Classific simple CRO. Unit – V Introduction-Comp Potentiometer cal TEXT BOOK: 1. Kalsi H.S	I Generator - AF Sine and Square Wave Generator – Fun - Random Noise Generator- Sweep Generator. Display Devices ation-LED & LCD-LCOS-Bar graph display-Segmental and Dor Instrument Calibration parison methods- Digital multimeters as standard Instru- ibration methods-Multifunction calibrators-Multiproduct calibrate	ction Ger t matrix d uments-C ors-Auton	alibration in: nated calibrat	a Dis strur tion.	and splay- nents 3,4.	Pulse OLE[ -Pote	Generato 9 D-FOLED- 9 ntiometers Total:4
Laboratory Signa (Laboratory Type) Unit – IV Displays-Classific simple CRO. Unit – V Introduction-Comp Potentiometer cal TEXT BOOK: 1. Kalsi H.S 2. David A E Unit 5	Il Generator - AF Sine and Square Wave Generator – Fun - Random Noise Generator- Sweep Generator. Display Devices ation-LED & LCD-LCOS-Bar graph display-Segmental and Do Instrument Calibration parison methods- Digital multimeters as standard Instru- ibration methods-Multifunction calibrators-Multiproduct calibrate 6. "Electronic Instrumentation", 3 <sup>rd</sup> Edition, Tata McGraw Hill, Ne	ction Ger t matrix d uments-C ors-Auton	alibration in: nated calibrat	a Dis strur tion.	and splay- nents 3,4.	Pulse OLE[ -Pote	Generato 9 D-FOLED- 9 ntiometers Total:4
Laboratory Signa (Laboratory Type) Unit – IV Displays-Classific simple CRO. Unit – V Introduction-Comp Potentiometer cal TEXT BOOK: 1. Kalsi H.S 2. David A E Unit 5 REFERENCES:	Il Generator - AF Sine and Square Wave Generator – Fun - Random Noise Generator- Sweep Generator. Display Devices ation-LED & LCD-LCOS-Bar graph display-Segmental and Do Instrument Calibration parison methods- Digital multimeters as standard Instru- ibration methods-Multifunction calibrators-Multiproduct calibrate 6. "Electronic Instrumentation", 3 <sup>rd</sup> Edition, Tata McGraw Hill, Ne	ction Ger t matrix d uments-C ors-Auton ew Delhi, , Oxford L	splay-Plasma alibration in nated calibrat 2019 for Unit Iniversity Pre	a Dis strur tion.	and splay- nents 3,4.	Pulse OLE[ -Pote	Generato 9 D-FOLED- 9 ntiometers Total:4

	SE OUTCOMES: mpletion of the course, the students will be able to	BT Mapped (Highest Level)
CO1	interpret the fundamentals of digital instruments in various measurements	Understanding (K2)
CO2	employ the functions of measuring instruments	Applying(K3)
CO3	make use of various instruments to generate the waveforms	Applying (K3)
CO4	infer the types of displays used in electronics instruments	Understanding (K2)
CO5	illustrate the calibration methods for standard instruments	Understanding (K2)

					Маррі	ing of C	Os witl	n Pos a	nd PSC	Ds				
COs/Pos	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1						1					2	2
CO2	3	2	1	1	1			1					3	3
CO3	3	2	1	1	1			1					3	3
CO4	3	1						1					2	2
CO5	3	1						1					2	2
						· -								

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy	

		ASSESSMEN	T PATTERN	– THEORY			
Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	40	30	30				100
CAT2	50	20	30				100
CAT3	60	40					100
ESE	40	40	20				100
* ±3% may be varied	(CAT 1, 2 & 3 – 50	marks & ESE – 10	0 marks)	LL			

22EIE25 - PIPING AND INSTRUMENTATIO	ON DIAGRAMS
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Programme & Branch	B.E. & Electronics and Instrumentation Engineering	Sem.	Category	L	т	Р	Credit
Prerequisites	Nil	7	PE	3	0	0	3
Preamble	This course discusses the basic knowledge on Instrument with Instrumentation Symbols, Abbreviations and Iden Instrumentation Diagrams for Process Industries						
Unit – I	Instrument Symbols And Standards:						9
Application to we Identification Sy	standards: Purpose, Industry codes and standards, Gover ork activities – Application to classes of Instrumentation and to I stems: Identification System guidelines: Instrument Index – M tion – Loop Identification number – Identification Letter Tables	Instrument	functions.	• •			
Unit – II	Graphic Symbol Systems:						9
devices - Shared	ymbols – Measurement and control devices – AND/OR function d On/Off devices – Multipoint, Multifunction, Multivariable dev ical schematic symbols.						
Unit – III	Fundamentals of P&ID Development:						9
Ownership Block Pipes and Equipr Manual Valves ar positions. Heat 1 exchanger P&ID.		ck – Main I ntifiers – s – Actua	Body of a P& Pipe Symbol tors – Taggin	ID. – Pi g Au	pe Ta Itoma	ag – atic va	Pipe fittings Ilves – valve Tag – Hea
Ownership Block Pipes and Equipr Manual Valves ar positions. Heat T exchanger P&ID. <b>Unit – IV</b> Fundamentals of (BPCS) –Instrum Elements - Simp	Reference Drawing Block – Revision Block – Comments Bloc nents: Fluid Conductors: Pipes, Tubes, and Ducts – Pipe Ide nd Automatic Valves – classification of valves – valve operator fransfer units: Heat exchanger identifier – Heat exchanger i Instrumentation and Control System: Instrumentation and Control - ICSS System Technology - ients on P&IDs - Instrument Identifier – Signals: Communica- pile control loops – Level Control Loops –Pressure Control Loops	ck – Main I ntifiers – s – Actua identifier S ICSS Eler ation Betw	Body of a P& Pipe Symbol tors – Taggin Symbol – He ments – Bas reen Instrume	ID. – Pi g Au eat e ic Pr ents	pe Ta itoma xcha ocesa – Dit	ag – atic va nger s Cor fferen	Pipe fittings Ilves – valvo Tag – Hea <b>9</b> htrol Systen t Instrumen
Ownership Block Pipes and Equipr Manual Valves ar positions. Heat T exchanger P&ID. <b>Unit – IV</b> Fundamentals of (BPCS) –Instrum Elements - Simp Control Loops – F	Reference Drawing Block – Revision Block – Comments Bloc nents: Fluid Conductors: Pipes, Tubes, and Ducts – Pipe Ide nd Automatic Valves – classification of valves – valve operator fransfer units: Heat exchanger identifier – Heat exchanger i Instrumentation and Control System: Instrumentation and Control - ICSS System Technology - ents on P&IDs - Instrument Identifier – Signals: Communica- ble control loops – Level Control Loops –Pressure Control Loo- Flow Control Loops.	ck – Main I ntifiers – s – Actua identifier S ICSS Eler ation Betw	Body of a P& Pipe Symbol tors – Taggin Symbol – He ments – Bas reen Instrume	ID. – Pi g Au eat e ic Pr ents	pe Ta itoma xcha ocesa – Dit	ag – atic va nger s Cor fferen	Pipe fittings Ilves – valve Tag – Hea <b>9</b> htrol Systen t Instrumen Composition
Ownership Block Pipes and Equipr Manual Valves ar positions. Heat T exchanger P&ID. Unit – IV Fundamentals of (BPCS) –Instrum Elements - Simp Control Loops – F Unit – V Introduction- Safe SIS Logic – Show	Reference Drawing Block – Revision Block – Comments Bloc nents: Fluid Conductors: Pipes, Tubes, and Ducts – Pipe Ide nd Automatic Valves – classification of valves – valve operator fransfer units: Heat exchanger identifier – Heat exchanger i Instrumentation and Control System: Instrumentation and Control - ICSS System Technology - ients on P&IDs - Instrument Identifier – Signals: Communica- pile control loops – Level Control Loops –Pressure Control Loops	ck – Main I ntifiers – s – Actua identifier S ICSS Eler ation Betw pops –Ter a SIS: SIS	Body of a P& Pipe Symbol tors – Taggin Symbol – He ments – Bas reen Instrume nperature Co Element Sym	ID. – Pi g Au eat e ic Pr ents introl mbol	pe Ta itoma xcha ocesa – Dif Loop	ag – nger s Cor fferen ps – S Fin	Pipe fittings Ilves – valve Tag – Hea <b>9</b> htrol Systen t Instrumen Composition <b>9</b> al Elements
Ownership Block Pipes and Equipr Manual Valves ar positions. Heat T exchanger P&ID. Unit – IV Fundamentals of (BPCS) –Instrum Elements - Simp Control Loops – F Unit – V Introduction- Safe SIS Logic – Show	Reference Drawing Block – Revision Block – Comments Bloc ments: Fluid Conductors: Pipes, Tubes, and Ducts – Pipe Ide and Automatic Valves – classification of valves – valve operator Transfer units: Heat exchanger identifier – Heat exchanger if Instrumentation and Control System: Instrumentation and Control System: Instrumentation and Control - ICSS System Technology - ents on P&IDs - Instrument Identifier – Signals: Communica ple control loops – Level Control Loops –Pressure Control Lo Flow Control Loops. Plant Interlocks and Alarms: ety strategies – Concept of a SIS – SIS extent – Anatomy of a wing Safety Instrumented Functions on P&IDs – Discrete Con-	ck – Main I ntifiers – s – Actua identifier S ICSS Eler ation Betw pops –Ter a SIS: SIS	Body of a P& Pipe Symbol tors – Taggin Symbol – He ments – Bas reen Instrume nperature Co Element Sym	ID. – Pi g Au eat e ic Pr ents introl mbol	pe Ta itoma xcha ocesa – Dif Loop	ag – nger s Cor fferen ps – S Fin	Pipe fittings Ilves – valve Tag – Hea <b>9</b> htrol Systen t Instrumer Composition <b>9</b> al Elements
Ownership Block Pipes and Equipr Manual Valves ar positions. Heat 1 exchanger P&ID. <b>Unit – IV</b> Fundamentals of (BPCS) –Instrum Elements - Simp Control Loops – F <b>Unit – V</b> Introduction- Safe SIS Logic – Show Alarm requiremer	Reference Drawing Block – Revision Block – Comments Bloc ments: Fluid Conductors: Pipes, Tubes, and Ducts – Pipe Ide and Automatic Valves – classification of valves – valve operator Transfer units: Heat exchanger identifier – Heat exchanger if Instrumentation and Control System: Instrumentation and Control System: Instrumentation and Control - ICSS System Technology - ents on P&IDs - Instrument Identifier – Signals: Communica ple control loops – Level Control Loops –Pressure Control Lo Flow Control Loops. Plant Interlocks and Alarms: ety strategies – Concept of a SIS – SIS extent – Anatomy of a wing Safety Instrumented Functions on P&IDs – Discrete Con-	ck – Main I ntifiers – s – Actua identifier S ICSS Eler ation Betw pops –Ter a SIS: SIS	Body of a P& Pipe Symbol tors – Taggin Symbol – He ments – Bas reen Instrume nperature Co Element Sym	ID. – Pi g Au eat e ic Pr ents introl mbol	pe Ta itoma xcha ocesa – Dif Loop	ag – nger s Cor fferen ps – S Fin	Pipe fittings lives – valv Tag – Hea ntrol Syster t Instrumer Compositio <b>9</b> al Elements rm systems
Ownership Block Pipes and Equipr Manual Valves ar positions. Heat 1 exchanger P&ID. Unit – IV Fundamentals of (BPCS) –Instrum Elements - Simp Control Loops – F Unit – V Introduction- Safe SIS Logic – Show Alarm requiremer TEXT BOOK:	Reference Drawing Block – Revision Block – Comments Bloc ments: Fluid Conductors: Pipes, Tubes, and Ducts – Pipe Ide and Automatic Valves – classification of valves – valve operator Transfer units: Heat exchanger identifier – Heat exchanger if Instrumentation and Control System: Instrumentation and Control System: Instrumentation and Control - ICSS System Technology - ents on P&IDs - Instrument Identifier – Signals: Communica ple control loops – Level Control Loops –Pressure Control Lo Flow Control Loops. Plant Interlocks and Alarms: ety strategies – Concept of a SIS – SIS extent – Anatomy of a wing Safety Instrumented Functions on P&IDs – Discrete Con-	ck – Main I ntifiers – s – Actua identifier S ICSS Eler ation Betw pops –Ter a SIS: SIS atrol – Ala	Body of a P& Pipe Symbol tors – Taggin Symbol – He ments – Bas reen Instrume nperature Co Element Sy rm System: A	ID. – Pi g Au eat e ic Pr ic Pr mbol Anato	pe Ti toma xcha ocess – Dit Loop s, SI: my c	ag – atic va nger s Cor fferen ps – S Fina of Ala	Pipe fittings lives – valv Tag – Hea <b>9</b> ntrol Syster t Instrumer Compositio <b>9</b> al Elements rm systems <b>Total:4</b>
Ownership Block         Pipes and Equipr         Manual Valves ar         positions. Heat T         exchanger P&ID.         Unit – IV         Fundamentals of         (BPCS) –Instrum         Elements - Simp         Control Loops – F         Unit – V         Introduction- Safe         SIS Logic – Show         Alarm requiremer         TEXT BOOK:         1.       Liptak B.         Book Co,	Reference Drawing Block – Revision Block – Comments Bloc ments: Fluid Conductors: Pipes, Tubes, and Ducts – Pipe Ide and Automatic Valves – classification of valves – valve operator Transfer units: Heat exchanger identifier – Heat exchanger if Instrumentation and Control System: Instrumentation and Control System: Instrumentation and Control - ICSS System Technology - ents on P&IDs - Instrument Identifier – Signals: Communication ole control loops – Level Control Loops –Pressure Control Loops Plant Interlocks and Alarms: ety strategies – Concept of a SIS – SIS extent – Anatomy of a wing Safety Instrumented Functions on P&IDs – Discrete Con- nts, Alarm system Symbology, Concept of 'Common Alarm'. G., "Instrumentation Engineers Handbook (Process Measuren	ck – Main I ntifiers – s – Actua identifier S ICSS Eler ation Betw pops –Ter a SIS: SIS atrol – Ala	Body of a P& Pipe Symbol tors – Taggin Symbol – He ments – Bas reen Instrume nperature Co Element Sy rm System: A	ID. – Pi g Au eat e ic Pr ic Pr mbol Anato	pe Ti toma xcha ocess – Dit Loop s, SI: my c	ag – atic va nger s Cor fferen ps – S Fina of Ala	Pipe fittings lives – valve Tag – Hea <b>9</b> ntrol System t Instrumer Composition <b>9</b> al Elements rm systems <b>Total:4</b>
Ownership Block Pipes and Equipr Manual Valves ar positions. Heat 1 exchanger P&ID. Unit – IV Fundamentals of (BPCS) –Instrum Elements - Simp Control Loops – F Unit – V Introduction- Safe SIS Logic – Show Alarm requiremer TEXT BOOK: 1. Liptak B. Book Co, REFERENCES:	Reference Drawing Block – Revision Block – Comments Bloc ments: Fluid Conductors: Pipes, Tubes, and Ducts – Pipe Ide and Automatic Valves – classification of valves – valve operator Transfer units: Heat exchanger identifier – Heat exchanger if Instrumentation and Control System: Instrumentation and Control System: Instrumentation and Control - ICSS System Technology - ents on P&IDs - Instrument Identifier – Signals: Communication ole control loops – Level Control Loops –Pressure Control Loops Plant Interlocks and Alarms: ety strategies – Concept of a SIS – SIS extent – Anatomy of a wing Safety Instrumented Functions on P&IDs – Discrete Con- nts, Alarm system Symbology, Concept of 'Common Alarm'. G., "Instrumentation Engineers Handbook (Process Measuren	ck – Main I ntifiers – s – Actua identifier S ICSS Eler ation Betw pops –Ter a SIS: SIS throl – Ala	Body of a P& Pipe Symbol tors – Taggin Symbol – He ments – Bas reen Instrume nperature Co Element Sym m System: A ralysis)", Volu	ID. – Pi g Au eat e ic Pr ents ntrol mbol Anato	pe Ti tromaa xcha ooces – Dif Loop s, SI: s, SI: omy c	ag – atic va nger s Cor fferen ps – S Fina of Ala	Pipe fittings lives – valv Tag – Hea <b>9</b> ntrol Syster t Instrumer Compositio <b>9</b> al Elements rm systems <b>Total:4</b> ion , Chilto

	SE OUTCOMES: mpletion of the course, the students will be able to	BT Mapped (Highest Level)
CO1	summarize the basics of instrumentation standards and symbols.	Understanding (K2)
CO2	identify the instrument symbols and function symbols for various elements.	Understanding (K2)
CO3	interpret the symbols of pipes and various equipments in process industry and recognize P&ID and its role in process industry.	Understanding (K2)
CO4	implement the control concepts in basic process systems and develop simple control loops	Applying (K3)
CO5	develop the safety interlock systems and alarm systems in process plants and equipments	Applying (K3)

					Маррі	ing of C	Os with	n Pos a	nd PSC	Ds				
COs/Pos	P01	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1						1		2			2	2
CO2	3	1						1		2			2	2
CO3	3	1						1		2			2	2
CO4	3	2	1	1	1			1		2			3	3
CO5	3	2	1	1	1			1		2			3	3
1 – Slight, 2	2 – Mode	erate, 3 -	- Substar	ntial, BT	- Bloom	's Taxor	iomy							

		ASSESSMEN	IPAILERN	- THEORY			
Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	40	60					100
CAT2	20	30	50				100
CAT3	20	30	50				100
ESE	20	40	40				100

#### 22EIE26 - MACHINE LEARNING AND ITS APPLICATIONS

Programme & Branch	B.E. & Electronics and Instrumentation Engineering	Sem.	Category	L	т	Ρ	Credit
Prerequisites	s Nil	7	PE	3	0	0	3
Preamble	This course is intended to provide the foundation on topics form the basis for many other areas in the mathematical so theory. As application of machine learning case studies will	iences inc	luding param				
Unit – I	Machine Learning Basic Concepts:		uresseu.				9
Learning Mult	ociations – Classification – Regression – Unsupervised Learning iple Classes - Model Selection and Generalization. Bayesian Deci biscriminant Function.						
Unit – II	Dimensionality Reduction, Clustering and Decision Tre	es:					9
Discriminate /	<ul> <li>Subset Selection – Principal Component Analysis – Factor Analysis. Clustering: Introduction – Mixture Densities – K-mean tivariate Trees.</li> </ul>	Analysis	<ul> <li>Multidiment</li> <li>Decision</li> </ul>	ensio Tree	nal es: U	Scalin nivari	g – Linea ate Trees
Unit – III	Multilayer Perceptrons:						9
Introduction – Approximator	The Perceptron - Training a Perceptron – Learning Boolean Func – Back Propagation Algorithm – Training Procedures - Tuning t						
Introduction – Approximator Learning Time <b>Unit – IV</b> Local Models: Graphical Mo	The Perceptron - Training a Perceptron – Learning Boolean Func – Back Propagation Algorithm – Training Procedures - Tuning to a: Time Delay Neural Networks – Recurrent Networks. Local and Graphical Models: : Introduction – Competitive Learning– Normalized and Competitive dels: Canonical cases for conditional independence – Example	the Networ ve Basis Free of Grap	k Size – Ba unction – Lea hical Models	yesia arnin . Re	an Vi g Ve	ew of ctor C	Learning 9 Quantization
Introduction – Approximator Learning Time <b>Unit – IV</b> Local Models: Graphical Mo Introduction –	The Perceptron - Training a Perceptron – Learning Boolean Funct – Back Propagation Algorithm – Training Procedures - Tuning t e: Time Delay Neural Networks – Recurrent Networks. <b>Local and Graphical Models:</b> : Introduction – Competitive Learning– Normalized and Competitive idels: Canonical cases for conditional independence – Example Elements of Reinforcement Learning – Model Based Learning - Te	the Networ ve Basis Free of Grap	k Size – Ba unction – Lea hical Models	yesia arnin . Re	an Vi g Ve	ew of ctor C	Suantization 9 20 Suantization 1 Learning 2 ation.
Introduction – Approximator Learning Time <b>Unit – IV</b> Local Models: Graphical Mo Introduction – <b>Unit – V</b> Clustering: Ar	The Perceptron - Training a Perceptron – Learning Boolean Func – Back Propagation Algorithm – Training Procedures - Tuning to a: Time Delay Neural Networks – Recurrent Networks. Local and Graphical Models: : Introduction – Competitive Learning– Normalized and Competitive dels: Canonical cases for conditional independence – Example	the Networ ve Basis Fi e of Grap emporal Dir	k Size – Ba unction – Lea hical Models iference Lear	yesia arnin . Re ning	g Ve inforo – Ge	ew of ctor C cemer nerali	Puantization guantization t Learning zation. g
Introduction – Approximator Learning Time <b>Unit – IV</b> Local Models: Graphical Mo Introduction – <b>Unit – V</b> Clustering: Ar	The Perceptron - Training a Perceptron – Learning Boolean Funct – Back Propagation Algorithm – Training Procedures - Tuning to e: Time Delay Neural Networks – Recurrent Networks. Local and Graphical Models: : Introduction – Competitive Learning– Normalized and Competitive dels: Canonical cases for conditional independence – Example Elements of Reinforcement Learning – Model Based Learning - Te Applications of Machine Learning: nalysis for Market Research -Regression: Predicting house prior	the Networ ve Basis Fi e of Grap emporal Dir	k Size – Ba unction – Lea hical Models iference Lear	yesia arnin . Re ning	g Ve inforo – Ge	ew of ctor C cemer nerali	9       Quantization       t       Learning       zation.       9       lusic       Genr
Introduction – Approximator Learning Time <b>Unit – IV</b> Local Models: Graphical Mo Introduction – <b>Unit – V</b> Clustering: Ar	The Perceptron - Training a Perceptron – Learning Boolean Funct – Back Propagation Algorithm – Training Procedures - Tuning to a: Time Delay Neural Networks – Recurrent Networks. <b>Local and Graphical Models:</b> : Introduction – Competitive Learning– Normalized and Competitive dels: Canonical cases for conditional independence – Example Elements of Reinforcement Learning – Model Based Learning - Tec <b>Applications of Machine Learning:</b> nalysis for Market Research -Regression: Predicting house prior – Computer vision.	the Networ ve Basis Fi e of Grap emporal Dir	k Size – Ba unction – Lea hical Models iference Lear	yesia arnin . Re ning	g Ve inforo – Ge	ew of ctor C cemer nerali	9       Quantization       t       Learning       zation.       9       lusic       Genr
Introduction – Approximator Learning Time <b>Unit – IV</b> Local Models: Graphical Mo Introduction – <b>Unit – V</b> Clustering: Ar Classification	The Perceptron - Training a Perceptron – Learning Boolean Funct – Back Propagation Algorithm – Training Procedures - Tuning to a: Time Delay Neural Networks – Recurrent Networks. <b>Local and Graphical Models:</b> : Introduction – Competitive Learning– Normalized and Competitive dels: Canonical cases for conditional independence – Example Elements of Reinforcement Learning – Model Based Learning - Tec <b>Applications of Machine Learning:</b> nalysis for Market Research -Regression: Predicting house prior – Computer vision.	the Network ve Basis Free of Grap emporal Directory ces with r	k Size – Ba hical Models iference Lear egression. C	yesia arnin . Re ning lassi	g Ve inford – Ge ficatio	ew of ctor C cemer nerali	9       Quantization       t       Learning       zation.       9       lusic       Genr
Introduction – Approximator Learning Time Unit – IV Local Models: Graphical Mo Introduction – Unit – V Clustering: Ar Classification TEXT BOOK: 1. Ethen	The Perceptron - Training a Perceptron – Learning Boolean Funct – Back Propagation Algorithm – Training Procedures - Tuning to a: Time Delay Neural Networks – Recurrent Networks. <b>Local and Graphical Models:</b> : Introduction – Competitive Learning– Normalized and Competitive dels: Canonical cases for conditional independence – Example Elements of Reinforcement Learning – Model Based Learning - Te <b>Applications of Machine Learning:</b> nalysis for Market Research -Regression: Predicting house price – Computer vision. n Alpaydin, "Introduction to Machine Learning ",3 <sup>rd</sup> Edition, The MI"	the Network ve Basis Free of Grap emporal Directory ces with r	k Size – Ba hical Models iference Lear egression. C	yesia arnin . Re ning lassi	g Ve inford – Ge ficatio	ew of ctor C cemer nerali	Puantization guantization t Learning zation. g
Introduction – Approximator Learning Time Unit – IV Local Models: Graphical Mo Introduction – Unit – V Clustering: Ar Classification TEXT BOOK: 1. Ethen REFERENCE	The Perceptron - Training a Perceptron – Learning Boolean Funct – Back Propagation Algorithm – Training Procedures - Tuning t a: Time Delay Neural Networks – Recurrent Networks. Local and Graphical Models: : Introduction – Competitive Learning– Normalized and Competitive dels: Canonical cases for conditional independence – Example Elements of Reinforcement Learning – Model Based Learning - Te Applications of Machine Learning: nalysis for Market Research -Regression: Predicting house prid – Computer vision. m Alpaydin, "Introduction to Machine Learning ",3 <sup>rd</sup> Edition, The MI" S: Pedro Coelho, Willi Richert, "Building Machine Learning Systems w	the Network ve Basis Fi e of Grap emporal Dif ces with r	k Size – Ba unction – Lea hical Models iference Lear egression. C	yesia arnin . Re ning lassi	g Ve inford – Ge ficati	ew of ctor C cemer nerali	Learning 9 Quantization nt Learning zation. 9 Iusic Genr Total:4
Introduction –         Approximator         Learning Time         Unit – IV         Local Models:         Graphical Models:         Graphical Modulation         Unit – V         Clustering: Ar         Classification         TEXT BOOK:         1.       Ethen         REFERENCE         1.       Luis F         2015.	The Perceptron - Training a Perceptron – Learning Boolean Funct – Back Propagation Algorithm – Training Procedures - Tuning t a: Time Delay Neural Networks – Recurrent Networks. Local and Graphical Models: : Introduction – Competitive Learning– Normalized and Competitive dels: Canonical cases for conditional independence – Example Elements of Reinforcement Learning – Model Based Learning - Te Applications of Machine Learning: nalysis for Market Research -Regression: Predicting house prid – Computer vision. m Alpaydin, "Introduction to Machine Learning ",3 <sup>rd</sup> Edition, The MI" S: Pedro Coelho, Willi Richert, "Building Machine Learning Systems w	the Network ve Basis Free of Grap emporal Difference ces with r T Press, Lo ith Python'	k Size – Ba unction – Lea hical Models iference Lear egression. C ondon, Engla	yesia arnin . Re ning lassi	g Ve inford – Ge ficati	ew of ctor C cemer nerali	9       Quantization       1       1       2       2       2       2       3       1       1       9       1       1       9       1

		UTCON		rse, the s	student	s will be	able to	)						BT Map (Highest	
CO1	infe	r the ba	isic conc	epts of le	earning	methods	involve	d in ma	chine le	earning			U	nderstand	ling (K2)
CO2	exp	lain the	fundam	entals of	dimens	ionality r	eductior	n, cluste	ring an	d decisi	on trees		U	nderstand	ling (K2)
CO3	sun	nmarize	the con	cepts of r	neural r	etworks	along w	ith its a	rchitect	ures				Applying	g(K3)
CO4	ехр	lain the	various	models a	and rein	forceme	nt learnii	ng techi	niques				U	nderstand	ling (K2)
CO5	app	ly mach	nine leari	ning algo	rithms f	or basic	clusterir	ng, class	sificatio	n and re	gressior	n problems		Applying	g(K3)
						Маррі	ng of C	Os witł	n POs a	and PS(	Ds				
COs/F	POs	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO	)1	3	1											2	2
CO	2	3	1											2	2
CO	3	3	2	1	1	1								3	3
CO	94	3	1											2	2
CO	95	3	2	1	1	1								3	3
1 – Sli	ight, 2	– Mode	erate, 3 -	- Substar	ntial, B1	- Bloom	s Taxor	nomy							
						ASSE	SSMEN		FERN -	THEOR	RY				
	st / Bl Categ	oom's ory*	Re	member (K1) %	ing l	Jndersta (K2)		Apply (K3)		Analyz (K4)	•	Evaluating (K5) %		reating K6) %	Total %
	CAT			20		60		20	)	<u> </u>		-		-	100
	CAT	2		20		30		50	)						100

40

40

100

100

\* ±3% may be varied (CAT 1, 2 & 3 – 50 marks & ESE – 100 marks)

40

40

20

20

CAT3

ESE

Programme & Branch	B.E. & Electronics and Instrumentation Engineering	Sem.	Category	L	т	Ρ	Credit
Prerequisites	Control Systems	7	PE	3	0	0	3
Preamble	To understand the basic principles and algorithm of predic fundamental contents of predictive control theory and appl		ol and to get a	acqua	aintec	l with	the
Unit – I	Need for Predictive Control:						9
methods: Control systems-the pote	assumptions: PID compensation-lag-lead compensation-cla ling systems with non-minimum phase zeros and time delays intial value of prediction-main components of Model Predictive	- impact	of delays- co				op unstabl
Unit – II	Generation and Development of Predictive Control:						9
algorithm and im	edictive Control (PC)-prediction model-dynamic matrix contriplementation-DMC in state space framework-general predictived on state space model.						
Unit – III	Synthesis of Stable Predictive Control:						9
	SVILLIESIS OF SLADIE FREUICLIVE CONTON.						3
•····		between	MPC and o	otima	l con	trol-s	-
Fundamental phi	losophy of qualitative synthesis theory of PC –relationship with zero terminal constraints – PC with terminal cost fu						ynthesis c
Fundamental phi stable PC – PC optimality analysi Unit – IV	losophy of qualitative synthesis theory of PC –relationship with zero terminal constraints – PC with terminal cost fu s of PC Predictive Control of Non-linear Systems:	inctions-g	eneral stabili	ty co	nditic	ons o	ynthesis o f PC- sub
Fundamental phi stable PC – PC optimality analysi <b>Unit – IV</b> General descript	losophy of qualitative synthesis theory of PC –relationship with zero terminal constraints – PC with terminal cost fu is of PC	unctions-g	eneral stabili zation – mult	ty co iple N	nditic	ons o base	ynthesis o f PC- sub <b>9</b> d on fuzz
Fundamental phi stable PC – PC optimality analysi <b>Unit – IV</b> General descript	losophy of qualitative synthesis theory of PC –relationship with zero terminal constraints – PC with terminal cost fu s of PC <b>Predictive Control of Non-linear Systems:</b> ion of PC for non-linear systems- PC based on input-outp	unctions-g	eneral stabili zation – mult	ty co iple N	nditic	ons o base	ynthesis o f PC- sub <b>9</b> d on fuzz
Fundamental phi stable PC – PC optimality analysi <b>Unit – IV</b> General descript clustering – neura <b>Unit – V</b> Industrial applica implementation –	losophy of qualitative synthesis theory of PC –relationship with zero terminal constraints – PC with terminal cost fu is of PC Predictive Control of Non-linear Systems: ion of PC for non-linear systems- PC based on input-outp al network PC – PC for Hammersian systems – PC with feed-	ut lineariz forward a al proces oblem forr	eneral stabili zation – mult nd feedback s optimizatior nulation and	iple N struct n – ke varia	Nditic MPC ure – ey tec ible s	base casc casc	ynthesis of f PC- sub g d on fuzz ade PC. g ogies pf P0
Fundamental phi stable PC – PC optimality analysi <b>Unit – IV</b> General descript clustering – neura <b>Unit – V</b> Industrial applica implementation –	Iosophy of qualitative synthesis theory of PC –relationship with zero terminal constraints – PC with terminal cost fu is of PC Predictive Control of Non-linear Systems: ion of PC for non-linear systems- PC based on input-outp al network PC – PC for Hammersian systems – PC with feed- Applications of Predictive Control: tions and software development of PC –role of PC in industri - process description and control system configuration –proc	ut lineariz forward a al proces oblem forr	eneral stabili zation – mult nd feedback s optimizatior nulation and	iple N struct n – ke varia	Nditic MPC ure – ey tec ible s	base casc casc	ynthesis of f PC- sub g d on fuzz ade PC. g ogies pf PC
Fundamental phi stable PC – PC optimality analysi <b>Unit – IV</b> General descript clustering – neur <b>Unit – V</b> Industrial applica implementation –	Iosophy of qualitative synthesis theory of PC –relationship with zero terminal constraints – PC with terminal cost fu is of PC Predictive Control of Non-linear Systems: ion of PC for non-linear systems- PC based on input-outp al network PC – PC for Hammersian systems – PC with feed- Applications of Predictive Control: tions and software development of PC –role of PC in industri - process description and control system configuration –proc	ut lineariz forward a al proces oblem forr	eneral stabili zation – mult nd feedback s optimizatior nulation and	iple N struct n – ke varia	Nditic MPC ure – ey tec ible s	base casc casc	ynthesis of f PC- sub g d on fuzz ade PC. g ogies pf PC ion – plar
Fundamental phi stable PC – PC optimality analysi Unit – IV General descript clustering – neura Unit – V Industrial applica implementation - testing and mode	Iosophy of qualitative synthesis theory of PC –relationship with zero terminal constraints – PC with terminal cost fu is of PC Predictive Control of Non-linear Systems: ion of PC for non-linear systems- PC based on input-outp al network PC – PC for Hammersian systems – PC with feed- Applications of Predictive Control: tions and software development of PC –role of PC in industri - process description and control system configuration –proc	ut lineariz forward a al proces oblem forr on system	eneral stabili zation – mult nd feedback s s optimization nulation and and in solar	iple N struct n – ke varia powe	nditic MPC ure – ey tec ble s br pla	base casc casc chnolo select nt.	ynthesis of f PC- sub g d on fuzz ade PC. g ogies pf P( ion – plar Total:4
Fundamental phi stable PC – PC optimality analysi Unit – IV General descript clustering – neura Unit – V Industrial applica implementation - testing and mode TEXT BOOK:	Iosophy of qualitative synthesis theory of PC –relationship with zero terminal constraints – PC with terminal cost fu is of PC Predictive Control of Non-linear Systems: ion of PC for non-linear systems- PC based on input-outp al network PC – PC for Hammersian systems – PC with feed- Applications of Predictive Control: tions and software development of PC –role of PC in industri - process description and control system configuration –pro- el identification-application of PC in an automatic train operation	ut lineariz forward a al proces oblem forr on system	eneral stabili zation – mult nd feedback s s optimization nulation and and in solar	iple N struct n – ke varia powe	nditic MPC ure – ey tec ble s br pla	base casc casc chnolo select nt.	ynthesis of f PC- sub g d on fuzz ade PC. g ogies pf P( ion – plar Total:4
Fundamental phi stable PC – PC optimality analysi Unit – IV General descript clustering – neur Unit – V Industrial applica implementation - testing and mode TEXT BOOK: 1. Yugeng 2019. REFERENCES:	<ul> <li>Iosophy of qualitative synthesis theory of PC –relationship with zero terminal constraints – PC with terminal cost furs of PC</li> <li>Predictive Control of Non-linear Systems:</li> <li>ion of PC for non-linear systems- PC based on input-outp al network PC – PC for Hammersian systems – PC with feed-</li> <li>Applications of Predictive Control:</li> <li>tions and software development of PC –role of PC in industri - process description and control system configuration –procel identification-application of PC in an automatic train operation</li> <li>Xi , Dewei Li, "Predictive Control: Fundamentals and Deve ho E.F., Bordons C., "Model Predictive control in Process</li> </ul>	ut lineariz forward a al proces oblem forr on system	eneral stabili zation – mult nd feedback s s optimization nulation and and in solar ", 1 <sup>st</sup> Editio	iple N struct varia powe	nditic MPC ure – ey tec bble s er pla	base casc chnolo select nt.	ynthesis of f PC- sub g d on fuzz ade PC. g ogies pf P ion – plan Total:4

COURS On com				urse, th	e stud	lents will	be able	e to					(	BT Map Highest				
CO1	reco	ognize	e the ne	ed for p	oredict	ive contro	I and to	identify	the m	nain com	ponents	i	Ur	derstand	ing (K2)			
CO2	form	nulate	the pr	edictive	contro	ol problem	and alg	porithms	6					Applying	(K3)			
CO3	appl	ly the	concep	ots of sy	nthesi	zing stable	e predic	tive con	itrol					Applying (K3)				
CO4	appl	ly the	concep	ots of pre	edictiv	e control i	n non-li	near sy	stems					Applying (K3)				
CO5														iderstand	ing (K2)			
						Марр	oing of	COs wi	th Pos	and PS	SOs							
COs/Po	s P	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2			
CO1		3	1											2	2			
CO2		3	2	1	1	1								3	3			
CO3		3	2	1	1	1								3	3			
CO4		3	2	1	1	1								3	3			
CO5		3	1											2	2			
1 – Sligh	nt, 2 –	- Mod	erate, 3	8 – Subs	tantia	, BT- Bloc	om's Tax	konomy		1		1	1					
						ASSE	SSME		TERN	– THEC	RY							
/ Test Cat	Bloo egory			nember (K1) %	ing	Understa (K2)		Apply (K3)		Analyz (K4) <sup>o</sup>	ing %	Evaluating (K5) %		eating K6) %	Total %			
С	AT1			20		50		30	)						100			
С	AT2			20		50		30	)						100			
С	AT3			20		50		30	)						100			
E	ESE			20		50		30	)						100			
* ±3% m	ay be	e varie	ed (CAT	1,2&	3 – 50	marks &	ESE – 1	00 mar	ˈks)		ł		1					

# 22EIE28 - MULTISENSOR AND DATA FUSION

Programme & Branch	B.E. & Electronics and Instrumentation Engineering	Sem.	Category	L	т	Р	Credit
Prerequisites	Digital Signal Processing	7	PE	3	0	0	3
Preamble	To impart the fundamental knowledge and applications of d algorithms	ata fusion	and impleme	ntatio	on of	data f	usion
Unit – I	Sensor and Data Fusion:						9
	nsors and Sensor data. Use of multiple sensors, Fusion applic hitectural concepts and issues – Benefits of data fusion.	ations. The	e inference hi	erar	chy: (	Dutpu	t data. Data
Unit – II	Data Registration:						9
	egistration Problem – Review of existing research – Reginger Images – Registration Assistance/Preprocessing – Regist						
Unit – III	Principles of Image and Spatial Data Fusion:						9
	tivation for combining image and spatial data – Defining imag						
	Multisensor Automatic Target – Image data fusion for Enha atial data fusion GEOINT.	ancement	of Imagery of	data	– Sp	batial	data tusioi
applications - Spa	Multisensor Automatic Target – Image data fusion for Enha atial data fusion GEOINT. Identity Declaration:	ancement	of Imagery o	data	– Sp	oatial	9
applications – Spa Unit – IV Identity declaratio	atial data fusion GEOINT.	mplates -	0,				9
applications – Spa Unit – IV Identity declaratio Neural Networks - Unit – V	atial data fusion GEOINT. Identity Declaration: on and pattern recognition – Future extraction – Parametric Tel – Physical Models – Knowledge-based Methods – Hybrid Tech Implementation of Data Fusion:	mplates – niques.	Cluster Analy	/sis -	Techr	niques	<b>9</b> s – Adaptiv <b>9</b>
applications – Spa Unit – IV Identity declaratio Neural Networks – Unit – V Introduction – Rea – Architecture Tr	atial data fusion GEOINT. Identity Declaration: In and pattern recognition – Future extraction – Parametric Tel Physical Models – Knowledge-based Methods – Hybrid Tech	mplates – niques. aluation – I	Cluster Analy	/sis <sup>-</sup>	Techr ion ai	niques nd De	9 s – Adaptiv 9 composition – Test and
applications – Spa Unit – IV Identity declaratio Neural Networks – Unit – V Introduction – Rea – Architecture Tr Evaluation – Surv	atial data fusion GEOINT.         Identity Declaration:         on and pattern recognition – Future extraction – Parametric Tell         – Physical Models – Knowledge-based Methods – Hybrid Tech         Implementation of Data Fusion:         quirements Analysis and Definition – Sensor Selection and Eva         rade-Offs – Algorithm Selection – Database Definition – HC	mplates – niques. aluation – I	Cluster Analy	/sis <sup>-</sup>	Techr ion ai	niques nd De	9 s – Adaptiv 9 composition – Test and
applications – Spa Unit – IV Identity declaratio Neural Networks - Unit – V Introduction – Rec – Architecture Tr Evaluation – Surv TEXT BOOK: 1 David L.	atial data fusion GEOINT.         Identity Declaration:         on and pattern recognition – Future extraction – Parametric Tell         – Physical Models – Knowledge-based Methods – Hybrid Tech         Implementation of Data Fusion:         quirements Analysis and Definition – Sensor Selection and Eva         rade-Offs – Algorithm Selection – Database Definition – HC	mplates – niques. aluation – I I design -	Cluster Analy Functional All	/sis <sup>-</sup> ocati nple	Techr ion ar ment	niques nd De ation	9 s – Adaptiv 9 composition – Test an Total:4
applications – Spa         Unit – IV         Identity declaration         Neural Networks -         Unit – V         Introduction – Rec         – Architecture Tr         Evaluation – Surver         TEXT BOOK:         1.       David L.         Boston, 2         Martin E.	atial data fusion GEOINT.         Identity Declaration:         on and pattern recognition – Future extraction – Parametric Tel         Physical Models – Knowledge-based Methods – Hybrid Tech         Implementation of Data Fusion:         quirements Analysis and Definition – Sensor Selection and Eva         rade-Offs – Algorithm Selection – Database Definition – HC         rey on Military Applications.         hall, Sonya A.H. McMullen, "Mathematical techniques in Mul	mplates – niques. aluation – I I design - ti sensor o	Cluster Analy Functional All - Software Ir data fusion",	/sis <sup>-</sup> ocati mple	Techi ion ai ment	niques nd De ation n, Art	9 s – Adaptive 9 composition – Test and Total:4
applications – Spa         Unit – IV         Identity declaratio         Neural Networks -         Unit – V         Introduction – Req         – Architecture Tr         Evaluation – Surver         TEXT BOOK:         1.       David L.         Boston, 2         Martin E.	atial data fusion GEOINT.         Identity Declaration:         on and pattern recognition – Future extraction – Parametric Tel         Physical Models – Knowledge-based Methods – Hybrid Tech         Implementation of Data Fusion:         quirements Analysis and Definition – Sensor Selection and Eva         rade-Offs – Algorithm Selection – Database Definition – HC         rey on Military Applications.         hall, Sonya A.H. McMullen, "Mathematical techniques in Mul         2004, for units 1, 4 and 5.         liggins, David L. Hall and James Llinas, "Handbook of Mul	mplates – niques. aluation – I I design - ti sensor o	Cluster Analy Functional All - Software Ir data fusion",	/sis <sup>-</sup> ocati mple	Techi ion ai ment	niques nd De ation n, Art	9 s – Adaptive 9 composition – Test and Total:4
applications – Spa         Unit – IV         Identity declaration         Neural Networks -         Unit – V         Introduction – Req         – Architecture Tr         Evaluation – Surver         TEXT BOOK:         1.       David L.         Boston, 2         2.       Martin E.         Edition, C         REFERENCES:         1       Brooks R	atial data fusion GEOINT.         Identity Declaration:         on and pattern recognition – Future extraction – Parametric Tel         Physical Models – Knowledge-based Methods – Hybrid Tech         Implementation of Data Fusion:         quirements Analysis and Definition – Sensor Selection and Eva         rade-Offs – Algorithm Selection – Database Definition – HC         rey on Military Applications.         hall, Sonya A.H. McMullen, "Mathematical techniques in Mul         2004, for units 1, 4 and 5.         liggins, David L. Hall and James Llinas, "Handbook of Mul	mplates – niques. aluation – I 21 design - ti sensor o ti sensor o	Cluster Analy Functional All - Software Ir data fusion", data Fusion:	vsis <sup>-</sup> ocati mple	Techn ion ar ment Editio	niques and De ation n, Art	9 s – Adaptive 9 composition – Test and Total:4 rech House ractice", 2 <sup>r</sup>

		UTCON tion of		rse, the s	student	s will be	e able to	)						BT Map (Highest	
CO1	des	cribe th	e basics	concept	s of sen	sor and	data fus	ion					U	nderstand	ling (K2)
CO2	illus	trate th	e data re	egistratior	n for dat	ta fusion							U	nderstand	ling (K2)
CO3	exa	mine th	e princip	oles of image	age and	d spatial	data fus	ion					U	nderstand	ling (K2)
CO4	exp	lain the	various	techniqu	es in da	ita fusion	)						U	nderstand	ling (K2)
CO5	perf	form ca	se study	on the d	ata fusio	on algori	thm for 1	realtime	applic	ations				Applying	J (K3)
						Маррі	ing of C	Os witl	h Pos a	and PSC	Ds				
COs/F	os	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO	1	3	1						1		1			2	2
CO2	2	3	1						1		1			2	2
CO	3	3	1						1		1			2	2
CO4	4	3	1						1		1			2	2
CO	5	3	2	1	1	1			1		1			3	3
1 – Slig	ght, 2	– Mode	erate, 3	- Substar	ntial, BT	- Bloom	's Taxon	iomy							
						ASSE	SSMEN	Τ ΡΑΤΤ	ERN -	THEOF	۲Y				
	t / Ble atege	oom's ory*	Re	member (K1) %	ing l	Jndersta (K2)		Apply (K3)		Analyz (K4) <sup>o</sup>		Evaluating (K5) %		reating K6) %	Total %
	CAT	1		30		70									100
	CAT	2		30		70									100
	CAT	3		30		40		30	)						100
	ESE	-		15		70		15	5						100

Programme & Branch	B.E. & Electronics and Instrumentation Engineering	Sem.	Category	L	т	Р	Credit
Prerequisites	Bio Medical Instrumentation	8	PE	3	0	0	3
Preamble	To impart the fundamental knowledge and applications of Dig	jital Signa	al Processing				
Unit – I	Respiratory Measurements Systems:						9
analyzers – Resp	on measurements – Basic spirometer- Ultrasonic spirometer – Flei iratory gas analyzers-Apnea monitor. Types of ventilators – Ventil ontrolled ventilator.						
Unit – II	Ultrasonic Imaging Systems:						9
	aging systems – Duplex scanner – Modern ultrasound imaging ultrasound systems.	systems	-Three-dime	nsior	nal ult	rasou	nd imagin
	Arrhythmia and Ambulatory Monitoring Instruments:						•
	ias – Arrhythmia monitor – QRS detection techniques – Ambula analysis. Foetal monitoring instruments: Cardiotocograph – I.						
Data replay and Phonocardiogram Unit – IV	analysis. Foetal monitoring instruments: Cardiotocograph – Blood Cell Counters:	Abdomi	nal foetal E	lectro	ocardi	ogran	n – Foeta
Data replay and Phonocardiogram <b>Unit – IV</b> Types of blood ce system: Need of	analysis. Foetal monitoring instruments: Cardiotocograph –	Abdomi nod – Ele	nal foetal E		ocardi y met	ogran	n – Foeta <b>9</b> Anaestheti
Data replay and Phonocardiogram <b>Unit – IV</b> Types of blood ce system: Need of audiometery.	analysis. Foetal monitoring instruments: Cardiotocograph – Blood Cell Counters: ells – Cell counting: Microscopic method – Automatic optical method	Abdomi nod – Ele	nal foetal E		ocardi y met	ogran	n – Foeta <b>9</b> Anaestheti
Data replay and Phonocardiogram <b>Unit – IV</b> Types of blood ce system: Need of audiometery. <b>Unit – V</b> Surgical diatherm	analysis. Foetal monitoring instruments: Cardiotocograph – Blood Cell Counters: ells – Cell counting: Microscopic method – Automatic optical meth anaesthesia – Anaesthesia machine. Audiometers: Mechanism	Abdomi nod – Ele n of hear	nal foetal E ctrical condu ing –Measur	lectro ctivity emer	y met	ogran hod. / sound	n – Foeta 9 Anaestheti d – Bekes 9
Data replay and Phonocardiogram <b>Unit – IV</b> Types of blood ce system: Need of audiometery. <b>Unit – V</b> Surgical diatherm	analysis. Foetal monitoring instruments: Cardiotocograph –      Blood Cell Counters:     Blood Cell Counters:     anaesthesia – Cell counting: Microscopic method – Automatic optical meth     anaesthesia – Anaesthesia machine. Audiometers: Mechanism     Surgical and Therapeutic Instruments:     y-Endoscopy basic components-Laparoscope, gastro scope, bror	Abdomi nod – Ele n of hear	nal foetal E ctrical condu ing –Measur	lectro ctivity emer	y met	ogran hod. / sound	n – Foeta 9 Anaestheti d – Bekes 9
Data replay and Phonocardiogram <b>Unit – IV</b> Types of blood ce system: Need of audiometery. <b>Unit – V</b> Surgical diatherm	analysis. Foetal monitoring instruments: Cardiotocograph –      Blood Cell Counters:     Blood Cell Counters:     anaesthesia – Cell counting: Microscopic method – Automatic optical meth     anaesthesia – Anaesthesia machine. Audiometers: Mechanism     Surgical and Therapeutic Instruments:     y-Endoscopy basic components-Laparoscope, gastro scope, bror	Abdomi nod – Ele n of hear	nal foetal E ctrical condu ing –Measur	lectro ctivity emer	y met	ogran hod. / sound	n – Foeta 9 Anaestheti d – Bekes 9 applicatior
Data replay and Phonocardiogram <b>Unit – IV</b> Types of blood ce system: Need of audiometery. <b>Unit – V</b> Surgical diatherm Operating microso <b>TEXT BOOK:</b>	analysis. Foetal monitoring instruments: Cardiotocograph –      Blood Cell Counters:     Blood Cell Counters:     anaesthesia – Cell counting: Microscopic method – Automatic optical meth     anaesthesia – Anaesthesia machine. Audiometers: Mechanism     Surgical and Therapeutic Instruments:     y-Endoscopy basic components-Laparoscope, gastro scope, bror	Abdomi nod – Ele n of hear	nal foetal E ctrical condu ing –Measur e-Cryogenic	techn	y met nt of	ogran hod. / sound	n – Foet 9 Anaesthet 9 – Bekes 9 application
Data replay and Phonocardiogram Unit – IV Types of blood ce system: Need of audiometery. Unit – V Surgical diatherm Operating microso TEXT BOOK: 1. Khandpu	analysis. Foetal monitoring instruments: Cardiotocograph – Blood Cell Counters: Bls – Cell counting: Microscopic method – Automatic optical meth anaesthesia – Anaesthesia machine. Audiometers: Mechanism Surgical and Therapeutic Instruments: y-Endoscopy basic components-Laparoscope, gastro scope, bror cope-arthroscopy-Modern lithotripter system-laser lithotripsy.	Abdomi nod – Ele n of hear	nal foetal E ctrical condu ing –Measur e-Cryogenic	techn	y met nt of	ogran hod. / sound	n – Foet 9 Anaesthet 9 – Bekes 9 application
Data replay and Phonocardiogram Unit – IV Types of blood ce system: Need of audiometery. Unit – V Surgical diatherm Operating microso TEXT BOOK: 1. Khandpu REFERENCES:	analysis. Foetal monitoring instruments: Cardiotocograph – Blood Cell Counters: Bls – Cell counting: Microscopic method – Automatic optical meth anaesthesia – Anaesthesia machine. Audiometers: Mechanism Surgical and Therapeutic Instruments: y-Endoscopy basic components-Laparoscope, gastro scope, bror cope-arthroscopy-Modern lithotripter system-laser lithotripsy.	Abdomi nod – Ele n of hear nchoscop	nal foetal E ctrical condu ing –Measur e-Cryogenic f w-Hill, New [	techn Delhi,	y met nt of iiques	ogran hod. / sound s and 3.	n – Foet 9 Anaesthet - Bekes 9 application Total:4
Data replay and         Phonocardiogram         Unit – IV         Types of blood ce         system: Need of         audiometery.         Unit – V         Surgical diatherm         Operating microso         TEXT BOOK:         1.         Khandpu         REFERENCES:         1.         Joseph J	Analysis. Foetal monitoring instruments: Cardiotocograph –      Blood Cell Counters:  ells – Cell counting: Microscopic method – Automatic optical meth anaesthesia – Anaesthesia machine. Audiometers: Mechanism  Surgical and Therapeutic Instruments: y-Endoscopy basic components-Laparoscope, gastro scope, bror cope-arthroscopy-Modern lithotripter system-laser lithotripsy.  Ir R.S., "Handbook of Biomedical Instrumentation", 3 <sup>rd</sup> Edition, Ta	Abdomi nod – Ele n of hear nchoscop ta McGra	nal foetal E ctrical condu ing –Measur e-Cryogenic f w-Hill, New [	techn	y met y met nt of iques 2018	ogran hod. / sound a and 3.	n – Foet 9 Anaesthet d – Bekes 9 application Total:4

		JTCOM ion of tl		se, the st	udents	s will be a	able to						(	BT Mapp Highest L		
CO1	inte	rpret the	e various	measure	ement t	echnique	s related	d to resp	oiratory	system			Ur	nderstandir	ng(K2)	
CO2	emp	oloy the	ultrasou	nd imagir	ng tech	niques ar	nd its us	efulnes	s in dia	gnosis				Applying (K3)		
CO3	ider	ntify the	various	monitorin	g instru	ments							Applying (K3)			
CO4	exp	lain the	mechan	isms of sp	pecial a	issist dev	ices						Ur	nderstandir	ng(K2)	
CO5	infe	r the co	ncepts ir	n surgical	and the	erapeutic	instrum	ents					Ur	nderstandir	ng(K2)	
						Марріі	ng of CO	Os with	Pos a	nd PSO	S					
COs/I	Pos	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	
CO	1	3	1				3							2	2	
CO	2	3	2	1	1	1	3							3	3	
CO	3	3	2	1	1	1	3							3	3	
CO	4	3	1				3							2	2	
CO	5	3	1				3							2	2	
1 – Slię	ght, 2	– Modei	rate, 3 –	Substant	ial, BT	Bloom's	Taxono	my								
						ASSES	SMENT	PATTI	ERN –	THEOR	Y					
	st / Blo Catego	oom's ory*	Re	memberi (K1) %	ing	Understa (K2)	5	Apply (K3)		Analyz (K4) <sup>o</sup>		Evaluating (K5) %	Crea	ating (K6) %	Tota %	
	CAT	1		20		50		30	)						100	
	CAT	2		50		20		30	)						100	
	CAT	3		40		60									100	
	ESE			30		50		20	)						100	

## 22EIE30 - INSTRUMENTATION AND CONTROL IN PAPER INDUSTRIES

Programn Branch	& B.E. & Electronics and Instrumentation Engineering	Sem.	Category	L	т	Р	Credit
Prerequis	es Nil	8	PE	3	0	0	3
Preamble	This course discusses the basic knowledge on Instrumen students to various control strategies employed in paper i		er making pro	oces	s and	l expo	se the
Unit – I	Paper Making Process:						9
system, j	ing process: Raw materials, pulping and preparation, screening per machine, drying section, calenders, drive, finishing, other afte ectrical, optical and chemical properties.						
Unit – II	Wet End Instrumentation:						9
	I measurements at wet end, pressure and vacuum, temperatu measurement, pH and ORP measurement, freeness measuremen		ensity and s	pecif	fic gr	avity,	level, flow
Unit – III	Dry End Instrumentation:						9
	I measurements, moisture basis weight, caliper, coat thickness, c tary and Batch type.	ptical variat	oles, measure	emer	nt of I	ength	and speed
Unit – IV	Control Strategies:						9
	l cross direction control techniques, control of pressure, vacuum, t eness, thickness, consistency, basis weight and moisture.	emperature,	liquid density	/ and	d spe	cific g	ravity, leve
Unit – V	Modernization in Paper Industries:						9
	g mechanism – packaging mechanism – Computer controls for onl s: Waste water Management, Advances in Pulp Purification, Pape			moi	sture	in mo	dern mills
							Total:4
TEXT BO	(:						
1. Li	ak, B.G., "Instrumentation Engineers Handbook (Measurement)", C	RC Press, 2	2005.				
REFEREN	ES:						
	y, C. E., "Pulp and Paper Science and Technology (Volume 1, A, 1962.	Pulp), (Volu	me 2, Paper	)", N	ew Y	′ork N	lcGraw Hil
-	n Lavigne, "Instrumentation Applications for the Pulp and Paper	Industry (A	Pulp & pape	r bo	ok)",	Back	beat Book

		UTCON		rse, the s	student	s will be	able to	)						BT Map (Highest	
CO1	dese	cribe th	e differe	ent stages	of ope	ration in	Paper Ir	ndustrie	S				ι	Inderstand	ling(K2)
CO2	expl	lain the	working	operatio	n of in	strument	ts used i	in wet e	nd sec	tion			ι	Inderstand	ling(K2)
CO3	expl	lain the	working	operatio	n of in	strument	is used i	in dry ei	nd sec	tion.			ι	Inderstand	ling(K2)
CO4	iider	ntify the	e contro	l aspects	used in	the pap	er indus	try						Applying	(K3)
CO5	dem	nonstrat	e abou	t the evol	ution of	compute	er applic	ations i	n pape	er industr	у		L	Inderstand	ling(K2)
						Маррі	ing of C	Os witl	h Pos	and PSC	Ds				
COs/F	Pos	P01	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO	1	3	1						1		2			2	2
CO	2	3	1						1		2			2	2
CO	3	3	1						1		2			2	2
CO	4	3	2	1	1	1			1		2			3	3
CO	5	3	2	1	1	1			1		2			2	2
1 – Sli	ght, 2	– Mode	erate, 3	- Substar	ntial, BT	- Bloom	s Taxon	iomy							
						ASSE	SSMEN	Τ ΡΑΤΤ	ERN -	- THEOF	RY				
	t / Blo atego		Re	member (K1) %	ing l	Jndersta (K2)		Apply (K3)		Analyzi (K4) %	0	Evaluating (K5) %		reating K6) %	Total %
	CAT	1		40		60									100

\*  $\pm$ 3% may be varied (CAT 1, 2 & 3 – 50 marks & ESE – 100 marks)

CAT2

CAT3

ESE

# 22EIE31 - INSTRUMENTATION AND CONTROL IN PETROCHEMICAL INDUSTRIES

Branch	B.E. & Electronics and Instrumentation Engineering	Sem.	Category	L	т	Ρ	Credit
Prerequisites	Industrial Instrumentation, Process Control	8	PE	3	0	0	3
Preamble	This course provides the concepts of petroleum processing applied to reactors, crystallizers, distillation columns, safety			ment	and	control	techniques
Unit – I	Petroleum Processing:						9
	ration – Composition of petroleum – Drilling – Recovery techr stocks of Petrochemicals – Separation of Gases into individual of						completio
Unit – II	Operations in Petroleum Industry:		•				9
	ion – Refining of crude oil –Thermal conversion processes: TI						
	g – Catalytic reforming – Hydro cracking – Catalytic alkylation – (	Catalytic Is	omerisation -	– Cat	talytic	polym	
Unit – III Popetors: Basic	Control of Reactors and Crystallizers: operation and fundamentals – Temperature control – Once the	brough co	oling Pooi	roulo	tod a	ooling	9 Cascad
control –Split ran	ge controls with multiple coolants – Crystallizers: Control basis allizers – Vacuum crystallizers – Reaction crystallizers.						
Unit – IV	Control of Distillation Columns:						9
Distillation equipr	nent –Column variables –Control configurations –Product Quali	tv Control	<ul> <li>Direct cont</li> </ul>	rol: F	eedb	ack cor	ntrol – Fee
forward control -	Cascade control - Inferring composition from Temperature -						
forward control – rate control - Ten <b>Unit – V</b>	Cascade control - Inferring composition from Temperature – perature control. Safety and ATEX Terminology & Regulations:	Column p	ressure contr	ol —F	Feed	control:	Feed flov
forward control – rate control - Ten Unit – V Introduction - In Hazardous Locat	Cascade control - Inferring composition from Temperature – perature control. Safety and ATEX Terminology & Regulations: trinsic Safety - Certification of Intrinsic Safety – NEC Defin ions – Introduction to ATEX Terminology & Regulations: EC D TEX 137 - North America - International IECEx Scheme -	Column p ition of H irectives -	azardous Lo Directive 94/	ol –F ocatio 9/EC	Feed	IEC D	Feed flow 9 efinition c – Directive
forward control – rate control - Ten Unit – V Introduction - In Hazardous Locat 1999/92/EC – A Certification Sche	Cascade control - Inferring composition from Temperature – perature control. Safety and ATEX Terminology & Regulations: trinsic Safety - Certification of Intrinsic Safety – NEC Defin ions – Introduction to ATEX Terminology & Regulations: EC D TEX 137 - North America - International IECEx Scheme -	Column p ition of H irectives -	azardous Lo Directive 94/	ol –F ocatio 9/EC	Feed	IEC D	Feed flow 9 efinition c – Directiv
forward control – rate control - Ten Unit – V Introduction - In Hazardous Locat 1999/92/EC – A Certification Sche	Cascade control - Inferring composition from Temperature – perature control. Safety and ATEX Terminology & Regulations: trinsic Safety - Certification of Intrinsic Safety – NEC Defin ions – Introduction to ATEX Terminology & Regulations: EC D TEX 137 - North America - International IECEx Scheme -	Column p ition of H irectives -	azardous Lo Directive 94/	ol –F ocatio 9/EC	Feed	IEC D	Feed flow 9 efinition c – Directive ternationa
forward control – rate control - Ten Unit – V Introduction - In Hazardous Locat 1999/92/EC – A Certification Sche TEXT BOOK:	Cascade control - Inferring composition from Temperature – perature control. Safety and ATEX Terminology & Regulations: trinsic Safety - Certification of Intrinsic Safety – NEC Defin ions – Introduction to ATEX Terminology & Regulations: EC D TEX 137 - North America - International IECEx Scheme -	Column p ition of H irectives - IECEx S	ressure contr azardous Lo Directive 94/ cheme Objec	ol –F ocatio /9/EC ctive	Feed of ons - C – AT – IE	IEC D EX 95 CEx Ir	Feed flow 9 efinition c – Directiv ternationa Total:4
forward control – rate control - Ten Unit – V Introduction - In Hazardous Locat 1999/92/EC – A Certification Sche TEXT BOOK: 1. Robert A 2. Liptak B. (Digitized	Cascade control - Inferring composition from Temperature – inperature control.  Safety and ATEX Terminology & Regulations: trinsic Safety - Certification of Intrinsic Safety – NEC Defin ions – Introduction to ATEX Terminology & Regulations: EC D TEX 137 - North America - International IECEx Scheme - eme Meyers, "Handbook of Petroleum Refining Processes",4 <sup>th</sup> Editi G, "Instrumentation in the Processing Industries", 1 <sup>st</sup> Edition, Ch 2008) for Unit-3,4	Column p ition of H irectives - IECEx S ion, McGra	ressure contr azardous Lc Directive 94/ cheme Object	ol –F ocatio ⁄9/EC ctive York,	Feed ( ons - 2 – AT – IE 2016	IEC D EX 95 CEx Ir	Feed flow 9 efinition c – Directiv ternationa Total:4
forward control – rate control - Ten Unit – V Introduction - In Hazardous Locat 1999/92/EC – A Certification Sche TEXT BOOK: 1. Robert A 2. Liptak B. (Digitized a https://to	Cascade control - Inferring composition from Temperature – perature control. Safety and ATEX Terminology & Regulations: trinsic Safety - Certification of Intrinsic Safety – NEC Defin ions – Introduction to ATEX Terminology & Regulations: EC D TEX 137 - North America - International IECEx Scheme - eme. . Meyers, "Handbook of Petroleum Refining Processes",4 <sup>th</sup> Editi G, "Instrumentation in the Processing Industries", 1 <sup>st</sup> Edition, Ch	Column p ition of H irectives - IECEx S ion, McGra	ressure contr azardous Lc Directive 94/ cheme Object	ol –F ocatio ⁄9/EC ctive York,	Feed ( ons - 2 – AT – IE 2016	IEC D EX 95 CEx Ir	Feed flow 9 efinition c – Directiv ternationa Total:4
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	SE OUTCOMES: mpletion of the course, the students will be able to	BT Mapped (Highest Level)
CO1	explain the basics of petroleum exploration and processing in petroleum industry	Understanding (K2)
CO2	illustrate the operations of petroleum refining process in petroleum industry	Understanding (K2)
CO3	build the instrumentation and control techniques involved in reactors and crystallizers	Applying (K3)
CO4	apply the various instrumentation and control schemes in distillation columns	Applying (K3)
CO5	describe the standards on Electrical, Intrinsic safety systems and ATEX terminology and regulations	Understanding (K2)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1											2	2
CO2	3	1											2	2
CO3	3	2	1	1	1								3	3
CO4	3	2	1	1	1								3	3
CO5	3	1											2	2

		ASSESSME	NI PAITERN	I - THEORY			
Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	40	60					100
CAT2	10	40	50				100
CAT3	10	40	50				100
ESE	20	40	40				100

Programme & Branch	B.E. & Electronics and Instrumentation Engineering	Sem.	Category	L	т	Ρ	Credit
Prerequisites	Nil	8	PE	3	0	0	3
Preamble	To impart knowledge about different modeling in VHDL preserveral level of abstractions.	rogramming	and synthesi	ze con	nplex	digita	l circuits a
Unit – I	VHDL Fundamentals:						9
Libraries and Pa Assignments – C	are Description Languages – HDL Abstraction – The Modern D ackages – The Entity – The Architecture – Modeling Con oncurrent Signal Assignments with Logical Operators –Conditio	current Fu	nctionality in				rent Signa
Unit – II	Dataflow Modeling:						9
	al Assignment Statement – Concurrent versus Sequential Si ement – Block Statement – Concurrent Assertion Statement – V			Delay	/ – C	onditi	onal Signa
	POPOL = POCK STATEMENT = CONCUTENT ASSEMDD STATEMENT = V						
<b>Unit – III</b> Components: Co Basic Configurati Configurations.	Structural Modeling: mponent Declarations – Component Instantiation – Packagir on Declarations – Configuring Multiple Levels of Hierarchy – D	ng Compon	ents – Config				ort Maps i
Unit – III Components: Co Basic Configurati Configurations. Unit – IV If Statements: C Statements: Exit	Structural Modeling:         mponent Declarations – Component Instantiation – Packagir         on Declarations – Configuring Multiple Levels of Hierarchy – D         Behavioral Modeling         onditional Variable Assignments – Case Statements: Select         Statements – Next Statements – While Loops – For Loops – Su	ng Compon irect Instan ed Variable	ents – Config tiation of Conf Assignments	igured	Entiti	es –P	Instances ort Maps i 9 nts – Loo
Unit – III Components: Co Basic Configurati Configurations. Unit – IV If Statements: C Statements: Exit Unit – V	Structural Modeling:         mponent Declarations – Component Instantiation – Packagir         on Declarations – Configuring Multiple Levels of Hierarchy – D         Behavioral Modeling         onditional Variable Assignments – Case Statements: Select         Statements – Next Statements – While Loops – For Loops – Su         Applications of VHDL in Digital System Design:	ng Compon lirect Instan ed Variable Immary of L	ents – Config tiation of Conf Assignments oop Statemen	igured s – Nu ts.	Entitio	es –P iteme	Instances ort Maps i 9 nts – Loo 9
Unit – III Components: Co Basic Configurati Configurations. Unit – IV If Statements: C Statements: Exit Unit – V Combinational	Structural Modeling:         mponent Declarations – Component Instantiation – Packagir         on Declarations – Configuring Multiple Levels of Hierarchy – D         Behavioral Modeling         onditional Variable Assignments – Case Statements: Select         Statements – Next Statements – While Loops – For Loops – Su         Applications of VHDL in Digital System Design:         -ogic Circuits: Adders, Multiplexer, Decoders and Encoders	ng Compon lirect Instan ed Variable Immary of L	ents – Config tiation of Conf Assignments oop Statemen	igured s – Nu ts.	Entitio	es –P iteme	Instances ort Maps i 9 nts – Loo
Unit – III Components: Co Basic Configurati Configurations. Unit – IV If Statements: C Statements: Exit Unit – V	Structural Modeling:         mponent Declarations – Component Instantiation – Packagir         on Declarations – Configuring Multiple Levels of Hierarchy – D         Behavioral Modeling         onditional Variable Assignments – Case Statements: Select         Statements – Next Statements – While Loops – For Loops – Su         Applications of VHDL in Digital System Design:         -ogic Circuits: Adders, Multiplexer, Decoders and Encoders	ng Compon lirect Instan ed Variable Immary of L	ents – Config tiation of Conf Assignments oop Statemen	igured s – Nu ts.	Entitio	es –P iteme	9 nts - Loo 9 - ALU -
Unit – III Components: Co Basic Configurati Configurations. Unit – IV If Statements: C Statements: Exit Unit – V Combinational	Structural Modeling:         mponent Declarations – Component Instantiation – Packagir         on Declarations – Configuring Multiple Levels of Hierarchy – D         Behavioral Modeling         onditional Variable Assignments – Case Statements: Select         Statements – Next Statements – While Loops – For Loops – Su         Applications of VHDL in Digital System Design:         -ogic Circuits: Adders, Multiplexer, Decoders and Encoders	ng Compon lirect Instan ed Variable Immary of L	ents – Config tiation of Conf Assignments oop Statemen	igured s – Nu ts.	Entitio	es –P iteme	Instances ort Maps i 9 nts – Loo 9
Unit – III Components: Co Basic Configurati Configurations. Unit – IV If Statements: C Statements: Exit Unit – V Combinational I Counters – Shift TEXT BOOK:	Structural Modeling:         mponent Declarations – Component Instantiation – Packagir         on Declarations – Configuring Multiple Levels of Hierarchy – D         Behavioral Modeling         onditional Variable Assignments – Case Statements: Select         Statements – Next Statements – While Loops – For Loops – Su         Applications of VHDL in Digital System Design:         -ogic Circuits: Adders, Multiplexer, Decoders and Encoders	ng Compon irect Instan ed Variable immary of L s. <b>Sequent</b> i	ents – Config tiation of Conf e Assignments oop Statemen	igured s – Nu ts. uits: F	Entitional II Sta	es –P iteme	9 nts - Loo 9 - ALU -
Unit – III         Components: Co         Basic Configurati         Configurations.         Unit – IV         If Statements: C         Statements: Exit         Unit – V         Combinational I         Counters – Shift         TEXT BOOK:         1.	Structural Modeling:         mponent Declarations – Component Instantiation – Packagir         on Declarations – Configuring Multiple Levels of Hierarchy – D         Behavioral Modeling         onditional Variable Assignments – Case Statements: Select         Statements – Next Statements – While Loops – For Loops – Su         Applications of VHDL in Digital System Design:         Logic Circuits: Adders, Multiplexer, Decoders and Encoders         registers.	ng Compon irect Instan ed Variable immary of L s. <b>Sequent</b> i	ents – Config tiation of Conf e Assignments oop Statemen	igured s – Nu ts. uits: F	Entitional II Sta	es –P iteme	9 nts - Loo 9 - ALU -
Unit – III         Components: Co         Basic Configurati         Configurations.         Unit – IV         If Statements: C         Statements: Exit         Unit – V         Combinational I         Counters – Shift         TEXT BOOK:         1.         Peter J         REFERENCES:         Brock	Structural Modeling:         mponent Declarations – Component Instantiation – Packagir         on Declarations – Configuring Multiple Levels of Hierarchy – D         Behavioral Modeling         onditional Variable Assignments – Case Statements: Select         Statements – Next Statements – While Loops – For Loops – Su         Applications of VHDL in Digital System Design:         Logic Circuits: Adders, Multiplexer, Decoders and Encoders         registers.	ng Compon irect Instan ed Variable immary of L s. <b>Sequent</b> i	ents – Config tiation of Conf Assignments oop Statemen al logic Circ	igured 5 – Nu ts. uits: F SA, 200	Entitional II Sta Iip flo	es –P iteme ops,	i Instances ort Maps i 9 nts – Loc 9 – ALU – Total:4
Unit – III         Components: Co         Basic Configurati         Configurations.         Unit – IV         If Statements: C         Statements: Exit         Unit – V         Combinational         Counters – Shift         TEXT BOOK:         1.       Peter J         REFERENCES:         1.       Brock J         2019.	Structural Modeling:         mponent Declarations – Component Instantiation – Packagir         on Declarations – Configuring Multiple Levels of Hierarchy – D         Behavioral Modeling         onditional Variable Assignments – Case Statements: Select         Statements – Next Statements – While Loops – For Loops – Su         Applications of VHDL in Digital System Design:         Logic Circuits: Adders, Multiplexer, Decoders and Encoders         registers.	ng Compon irect Instan ed Variable immary of L s. <b>Sequenti</b> n Kaufmani HDL", 2 <sup>nd</sup> Ed	ents – Config tiation of Conf Assignments oop Statemen al logic Circ	igured 5 – Nu ts. uits: F SA, 200	Entitional II Sta Iip flo	es –P iteme ops,	Instance ort Maps 9 nts – Loc 9 – ALU – Total:4

	E OUTCO		rse, the	studen	ts will be	e able to	)							(	BT Maj Highest	
CO1	underst	and the	significar	nce of V	HDL									Ur	nderstan	ding (K2)
CO2	apply th	ie conce	pts for cr	reating c	lataflow i	modeling	9								Applyir	ig(K3)
CO3	design	the logic	circuits (	using str	uctural r	nodeling									Applyir	ig(K3)
CO4	develop	the digi	tal circuit	ts using	behavio	ral mode	ling								Applyir	g(K3)
CO5	design	and synt	hesize th	ne variou	us applic	ations of	digital o	circuits	using VI	HDL p	orogr	amming			Applyir	ig(K3)
					Мај	pping of	COs w	ith Pos	and PS	SOs						
COs/Pos	s PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	РО	10	PO11	PO1	12	PSO1	PSO2
CO1	3	1									1				2	2
CO2	3	2	1	1	1						1				3	3
CO3	3	2	1	1	1						1				3	3
CO4	3	2	1	1	1						1				3	3
CO5	3	2	1	1	1						1				3	3
1 – Sligh	t, 2 – Mod	erate, 3	– Substa	antial, B	Γ- Bloom	's Taxor	nomy									
					ASS	SESSME		TTERN	– THEC	DRY						
	Bloom's egory*	Rei	nember (K1) %	ing l	Jndersta (K2)		Apply (K3)		Analyz (K4) 9		Ev	aluating (M	(5) %		eating (6) %	Total %
С	AT1		30		70											100
С	AT2		10		30		60	)								100
С	AT3		10		30		60	)								100
F	SE		10		40		50	)								100

Programme & Branch	B.E. & Electronics and Instrumentation Engineering	Sem.	Category	L	т	Ρ	Credit
Prerequisites	Process Control	8	PE	3	0	0	3
Preamble	To provide knowledge, and understanding required to effective systems.	vely analyze	and design c	ompu	iter-c	ontrolle	ed
Unit – I	Computer Aided Process Control:						9
sequential con process contro computer contro	ole of computers in process control – Classification of con trol processes – supervisory computer control processes – I architecture- Centralized computer control systems – Dis rol systems-Man Machine Interface-Economics of computer a uter control process software.	Direct Dig tributed co	tal Control p	oroces ol sys	sses- stems	Compu s – H	uter aide ierarchica
Unit – II	Sampled Data Control Systems:						9
considerations series represer Asymptotic stat	control Vs Computer control– Mathematical representation – Selection of optimum sampling period – Zero Order Hold- ntation of the sampler – Development of the Pulse transfer pility - BIBO stability – Internal stability- Jury's stability analysis.	First order Function –	hold -Pulse	transf	er fu	nction-	Comple analysis
Unit – III	Design of Controllers for Linear Systems:						9
Digital equivale	ent of conventional PID controller - implementation of discre	te PID algo	rithm-controll	er de	eian		
difficult dynami	cs: Non-minimum phase systems - time delay systems- Smi	th Predictor					
difficult dynami Inverse respon Unit – IV	cs: Non-minimum phase systems – time delay systems- Smise compensator-Open loop unstable systems Pole Placement Design:		algorithm –I	nvers	e res	ponse	systems
difficult dynami Inverse response Unit – IV State space a observers-outp	cs: Non-minimum phase systems – time delay systems- Smi se compensator-Open loop unstable systems	ty and dele	algorithm –l ectability-regu problem – Th	nvers lation	by	state	systems 9 feedback
difficult dynami Inverse response Unit – IV State space a observers-outp	cs: Non-minimum phase systems – time delay systems- Smisse compensator-Open loop unstable systems Pole Placement Design: pproach-concepts of controllability, observability, reachability ut feedback –the servo problem. Polynomial approach): simplications of the serve problem.	ty and dele	algorithm –l ectability-regu problem – Th	nvers lation	by	state	systems 9 feedback
difficult dynami Inverse response Unit – IV State space a observers-outp Design procedu Unit – V Linearization a control-Self tun	cs: Non-minimum phase systems – time delay systems- Smi se compensator-Open loop unstable systems <b>Pole Placement Design:</b> pproach-concepts of controllability, observability, reachability ut feedback –the servo problem. Polynomial approach): sime ure –Design of controller for double integrator, Harmonic oscillat	ty and dele ole design p or and flexik duled adapt ntrol: Direct	algorithm –I ectability-regu problem – Th ile robotic arm ive control – synthesis cor	nvers lation ne Dio n. -Mode	e res by ophar	state state ntine e	e systems 9 feedback equation - 9 e adaptive
difficult dynami Inverse response Unit – IV State space a observers-outp Design procedu Unit – V Linearization a control-Self tun	cs: Non-minimum phase systems – time delay systems- Smisse compensator-Open loop unstable systems           Pole Placement Design:           pproach-concepts of controllability, observability, reachability           tfeedback –the servo problem. Polynomial approach): simpline –Design of controller for double integrator, Harmonic oscillation           Controller Design for Nonlinear Systems:           nd the classical approach-Adaptive control principles: Schering adaptive control-Variable transformations. Model based control-Variable transformations.	ty and dele ole design p or and flexik duled adapt ntrol: Direct	algorithm –I ectability-regu problem – Th ile robotic arm ive control – synthesis cor	nvers lation ne Dio n. -Mode	e res by ophar	state state ntine e	e systems 9 feedback equation - 9 e adaptive
difficult dynami Inverse response Unit – IV State space a observers-outp Design procedu Unit – V Linearization a control-Self tun	cs: Non-minimum phase systems – time delay systems- Smisse compensator-Open loop unstable systems           Pole Placement Design:           pproach-concepts of controllability, observability, reachability           tfeedback –the servo problem. Polynomial approach): simpline –Design of controller for double integrator, Harmonic oscillation           Controller Design for Nonlinear Systems:           nd the classical approach-Adaptive control principles: Schering adaptive control-Variable transformations. Model based control-Variable transformations.	ty and dele ole design p or and flexik duled adapt ntrol: Direct	algorithm –I ectability-regu problem – Th ile robotic arm ive control – synthesis cor	nvers lation ne Dio n.	e res by ophar	state state ntine e	e systems 9 feedback equation - 9 e adaptive systems -
difficult dynami Inverse response Unit – IV State space a observers-outp Design procedu Unit – V Linearization a control-Self tun Higherorder system TEXT BOOK:	cs: Non-minimum phase systems – time delay systems- Smisse compensator-Open loop unstable systems           Pole Placement Design:           pproach-concepts of controllability, observability, reachability           tfeedback –the servo problem. Polynomial approach): simpline –Design of controller for double integrator, Harmonic oscillation           Controller Design for Nonlinear Systems:           nd the classical approach-Adaptive control principles: Schering adaptive control-Variable transformations. Model based control-Variable transformations.	ty and dele ole design p or and flexib duled adapt ntrol: Direct model contr	algorithm –I	nvers lation ne Dio n. -Mode ntrol –	by by ophar el ref First	state state ntine e erence order	e systems 9 feedback equation 9 e adaptiv systems Total:4
difficult dynami Inverse response Unit – IV State space a observers-outp Design procedu Unit – V Linearization a control-Self tun Higherorder system TEXT BOOK: 1. Karl Pub 2 Bab	cs: Non-minimum phase systems – time delay systems- Smi se compensator-Open loop unstable systems Pole Placement Design: pproach-concepts of controllability, observability, reachability ut feedback –the servo problem. Polynomial approach): sime irre –Design of controller for double integrator, Harmonic oscillat Controller Design for Nonlinear Systems: nd the classical approach-Adaptive control principles: Scher- ing adaptive control-Variable transformations. Model based con- stems –Time delay systems-Inverse response systems-Internal Astrom J , & JornWittenmar B, "Computer Controlled Systems	ty and dele ole design p or and flexit duled adapt ntrol: Direct model contr ms: Theory	algorithm –I ectability-regu problem – Th le robotic arm ive control – synthesis cor ol. and Design"	nvers lation ne Dio n. -Mode ntrol –	e res by pphar el ref First	sponse state ntine e erence order	e systems 9 feedback equation 9 e adaptiv systems Total:4 entice Ha
difficult dynami Inverse response Unit – IV State space a observers-outp Design procedu Unit – V Linearization a control-Self tun Higherorder system TEXT BOOK: 1. Karl Pub 2 Bab	cs: Non-minimum phase systems – time delay systems- Smi se compensator-Open loop unstable systems Pole Placement Design: pproach-concepts of controllability, observability, reachability ut feedback –the servo problem. Polynomial approach): sime irre –Design of controller for double integrator, Harmonic oscillat Controller Design for Nonlinear Systems: nd the classical approach-Adaptive control principles: Schering adaptive control-Variable transformations. Model based constems –Time delay systems-Inverse response systems-Internal Astrom J , & JornWittenmar B, "Computer Controlled Syste lishers,1997 for Unit 1, 2 and 4. atunte A. Ogunnaike & W. Harmon Ray, "Process Dynamics	ty and dele ole design p or and flexit duled adapt ntrol: Direct model contr ms: Theory	algorithm –I ectability-regu problem – Th le robotic arm ive control – synthesis cor ol. and Design"	nvers lation ne Dio n. -Mode ntrol –	e res by pphar el ref First	sponse state ntine e erence order	e systems 9 feedback equation 9 e adaptiv systems Total:4 entice Ha
difficult dynami Inverse response Unit – IV State space a observers-outp Design procedu Unit – V Linearization a control-Self tun Higherorder system TEXT BOOK: 1. Karl Pub 2. Bab Univ REFERENCES:	cs: Non-minimum phase systems – time delay systems- Smi se compensator-Open loop unstable systems Pole Placement Design: pproach-concepts of controllability, observability, reachability ut feedback –the servo problem. Polynomial approach): sime irre –Design of controller for double integrator, Harmonic oscillat Controller Design for Nonlinear Systems: nd the classical approach-Adaptive control principles: Schering adaptive control-Variable transformations. Model based constems –Time delay systems-Inverse response systems-Internal Astrom J , & JornWittenmar B, "Computer Controlled Syste lishers,1997 for Unit 1, 2 and 4. atunte A. Ogunnaike & W. Harmon Ray, "Process Dynamics	ty and dele ole design p or and flexik duled adapt ntrol: Direct model contr ms: Theory s Modeling	algorithm –I ectability-regu problem – Th ile robotic arm ive control – synthesis cor ol. and Design" and Control	nvers lation ne Dio n. -Mode ntrol –	e res by pphar el ref First Edition	sponse state ntine e erence order	e systems 9 feedback equation 9 e adaptiv systems Total:4 entice Ha
difficult dynami Inverse response Unit – IV State space a observers-outp Design procedu Unit – V Linearization a control-Self tun Higherorder system TEXT BOOK: 1. Karl Pub 2. Bab Univ REFERENCES: 1. Sing	cs: Non-minimum phase systems – time delay systems- Smi se compensator-Open loop unstable systems Pole Placement Design: pproach-concepts of controllability, observability, reachability ut feedback –the servo problem. Polynomial approach): sime irre –Design of controller for double integrator, Harmonic oscillat Controller Design for Nonlinear Systems: nd the classical approach-Adaptive control principles: Schering adaptive control-Variable transformations. Model based con- stems –Time delay systems-Inverse response systems-Internal Astrom J , & JornWittenmar B, "Computer Controlled Syste lishers,1997 for Unit 1, 2 and 4. atunte A. Ogunnaike & W. Harmon Ray, "Process Dynamics versityPress, Newyork, 1994 for Unit 3 and 5.	ty and dele ole design p or and flexik duled adapt ntrol: Direct model contr model contr ms: Theory s Modeling Hall India P	algorithm –I ectability-regu problem – Th le robotic arm ive control – synthesis cor ol. and Design" and Control	nvers lation ne Dio n. -Mode ntrol –	e res by pphar el ref First Edition	sponse state ntine e erence order	e systems 9 feedback equation 9 e adaptiv systems Total:4 entice Ha

COURSE On compl			urse, the	e studen	ts will be	e able to	)						BT Ma (Highest	
CO1	recoę	gnize the	impact o	of compu	ters in pr	ocess co	ontrol						Understa (K2	
CO2	analy	/ze the p	erformar	nce of dis	crete tim	e systen	าร						Analyzin	g (K4)
CO3			cepts in t systems	the desig	n of basi	c digital	controlle	ers and a	nalyze the	stability c	of the clos	sed	Applyin	g (K3)
CO4	apply	the con	cepts in	designing	g controll	ers for li	near and	l nonline	ar systems.				Applyin	g (K3)
CO5	apply	the con	cepts of	pole plac	ement de	esign for	control	application	ons				Applyin	g (K3)
					Марр	oing of C	COs with	n Pos an	d PSOs					
COs/PO s	PO 1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO1 0	PO1 1	PO1 2	PSO1	PSO2
CO1	3	1											2	2
CO2	3	3	2	2	2								3	3
CO3	3	2	1	1	1								3	3
CO4	3	2	1	1	1								3	3
CO5	3	2	1	1	1								3	3
1 – Slight,	2 – Mo	derate, 3	3 – Subst	antial, B	T- Bloom	's Taxon	iomy			I.		I		
					ASSE	SSMEN	ΙΤ ΡΑΤΤ	ERN – T	HEORY					
Test / Bl Catego			emberin K1) %	g Un	derstanc (K2) %	ling	Applyi (K3)		Analyzing (K4) %		aluating (K5) %		reating (6) %	Total %
CAT	1		30		30		40	)						100
CAT	2		10		40		30	)	20					100
CAT	3		10		30		60	)						100
	-		20		20		40		20					100

	22EIE34 - DIGITAL TWINS						
Programme & Branch	B.E. & Electronics and Instrumentation Engineering	Sem.	Category	L	т	Ρ	Credit
Prerequisites	Nil	8	PE	3	0	0	3
Preamble	This course is designed to impart students with introduction for cyber –physical fusion, as emerging approach to suppor			twine	s in a	pragr	natic way
Unit – I	Introduction to Digital Twin Driven Smart Design:						9
twins-Five Dime	f Product design and Prospect forecast-Digital Twin and its App ension digital twin of a Product-physical, virtual, Digital twin data rt product design-Case study: Bicycle and Landing gear.						
Unit – II	Digital Twin Driven Conceptual Design						9
	straint management, complexity management, collaborative se study: robot vacuum cleaner (functional formulation, concept Digital Twin Driven Energy-aware Green Design						
Iterative optimi	zation of energy consumption-energy consumption digital three	ad-product	t –life cycle,	gree	en de	esign	(in materi
selection, disas	sembly, supply chain and its potential applications). Energy awar					esign	`
selection, disas	sembly, supply chain and its potential applications). Energy aware Application and Case Study	e five-dim	ension digital	twin	,	•	9
selection, disas <b>Unit – IV</b> Digital twin driv	sembly, supply chain and its potential applications). Energy aware Application and Case Study en factory design: framework, functions at different stages and	e five-dim modular a	ension digital	twin	,	•	9
selection, disas Unit – IV Digital twin driv factory design o Unit – V	<ul> <li>sembly, supply chain and its potential applications). Energy aware</li> <li>Application and Case Study</li> <li>en factory design: framework, functions at different stages and of a paper cup factory, digital twin driven factory design of a nylon</li> <li>Digital Twin Driven Process Design Evaluation</li> </ul>	e five-dim modular a factory.	ension digital	twin e stu	, udy: (	digital	9 twin drive 9
selection, disas Unit – IV Digital twin driv factory design of Unit – V Process design digital twin data of process desi	Sembly, supply chain and its potential applications). Energy award         Application and Case Study         en factory design: framework, functions at different stages and of a paper cup factory, digital twin driven factory design of a nylon         Digital Twin Driven Process Design Evaluation         en process design evaluation- Digital Twin driven process design evaluation-Reconfigurable process plan creation-Digital twin d-case study: digital engine connecting rod model description-rea	e five-dim modular a factory. sign evalua ata genera	ension digital approach-cas ation-framewo ation-process	twin e stu ork f	, udy: ( or Di n eva	digital gital	9 twin drive 9 Twin drive n based c
selection, disas Unit – IV Digital twin driv factory design of Unit – V Process design digital twin data of process desi TEXT BOOK:	sembly, supply chain and its potential applications). Energy award         Application and Case Study         ren factory design: framework, functions at different stages and of a paper cup factory, digital twin driven factory design of a nylon         Digital Twin Driven Process Design Evaluation         I- process design evaluation- Digital Twin driven process design evaluation-Reconfigurable process plan creation-Digital twin d-case study: digital engine connecting rod model description-reagn evaluation.	e five-dim modular a factory. ign evalua ata genera I time data	approach-cas ation-framewo ation-process collection ar	twin e stu ork f plar od ma	, or Di n eva anago	digital gital luatio emen	9 twin drive 9 Twin drive n based o t-verificatio Total:4
selection, disas Unit – IV Digital twin driv factory design of Unit – V Process design digital twin data of process desi TEXT BOOK:	sembly, supply chain and its potential applications). Energy aware         Application and Case Study         en factory design: framework, functions at different stages and of a paper cup factory, digital twin driven factory design of a nylon         Digital Twin Driven Process Design Evaluation         en process design evaluation- Digital Twin driven process design evaluation-Reconfigurable process plan creation-Digital twin d-case study: digital engine connecting rod model description-reagn evaluation.         o, Ang Liu, Tianliang Hu, "Digital Twin Driven Smart Design", Academic State Stat	e five-dim modular a factory. ign evalua ata genera I time data	approach-cas ation-framewo ation-process collection ar	twin e stu ork f plar od ma	, or Di n eva anago	digital gital luatio emen	9 twin drive 9 Twin drive n based o t-verificatio Total:4
selection, disas Unit – IV Digital twin driv factory design of Unit – V Process design process design digital twin data of process desi TEXT BOOK: 1. Fei Tao REFERENCES 1. Pethuru	sembly, supply chain and its potential applications). Energy awars Application and Case Study en factory design: framework, functions at different stages and of a paper cup factory, digital twin driven factory design of a nylon Digital Twin Driven Process Design Evaluation - process design evaluation- Digital Twin driven process design evaluation-Reconfigurable process plan creation-Digital twin d -case study: digital engine connecting rod model description-reagn evaluation.	e five-dim modular a factory. sign evalua ata genera I time data demic Pres	ension digital approach-cas ation-framewo ation-process collection ar ss, Elsevier, U	e stu prk f plar d ma	, or Di n eva anago d Kin	digital gital luatio emen	9 twin drive 9 Twin drive n based o t-verificatio <b>Total:</b> , 2020.
selection, disas Unit – IV Digital twin driv factory design of Unit – V Process design digital twin data of process desi TEXT BOOK: 1. Fei Tac REFERENCES 1. Pethur cases" 2. Shyam Solutio	<ul> <li>sembly, supply chain and its potential applications). Energy aware Application and Case Study</li> <li>en factory design: framework, functions at different stages and of a paper cup factory, digital twin driven factory design of a nylon Digital Twin Driven Process Design Evaluation</li> <li>process design evaluation- Digital Twin driven process design evaluation-Reconfigurable process plan creation-Digital twin di-case study: digital engine connecting rod model description-reagn evaluation.</li> <li>Ang Liu, Tianliang Hu, "Digital Twin Driven Smart Design", Acade:</li> </ul>	e five-dim modular a factory. sign evalua ata genera I time data demic Pres Systems a rins: Design ishing, 202	ension digital approach-cas ation-framewo ation-process collection ar es, Elsevier, L nd Environmo n, Develop ar	twin e stu pork f plar d ma Jnite	, udy: ( or Di t eva anag d Kin, The eploy	digital gital luatio emen gdom indus Digita	9 twin drive 9 Twin drive n based o t-verificatio <b>Total:</b> , 2020. try use al Twin

		UTCON tion of		rse, the s	students	s will be	able to	)						BT Map (Highest	
CO1	rela	ted key	proces	ses and te	echnolog	gies.				•		liscusses t	U	nderstand	ling (K2)
CO2				igital twin tion and c						function	al mode	ling, conce	ept	Applying	J (K3)
CO3	ene		servatio									DT model green desi		nderstanc	ling (K2)
CO4			e practic Ion facto		tion of E	OT drive	n smart	design	and pre	esent ca	se study	about pap	ber	Applying	g(K3)
CO5			DT base necting		s desigr	n evalua	tion and	l exemp	lify the	e machin	ing proc	ess of dies	sel	Applying	g(K3)
													·		
						Маррі	ng of C	Os with	n POs a	and PSC	Ds				
COs/F	POs	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO	1	3	1					1	2	1		1		2	2
CO	2	2	2	1	1	1		1	2	1		1		3	3
CO	3	2	1					1	2	1		1		2	2
CO	4	3	2	1	1	1		2	2	1		2		3	3
CO	5	3	2	1	1	1		2	2	1		2		3	3
1 – Sli	ght, 2	– Mode	erate, 3	<ul> <li>Substar</li> </ul>	ntial, BT	- Bloom	's Taxor	nomy							
						ASSE	SSMEN		FERN -	THEOR	Y				
	t / Bl ateg	oom's ory*	Re	memberi (K1) %	ing L	Jndersta (K2)		Apply (K3)		Analyz (K4) 9		Evaluating (K5) %		reating K6) %	Total %
	CAT	1		20		60		20	)						100
	CAT	2		20		70		10	)						100
	CAT	-		20		60		20	)						100
	ESE	Ξ		20		60		20	)						100

Programme & Branch	All BE/Btech branches except Electronics and Instrumentation Engineering	Sem.	Category	L	т	Ρ	Credit
Prerequisites	Nil	5	OE	3	1	0	4
Preamble	This course imparts the knowledge of measuring insparameters. Measurements and Instrumentation cours PMMC,MI, power, Energy, recorders and various metransducers.	e gives	overview of	variou	s me	easure	ements like
Unit – I	Electrical Meters:						9+3
	lling and damping forces in indicating instruments – Principle nent Magnet Moving Coil instruments -Moving iron instrume argy meters.						
Unit – II	DC Null Methods:						9+3
	ow resistance: Kelvin Double Bridge- Measurement of high re						
voltmeter, wattmet	Basic Potentiometer circuit-Laboratory Type (Crompton's) p ter using potentiometer, measurement of unknown resistance				alibrat	ion c	
voltmeter, wattmet Unit – III	ter using potentiometer, measurement of unknown resistance Methods of Measurements using AC bridges :	using DC	potentiometer				9+3
voltmeter, wattmer Unit – III Introduction to A Measurement of bridge. Measurem	ter using potentiometer, measurement of unknown resistance Methods of Measurements using AC bridges : A.C. bridges-Sources and detectors-General Equation for Self Inductance: Maxwell's inductance Bridge and Andersor ment of Mutual Inductance: uses of Mutual Inductance in br	using DC bridge I n's bridge	potentiometer palance-Gene . Measureme	ral fo	rm o Capao	f an citanc	<b>9+3</b> AC bridg e: Scherin
voltmeter, wattmer Unit – III Introduction to A Measurement of bridge. Measurem	ter using potentiometer, measurement of unknown resistance Methods of Measurements using AC bridges : A.C. bridges-Sources and detectors-General Equation for Self Inductance: Maxwell's inductance Bridge and Andersor	using DC bridge I n's bridge	potentiometer palance-Gene . Measureme	ral fo	rm o Capao	f an citanc	<b>9+3</b> AC bridg e: Scherin
voltmeter, wattmet Unit – III Introduction to A Measurement of a bridge. Measurement Measurement of fr Unit – IV Segmental Displa	ter using potentiometer, measurement of unknown resistance Methods of Measurements using AC bridges : A.C. bridges-Sources and detectors-General Equation for Self Inductance: Maxwell's inductance Bridge and Andersor nent of Mutual Inductance: uses of Mutual Inductance in bi- requency: Wien's bridge. Display Devices and Recorders: ys: Seven segment display-Dot Matrices-Rear Projection Display	using DC bridge I n's bridge ridge circ	potentiometer palance-Gene . Measureme uits, Heavisid	ral fo nt of ( e muti	rm o Capao Jal in	f an citanc ducta	9+3 AC bridg e: Scherin nce bridge 9+3
voltmeter, wattmet Unit – III Introduction to A Measurement of b bridge. Measurem Measurement of fr Unit – IV Segmental Displat Diode-X-Y Record Unit – V	ter using potentiometer, measurement of unknown resistance Methods of Measurements using AC bridges : A.C. bridges-Sources and detectors-General Equation for Self Inductance: Maxwell's inductance Bridge and Andersor ment of Mutual Inductance: uses of Mutual Inductance in bi- requency: Wien's bridge. Display Devices and Recorders: ys: Seven segment display-Dot Matrices-Rear Projection Dis- lers-Magnetic Tape Recorders-Digital tape recorders Transducers:	using DC bridge I n's bridge ridge circ play-Nixie	potentiometer palance-Gene . Measureme uits, Heavisid Tube- Light	ral fo nt of ( e muti Emittin	rm o Capao Jal in g Dic	f an citanc ducta de-Li	9+3 AC bridg e: Schering nce bridge 9+3 quid Crysta 9+3
voltmeter, wattmet Unit – III Introduction to A Measurement of a bridge. Measurem Measurement of fr Unit – IV Segmental Display Diode-X-Y Record Unit – V Classification of Transducers: Stra	ter using potentiometer, measurement of unknown resistance Methods of Measurements using AC bridges : A.C. bridges-Sources and detectors-General Equation for Self Inductance: Maxwell's inductance Bridge and Andersor ment of Mutual Inductance: uses of Mutual Inductance in bi- requency: Wien's bridge. Display Devices and Recorders: ys: Seven segment display-Dot Matrices-Rear Projection Dis- lers-Magnetic Tape Recorders-Digital tape recorders	bridge I bridge Circ ridge circ play-Nixie Analog a tion of Th	potentiometer palance-Gene . Measureme uits, Heavisid Tube- Light nd Digital-Inv nermistor. The ges and Disad	ral fo nt of ( e muti Emittin erse 1 ermoco	rm o Capac Jal in g Dic Transc puple jes.	f an citanc ducta de-Li ducer Con	9+3 AC bridg e: Scherin nce bridge 9+3 quid Crysta 9+3 s. Resistiv struction of
voltmeter, wattmet Unit – III Introduction to A Measurement of a bridge. Measurem Measurement of fr Unit – IV Segmental Displat Diode-X-Y Record Unit – V Classification of Transducers: Strat Thermocouple. Lir	ter using potentiometer, measurement of unknown resistance Methods of Measurements using AC bridges : A.C. bridges-Sources and detectors-General Equation for Self Inductance: Maxwell's inductance Bridge and Andersor ment of Mutual Inductance: uses of Mutual Inductance in brequency: Wien's bridge. Display Devices and Recorders: ys: Seven segment display-Dot Matrices-Rear Projection Dis- lers-Magnetic Tape Recorders-Digital tape recorders Transducers: Transducers: Transducers-Primary and Secondary –Passive and Active- ain Gauges-Theory of Strain Gauge- Thermistor: Construct	bridge I bridge Circ ridge circ play-Nixie Analog a tion of Th	potentiometer palance-Gene . Measureme uits, Heavisid Tube- Light nd Digital-Inv nermistor. The ges and Disad	ral fo nt of ( e muti Emittin erse 1 ermoco	rm o Capac Jal in g Dic Transc puple jes.	f an citanc ducta de-Li ducer Con	9+3 AC bridg e: Scherin nce bridge 9+3 quid Crysta 9+3 s. Resistiv
voltmeter, wattmet Unit – III Introduction to A Measurement of a bridge. Measurem Measurement of fr Unit – IV Segmental Display Diode-X-Y Record Unit – V Classification of Transducers: Strat Thermocouple. Lir TEXT BOOK:	ter using potentiometer, measurement of unknown resistance Methods of Measurements using AC bridges : A.C. bridges-Sources and detectors-General Equation for Self Inductance: Maxwell's inductance Bridge and Andersor ment of Mutual Inductance: uses of Mutual Inductance in brequency: Wien's bridge. Display Devices and Recorders: ys: Seven segment display-Dot Matrices-Rear Projection Dis- lers-Magnetic Tape Recorders-Digital tape recorders Transducers: Transducers: Transducers-Primary and Secondary –Passive and Active- ain Gauges-Theory of Strain Gauge- Thermistor: Construction – Matrices (LVDT): Construction –	using DC bridge I n's bridge ridge circ play-Nixie play-Nixie Analog a tion of Th Advantag	potentiometer palance-Gene . Measureme uits, Heavisid Tube- Light I nd Digital-Inv nermistor. Tho ges and Disad Lectu	ral fo nt of ( e muti Emittin errse T ermoco lvantag	rm o Capao Jal in g Dic Transo puple: ges. <b>Tuto</b>	f an bitanc ducta de-Lid ducers Con	9+3 AC bridge e: Scherin nce bridge 9+3 quid Crysta 9+3 s. Resistiv struction of 15, Total:6
voltmeter, wattmet Unit – III Introduction to A Measurement of fr Unit – IV Segmental Displa Diode-X-Y Record Unit – V Classification of Transducers: Stra Thermocouple. Lir TEXT BOOK: 1 Sawh	ter using potentiometer, measurement of unknown resistance Methods of Measurements using AC bridges : A.C. bridges-Sources and detectors-General Equation for Self Inductance: Maxwell's inductance Bridge and Andersor ment of Mutual Inductance: uses of Mutual Inductance in brequency: Wien's bridge. Display Devices and Recorders: ys: Seven segment display-Dot Matrices-Rear Projection Dis- lers-Magnetic Tape Recorders-Digital tape recorders Transducers: Transducers: Transducers-Primary and Secondary –Passive and Active- ain Gauges-Theory of Strain Gauge- Thermistor: Construct	using DC bridge I n's bridge ridge circ play-Nixie play-Nixie Analog a tion of Th Advantag	potentiometer palance-Gene . Measureme uits, Heavisid Tube- Light I nd Digital-Inv nermistor. Tho ges and Disad Lectu	ral fo nt of ( e muti Emittin errse T ermoco lvantag	rm o Capao Jal in g Dic Transo puple: ges. <b>Tuto</b>	f an bitanc ducta de-Lid ducers Con	9+3 AC bridge e: Scherin nce bridge 9+3 quid Crysta 9+3 s. Resistiv struction of 15, Total:6
voltmeter, wattmet         Unit – III         Introduction to A         Measurement of f         bridge. Measurem         Measurement of fr         Unit – IV         Segmental Displa         Diode-X-Y Record         Unit – V         Classification of Transducers: Stra         Thermocouple. Lin         TEXT BOOK:         1.       Sawh         New D	ter using potentiometer, measurement of unknown resistance Methods of Measurements using AC bridges : A.C. bridges-Sources and detectors-General Equation for Self Inductance: Maxwell's inductance Bridge and Andersor nent of Mutual Inductance: uses of Mutual Inductance in brequency: Wien's bridge. Display Devices and Recorders: ys: Seven segment display-Dot Matrices-Rear Projection Dis- lers-Magnetic Tape Recorders-Digital tape recorders Transducers: Transducers: Transducers-Primary and Secondary –Passive and Active- ain Gauges-Theory of Strain Gauge- Thermistor: Construction – near Variable Differential Transformers (LVDT): Construction – ney A.K., "A Course in Electronic Measurements and Instrum	using DC bridge I n's bridge ridge circ play-Nixie play-Nixie Analog a tion of Th Advantag	potentiometer palance-Gene . Measureme uits, Heavisid Tube- Light I nd Digital-Inv nermistor. Tho ges and Disad Lectu	ral fo nt of ( e muti Emittin errse T ermoco lvantag	rm o Capao Jal in g Dic Transo puple: ges. <b>Tuto</b>	f an bitanc ducta de-Lid ducers Con	9+3 AC bridge e: Scherin nce bridge 9+3 quid Crysta 9+3 s. Resistiv struction of 15, Total:6
voltmeter, wattmet Unit – III Introduction to A Measurement of fi bridge. Measurem Measurement of fir Unit – IV Segmental Displa Diode-X-Y Record Unit – V Classification of Transducers: Stra Thermocouple. Lir TEXT BOOK: 1. Sawh New I REFERENCES: 1 Josep	ter using potentiometer, measurement of unknown resistance Methods of Measurements using AC bridges : A.C. bridges-Sources and detectors-General Equation for Self Inductance: Maxwell's inductance Bridge and Andersor nent of Mutual Inductance: uses of Mutual Inductance in brequency: Wien's bridge. Display Devices and Recorders: ys: Seven segment display-Dot Matrices-Rear Projection Dis- lers-Magnetic Tape Recorders-Digital tape recorders Transducers: Transducers: Transducers-Primary and Secondary –Passive and Active- ain Gauges-Theory of Strain Gauge- Thermistor: Construction – near Variable Differential Transformers (LVDT): Construction – ney A.K., "A Course in Electronic Measurements and Instrum	using DC bridge I n's bridge ridge circ play-Nixie Analog a tion of Th Advantag	potentiometer balance-Gene . Measureme uits, Heavisid Tube- Light I nd Digital-Inv nermistor. The ges and Disad Lectu 2 <sup>nd</sup> Edition,	ral fo nt of ( e muti Emittin errse T ermoco lvantag ire:45,	m o Capac Jal in g Dic Transc puple Jes. <b>Tuto</b>	f an bitanc ducta de-Li ducers Con <b>rial :</b> 1	9+3 AC bridg e: Scherin nce bridge 9+3 quid Cryst 9+3 s. Resistiv struction of 15, Total:6

	E OUTCOMES: pletion of the course, the students will be able to	BT Mapped (Highest Level)
CO1	explain the working of various electrical meters	Understanding (K2)
CO2	employ the DC null methods for measurement of resistance	Applying (K3)
CO3	make use of the AC bridges for measurement of Capacitance	Applying (K3)
CO4	interpret the concepts of storage and display devices in instruments	Understanding (K2)
CO5	select appropriate Transducer for different applications	Understanding (K2)

	Mapping of COs with Pos and PSOs														
COs/Pos	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	
CO1	3	2	1	1	1								3	3	
CO2	3	2	1	1	1								3	3	
CO3	3	2	1	1	1								3	3	
CO4	3	2	1	1	1								3	3	
CO5	3	1											2	2	
1 – Slight, 2	2 – Mode	erate, 3 -	- Substa	ntial, BT	- Bloom	i's Taxo	nomy						·		

		ASSESSME	NT PATTER	N – THEORY			
Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	40	30	30				100
CAT2	30	30	40				100
CAT3	40	60					100
ESE	40	40	20				100
* ±3% may be varied	-	-	_				100

	2EIO02 - BIOMEDICAL INSTRUMENTATION A (Offered by Department of Electronics and Instrur			g)			
Programme Branch	& All BE/Btech branches except Electronics and Instrumentation Engineering	Sem.	Category	L	т	Ρ	Credit
Prerequisit	s Nil	5	OE	3	1	0	4
Preamble	To impart the knowledge of some human anatomy and r specific instruments which is most commonly used in host various biomedical imaging techniques and learn the advance	pitals. Als	o understand	the fu	ndam	ental	concept of
Unit – I	Human Physiological Systems:						9+3
nervous sys	structure – Resting and action potentials – Different systems of hum tem – Components of the Bio medical instrument system – strain sducer – piezoelectric ultrasonic transducer.						
Unit – II	Bio Potential Electrodes:						9+3
	de-depth and needle electrode-surface electrodes. Biomedical Elected ad systems, recording methods and typical waveforms.	ctrical sig	nal measurem	nent: E	CG, E	EG,	EMG, EOG
Unit – III	Biomedical Non Electrical Signal Measurement:						9+3
ultrasonic b	graphy – GSR- Blood pressure Measurement: Sphygmomanom ood pressure monitor. Spirometer – Blood pH measurement –						
Unit – IV X-ray mach	nd cardiac rate. Biomedical Imaging Systems: ne – Computer tomography – Thermography – Ultrasonic imaging			resona	nce i	magir	9+3
Unit – IV X-ray mach SPECT – FI	Biomedical Imaging Systems: ne – Computer tomography – Thermography – Ultrasonic imaging IRI – Magnetic Particle Imaging.			resona	nce i	magir	<b>9+3</b> ng – PET
Unit – IV X-ray mach SPECT – FN Unit – V Ventricular a	Biomedical Imaging Systems: ne – Computer tomography – Thermography – Ultrasonic imaging	g systems	- Magnetic				9+3 ng – PET 9+3
Unit – IV X-ray mach SPECT – FI Unit – V Ventricular a	Biomedical Imaging Systems:           ne – Computer tomography – Thermography – Ultrasonic imaging           IRI – Magnetic Particle Imaging.           Physiological Assist Devices:           synchronous pacemaker – AC Defibrillator – Heart lung machine	g systems	- Magnetic machine - A	udiome	eter -	- Biot	9+3 ng – PET 9+3
Unit – IV X-ray mach SPECT – FI Unit – V Ventricular a	Biomedical Imaging Systems:           ne – Computer tomography – Thermography – Ultrasonic imaging           IRI – Magnetic Particle Imaging.           Physiological Assist Devices:           isynchronous pacemaker – AC Defibrillator – Heart lung machine           – Biotelemetry – Telemedicine.	g systems	- Magnetic machine - A	udiome	eter -	- Biot	9+3 ng – PET 9+3 hesiometry
Unit – IV X-ray mach SPECT – FM Unit – V Ventricular a Vibroscreen	Biomedical Imaging Systems:           ne – Computer tomography – Thermography – Ultrasonic imaging           IRI – Magnetic Particle Imaging.           Physiological Assist Devices:           isynchronous pacemaker – AC Defibrillator – Heart lung machine           – Biotelemetry – Telemedicine.	g systems – Kidney	– Magnetic machine – A Lectu	udiome Ire:45,	eter – Tuto	- Biot	9+3 ng – PET 9+3 hesiometry
Unit – IV X-ray mach SPECT – FM Unit – V Ventricular a Vibroscreen	Biomedical Imaging Systems:         me – Computer tomography – Thermography – Ultrasonic imaging         IRI – Magnetic Particle Imaging.         Physiological Assist Devices:         Isynchronous pacemaker – AC Defibrillator – Heart lung machine         – Biotelemetry – Telemedicine.         X:         andpur R.S," Handbook of Biomedical Instrumentation", 2 <sup>nd</sup> Edition,	g systems – Kidney	– Magnetic machine – A Lectu	udiome Ire:45,	eter – Tuto	- Biot	9+3 ng – PET 9+3 hesiometry
Unit – IV X-ray mach SPECT – FI Unit – V Ventricular a Vibroscreen TEXT BOOI 1. Kr REFERENC	Biomedical Imaging Systems:         me – Computer tomography – Thermography – Ultrasonic imaging         IRI – Magnetic Particle Imaging.         Physiological Assist Devices:         Isynchronous pacemaker – AC Defibrillator – Heart lung machine         – Biotelemetry – Telemedicine.         X:         andpur R.S," Handbook of Biomedical Instrumentation", 2 <sup>nd</sup> Edition,	g systems – Kidney Tata McC	– Magnetic machine – A <b>Lectu</b> Graw-Hill , Ne	udiome ire:45, w Delhi	eter – <b>Tuto</b> i ,201	- Biot rial :1 7.	9+3 ng – PET 9+3 hesiometry 15, Total:6
Unit – IV       X-ray machi       SPECT – FI       Unit – V       Ventricular a       Vibroscreen       TEXT BOOI       1.     Kr       REFERENC       1.     Jo	Biomedical Imaging Systems:         ne – Computer tomography – Thermography – Ultrasonic imaging         IRI – Magnetic Particle Imaging.         Physiological Assist Devices:         issynchronous pacemaker – AC Defibrillator – Heart lung machine         – Biotelemetry – Telemedicine.         K:         andpur R.S," Handbook of Biomedical Instrumentation", 2 <sup>nd</sup> Edition,         ES:         an G. Webster, "Medical Instrumentation Application and Design", 4 <sup>th</sup> drew G. Webb, "Principles of Biomedical Instrumentation" 1 <sup>st</sup> Editior	g systems – Kidney Tata McC	– Magnetic machine – A <b>Lectu</b> Graw-Hill , Ne John Wiley a	udioma ire:45, w Delhi nd Son	eter – <b>Tuto</b> i i ,201 is, Ne	- Biot rial :1 7.	9+3 ng – PET 9+3 hesiometr 15, Total:6

	E OUTCOMES: pletion of the course, the students will be able to	BT Mapped (Highest Level)
CO1	interpret the basic principles and phenomena of Biomedical Engineering	Understanding (K2)
CO2	record the bioelectric potentials using bio potential electrode through bio signal recording devices	Applying (K3)
CO3	measure biomedical signal parameters through medical instruments	Applying (K3)
CO4	summarize the basic principles in medical imaging techniques	Understanding (K2)
CO5	illustrate the physiological assist devices	Applying (K3)
	Mapping of COs with Pos and PSOs	

					-									
COs/Pos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1				2		1					2	2
CO2	3	2	1	1	1	2		1					3	3
CO3	3	2	1	1	1	2		1					3	3
CO4	3	1				2		1					2	2
CO5	3	2	1	1	1	2		1					3	3
						. –								

	ACCECCINE		N – THEORY			
Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
20	40	40				100
10	40	50				100
10	40	50				100
10	40	50				100
	(K1) % 20 10 10	Remembering (K1) %         Understanding (K2) %           20         40           10         40           10         40	Remembering (K1) %         Understanding (K2) %         Applying (K3) %           20         40         40           10         40         50           10         40         50	Remembering (K1) %Understanding (K2) %Applying (K3) %Analyzing (K4) %204040104050104050	Remembering (K1) %Understanding (K2) %Applying (K3) %Analyzing (K4) %Evaluating (K5) %204040%104050104050	Remembering (K1) %Understanding (K2) %Applying (K3) %Analyzing (K4) %Evaluating (K5) %Creating (K6) %20404010104050101040501010405010

					)			
Program Branch	me &	All BE/Btech branches except Electronics and Instrumentation Engineering	Sem.	Category	L	т	Р	Credit
Prerequis	sites	Nil	5	OE	3	1	0	4
Preamble	、 、	To provide solution towards better control action for various	process	polications				
Unit – I	;	Introduction To Industrial Automation:	process a	ipplications				9+3
	on Indua	trial Automation vs. Industrial Information Technology – Role	o of outor	nation in indu	otro /	т		
systems -	<ul> <li>Types of</li> </ul>	Automation Systems - The Functional Elements of Industria	al Automa	tion – Industr	ial S	enso	rs and	d İnstrume
	<ul> <li>Industria</li> </ul>	Actuator Systems – Industrial Control Systems – The Archite	ecture of E	Elements: The	e Aut	oma	tion P	
Unit – II		Programmable Logic Controllers (PLCs) An Overview:						9+3
Processir	ng Unit (CF	inciple of operation. PLC Hardware Components: Discrete PU) – Programming Terminal Devices. Converting Relay Scho ctions – Types of timers – On-Delay Timer Instruction – Off-D	ematics ir	to PLC Ladd	er Pr	ogra	ms. P	rogrammin
Unit – III		Advanced PLC Programming:						9+3
Master C	Control Re	ters: Counter Instructions – Up-Counter – Down counter – Ca set Instruction – Subroutine Functions. Data Manipulation o Instruction – Subtraction Instruction – Multiplication Instruct	n Instructi	ons: Data Co	ompa			
Master C Instruction Unit – IV Types of	Control Re ns: Additio Processes	set Instruction – Subroutine Functions. Data Manipulation <u>n Instruction – Subtraction Instruction – Multiplication Instruction</u> <b>Process Control, Network Systems, and SCADA:</b> <u>a</u> – Structure of Control Systems – On/Off Control – PID Co	ion – Divis	ons: Data Co sion Instructio otion Control	ompa n. – Da	are I ata C	nstruc	tions. Mat 9+3
Master C Instruction <b>Unit – IV</b> Types of Superviso	Control Re ns: Additio Processes	set Instruction – Subroutine Functions. Data Manipulation n Instruction – Subtraction Instruction – Multiplication Instruction Process Control, Network Systems, and SCADA:	ion – Divis	ons: Data Co sion Instructio otion Control	ompa n. – Da	are I ata C	nstruc	tions. Mat 9+3
Master C Instruction Unit – IV Types of Supervisc Unit – V Introductio Protocols	Control Re ns: Additio Processes ory Control on – Interr	<ul> <li>set Instruction – Subroutine Functions. Data Manipulation n Instruction – Subtraction Instruction – Multiplication Instruction Process Control, Network Systems, and SCADA:</li> <li>and Data Acquisition (SCADA) – Human Machine Interfaces Internet of Things – An Overview:</li> <li>et of Things Definition Evaluation – IoT Architectures – IoT D of Things Applications – Security – Identity Management ar</li> </ul>	n Instructi ion – Divis ontrol – M (HMIs) – Data Mana	ons: Data Co sion Instruction otion Control Introduction t agement and tication – Priv	ompa n. – Da o DC Analy vacy	are I ata C S ytics – St	Comm – Cor andar	tions. Mat 9+3 unications 9+3 nmunicatic dization an
Master C Instruction Unit – IV Types of Superviso Unit – V Introduction Protocols Regulator	Control Re ns: Additio Processes ory Control on – Internet ry Limitatio	<ul> <li>set Instruction – Subroutine Functions. Data Manipulation n Instruction – Subtraction Instruction – Multiplication Instruction Process Control, Network Systems, and SCADA:</li> <li>and Data Acquisition (SCADA) – Human Machine Interfaces Internet of Things – An Overview:</li> <li>et of Things Definition Evaluation – IoT Architectures – IoT D of Things Applications – Security – Identity Management ar</li> </ul>	n Instructi ion – Divis ontrol – M (HMIs) – Data Mana	ons: Data Co sion Instruction otion Control Introduction t agement and tication – Priv	ompa n. – Da o DC Analy vacy	are I ata C S ytics – St	Comm – Cor andar	etions. Mat 9+3 unications 9+3 mmunicatio
Master C Instruction Unit – IV Types of Superviso Unit – V Introduction Protocols Regulator TEXT BO	Control Re ns: Additio Processes ory Control on – Internet ry Limitatio	set Instruction – Subroutine Functions. Data Manipulation n Instruction – Subtraction Instruction – Multiplication Instruction <b>Process Control, Network Systems, and SCADA:</b> a – Structure of Control Systems – On/Off Control – PID Co and Data Acquisition (SCADA) – Human Machine Interfaces <b>Internet of Things – An Overview:</b> let of Things Definition Evaluation – IoT Architectures – IoT E of Things Applications – Security – Identity Management ar ns. etruzella, "Programmable Logic Controllers", 5 <sup>th</sup> Edition, Ta	n Instructi ion – Divis ontrol – M (HMIs) – Data Mana nd Authen	ons: Data Co sion Instruction otion Control Introduction t agement and tication – Priv Lectur	ompa on. – Di o DC Analy vacy	are I ata C S ytics – St , <b>Tut</b>	Comm - Cor andar orial:	tions. Mat 9+3 unications 9+3 nmunicatic dization ar 15, Total:6
Master C Instruction Unit – IV Types of Superviso Unit – V Introduction Protocols Regulator TEXT BO 1. F 2 R	Control Re ns: Additio Processes ory Control on – Internet ry Limitatio <b>DOK:</b> Frank D. P 2019 for Un Rajkumar E	set Instruction – Subroutine Functions. Data Manipulation n Instruction – Subtraction Instruction – Multiplication Instruction <b>Process Control, Network Systems, and SCADA:</b> a – Structure of Control Systems – On/Off Control – PID Co and Data Acquisition (SCADA) – Human Machine Interfaces <b>Internet of Things – An Overview:</b> let of Things Definition Evaluation – IoT Architectures – IoT E of Things Applications – Security – Identity Management ar ns. etruzella, "Programmable Logic Controllers", 5 <sup>th</sup> Edition, Ta	n Instructi ion – Divis ontrol – M (HMIs) – Data Mana nd Authen	ons: Data Co sion Instruction otion Control Introduction t agement and tication – Priv Lectur	- Da o DC Analy vacy e:45	are I ata C S ytics – St , <b>Tut</b> Priva	orial:	etions. Mat 9+3 unications 9+3 nmunication dization an 15, Total:6 nited, India
Master C Instruction Unit – IV Types of Superviso Unit – V Introduction Protocols Regulator TEXT BO 1. F 2 R	Control Re ns: Additio Processes ory Control on – Internet ry Limitatio <b>DOK:</b> Frank D. P 2019 for Un Rajkumar E Imprint of E	set Instruction – Subroutine Functions. Data Manipulation n Instruction – Subtraction Instruction – Multiplication Instruction <b>Process Control, Network Systems, and SCADA:</b> a – Structure of Control Systems – On/Off Control – PID Co and Data Acquisition (SCADA) – Human Machine Interfaces <b>Internet of Things – An Overview:</b> let of Things Definition Evaluation – IoT Architectures – IoT E of Things Applications – Security – Identity Management ar ns. etruzella, "Programmable Logic Controllers", 5 <sup>th</sup> Edition, Ta it 1,2,3,4. uyya & Amir Vahid Dastjerdi, "Internet of Things Principles ar	n Instructi ion – Divis ontrol – M (HMIs) – Data Mana nd Authen	ons: Data Co sion Instruction otion Control Introduction t agement and tication – Priv Lectur	- Da o DC Analy vacy e:45	are I ata C S ytics – St , <b>Tut</b> Priva	orial:	etions. Mat 9+3 unications 9+3 nmunication dization an 15, Total:6 nited, India
Master C Instruction Unit – IV Types of Supervisc Unit – V Introductii Protocols Regulator TEXT BO 1. F 2. R (I REFEREI	Control Re ns: Additio Processes ory Control on – Internet ry Limitatio <b>DOK:</b> Frank D. P 2019 for Ur Rajkumar E Imprint of E <b>NCES:</b>	set Instruction – Subroutine Functions. Data Manipulation n Instruction – Subtraction Instruction – Multiplication Instruction <b>Process Control, Network Systems, and SCADA:</b> a – Structure of Control Systems – On/Off Control – PID Co and Data Acquisition (SCADA) – Human Machine Interfaces <b>Internet of Things – An Overview:</b> let of Things Definition Evaluation – IoT Architectures – IoT E of Things Applications – Security – Identity Management ar ns. etruzella, "Programmable Logic Controllers", 5 <sup>th</sup> Edition, Ta it 1,2,3,4. uyya & Amir Vahid Dastjerdi, "Internet of Things Principles ar	n Instructi ion – Divis ontrol – M (HMIs) – Data Mana nd Authen	ons: Data Co sion Instruction otion Control Introduction t agement and tication – Priv Lectur	ompa n. – D: o DC Anal vacy e:45	are I ata C S ytics – St , <b>Tut</b> Priva	orial:	tions. Mar 9+3 unications 9+3 nmunication dization ar 15, Total:6

xplain the evelop pro nalyze the terpret the	ogrammine ory of op	ng with P peration i	LC		ation sys	tem					U	nderstand	
alyze the	eory of op	peration i		iced PL									
-			n advan	ced PLC								Applying	(K3)
terpret the	e archite	oturalist			C and S	CADA						Applying	(K3)
			erfaces a	and ope	ration al	bout DC	S				U	nderstand	ing (K2)
ustrate the	e advanc	ced techn	ologies,	, opportu	unities, c	challeng	jes to br	ing out	industry 4	4.0	U	nderstand	ing (K2)
				Маррі	ng of C	Os witł	n POs a	nd PSC	)s				
PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
3	1											2	2
3	2	1	1	1								3	3
3	2	1	1	1								3	3
3	1										-	2	2
3	1											2	2
2 – Mode	erate, 3 -	- Substar	ntial, BT	- Bloom'	's Taxon	iomy	·		'				
	PO1 3 3 3 3 3 3 3 3	PO1         PO2           3         1           3         2           3         2           3         1           3         1           3         1           3         1           3         1           3         1	PO1         PO2         PO3           3         1         1           3         2         1           3         2         1           3         1         1           3         1         1           3         1         1           3         1         1           3         1         1	PO1         PO2         PO3         PO4           3         1         -         -           3         2         1         1           3         2         1         1           3         1         -         -           3         1         -         1           3         1         -         -           3         1         -         -           3         1         -         -	PO1         PO2         PO3         PO4         PO5           3         1         1         1           3         2         1         1         1           3         1         -         -         -           3         1         -         -         -           3         1         -         -         -           3         1         -         -         -           2         -         Moderate, 3         -         Substantial, BT- Bloom	PO1         PO2         PO3         PO4         PO5         PO6           3         1         -         <	PO1         PO2         PO3         PO4         PO5         PO6         PO7           3         1	Mapping of COs with POs a           PO1         PO2         PO3         PO4         PO5         PO6         PO7         PO8           3         1	PO1         PO2         PO3         PO4         PO5         PO6         PO7         PO8         PO9           3         1	PO1         PO2         PO3         PO4         PO5         PO6         PO7         PO8         PO9         PO10           3         1	PO1         PO2         PO3         PO4         PO5         PO6         PO7         PO8         PO9         PO10         PO11           3         1	Mapping of COs with POs and PSOs         P01       P02       P03       P04       P05       P06       P07       P08       P09       P010       P011       P012         3       1 </td <td>Mapping of COs with POs and PSOs         PO1       PO2       PO3       PO4       PO5       PO6       PO7       PO8       PO9       PO10       PO11       PO12       PS01         3       1      </td>	Mapping of COs with POs and PSOs         PO1       PO2       PO3       PO4       PO5       PO6       PO7       PO8       PO9       PO10       PO11       PO12       PS01         3       1

		ASSESSMEN	T PATTERN	- THEORY			
Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	20	50	30				100
CAT2	10	40	50				100
CAT3	30	70	-				100
ESE	10	50	40				100
* ±3% may be varied	(CAT 1. 2 & 3 – 50 r	 marks & ESE – 100	marks)			1	

Programme & Branch	All BE/BTech branches except Electronics and Instrumentation Engineering	Sem.	Category	L	т	Ρ	Credit
Prerequisites	Nil	6	OE	3	1	0	4
Preamble	To develop PLC programs using high-level languages, tro	ubleshoot a	nd debug PL	C pro	gran	าร	
Unit - I	Programmable Logic Controllers (PLCs) An Overview	:	-		-		9+3
	Parts of a PLC - Principle of operation - PLC Hardware Compone Special I/O modules - I/O Specifications – The Central Processin	ents: The I/C					iles- Analo
Unit - II	Basics of PLC Programming:						9+3
	<ul> <li>PLC Programming Languages –Instruction Addressing – Brain Seal-In Circuits – Latching – Simple PLC ladder programming.</li> </ul>	nch Instructi	ons – NO an	d NC	lnst	ructio	ns – Mode
Unit - III	Programming Timers and Counters:						9+3
	r rogramming rimers and ocumers.						010
	Programming runces and occurrers. Iay Timer Instruction – Off-Delay Timer Instruction – Retentive Jp-Counter – Down-Counter –Combining Counter and Timer Fur				s. C	counte	ers: Counte
Instructions – L	lay Timer Instruction - Off-Delay Timer Instruction - Retentiv				s. C	counte	•.•
Instructions – L Unit - IV Review of Pyth	lay Timer Instruction – Off-Delay Timer Instruction – Retentiv Jp-Counter – Down-Counter –Combining Counter and Timer Fur	nctions - bas	ic application	IS.			ers: Counte 9+3
Instructions – L Unit - IV Review of Pyth Reading and w	lay Timer Instruction – Off-Delay Timer Instruction – Retentiv Jp-Counter – Down-Counter –Combining Counter and Timer Fur PLC Programming with high level languages: non syntax and data structures - Python scripts with Node-RED	nctions - bas	ic application	IS.			ers: Counte 9+3
Instructions – L Unit - IV Review of Pyth Reading and w Unit - V PLC programm	lay Timer Instruction – Off-Delay Timer Instruction – Retentiv Jp-Counter – Down-Counter –Combining Counter and Timer Fur PLC Programming with high level languages: non syntax and data structures - Python scripts with Node-RED riting data to PLC registers -IoT devices with Node-RED.	nctions - bas ) - communi r opening ar	cation betwee	is. en N	ode-l	RED a	9+3 and PLCs 9+3
Instructions – L Unit - IV Review of Pyth Reading and w Unit - V PLC programm	<ul> <li>Iay Timer Instruction – Off-Delay Timer Instruction – Retentive Jp-Counter – Down-Counter –Combining Counter and Timer Fur PLC Programming with high level languages:</li> <li>Inon syntax and data structures - Python scripts with Node-RED riting data to PLC registers -IoT devices with Node-RED.</li> <li>Advanced PLC Programming for Basic Applications:</li> <li>Ining with C++ - Database creation with MySQL - Automatic Door</li> </ul>	nctions - bas ) - communi r opening ar	cation between the contract of	ns. en No ne w	ode-l ay tra	RED a	9+3 and PLCs 9+3
Instructions – L Unit - IV Review of Pyth Reading and w Unit - V PLC programm	<ul> <li>Iay Timer Instruction – Off-Delay Timer Instruction – Retentive Jp-Counter – Down-Counter –Combining Counter and Timer Fur PLC Programming with high level languages:</li> <li>Inon syntax and data structures - Python scripts with Node-RED riting data to PLC registers -IoT devices with Node-RED.</li> <li>Advanced PLC Programming for Basic Applications:</li> <li>Ining with C++ - Database creation with MySQL - Automatic Door</li> </ul>	nctions - bas ) - communi r opening ar	cation between the contract of	ns. en No ne w	ode-l ay tra	RED a	9+3 and PLCs 9+3 ght control
Instructions – L Unit - IV Review of Pyth Reading and w Unit - V PLC programm Motor Start-Sto TEXT BOOK:	<ul> <li>Jay Timer Instruction – Off-Delay Timer Instruction – Retentive Jp-Counter – Down-Counter –Combining Counter and Timer Fur PLC Programming with high level languages:</li> <li>Inon syntax and data structures - Python scripts with Node-RED riting data to PLC registers -IoT devices with Node-RED.</li> <li>Advanced PLC Programming for Basic Applications:</li> <li>Ining with C++ - Database creation with MySQL - Automatic Door op Operation control- Elevator Control - Water Tank Level Control</li> <li>D. Petruzella, "Programmable Logic Controllers", 5<sup>th</sup> Edition, Tata</li> </ul>	nctions - bas ) - communi r opening ar ol	cation between nd closing –O Lectur	is. en N ne w <b>e:45</b>	ode-l ay tra	RED a	9+3 and PLCs 9+3 ght control 15, Total:6
Instructions – L Unit - IV Review of Pyth Reading and w Unit - V PLC programm Motor Start-Sto TEXT BOOK: 1 Frank I	Advanced PLC Programming for Basic Applications:     Advanced PLC Programming Level Industry Conters and Conters     Advanced PLC Programming for Basic Applications:     Ding with C++ - Database creation with MySQL - Automatic Door     Ding Operation control- Elevator Control - Water Tank Level Control	nctions - bas ) - communi r opening ar ol	cation between nd closing –O Lectur	is. en N ne w <b>e:45</b>	ode-l ay tra	RED a	9+3 and PLCs 9+3 ght control 15, Total:6
Instructions – U Unit - IV Review of Pyth Reading and wi Unit - V PLC programm Motor Start-Sto TEXT BOOK: 1. Frank I Delhi, 2 REFERENCES 1. John V	Advanced PLC Programming for Basic Applications:     Advanced PLC Programming Level Industry Conters and Conters     Advanced PLC Programming for Basic Applications:     Ding with C++ - Database creation with MySQL - Automatic Door     Ding Operation control- Elevator Control - Water Tank Level Control	nctions - bas ) - communi r opening ar ol	ic application cation between ad closing –O Lectur lill Education	en N ne w <b>e:45</b>	ode-l ay tra , <b>Tut</b> e	RED a	9+3 and PLCs 9+3 ght control 15, Total:6

		UTCON tion of		rse, the s	student	ts will be	e able to	)						BT Map (Highest	
CO1	des	cribe th	e basic (	compone	nts of F	PLC							L	Inderstand	ling (K2)
CO2	inte	rpret va	rious pro	ogrammir	ng logic	s and lar	nguages	of PLC						Applying	ı (K3)
CO3	dev	elop PL	.C progra	ams with	times a	nd count	ters							Applying	ı (K3)
CO4	dev	elop PL	.C progra	ams with	high le	vel langu	ages							Applying	ı (K3)
CO5	crea	ate data	base for	<sup>-</sup> data sto	rage ar	nd develo	p select	applica	ations					Applying	ı (K3)
											-				
										and PSC	1				
COs/P		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	P011	P012	PSO1	PSO2
CO	1	3	1											2	2
CO2	2	3	2	1	1	1								3	3
COS	3	3	2	1	1	1								3	3
CO4	4	3	2	1	1	1								3	3
CO	5	3	2	1	1	1								3	3
1 – Slię	ght, 2	– Mode	erate, 3 -	- Substar	ntial, BT	- Bloom	's Taxor	iomy							
						ASSE	SSMEN	T PAT	FERN -	THEOR	Y				
	t / Ble atege	oom's ory*	Re	member (K1) %	ing	Understa (K2)		Apply (K3)		Analyz (K4) 9		Evaluating (K5) %		reating (K6) %	Total %
	CAT	1		10		60	)	30	)						100
	CAT	2		10		30		60	)						100
	CAT	3		10		30		60	)						100
	ESE	_		10		30		60	<b>`</b>						100

			Engineering	/			
Programme & Branch	All BE/BTech branches except Electronics and Instrumentation Engineering	Sem.	Category	L	т	Р	Credit
Prerequisites	Nil	6	OE	3	1	0	4
Preamble	Virtual instrumentation is a powerful concept for control, problems. This course aims at giving an adequate exposure system to overcome the limitations of classical methods.						
Unit – I	Introduction to Virtual Instrumentation:						9+3
Instruments- Adv Graphical Progra Programming.	tation- Programming Requirements- Drawbacks of Recent App antages of VI- Creating Virtual Instruments Using LabVIEW- Vir mming and Textual Programming- Advantages of LabVIEW- La	rtual Instr	umentation i	n the	Eng	ineeri	ng Process ramming- (
Unit – II	Basic Tools, Loops and Graphs:						9+3
	avetorm (Frann-31) (Franns						
Unit – III Structures: Case	aveform Graph-3D Graphs.	ed Struct	ures, Formu	la No	odes,	Ever	9+3 nt Structure
Unit – III Structures: Case MathScript-String	Programming with Structures:	ed Struct	ures, Formu	la No	odes,	Ever	
Unit – III Structures: Case MathScript-String Unit – IV Interface Buses: Techniques-Data	Programming with Structures:         Structure, Sequence Structures, Customizing Structures, Time         Is-File I/O-State Machine.         Data Acquisition:         RS 232, RS422, RS485, GPIB and USB. Hardware Aspects:         Acquisition in LabVIEW-Hardware Installation and Configuratio         AQ Hardware- DAQ Software.	Signal G	rounding-Sig	nal (	Condi	itionin	nt Structure 9+3 g-Digital I/C
Unit – III Structures: Case MathScript-String Unit – IV Interface Buses: Techniques-Data DAQ Assistant-D Unit – V	Programming with Structures:         Structure, Sequence Structures, Customizing Structures, Time         Is-File I/O-State Machine.         Data Acquisition:         RS 232, RS422, RS485, GPIB and USB. Hardware Aspects:         Acquisition in LabVIEW-Hardware Installation and Configuration         AQ Hardware- DAQ Software.         Tools and Applications:	Signal G on-Comp	rounding-Sig onents of DA	nal ( \Q-D	Condi DAQ S	itionin Signal	9+3 g-Digital I/0 Accessory 9+3
Unit – III Structures: Case MathScript-String Unit – IV Interface Buses: Techniques-Data DAQ Assistant-D Unit – V Signal processin	Programming with Structures:         Structure, Sequence Structures, Customizing Structures, Time         Is-File I/O-State Machine.         Data Acquisition:         RS 232, RS422, RS485, GPIB and USB. Hardware Aspects:         Acquisition in LabVIEW-Hardware Installation and Configuratio         AQ Hardware- DAQ Software.	Signal G on-Comp Fools-Sig	rounding-Sig onents of DA nal, Voltage	nal ( \Q-D and	Condi DAQ S	itionin Signal	9+3 g-Digital I/0 Accessory 9+3
Unit – III Structures: Case MathScript-String Unit – IV Interface Buses: Techniques-Data DAQ Assistant-D Unit – V Signal processin	Programming with Structures:         Structure, Sequence Structures, Customizing Structures, Time         s-File I/O-State Machine.         Data Acquisition:         RS 232, RS422, RS485, GPIB and USB. Hardware Aspects:         Acquisition in LabVIEW-Hardware Installation and Configuratio         AQ Hardware- DAQ Software.         Tools and Applications:         g and Analysis Tools-Control System Design and Simulation T	Signal G on-Comp Fools-Sig	rounding-Sig onents of DA nal, Voltage ature Measur	nal ( AQ-D and reme	Condi AQ S Curr nt.	itionin Signal ent m	9+3 g-Digital I/0 Accessory 9+3
Unit – III Structures: Case MathScript-String Unit – IV Interface Buses: Techniques-Data DAQ Assistant-D Unit – V Signal processin using general put	Programming with Structures:         Structure, Sequence Structures, Customizing Structures, Time         s-File I/O-State Machine.         Data Acquisition:         RS 232, RS422, RS485, GPIB and USB. Hardware Aspects:         Acquisition in LabVIEW-Hardware Installation and Configuratio         AQ Hardware- DAQ Software.         Tools and Applications:         g and Analysis Tools-Control System Design and Simulation T	Signal G on-Comp Fools-Sig	rounding-Sig onents of DA nal, Voltage ature Measur	nal ( AQ-D and reme	Condi AQ S Curr nt.	itionin Signal ent m	9+3 g-Digital I/( Accessory 9+3 easuremer
Unit – III Structures: Case MathScript-String Unit – IV Interface Buses: Techniques-Data DAQ Assistant-D Unit – V Signal processin using general put TEXT BOOK: S.Sumat	Programming with Structures:         Structure, Sequence Structures, Customizing Structures, Time         s-File I/O-State Machine.         Data Acquisition:         RS 232, RS422, RS485, GPIB and USB. Hardware Aspects:         Acquisition in LabVIEW-Hardware Installation and Configuratio         AQ Hardware- DAQ Software.         Tools and Applications:         g and Analysis Tools-Control System Design and Simulation T	Signal G on-Comp Fools-Sig –Tempera	rounding-Sig onents of DA nal, Voltage ature Measur Lectur	nal ( AQ-D and eme	Condi AQ S Curr nt. , Tut	itionin Signal ent m orial:	9+3 g-Digital I/( Accessory 9+3 easuremer 15, Total:6
Unit – III Structures: Case MathScript-String Unit – IV Interface Buses: Techniques-Data DAQ Assistant-D Unit – V Signal processin using general put TEXT BOOK: 1 S.Sumat	Programming with Structures:         Structure, Sequence Structures, Customizing Structures, Time         Is-File I/O-State Machine.         Data Acquisition:         RS 232, RS422, RS485, GPIB and USB. Hardware Aspects:         Acquisition in LabVIEW-Hardware Installation and Configuratio         AQ Hardware- DAQ Software.         Tools and Applications:         g and Analysis Tools-Control System Design and Simulation Topose DAQ Card-Bio-Medical Signal Acquisition using NI-ELVIS	Signal G on-Comp Fools-Sig –Tempera	rounding-Sig onents of DA nal, Voltage ature Measur Lectur	nal ( AQ-D and eme	Condi AQ S Curr nt. , Tut	itionin Signal ent m orial:	9+3 g-Digital I/( Accessory 9+3 easuremer 15, Total:6

		UTCON		rse, the s	student	s will be	e able to	0						BT Map (Highest	
CO1	exp	lain the	Virtual I	nstrumer	ntation c	oncepts							U	nderstand	ling (K2)
CO2	арр	ly struc	tured pro	ogrammir	ng conce	epts in d	evelopir	ng LabV	IEW p	rograms				Applying	ı (K3)
CO3	buil	d LabVI	EW prog	grams us	ing stru	ctures, n	odes ar	nd state	machi	ne conce	epts			Applying	ı (K3)
CO4	utili	ze DAQ	System	to solve	real tim	e proble	ms							Applying	ı (K3)
CO5	арр	oly know	ledge or	n various	tools in	practica	l works							Applying	ı (K3)
						Маррі	ing of C	Os wit	n Pos a	and PSC	Ds				
COs/F	os	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO	1	3	1											2	2
CO	2	3	2	1	1	1								3	3
CO	3	3	2	1	1	1								3	3
CO	4	3	2	1	1	1								3	3
CO	5	3	2	1	1	1								3	3
1 – Sli	ght, 2	2 – Mode	erate, 3 -	- Substa	ntial, BT			•							
	t / Ble atege	oom's ory*	Re	member (K1) %	ing L	ASSE Jndersta (K2)	anding	T PATI Apply (K3)	ying	THEOF Analyz (K4)	ing I	Evaluating (K5) %		reating K6) %	Total %
	CAT	1		20		50		30	)						100
	CAT	2		15		40		45	5						100
	CAT	3		15		60		30	)						100
	ESE	Ξ		20		40		40	)						100

	(Offered by Department of Electronics and Instrume		Linginieering	/			
Programme & Branch	All BE/BTech branches except Electronics and Instrumentation Engineering	Sem.	Category	L	т	Ρ	Credit
Prerequisites	Nil	7	OE	3	0	0	3
Preamble	This course provides the basic concepts in Control Systems a systems, its interfaces, displays and applications.	and gives	an introduct	ion to	o dist	ribute	d control
Unit - I	Control Systems:						9
controller-Signal	Definition, Open loop and closed loop control system, Open loo conversions: I/P converter - Actuators: Electric and Pneumatic typ			yster	ms-P	, PI, F	
Unit - II	Distributed Control Systems:						9
Developments -	tributed Control Systems: Traditional Control System Deve Resulting System Architecture - Emergence of the Distribute tral Computer System Architecture – Generalized Distributed Cor	d Contro	ol System ar	chite			
Unit - III							9
	Microprocessor based Controller:						9
Basic elements o	a microprocessor based controller: a microprocessor based controller – Functional blocks: An intro the local control unit: Redundant controller designs.	duction -	- Comparisor	n of A	Archit	ecture	-
Basic elements o	a microprocessor based controller – Functional blocks: An intro	duction -	- Comparisor	n of A	Archit	ecture	-
Basic elements o design issues for <b>Unit - IV</b> Operator interface	a microprocessor based controller – Functional blocks: An intro the local control unit: Redundant controller designs.	tor interfa	ace: Architect	ural	alterr	natives	es - Securit 9
Basic elements o design issues for <b>Unit - IV</b> Operator interface	a microprocessor based controller – Functional blocks: An intro the local control unit: Redundant controller designs. DCS Operator Interfaces: es: Introduction – Low level operator interface – High level operator	tor interfa	ace: Architect	ural	alterr	natives	es - Securit 9
Basic elements o design issues for Unit - IV Operator interface elements in the o Unit - V	a microprocessor based controller – Functional blocks: An intro the local control unit: Redundant controller designs. DCS Operator Interfaces: es: Introduction – Low level operator interface – High level operator perator interface, Operator displays. Engineering interfaces: Engineering interfaces:	tor interfa neering i	ace: Architect nterface requ	ural	alterr ents.	natives	es - Securit 9 s, Hardwar 9
Basic elements o design issues for Unit - IV Operator interface elements in the o Unit - V Power Plants - W	a microprocessor based controller – Functional blocks: An intro the local control unit: Redundant controller designs.     DCS Operator Interfaces:     S: Introduction – Low level operator interface – High level operator perator interface, Operator displays. Engineering interfaces: Engi     DCS issues and Applications:	tor interfa neering i	ace: Architect nterface requ	ural	alterr ents.	natives	es - Securit 9 s, Hardwar 9
Basic elements o design issues for Unit - IV Operator interface elements in the o Unit - V Power Plants - W	a microprocessor based controller – Functional blocks: An intro the local control unit: Redundant controller designs.     DCS Operator Interfaces:     S: Introduction – Low level operator interface – High level operator perator interface, Operator displays. Engineering interfaces: Engi     DCS issues and Applications:	tor interfa neering i	ace: Architect nterface requ	ural	alterr ents.	natives	es - Securit 9 s, Hardwar 9 its – Oil an
Basic elements o design issues for Unit - IV Operator interface elements in the o Unit - V Power Plants - W Gas Fields. TEXT BOOK:	a microprocessor based controller – Functional blocks: An intro the local control unit: Redundant controller designs.     DCS Operator Interfaces:     S: Introduction – Low level operator interface – High level operator perator interface, Operator displays. Engineering interfaces: Engi     DCS issues and Applications:	tor interfa neering i d Paper	ace: Architect nterface requ plants – Glas	ural	alterr ents.	natives	es - Securit 9 s, Hardwar 9 its – Oil an
Basic elements o design issues for Unit - IV Operator interface elements in the o Unit - V Power Plants - W Gas Fields. TEXT BOOK: 1. Michael F	a microprocessor based controller – Functional blocks: An intro the local control unit: Redundant controller designs.     DCS Operator Interfaces:     S: Introduction – Low level operator interface – High level operator perator interface, Operator displays. Engineering interfaces: Engi DCS issues and Applications:     ater and waste water treatment plants - Cement plants – Pulp an	tor interfa neering i d Paper	ace: Architect nterface requ plants – Glas	ural	alterr ents.	natives	es - Securit 9 s, Hardwar 9 its – Oil an
Basic elements o design issues for Unit - IV Operator interface elements in the o Unit - V Power Plants - W Gas Fields. TEXT BOOK: 1. Michael F REFERENCES:	a microprocessor based controller – Functional blocks: An intro the local control unit: Redundant controller designs.     DCS Operator Interfaces:     S: Introduction – Low level operator interface – High level operator perator interface, Operator displays. Engineering interfaces: Engi DCS issues and Applications:     ater and waste water treatment plants - Cement plants – Pulp an	tor interfa neering i Id Paper o., Cana	ace: Architect nterface requ plants – Glas da, 2019	ural i iirem	alterr ents.	natives	9 s, Hardwar 9 ts – Oil an
Basic elements o design issues for Unit - IV Operator interface elements in the o Unit - V Power Plants - W Gas Fields. TEXT BOOK: 1. Michael F REFERENCES: 1. Norman	a microprocessor based controller – Functional blocks: An intro the local control unit: Redundant controller designs. DCS Operator Interfaces: es: Introduction – Low level operator interface – High level operator berator interface, Operator displays. Engineering interfaces: Engi DCS issues and Applications: ater and waste water treatment plants - Cement plants – Pulp an P. Lukas, "Distributed Control System", Van Nostrand Reinhold Control System", Van Nostrand Reinhold Control System", Van Nostrand Reinhold Control System", Van Nostrand Reinhold Control System", Van Nostrand Reinhold Control System", Van Nostrand Reinhold Control System", Van Nostrand Reinhold Control System", Van Nostrand Reinhold Control System", Van Nostrand Reinhold Control System", Van Nostrand Reinhold Control System", Van Nostrand Reinhold Control System", Van Nostrand Reinhold Control System", Van Nostrand Reinhold Control System", Van Nostrand Reinhold Control System", Van Nostrand Reinhold Control System", Van Nostrand Reinhold Control System (States States S	tor interfa neering i Id Paper o., Cana Publisher	ace: Architect nterface requ plants – Glas da, 2019 s, New Delhi,	ural lirem	alterr ents. nakin	g Plan	9 s, Hardwar 9 ts – Oil an Total:4

		UTCON tion of		rse, the s	studen	ts will be	e able to	)						BT Map (Highest	
CO1	pro	vide ba	sic con	cepts in C	Control	Systems	6						U	nderstand	ling (K2)
CO2	des	scribe th	ne archi	tecture of	Distrib	uted Con	trol Syst	ems					U	nderstand	ling (K2)
CO3	giv	e adequ	uate info	ormation v	vith res	pect to in	terfaces	used in	n DCS					Applying	ı (K3)
CO4	cho	ose the	operato	or Interfac	es and	displays	in DCS							Applying	ı (K3)
CO5	арр	ly DCS	for sele	ct applica	tions									Applying	ı (K3)
					1		ing of C	1	1		1		1		1
COs/P	Os	P01	PO2	PO3	PO4	PO5	PO6	<b>PO7</b>	PO8	PO9	PO10	P011	PO12	PSO1	PSO2
CO	1	3	1						1		2			2	2
CO2	2	3	1						1		2			2	2
COS	3	3	2						1		1			3	3
CO4	4	3	2	1	1	1			1		1			3	3
COS	5	3	2	1	1	1			1		1			3	3
1 – Slię	ght, 2	– Mode	erate, 3	- Substai	ntial, B	T- Bloom	's Taxon	iomy							
							SSMEN	T		-					
	t / Blo atego	oom's ory*	Re	member (K1) %	ing	Understa (K2)		Apply (K3)		Analyz (K4) 9		Evaluating (K5) %		reating K6) %	Total %
	CAT	1		30		70									100
	CAT	2		20		40		4(	)						100
	CAT	3		20		30	)	50	)						100
	ESE	=		20		40	)	4(	)						100
* ±3%	may l	be varie	d (CAT	1,2&3-	- 50 ma	arks & ES	SE – 100	marks	)				1		

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	(Offered by Department of Electronics and Instru	umentati	ion Engineer	ing)			
Programme & Branch	All BE/BTech branches except Electronics and Instrumentation Engineering	Sem.	Category	L	т	Р	Credit
Prerequisites	Nil	7	OE	3	0	0	3
Preamble	To discuss the concepts of aircraft instruments and co conventional and advanced flight instruments.	ockpit lay	out in mode	ern air	rcraft a	and dea	als with the
Unit – I	Basics of Aircraft and Aircraft Instruments:						9
Instruments and Grouping, Glass (	ntrol Surfaces – Forces – Moments and Angle of Attack – E their Layout – Aircraft Display Types – Quantitative and C Cockpits of Modern Aircraft.						g – Basic
Unit – II	Air Data Instruments and Directional Systems:				_		9
Instruments - Air	r Data Instruments – Pitot pressure and Pitot tube – Types Speed Indicator, Air Data Computer – International Standa c Compass – Earth Magnetic Field – Flux Detector Unit.						
Unit – III	Gyroscopic and Advanced Flight Instruments:						9
	pes of Gyro – Conventional Mechanical, Vibrating Gyros, RLC and limitations – Gyro Horizon – Turn and Bank Indicator – T						
Directional Gyro a Advanced Direction <b>Unit – IV</b> Introduction – En Tachometer, Hall	and limitations – Gyro Horizon – Turn and Bank Indicator – T	urn Coo	rdinator – Sta r, Servo Typ	andby be, No	Attituc	le Direc	tor Indicato 9 ype, Optica
Directional Gyro a Advanced Direction <b>Unit – IV</b> Introduction – En Tachometer, Hall	and limitations – Gyro Horizon – Turn and Bank Indicator – T on Indicators. <b>Engine Instruments and Indicators:</b> ngine Speed Measurements – Electrical Tacho Generator Effect Sensor – Torque Measurements – Electronic Torque	urn Coo	rdinator – Sta r, Servo Typ	andby be, No	Attituc	le Direc	tor Indicato 9 ype, Optica
Directional Gyro a Advanced Direction Unit – IV Introduction – En Tachometer, Hall Ratio Indicator. En Unit – V Introduction – Ra Distance Measuri	and limitations – Gyro Horizon – Turn and Bank Indicator – T on Indicators. <b>Engine Instruments and Indicators:</b> ngine Speed Measurements – Electrical Tacho Generator Effect Sensor – Torque Measurements – Electronic Torque ngine Fuel Indicators: Fuel Quantity Indicator.	Turn Coo /Indicato Meter –	rdinator – Sta r, Servo Typ Pressure Me _S/INS/GPS -	oe, No asure – Prin	Attituc on-Cor ments	te Direct ntact Tr – Engi	etor Indicato 9 ype, Optica ne Pressur 9 operation p Down INS
Directional Gyro a Advanced Directio Unit – IV Introduction – En Tachometer, Hall Ratio Indicator. En Unit – V Introduction – Ra Distance Measuri – Global Positioni	and limitations – Gyro Horizon – Turn and Bank Indicator – T on Indicators. <b>Engine Instruments and Indicators:</b> ngine Speed Measurements – Electrical Tacho Generator Effect Sensor – Torque Measurements – Electronic Torque ngine Fuel Indicators: Fuel Quantity Indicator. <b>Aircraft Navigation and Safety Warning Systems:</b> dio Navigation Aids – VHF Omni Directional Range System ng Equipment, Instrument Landing Systems –Inertial Navigati	Turn Coo /Indicato Meter –	rdinator – Sta r, Servo Typ Pressure Me _S/INS/GPS -	oe, No asure – Prin	Attituc on-Cor ments	te Direct ntact Tr – Engi	ype, Optica ne Pressure 9 operation
Directional Gyro a Advanced Direction Unit – IV Introduction – El Tachometer, Hall Ratio Indicator. El Unit – V Introduction – Ra Distance Measuri – Global Positioni	and limitations – Gyro Horizon – Turn and Bank Indicator – T on Indicators. <b>Engine Instruments and Indicators:</b> ngine Speed Measurements – Electrical Tacho Generator Effect Sensor – Torque Measurements – Electronic Torque ngine Fuel Indicators: Fuel Quantity Indicator. <b>Aircraft Navigation and Safety Warning Systems:</b> dio Navigation Aids – VHF Omni Directional Range System ng Equipment, Instrument Landing Systems –Inertial Navigati ng System. Air Data Warning Systems.	Turn Coo /Indicato Meter – n DME/IL on Syste	rdinator – Sta r, Servo Typ Pressure Me -S/INS/GPS - em: Principle,	eandby be, No easure – Prin Gimb	Attituc on-Cor ments ciple c alled a	htact Tr – Engi of VOR	ype, Optica ne Pressur 9 operation p Down INS Total:4
Directional Gyro a Advanced Direction Unit – IV Introduction – En Tachometer, Hall Ratio Indicator. En Unit – V Introduction – Ra Distance Measuri – Global Positioni TEXT BOOK:	and limitations – Gyro Horizon – Turn and Bank Indicator – T on Indicators. <b>Engine Instruments and Indicators:</b> ngine Speed Measurements – Electrical Tacho Generator Effect Sensor – Torque Measurements – Electronic Torque ngine Fuel Indicators: Fuel Quantity Indicator. <b>Aircraft Navigation and Safety Warning Systems:</b> dio Navigation Aids – VHF Omni Directional Range System ng Equipment, Instrument Landing Systems –Inertial Navigati	Turn Coo /Indicato Meter – n DME/IL on Syste	rdinator – Sta r, Servo Typ Pressure Me -S/INS/GPS - em: Principle,	eandby be, No easure – Prin Gimb	Attituc on-Cor ments ciple c alled a	htact Tr – Engi of VOR	ype, Optica ne Pressur 9 operation p Down IN: Total:4
Directional Gyro a Advanced Direction Unit – IV Introduction – En Tachometer, Hall Ratio Indicator. En Unit – V Introduction – Ra Distance Measuri – Global Positioni TEXT BOOK:	And limitations – Gyro Horizon – Turn and Bank Indicator – T on Indicators. <b>Engine Instruments and Indicators:</b> Ingine Speed Measurements – Electrical Tacho Generator Effect Sensor – Torque Measurements – Electronic Torque Ingine Fuel Indicators: Fuel Quantity Indicator. <b>Aircraft Navigation and Safety Warning Systems:</b> dio Navigation Aids – VHF Omni Directional Range System ng Equipment, Instrument Landing Systems –Inertial Navigati ng System. Air Data Warning Systems.	Turn Coo /Indicato Meter – n DME/IL on Syste	rdinator – Sta r, Servo Typ Pressure Me -S/INS/GPS - em: Principle,	eandby be, No easure – Prin Gimb	Attituc on-Cor ments ciple c alled a	htact Tr – Engi of VOR	ype, Optica ne Pressur 9 operation p Down INS Total:4
Directional Gyro a Advanced Directio Unit – IV Introduction – En Tachometer, Hall Ratio Indicator. En Unit – V Introduction – Ra Distance Measuri – Global Positioni TEXT BOOK: 1. Naga Pvt. I REFERENCES: 1. Fede Wash	And limitations – Gyro Horizon – Turn and Bank Indicator – T on Indicators. <b>Engine Instruments and Indicators:</b> Ingine Speed Measurements – Electrical Tacho Generator Effect Sensor – Torque Measurements – Electronic Torque Ingine Fuel Indicators: Fuel Quantity Indicator. <b>Aircraft Navigation and Safety Warning Systems:</b> dio Navigation Aids – VHF Omni Directional Range System ng Equipment, Instrument Landing Systems –Inertial Navigati ng System. Air Data Warning Systems.	ems", 2 <sup>n</sup>	rdinator – Sta r, Servo Typ Pressure Me -S/INS/GPS - em: Principle, d Edition, I.K.	e, No easure - Prin Gimb	Attituc on-Cor ments ciple c alled a nationa	al Publice al Publice es and	etor Indicato 9 ype, Optica ne Pressur 9 operation p Down IN: Total:4 shing Hous Academics

COURSE On compl			urse, th	e stud	ents will	be able	e to						BT Ma (Highes	
CO1	infer t	he basio	cs of airc	craft ar	d aircraft	instrum	nents						Understa	nding(K2)
CO2	discu	ss abou	t air data	a instru	ments an	d direct	ional sy	stems					Understar	nding (K2)
CO3	make	use of g	gyroscop	oes for	advance	d flight i	nstrume	ents					Applyi	ng(K3)
CO4	outline	e the fur	ndament	tals of	engine in	strumen	its and i	ndicat	ors				Understar	nding (K2)
CO5	utilize	the cor	icepts of	faircra	ft navigat	ion safe	ty warn	ing sy	stems				Applyi	ng(K3)
					Ма	apping	of COs	with F	os and	PSOs				
COs/Pos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P010	) PO11	PO12	PSO1	PSO2
CO1	3	1											2	2
CO2	3	1											2	2
CO3	3	2	1	1	1								3	3
CO4	3	1											2	2
CO5	3	1	1	1	1								3	3
1 – Slight,	2 – Moc	lerate, 3	8 – Subs	tantial,	BT- Bloc	om's Tax	konomy							
									RN – TH					
Test / B Categ			nember (K1) %	ing	Jndersta (K2)		Apply (K3)		Analyzi (K4) %		Evaluating	(K5) %	Creating (K6) %	Total %
CA	Г1		30		70									100
CA	Γ2		30		40		30	)						100
CA	ГЗ		30		40		30	)						100
ES	E		30		40		30	)						100
* ±3% may	be vari	ed (CAT	1,2&	3 – 50	marks &	ESE – 1	100 mar	ks)						

	(Offered by Department of Electronics and Instrum	entation	Linginieering	/			
Programme & Branch	All BE/BTech branches except Electronics and Instrumentation Engineering	Sem.	Category	L	т	Ρ	Credit
Prerequisites	Nil	7	OE	3	0	0	3
Preamble	To transform the industrial processes through the integration communication, and computational processing.	n of mode	n technologie	es su	ich a	s sens	ors,
Unit – I	Introduction to Industrial IoT and Industry 4.0:						9
IIoT – Intelligen	T Background and History, IIoT key technologies, IoT and IIoT t devices – Key opportunities and benefits: Digital and human witics and design principles.						
Unit – II	IIoT Architectures:						9
topology – Co	Architecture – Industrial Internet Architecture Framework – Fi nnectivity: Key system characteristics, Connectivity security layer – Overview of Predictive Maintenance Architecture.						
Unit – III	IIoT WAN Technologies and Protocols:						9
	ols – Legacy Industrial protocols – Modern Communication proto						
Standard Ether RPMA, Low Por	net. IIoT device Low-Power WAN optimized technologies for M2 wer Wi-Fi, LTE Category-M, Weightless, Millimeter Radio.						n7, Ingenue
Standard Ether RPMA, Low Por <b>Unit – IV</b> Introduction – S solutions – Stra	net. IIoT device Low-Power WAN optimized technologies for M2	2M: SigFo	ox, LoRaWAN	N, nV	Vave	, Dasł cyber	n7, Ingenue 9 attacks and
Standard Ether RPMA, Low Por <b>Unit – IV</b> Introduction – S solutions – Stra	net. IIoT device Low-Power WAN optimized technologies for M2 wer Wi-Fi, LTE Category-M, Weightless, Millimeter Radio. Industrial IoT Security and Governance: Security threats and vulnerabilities of IoT – Industrial challenges tegic principles of cyber security – cyber security measures - Ind	2M: SigFo	ox, LoRaWAN	N, nV	Vave	, Dasł cyber	n7, Ingenue 9 attacks and
Standard Ether RPMA, Low Por Unit – IV Introduction – S solutions – Stra patterns – four Unit – V Software Define	net. IIoT device Low-Power WAN optimized technologies for M2 wer Wi-Fi, LTE Category-M, Weightless, Millimeter Radio. Industrial IoT Security and Governance: Security threats and vulnerabilities of IoT – Industrial challenges tegic principles of cyber security – cyber security measures - Inc Fier IIoT security model- Management risks with IIoT. Industrial IoT Analytics and Applications: ed Networks: Difference between SDN and NFV – Cloud and components of Robots: Industrial Robotic applications – Indus	2M: SigFo - Evoluti dustrial lo	on of Cyber r security arc	Ana	Vave cks: c cture	, Dasł cyber : IloT s in Il	9 attacks and architecture 9 IoT. Recen , assembly
Standard Ether RPMA, Low Por <b>Unit – IV</b> Introduction – S solutions – Stra patterns – four <b>Unit – V</b> Software Define Technological of	net. IIoT device Low-Power WAN optimized technologies for M2 wer Wi-Fi, LTE Category-M, Weightless, Millimeter Radio. Industrial IoT Security and Governance: Security threats and vulnerabilities of IoT – Industrial challenges tegic principles of cyber security – cyber security measures - Inc Fier IIoT security model- Management risks with IIoT. Industrial IoT Analytics and Applications: ed Networks: Difference between SDN and NFV – Cloud and components of Robots: Industrial Robotic applications – Indus	2M: SigFo - Evoluti dustrial lo	on of Cyber r security arc	Ana	Vave cks: c cture	, Dasł cyber : IloT s in Il	n7, Ingenu 9 attacks and architectur 9 loT. Recer
Standard Ether RPMA, Low Por <b>Unit – IV</b> Introduction – S solutions – Stra patterns – four <b>Unit – V</b> Software Define Technological of	net. IIoT device Low-Power WAN optimized technologies for M2 wer Wi-Fi, LTE Category-M, Weightless, Millimeter Radio. Industrial IoT Security and Governance: Security threats and vulnerabilities of IoT – Industrial challenges tegic principles of cyber security – cyber security measures - Inc Fier IIoT security model- Management risks with IIoT. Industrial IoT Analytics and Applications: ed Networks: Difference between SDN and NFV – Cloud and components of Robots: Industrial Robotic applications – Indus	2M: SigFo - Evoluti dustrial lo	on of Cyber r security arc	Ana	Vave cks: c cture	, Dasł cyber : IloT s in Il	9 attacks an architectur 9 IoT. Recer , assembly
Standard Ether RPMA, Low Por Unit – IV Introduction – S solutions – Stra patterns – four Unit – V Software Define Technological of operation and tr TEXT BOOK:	net. IIoT device Low-Power WAN optimized technologies for M2 wer Wi-Fi, LTE Category-M, Weightless, Millimeter Radio. Industrial IoT Security and Governance: Security threats and vulnerabilities of IoT – Industrial challenges tegic principles of cyber security – cyber security measures - Inc Fier IIoT security model- Management risks with IIoT. Industrial IoT Analytics and Applications: ed Networks: Difference between SDN and NFV – Cloud and components of Robots: Industrial Robotic applications – Indus	2M: SigFo = Evoluti dustrial lo d Fog - E strial appli	on of Cyber T security arc ig Data and cation of AR	Ana Ana Ana	Vave cks: c cture alytic: ainter	, Dasł cyber : IloT s in Il nance	9 attacks an architectur 9 IoT. Recer , assembly
Standard Ether RPMA, Low Por Unit – IV Introduction – S solutions – Stra patterns – four Unit – V Software Define Technological of operation and tr TEXT BOOK:	net. IIoT device Low-Power WAN optimized technologies for M2 wer Wi-Fi, LTE Category-M, Weightless, Millimeter Radio. Industrial IoT Security and Governance: Security threats and vulnerabilities of IoT – Industrial challenges tegic principles of cyber security – cyber security measures - Inc Fier IIoT security model- Management risks with IIoT. Industrial IoT Analytics and Applications: ed Networks: Difference between SDN and NFV – Cloud and components of Robots: Industrial Robotic applications – Indus aining.	2M: SigFo = Evoluti dustrial lo d Fog - E strial appli	on of Cyber T security arc ig Data and cation of AR	Ana Ana Ana	Vave cks: c cture alytic: ainter	, Dasł cyber : IloT s in Il nance	9 attacks an architectur 9 IoT. Recer , assembly
Standard Ether         RPMA, Low Por         Unit – IV         Introduction – S         solutions – Strapatterns – four         Unit – V         Software Definit         Technological of operation and tr         TEXT BOOK:         1.       Alasdai         REFERENCES         1.       Alp Us Manufa	net. IIoT device Low-Power WAN optimized technologies for M2 wer Wi-Fi, LTE Category-M, Weightless, Millimeter Radio. Industrial IoT Security and Governance: Security threats and vulnerabilities of IoT – Industrial challenges tegic principles of cyber security – cyber security measures - Inc Fier IIoT security model- Management risks with IIoT. Industrial IoT Analytics and Applications: ed Networks: Difference between SDN and NFV – Cloud and components of Robots: Industrial Robotic applications – Indus aining.	2M: SigFo = – Evoluti dustrial lo d Fog - E strial appli ition, Apre	on of Cyber T security ard ig Data and cation of AR ss Media, Ne	attac chited Ana R: Ma	vave ks: c cture alytic: alytic: rk, 20 rr se	, Dasł cyber : IloT s in Il nance 016.	n7, Ingenu 9 attacks an architectur 9 loT. Recer , assembly Total:4

	SE OUTCOMES: mpletion of the course, the students will be able to	BT Mapped (Highest Level)
CO1	explore the basics of industrial internet of things	Understanding (K2)
CO2	interpret the concepts of various architectures and components	Understanding (K2)
CO3	design and implement protocols and sensors for IIoT	Applying (K3)
CO4	impart the knowledge of IIoT security layers	Understanding (K2)
CO5	apply IIoT in real time Industrial applications	Applying (K3)

					Маррі	ng of C	Os with	n POs a	nd PSC	Ds				
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3							1					2	2
CO2	3	1						1					2	2
CO3	3	2	1	1	1			1					3	3
CO4	3	1						1					2	2
CO5	3	2	1	1	1			1					3	3
1 – Slight, 2	2 – Mode	erate, 3 -	- Substar	ntial, BT	- Bloom	's Taxon	iomy							

		ASSESSMEN	T PATTERN	- THEORY			
Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	15	85					100
CAT2	10	50	40				100
CAT3	5	35	60				100
ESE	10	50	40				100

Programma 8	All DE/DTack branches event Electronics and						
Programme & Branch	All BE/BTech branches except Electronics and Instrumentation Engineering	Sem.	Category	L	Т	Ρ	Credit
Prerequisites	Nil	7	OE	3	0	0	3
Preamble	To educate on the basic concepts of data communication	on, different	industrial com	munica	tion p	rotoco	ls and
Unit – I	Serial communication:						9
standard) - Half-c	ation: OSI reference model – Protocols – RS-232 overv Juplex operation of the RS-232 interface – Limitations – R The 20 mA Current loop.	view, RS-232 S-485 overv	2 interface st iew – The RS	andard S-485 ir	(CCI nterfac	FT V.2 e star	24 interface Idard – RS
Unit – II	Copper Cable and Fiber Optics Cable Communicati						9
	haracteristics – Cable selection – Coaxial cables – Tw rds. Fibre optics Communication: Fiber-optic cable compo necting fibers.						
Unit – III	MODBUS, PROFIBUS PA/DP/FMS and TCP/IP:						9
Formatting. PROI application proces	s Overview – MODBUS protocol structure – Function code FIBUS PA/DP/FMS: PROFIBUS protocol stack- The PR is and communication – Communication objects. TCP/IP –	ROFIBUS co TCP/IP over	mmunication view: Introdu	model	- Rela Interne	itionsh et Laye	ip betweel er Protocol
Formatting. PROI application proces (Packet Transport network layer prob <b>Unit – IV</b> HART: HART Intro Foundation Field I	FIBUS PA/DP/FMS: PROFIBUS protocol stack- The PF is and communication – Communication objects. TCP/IP – t) – Host-to-host layer: end to end reliability. TCP/IP trout olems – Transport layer problems. HART and Foundation Field Bus: oduction – HART and smart instrumentation – Physical lay Bus: Introduction – The Physical layer and Wiring Rules, T	CFIBUS co TCP/IP over bleshooting: yer, Data lin	mmunication view: Introduction - Introduction -	model ction – - Comr tion lay	- Rela Interne non pr er – H	tionsh et Laye roblem	ip between er Protocols is – Typica 9 Commands
Formatting. PROI application process (Packet Transport network layer prob <b>Unit – IV</b> HART: HART Intrr Foundation Field I Error detection an	FIBUS PA/DP/FMS: PROFIBUS protocol stack- The PF is and communication – Communication objects. TCP/IP – i) – Host-to-host layer: end to end reliability. TCP/IP trout olems – Transport layer problems. HART and Foundation Field Bus: oduction – HART and smart instrumentation – Physical lay Bus: Introduction – The Physical layer and Wiring Rules, T d diagnostics - High-speed Ethernet (HSE)	CFIBUS co TCP/IP over bleshooting: yer, Data lin	mmunication view: Introduction - Introduction -	model ction – - Comr tion lay	- Rela Interne non pr er – H	tionsh et Laye roblem	ip betweer er Protocols is – Typica <b>9</b> Commands User layer
Formatting. PROI application process (Packet Transport network layer prot <b>Unit – IV</b> HART: HART Intrr Foundation Field I <u>Error detection an</u> <b>Unit – V</b>	FIBUS PA/DP/FMS: PROFIBUS protocol stack- The PF is and communication – Communication objects. TCP/IP – i) – Host-to-host layer: end to end reliability. TCP/IP trout olems – Transport layer problems. HART and Foundation Field Bus: oduction – HART and smart instrumentation – Physical lay Bus: Introduction – The Physical layer and Wiring Rules, T d diagnostics - High-speed Ethernet (HSE) Industrial Ethernet and Wireless Communication:	ROFIBUS cc TCP/IP over bleshooting: yer, Data link he Data link	k and application k and application Application	model ction – - Comr tion lay	- Rela Interne non pi er – H n laye	tionsh et Laye roblem	ip between er Protocols is – Typica 9 Commands
Formatting. PROI application process (Packet Transport network layer prot Unit – IV HART: HART Intro Foundation Field I Error detection an Unit – V Industrial Etherner Wireless commun	FIBUS PA/DP/FMS: PROFIBUS protocol stack- The PF is and communication – Communication objects. TCP/IP – i) – Host-to-host layer: end to end reliability. TCP/IP trout olems – Transport layer problems. HART and Foundation Field Bus: oduction – HART and smart instrumentation – Physical lay Bus: Introduction – The Physical layer and Wiring Rules, T d diagnostics - High-speed Ethernet (HSE)	COFIBUS cc TCP/IP over bleshooting: yer, Data link he Data link Gigabit Ethe	mmunication view: Introduc Introduction - k and applica layer, The Ap	model ction – – Comr tion lay plicatio	- Rela Interne non pr er – H n laye rnet.	itionsh et Layo oblem IART ( r, The	ip betweer er Protocols is – Typica 9 Commands User layer 9
Formatting. PROI application process (Packet Transport network layer prot Unit – IV HART: HART Intro Foundation Field I Error detection an Unit – V Industrial Etherner Wireless commun	FIBUS PA/DP/FMS: PROFIBUS protocol stack- The PR         and communication – Communication objects. TCP/IP –         t) – Host-to-host layer: end to end reliability. TCP/IP trout         olems – Transport layer problems.         HART and Foundation Field Bus:         oduction – HART and smart instrumentation – Physical lat         Bus: Introduction – The Physical layer and Wiring Rules, T         d diagnostics - High-speed Ethernet (HSE)         Industrial Ethernet and Wireless Communication:         t: Introduction – 10 Mbps Ethernet – 100 Mbps Ethernet – 0         ication: Satellite systems – Wireless LANs- Radio and wire	COFIBUS cc TCP/IP over bleshooting: yer, Data link he Data link Gigabit Ethe	mmunication view: Introduc Introduction - k and applica layer, The Ap	model ction – – Comr tion lay plicatio	- Rela Interne non pr er – H n laye rnet.	itionsh et Layo oblem IART ( r, The	ip betwee er Protocol is – Typica 9 Commands User layer 9 ents of radi
Formatting. PROI application process (Packet Transport network layer prot Unit – IV HART: HART Intro Foundation Field I Error detection an Unit – V Industrial Etherner Wireless commun	FIBUS PA/DP/FMS: PROFIBUS protocol stack- The PR         and communication – Communication objects. TCP/IP –         t) – Host-to-host layer: end to end reliability. TCP/IP trout         olems – Transport layer problems.         HART and Foundation Field Bus:         oduction – HART and smart instrumentation – Physical lat         Bus: Introduction – The Physical layer and Wiring Rules, T         d diagnostics - High-speed Ethernet (HSE)         Industrial Ethernet and Wireless Communication:         t: Introduction – 10 Mbps Ethernet – 100 Mbps Ethernet – 0         ication: Satellite systems – Wireless LANs- Radio and wire	COFIBUS cc TCP/IP over bleshooting: yer, Data link he Data link Gigabit Ethe	mmunication view: Introduc Introduction - k and applica layer, The Ap	model ction – – Comr tion lay plicatio	- Rela Interne non pr er – H n laye rnet.	itionsh et Layo oblem IART ( r, The	ip betweer er Protocols is – Typica 9 Commands User layer 9
Formatting. PROI application proces (Packet Transport network layer prot <b>Unit – IV</b> HART: HART Intre Foundation Field I Error detection an <b>Unit – V</b> Industrial Etherner Wireless commun link – radio spectre	FIBUS PA/DP/FMS: PROFIBUS protocol stack- The PR         and communication – Communication objects. TCP/IP –         t) – Host-to-host layer: end to end reliability. TCP/IP trout         olems – Transport layer problems.         HART and Foundation Field Bus:         oduction – HART and smart instrumentation – Physical lat         Bus: Introduction – The Physical layer and Wiring Rules, T         d diagnostics - High-speed Ethernet (HSE)         Industrial Ethernet and Wireless Communication:         t: Introduction – 10 Mbps Ethernet – 100 Mbps Ethernet – 0         ication: Satellite systems – Wireless LANs- Radio and wire	COFIBUS co TCP/IP over bleshooting: yer, Data link he Data link Gigabit Ethe less commu	mmunication view: Introduc Introduction - k and applica layer, The Ap rnet – Industri nication : Intro	model ction – – Comr tion lay pplicatio	- Rela Interno non pi er – H n laye rnet. n – co	tionsh et Lay oblem IART ( r, The	ip betwee er Protocol is – Typica 9 Commands User layer 9 ents of radi Total:4
Formatting. PROI application proces (Packet Transport network layer prot Unit – IV HART: HART Intre Foundation Field I Error detection an Unit – V Industrial Etherne Wireless commun link – radio spectre TEXT BOOK: 1. Deon	FIBUS PA/DP/FMS: PROFIBUS protocol stack- The PR         as and communication – Communication objects. TCP/IP –         t) – Host-to-host layer: end to end reliability. TCP/IP trout         olems – Transport layer problems.         HART and Foundation Field Bus:         oduction – HART and smart instrumentation – Physical lay         Bus: Introduction – The Physical layer and Wiring Rules, T         d diagnostics - High-speed Ethernet (HSE)         Industrial Ethernet and Wireless Communication:         t: Introduction – 10 Mbps Ethernet – 100 Mbps Ethernet – 0         ication: Satellite systems – Wireless LANs- Radio and wire         um and frequency allocation – Radio MODEMs.	COFIBUS co TCP/IP over bleshooting: yer, Data link he Data link Gigabit Ethe less commu	mmunication view: Introduc Introduction - k and applica layer, The Ap rnet – Industri nication : Intro	model ction – – Comr tion lay pplicatio	- Rela Interno non pi er – H n laye rnet. n – co	tionsh et Lay oblem IART ( r, The	ip betwee er Protocol is – Typica 9 Commands User layer 9 ents of radi Total:4
Formatting. PROI application proces (Packet Transport network layer prot Unit – IV HART: HART Intre Foundation Field I Error detection an Unit – V Industrial Etherner Wireless commun link – radio spectre TEXT BOOK: 1. Deon REFERENCES:	FIBUS PA/DP/FMS: PROFIBUS protocol stack- The PR         as and communication – Communication objects. TCP/IP –         t) – Host-to-host layer: end to end reliability. TCP/IP trout         olems – Transport layer problems.         HART and Foundation Field Bus:         oduction – HART and smart instrumentation – Physical lay         Bus: Introduction – The Physical layer and Wiring Rules, T         d diagnostics - High-speed Ethernet (HSE)         Industrial Ethernet and Wireless Communication:         t: Introduction – 10 Mbps Ethernet – 100 Mbps Ethernet – 0         ication: Satellite systems – Wireless LANs- Radio and wire         um and frequency allocation – Radio MODEMs.	ROFIBUS co TCP/IP over bleshooting: yer, Data link he Data link Gigabit Ethe bless commu	mmunication view: Introduc Introduction - k and applicat layer, The Ap rnet – Industri nication : Intro	model- ction – - Comr tion lay pplicatio	- Rela Interno non pr er – H n laye rnet. n – co	tionsh et Layo roblem IART ( r, The mpone	ip betwee er Protocol is – Typica 9 Commands User layer 9 ents of radi Total:4 er, 2005.
Formatting. PROI application proces (Packet Transport network layer prob Unit – IV HART: HART Intrr Foundation Field I Error detection an Unit – V Industrial Etherner Wireless commun link – radio spectrr TEXT BOOK: 1. Deon REFERENCES: 1. Forou	FIBUS PA/DP/FMS: PROFIBUS protocol stack- The PR         as and communication – Communication objects. TCP/IP –         t) – Host-to-host layer: end to end reliability. TCP/IP troub         olems – Transport layer problems.         HART and Foundation Field Bus:         oduction – HART and smart instrumentation – Physical lay         Bus: Introduction – The Physical layer and Wiring Rules, T         d diagnostics - High-speed Ethernet (HSE)         Industrial Ethernet and Wireless Communication:         t: Introduction – 10 Mbps Ethernet – 100 Mbps Ethernet – 0         ication: Satellite systems – Wireless LANs- Radio and wire         um and frequency allocation – Radio MODEMs.	COFIBUS co TCP/IP over bleshooting: yer, Data link he Data link Gigabit Ethe eless commu	mmunication view: Introduction Introduction - k and applicat layer, The Ap rnet – Industri nication : Intro munications"	model- ction – - Comr tion lay pplicatio	- Rela Interno non pr er – H n laye rnet. n – co	tionsh et Layo roblem IART ( r, The mpone	ip betwee er Protocol is – Typica 9 Commands User laye 9 ents of radi <b>Total:4</b> er, 2005.

	E OUTCOMES: pletion of the course, the students will be able to	BT Mapped (Highest Level)
CO1	Make use of the essentials of the communication system and learn the serial communication interface	Understanding(K2)
CO2	Interpret knowledge about Copper cable and fiber optic cable communication	Understanding(K2)
CO3	Examine the suitability of various communication protocols	Understanding(K2)
CO4	Identify the architecture and applications of HART and Field bus	Applying (K3)
CO5	Examine the concepts of Industrial Ethernet and wireless communications	Understanding(K2)

					Ма	pping o	f COs v	vith Po	s and F	<b>PSOs</b>				
COs/Pos	P01	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1				1							2	2
CO2	3	1				1							2	2
CO3	3	1				1							2	2
CO4	3	2	1	1	1	1							3	3
CO5	3	1				1							2	2
	-		Subat			· ·	I	1	<u> </u>					-

1 – Slight, 2 – Moderate, 3 – Substantial, B1- Bloom's Taxonomy

		ASSESSM	ENT PATTE	RN – THEORY			
Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	20	80					100
CAT2	20	80					100
CAT3	20	60	20				100
ESE	20	60	20				100
* ±3% may be varied	(CAT 1, 2 & 3 – 50	) marks & ESE – 10	00 marks)				

	22EIO10 - WIRELESS INSTRUMI (Offered by Department of Electronics and Instr	-	Engineering	)			
Programme & Branch	All BE/BTech branches except Electronics and Instrumentation Engineering	Sem.	Category	L	т	Ρ	Credit
Prerequisites	Nil	7	OE	3	0	0	3
Preamble	To impart knowledge on wireless technology for instrume To provide adequate technical information on power sou						
Unit – I	Wireless Instrumentation Technology:						9
communication p	struments and Instrumentation: Measurement systems – protocols – RF interfaces and examples – Networks of stem – Communication subsystem – Power subsystems – S	wireless ins	truments – S				
Unit – II	Powering Autonomous Sensors:						9
instruments – En	sors – Ambient energy sources and transducers – Energ nergy harvesting: Solar and wind energy harvesting, RF e narvesting – Energy management techniques – Calculation	energy harves	sting, Energy	harv	/estin	ig fror	m vibratior SSI and LC
	Wireless Systems/Standards for Automation:	0		10.4	00.4		9
Scope - Working	Wireless Systems/Standards for Automation: Protocol stack – Network components – Addressing control - g group of ISA 100 – Features – Sensor classes – Syste een ISA100.11a and WHART protocol stacks.						troduction
Wireless HART: F Scope – Working Comparison betw	Protocol stack – Network components – Addressing control - g group of ISA 100 – Features – Sensor classes – Syste						troduction
Wireless HART: F Scope – Working Comparison betw <b>Unit – IV</b> Wireless sensor a Industrial wireless	Protocol stack – Network components – Addressing control- g group of ISA 100 – Features – Sensor classes – Syste een ISA100.11a and WHART protocol stacks.	em configura	tion and arch	nitect ay se	ure o	of ISA s and	100.11a 9 networks
Wireless HART: F Scope – Working Comparison betw <b>Unit – IV</b> Wireless sensor a Industrial wireless	Protocol stack – Network components – Addressing control- g group of ISA 100 – Features – Sensor classes – Syste een ISA100.11a and WHART protocol stacks. Design of Wireless Devices and LoRa: and instrument network design – Wireless integrated networks networks and automation. mmunication Methods – Difference between LoRa and LoRa	em configura	tion and arch	nitect ay se	ure o	of ISA s and	100.11a 9 networks
Wireless HART: F Scope – Working Comparison betw Unit – IV Wireless sensor a Industrial wireless Introduction – Col Unit – V Application specif and instrument n	Protocol stack – Network components – Addressing control- g group of ISA 100 – Features – Sensor classes – Syste een ISA100.11a and WHART protocol stacks. Design of Wireless Devices and LoRa: and instrument network design – Wireless integrated network networks and automation.	em configura ork sensors - aWAN – LoRa s sensors and nental applica	tion and arch - Plug-and-pla aWAN archite instruments - ations – Radio	ay se cture – Ind	ure c ensore e – Lo lustria	of ISA s and pRaW/	troduction 100.11a 9 networks AN classes 9 less senso
Wireless HART: F Scope – Working Comparison betw Unit – IV Wireless sensor a Industrial wireless Introduction – Col Unit – V Application specif and instrument n	Protocol stack – Network components – Addressing control- g group of ISA 100 – Features – Sensor classes – Syste een ISA100.11a and WHART protocol stacks. Design of Wireless Devices and LoRa: and instrument network design – Wireless integrated networks and automation. mmunication Methods – Difference between LoRa and LoRa Wireless Sensor and Instrument Applications: fic wireless sensors and instruments – Commercial wireless etworks – Wireless human health monitoring and environm	em configura ork sensors - aWAN – LoRa s sensors and nental applica	tion and arch - Plug-and-pla aWAN archite instruments - ations – Radio	ay se cture – Ind	ure c ensore e – Lo lustria	of ISA s and pRaW/	roduction 100.11a 9 networks AN classes 9 less senso ntification
Wireless HART: F Scope – Working Comparison betw Unit – IV Wireless sensor a Industrial wireless Introduction – Col Unit – V Application specif and instrument n Consumer produc	Protocol stack – Network components – Addressing control- g group of ISA 100 – Features – Sensor classes – Syste een ISA100.11a and WHART protocol stacks. Design of Wireless Devices and LoRa: and instrument network design – Wireless integrated networks and automation. mmunication Methods – Difference between LoRa and LoRa Wireless Sensor and Instrument Applications: fic wireless sensors and instruments – Commercial wireless etworks – Wireless human health monitoring and environm	em configura ork sensors - aWAN – LoRa s sensors and nental applica	tion and arch - Plug-and-pla aWAN archite instruments - ations – Radio	ay se cture – Ind	ure c ensore e – Lo lustria	of ISA s and pRaW/	roduction 100.11a 9 networks AN classes 9 less senso ntification
Wireless HART: F Scope – Working Comparison betw Unit – IV Wireless sensor a Industrial wireless Introduction – Col Unit – V Application specif and instrument n Consumer produce TEXT BOOK:	Protocol stack – Network components – Addressing control- g group of ISA 100 – Features – Sensor classes – Syste een ISA100.11a and WHART protocol stacks. Design of Wireless Devices and LoRa: and instrument network design – Wireless integrated networks and automation. mmunication Methods – Difference between LoRa and LoRa Wireless Sensor and Instrument Applications: fic wireless sensors and instruments – Commercial wireless etworks – Wireless human health monitoring and environm	em configura ork sensors – aWAN – LoRa s sensors and nental applica nd Agriculture	tion and arch - Plug-and-pla aWAN archite instruments - ations – Radio	ay se cture - Ind o free	ure c ensors e – Lo lustria queno	of ISA s and bRaW/ al wire cy ide	roduction 100.11a 9 networks AN classes 9 less senso ntification Total:4
Wireless HART: F Scope – Working Comparison betw Unit – IV Wireless sensor a Industrial wireless Introduction – Col Unit – V Application specif and instrument n Consumer produc TEXT BOOK: 1. John G. V Francis G	Protocol stack – Network components – Addressing control- g group of ISA 100 – Features – Sensor classes – Syste ieen ISA100.11a and WHART protocol stacks.  Design of Wireless Devices and LoRa: and instrument network design – Wireless integrated networks and automation. mmunication Methods – Difference between LoRa and LoRa Wireless Sensor and Instrument Applications: fic wireless sensors and instruments – Commercial wireless etworks – Wireless human health monitoring and environmets and other applications – Applications in Transportation ar Nebster, Halit Eren, "Measurement, Instrumentation, and Second	em configura ork sensors – aWAN – LoRa s sensors and nental applica nd Agriculture	tion and arch - Plug-and-pla aWAN archite instruments - ations – Radio	ay se cture - Ind o free	ure c ensors e – Lo lustria queno	of ISA s and bRaW/ al wire cy ide	roduction 100.11a 9 networks AN classes 9 less sensc ntification Total:4
Wireless HART: F         Scope – Working         Comparison betw         Unit – IV         Wireless sensor a         Industrial wireless         Introduction – Condition         Unit – V         Application specified         and instrument m         Consumer product         TEXT BOOK:         1.       John G. V         REFERENCES:         1.       Subhas C         Business	<ul> <li>Protocol stack – Network components – Addressing control- g group of ISA 100 – Features – Sensor classes – Syste een ISA100.11a and WHART protocol stacks.</li> <li>Design of Wireless Devices and LoRa: and instrument network design – Wireless integrated networks and automation. mmunication Methods – Difference between LoRa and LoRa</li> <li>Wireless Sensor and Instrument Applications: fic wireless sensors and instruments – Commercial wireless etworks – Wireless human health monitoring and environmets and other applications – Applications in Transportation ar</li> <li>Webster, Halit Eren, "Measurement, Instrumentation, and Secoup, LLC, Boca Raton, Florida, 2017</li> <li>Chandra Mukhopadhyay, "Smart Sensors, Measurement and Media, Heidelberg, Germany, 2013</li> </ul>	em configura ork sensors – aWAN – LoRa s sensors and nental applica nd Agriculture ensors Handb d Instrumenta	tion and arch - Plug-and-pla aWAN archite instruments - ations – Radio book", 2 <sup>nd</sup> Edit	ay sectored at the sectored at	ure c ensor: → – Lc ustria quenc CRC	of ISA s and oRaW, al wire cy ide	troduction 100.11a 9 networks AN classes 9 less sensc ntification Total:4 s - Taylor a Science &
Wireless HART: F Scope – Working Comparison betw Unit – IV Wireless sensor a Industrial wireless Introduction – Col Unit – V Application specif and instrument n Consumer produce TEXT BOOK: 1. John G. V Francis G REFERENCES: 1. Subhas C Business	Protocol stack – Network components – Addressing control- g group of ISA 100 – Features – Sensor classes – Syste een ISA100.11a and WHART protocol stacks. Design of Wireless Devices and LoRa: and instrument network design – Wireless integrated networks and automation. mmunication Methods – Difference between LoRa and LoRa Wireless Sensor and Instrument Applications: fic wireless sensors and instruments – Commercial wireless etworks – Wireless human health monitoring and environmets and other applications – Applications in Transportation ar Nebster, Halit Eren, "Measurement, Instrumentation, and Secoup, LLC, Boca Raton, Florida, 2017 Chandra Mukhopadhyay, "Smart Sensors, Measurement and	em configura ork sensors – aWAN – LoRa s sensors and nental applica nd Agriculture ensors Handb d Instrumenta	tion and arch - Plug-and-pla aWAN archite instruments - ations – Radio book", 2 <sup>nd</sup> Edit	ay sectored at the sectored at	ure c ensor: → – Lc ustria quenc CRC	of ISA s and oRaW, al wire cy ide	roduction 100.11a 9 networks AN classes 9 eless senso ntification Total:4 s - Taylor Science &

cate the ognize the cover de	power s he differe sign cor	sources a ent wirele ncepts ar	and ene ess prote	rgy stora ocols ar edure for	age unit nd netwo r wireles	s used t ork stan s device	for autor dards fo es and L	nomous or wirele _oRA	s sensors s sensors ess instrur stems an		Und Und A	lerstanding lerstanding lerstanding Applying (K	g (K2) g (K2) <3)
ognize tl cover de nonstrat	he differe	ent wirele	ess prote	ocols ar edure for	nd netwo	ork stan s devic	dards fo	or wirele ₋oRA	ess instrur		Und A	lerstandin Applying (F	g (K2) <3)
cover de	sign cor	ncepts ar	nd proce	edure for	r wireles	s devic	es and l	₋oRA			A	Applying (P	<3)
nonstrat	-								stems an	d			
	e the va	rious app	olication	s of wire	eless sei	nsor an	d instrur	ment sy	stems an	d			
											F	Applying (ł	<3)
				Марр	ing of C	COs wit	h POs a	and PS	Os				
PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
3	1											2	2
3	1											2	2
3	1											2	2
3	2	1	1	1								3	3
3	2	1	1	1		2						3	3
– Mode	erate, 3 -	- Substai	ntial, BT	- Bloom	ı's Taxoı	nomy	1	1	1		1	1	·
	3 3 3 3 3 3	3     1       3     1       3     1       3     2       3     2       3     2	3     1       3     1       3     1       3     1       3     2       3     2       3     2	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	3     1       3     1       3     1       3     1       3     2       1     1       3     2       1     1       3     2       1     1       3     2       1     1	3     1     1       3     1       3     1       3     1       3     2       1     1       3     2       1     1       3     2       1     1       3     2       1     1       3     2       1     1       - Moderate, 3 – Substantial, BT- Bloom's Taxon	3     1     1     1       3     1     -     -       3     1     -     -       3     2     1     1       3     2     1     1       3     2     1     1       - Moderate, 3 – Substantial, BT- Bloom's Taxonomy	3     1     1     1       3     1     1     1       3     1     1     1       3     2     1     1     1       3     2     1     1     1       3     2     1     1     2   – Moderate, 3 – Substantial, BT- Bloom's Taxonomy	3     1     1     1       3     1     1     1       3     1     1     1       3     2     1     1     1       3     2     1     1     1       3     2     1     1     2   – Moderate, 3 – Substantial, BT- Bloom's Taxonomy	3     1     1     1       3     1     1     1       3     1     1     1       3     2     1     1     1       3     2     1     1     1       3     2     1     1     1       - Moderate, 3 – Substantial, BT- Bloom's Taxonomy	3     1     3     1       3     1     1       3     1       3     1       3     2       1     1       3     2       1     1       2     1       1     1       2     1       3     2       - Moderate, 3 – Substantial, BT- Bloom's Taxonomy	3     1	3       1       2         3       1       2         3       1       2         3       1       2         3       1       2         3       2       1       1       2         3       2       1       1       2       3         - Moderate, 3 – Substantial, BT- Bloom's Taxonomy       3       3       3

		ASSESSMEN	IT PATTERN	I - THEORY			
Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	15	85					100
CAT2	15	85					100
CAT3	15	50	35				100
ESE	10	70	20				100
* ±3% may be varied	(CAT 1, 2 & 3 – 50	marks & ESE – 100	) marks)		L		I.

		22EIO11 - INSTRUMENTATION TECHNIQUES II (Offered by Department of Electronics and Instrum						
Programme Branch	e &	All BE/BTech branches except Electronics and Instrumentation Engineering	Sem.	Category	L	т	Р	Credit
Prerequisit	es	Nil	7	OE	3	0	0	3
Preamble Unit – I		To discuss the sensing and automation technology associate <b>Necessity of Instrumentation:</b>	d with ag	riculture.	L	L		9
Agriculture	sector	<ul> <li>imentation &amp; control for agriculture and food processing i</li> <li>A synoptic Review- Areas of Concern. Information, roduction to Transducers – Characteristics.</li> </ul>						
Unit – II		Agri Transducers:						9
Temperatur pH transduc	e transc	<ul> <li>Conventional and Silicon transducers, Capacitive gas lucer, Silicon Pressure Transducer. Grain Moisture transducers s transducers, Intelligent Sensors.</li> </ul>						ansducers,
Unit – III		Automation in Agriculture: sed Grain moisture measurement- Introduction, Sensing Mech						9
mechanism Agriculture	. Prepa process	t Estimation Systems- Soil nutrients and their role, collecti ration of soil extract for estimation of N,P,K and S, I/O ro monitoring. acing of agri sensors with Microcontroller. Drip Irrigation and Precision Agriculture:						
	Sanca	s, Hardware block Schematic, system operation, I/O Requirem	ont Analy		- Sve	tome		9
Precision: I	ntroduc	tion, need for precision agriculture. Subsystem and compor agriculture status – Working Philosophy.						munication
Unit – V		Green House Cultivation:						9
structures/c	ontaine	fication of greenhouse- Orientation of Greenhouse / Poly ho is in green house production- Environmental factors influencing gation and fertigation systems greenhouse cultivation- Problem	ng greenł	nouse cultivat	ion- N	Nedia	prep	aration and
								Total:45
TEXT BOO	K:							
1. Kri	ishna Ka	ant , "Microprocessor Based Agri Instrumentation", 1 <sup>st</sup> Edition,	PHI Priva	ate Limited, No	ew De	elhi, 2	2010.	
REFERENC	CES:							
-		se Cultivation, Tamilnadu Agritech Portal. ech.tnau.ac.in/horticulture/horti_Greenhouse%20cultivation.htr	nl					
		Iter Reginald Cox, Filby D E , "Instrumentation in Agriculture",		d Publishers.	UK. 2	2011.		
	, -	<u> </u>		,	,			

		UTCOI tion of		rse, the	student	ts will be	e able to	D					(	BT Map Highest	
CO1	ex	plain th	e neces	sity of ins	strument	ation for	agricult	ure					Ui	nderstand	ling (K2)
CO2	far	miliarize	with the	e Soil par	ameters	s and tra	nducers	in agric	cultural	instrume	entation		U	nderstand	ling (K2)
CO3	illu	illustrate the techniques of agriculture using Microprocessor and SCADA													
CO4	ou	outline the fundamentals of Drip Irrigation and Precision Agriculture Unders													
CO5	uti	utilize the concepts of instruments in Green house cultivation Understandin													
						Марр	oing of (	COs wit	h Pos	and PS	Os				
COs/P	os	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	P011	PO12	PSO1	PSO2
CO1		3	1											2	2
CO2		3	1											2	2
CO3		3	2	1	1	1								3	3
CO4		3	1											2	2
CO5		3	1											2	2
1 – Slig	jht, 2	2 – Mod	erate, 3	– Substa	intial, B1	Γ- Bloom	's Taxoi	nomy							
						ASSE	ESSMEN		TERN -	- THEO	RY				
		oom's ory*	Rei	memberi (K1) %	ing U	Indersta (K2)		Apply (K3)		Analyz (K4) <sup>c</sup>	•	Evaluating (K5) %		eating (6) %	Total %
	САТ	1		30		70									100
	САТ	2	20			60		20	)						100
	САТ	3		40		60									100
	ESE	=		20		60		20	)						100

	(Offered by Department of Electronics and Instru	mentation	Engineering	)			
Programme & Branch	All BE/BTech branches except Electronics and Instrumentation Engineering	Sem.	Category	L	т	Ρ	Credit
Prerequisites	Nil	8	OE	3	0	0	3
Preamble	This course is a fundamental course on sensors, environmental systems.	instruments	and real-	time	sys	tems	to monito
Unit – I	Fibre Optic Sensors:						9
Raman sensors-E	ronmental monitoring and new technology-principles of fibre of vanescent field sensors - fibre optic sensors for environmentang water contamination and Soil contamination.						monitoring,
Unit – II	Integrated Optic Sensors:						9
waves, Spectrosc environmental ser	tegrated optics- Fabrication of integrated optic devices- So opy, Ellipsometry, Surface plasmon resonance, Light scatte using: An integrated optic biosensor- An integrated optic gas s	ering - App					devices for
Unit – III	Piezoelectric Sensors and Gas Analysers: tal theory, Instrumentation, Gas analysis, Piezoelectric aeros						9
	perating in liquids. Gas analysers: Principles of operation, I troscopy, Differential absorption LIDAR, Laser-induced fluore						opy, i oune
Unit – IV Common contami Factors affecting o subsurface condit	Monitoring of Land Pollution: nant types and environmental behavior: Contaminants and contaminant behavior - Monitoring equipment and instrumen tions, Discrete monitoring: direct determination of subsurfa	site use, C tation: Discr	commonly oc ete monitorin	currir ig: ini	ng co direc	ontam t dete	rmination
Unit – IV Common contami Factors affecting o subsurface condit automatic monitor	Monitoring of Land Pollution: nant types and environmental behavior: Contaminants and contaminant behavior - Monitoring equipment and instrumen tions, Discrete monitoring: direct determination of subsurfa ing.	site use, C tation: Discr	commonly oc ete monitorin	currir ig: ini	ng co direc	ontam t dete	inant types rmination ( tinuous an
Unit – IV Common contami Factors affecting o subsurface condit automatic monitor Unit – V	Monitoring of Land Pollution: nant types and environmental behavior: Contaminants and contaminant behavior - Monitoring equipment and instrumen tions, Discrete monitoring: direct determination of subsurfa ing. Monitoring of Water Pollution and Air Pollution:	site use, C tation: Discr ace conditio	commonly oc ete monitorin ns, Field tes	currir Ig: ind sting	ng co direc kits,	ontam t dete Cont	inant types rmination o tinuous an <b>9</b>
Unit – IV Common contami Factors affecting of subsurface condit automatic monitor Unit – V Water Pollution: C and suspended s variables: Biocher	Monitoring of Land Pollution: nant types and environmental behavior: Contaminants and contaminant behavior - Monitoring equipment and instrumen tions, Discrete monitoring: direct determination of subsurfa ing.	site use, C tation: Discr ace conditio ductivity, sa dity, alkalinit gen deman	commonly oc ete monitorin ns, Field tes linity and tota y and pH, A	currir g: ing sting al diss	ng co direc kits, solve s, C	ontam t dete Cont d solid ations	inant type: rmination tinuous ar <b>9</b> ds, Turbidi 5. Biologic
Unit – IV Common contami Factors affecting of subsurface condit automatic monitor Unit – V Water Pollution: C and suspended s variables: Biocher	Monitoring of Land Pollution:           nant types and environmental behavior: Contaminants and contaminant behavior - Monitoring equipment and instrumentions, Discrete monitoring: direct determination of subsurfaing.           Monitoring of Water Pollution and Air Pollution:           continuous monitoring - Physical variables: Temperature, Contactions, Colour. Chemical variables: Dissolved oxygen, Acide mical oxygen demand- Total organic carbon, Chemical oxygen	site use, C tation: Discr ace conditio ductivity, sa dity, alkalinit gen deman	commonly oc ete monitorin ns, Field tes linity and tota y and pH, A	currir g: ing sting al diss	ng co direc kits, solve s, C	ontam t dete Cont d solid ations	inant type: rmination tinuous ar <b>9</b> ds, Turbidi s. Biologic standards
Unit – IV Common contami Factors affecting of subsurface condit automatic monitor Unit – V Water Pollution: C and suspended s variables: Biocher	Monitoring of Land Pollution:           nant types and environmental behavior: Contaminants and contaminant behavior - Monitoring equipment and instrumentions, Discrete monitoring: direct determination of subsurfaing.           Monitoring of Water Pollution and Air Pollution:           continuous monitoring - Physical variables: Temperature, Contactions, Colour. Chemical variables: Dissolved oxygen, Acide mical oxygen demand- Total organic carbon, Chemical oxygen	site use, C tation: Discr ace conditio ductivity, sa dity, alkalinit gen deman	commonly oc ete monitorin ns, Field tes linity and tota y and pH, A	currir g: ing sting al diss	ng co direc kits, solve s, C	ontam t dete Cont d solid ations	inant type: rmination tinuous an <b>9</b> ds, Turbidi 5. Biologica
Unit – IV Common contami Factors affecting of subsurface condit automatic monitor Unit – V Water Pollution: C and suspended s variables: Biocher Characterisation of	Monitoring of Land Pollution:           nant types and environmental behavior: Contaminants and contaminant behavior - Monitoring equipment and instrumentions, Discrete monitoring: direct determination of subsurfaing.           Monitoring of Water Pollution and Air Pollution:           continuous monitoring - Physical variables: Temperature, Contactions, Colour. Chemical variables: Dissolved oxygen, Acide mical oxygen demand- Total organic carbon, Chemical oxygen	site use, C tation: Discr ace conditio ductivity, sa dity, alkalinit /gen deman modes.	commonly oc ete monitorin ns, Field tes linity and tota y and pH, <i>I</i> d. Air Polluti	currin g: ing sting al diss Anion on: A	ng co direc kits, solve s, C Air qu	ontam t dete Cont d solid ations Jality	inant type rmination tinuous ar 9 ds, Turbidi s. Biologic standards Total:4
Unit – IV         Common contami         Factors affecting of         subsurface condita         automatic monitor         Unit – V         Water Pollution: C         and suspended s         variables: Biocher         Characterisation c         TEXT BOOK:         1	Monitoring of Land Pollution:         nant types and environmental behavior: Contaminants and contaminant behavior - Monitoring equipment and instrumentions, Discrete monitoring: direct determination of subsurfaing.         Monitoring of Water Pollution and Air Pollution:         continuous monitoring - Physical variables: Temperature, Contaminal oxygen demand- Total organic carbon, Chemical oxygen fatmospheric pollutants – Air pollution sampling - Monitoring	site use, C tation: Discr ace conditio ductivity, sa dity, alkalinit /gen deman modes.	commonly oc ete monitorin ns, Field tes linity and tota y and pH, <i>I</i> d. Air Polluti	currin g: ing sting al diss Anion on: A	ng co direc kits, solve s, C Air qu	ontam t dete Cont d solid ations Jality	inant type: rmination tinuous ar 9 ds, Turbidi s. Biologic standards Total:4
Unit – IV         Common contami         Factors affecting of         subsurface condit         automatic monitor         Unit – V         Water Pollution: C         and suspended s         variables: Biocher         Characterisation c         TEXT BOOK:         1.         Miguel F.         2015.         REFERENCES:         1.         Janick Art         2004	Monitoring of Land Pollution:         nant types and environmental behavior: Contaminants and contaminant behavior - Monitoring equipment and instrumentions, Discrete monitoring: direct determination of subsurfaing.         Monitoring of Water Pollution and Air Pollution:         continuous monitoring - Physical variables: Temperature, Contaminal oxygen demand- Total organic carbon, Chemical oxygen fatmospheric pollutants – Air pollution sampling - Monitoring	site use, C tation: Discr ace conditio ductivity, sa dity, alkalinit 'gen deman modes. d Systems'', itoring and (	iommonly oc ete monitorin ns, Field tes linity and tota y and pH, <i>A</i> d. Air Polluti 1 <sup>st</sup> Edition, Characterizat	currir g: ing sting al diss Anion on: /	ng cc direc kits, solve s, C Air qu	ontam t dete Cont d solid ations Jality ss, Ur	inant type rmination tinuous ar 9 ds, Turbidi s. Biologic standards Total:4 nited State

	SE OUTCOMES: mpletion of the course, the students will be able to	BT Mapped (Highest Level)
CO1	identify the role of fibre optic sensors for environmental monitoring	Understanding (K2)
CO2	apply the integrated optic sensors for environmental sensing	Applying (K3)
CO3	apply the piezoelectric sensors and gas analyzers for Environmental Monitoring	Applying (K3)
CO4	identify the cases and concept of land pollution	Understanding (K2)
CO5	explain the concept of Water pollution and Air pollution	Understanding (K2)
	Mapping of COs with POs and PSOs	

						5 .	·							
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1					3						2	2
CO2	3	2	1	1	1		3						3	3
CO3	3	2	1	1	1		3						3	3
CO4	3	1					3						2	2
CO5	3	1					3						2	2
			<u> </u>			. <u>-</u>					•	÷		

		ASSESSMEN	T PATTERN	- THEORY			
Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	30	50	20				100
CAT2	30	50	20				100
CAT3	40	60					100
ESE	30	50	20				100
* ±3% may be varied	(CAT 1, 2 & 3 – 50 r	narks & ESE – 100	marks)				·

		(Offered by Department of Electronics and Ins	trumentation	Engineering	)			
Progra Branc	amme & h	All BE/BTech branches except Electronics and Instrumentation Engineering	Sem.	Category	L	т	Р	Credit
Preree	quisites	Nil	8	OE	3	0	0	3
Pream	ble	The course will cover various aspects of pollution c regulatory frameworks, and management strategies. So of pollutants, their sources, and the impact they have o	tudents will ga	in an underst	andir	ng of	the v	
Unit –	1	Introduction to Pollution Control Management:						9
		lution Control Management - Professional Codes of Ethesource Management System - Wastewater Disposal Sub						
Unit -		Water Pollution:					- )	9
Water	Pollutants A	And Their Sources - Water Pollution In Rivers - Water tion – Applications.	r Pollution In	Lakes - Wat	er P	olluti	on In	Estuaries
Unit -		Wastewater Treatment:						9
		Nastewater - Wastewater Treatment Standards - Munici Sludge Treatment - Alternative Sludge Disposal Technique		er Treatment	Syst	ems	- Lan	d Treatmer
Unit –	IV	Air Pollution:						9
		ective - Effects of Air Pollutants - Origin and Fate of Air P Pollution Control of Stationary Sources - Air Pollution Cont			Air	Pollu	tion -	Air Pollutio
Unit –	V	Solid Waste Management:						9
		Solid Waste - Solid waste management decision alternati I by Municipal Solid Waste Landfill - Waste to Energy – Ca		d Solid Wast	e Ma	nage	ement	- Collectio
								Total:4
техт	BOOK:							
1.	Mackenzie Series, 202	L. Davis & David A. Cornwell, "Introduction To Enviro	onmental Engi	neering", 5 <sup>th</sup>	Editi	on, 1	The N	1cGraw -Hi
DEEE	RENCES:							
KEFE		Masters Wendell P. Ela , "Introduction to Environment	ntal Engineerir	ng and Scier	nce"	3 <sup>rd</sup>	Editio	on, Pearso
<b>REFE</b>		Limited, 2014. eirce, P.Aarne Vesilind, Ruth F.Weiner, "Environmental I						

	SE OUTCOMES: mpletion of the course, the students will be able to	BT Mapped (Highest Level)
CO1	outline the fundamentals of pollution control and management	Understanding (K2)
CO2	interpret the concepts of water pollution and control methods	Understanding (K2)
CO3	summarize the methods of wastewater treatment and waste disposal	Understanding (K2)
CO4	apply suitable method for air pollution management techniques	Applying (K3)
CO5	identify various method for solid waste management techniques	Applying (K3)

					Маррі	ng of C	Os with	n POs a	nd PSC	Ds				
COs/POs	P01	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1				2		1					2	2
CO2	3	1				2		1					2	2
CO3	3	1				2		1					2	2
CO4	3	2	1	1	1	2		1					3	3
CO5	3	2	1	1	1	2		1					3	3
1 Slight 2	Mod	arota 2	Substar		Ploom'	o Tovon	omu							

•	-	Applying	Analyzing	Evaluating	Creating	1
	(2) %	(K3) %	(K4) %	(K5) %	Creating (K6) %	Total %
0	80					100
0	80					100
0	40	40				100
0	40	40				100
	0 0 0	0 80 0 40	0         80           0         40         40           0         40         40	0         80           0         40	0         80           0         40	0         80

	22GE001 - GERMAN LANGUAGE LE		• •				
	(Offered by Department of Electronics and Commun	ication Engi	neering)	1			1
Programme& Branch	All BE/BTech Engineering and Technology Branches	Sem.	Category	L	Т	Р	Credit
Prerequisites	Nil	All	OE	4	0	0	4
Preamble	This course serves as an introduction to the German language cultural aspects of Germany and German speaking countries. the basic day to day vocabulary. On keen learning one would be able to reciprocate to basic questions	One can lea	arn to introduc	e one	self a	ind ab	ole to gai
Unit – I	Good Day (Guten Tag)						12
	troduction and introducing others, Numbers, Alphabets, Countries, Verb conjugation and personal pronoun.	s and langu	ages spoken.	Gram	nmar	– W (	questions
Unit – II	Friends & Colleague (Freund und Kollegen):						12
Hobbies, Profess questions.	ion, Week, Months, Season and Generate Profile. Grammar -	Articles, Pl	ural, Verbs –	have	and	to be	e, Yes/N
Unit – III	n the City (In der Stadt):						12
Name of places/b Negation articles	uildings in the city, asking for directions, Understanding means of t and Imperative	transport. G	rammar – defi	nite a	nd in	definit	te articles
Unit – IV	Food and Appointment (Essen und Termin):						12
Understanding tir	initiate conversations to understand and do shopping. Gram ne and reciprocating, Appointments, Asking excuse, Family. Gram in Modal verbs- müssen, können, wollen						
Unit – V	Socializing ( Zeit mit Freunden):						12
	r, Birthday, Invitation, Restaurant, looking for specific information i ase, Past tense of have and to be, Personal pronoun with Accusation		ammar – Sepa	arable	e verb	os, Pro	eposition
with Accusative c							Total:6
with Accusative c							
TEXT BOOK:							
TEXT BOOK:	Dengler, Paul Rusch, Helen Schmitz, Tanja Sieber, "Netzwerk De sar with 2 CDs", Goyal Publishers, Delhi, 2015.	eutsch als F	remdsprache	Α1–ι	ırsbu	ch, Ai	rbeitsbuc
TEXT BOOK:       1.     Stefanie und Glos		eutsch als F	remdsprache	A1–ι	irsbu	ch, Aı	rbeitsbuc
TEXT BOOK: 1. Stefanie und Glos REFERENCES:			remdsprache	A1–u	irsbu	ch, Ai	rbeitsbuc

	COURSE OUTCOMES: On completion of the course, the students will be able to												(	BT Mapp Highest L				
CO1	unde	erstand	structure	of langu	age and	l introduci	ng each	other					Remembering (K1)					
CO2	unde	erstand	vocabula	ary on sea	asons a	nd basic v	verbs						Und	erstanding	ı (K2)			
CO3	CO3 ask for directions in a new place and avail transport as required												Und	Understanding (K2)				
CO4	O4 understand food habits of German and ask for appointments.												Und	Understanding (K2)				
CO5	5 learn to socialize in a German speaking country Understandin											g (K2)						
						Маррі	ng of C(	Os with	POs ar	nd PSOs	;							
COs/F	POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P010	) PO11	PO12	PO12 PSO1				
СО	1								1	2	3		3					
CO	2								1	2	3		3					
CO	3								1	2	3		3					
CO	4								1	2	3		3					
CO	5								1	2	3		3					
1 – Slię	ght, 2 -	- Mode	rate, 3 –	Substant	ial, BT-	Bloom's T	Faxonom	У										
						ASSE	SSMEN		ERN - 1	HEORY								
Test / Bloom's Category*		Re	Remembering (K1) %		Understanding (K2) %		Apply (K3)		Analyzing (K4) %		Evaluating (K5) %		reating K6) %	Total %				
	CAT1	1		75		25									100			
	CAT2	2		25		75									100			
	CAT	3		25		75									100			
	ESE			25		75									100			

	(Offered by Department of Electronics and Commun	ication Eng	ineering)				
Programme& Branch	All BE/BTech Engineering and Technology Branches	Sem.	Category	L	т	Р	Credit
Prerequisites	Nil	All	OE	4	0	0	4
Preamble	The basic level of Japanese which provides understanding one to greet, introduce oneself and other person and also proversations						
Unit – I	Introduction to Hiragana and Katakana:						12
Chart 1, Chart 2,	Chart 3, Annexures 1 and 2 and basic Japanese rules along with	similar sou	inded vocabul	aries	for ea	ach ch	nart.
Unit – II	Introduction to Nouns, various particles and usages:						12
Forming simple s	entences, asking questions, positioning differentiation and owning	g fundamer	itals – new pa	rticles	s and	usage	es
Unit – III	Introduction of Verbs, time and place markers:						12
Unit – III Usage of action particles in a ser	words in sentences and framing them - place and time markers u	ısages – gi	ving and recei	ving -	– omi	ssion	
Usage of action	words in sentences and framing them - place and time markers u	isages – gi	ving and recei	ving -	– omi	ssion	
Usage of action particles in a ser <b>Unit – IV</b> Describing noun	words in sentences and framing them – place and time markers u tence.						of certai
Usage of action particles in a ser <b>Unit – IV</b> Describing noun	words in sentences and framing them – place and time markers u tence. Introduction of Adjectives, Adverbs and usages: s and verbs and framing them to relate day to day conversation						of certai
Usage of action particles in a ser Unit – IV Describing noun introduction of th Unit – V How to use num	words in sentences and framing them – place and time markers u tence. Introduction of Adjectives, Adverbs and usages: s and verbs and framing them to relate day to day conversation e likes and dislikes expressions	ons- positiv	e and negativ	/e en	ding	of the	of certai
Usage of action particles in a ser <b>Unit – IV</b> Describing noun introduction of th <b>Unit – V</b> How to use num	words in sentences and framing them – place and time markers u tence. Introduction of Adjectives, Adverbs and usages: s and verbs and framing them to relate day to day conversation e likes and dislikes expressions Introduction to Counters and Kanji: bers-How to use quantifiers-Present form of adjectives and Nour	ons- positiv	e and negativ	/e en	ding	of the	of certai
Usage of action particles in a ser <b>Unit – IV</b> Describing noun introduction of th <b>Unit – V</b> How to use num	words in sentences and framing them – place and time markers u tence. Introduction of Adjectives, Adverbs and usages: s and verbs and framing them to relate day to day conversation e likes and dislikes expressions Introduction to Counters and Kanji: bers-How to use quantifiers-Present form of adjectives and Nour	ons- positiv	e and negativ	/e en	ding	of the	of certai
Usage of action particles in a ser Unit – IV Describing noun introduction of th Unit – V How to use num and quantifiers –	words in sentences and framing them – place and time markers u tence. Introduction of Adjectives, Adverbs and usages: s and verbs and framing them to relate day to day conversation e likes and dislikes expressions Introduction to Counters and Kanji: bers-How to use quantifiers-Present form of adjectives and Nour	ons- positiv	ecessary partic	ve en	lding How t	of the	of certai
Usage of action particles in a ser Unit – IV Describing noun introduction of th Unit – V How to use num and quantifiers – TEXT BOOK: 1. "MINNA	words in sentences and framing them – place and time markers u tence. Introduction of Adjectives, Adverbs and usages: s and verbs and framing them to relate day to day conversation e likes and dislikes expressions Introduction to Counters and Kanji: bers-How to use quantifiers-Present form of adjectives and Nour 55 kanji characters	ons- positiv	ecessary partic	ve en	lding How t	of the	of certai
Usage of action particles in a ser Unit – IV Describing noun introduction of th Unit – V How to use num and quantifiers – TEXT BOOK: 1. "MINNA REFERENCES:	words in sentences and framing them – place and time markers u tence. Introduction of Adjectives, Adverbs and usages: s and verbs and framing them to relate day to day conversation e likes and dislikes expressions Introduction to Counters and Kanji: bers-How to use quantifiers-Present form of adjectives and Nour 55 kanji characters	ons- positiv	ecessary partic	ve en	lding How t	of the	of certai

	DURSE OUTCOMES:         completion of the course, the students will be able to         D1       read and understand typical expression in Hiragana and Katakana												BT Mapped (Highest Level						
CO1	read	d and ur	nderstan	d typical	express	ion in Hir	agana a	nd Katal	kana				Ren	nembering	g (K1)				
CO2	gree	et and ir	troduce	oneself a	and othe	er							Und	erstandin	ng (K2)				
CO3	3 communicate day to day conversations – basic level Understan													erstandin	anding (K2)				
CO4	4 understand the Kanjis in Japanese Script												Und	erstandin	g (K2)				
CO5	com	prehen	d conce	ot of num	bers, da	ays, mont	hs, time	and cou	inters				Und	g (K2)					
						Маррі	ng of CC	Os with	POs ar	nd PSOs	;								
COs/F	POs	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2				
СО	1								1	2	3		3						
CO	2								1	2	3		3						
CO	3								1	2	3		3						
CO	4								1	2	3		3						
CO	5								1	2	3		3						
1 – Slig	ght, 2	– Mode	erate, 3 -	Substar	itial, BT·	- Bloom's	Taxono	my							L				
						ASSE	SSMEN		ERN - 1	HEORY									
Test / Bloon Category*			Re	Remembering (K1) %		Understa (K2)		Applying (K3) %		Analyzing (K4) %		Evaluating (K5) %		Creating (K6) %					
	CAT	1		75		25									100				
	CAT	2		25		75									100				
	CAT	3		25		75									100				
	ESE	Ξ		25		75									100				

	22GE003 - DESIGN THINKING FOR EN	GINEERS					
	(Offered by Department of Computer Science ar	nd Engineeri	ng)				
Programme & Branch	All BE/BTech Engineering and Technology Branches	Sem.	Category	L	Т	Ρ	Credit
Prerequisites	Nil	5	OE	3	1	0	4
Preamble	Design Thinking is human-centered problem solving tool of creation and stakeholder feedback to unlock creativity a idea/solutions.			-			
Unit – I	Design Thinking and Explore:						9+3
Building for Design Mapping – Opportur <b>Unit – II</b> <b>Empathize</b> : Method	Empathize Is & Tools – Field Observation – Deep User Interview – Emp	Strategic Prio	orities – Activity	/ Sys	stem	– Sta	akeholder 9+3
User Insights - User	Persona Development. Experiment						9+3
-	ds & Tools – Ideation – SCAMPER – Analogous Inspiration ng– Idea Refinement.	<ul> <li>Deconstruct</li> </ul>	uct & Reconst	ruct	– Us	er E	xperience
Unit – IV	Engage						9+3
Engage: Methods 8 Users.	Tools – Story Telling – Art of Story Telling – Storyboarding –	- Co-Creatio	n with Users -	- Col	lect F	eedt	back from
Unit – V	Evolve						9+3
	Tools – Concept Synthesis – Strategic Requirements –Evolve nnovation Tools using User Needs, CAP, 4S – Change Manag						
TEXT BOOK:				•, ••			
	Hwa, "Design Thinking The Guidebook", Design Thinking Mast	er Trainers o	of Bhutan, 201	7. (E	-Boo	k)	
REFERENCES:							
Jeanne Lied1.Press, 2011	dtka and Tim Ogilvie, "Designing for Growth: A Design Thinl	king Tool Ki	t for Manager	s", C	olum	ibia l	Jniversity
2. Jeanne Liec Columbia U	tka, Tim Ogilvie, and Rachel Brozenske, "The Designing for (	Growth Field	Book: A Step-	by-S	tep F	Projec	ct Guide",
	niversity Press, 2014.						

COUR On co			MES: the cou	rse, the	studen	ts will	be ab	le to						BT Ma (Highest	
CO1	Con	struct	design cl	nallenge	and ref	rame th	ne des	ign chall	enge in	to design op	portunity.			Applyin	g (K3)
CO2			he user, ne deep u					s to fost	er deep	user unders	standing and	be able to	)	Applyin	g (K3)
CO3	Dev	elop io	leas and	prototyp	es by b	rain sto	orming	using th	e ideati	on tools.				Applyin	g (K3)
CO4	Orga	anize t	the user v	walkthro	ugh exp	erience	e using	ideal us	er expe	rience journ	ey.			Applyin	g (K3)
CO5		elop s ier pha		tegies &	implem	entatio	n plan	that will	deliver/	achieve the	idea/solution	deduced	from	Applyin	g (K3)
						Ма	pping	of COs	with P	Os and PSO	s				
COs/P	POs	РО 1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	PSO1	PSO
CO	1	3	3	3	1					3	2	1		3	1
CO	2	3	3	3	1					3	2	1		3	1
CO	3	3	3	3	1					3	2	1		3	1
CO	4	3	3	3	1					3	2	1		3	1
CO	5	3	3	3	1					3	2	1		3	1
1 – Sli	ght, 2	– Moc	derate, 3	– Substa	antial, B	T- Bloo	m's Ta	axonomy	/						
						AS	SESS	MENT P	ATTER	N – THEOR	Y				
Te	ests		Rememi (K1)			erstanc (K2) %	ding	Apply (K3)		Analyzin g (K4) %	Evaluati ng (K5) %	Creat (K6) 9		Tota	۱%
CA	AT 1		10	)		20		70	)					10	0
CA	AT 2		10	)		15		75	5					10	0
CA	AT 3		10	)		15		75	5					10	0
	SE		10	)		15		75	5					10	0

	(Offered by Department of Mechatronics Er	naineerina)					
Programme & Branch	All BE/BTech Engineering and Technology Branches	Sem.	Category	L	т	Р	Credit
Prerequisites	Nil	6	OE	3	1	0	4
Preamble	This course will inspire the students to think innovation conce	epts and id	eas for busine	ess n	nodel	deve	lopments
Unit - I	Innovation and Design Thinking:						9+
Design Thinking a	reativity– Types of innovation – challenges in innovation- steps i and Entrepreneurship – Design Thinking Stages: Empathize – De Brainstorming – Mind mapping						
Unit - II	User Study and Contextual Enquiry:						9+
research – focus	arch – primary and secondary data – classification of secondar groups – depth interviews – analysis of qualitative data – surve organize needs into a hierarchy –establish relative importance c	y methods	- observatio	ns- F	roce	ss of	identifying
Unit - III	Product Design:						9+
prototyping - too interaction	ools for concept generation, concept evaluation – Product archit ls and techniques– overview of processes and materials – e						
Unit - IV	Business Model Canvas (BMC):						9+
Lean Canvas and Reasons and rem	BMC - difference and building blocks- BMC: Patterns – Desig edies	ın – Strateç	gy – Process-	-Busi	ness	mode	el failures
Unit - V	IPR and Commercialization:						9+
	tual Property- Basic concepts - Different Types of IPs: Co Secrets and Industrial Design– Patent Licensing - Technology (						
			Lecture:	45, 1	utor	ial:15	, Total:6
TEXT BOOK:	na T.Krishnan, "8 Steps To Innovation: Going From Jugaad To E	xcellence",	Collins India,	201	3.		
O O O O							
1.RishikeshREFERENCES:	icker, "Innovation and Entrepreneurship", Routledge CRC Press,	, London, 2	014.				
1.     Rishikesh       REFERENCES:     1.				er Eo	ducat	ion, 2	020.
1.     Rishikest       REFERENCES:     1.       1.     Peter Dru       2.     Eppinge       3.     Alexand	icker, "Innovation and Entrepreneurship", Routledge CRC Press, er, S.D. and Ulrich, K.T. "Product design and development", 7 <sup>th</sup> e ler Osterwalder, "Business model generation: A handbook for v	dition, McC	Graw-Hill High				
1.     Rishikest       REFERENCES:     1.       1.     Peter Dru       2.     Eppinge       3.     Alexand edition,	icker, "Innovation and Entrepreneurship", Routledge CRC Press, er, S.D. and Ulrich, K.T. "Product design and development", 7 <sup>th</sup> e	dition, McC visionaries,	Graw-Hill High game chang	ers, a	and o	halle	

	SE OUTCOMES: mpletion of the course, the students will be able to	BT Mapped (Highest Level)
CO1	understand innovation need and design thinking phases	Understanding (K2)
CO2	identify, screen and analyse ideas for new products based on customer needs	Analysing (K4)
CO3	develop and analyse the product concepts based on the customer needs and presents the overall architecture of the product.	Analysing (K4)
CO4	predict a structured business model for MVP	Applying (K3)
CO5	practice the procedures for protection of their ideas' IPR	Applying (K3)

				mappin		5 WILLI	PUSar	d PSO	S				
PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
		2			2						3		
3	3	3	3	2	2	2	2	3	3	3	3		
2	2	3	3	3	3	3	3	3	3	3	3		
			3	2	2	2	3	3	3	3	3		
			3	2	2		3	2	3	3	3		
	3	3 3	2 3 3 3 3	2           3         3         3           2         2         3           3         3         3           2         2         3           3         3         3           2         2         3           3         3         3	2     2       3     3     3     3       2     2     3     3       2     2     3     3       3     3     3     3	2     2       3     3       2     3       3     3       2     2       3     3       3     3       2     3       3     3       3     3       3     3       3     2       2     3       3     3       3     2	2     2     2       3     3     3     2     2       2     2     3     3     3     3       2     2     3     3     3     3       3     3     3     3     3     3       2     2     3     3     3     3       3     3     2     2     2	2     2     2       3     3     3     2     2     2       2     2     3     3     3     3     3       1     1     1     1     1     1       1     1     1     1     1     1	2       2       2       2       3         3       3       3       2       2       2       2       3         2       2       3       3       3       2       2       2       3         2       2       3       3       3       3       3       3       3         2       2       3       3       3       3       3       3       3         4       4       4       4       4       4       4       4	2       2       2       1       1       1       1         3       3       3       2       2       2       2       3       3         2       2       3       3       3       3       3       3       3       3         2       2       3       3       3       3       3       3       3       3         2       2       3       3       3       3       3       3       3       3         4	2       2       2       1       1       1         3       3       3       2       2       2       3       3       3         2       2       3       3       3       2       2       2       3       3       3         2       2       3       3       3       3       3       3       3       3         2       2       3       3       3       3       3       3       3       3         4       4       4       4       4       4       4       4       4	2       2       2       2       3       3       3       3       2       2       2       2       3	2       2       2       2       2       3       3       3       3       3       2       2       2       2       3       3       3       3         2       2       3       3       3       2       2       2       2       3       3       3       3         2       2       3

1 - Slight, 2 - Moderate, 3 - Substantial, BT- Bloom's Taxonomy

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Tota %
CAT1	20	30	40	10			100
CAT2	20	30	40	10			100
CAT3	30	30	40				100
ESE	20	30	30	20			100

	22GEO05 - GERMAN LANGUAGE L	EVEL 2					
	(Offered by Department of Electronics and Commu	nication Eng	ineering)				
Programme& Branch	All BE/BTech Engineering and Technology Branches	Sem.	Category	L	т	Ρ	Credit
Prerequisites	German Language Level 1	All	OE	4	0	0	4
Preamble	This course aims to help the learner to acquire the vocabular German language A1 level competence. This course will help vocabulary to understand and reciprocate in daily life situatio able to gain a comprehensive understanding of the German g situations	o to assimila ns on a broa	te the basic g ader sense. A	ramm thoro	ar str ugh le	ucture earner	es and gain will be
Unit – I	Contacts(Kontakte):						12
	etters, simple instructions, speaking about language learning, fir rstanding conversations, Making appointments. Grammar – Prep es.						
Unit – II	Accomodation(Die Wohnung):						12
	ccommodation advertisements, describing accommodation and Grammar – Adjective with to be verb, Adjective with sehr/zu, Adjecti						
Unit – III	Are you Working?(Arbeiten Sie):		· •				12
	speaking about past, understanding Job openings advertiseme		ns, Telephoni	c cor	nvers	ations	. Speakin
about JODS. Glall	nmar – Perfect tense, Participle II – regular and irregular verbs, Co	onjunctions -	- und, oder, al	ber			, -
	Clothes and Style(Kleidung und mode):	onjunctions -	- und, oder, al	ber			12
<b>Unit – IV</b> Clothes, Chats c Grammar – Inter	Clothes and Style(Kleidung und mode): on shopping clothes, reporting on past, Orienting oneself in Su rogative articles and Demonstrative articles, Partizip II – separa	permarkets	Information a	and r		ch ab	12 bout Berlin
Unit – IV Clothes, Chats c	Clothes and Style(Kleidung und mode): on shopping clothes, reporting on past, Orienting oneself in Su rogative articles and Demonstrative articles, Partizip II – separa	permarkets	Information a	and r		ch ab	12 bout Berlin
Unit – IV Clothes, Chats of Grammar – Inter Dative, Verbs with Unit – V Personal informa <i>du/lhr</i> , Modal ver	Clothes and Style(Kleidung und mode): on shopping clothes, reporting on past, Orienting oneself in Su rogative articles and Demonstrative articles, Partizip II – separa h Dative	permarkets, ble and nor d prompts, l, Path, Post	Information an- separable ver health tips. C	and re erbs, Gramr er, Tra	Perso nar - avel ro	rch at onal p · Impe eports	12 pout Berlin pronouns i 12 erative wit , Problem
Unit – IV Clothes, Chats of Grammar – Inter Dative, Verbs with Unit – V Personal informa <i>du/lhr</i> , Modal ver in hotel, Tourist d	Clothes and Style(Kleidung und mode): on shopping clothes, reporting on past, Orienting oneself in Su rogative articles and Demonstrative articles, Partizip II – separa h Dative Health and Vacation(Gesundheit und Urlaub): tition, Human Body parts, Sports, Understanding instructions an bs – sollen, müssen, nicht dürfen, dürfen. Suggestions for travel	permarkets, ble and nor d prompts, l, Path, Post	Information an- separable ver health tips. C	and re erbs, Gramr er, Tra	Perso nar - avel ro	rch at onal p · Impe eports	12 pout Berlin pronouns i 12 erative wit , Problem
Unit – IV Clothes, Chats of Grammar – Inter Dative, Verbs with Unit – V Personal informa <i>du/lhr</i> , Modal ver in hotel, Tourist d <i>Schl</i>	Clothes and Style(Kleidung und mode): on shopping clothes, reporting on past, Orienting oneself in Su rogative articles and Demonstrative articles, Partizip II – separa h Dative Health and Vacation(Gesundheit und Urlaub): tition, Human Body parts, Sports, Understanding instructions an bs – sollen, müssen, nicht dürfen, dürfen. Suggestions for travel	permarkets, ble and nor d prompts, l, Path, Post	Information an- separable ver health tips. C	and re erbs, Gramr er, Tra	Perso nar - avel ro	rch at onal p · Impe eports	12 pout Berlin pronouns i 12 erative wit pater, Zur
Unit – IV Clothes, Chats of Grammar – Inter Dative, Verbs with Unit – V Personal informa <i>du/lhr</i> , Modal ver in hotel, Tourist d Schl TEXT BOOK:	Clothes and Style(Kleidung und mode): on shopping clothes, reporting on past, Orienting oneself in Su rogative articles and Demonstrative articles, Partizip II – separa h Dative Health and Vacation(Gesundheit und Urlaub): tition, Human Body parts, Sports, Understanding instructions an bs – sollen, müssen, nicht dürfen, dürfen. Suggestions for travel	permarkets, Ible and nor Id prompts, I, Path, Post <i>(en, Was, W</i>	Information an- n-separable ver health tips. C ccards, weather em, Adverbs -	and r erbs, Gramr er, Tra - <i>Zue</i>	Perso nar – avel ro rst, da	ch at onal p - Impe eports ann, S	12 pout Berlir pronouns i 12 erative wit pater, Zur Total:6
Unit – IV Clothes, Chats of Grammar – Inter Dative, Verbs with Unit – V Personal informa <i>du/lhr</i> , Modal ver in hotel, Tourist d Schl TEXT BOOK:	Clothes and Style(Kleidung und mode): on shopping clothes, reporting on past, Orienting oneself in Su rogative articles and Demonstrative articles, Partizip II – separa h Dative Health and Vacation(Gesundheit und Urlaub): tition, Human Body parts, Sports, Understanding instructions an bs – sollen, müssen, nicht dürfen, dürfen. Suggestions for travel lestinations. Grammar – Pronoun: <i>man</i> , Question words – <i>Wer, W</i> Dengler, Paul Rusch, Helen Schmitz, Tanja Sieber, "Netzwerk I	permarkets, Ible and nor Id prompts, I, Path, Post <i>(en, Was, W</i>	Information an- n-separable ver health tips. C ccards, weather em, Adverbs -	and r erbs, Gramr er, Tra - <i>Zue</i>	Perso nar – avel ro rst, da	ch at onal p - Impe eports ann, S	12 pout Berlir pronouns i 12 erative wit pater, Zur Total:6
Unit – IV         Clothes, Chats of         Grammar – Inter         Dative, Verbs with         Unit – V         Personal informa         du/lhr, Modal ver         in hotel, Tourist d         Schl         TEXT BOOK:         1.         Stefanie         und Glos	Clothes and Style(Kleidung und mode): on shopping clothes, reporting on past, Orienting oneself in Su rogative articles and Demonstrative articles, Partizip II – separa h Dative Health and Vacation(Gesundheit und Urlaub): tition, Human Body parts, Sports, Understanding instructions an bs – sollen, müssen, nicht dürfen, dürfen. Suggestions for travel lestinations. Grammar – Pronoun: <i>man</i> , Question words – <i>Wer, W</i> Dengler, Paul Rusch, Helen Schmitz, Tanja Sieber, "Netzwerk I	permarkets, Ible and nor Id prompts, I, Path, Post <i>(en, Was, W</i>	Information an- n-separable ver health tips. C ccards, weather em, Adverbs -	and r erbs, Gramr er, Tra - <i>Zue</i>	Perso nar – avel ro rst, da	ch at onal p - Impe eports ann, S	12 pout Berlir pronouns i 12 erative wit pater, Zur Total:6
Unit – IV Clothes, Chats of Grammar – Inter Dative, Verbs with Unit – V Personal informa <i>du/lhr</i> , Modal ver in hotel, Tourist d Schl TEXT BOOK: 1. Stefanie und Glos 2. REFERENCES:	Clothes and Style(Kleidung und mode): on shopping clothes, reporting on past, Orienting oneself in Su rogative articles and Demonstrative articles, Partizip II – separa h Dative Health and Vacation(Gesundheit und Urlaub): tition, Human Body parts, Sports, Understanding instructions an bs – sollen, müssen, nicht dürfen, dürfen. Suggestions for travel lestinations. Grammar – Pronoun: <i>man</i> , Question words – <i>Wer, W</i> Dengler, Paul Rusch, Helen Schmitz, Tanja Sieber, "Netzwerk I	permarkets, ible and nor id prompts, i, Path, Post <i>(en, Was, W</i>	Information an- n-separable ver health tips. C ccards, weather em, Adverbs -	and r erbs, Gramr er, Tra - <i>Zue</i>	Perso nar – avel ro rst, da	ch at onal p - Impe eports ann, S	12 pout Berlir pronouns i 12 erative wit pater, Zur Total:6

		UTCON tion of t	-	se, the s	tudent	s will be a	able to						(	BT Map Highest	
CO1	und	lerstand	letters a	and simple	e texts								R	emember	ing (K1)
CO2	ass	imilate v	vocabula	ry on Acc	ommoo	lation and	l invitatic	n					Ur	nderstand	ling (K2)
CO3	con	nprehen	d conce	pt of time,	teleph	onic conv	ersation	and job·	related	informa	tion		Ur	nderstand	ling (K2)
CO4	und	lerstand	how to	do shoppi	ng in a	German	store						Ur	nderstand	ling (K2)
CO5	und	lerstand	body pa	arts and h	ow to p	an perso	nal trave	I					Ur	nderstand	ling (K2)
						Марр	oing of C	COs with	n POs a	nd PSC	s				
COs/F	POs	P01	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO	1								1	2	3		3		
CO	2								1	2	3		3		
CO	3								1	2	3		3		
CO	4								1	2	3		3		
CO	5								1	2	3		3		
1 – Sli	ght, 2	– Mode	erate, 3 -	- Substan	tial, BT	- Bloom's	Taxonoi	my							
						ASSI	ESSMEN		FERN -	THEOR	Y				
	st / Bl Categ	oom's ory*	Re	emember (K1) %	ing	Understa (K2)		Apply (K3)		Analyz (K4)		Evaluating (K5) %		eating <6) %	Total %
	CAT	Г1		75		25									100
	CAT	Г2		25		75									100
	CAT	ГЗ		25		75									100
	ES	E		25		75									100
* ±3%	may I	be varie	d (CAT <sup>·</sup>	1,2,3 – 50	marks	& ESE –	100 mar	ks)							

	22GEO06-GERMAN LANGUAGE LE	VEL 3					
	(Offered by Department of Electronics and Commun	ication Engir	neering)				
Programme& Branch	All BE/BTech Engineering and Technology Branches	Sem.	Category	L	Т	Ρ	Credit
Prerequisites	German Language Level 2	All	OE	3	0	0	3
Preamble	This course provides enriching information about various even enhances the vocabulary and speaking ability to respond to a equips one to express opinions and negotiate appointments. grammatical structure to answer confidently in everyday situa	nd also seek With diligent	information in	thos	e situ	ations	s. It also asic
Jnit – I	All about food (Rund Ums Essen):						9
ustify something, <sup>-</sup>	ation about person, Speak about food, Introduce self and other To speak about feelings, To express opinions, To answer quest s in Dative, Yes/No questions, Reflexive verbs, Sentence with 'we	ons on a tex					
Jnit – II	School days ( Nach der Schulzeit):						9
	I reports, Speak and write comments about schooldays, To speathool types in Germany and speak about it. Grammar: Mode						
Jnit – III	Media in everyday life (Medien in Alltag):						9
	dvantages and disadvantages of Media, formulate comparisor rite Movie reviews. Grammar: Comparative degree, Comparative						
/ith 'dass', Superla	ative degree.	Contenees	with AIS and	wie	Subo	Jiana	1
vith 'dass', Superla <b>Jnit – IV</b>	tive degree. Feelings and expressions (Gefühle):						9
<u>vith 'dass', Superla</u> <b>Init – IV</b> Express thanks an ity, Express joy a	ative degree. Feelings and expressions (Gefühle): d congratulations, Talk about feelings, To understand informatic and regrets, Understand and write Blog entries, Write appropr	on about fest	ivals and spea	ak ab	out it,	To d	9 lescribe
vith 'dass', Superla <b>Jnit – IV</b> Express thanks an ity, Express joy a <u>Nenn', Adjectives</u> <b>Jnit – V</b>	Ative degree. Feelings and expressions (Gefühle): d congratulations, Talk about feelings, To understand information and regrets, Understand and write Blog entries, Write appropri- to be used along with definite articles. Profession and Travel (Beruf und Reisen):	on about fest iate heading	ivals and spea . Grammar:	ak abo Subo	out it, rdina	To d te Cla	9 lescribe ause wit 9
vith 'dass', Superla <b>Init – IV</b> Express thanks an ity, Express joy a Venn', Adjectives <b>Jnit – V</b> To have a converse areer preferences formation, Express he way to work, D hedefinite articles,	trive degree.         Feelings and expressions (Gefühle):         d congratulations, Talk about feelings, To understand information and regrets, Understand and write Blog entries, Write appropriate be used along with definite articles.         Profession and Travel ( Beruf und Reisen):         action at ticket counter, To talk about leisure activities, To gathers, Ideate the dream job, To prepare and make telephone call se uncertainty, Understand and give directions, Understand and give directions, Understand and Prepositions, verb – 'werden', Subordinate clause – indirect que	n about fest iate heading r information s, To unders ewspaper ar ut travel. Gr	ivals and spea J. Grammar: from Texts, listand text about ticle, Say your ammar: Adjec	ak abo Subo ntrodu but W own tive to	out it, rdina uce p orkpl opini o be u	To d te Cla eople ace. on, T ised a	9 lescribe ause wit 9 , Expres Ask fo alk about along wit
vith 'dass', Superla <b>Jnit – IV</b> Express thanks an ity, Express joy a Nenn', Adjectives <b>Jnit – V</b> To have a converse areer preferences nformation, Expresence the way to work, D	trive degree.         Feelings and expressions (Gefühle):         d congratulations, Talk about feelings, To understand information and regrets, Understand and write Blog entries, Write appropriate be used along with definite articles.         Profession and Travel ( Beruf und Reisen):         action at ticket counter, To talk about leisure activities, To gathers, Ideate the dream job, To prepare and make telephone call se uncertainty, Understand and give directions, Understand and give directions, Understand and Prepositions, verb – 'werden', Subordinate clause – indirect que	n about fest iate heading r information s, To unders ewspaper ar ut travel. Gr	ivals and spea J. Grammar: from Texts, listand text about ticle, Say your ammar: Adjec	ak abo Subo ntrodu but W own tive to	out it, rdina uce p orkpl opini o be u	To d te Cla eople ace. on, T ised a	9 lescribe ause wit 9 e, Expres Ask fo alk abou along wit r reading
vith 'dass', Superla <b>Init – IV</b> Express thanks an ity, Express joy a Venn', Adjectives <b>Jnit – V</b> To have a converse areer preferences formation, Express he way to work, D hedefinite articles,	trive degree.         Feelings and expressions (Gefühle):         d congratulations, Talk about feelings, To understand information and regrets, Understand and write Blog entries, Write appropriate be used along with definite articles.         Profession and Travel ( Beruf und Reisen):         action at ticket counter, To talk about leisure activities, To gathers, Ideate the dream job, To prepare and make telephone call se uncertainty, Understand and give directions, Understand and give directions, Understand and Prepositions, verb – 'werden', Subordinate clause – indirect que	n about fest iate heading r information s, To unders ewspaper ar ut travel. Gr	ivals and spea J. Grammar: from Texts, listand text about ticle, Say your ammar: Adjec	ak abo Subo ntrodu but W own tive to	out it, rdina uce p orkpl opini o be u	To d te Cla eople ace. on, T ised a	9 lescribe ause wit 9 e, Expres Ask fo alk abou along wit r reading
vith 'dass', Superla <b>Init – IV</b> Express thanks an ity, Express joy a Venn', Adjectives <b>Jnit – V</b> To have a converse areer preferences formation, Express he way to work, D hedefinite articles, vitting, speaking an <b>TEXT BOOK:</b> 1 Stefanie D	trive degree.         Feelings and expressions (Gefühle):         d congratulations, Talk about feelings, To understand information and regrets, Understand and write Blog entries, Write appropriate be used along with definite articles.         Profession and Travel ( Beruf und Reisen):         action at ticket counter, To talk about leisure activities, To gathers, Ideate the dream job, To prepare and make telephone call se uncertainty, Understand and give directions, Understand and give directions, Understand and Prepositions, verb – 'werden', Subordinate clause – indirect que	n about fest iate heading r information s, To unders ewspaper ar ut travel. Gr lestions, All	ivals and spea J. Grammar: from Texts, listand text about ticle, Say your ammar: Adjec units will inclu	ak abo Subo ntrodu but W own tive to ide e	out it, rdina orkpl opini o be u lemer	To d te Cla eople ace. on, T ised a hts fo	9 lescribe ause wit 9 c, Expres Ask fo Falk abou along wit r reading <b>Total:4</b>
vith 'dass', Superla <b>Init – IV</b> Express thanks an ity, Express joy a Venn', Adjectives <b>Jnit – V</b> To have a converse areer preferences formation, Express he way to work, D hedefinite articles, vitting, speaking an <b>TEXT BOOK:</b> 1 Stefanie D	Antive degree.         Feelings and expressions (Gefühle):         d congratulations, Talk about feelings, To understand information and regrets, Understand and write Blog entries, Write appropriate be used along with definite articles.         Profession and Travel (Beruf und Reisen):         action at ticket counter, To talk about leisure activities, To gathers, Ideate the dream job, To prepare and make telephone call ss uncertainty, Understand and give directions, Understand a mescribe a statistic, Understand information about a trip, Talk about Prepositions, verb – 'werden', Subordinate clause – indirect quind listening.	n about fest iate heading r information s, To unders ewspaper ar ut travel. Gr lestions, All	ivals and spea J. Grammar: from Texts, listand text about ticle, Say your ammar: Adjec units will inclu	ak abo Subo ntrodu but W own tive to ide e	out it, rdina orkpl opini o be u lemer	To d te Cla eople ace. on, T ised a hts fo	9 lescribe ause wit 9 c, Expres Ask fo Falk abou along wit r reading <b>Total:4</b>
vith 'dass', Superla Init – IV Express thanks an ity, Express joy a Wenn', Adjectives Init – V To have a convers areer preferences formation, Express the way to work, D adefinite articles, vriting, speaking an TEXT BOOK: 1. Stefanie D und Glossa	Antive degree.         Feelings and expressions (Gefühle):         d congratulations, Talk about feelings, To understand information and regrets, Understand and write Blog entries, Write appropriate be used along with definite articles.         Profession and Travel (Beruf und Reisen):         action at ticket counter, To talk about leisure activities, To gathers, Ideate the dream job, To prepare and make telephone call ss uncertainty, Understand and give directions, Understand a mescribe a statistic, Understand information about a trip, Talk about Prepositions, verb – 'werden', Subordinate clause – indirect quind listening.	n about fest iate heading r information s, To unders ewspaper ar ut travel. Gr lestions, All	ivals and spea J. Grammar: from Texts, listand text about ticle, Say your ammar: Adjec units will inclu	ak abo Subo ntrodu but W own tive to ide e	out it, rdina orkpl opini o be u lemer	To d te Cla eople ace. on, T ised a hts fo	9 lescribe ause wit 9 c, Expres Ask fo Talk abou along wit r reading <b>Total:4</b>
vith 'dass', Superla Init – IV Express thanks an ity, Express joy a Venn', Adjectives Init – V To have a convers areer preferences nformation, Expres he way to work, D hdefinite articles, vriting, speaking an TEXT BOOK: 1. Stefanie D und Glossa 2. SEFERENCES:	Antive degree.         Feelings and expressions (Gefühle):         d congratulations, Talk about feelings, To understand information and regrets, Understand and write Blog entries, Write appropriate be used along with definite articles.         Profession and Travel (Beruf und Reisen):         action at ticket counter, To talk about leisure activities, To gathers, Ideate the dream job, To prepare and make telephone call ss uncertainty, Understand and give directions, Understand a mescribe a statistic, Understand information about a trip, Talk about Prepositions, verb – 'werden', Subordinate clause – indirect quind listening.	n about fest iate heading r information s, To unders ewspaper ar ut travel. Gr lestions, All eutsch als F	ivals and spea . Grammar: from Texts, li stand text abo ticle, Say you ammar: Adjec units will inclu	ak ab Subo ntrodu out W · own tive to de e	out it, rdina uce p orkpl opini b be u emer	To c te Cla eople ace. on, T sed a tits fo	9 lescribe ause wit 9 c, Expres Ask fo Falk abou along wit r reading <b>Total:4</b>

		UTCOM ion of t		se, the st	udents	will be a	ble to						(	BT Mapp Highest L	
CO1	und	erstand	Germar	food style	e, restau	urant and	be able	express	oneself	•			Rem	nembering	(K1)
CO2	und	erstand	Germa	n school s	ystem a	ind discus	ss about	habits a	nd prov	ide City-	Tipps		Und	erstanding	g (K2)
CO3	ana	lyze and	l compa	re media i	n every	day life.							Und	erstanding	g (K2)
CO4	expi	ress fee	lings, de	scribe a c	ity and	write blog	entries.						Und	erstanding	g (K2)
CO5	seel	k and pr	ovide in	formation	in a pro	fessional	setup, gi	ve direc	tions to	others a	nd talk	about travel	Und	erstanding	g (K2)
						Маррі	ing of CO	Os with	POs ar	d PSOs					
COs/F	POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
СО	1								1	2	3		3		
CO	2								1	2	3		3		
CO	3								1	2	3		3		
CO	4								1	2	3		3		
CO	5								1	2	3		3		
1 – Slię	ght, 2	– Mode	rate, 3 -	Substant	ial, BT-	Bloom's	Taxonom	iy							
						ASSE	SSMEN	Γ ΡΑΤΤΙ	ERN - T	HEORY					
	st / Bl Catego	oom's ory*	Re	ememberi (K1) %	ing	Understa (K2)	•	Apply (K3)		Analyzi (K4) %		Evaluating (K %		reating K6) %	Total %
	CAT	1		75		25									100
	CAT	2		25		75									100
	CAT	3		25		75									100
	ESE	=		25		75									100

	(Offered by Department of Electronics and Commur	nication Engir	neering)				
Programme& Branch	All BE/BTech Engineering and Technology Branches	Sem.	Category	L	т	Ρ	Credit
Prerequisites	German Language Level 3	All	OE	3	0	0	3
Preamble	This course imparts knowledge about interacting with external behaviour and addressing relationships in personal and profe various media and at work. Enhance learner's grammatical e concepts which would lay the foundation to have a better hole be able to read and respond to reports, write simple formal an engage in simple conversations in known situations.	essional front xposure and d of the langu	It helps one to cover the core lage. With focu	b unc basi used	lersta c grar learni	nd rep nmati ng on	oorts from ical e should
Unit – I	Learning (Lernen):						9
everyday work lif	nd describing learning problems, Understanding and giving ad e, Talking about everyday working life, Understanding a radio rep nctions- denn,weil, Konjuntiv II: Sollte( suggestions), Genitive, Tem	oort, Underst	anding and ma	aking	a mi	ni-pre	sentation
Unit – II	Athletic (Sportlich):						9
and reacting, Ma attraction. Gram	Isiasm, hope, disappointment, Understanding and writing fan con king an appointment, Understanding a report about an excursion mar: Conjunctions – deshalb, trotzdem, Verbs with Dativ and Akku	n, Understan					
Unit – III	Living Together (Zusammen Leben):						9
	logize & give in, As for something, Understand experience reports,		ne past, Talk a	bout	pets,	Resp	ond to
			1 1 1 1 1 1		-		
	and correct a story. Grammatik: Konjunctiv II- könnte, Subordina	te clauses –	als and Wenn.		-		0
Unit – IV	Good Entertainment (Gute Unterhaltung):				e deta	iled ir	9
<b>Unit – IV</b> Talk about music about a person,	Good Entertainment (Gute Unterhaltung): style, Buy concert tickets, Introduce a musician / band, Understan Understand information about painting, Understand description	d newspaper o of a pictur	reports, Give e, Describe a	more i pict	ure.	G	nformation rammatik
Unit – IV Talk about music about a person, Interrogative Artic Unit – V	Good Entertainment (Gute Unterhaltung): style, Buy concert tickets, Introduce a musician / band, Understan Understand information about painting, Understand descriptior cles: Was fuer eine?, Pronouns – man/jemand/niemand and alles/ Passage of time and Culture (Zeitablauf & Kultur):	d newspaper o of a pictur etwas/nichts	r reports, Give e, Describe a , Relative sent	more pict	ture. s in N	G Iomina	nformatior rammatik ativ <b>9</b>
Unit – IV Talk about music about a person, Interrogative Artic Unit – V Talk about wishe Understand a te about behavior, Give more inform listening. Gramm	Good Entertainment (Gute Unterhaltung): style, Buy concert tickets, Introduce a musician / band, Understan Understand information about painting, Understand description cles: Was fuer eine?, Pronouns – man/jemand/niemand and alles/	d newspaper of a pictur etwas/nichts , Plan somet nderstand inf ps in a text, include elem	r reports, Give e, Describe a , Relative sent ning together, ormation abou Talk about for nents for readi	more pict ence To as it oth ms c ng, v	sk oth sk oth er cu of add vriting	G lomina ers so ltures ressir , spea	iformation rammatik ativ 9 omething o, Discuss ng others aking and
Unit – IV Talk about music about a person, Interrogative Artic Unit – V Talk about wishe Understand a te about behavior, Give more inform listening. Gramm	Good Entertainment (Gute Unterhaltung):           style, Buy concert tickets, Introduce a musician / band, Understand           Understand information about painting, Understand description           cles: Was fuer eine?, Pronouns – man/jemand/niemand and alles/           Passage of time and Culture (Zeitablauf & Kultur):           s, Express wishes, Give Suggestions, Understand a conversation           kt, Exchange information, Talk about proverbs, write a story. Ur           Express intentions, Use the appropriate salutation, Understand timation, Discuss about clichés and write about them. All units will           matik: Konjunctiv II (Wishes, Suggestions), Verbs with prepositions	d newspaper of a pictur etwas/nichts , Plan somet nderstand inf ps in a text, include elem	r reports, Give e, Describe a , Relative sent ning together, ormation abou Talk about for nents for readi	more pict ence To as it oth ms c ng, v	sk oth sk oth er cu of add vriting	G lomina ers so ltures ressir , spea	ativ <b>9</b> omething a, Discuss aking and sentence
Unit – IV Talk about music about a person, Interrogative Artic Unit – V Talk about wishe Understand a te about behavior, Give more inform listening. Gramm in Akkusativ, Sub	Good Entertainment (Gute Unterhaltung):           style, Buy concert tickets, Introduce a musician / band, Understand           Understand information about painting, Understand description           cles: Was fuer eine?, Pronouns – man/jemand/niemand and alles/           Passage of time and Culture (Zeitablauf & Kultur):           s, Express wishes, Give Suggestions, Understand a conversation           kt, Exchange information, Talk about proverbs, write a story. Ur           Express intentions, Use the appropriate salutation, Understand timation, Discuss about clichés and write about them. All units will           matik: Konjunctiv II (Wishes, Suggestions), Verbs with prepositions	d newspaper of a pictur etwas/nichts , Plan somet nderstand inf ps in a text, include elem	r reports, Give e, Describe a , Relative sent ning together, ormation abou Talk about for nents for readi	more pict ence To as it oth ms c ng, v	sk oth sk oth er cu of add vriting	G lomina ers so ltures ressir , spea	formation rammatik ativ omething a, Discus ng others aking and sentence
Unit – IV Talk about music about a person, Interrogative Artic Unit – V Talk about wishe Understand a te about behavior, Give more inform listening. Gramm in Akkusativ, Sub TEXT BOOK:	Good Entertainment (Gute Unterhaltung):           style, Buy concert tickets, Introduce a musician / band, Understand           Understand information about painting, Understand description           cles: Was fuer eine?, Pronouns – man/jemand/niemand and alles/           Passage of time and Culture (Zeitablauf & Kultur):           s, Express wishes, Give Suggestions, Understand a conversation           kt, Exchange information, Talk about proverbs, write a story. Ur           Express intentions, Use the appropriate salutation, Understand timation, Discuss about clichés and write about them. All units will           matik: Konjunctiv II (Wishes, Suggestions), Verbs with prepositions	d newspaper of a pictur etwas/nichts , Plan sometinderstand inf ps in a text, include elem , W- question	r reports, Give e, Describe a , Relative sent ning together, ormation abou Talk about for nents for readi ns with prepos	more pict ence To as it oth ms c ng, v itions	sk oth sk oth er cu of add vriting s, Rela	G lomina lers so ltures ressir , spea ative s	formatio rammatik ativ 9 omething 5, Discus ng others aking and sentence Total:4
Unit – IV         Talk about music         about a person,         Interrogative Artic         Unit – V         Talk about wishe         Understand a te         about behavior,         Give more inform         istening. Gramm         in Akkusativ, Sub         TEXT BOOK:         1.       Stefanie         Goyal Pu	Good Entertainment (Gute Unterhaltung):         style, Buy concert tickets, Introduce a musician / band, Understand information about painting, Understand description cles: Was fuer eine?, Pronouns – man/jemand/niemand and alles/         Passage of time and Culture (Zeitablauf & Kultur):         s, Express wishes, Give Suggestions, Understand a conversation tt, Exchange information, Talk about proverbs, write a story. Ur Express intentions, Use the appropriate salutation, Understand timation, Discuss about clichés and write about them. All units will natik: Konjunctiv II (Wishes, Suggestions), Verbs with prepositions ordinate clauses with damit and UmZu.         Dengler, Paul Rusch, Helen Schmitz, Tanja Sieber, "Netzwerk Dengler, Paul Rusch, Helen Schmitz, Tanja Sieber, "Netzwerk Dengler, Paul Rusch, Helen Schmitz, Tanja Sieber, "Netzwerk Dengler, Paul Rusch, Helen Schmitz, Tanja Sieber, "Netzwerk Dengler, Paul Rusch, Helen Schmitz, Tanja Sieber, "Netzwerk Dengler, Paul Rusch, Helen Schmitz, Tanja Sieber, "Netzwerk Dengler, Paul Rusch, Helen Schmitz, Tanja Sieber, "Netzwerk Dengler, Paul Rusch, Helen Schmitz, Tanja Sieber, "Netzwerk Dengler, Paul Rusch, Helen Schmitz, Tanja Sieber, "Netzwerk Dengler, Paul Rusch, Helen Schmitz, Tanja Sieber, "Netzwerk Dengler, Paul Rusch, Helen Schmitz, Tanja Sieber, "Netzwerk Dengler, Paul Rusch, Helen Schmitz, Tanja Sieber, "Netzwerk Dengler, Paul Rusch, Helen Schmitz, Tanja Sieber, "Netzwerk Dengler, Paul Rusch, Helen Schmitz, Tanja Sieber, "Netzwerk Dengler, Paul Rusch, Helen Schmitz, Tanja Sieber, "Netzwerk Dengler, Paul Rusch, Helen Schmitz, Tanja Sieber, "Netzwerk Dengler, Paul Rusch, Helen Schmitz, Tanja Sieber, "Netzwerk Dengler, Paul Rusch, Paul Rusch, Paul Rusch, Paul Rusch, Paul Rusch, Paul Rusch, Paul Rusch, Paul Rusch, Paul Rusch, Paul Rusch, Paul Rusch, Paul Rusch, Paul Rusch, Paul	d newspaper of a pictur etwas/nichts , Plan sometinderstand inf ps in a text, include elem , W- question	r reports, Give e, Describe a , Relative sent ning together, ormation abou Talk about for nents for readi ns with prepos	more pict ence To as it oth ms c ng, v itions	sk oth sk oth er cu of add vriting s, Rela	G lomina lers so ltures ressir , spea ative s	formation rammatikativ <b>9</b> omething omething omething s, Discuss ng others aking and sentences <b>Total:4</b>
Unit – IV         Talk about music         about a person,         Interrogative Artic         Unit – V         Talk about wishe         Understand a te         about behavior,         Give more inform         listening. Gramm         in Akkusativ, Sub         TEXT BOOK:         1.         Stefanie         Goyal Pu         REFERENCES:	Good Entertainment (Gute Unterhaltung):         style, Buy concert tickets, Introduce a musician / band, Understand information about painting, Understand description cles: Was fuer eine?, Pronouns – man/jemand/niemand and alles/         Passage of time and Culture (Zeitablauf & Kultur):         s, Express wishes, Give Suggestions, Understand a conversation tt, Exchange information, Talk about proverbs, write a story. Ur Express intentions, Use the appropriate salutation, Understand timation, Discuss about clichés and write about them. All units will natik: Konjunctiv II (Wishes, Suggestions), Verbs with prepositions ordinate clauses with damit and UmZu.         Dengler, Paul Rusch, Helen Schmitz, Tanja Sieber, "Netzwerk Dengler, Paul Rusch, Helen Schmitz, Tanja Sieber, "Netzwerk Dengler, Paul Rusch, Helen Schmitz, Tanja Sieber, "Netzwerk Dengler, Paul Rusch, Helen Schmitz, Tanja Sieber, "Netzwerk Dengler, Paul Rusch, Helen Schmitz, Tanja Sieber, "Netzwerk Dengler, Paul Rusch, Helen Schmitz, Tanja Sieber, "Netzwerk Dengler, Paul Rusch, Helen Schmitz, Tanja Sieber, "Netzwerk Dengler, Paul Rusch, Helen Schmitz, Tanja Sieber, "Netzwerk Dengler, Paul Rusch, Helen Schmitz, Tanja Sieber, "Netzwerk Dengler, Paul Rusch, Helen Schmitz, Tanja Sieber, "Netzwerk Dengler, Paul Rusch, Helen Schmitz, Tanja Sieber, "Netzwerk Dengler, Paul Rusch, Helen Schmitz, Tanja Sieber, "Netzwerk Dengler, Paul Rusch, Helen Schmitz, Tanja Sieber, "Netzwerk Dengler, Paul Rusch, Helen Schmitz, Tanja Sieber, "Netzwerk Dengler, Paul Rusch, Helen Schmitz, Tanja Sieber, "Netzwerk Dengler, Paul Rusch, Helen Schmitz, Tanja Sieber, "Netzwerk Dengler, Paul Rusch, Helen Schmitz, Tanja Sieber, "Netzwerk Dengler, Paul Rusch, Paul Rusch, Paul Rusch, Paul Rusch, Paul Rusch, Paul Rusch, Paul Rusch, Paul Rusch, Paul Rusch, Paul Rusch, Paul Rusch, Paul Rusch, Paul Rusch, Paul	d newspaper of a pictur etwas/nichts , Plan somet nderstand inf ps in a text, include elem , W- question eutsch als Fr	er reports, Give e, Describe a , Relative sent ning together, ormation about Talk about for nents for readi ns with prepos	more ence To a tt oth ms c ng, v itions	sk oth sk oth er cu of add vriting s, Rela	G lomina lers so ltures ressir , spea ative s	formation rammatikativ <b>9</b> omething omething omething s, Discuss ng others aking and sentences <b>Total:4</b>

		UTCOM ion of t		se, the st	udents	will be al	ble to						(	BT Mapp Highest L	
CO1	leve	rage lea	arning in	Workplac	e, unde	rstanding	reports	and mak	e prese	entation.			Rem	nembering	J (K1)
CO2	reci	orocate	to differe	ent situatio	ons, mal	ke appoin	tment ar	nd under	stand to	exts.			Und	erstanding	g (K2)
CO3	han	dle relat	ionships	and resp	ond app	ropriately	to exch	ange inf	ormatio	n			Und	erstandin	g (K2)
CO4	fam	liarize to	o various	channel	s of ente	ertainmen	t						Und	erstandin	g (K2)
CO5	knov	w about	various	cultural a	spects,	usage of	proverbs	and clic	hes.				Und	erstanding	g (K2)
						Маррі	ng of C(	Os with	POs ar	nd PSOs					
COs/F	POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	P011	PO12	PSO1	PSO2
СО	1								1	2	3		3		
CO	2								1	2	3		3		
CO	3								1	2	3		3		
CO	4								1	2	3		3		
CO	5								1	2	3		3		
1 – Sli	ght, 2	– Mode	rate, 3 –	Substant	ial, BT-	Bloom's T	Faxonom	iy							
						ASSE	SSMEN	Γ ΡΑΤΤΙ	ERN - T	HEORY					
	st / Bl Catego	oom's ory*	Re	member (K1) %	ing	Understa (K2)	•	Apply (K3)		Analyzi (K4) %		Evaluating (K %		reating K6) %	Total %
	CAT	1		75		25									100
	CAT	2		25		75									100
	CAT	3		25		75									100
	ESE	=		25		75									100

	(Offered by Department of Electronics and Commun	instian Engin					
<b>_</b>	(Offered by Department of Electronics and Commun	lication Engir	ieering)		1	1	
Programme& Branch	All BE/BTech Engineering and Technology Branches	Sem.	Category	L	Т	Р	Credit
Prerequisites	Japanese Language Level 1	All	OE	4	0	0	4
Preamble	The basic level of Japanese which provides understanding of the ability to understand basic conversations and also enable Casual form						
Unit – I	Introduction to groups of verbs:						12
	Introduction to Casual Form: ry form-ta form-Polite style and Casual style differences-Conversa	ation in plain	style-Place of	usag	ge of	Polite	12 style an
Casual style							-
Unit – III	Express opinions and thoughts:	_					12
Introduction to ne is right -Noun mo	w particle-Express someone one's thought-Convey the message difications	of one perso	n to another-A	Ask so	omeo	ne if s	somethin
Unit – IV	Introduction to If clause and remaining Kanjis:						12
If clause tara form	Introduction to If clause and remaining Kanjis: n-Express gratitude for an action done by other person-Hypothetic	al situation-F	Particles to us	e in c	ase c	of Moti	•
If clause tara forr 50 Kanjis				e in c	ase c	of Mot	•
If clause tara forr 50 Kanjis <b>Unit – V</b>	n-Express gratitude for an action done by other person-Hypothetic	en, even if"	usages:				on verbs
If clause tara forr 50 Kanjis <b>Unit – V</b>	n-Express gratitude for an action done by other person-Hypothetic Introduction to giving and receiving with te form and "wh	en, even if"	usages:				on verbs
If clause tara forr 50 Kanjis <b>Unit – V</b> Providing to and	n-Express gratitude for an action done by other person-Hypothetic Introduction to giving and receiving with te form and "wh	en, even if"	usages:				on verbs
If clause tara forr 50 Kanjis Unit – V Providing to and TEXT BOOK:	n-Express gratitude for an action done by other person-Hypothetic Introduction to giving and receiving with te form and "wh	en, even if" sentences us	usages: ing when and	even	ifet	C.	12 Total:6
If clause tara forr         50 Kanjis         Unit – V         Providing to and         TEXT BOOK:         1.	n-Express gratitude for an action done by other person-Hypothetic Introduction to giving and receiving with te form and "wh getting from differences - Understanding of situations and framing s	en, even if" sentences us	usages: ing when and	even	ifet	C.	12 Total:6
50 Kanjis Unit – V Providing to and TEXT BOOK: 1. "MINNA REFERENCES:	n-Express gratitude for an action done by other person-Hypothetic Introduction to giving and receiving with te form and "wh getting from differences - Understanding of situations and framing s	en, even if" sentences us ners & Distrib	usages: ing when and	even	ifet	C.	12 Total:6

		UTCOM ion of t		se, the st	udents	will be a	ble to						(1	BT Mapp Highest L	
CO1	diffe	erentiate	groups	of verbs a	nd its fo	orms							Rem	embering	J (K1)
CO2	und	erstand	Polite fo	rm and C	asual fo	rm of Jap	anese						Und	erstanding	g (K2)
CO3	com	preheno	d person	al commu	inicatior	and exp	ress gree	etings					Und	erstanding	g (K2)
CO4	und	erstand	the Kanj	is in Japa	nese So	cript and I	f clause						Und	erstanding	g (K2)
								erstanding	g (K2)						
						Маррі	ing of CO	Os with	POs ar	nd PSOs					
COs/F	POs	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO	1								1	2	3		3		
CO	2								1	2	3		3		
CO	3								1	2	3		3		
CO	4								1	2	3		3		
CO	5								1	2	3		3		
1 – Slię	ght, 2	– Mode	rate, 3 –	Substant	ial, BT-	Bloom's T	Taxonom	у							
						ASSE	SSMEN		ERN - T	HEORY					
	st / Bl Catego	oom's ory*	Re	memberi (K1) %	ing	Understa (K2)		Apply (K3)		Analyz (K4) 9	•	Evaluating (K5) %		eating K6) %	Total %
	CAT	1		75		25									100
	CAT	2		25		75									100
	CAT	3		25		75									100
	ESE	=		25		75									100

			EVEL 3					
		(Offered by Department of Electronics and Commun	ication Engir	neering)				
Progra Branch	amme& h	All BE/BTech Engineering and Technology Branches	Sem.	Category	L	т	Ρ	Credi
Prereq	luisites	Japanese Language Level 2	All	OE	3	0	0	3
Preamb	ble	The intermediate level of Japanese which provides understan which includes 150 Kanji's and provides the ability to compret						
Unit – I	I	Introduction to Potential verbs:						9
		sons-Favouring Expressions-Expressing a State-Potential Verb actions-Nouns-Basic Questions and Kanji's.	Sentences	-Simultaneous	s acti	ons-\	/erb(	Groups-1
Unit – I	11	Introduction to Transitive and Intransitive verbs:						9
		erbs- Embarrassment about Facts- Consequence of Verbs with	an Intention	s-Affirmative	Sente	nces	- Con	junctions
20010 0	Juestions ar	nd kanji's.						
Unit – I	111	Introduction to Volitional forms:	urbs and Qua	ntifiers-Basic (	Quest	ions	and k	9 anii's
Unit – I Express	III sions of Spe	Introduction to Volitional forms: eakers Intention-Expressing Suggestion or Advice-Usage of Adve	rbs and Qua	ntifiers-Basic	Quest	ions	and ka	anji's.
Unit – I Express Unit – I Comma	III sions of Spe IV anding pers	Introduction to Volitional forms:						anji's. 9
Unit – I Express Unit – I Comma States I	III sisions of Spe IV anding pers Basic Quest	Introduction to Volitional forms: eakers Intention-Expressing Suggestion or Advice-Usage of Adve Introduction to Imperative and Prohibitive verbs: on- Interrogatives-Expressions of Third Person-Actions and its						anji's. 9
Unit – I Express Unit – I Comma States I Unit – V Descrip	III ssions of Spe IV anding pers Basic Quest V	Introduction to Volitional forms:           eakers Intention-Expressing Suggestion or Advice-Usage of Adve           Introduction to Imperative and Prohibitive verbs:           on- Interrogatives-Expressions of Third Person-Actions and its tions and Kanji's.           Introduction to Conditional form and Passive verbs:           quirement and Speaker's Judgement, HabitualActions, Direction	Occurrence	- Possibilities	of an	Actio	on-Ch	anji's. 9 anging c 9
Unit – I Express Unit – I Comma States I Unit – V Descrip	III ssions of Spe IV anding pers Basic Quest V ption of Rec	Introduction to Volitional forms:           eakers Intention-Expressing Suggestion or Advice-Usage of Adve           Introduction to Imperative and Prohibitive verbs:           on- Interrogatives-Expressions of Third Person-Actions and its tions and Kanji's.           Introduction to Conditional form and Passive verbs:           quirement and Speaker's Judgement, HabitualActions, Direction	Occurrence	- Possibilities	of an	Actio	on-Ch	9 anging o 9 rbs-Basi
Unit – I Express Unit – I Comma States I Unit – V Descrip	III ssions of Spe IV anding pers Basic Quest V V ption of Rec ons and Kar	Introduction to Volitional forms:           eakers Intention-Expressing Suggestion or Advice-Usage of Adve           Introduction to Imperative and Prohibitive verbs:           on- Interrogatives-Expressions of Third Person-Actions and its tions and Kanji's.           Introduction to Conditional form and Passive verbs:           quirement and Speaker's Judgement, HabitualActions, Direction	Occurrence	- Possibilities	of an	Actio	on-Ch	anji's. 9 anging c 9
Unit – I Express Unit – I Comma States I Unit – V Descrip Questic	III ssions of Spe IV anding pers Basic Quest V ption of Rec ons and Kar BOOK:	Introduction to Volitional forms:           eakers Intention-Expressing Suggestion or Advice-Usage of Adve           Introduction to Imperative and Prohibitive verbs:           on- Interrogatives-Expressions of Third Person-Actions and its tions and Kanji's.           Introduction to Conditional form and Passive verbs:           quirement and Speaker's Judgement, HabitualActions, Direction	Occurrence	- Possibilities gestions-Pass	of an	Actio	on-Ch of Ve	9 anging o 9 rbs-Bas Total:4
Unit – I Express Unit – I Comma States I Unit – V Descrip Questic TEXT E	III ssions of Spe IV anding pers Basic Quest V ption of Rec ons and Kar BOOK:	Introduction to Volitional forms: eakers Intention-Expressing Suggestion or Advice-Usage of Adve Introduction to Imperative and Prohibitive verbs: on- Interrogatives-Expressions of Third Person-Actions and its tions and Kanji's. Introduction to Conditional form and Passive verbs: quirement and Speaker's Judgement, HabitualActions, Direction nji's.	Occurrence	- Possibilities gestions-Pass	of an	Actio	on-Ch of Ve	9 anging o 9 rbs-Bas Total:4
Unit – I Express Unit – I Comma States I Unit – V Descrip Questic TEXT E	III ssions of Spe IV anding pers Basic Ques V ption of Rec ons and Kar BOOK: "MINNA N RENCES:	Introduction to Volitional forms: eakers Intention-Expressing Suggestion or Advice-Usage of Adve Introduction to Imperative and Prohibitive verbs: on- Interrogatives-Expressions of Third Person-Actions and its tions and Kanji's. Introduction to Conditional form and Passive verbs: quirement and Speaker's Judgement, HabitualActions, Direction nji's.	Occurrence ons and sugg	- Possibilities gestions-Pass	of an	Actio	on-Ch of Ve	9 anging 0 9 rbs-Bas Total:4

		UTCOM tion of t		se, the st	udents	will be al	ble to							(1	BT Mapp Highest L	
CO1	read	d and un	derstand	l BasicVo	cabulari	es.								Re	memberir	ng (K1)
CO2	und	erstand	Convers	ations us	ed in da	ily life.								Un	derstandi	ng (K2)
CO3	com	nprehend	d person	al commu	nication	and exp	ress gree	etings.						Un	derstandi	ng (K2)
CO4	und	erstand	the Kanj	i's in Japa	anese S	cript.								Un	derstandi	ng (K2)
CO5	com	nprehend	d Cohere	ent conver	sations	in everyd	ay situat	ions.						Un	derstandii	ng (K2)
						Маррі	ng of C	Os with	POs ar	d PSOs	;					
COs/F	POs	P01	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1	0 PO11	PC	<b>D12</b>	PSO1	PSO2
СО	1								1	2	3			3		
CO	2								1	2	3			3		
CO	3								1	2	3			3		
CO	4								1	2	3			3		
CO	5								1	2	3			3		
1 – Slię	ght, 2	– Mode	rate, 3 –	Substant	ial, BT-	Bloom's T	Faxonom	iy							·	
						ASSE	SSMEN	Γ ΡΑΤΤΙ	ERN - T	HEORY						
	st / Bl Categ	oom's ory*	Re	memberi (K1) %	ng	Understa (K2)	-	Apply (K3)		Analyz (K4) 9	-	Evaluating %	(K5)		eating K6) %	Total %
	CAT	Г1		75		25										100
	CAT	Г2		25		75										100
	CAT	ГЗ		25		75										100
	ESI	F		25		75										100

	22GEO10 -JAPANESE LANGUAGE L	EVEL 4					
	(Offered by Department of Electronics and Communi	ication Engir	neering)				
Programme& Branch	All BE/BTech Engineering and Technology Branches	Sem.	Category	L	т	Ρ	Credi
Prerequisites	JAPANESE LANGUAGE LEVEL 3	All	OE	3	0	0	3
Preamble	The intermediate level of Japanese provides understanding of which also includes 150 Kanji's and also provides the ability to						
Unit – I	Introduction to Reasoning:		•				9
Causes and Sequ	ences-Causes and Effects-Interrogative Patterns-Adjective as a Network	oun -Basic C	Questions and	Kanji	s		
Unit – II	Introduction to Exchanging of things:						9
	iving and Receiving of Things-Polite Expression of Request-Indic	cating a Pur	pose of Action	is-Ba	sic Q	uantif	iers-Basi
Questions and kar	nji's.						
Unit – III	nji's. Introduction to States of an Action:						9
Unit – III		Adverbs- C	onvey informa	tion -	Basic	Ques	
Unit – III Sentence Pattern	Introduction to States of an Action:	Adverbs- C	onvey informa	tion -	Basic	Ques	
Unit – III Sentence Pattern kanji's. Unit – IV	Introduction to States of an Action:           to Indicate Appearance-Degree of Action and State-Adjectives as           Introduction to Causative Verbs:           of Verbs-Asking Opportunity to do something-Hypothetical Que		-				stions an
Unit – III Sentence Pattern kanji's. Unit – IV Causative Forms	Introduction to States of an Action: to Indicate Appearance-Degree of Action and State-Adjectives as Introduction to Causative Verbs: of Verbs-Asking Opportunity to do something-Hypothetical Que nji's.		-				stions an
Unit – III Sentence Pattern kanji's. Unit – IV Causative Forms Questions and Ka Unit – V	Introduction to States of an Action:           to Indicate Appearance-Degree of Action and State-Adjectives as           Introduction to Causative Verbs:           of Verbs-Asking Opportunity to do something-Hypothetical Que	estions-Judge	ement and Co	ourse	of a		stions an 9 ons-Basi
Unit – III Sentence Pattern kanji's. Unit – IV Causative Forms Questions and Ka Unit – V	Introduction to States of an Action:           to Indicate Appearance-Degree of Action and State-Adjectives as           Introduction to Causative Verbs:           of Verbs-Asking Opportunity to do something-Hypothetical Que nji's.           Introduction to Relationship in Social Status:	estions-Judge	ement and Co	ourse	of a		stions an 9 ons-Bas 9
Unit – III Sentence Pattern kanji's. Unit – IV Causative Forms Questions and Ka Unit – V	Introduction to States of an Action:           to Indicate Appearance-Degree of Action and State-Adjectives as           Introduction to Causative Verbs:           of Verbs-Asking Opportunity to do something-Hypothetical Que nji's.           Introduction to Relationship in Social Status:	estions-Judge	ement and Co	ourse	of a		stions an 9 ons-Bas
Unit – III Sentence Pattern kanji's. Unit – IV Causative Forms Questions and Ka Unit – V Honorific expressi TEXT BOOK:	Introduction to States of an Action:           to Indicate Appearance-Degree of Action and State-Adjectives as           Introduction to Causative Verbs:           of Verbs-Asking Opportunity to do something-Hypothetical Que nji's.           Introduction to Relationship in Social Status:	ons-Basic Q	ement and Co uestions and k	ourse Kanji's	of a	n acti	stions an 9 ons-Bas 9 Total:4
Unit – III Sentence Pattern kanji's. Unit – IV Causative Forms Questions and Ka Unit – V Honorific expressi TEXT BOOK:	Introduction to States of an Action: to Indicate Appearance-Degree of Action and State-Adjectives as Introduction to Causative Verbs: of Verbs-Asking Opportunity to do something-Hypothetical Que nji's. Introduction to Relationship in Social Status: ons- Respectful expressions- Humble expressions-Polite expression	ons-Basic Q	ement and Co uestions and k	ourse Kanji's	of a	n acti	stions ar 9 ons-Bas 9 Total:4
Unit – III Sentence Pattern kanji's. Unit – IV Causative Forms Questions and Ka Unit – V Honorific expressi TEXT BOOK: 1. "MINNA N REFERENCES:	Introduction to States of an Action: to Indicate Appearance-Degree of Action and State-Adjectives as Introduction to Causative Verbs: of Verbs-Asking Opportunity to do something-Hypothetical Que nji's. Introduction to Relationship in Social Status: ons- Respectful expressions- Humble expressions-Polite expression	ers & Distrib	ement and Co uestions and k	ourse Kanji's	of a	n acti	stions ar 9 ons-Bas 9 Total:4

		UTCOM ion of t		se, the st	udents	will be a	ble to							BT Maj (Highest	
CO1	read	d and Ur	nderstan	d Relatior	nship of	a Person							F	Rememberir	ng (K1)
CO2	und	erstand	Convers	ations Us	ed in Ev	veryday A	ctivities.						ι	Inderstandi	ng (K2)
CO3	com	preheno	d Conter	nts at Nea	r Natura	l Speed.							ι	Jnderstandi	ng (K2)
CO4	und	erstand	the Kanj	ji's in Japa	anese S	cript							ι	Jnderstandi	ng (K2)
CO5	com	preheno	d Orally	Presented	d Materia	als.							ι	Jnderstandi	ng (K2)
						Маррі	ng of C(	Os with	POs ar	d PSOs					
COs/F	POs	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	P010	) PO11	PO1	2 PSO1	PSO2
CO	1								1	2	3		3		
CO	2								1	2	3		3		
CO	3								1	2	3		3		
CO	4								1	2	3		3		
CO	5								1	2	3		3		
1 – Slię	ght, 2	– Mode	rate, 3 –	Substant	ial, BT-	Bloom's <sup>-</sup>	Faxonom	У						I	
						ASSE	SSMEN		ERN - T	HEORY					
	st / Bl Catego	oom's ory*	Re	ememberi (K1) %	ing	Understa (K2)	•	Apply (K3)		Analyzi (K4) %		Evaluating (I %	(5)	Creating (K6) %	Total %
	CAT	1		75		25									100
	CAT	2		25		75									100
	CAT	3		25		75									100
	ESE	=		25		75									100

	22GEO11 - FRENCH LANGUAGE LE	EVEL 1					
	(Offered by Department of Electronics and Commun	ication Engir	neering)				
Programme& Branch	All BE/BTech Engineering and Technology Branches	Sem.	Category	L	Т	Р	Credi
Prerequisites	Fundamentals of French Language	All	OE	4	0	0	4
Preamble	This course provides a foundation of the French language as lifestyle of France and other French-speaking nations. The str and acquire basic everyday vocabulary. By following the struct learning process, one can comprehend the structure of senter	udent will be ctured curricu	learning how	to intı ticing	oduc the s	e him/ ame a	herself as per the
Unit – I	Introduction culture, alphabets, pronunciation, accents, rules, and terms for p	vonunciation	(mas-fem) S	aluta	lione	numh	<b>12</b>
Unit – II	Daily Life			aiuta		nume	12
	Francophonie's, adjectives – colors, week, months, seasons.						12
Unit – III	Articles and Verbs						12
Articles - Indefinite	, definite, partitive, and contracted, (examples), introductions to ve	erbs, 1 <sup>st</sup> grou	p of verb				
Unit – IV	In the City		•				12
2 <sup>nd</sup> group of verback expressions)	s, irregular verbs (avoir, etre, faire) present yourself & ne	egative sent	ences. (faire	and	Joue	r verb	with th
Unit – V	Food and Culture						12
Prepositions – pre (recent future)	position of places (country, cities and etc), Imperative mode, ir	nvitations, cu	ulture – food	(wine	, che	ese	) Futur
TEXT BOOK:							Totalle
	n						
1. A1 – saiso							
1.A1 – saiso <b>REFERENCES:</b>							
REFERENCES:	e les francais – 0 and 1						

		UTCOM		se, the st	udents	will be a	ble to						(	BT Mapı Highest L	
CO1	Und	lerstand	the grar	nmatical s	structur	e of the la	nguage a	and intro	duce se	elf to oth	ers.		Rem	nembering	j (K1)
CO2	Und	lerstand	basic ve	erbs and a	ppropri	ate vocab	ulary.						Und	erstanding	g (K2)
CO3	Ask	for direct	ctions ar	nd arrange	e for tra	nsportatio	n, etc, as	s neede	d.				Und	erstanding	g (K2)
CO4	Und	lerstand	the food	habits of	France	and ask	for appoi	intments	i				Und	erstanding	g (K2)
CO5	Lea	rn to soo	cialize in	French-s	peaking	g countries	6						Und	erstanding	g (K2)
						Маррі	ng of C	Os with	POs ar	d PSOs					
COs/F	POs	P01	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO	1								1	2	3		3		2
CO	2								1	2	3		3		2
CO	3								1	2	3		3		2
CO	4								1	2	3		3		2
CO	5								1	2	3		3		2
1 – Slig	ght, 2	– Mode	rate, 3 –	Substant	ial, BT-	Bloom's T	Faxonom	iy							
						ASSE	SSMEN <sup>.</sup>		ERN - T	HEORY					
	st / Bl Categ	oom's ory*	Re	ememberi (K1) %	ing	Understa (K2)		Apply (K3)		Analyzi (K4) 9		Evaluating (K5) %		reating K6) %	Total %
	CAT	[1		75		25									100
	CAT	2		25		75									100
	CAT	3		25		75									100
	ESI	E		25		75									100
* ±3%	may b	be varied	d (CAT 1	,2,3 – 50	marks a	& ESE – 1	00 mark	s)	1		·				

	22GEO12 -FRENCH LANGUAGE LE								
	(Offered by Department of Electronics and Commun	ication Engi	neering)						
Programme& Branch	All BE/BTech Engineering and Technology Branches	Sem.	Category	L	т	Ρ	Credi		
Prerequisites	Fundamentals of French Language	All	OE	4	0	0	4		
Preamble	This course is designed to assist students in developing voca Framework of Reference for Languages at the A2 level. This structures as well as the acquisition of vocabulary necessary circumstances. The learner will be able to develop a thorough confidently express themselves in everyday circumstances.	course will a to comprehe	aid in the integ end and respo	ration and in	n of b i ever	asic g yday			
Unit – I	French and You						12		
	s & Weakness, Recommendations, Sentiments, Motivations, abore agulars and irregulars), Reflexive Verbs, Prepositions	ut favorite fil	ms and Types	s of s	creer	ns in t	he movi		
Unit – II	Eat and Repeat						12		
	Recopies, Types of meals, Describing House and Kitchen, Pres nt continuous tense, Simple conditional form	entation of	the recipe, Co	ompa	rative	es, Po	ossessiv		
	Recopies, Types of meals, Describing House and Kitchen, Pres	entation of	the recipe, Co	ompa	irative	es, Po	ossessive		
pronouns, Prese Unit – III Invitations, pre	Recopies, Types of meals, Describing House and Kitchen, Pres nt continuous tense, Simple conditional form		• ·				12		
pronouns, Prese Unit – III Invitations, pre	Recopies, Types of meals, Describing House and Kitchen, Pres nt continuous tense, Simple conditional form <b>Vacation</b> sentation, Greetings, Goodbyes, Activities on vacation,		• ·				12		
pronouns, Prese Unit – III Invitations, pre Recommendatio Unit – IV Favorite persons	Recopies, Types of meals, Describing House and Kitchen, Pres nt continuous tense, Simple conditional form <b>Vacation</b> sentation, Greetings, Goodbyes, Activities on vacation, ns on various tours, Past perfect, Past imperfect tense	past expei	riences, Des	cribir	ng fa	avorite	12 e place		
pronouns, Prese Unit – III Invitations, pre Recommendatio Unit – IV Favorite persons	Recopies, Types of meals, Describing House and Kitchen, Present continuous tense, Simple conditional form         Vacation         sentation, Greetings, Goodbyes, Activities on vacation, ns on various tours, Past perfect, Past imperfect tense         Likes and Views         & things, Giving advice, Experience, Moods, Illness, Discomforts	past expei	riences, Des	cribir	ng fa	avorite	12 e place		
pronouns, Prese Unit – III Invitations, pre Recommendatio Unit – IV Favorite persons Tourist, Pharma Unit – V Habits, customs	Recopies, Types of meals, Describing House and Kitchen, Present continuous tense, Simple conditional form         Vacation         sentation, Greetings, Goodbyes, Activities on vacation, ns on various tours, Past perfect, Past imperfect tense         Likes and Views         s & things, Giving advice, Experience, Moods, Illness, Discomfortscist & Patient), Past perfect, Past indefinite, Imperative	past exper	riences, Des s, Roleplay (D	cribir	ng fá · & Pá	avorite atient,	12 e place 12 Guide a		
pronouns, Prese Unit – III Invitations, pre Recommendatio Unit – IV Favorite persons Tourist, Pharma Unit – V Habits, customs	Recopies, Types of meals, Describing House and Kitchen, Present continuous tense, Simple conditional form         Vacation         sentation, Greetings, Goodbyes, Activities on vacation, ns on various tours, Past perfect, Past imperfect tense         Likes and Views         s & things, Giving advice, Experience, Moods, Illness, Discomforts cist & Patient), Past perfect, Past indefinite, Imperative         Then and Now         , circumstances of the past and present, Debates on past and present	past exper	riences, Des s, Roleplay (D	cribir	ng fá · & Pá	avorite atient,	12 e place 12 Guide d		
pronouns, Prese Unit – III Invitations, pre Recommendatio Unit – IV Favorite persons Tourist, Pharma Unit – V Habits, customs	Recopies, Types of meals, Describing House and Kitchen, Present continuous tense, Simple conditional form         Vacation         sentation, Greetings, Goodbyes, Activities on vacation, ns on various tours, Past perfect, Past imperfect tense         Likes and Views         s & things, Giving advice, Experience, Moods, Illness, Discomforts cist & Patient), Past perfect, Past indefinite, Imperative         Then and Now         , circumstances of the past and present, Debates on past and present	past exper	riences, Des s, Roleplay (D	cribir	ng fá · & Pá	avorite atient,	12 e place 12 Guide o 12 ect tense		
pronouns, Prese Unit – III Invitations, pre Recommendatio Unit – IV Favorite persons Tourist, Pharma Unit – V Habits, customs Past perfect and	Recopies, Types of meals, Describing House and Kitchen, Present continuous tense, Simple conditional form         Vacation         sentation, Greetings, Goodbyes, Activities on vacation, ns on various tours, Past perfect, Past imperfect tense         Likes and Views         s & things, Giving advice, Experience, Moods, Illness, Discomforts cist & Patient), Past perfect, Past indefinite, Imperative         Then and Now         , circumstances of the past and present, Debates on past and present comparatives.	past exper	riences, Des s, Roleplay (D	cribir	ng fá · & Pá	avorite atient,	<b>12</b> e place <b>12</b> Guide <b>12</b> ect tense		
pronouns, Prese Unit – III Invitations, pre Recommendatio Unit – IV Favorite persons Tourist, Pharma Unit – V Habits, customs Past perfect and TEXT BOOK:	Recopies, Types of meals, Describing House and Kitchen, Present continuous tense, Simple conditional form           Vacation           sentation, Greetings, Goodbyes, Activities on vacation, ns on various tours, Past perfect, Past imperfect tense           Likes and Views           s & things, Giving advice, Experience, Moods, Illness, Discomforts cist & Patient), Past perfect, Past indefinite, Imperative           Then and Now           , circumstances of the past and present, Debates on past and present comparatives.	past exper	riences, Des s, Roleplay (D	cribir	ng fá · & Pá	avorite atient,	12 e place 12 Guide 12 ect tense		
pronouns, Prese Unit – III Invitations, pre Recommendatio Unit – IV Favorite persons Tourist, Pharma Unit – V Habits, customs Past perfect and TEXT BOOK: 1. A2 – Sa REFERENCES:	Recopies, Types of meals, Describing House and Kitchen, Present continuous tense, Simple conditional form           Vacation           sentation, Greetings, Goodbyes, Activities on vacation, ns on various tours, Past perfect, Past imperfect tense           Likes and Views           s & things, Giving advice, Experience, Moods, Illness, Discomforts cist & Patient), Past perfect, Past indefinite, Imperative           Then and Now           , circumstances of the past and present, Debates on past and present comparatives.	past exper	riences, Des s, Roleplay (D	cribir	ng fá · & Pá	avorite atient,	<b>12</b> e place <b>12</b> Guide <b>12</b> ect tense		

		UTCON		se, the st	tudents	will be a	able to						()	BT Mapp lighest L	
CO1	Und	lerstanc	the Frer	nch langu	age in c	leep and	its usag	е					Rem	nembering	g (K1)
CO2	Pre	paration	of their l	Favorite r	ecipes,	Know the	e Object	s used i	n Kitche	en and h	ouse.		Und	erstandin	g (K2)
CO3	Con	iverse a	bout thei	r vacatio	n, their F	avorite [	Destinati	on					Und	erstandin	g (K2)
CO4	Und	lerstanc	l comple>	verbs ar	nd be at	ole to con	nmunica	te about	t their p	ast expe	riences		Und	erstandin	g (K2)
CO5	Kno	w the d	ifference	between	Past ar	nd Preser	nt and C	ompare	them.				Und	erstandin	g (K2)
						Mappir	ng of CC	Ds with	POs an	d PSOs	;				
COs/P	POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO	1								1	2	3		3		
CO	2								1	2	3		3		
CO	3								1	2	3		3		
CO	4								1	2	3		3		
CO	5								1	2	3		3		
1 – Slig	ght, 2	– Mode	erate, 3 –	Substan	tial, BT-	Bloom's	Taxono	my							
						ASSES	SMENT		ERN - T	HEORY					
-	st / Bl Categ	oom's ory*	Re	member (K1) %	ing l	Understa (K2)		Apply (K3)		Analyz (K4) 9		Evaluating (K5) %		eating K6) %	Total %
	CAT	Г1		75		25									100
	CAT	Г2		25		75									100
	CAT	ГЗ		25		75									100
	ES	F		25		75									100

	22GE013- FRENCH LANGUAGE LE	-					
	(Offered by Department of Electronics and Commun	ication Engir	neering)	1	1	1	
Programme& Branch	All BE/BTech Engineering and Technology Branches	Sem.	Category	L	т	Р	Credit
Prerequisites	Fundamentals of French Language	All	OE	3	0	0	3
Preamble	This course gives knowledge regarding a variety of personal a improving vocabulary and speaking abilities to reply to and see the ability to articulate yourself and arrange appointments. Wi grammatical structures needed to respond confidently in ever how Natives communicate.	ek information the perseveration of the perseverati	on in those set ince, one can r	tings naste	It als er all o	so give	es you essentia
Unit – I	Start Over						9
	s, Discuss a day in life, work, problems in the world, Predictions a ect and future tense.	bout the futu	ire (actions and	d situ	ations	s), Hy	pothetica
Unit – II	Prohibitions and More						9
Deskikister OLT					1.14	and and	ion to rea
	pations, Habits to change, social customs, Use of the subjunctive oks vs movies, usage of connectors, Object Direct and Indirect.	, Describe s	ynopsis of Mo	vie ai	nd its	relat	
		, Describe s	ynopsis of Mo	vie ai	nd its	relat	9
life, Debate on boo Unit – III Write a letter by c	oks vs movies, usage of connectors, Object Direct and Indirect.	ose solution	s, Recommen				9
life, Debate on boo Unit – III Write a letter by c	bks vs movies, usage of connectors, Object Direct and Indirect.  Let's be Creative describing the problem, talk about desires and Necessities, prop	ose solution	s, Recommen				9
life, Debate on boo Unit – III Write a letter by c Create an Advertis Unit – IV Talk about Tours,	bks vs movies, usage of connectors, Object Direct and Indirect. Let's be Creative describing the problem, talk about desires and Necessities, prop sement, Give Instructions, Imperative negative, Use of Object Dire	ose solution ct, and Indire	s, Recommendect	datio	ns an	d Su	9 ggestions 9
life, Debate on boo Unit – III Write a letter by c Create an Advertis Unit – IV Talk about Tours,	bks vs movies, usage of connectors, Object Direct and Indirect.         Let's be Creative         describing the problem, talk about desires and Necessities, prop         sement, Give Instructions, Imperative negative, Use of Object Direct         Travel and Communication         Types of tourism and communication, Send messages, petitions,	ose solution ct, and Indire	s, Recommendect	datio	ns an	d Su	9 ggestions 9
life, Debate on boo Unit – III Write a letter by c Create an Advertis Unit – IV Talk about Tours, and Guide, Tourist Unit – V Expression of Inter-	bks vs movies, usage of connectors, Object Direct and Indirect.         Let's be Creative         describing the problem, talk about desires and Necessities, propsement, Give Instructions, Imperative negative, Use of Object Direct Direct         Travel and Communication         Types of tourism and communication, Send messages, petitions, ts and Travel agents), Past Pluscumperfect, All Past tenses.	ose solution ct, and Indire Talk to peo	s, Recommentect	dation	ns an e, Ro	d Suç leplay	9 ggestions 9 (Tourist: 9
life, Debate on boo Unit – III Write a letter by c Create an Advertis Unit – IV Talk about Tours, and Guide, Tourist Unit – V Expression of Inter-	bks vs movies, usage of connectors, Object Direct and Indirect.         Let's be Creative         describing the problem, talk about desires and Necessities, propsement, Give Instructions, Imperative negative, Use of Object Direct Direct         Travel and Communication         Types of tourism and communication, Send messages, petitions, ts and Travel agents), Past Pluscumperfect, All Past tenses.         Let's Talk         erests, Sentiments, Feelings, Sensations, Manias etc. Certain	ose solution ct, and Indire Talk to peo	s, Recommentect	dation	ns an e, Ro	d Suç leplay	9 ggestions 9 (Tourist: 9
life, Debate on boo Unit – III Write a letter by c Create an Advertis Unit – IV Talk about Tours, and Guide, Tourist Unit – V Expression of Inter-	bks vs movies, usage of connectors, Object Direct and Indirect.         Let's be Creative         describing the problem, talk about desires and Necessities, propsement, Give Instructions, Imperative negative, Use of Object Direct Direct         Travel and Communication         Types of tourism and communication, Send messages, petitions, ts and Travel agents), Past Pluscumperfect, All Past tenses.         Let's Talk         erests, Sentiments, Feelings, Sensations, Manias etc. Certain	ose solution ct, and Indire Talk to peo	s, Recommentect	dation	ns an e, Ro	d Suç leplay	9 ggestions 9 (Tourist: 9 ne use o
life, Debate on boo Unit – III Write a letter by c Create an Advertis Unit – IV Talk about Tours, and Guide, Tourist Unit – V Expression of Inte superlatives, Excla	bks vs movies, usage of connectors, Object Direct and Indirect.         Let's be Creative         describing the problem, talk about desires and Necessities, prop         sement, Give Instructions, Imperative negative, Use of Object Direct Direct         Travel and Communication         Types of tourism and communication, Send messages, petitions, ts and Travel agents), Past Pluscumperfect, All Past tenses.         Let's Talk         erests, Sentiments, Feelings, Sensations, Manias etc. Certain amatory phrases, subjunctives.	ose solution ct, and Indire Talk to peo	s, Recommentect	dation	ns an e, Ro	d Suç leplay	9 ggestions 9 (Tourist 9 ne use o
life, Debate on boo Unit – III Write a letter by c Create an Advertis Unit – IV Talk about Tours, and Guide, Tourist Unit – V Expression of Inte superlatives, Excla	bks vs movies, usage of connectors, Object Direct and Indirect.         Let's be Creative         describing the problem, talk about desires and Necessities, prop         sement, Give Instructions, Imperative negative, Use of Object Direct Direct         Travel and Communication         Types of tourism and communication, Send messages, petitions, ts and Travel agents), Past Pluscumperfect, All Past tenses.         Let's Talk         erests, Sentiments, Feelings, Sensations, Manias etc. Certain amatory phrases, subjunctives.	ose solution ct, and Indire Talk to peo	s, Recommentect	dation	ns an e, Ro	d Suç leplay	9 ggestions 9 (Tourist: 9 ne use o
life, Debate on boo Unit – III Write a letter by c Create an Advertis Unit – IV Talk about Tours, and Guide, Tourist Unit – V Expression of Intr superlatives, Excla TEXT BOOK: 1. B1 – Saist REFERENCES:	bks vs movies, usage of connectors, Object Direct and Indirect.         Let's be Creative         describing the problem, talk about desires and Necessities, prop         sement, Give Instructions, Imperative negative, Use of Object Direct Direct         Travel and Communication         Types of tourism and communication, Send messages, petitions, ts and Travel agents), Past Pluscumperfect, All Past tenses.         Let's Talk         erests, Sentiments, Feelings, Sensations, Manias etc. Certain amatory phrases, subjunctives.	ose solution ct, and Indire Talk to peo	s, Recommentect	dation	ns an e, Ro	d Suç leplay	9 ggestions 9 (Tourist 9 ne use o

		JTCOM		se, the st	udents	will be al	ble to						()	BT Mapp Highest L	
CO1	Lear	n on Fu	iture tens	se.									Rem	nembering	J (K1)
CO2	Unde	erstand	Permiss	ions and	Prohibit	ions.							Und	erstanding	g (K2)
CO3	Knov	wing ab	out Lette	er writing,	Creating	g Ads, Ex	pressing	Desires	s, and Ir	nstructing	others.		Und	erstanding	g (K2)
CO4	Unde	erstand	ing rules	for travel	and En	hancing c	communi	cations.					Und	erstanding	g (K2)
CO5	Expr	essing	the feelir	ngs and e	motions	using ad	vanced (	gramma	r				Und	erstanding	g (K2)
						Маррі	ng of CO	Os with	POs ar	nd PSOs					
COs/F	POs	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO	1								1	2	3		3		2
CO	2								1	2	3		3		2
CO	3								1	2	3		3		2
CO	4								1	2	3		3		2
CO	5								1	2	3		3		2
1 – Slię	ght, 2 -	– Mode	rate, 3 –	Substant	ial, BT-	Bloom's ⊺	Faxonom	у						·	
						ASSE	SSMEN	ΓΡΑΤΤΙ	ERN - 1	HEORY					
	st / Blo Catego	oom's ory*	Re	memberi (K1) %	ing	Understa (K2)	•	Apply (K3)		Analyzi (K4) %		Evaluating (K5) %		eating K6) %	Total %
	CAT	1		75		25									100
	CAT	2		25		75									100
	CAT	3		25		75									100
	ESE			25		75									100

	(Offered by Department of Electronics and Commun	ication Engi	neering)				
Programme& Branch	All BE/BTech Engineering and Technology Branches	Sem.	Category	L	т	Р	Credit
Prerequisites	Fundamentals of Spanish Language	All	OE	4	0	0	4
Preamble	This course provides a foundation of the Spanish language and lifestyle of Spain and other Spanish-speaking nation him/herself and acquire basic everyday vocabulary. By foll same as per the learning process, one can comprehend communications.	s. The stud owing the s	lent will be le tructured curri	arnin culun	g ho n and	w to d prac	introduce ticing the
Unit – I	Greetings and Good byes (Los Saludos y Despidirse):						12
	oduction,Formal and Informal ways of introducing oneself n, Parts of Grammar – Noun, Personal Pronoun, Describe surrour			Num	oers,	Coun	ntries and
Unit – II	Vida Cotidiana (Daily Life):						12
	ays of the week, Months of the year, Seasons, Verb (To be, To n, simple sentences	Have), Adve	erbs, Likes and	Disli	kes, I	Perso	nality and
Unit – III	Friends and Family (Amigos y La Familia):						12
Vocabulary of fam Regular and Irregu	ily, Animals, Professions, Parts of the body, Opinions on family lar verbs.	cultures, Art	ticles – Definite	e and	l Inde	finite,	Hobbies
Unit – IV	In the City (En la Cuidad):						12
	y, Name of the places, asking for directions, Helping each other, ar - Possessive articles, prepositions	Description	of house and	its co	mpor	nents,	Modes o
Unit – V	Food and Culture( La comida y cultura):						12
	/arieties), shopping, ordering at a restaurant, inviting to parties ast tense (all three tenses-Past Participle, Indefinite past and past				omer,	sales	sman and
							Total:60
TEXT BOOK:							
TEXT BOOK:	icas Libro de Alumno nivel 1, Ma Angeles Palomino , edelsa, G		ASCALIA, S.A.	, plaz	a cui	dad d	le salta,3
1 Chicos Ch	DRID(ESPANA).						
1 Chicos Ch							

		UTCOM ion of t		se, the st	udents	will be a	ble to						(	BT Mapı Highest L	
CO1	und	erstand	the gram	nmatical s	tructure	of the lar	nguage a	and intro	duce se	elf to othe	ers.		Rem	nembering	J (K1)
CO2	und	erstand	basic ve	rbs and a	ppropria	ate vocab	ulary.						Und	erstanding	g (K2)
CO3	ask	for direa	ctions an	d arrange	for trar	sportatio	n, etc, as	needeo	ł.				Und	erstanding	g (K2)
CO4	und	erstand	the food	habits of	Spain a	nd Latin o	countries	and asl	k for ap	pointmer	nts		Und	erstanding	g (K2)
CO5	lear	n to soc	ialize in S	Spanish s	peaking	countrie	S						Und	erstanding	g (K2)
						Маррі	ing of C	Os with	POs ar	d PSOs					
COs/P	os	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	P011	PO12	PSO1	PSO2
CO	1								1	2	3		3		2
CO2	2								1	2	3		3		2
COS	3								1	2	3		3		2
CO4	4								1	2	3		3		2
COS	5								1	2	3		3		2
1 – Sliç	ght, 2	– Mode	rate, 3 –	Substant	ial, BT-	Bloom's T	Taxonom	iy							
						ASSE	SSMEN	Γ ΡΑΤΤΙ	ERN - T	HEORY					
	st / Ble Catego	oom's ory*	Re	memberi (K1) %	ing	Understa (K2)	-	Apply (K3)		Analyzi (K4) %		Evaluating (K5) %		eating K6) %	Total %
	CAT	1		75		25									100
	CAT	2		25		75									100
	CAT	3		25		75									100
	ESE	=		25		75									100

	(Offered by Department of Electronics and Commur	nication Engin	neering )				
Programme& Branch	All BE/BTech Engineering and Technology Branches	Sem.	Category	L	т	Р	Credit
Prerequisites	Fundamentals of Spanish Language	All	OE	4	0	0	4
Preamble	This course aims to help the Learner to acquire the vocabular level competence. This course will help to assimilate the basi understand and reciprocate in daily life situations on a broade comprehensive understanding of the Spanish grammar and c	cgrammar st er sense. A tl	ructures and g	jain v er will	ocabu be al	ulary t	o gain a
Unit – I	Spanish and You (El Español y tú)	<b>x</b>	<b>*</b>				12
	& Weakness, Recommendations, Sentiments, Motivations, Abo ulars and irregulars), Reflexive Verbs, Prepositions	ul tavorite fil	ms and Types	SUTS	creer	is in "	
Unit – II	Eat and Repeat (Comer y repetir)						12
	ecipies, Types of meals, Describing House and Kitchen, Presenta is tense, Simple conditional form	ation of recip	e, Comparativ	es, P	osses	ssive	pronouns
Unit – III	Its Vacation Time (Tiempo de vacaciones)						12
	ntation, Greetings, Goodbyes, Activities on vacation, past experie Past perfect, Past imperfect tense, Usage of Todavia or No	ences, Desc	ribing favorite	place	e, Red	comm	endation
Unit – IV	Likes and Views (Gustasyvistas)						12
	& things, Giving advices, Experience, Moods, Illness, Discomfor st & Patient), Past perfect, Past indefinite, Imperative	ts, Symptom	is, Roleplay ([	Docto	r&P	atient	, Guide &
Unit – V	Then and Now( Antes y Ahora)						12
	circumstances of the past and present, Debates on past and pr Present comparatives.	esent situati	ons and feelin	igs. F	Past i	mperf	ect tense
							Total:60
TEXT BOOK:							
	TERNACIONAL 2 (A2) Jaime Corpas, AgusinGarmendia, Nuria rs Pvt LTD, 86, UB Jawahar Nagar, Kamla Nagar, Delhi-110007.	a Sanchez,	Carmen Soria	no G	oyal	Publis	shers and
	is Fit LTD, 60, 0D Jawanai Nagai, Kamia Nagai, Denni-110007.						
	is FVLLTD, 60, 0D Jawallal Nayal, Kalilia Nayal, Delli-110007.						

		JTCOM ion of t		se, the st	udents	will be a	ble to						(	BT Mapp Highest L	
CO1	unde	erstand	the Spa	nish langu	age in	deep and	its usage	e					Rem	nembering	<b>j</b> (K1)
CO2	prep	are for	their Fav	vorite recij	oes, Kn	ow the Ob	jects us	ed in Kit	chen ar	nd house			Und	erstanding	g (K2)
CO3	conv	/erse ab	out thei	r vacation	, their F	avorite De	estinatior	า					Und	erstanding	g (K2)
CO4 understand complex verbs and be able to communicate about their past experiences Understanding										g (K2)					
CO5	knov	w the dif	ference	between	Past an	d Present	and Cor	mparing	them.				Und	erstanding	g (K2)
						Маррі	ng of C(	Os with	POs ar	nd PSOs					
COs/F	POs	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO	1								1	2	3		3		2
CO	2								1	2	3		3		2
CO	3								1	2	3		3		2
CO	4								1	2	3		3		2
CO	5								1	2	3		3		2
1 – Slię	ght, 2	– Mode	rate, 3 –	Substant	ial, BT-	Bloom's	Faxonom	iy				· · · · · · · · · · · · · · · · · · ·			
						ASSE	SSMEN	Γ ΡΑΤΤΙ	ERN - T	HEORY					
	st / Blo Catego	oom's ory*	Re	memberi (K1) %	ing	Understa (K2)	•	Apply (K3)	-	Analyzi (K4) 9		Evaluating (K5) %		eating K6) %	Total %
	CAT	1		75		25									100
	CAT	2		25		75									100
	CAT	3		25		75									100
	ESE	=		25		75									100
' ±3%	may b	e varied	d (CAT 1	,2,3 – 50	marks &	& ESE – 1	00 mark	s)							

	22GEO16 - SPANISH LANGUAGE L		• 、				
	(Offered by Department of Electronics and Commun	ication Engin	eering)	1		1	
Programme& Branch	All BE/BTech Engineering and Technology Branches	Sem.	Category	L	Т	Р	Credi
Prerequisites	Fundamentals of Spanish Language	All	OE	3	0	0	3
Preamble	This course provides enriching information about various every enhances the vocabulary and speaking ability to respond to an equips one to express opinions and negotiate appointments. W grammatical structure to answer confidently in everyday situati speak.	id also seek ii /ith diligent le	nformation in t arning one ca	hose n cap	situa ture a	tions. all bas	It also sic
Unit – I	Start Over( Volver a Empezar)						9
	es, Discuss a day in life, work, problems in the world, Prediction fect and future tense.	ns about futur	re (actions an	d situ	ation	s),Hy	pothetica
Unit – II	Prohibitions and More(Prohibiciones y mas)						9
	gations, Habits to change, social customs, Use of subjunctive, De vs movies, usage of connectors, Object Direct and Indirect.	escribe synop	sis of Movie a	nd its	s rela	tion to	o real life
Unit – III	Let's be Creative (Seamoscreatives)						9
	describing the problem,talk about desires and Necessities, prop isement, Give Instructions, Imperative negative, Use of Object Dire			dation	s an	d Sug	gestion
Unit – IV	Travel and Communication (Viajar y comunicar)						9
	, Types of tourism and communication, Send messages, petitions, nd Travel agents), Past Pluscumperfect, All Past tenses.	Talk to peop	le on telephon	e, Ro	le pla	ay(To	urists an
Unit – V	Let's Talk(Hablemos)						9
	erests, Sentiments, Feelings, Sensations, Manias etc. Certain sugases, subjunctive.	gestions to m	ake a better fu	uture,	use	of sup	perlatives
							Total:4
TEXT BOOK:							
	rnational 3 (B1) [Paperback] Jaime Corpas, Agusin Garmendia, Nu ors Pvt LTD, 86, UB Jawahar Nagar, Kamla Nagar, Delhi-110007.	uria Sanchez,	Carmen Soria	ano G	oyal	Publis	shers an
REFERENCES:							

		UTCOM ion of t		rse, the stu	dents w	vill be ab	le to						(1	BT Map Highest L				
CO1	learr	n on Fut	ure ten	se.									Rem	nembering	g (K1)			
CO2	unde	erstand	about F	Permissions a	and Pro	hibitions.							Und	erstandin	g (K2)			
CO3	knov	ving abo	out Lette	er writing, Cr	eating /	Ads, Expr	essing D	Desires a	and Inst	ructing (	Others.		Und	erstandin	anding (K2)			
CO4	unde	erstandi	ng rules	s for travel ar	nd Enha	ince com	municati	ons.					Und	erstandin	g (K2)			
CO5	expr	essing t	the feeli	ings and em	otions u	sing adva	anced gr	ammar					Und	erstandin	g (K2)			
						Mappin	g of CO	s with F	POs and	d PSOs								
COs/F	<b>POs</b>	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2			
CO	1								1	2	3		3		2			
CO	2								1	2	3		3		2			
CO	3								1	2	3		3		2			
CO	4								1	2	3		3		2			
CO	5								1	2	3		3		2			
1 – Sli	ght, 2	– Mode	rate, 3 ·	– Substantia	I, BT- B	loom's Ta	axonomy	1										
						ASSES	SMENT	PATTE	RN - TH	IEORY								
	est / B Categ	loom's jory*		Remember (K1) %	ing	Understa (K2)		Apply (K3)		Analyz (K4) 9		Evaluating (K5) %		eating K6) %	Total %			
	CA	T1		75		25									100			
	CA	T2		25		75									100			
	CA	T3		25		75									100			
				25		75												

		(Offered by Department of Mechatronics E	Ingineerin	g)				
Program Branch	nme &	All BE/BTech Engineering and Technology Branches	Sem.	Category	L	т	Ρ	Credit
Prerequi	isites	Engineering Economics & Management	7	OE	3	0	0	3
Preamble	•	The purpose of this course to create entrepreneurial awarene		onginooring	atuda	nto		
Unit – I	e	Entrepreneurship Concepts:	ess among	engineening	siuue	1115.		9
	neurshin 8	Entrepreneur- Role in Economic Development - Factors affect	ting Entre	oreneurshin-	Crea	tivitv	and I	
		vs Intrapreneurship- Entrepreneurial Motivation factors –	•					
•	•	Entrepreneurs - Entrepreneurship Development in India	Types of	Lintepreneu	Ship	u L	.nuep	Terreurs
Unit – II		Entrepreneurial Ventures and opportunity assessment:						9
		tion – Bootstrapping, Minipreneurship, Start-ups, Acquirin	na Franci	nising & Soc	vial v	/entu	ring	
		s - Models of market opportunity- Opportunity assessment: Cr						
		ation process, Global opportunities for entrepreneurs.			inty /	10000	Sinci	
Unit – III		Business Plan:						9
		s Model- Business Model Canvas- Objectives of a Business P	lan - Rusir	ess Planning	Proc	ess	- Stri	_
		echnical, Markeling, Financial Feasibility assessment - Compe	titive analy	sis - Commo	n erro	ors ir	Busi	ness Pla
formulation		echnical, Marketing, Financial Feasibility assessment - Compe ntation of the Business Plan: The 'Pitch'- case studies	titive analy	sis - Commo	n erro	ors ir	Busi	ness Pla
	ion - Prese	ntation of the Business Plan: The 'Pitch'- case studies	titive analy	sis - Commo	n erro	ors ir	Busi	ness Plai
Unit – IV	ion - Prese /	ntation of the Business Plan: The 'Pitch'- case studies Financing and accounting:	-					9
Unit – IV Forms of	ion - Prese / f entrepre	ntation of the Business Plan: The 'Pitch'- case studies Financing and accounting: neurial capital – Sources of Financial capital: debt financing	g- Comme	rcial banks a	nd o	ther	sourc	9 es, equit
Unit – IV Forms of financing investors	ion - Prese / of entreprese g: Initial Pu s, Micro-fir	ntation of the Business Plan: The 'Pitch'- case studies Financing and accounting: neurial capital – Sources of Financial capital: debt financing ublic offering (IPO), Private placement - Venture capitalists - nancing, Peer-to-Peer Lending, Crowd funding - Natural ca	g- Comme Angel inve apital. Prej	rcial banks ar estors-New fo	nd o	ther of fir	sourc	<b>9</b> es, equit ig: Impac
Unit – IV Forms of financing investors analysis,	ion - Prese / of entrepred g: Initial Pu s, Micro-fir , Taxation-	ntation of the Business Plan: The 'Pitch'- case studies Financing and accounting: neurial capital – Sources of Financial capital: debt financing iblic offering (IPO), Private placement - Venture capitalists - nancing, Peer-to-Peer Lending, Crowd funding - Natural ca Direct and indirect taxes, Insolvency and Bankruptcy- Case Stu	g- Comme Angel inve apital. Prej	rcial banks ar estors-New fo	nd o	ther of fir	sourc	<b>9</b> es, equit ig: Impac eak eve
Unit – IV Forms of financing investors analysis, Unit – V	ion - Prese / of entrepred g: Initial Pu s, Micro-fir , Taxation-	ntation of the Business Plan: The 'Pitch'- case studies Financing and accounting: neurial capital – Sources of Financial capital: debt financing iblic offering (IPO), Private placement - Venture capitalists - nancing, Peer-to-Peer Lending, Crowd funding - Natural ca Direct and indirect taxes, Insolvency and Bankruptcy- Case Stu Small Business Management:	g- Comme Angel inve apital. Prej udy	rcial banks an estors-New fo paring Financ	nd o orms cial E	ther of fir 3udge	sourc nancir et, Br	9 es, equit <u>y</u> g: Impac eak ever <b>9</b>
Unit – IV Forms of financing investors analysis, Unit – V Definition	ion - Prese f entrepren g: Initial Pu s, Micro-fir , Taxation- n of Small \$	ntation of the Business Plan: The 'Pitch'- case studies Financing and accounting: neurial capital – Sources of Financial capital: debt financing iblic offering (IPO), Private placement - Venture capitalists - nancing, Peer-to-Peer Lending, Crowd funding - Natural ca Direct and indirect taxes, Insolvency and Bankruptcy- Case Stu Scale Industries: Strengths and Weaknesses, Sickness in Sma	g- Comme Angel inve apital. Prej udy	rcial banks an estors-New fo paring Financ es: Symptom	nd o orms cial E s -Ca	ther of fir Budge	sourc nancir et, Br	9 es, equit g: Impac eak even 9 remedies
Unit – IV Forms of financing investors analysis, Unit – V Definition Indian St	ion - Prese f entrepren g: Initial Pu s, Micro-fir , Taxation- n of Small s tartup Ecos	ntation of the Business Plan: The 'Pitch'- case studies Financing and accounting: neurial capital – Sources of Financial capital: debt financing iblic offering (IPO), Private placement - Venture capitalists - nancing, Peer-to-Peer Lending, Crowd funding - Natural ca Direct and indirect taxes, Insolvency and Bankruptcy- Case Stu Scale Industries: Strengths and Weaknesses, Sickness in Sma system – Institutions supporting small business enterprises, Bu	g- Comme Angel inve apital. Prej udy Ill Enterpris isiness Inc	rcial banks an estors-New fo paring Financ es: Symptom ubators – Gov	nd o orms cial E s -Ca	ther of fir 3udge auses nent	sourc nancir et, Br s and Policy	9 es, equit g: Impac eak eve 9 remedies for Sma
Unit – IV Forms of financing investors analysis, Unit – V Definition Indian St Scale Er	ion - Prese f entrepren g: Initial Pu s, Micro-fir , Taxation- n of Small s tartup Ecos nterprises	ntation of the Business Plan: The 'Pitch'- case studies Financing and accounting: neurial capital – Sources of Financial capital: debt financing iblic offering (IPO), Private placement - Venture capitalists - nancing, Peer-to-Peer Lending, Crowd funding - Natural ca Direct and indirect taxes, Insolvency and Bankruptcy- Case Stu Scale Industries: Strengths and Weaknesses, Sickness in Sma	g- Comme Angel inve apital. Prej udy Ill Enterpris isiness Inc	rcial banks an estors-New fo paring Financ es: Symptom ubators – Gov	nd o orms cial E s -Ca	ther of fir 3udge auses nent	sourc nancir et, Br s and Policy	9 es, equit g: Impace eak even 9 remedies for Sma
Unit – IV Forms of financing investors analysis, Unit – V Definition Indian St	ion - Prese f entrepren g: Initial Pu s, Micro-fir , Taxation- n of Small s tartup Ecos nterprises	ntation of the Business Plan: The 'Pitch'- case studies Financing and accounting: neurial capital – Sources of Financial capital: debt financing iblic offering (IPO), Private placement - Venture capitalists - nancing, Peer-to-Peer Lending, Crowd funding - Natural ca Direct and indirect taxes, Insolvency and Bankruptcy- Case Stu Scale Industries: Strengths and Weaknesses, Sickness in Sma system – Institutions supporting small business enterprises, Bu	g- Comme Angel inve apital. Prej udy Ill Enterpris isiness Inc	rcial banks an estors-New fo paring Financ es: Symptom ubators – Gov	nd o orms cial E s -Ca	ther of fir 3udge auses nent	sourc nancir et, Br s and Policy	9 es, equit g: Impac eak even 9 remedies for Sma and Sub
Unit – IV Forms of financing investors analysis, Unit – V Definitior Indian St Scale Er Contracti	ion - Prese f entrepren g: Initial Pu s, Micro-fir , Taxation n of Small s tartup Ecos nterprises ing	ntation of the Business Plan: The 'Pitch'- case studies Financing and accounting: neurial capital – Sources of Financial capital: debt financing iblic offering (IPO), Private placement - Venture capitalists - nancing, Peer-to-Peer Lending, Crowd funding - Natural ca Direct and indirect taxes, Insolvency and Bankruptcy- Case Stu Scale Industries: Strengths and Weaknesses, Sickness in Sma system – Institutions supporting small business enterprises, Bu	g- Comme Angel inve apital. Prej udy Ill Enterpris isiness Inc	rcial banks an estors-New fo paring Financ es: Symptom ubators – Gov	nd o orms cial E s -Ca	ther of fir 3udge auses nent	sourc nancir et, Br s and Policy	9 es, equity g: Impace eak ever 9 remedies for Smal
Unit – IV Forms of financing investors analysis, Unit – V Definition Indian St Scale Er	ion - Prese f entrepren g: Initial Pu s, Micro-fir , Taxation n of Small s tartup Ecos nterprises ing	ntation of the Business Plan: The 'Pitch'- case studies Financing and accounting: neurial capital – Sources of Financial capital: debt financing iblic offering (IPO), Private placement - Venture capitalists - nancing, Peer-to-Peer Lending, Crowd funding - Natural ca Direct and indirect taxes, Insolvency and Bankruptcy- Case Stu Scale Industries: Strengths and Weaknesses, Sickness in Sma system – Institutions supporting small business enterprises, Bu	g- Comme Angel inve apital. Prej udy Ill Enterpris isiness Inc	rcial banks an estors-New fo paring Financ es: Symptom ubators – Gov	nd o orms cial E s -Ca	ther of fir 3udge auses nent	sourc nancir et, Br s and Policy	9 es, equity g: Impace eak even 9 remedies for Sma and Sub
Unit – IV Forms of financing investors analysis, Unit – V Definition Indian St Scale Er Contracti	ion - Prese f entreprei i Initial Pu s, Micro-fir , Taxation-l n of Small s tartup Ecos nterprises ing DOK:	ntation of the Business Plan: The 'Pitch'- case studies Financing and accounting: neurial capital – Sources of Financial capital: debt financing iblic offering (IPO), Private placement - Venture capitalists - nancing, Peer-to-Peer Lending, Crowd funding - Natural ca Direct and indirect taxes, Insolvency and Bankruptcy- Case Stu Scale Industries: Strengths and Weaknesses, Sickness in Sma system – Institutions supporting small business enterprises, Bu	g- Commer Angel inve apital. Prep udy Ill Enterpris isiness Inc sification,	rcial banks a estors-New fo paring Financ es: Symptom ubators – Gov Joint Venture	nd o erms sial E s -Ca /ernn , Me	ther of fir Budge auses nent rger,	sourc nancir et, Br s and Policy FDI	9 es, equit g: Impac eak even 9 remedies for Sma and Sub
Unit – IV Forms of financing investors analysis, Unit – V Definition Indian St Scale Er Contracti	ion - Prese / of entreprend c: Initial Put c, Micro-fir , Taxation	ntation of the Business Plan: The 'Pitch'- case studies Financing and accounting: neurial capital – Sources of Financial capital: debt financing ablic offering (IPO), Private placement - Venture capitalists - nancing, Peer-to-Peer Lending, Crowd funding - Natural ca Direct and indirect taxes, Insolvency and Bankruptcy- Case Stu Scale Industries: Strengths and Weaknesses, Sickness in Sma system – Institutions supporting small business enterprises, Bu - Growth Strategies in small industry – Expansion, Divers	g- Commer Angel inve apital. Prep udy Ill Enterpris isiness Inc sification,	rcial banks a estors-New fo paring Financ es: Symptom ubators – Gov Joint Venture	nd o erms sial E s -Ca /ernn , Me	ther of fir Budge auses nent rger,	sourc nancir et, Br s and Policy FDI	9 es, equit g: Impac eak even 9 remedies for Sma and Sub
Unit – IV       Forms of financing investors analysis,       Unit – V       Definition       Indian St       Scale Er       Contraction       TEXT BC       1.       REFERE       1.       I.	ion - Prese / of entreprese g: Initial Pu s, Micro-fir , Taxation-fir , Taxation-fir , Taxation-fir , Taxation-fir tartup Ecos nterprises ing OOK: Donald F. I ENCES: Robert D. I Hill, Noida,	Intation of the Business Plan: The 'Pitch'- case studies          Financing and accounting:         neurial capital – Sources of Financial capital: debt financing         iblic offering (IPO), Private placement - Venture capitalists -         nancing, Peer-to-Peer Lending, Crowd funding - Natural capital         Direct and indirect taxes, Insolvency and Bankruptcy- Case Stu         Scale Industries: Strengths and Weaknesses, Sickness in Smasystem – Institutions supporting small business enterprises, Bu         - Growth Strategies in small industry – Expansion, Divers         Kuratko, "Entrepreneurship: Theory, Process, Practice", 11 <sup>th</sup> Edi         Hisrich, Michael P. Peters & Dean A. Shepherd, Sabyasachi Sia         2020.	g- Comme Angel inve apital. Pre udy II Enterpris isiness Inc sification, s ition, Ceng	rcial banks an estors-New fo paring Financ ees: Symptom ubators – Gov Joint Venture, age Learning, preneurship",	nd o rms ial E s -Ca vernn , Me Bos	ther of fir Budga auses nent rger, ton, 2	sourc nancir et, Br s and Policy FDI 2020.	9 es, equit ig: Impace eak eve 9 remedies for Sma and Sub Total:4
Unit – IV Forms of financing investors analysis, Unit – V Definitior Indian St Scale Er Contracti TEXT BC 1. [ REFERE 1.   1.	ion - Prese / of entreprese g: Initial Pu s, Micro-fir , Taxation-l r, Taxation-l n of Small S tartup Ecos nterprises ing DOK: Donald F. I ENCES: Robert D. I Hill, Noida, Charantima	ntation of the Business Plan: The 'Pitch'- case studies Financing and accounting: neurial capital – Sources of Financial capital: debt financing iblic offering (IPO), Private placement - Venture capitalists - nancing, Peer-to-Peer Lending, Crowd funding - Natural ca Direct and indirect taxes, Insolvency and Bankruptcy- Case Stu Small Business Management: Scale Industries: Strengths and Weaknesses, Sickness in Sma system – Institutions supporting small business enterprises, Bu - Growth Strategies in small industry – Expansion, Diverse Kuratko,"Entrepreneurship: Theory, Process, Practice", 11 <sup>th</sup> Edi Hisrich, Michael P. Peters & Dean A. Shepherd, Sabyasachi Si	g- Comme Angel inve apital. Pre udy II Enterpris isiness Inc sification, s ition, Ceng	rcial banks an estors-New fo paring Financ ees: Symptom ubators – Gov Joint Venture, age Learning, preneurship",	nd o rms ial E s -Ca vernn , Me Bos	ther of fir Budga auses nent rger, ton, 2	sourc nancir et, Br s and Policy FDI 2020.	9 es, equit g: Impace eak eve 9 remedies for Sma and Sub Total:4

		UTCOM tion of t		se, the st	udents	s will be	able to						(	BT Map Highest L	
CO1	und	erstand	the impo	ortance of	entrep	reneursh	ip and d	lemonst	trate th	e traits c	of an en	trepreneur	Арр	lying (K3)	
CO2	ider	ntify suita	able entr	epreneuri	al vent	ures and	busines	s oppo	rtunity				Арр	lying (K3)	
CO3	ass	ess the	compone	ents of bu	siness	plan							Ana	lyzing (K4	)
CO4	арр	raise the	e source:	s of finand	ce and	interpret	account	ing stat	ements	6			Арр	lying (K3)	
CO5	inte	rpret the	e causes	of sickne	ss of s	mall scale	e enterp	rises ar	nd its re	emedies			Und	lerstanding	g (K2)
						Mappin	ng of CC	)s with	POs a	nd PSO	S				
COs/F	POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	P011	PO12	PSO1	PSO2
СО	1						2	2	1	1		3	2		
CO	2	1	2	2	2		2	2	1	1		3	2		
CO	3	2	2	2	2	2	2	2	2	2	2	3	2		
CO	4	1	1	2	1		2	1	1	1	2	3	2		
CO	5	1	1	2	1		2	1	1	1	2	3	2		
1 – Slig	ght, 2	– Mode	rate, 3 –	Substant	ial, BT	- Bloom's	Taxono	omy							
						ASSES	SMENT	PATTI	ERN -	THEOR	Y				
	st / Blo Catego	oom's ory*	Rei	nemberii (K1) %	ng	Jndersta (K2)		Apply (K3)		Analyz (K4) 9	0	Evaluating (K5) %		reating K6) %	Total %
	CAT	1		20		40		40	)						100
	CAT	2		20		30		30	)	20					100
	CAT	3		30		30		40	)						100

40

20

100

10 \* ±3% may be varied (CAT 1,2,3 - 50 marks & ESE - 100 marks)

ESE

30

	22GEX01 – NCC Studies (Ar						
<b>D</b>	(Offered by Department of Electrical and	Electronics Engi	neering)	1			[
Programme & Branch	All BE/BTech Engineering and Technology Brand	ches Sem.	Category	L	Т	Ρ	Credit
Prerequisites	Nil	5/6	OE	3	0	2	4
Preamble	This course is designed especially for NCC Cadets. discipline, secular outlook, the spirit of adventure, sp cadets by working in teams, learning military subject	ortsman spirit and	ideals of self				
Unit - I	NCC Organisation & National Integration						9
advantages of N National Integra		- Incentives for N	CC cadets by	cen	tral a	nd sta	ite govt. Slogans or
Unit - II	Basic physical Training & Drill						9
Drill- Words of a		aluting- marching-	turning on the	e ma			
Unit - III	Weapon Training						9
holding- safety	Rifle- Characteristics of 5.56mm INSAS rifle- Characteristi precautions – range procedure- MPI and Elevation- Group SION) - Characteristics of 7.62mm SLR- LMG- carbine m	and Snap shooting	ing and unloa g- Long/Short	ding rang	– po ge firi	sition ng( W	and ITH
Unit - IV	Social Awareness and Community Development						9
	service-Various Means and ways of social services- fa sures- NGO and their activities- Drug trafficking- Rural Terrorism and counter terrorism- Corruption – female foeti	l development pro	grammes - I	MGN	REG	A-SG	SY-JGSY
NSAP-PMGSY-	xual offences act- civic sense and responsibility	•		01 11			otection o
NSAP-PMGSY-	xual offences act- civic sense and responsibility Specialized Subject (ARMY)	-					otection o
NSAP-PMGSY- children from se <b>Unit - V</b> Basic structure		Indo-Pak war- Par	am Vir Chakr				9
NSAP-PMGSY- children from se <b>Unit - V</b> Basic structure	Specialized Subject (ARMY) of Armed Forces- Military History – War heroes- battles of	Indo-Pak war- Par	am Vir Chakr	a- Ca	areer	in the	9 Defence
NSAP-PMGSY- children from se <b>Unit - V</b> Basic structure	Specialized Subject (ARMY) of Armed Forces- Military History – War heroes- battles of	Indo-Pak war- Par	am Vir Chakr g practical.	a- Ca	areer	in the	9 Defence
NSAP-PMGSY- children from se Unit - V Basic structure forces- Service TEXT BOOK:	Specialized Subject (ARMY) of Armed Forces- Military History – War heroes- battles of	Indo-Pak war- Par ap reading includin	am Vir Chakr g practical. <b>Lecture :</b> 4	a- Ca <b>I5, P</b>	areer racti	in the cal:30	9 Defence
NSAP-PMGSY- children from se Unit - V Basic structure forces- Service TEXT BOOK:	Specialized Subject (ARMY) of Armed Forces- Military History – War heroes- battles of tests and interviews-Fieldcraft and Battlecraft-Basics of Ma I Cadet Corps- A Concise handbook of NCC Cadets by Ra	Indo-Pak war- Par ap reading includin	am Vir Chakr g practical. <b>Lecture :</b> 4	a- Ca <b>I5, P</b>	areer racti	in the cal:30	9 Defence
NSAP-PMGSY- children from se Unit - V Basic structure forces- Service TEXT BOOK: 1. Nationa REFERENCES	Specialized Subject (ARMY) of Armed Forces- Military History – War heroes- battles of tests and interviews-Fieldcraft and Battlecraft-Basics of Ma I Cadet Corps- A Concise handbook of NCC Cadets by Ra	Indo-Pak war- Par ap reading includin amesh Publishing I	am Vir Chakr g practical. <b>Lecture :</b> 4	a- Ca <b>I5, P</b>	areer racti	in the cal:30	9 9 Defence
NSAP-PMGSY- children from se Unit - V Basic structure forces- Service TEXT BOOK: 1. Nationa REFERENCES 1. Cadets	Specialized Subject (ARMY) of Armed Forces- Military History – War heroes- battles of tests and interviews-Fieldcraft and Battlecraft-Basics of Ma I Cadet Corps- A Concise handbook of NCC Cadets by Ra	Indo-Pak war- Par ap reading includin amesh Publishing I NCC, New Delhi.	am Vir Chakr g practical. <b>Lecture :</b> 4	a- Ca <b>I5, P</b>	areer racti	in the cal:30	9 Defence

	SE OUTCOMES: mpletion of the course, the students will be able to	BT Mapped (Highest Level)
CO1	display sense of patriotism, secular values and shall be transformed into motivated youth who will contribute towards nation building through national unity and social cohesion.	Applying (K3)
CO2	demonstrate Health Exercises, the sense of discipline, improve bearing, smartness, turnout, develop the quality of immediate and implicit obedience of orders	Applying (K3)
CO3	basic knowledge of weapons and their use and handling.	Applying (K3)
CO4	understanding about social evils and shall inculcate sense of whistle blowing against such evils and ways to eradicate such evils	Applying (K3)
CO5	acquaint, expose & provide knowledge about Army/Navy/ Air force and to acquire information about expansion of Armed Forces, service subjects and important battles.	Applying (K3)

	Mapping of COs with POs and PSOs														
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	
CO1						3	3	3	3	3					
CO2					3										
CO3	3	2	1	1											
CO4	3	2	1	1											
CO5	3	2	1	1											
1 – Slight, 2	– Mode	erate, 3 –	Substant	ial, BT-	Bloom's	Taxono	my							-	

ASSESSMENT PATTERN - THEORY												
Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %					
CAT1	-	-	-	-	-	-	-					
CAT2	-	-	-	-	-	-	-					
CAT3	-	-	-	-	-	-	-					
ESE	The examination and av includes all K1 to K6 kn It will be converted to 10	owledge levels. The	-	-								

	22GEX02 - NCC STUDIES (AIR WI	NG) – I					
	(Offered by Department of Information 1	<b>Fechnolo</b>	gy)				
Programme & Branch	All BE/BTech Engineering and Technology Branches	Sem.	Category	L	т	Ρ	Credit
Prerequisites	Nil	5/6	OE	3	0	2	4
						1	
Preamble	This course is designed especially for NCC Cadets. This co discipline, secular outlook, the spirit of adventure, sportsma cadets by working in teams, honing qualities such as self-di of labour in the cadets.	n spirit a	nd ideals of self	ess	servic	e am	ongst
Unit–I	NCC Organization and National Integration						9+3
advantages of NC History and Orga	History of NCC- NCC Organization- NCC Training- NCC C Training - NCC badges of Rank - Honors' and Awards – Ind nization of IAF - Indo-Pak War-1971 - Operation Safed S th in nation building - national integration council - Images and	centives f Sagar. Na	or NCC cadets ational Integrati	by c on -	entral Unit	and	state govt.
Unit–II	Drill and Weapon Training						9+3
<ul> <li>saluting on the mounting.(WITH E</li> </ul>	nmands - position and commands - sizing and forming - salution march - side pace, pace forward and to the rear - marking DEMONSTRATION). Main Parts of a Rifle - Characteristics of recautions – range procedure - MPI and Elevation - Group ar ION).	time - [ of .22 rifle	Drill with arms	- cer unlo	emor ading	nial dı 1 - po	rill - guard
Unit–III	Principles of Flight						9+3
Laws of motion-Fo Aircraft recognition	rces acting on aircraft – Bernoulli's theorem - Stalling - Primar n.	y control	surfaces – secc	ndar	y cor	ntrol s	urfaces -
Unit-IV	Aero Engines						9+3
Introduction of Aer trends.	o engine -Types of engine - piston engine - jet engines - Turbo	o prop en	gines-Basic Flig	ht In	strum	nents	- Modern
Unit–V	Aero Modeling						9+3
	deling - Materials used in Aero-modeling - Types of Aero-mode lels - Building and Flying of Aero-models.	els – Stati	ic Models - Glid	ers -	Cont	rolline	e models -
			Looturo	. 4 6	Tutor		), Total:75
TEXT BOOK:			Lecture	.43,	Tutor	141.50	J, TOLAI.75
1. "National	Cadet Corps - A Concise handbook of NCC Cadets", Ramesh	Publishin	ig House, NewD	elhi,	2014		
REFERENCES/ M	ANUAL / SOFTWARE:						
1. "Cadets H	landbook – Common Subjects SD/SW", DGNCC, New Delhi.						
2. "Cadets ⊢	landbook – Specialised Subjects SD/SW", DGNCC, New Delh	i.					
3. "NCCOTA	Precise", DGNCC, New Delhi.						

		UTCOM tion of t		se, the st	udent	s will be a	able to						(	BT Map Highest L	
CO1						alues and itional unit					vated you	ıth who wil		Applying	(K3)
CO2			e the se nd handl		cipline	with sma	rtness a	nd have	e basic	knowled	lge of we	apons and	ł	Applying	(K3)
CO3	illus	strate va	rious foi	ces and n	nomer	nts acting o	on aircra	ıft						Applying	(K3)
CO4	out	ine the	concept	s of aircrat	't engi	ne and roo	ket prop	oulsion						Applying	(K3)
CO5	des	ign, buil	d and fly	/ chuck gli	ders/r	nodel air p	lanes a	nd displ	ay stat	ic mode	ls.			Applying	(K3)
						Mappin	g of CC	s with	POs ai	nd PSOs	S				
COs/I	POs	P01	PO2	PO3	PO	4 PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO	)1						3	3	3	3	3				
CO	)2					3									
CO	3	3	2	1	1										
CO	)4	3	2	1	1										
CO	95	3	2	1	1										
1 – Sli	ght, 2	– Mode	rate, 3 -	- Substant	ial, BT	- Bloom's	Taxono	my							
						ASSES	SMENT	PATTE	RN - 1	HEORY	,				
	st / Bl Catego	oom's ory*	Re	ememberi (K1) %	ng	Understa (K2)		Apply (K3)		Analyz (K4) 9		Evaluating (K5) %		reating (K6) %	Total %
	CAT	1		-		-		-		-		-		-	-
	CAT	2		-		-		-		-		-		-	-
	CAT	3		-		-		-		-		-		-	-
	ESE	Ξ	incl	udes all K	1 to K		ge level	s. The r				Defence, 0 End Seme			

	(Offered by Department of Managemer	t Studies)					
Programme& Branch		Sem.	Category	L	Т	Р	Credit
Prerequisites	s NIL	5	OE	3	1	0	4
Preamble	To provide an In-depth study of the Cost Accounting principles classification of costs components to facilitate decision Making		iques for iden	itifica	tion, a	analys	is and
Unit – I	Introduction to Cost Accounting						9 + 3
Introduction accounting ar sheet.	to Cost Accounting: Meaning - Scope, objectives and significant ad management accounting- cost centres - cost units - Elements	e of Cost A of cost – cla	accounting its assification of	relati cost	onshi – prej	p with paratio	financial on of cost
Unit – II	Cost Ascertainment – Elements of cost						9 + 3
incentive sche	Item States is a second state of the second		les and meth	nods	of re	mune	ration and
	sting - Meaning - Preparation of Operating Cost Sheet - Transport	Costing - P	ower Supply	Costi	ng - H	lospita	
Unit – IV	Advanced Costing Methods	0	,		0		9+3
Features of Jo	bb Costing - Batch Costing - Preparation of Cost Sheet Under Job - Normal and Abnormal Loss.	Costing, an	nd Batch Cost	ing -	Proce	ess Co	
Unit – V	Cost Accounting Techniques						9 + 3
Budget and i	<b>Budgetary Control</b> : Budgetary control as a management Tool – Ir of budgets – Fixed and Flexible Budgeting.	istaliation o					andard
Standard Co costing as a r	sting and Variance Analysis: Budgetary control and standard con nanagement Tool – Cost variances – Direct material cost variances ales variance.						
Standard Co costing as a r variances – S	sting and Variance Analysis: Budgetary control and standard con nanagement Tool – Cost variances – Direct material cost variances ales variance.		abour cost var	iance	es – C	verhe	
Standard Co costing as a r variances – S	sting and Variance Analysis: Budgetary control and standard con nanagement Tool – Cost variances – Direct material cost variances ales variance.		abour cost var	iance	es – C	verhe	ad
Standard Co costing as a r variances – S TEXT BOOKS 1. Jawa Educ	sting and Variance Analysis: Budgetary control and standard con nanagement Tool – Cost variances – Direct material cost variances ales variance. S harLal, SeemaSrivastava, Manisha Singh, " Cost Accounting, Text ation, New Delhi, 2020.	s – Direct la , Problems	abour cost var Lecture: and Cases", (	iance 45, 6th E	es – C Tutor	ial: 15	ad 5 <b>, Total:6</b> 0 raw Hill
Standard Co costing as a r variances – S TEXT BOOKS 1. Jawa Educ 2 Willia	sting and Variance Analysis: Budgetary control and standard con nanagement Tool – Cost variances – Direct material cost variances ales variance. S harLal, SeemaSrivastava, Manisha Singh, " Cost Accounting, Text	s – Direct la , Problems	abour cost var Lecture: and Cases", (	iance 45, 6th E	es – C Tutor	ial: 15	ad 5, <b>Total:6</b> 0 raw Hill
Standard Co costing as a r variances – S TEXT BOOKS 1. Jawa Educ 2 Willia	sting and Variance Analysis: Budgetary control and standard con nanagement Tool – Cost variances – Direct material cost variances ales variance. S harLal, SeemaSrivastava, Manisha Singh, " Cost Accounting, Text ation, New Delhi, 2020. m Lanen, Shannon Anderson and Michael Maher, "Fundamentals ation, New Delhi, 2020.	s – Direct la , Problems	abour cost var Lecture: and Cases", (	iance 45, 6th E	es – C Tutor	ial: 15	ad 5, <b>Total:6</b> 0 raw Hill
Standard Co costing as a r variances – S TEXT BOOKS 1. Jawa Educ 2. Willia Educ REFERENCE	sting and Variance Analysis: Budgetary control and standard con nanagement Tool – Cost variances – Direct material cost variances ales variance. S harLal, SeemaSrivastava, Manisha Singh, " Cost Accounting, Text ation, New Delhi, 2020. m Lanen, Shannon Anderson and Michael Maher, "Fundamentals ation, New Delhi, 2020.	s – Direct la , Problems of cost Acc	abour cost var Lecture: and Cases", ( ounting",7th E	iance 45, 6th E Editio	es – C Tutor dition n, Mc	ial: 15	ad 5, <b>Total:6</b> 0 raw Hill
Standard Co costing as a r variances – S TEXT BOOKS 1. Jawa Educ 2. Willia Educ REFERENCE	sting and Variance Analysis: Budgetary control and standard con nanagement Tool – Cost variances – Direct material cost variances ales variance. S harLal, SeemaSrivastava, Manisha Singh, " Cost Accounting, Text ation, New Delhi, 2020. m Lanen, Shannon Anderson and Michael Maher, "Fundamentals ation, New Delhi, 2020. S	s – Direct la , Problems of cost Acc blishing Ho	abour cost var Lecture: and Cases", ( ounting",7th E use, New Del	iance 45, 6th E Editio	es – C Tutor dition n, Mc	ial: 15	ad 5, <b>Total:6</b> 0 raw Hill

		UTCOM tion of t		se, the st	udents	will be a	able to	)						BT Ma (Highest	
CO1	unc	derstand	I the con	ceptual fra	ame wo	rk of cos	t accou	unting						Understand	ding (K2)
CO2	und	erstand	the basi	c concepts	s and pr	ocess in	deterr	mination o	of cost	of produ	ict and se	ervices		Understand	ding (K2)
CO3	use	the bas	ic costin	g methods	s in diffe	rent bus	iness s	situation						Applyin	g (K3)
CO4	dem	nonstrate	e the adv	anced co	sting me	ethods ir	n variou	us decisio	n maki	ng situa	ition			Applyin	g (K3)
CO5	prep	oare var	ious type	es of budg	ets and	determi	ne vari	ance in d	ifferent	situatio	ns.			Applyin	g (K3)
						Mappin	g of C	Os with F	POs an	d PSOs	5				
COs/I	POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO1	2 PSO1	PSO2
CO	)1										2	3	1		
CO	)2										2	3	1		
CO	3										2	3	1		
CO	)4										2	3	1		
CO	95										2	3	1		
1 – Sli	ght, 2	– Mode	rate, 3 –	Substanti	al, BT-	Bloom's	Taxon	omy					·		
						ASSES	SMEN	Τ ΡΑΤΤΕ	RN - T	HEORY	,				
	t / Blo atego			embering K1) %	Und	lerstand (K2) %	ling	Applying (K3) %		alyzing K4) %	Eval	uating (K	5) %	Creating (K6) %	Total %
	CAT1	-		30		70				-					100
	CAT2	2		15		35		50							100
	CAT 3	3		15		35		50							100
	ESE			25		25		50							100
* ±3%	may b	be varied	d (CAT 1	,2 & 3 – 5	0 marks	& ESE	– 100	marks)							

	(Offered by Department of Managemen	t Studies )					
Programme&							
Branch	All BE/BTech Engineering and Technology Branches	Sem.	Category	L	Т	Р	Credit
Prerequisites	Basic understanding of differential calculus	6	OE	3	1	0	4
Preamble	The course aims at introducing a few vital techniques required informed managerial decisions.	for carrying	out economic	c ana	alysis	for m	aking
Unit – I	Economic Optimization						9+3
Economic Op Theory of firm incremental co	- Business versus Economic profit - Revenue relations - Cost rel	lations – Pro	fit relations –	Mar	ginal	versu	5
Unit – II	Forecasting						9 + 3
Linear Trend -	Forecasting applications – Techniques –Naire method – Moving a Growth Trend – Sales, cost and revenue forecasting.	verage – Ex	ponential smo	Dothi	ng - 1	rena	-
Unit – III	Draduation and Cost Analysis						9+3
	Production and Cost Analysis Production function – Returns to scale and returns to factor – Total	, manageria	l and average	pro	duct -	- Law	
diminishing ret	Production function – Returns to scale and returns to factor – Total urns – Optimal input usage – Production function estimation.	, C	U	•			of
diminishing ref Cost Analysis volume – profi	Production function – Returns to scale and returns to factor – Total urns – Optimal input usage – Production function estimation. Economic and Accounting costs – Time in cost analysis – Short	, C	U	•			of
diminishing ret Cost Analysis volume – profi Unit – IV	Production function – Returns to scale and returns to factor – Total turns – Optimal input usage – Production function estimation. Economic and Accounting costs – Time in cost analysis – Short t analysis. Competitive Market Analysis	run cost – L	ong run cost	- co:	st rela	ations	of – cost <b>9 +</b> 3
diminishing ret Cost Analysis volume – profi Unit – IV Competitive M	Production function – Returns to scale and returns to factor – Total nurns – Optimal input usage – Production function estimation. Economic and Accounting costs – Time in cost analysis – Short t analysis.	run cost – L	ong run cost	- co: nalys	st rela	ations	of – cost <b>9 +</b> 3
diminishing ret Cost Analysis volume – profi Unit – IV Competitive M competitive ma	Production function – Returns to scale and returns to factor – Total turns – Optimal input usage – Production function estimation. Economic and Accounting costs – Time in cost analysis – Short t analysis. Competitive Market Analysis Market Analysis: Characteristics of competitive markets – Profit m	run cost – L	ong run cost	- co: nalys	st rela	ations	of – cost <b>9 + 3</b> etition –
diminishing rei Cost Analysis volume – profi Unit – IV Competitive M competitive ma Unit – V Game Theory	Production function – Returns to scale and returns to factor – Total surns – Optimal input usage – Production function estimation. Economic and Accounting costs – Time in cost analysis – Short t analysis. Competitive Market Analysis Market Analysis: Characteristics of competitive markets – Profit market supply curve – Equilibrium in competitive markets - Monopo	run cost – L naximisation Iy – Monopo	ong run cost – Marginal ar listic competit	- cos nalys	st rela	compe	of – cost <b>9 + 3</b> etition – <b>9 + 3</b>
diminishing rei Cost Analysis volume – profi Unit – IV Competitive M competitive ma Unit – V Game Theory	Production function – Returns to scale and returns to factor – Total Jurns – Optimal input usage – Production function estimation. Economic and Accounting costs – Time in cost analysis – Short t analysis. Competitive Market Analysis Market Analysis: Characteristics of competitive markets – Profit market supply curve – Equilibrium in competitive markets - Monopo Game theory and Competitive Strategy Basics - Prisoner's Dilemma - Saddle Point - Two Person Zero Su	run cost – L naximisation Iy – Monopo	ong run cost – Marginal ar listic competit	nalys tion.	st rela sis in d	ations compe	of – cost <b>9 + 3</b> etition – <b>9 + 3</b> -
diminishing ret Cost Analysis volume – profi Unit – IV Competitive M competitive m Unit – V Game Theory Dominance Ru	Production function – Returns to scale and returns to factor – Total furns – Optimal input usage – Production function estimation. Economic and Accounting costs – Time in cost analysis – Short t analysis. Competitive Market Analysis Market Analysis: Characteristics of competitive markets – Profit m arket supply curve – Equilibrium in competitive markets - Monopo Game theory and Competitive Strategy Basics - Prisoner's Dilemma - Saddle Point - Two Person Zero Su ale - Mixed Strategies.	run cost – L naximisation Iy – Monopo	– Marginal ar listic competit	- cos nalys tion. t Sac	st rela sis in d	ations compe	of – cost <b>9 + 3</b> etition – <b>9 + 3</b> -
diminishing ref Cost Analysis volume – profi Unit – IV Competitive M competitive M Unit – V Game Theory Dominance R TEXT BOOKS	Production function – Returns to scale and returns to factor – Total furns – Optimal input usage – Production function estimation. Economic and Accounting costs – Time in cost analysis – Short t analysis. Competitive Market Analysis Market Analysis: Characteristics of competitive markets – Profit m arket supply curve – Equilibrium in competitive markets - Monopo Game theory and Competitive Strategy Basics - Prisoner's Dilemma - Saddle Point - Two Person Zero Su ale - Mixed Strategies.	naximisation ly – Monopo	ong run cost	- cos nalys tion. t Sac	st rela sis in d	ations compe	of – cost <b>9 + 3</b> etition – <b>9 + 3</b> -
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		UTCOM tion of t		se, the stu	Idents	will be a	able to								apped st Level)
CO1	Unc	lerstand	revenue	e, cost and	profit r	elations	and ap	ply techr	iques	to find b	est cours	e of actio	n.	Applyi	ng (K3)
CO2	Арр	ly appro	priate fo	recasting t	echniq	ues for e	estimati	ng sales	, cost a	and reve	nue.			Applyi	ng (K3)
CO3		lerstand ofit anal		tion betwe	en inpu	its and o	output o	of produc	tion sy	stem ar	d perforr	n cost – v	olume/	Applyi	ng (K3)
CO4	Арр	ly marke	et equilib	rium conce	epts in	monopo	ly and ı	monopoli	stically	compe	itive mar	kets.		Applyi	ng (K3)
CO5	Unc	lerstand	game th	eory and a	apply in	differen	t strate	gic decis	ions					Applyi	ng (K3)
						Mappin	g of C	Os with	POs ar	nd PSO:	6				
COs/I	POs	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO	)1					2					1	3			
CO	2					2					1	3			
CO	3					2					1	3			
CO	94					2					1	3			
CO	95					2					1	3			
1 – Sli	ght, 2	– Mode	rate, 3 –	Substantia	al, BT-	Bloom's	Taxon	omy							
						ASSES	SMEN <sup>.</sup>	Τ ΡΑΤΤΕ	RN - T	HEORY	,				
	t / Blo atego			embering K1) %	Und	erstand (K2) %	ling	Applying (K3) %		nalyzing K4) %	Eval	uating (K	5) %	Creating (K6) %	Total %
	CAT1			35		35		30							100
	CAT2	2		15		45		40							100
	CAT	3		15		35		50							100
	ESE			5		40		55							100

	22MBO03 Marketing Analytic	cs					
	(Offered by Department of Managemen	nt Studies)					
Programme& Branch	All BE/BTech Engineering and Technology Branches	Sem.	Category	L	т	Ρ	Credit
Prerequisites	Basic understanding of differential calculus	7	OE	3	1	0	4
Preamble	Marketing analytics enables marketers to measure, manage a effectiveness and optimize return on investment (ROI). This cameasure customer value and apply analytic tools to various m	ourse expos	es the studen				
Unit – I	Market & Marketing Analytics	<u> </u>					9 + 3
Market Insigh	<ul> <li>Introduction to marketing analytics, Models &amp; Metrics</li> <li>t - Market sizing.</li> <li>entation –Segmentation, Targeting &amp; Positioning</li> </ul>						
Unit – II	Business & Competition						9+3
	erations - Forecasting						0
	Product and Price						9+
	Product and Price Service Analytics - Conjoint analysis and product/service metrics cs - Pricing techniques and assessment	;					9+,
Product and	Service Analytics - Conjoint analysis and product/service metrics						
Product and Price Analytic Unit – IV Distribution	Service Analytics - Conjoint analysis and product/service metrics s - Pricing techniques and assessment		tribution and i	metri	CS.		
Product and Price Analytic Unit – IV Distribution	Service Analytics - Conjoint analysis and product/service metrics - Pricing techniques and assessment Distribution & Promotion Analytics –Characteristics, Channel evaluation and selection, Mul-		tribution and I	metri	CS.		9+3
Product and Price Analytic Unit – IV Distribution A Promotion A Unit – V	Service Analytics - Conjoint analysis and product/service metrics         Service Analytics - Conjoint analysis and product/service metrics         Service Analytics - Pricing techniques and assessment         Distribution & Promotion         Analytics - Characteristics, Channel evaluation and selection, Multipalytics - Promotion budget estimation and allocation, Metrics		tribution and i	metri	CS.		9+3
Product and Price Analytic Unit – IV Distribution A Promotion A Unit – V	Service Analytics - Conjoint analysis and product/service metrics cs - Pricing techniques and assessment Distribution & Promotion Analytics – Characteristics, Channel evaluation and selection, Multi- nalytics - Promotion budget estimation and allocation, Metrics Sales		tribution and i			al: 15	9+3 9+3
Product and Price Analytic Unit – IV Distribution A Promotion A Unit – V Sales Analyti	Service Analytics - Conjoint analysis and product/service metrics         Service Analytics - Conjoint analysis and product/service metrics         Distribution & Promotion         Analytics - Characteristics, Channel evaluation and selection, Multipalytics - Promotion budget estimation and allocation, Metrics         Sales         cs - Metrics for sales, profitability, and support					al: 15	9+3 9+3
Product and Price Analytic Unit – IV Distribution A Promotion A Unit – V Sales Analyti	Service Analytics - Conjoint analysis and product/service metrics         Service Analytics - Conjoint analysis and product/service metrics         Distribution & Promotion         Analytics - Characteristics, Channel evaluation and selection, Multipalytics - Promotion budget estimation and allocation, Metrics         Sales         cs - Metrics for sales, profitability, and support	tichannel dis	Lecture: 4	45, T	utor		9+3 9+3
Product and Price Analytic Unit – IV Distribution A Promotion A Unit – V Sales Analyti TEXT BOOKS	Service Analytics - Conjoint analysis and product/service metrics Service Analytics - Conjoint analysis and product/service metrics Distribution & Promotion Analytics – Characteristics, Channel evaluation and selection, Multi- nalytics - Promotion budget estimation and allocation, Metrics Sales Cs - Metrics for sales, profitability, and support en Sorger, "Marketing Analytics: Strategic Models and Metrics", 1se L. Winston, "Marketing Analytics: Data-Driven Techniques with N	tichannel dis	Lecture: 4 dmiral Press,	<b>45, T</b> UK, :	<b>utor</b> 2016		9 + 3 9 + 3 , Total:6(
Product and Price Analytic Unit – IV Distribution A Promotion An Unit – V Sales Analyti TEXT BOOKS 1. Steph 2. Wayn 2018.	Service Analytics - Conjoint analysis and product/service metrics Service Analytics - Conjoint analysis and product/service metrics Distribution & Promotion Analytics – Characteristics, Channel evaluation and selection, Multi- nalytics - Promotion budget estimation and allocation, Metrics Sales cs - Metrics for sales, profitability, and support en Sorger, "Marketing Analytics: Strategic Models and Metrics", 1: e L. Winston, "Marketing Analytics: Data-Driven Techniques with N	tichannel dis	Lecture: 4 dmiral Press,	<b>45, T</b> UK, :	<b>utor</b> 2016		9 + 3 9 + 3 , Total:60
Product and Price Analytic Unit – IV Distribution A Promotion A Unit – V Sales Analyti TEXT BOOKS 1. Steph 2. Wayn 2018. REFERENCE	Service Analytics - Conjoint analysis and product/service metrics Service Analytics - Conjoint analysis and product/service metrics Distribution & Promotion Analytics – Characteristics, Channel evaluation and selection, Multi- nalytics - Promotion budget estimation and allocation, Metrics Sales cs - Metrics for sales, profitability, and support en Sorger, "Marketing Analytics: Strategic Models and Metrics", 1: e L. Winston, "Marketing Analytics: Data-Driven Techniques with N	tichannel dis	Lecture: 4 dmiral Press, cel", 1st Editic	<b>45, T</b> UK, 2 on, W	<b>utor</b> 2016		9 + 3 9 + 3 , Total:60
Product and Price Analytic Unit – IV Distribution A Promotion A Unit – V Sales Analyti TEXT BOOKS 1. Steph 2. Wayn 2018. REFERENCE 1. Tomm	Service Analytics - Conjoint analysis and product/service metrics Service Analytics - Conjoint analysis and product/service metrics Distribution & Promotion Analytics - Characteristics, Channel evaluation and selection, Multi- nalytics - Promotion budget estimation and allocation, Metrics Sales cs - Metrics for sales, profitability, and support en Sorger, "Marketing Analytics: Strategic Models and Metrics", 1: e L. Winston, "Marketing Analytics: Data-Driven Techniques with N S	tichannel dis st Edition, Ad Microsoft Exc Packt Publis	Lecture: 4 dmiral Press, cel", 1st Editic	<b>45, T</b> UK, 2 on, W	<b>utor</b> 2016		9 + 9 +

		UTCOM		se, the stu	dents	will be a	able to							BT Maj (Highest	
CO1	Und	lerstand	the impo	ortance of	Analytic	cs in Ma	rketing	, size and	d segm	ent the	market			Understand	ding (K2)
CO2	Und	lerstand	the Busi	iness, com	petitior	and its	related	decisior	IS.					Understand	ding (K2)
CO3	Ider	ntify imp	ortant fea	atures of a	produc	t and su	uitable p	pricing m	ethods	•				Applying	g (K3)
CO4	Ass	ess Cha	innel per	formance a	and Pro	motion	Metrics	8.						Applying	g (K3)
CO5	Ass	ess sale	es perforr	mance.										Applying	g (K3)
						Mappin	g of C	Os with I	POs ar	nd PSOs	6				
COs/	POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO1	2 PSO1	PSO2
CO	1										2	3	1		
CO	2										2	3	1		
CO	3										2	3	1		
CO	4										2	3	1		
CO	5										2	3	1		
1 – Sli	ght, 2	– Mode	rate, 3 –	Substantia	al, BT- I	Bloom's	Taxon	omy							
						ASSES	SMEN <sup>.</sup>	Τ ΡΑΤΤΕ	RN - T	HEORY	,				
	t / Blo atego			embering (1) %		erstand (K2) %	ling	Applying (K3) %		alyzing K4) %	Eval	uating (K	5) %	Creating (K6) %	Total %
	CAT1			35		65									100
	CAT2	2		15		35		50							100
	CAT	3		15		15		70							100
	ESE			25		25		50							100

## KONGU ENGINEERING COLLEGE, PERUNDURAI, ERODE-638060 (AUTONOMOUS) BOARD OF ELECTRONICS AND INSTRUMENTATION ENGINEERING

## PROGRAMME: **BE - EIE** HONOURS DEGREE TITLE: **INTELLIGENT SENSOR TECHNOLOGY**

The following courses are identified to earn additional 18 credits to get a Honours degree with specialization in EIE.

S.No	Course Code	Course Title	Credits	Prerequisites	Semester
1.	22EIH01	Intelligent Building Automation	4	Transducers Engineering	5
2.	22EIH02	System on chip	3	Digital Logic Circuits	5
3.	22EIH03	Intelligent Technology in Industrial Automation	4	Transducers Engineering	6
4.	22EIH04	Embedded IoT	3	Microcontroller and its Applications	6
5.	22EIH05	Smart Sensors and Intelligent Instrumentation	4	Transducers Engineering	7
		TOTAL	18		

Programme & Branch	BE & Electronics and Instrumentation Engineering	Sem.	Category	L	т	Ρ	Credit
Prerequisites	Transducers Engineering	5	Honours	3	1	0	4
Preamble	This course discusses about the wide variety of teo areas such as energy, HVAC, information, transportat management. This course enables scientists and development and application of sensors in the building	tion, safet engineers	y, security, m engaged in	ainte	enano	ce, ar	nd facility
Unit – I	Building Automation System						9+3
and evolution of	nitions of intelligent building – Facilities management v intelligent buildings – Introduction to building automa d monitoring platforms and environment.						
Unit – II	BAS Communication Standards and Internet Tech	nologies					9+3
standards - Integ	eatures – Lon Works and its features– EIB and its features gration at management level – Internet protocols – use chnologies at management level – Convergence network	of Interne	t technologie	s at			
Unit – III	Lighting, Security and Safety Control Systems						9+3
management and	ghting control systems – Systems based on common d lighting control – Basic CCTV components and analog						or energ
management and Access control sy <b>Unit – IV</b> Typical control l	ghting control systems – Systems based on common d lighting control – Basic CCTV components and analog /stems – Burglar alarm systems. Control and Optimization of Air- Conditioning Sys oops of the air- conditioning process – Control of C/	ue CCTV tems	systems – II ns: Basic co	> sur	veilla of (		or energ system 9+3 systems
management and Access control sy <b>Unit – IV</b> Typical control I Sequential split r room temperatur	ghting control systems – Systems based on common d lighting control – Basic CCTV components and analog /stems – Burglar alarm systems. Control and Optimization of Air- Conditioning Sys oops of the air- conditioning process – Control of C/ ange control of AHU – Control of VAV systems: Contro e control – Outdoor air ventilation control and optimizati	tems AV syster	systems – If ns: Basic co air handling u	> sur	veilla of ( VAV	CAV	or energ system 9+3 systems ninal and
management and Access control sy <b>Unit – IV</b> Typical control le Sequential split r room temperatur systems – Optim <b>Unit – V</b>	ghting control systems – Systems based on common         d lighting control – Basic CCTV components and analog         ystems – Burglar alarm systems.         Control and Optimization of Air- Conditioning Sys         oops of the air- conditioning process – Control of CA         ange control of AHU – Control of VAV systems: Control         e control – Outdoor air ventilation control and optimizati         al control of air side systems.         Control and Optimization of Central Chilling System	tems AV syster I of VAV on – Opti ms	systems – If ns: Basic co air handling u mal control m	P sur	of ( VAV	CAV tern sed f	9+3 system systems ninal and or HVAC 9+3
management and Access control sy <b>Unit – IV</b> Typical control I Sequential split r room temperatur systems – Optim <b>Unit – V</b> Basic working pri energy performa	ghting control systems – Systems based on common         d lighting control – Basic CCTV components and analog         ystems – Burglar alarm systems.         Control and Optimization of Air- Conditioning Sys         oops of the air- conditioning process – Control of CA         ange control of AHU – Control of VAV systems: Control         e control – Outdoor air ventilation control and optimizati         al control of air side systems.         Control and Optimization of Central Chilling System         inciples – Basic components and typical types – Chiller         nce – Optimal control of central chilling systems – Ope         equence control of multiple chiller plants: Temperature	tems AV syster I of VAV on – Opti ms capacity o ptimal set	systems – If ns: Basic co air handling u mal control m control and sa point reset	P sur	of ( VAV ds u interl	CAV / tern sed f ocks wate	9+3 system systems ninal and or HVAC 9+3 – Chille er suppl
management and Access control sy <b>Unit – IV</b> Typical control I Sequential split r room temperatur systems – Optim <b>Unit – V</b> Basic working pri energy performa temperature – S	ghting control systems – Systems based on common         d lighting control – Basic CCTV components and analog         ystems – Burglar alarm systems.         Control and Optimization of Air- Conditioning Sys         oops of the air- conditioning process – Control of CA         ange control of AHU – Control of VAV systems: Control         e control – Outdoor air ventilation control and optimizati         al control of air side systems.         Control and Optimization of Central Chilling System         inciples – Basic components and typical types – Chiller         nce – Optimal control of central chilling systems – Ope         equence control of multiple chiller plants: Temperature	tems AV syster I of VAV on – Opti ms capacity o ptimal set	systems – If ns: Basic co air handling u mal control m control and sa point reset	P sur Introl Inits, netho afety of ch rol, E	veilla of ( VAV ods u interl nilled 3ypas	CAV tern sed f ocks wate	9+3 systems ninal and or HVAC 9+3 – Chille er supply w based
management and Access control sy <b>Unit – IV</b> Typical control la Sequential split r room temperatur systems – Optim <b>Unit – V</b> Basic working pri energy performa temperature – S sequence control	ghting control systems – Systems based on common         d lighting control – Basic CCTV components and analog         ystems – Burglar alarm systems.         Control and Optimization of Air- Conditioning Sys         oops of the air- conditioning process – Control of CA         ange control of AHU – Control of VAV systems: Control         e control – Outdoor air ventilation control and optimizati         al control of air side systems.         Control and Optimization of Central Chilling System         inciples – Basic components and typical types – Chiller         nce – Optimal control of central chilling systems – Ope         equence control of multiple chiller plants: Temperature	tems AV syster I of VAV on – Opti ms capacity o ptimal set	systems – If ns: Basic co air handling u mal control m control and sa point reset equence cont	P sur Introl Inits, netho afety of ch rol, E	veilla of ( VAV ods u interl nilled 3ypas	CAV tern sed f ocks wate	9+3 systems ninal and or HVAC 9+3 – Chille er supply w based
management and Access control sy Unit – IV Typical control I Sequential split r room temperatur systems – Optim Unit – V Basic working pri energy performa temperature – S sequence control TEXT BOOK: 1 Shengw	ghting control systems – Systems based on common         d lighting control – Basic CCTV components and analog         ystems – Burglar alarm systems.         Control and Optimization of Air- Conditioning Sys         oops of the air- conditioning process – Control of CA         ange control of AHU – Control of VAV systems: Control         e control – Outdoor air ventilation control and optimizati         al control of air side systems.         Control and Optimization of Central Chilling System         inciples – Basic components and typical types – Chiller         nce – Optimal control of central chilling systems – Ope         equence control of multiple chiller plants: Temperature	tems AV syster I of VAV on – Opti ms capacity o btimal set based se	systems – If ns: Basic co air handling u mal control m control and sa point reset equence cont Lecture:4	Sur Introl units, netho afety of ch rol, E 5, Tu	of ( VAV ds u interl nilled Bypas	CAV tern sed f ocks wate ss flo I:15,	9+3 systems ninal and or HVAC 9+3 – Chille er suppl w based Total:60
management and Access control sy Unit – IV Typical control I Sequential split r room temperatur systems – Optim Unit – V Basic working pri energy performa temperature – S sequence control TEXT BOOK: 1 Shengw	ghting control systems – Systems based on common d lighting control – Basic CCTV components and analog ystems – Burglar alarm systems.           Control and Optimization of Air- Conditioning Sys           oops of the air- conditioning process – Control of CA           ange control of AHU – Control of VAV systems: Control           e control – Outdoor air ventilation control and optimizati           al control of air side systems.           Control and Optimization of Central Chilling System           inciples – Basic components and typical types – Chiller           ince – Optimal control of central chilling systems – Ope           equence control of multiple chiller plants: Temperature	tems AV syster I of VAV on – Opti ms capacity o btimal set based se	systems – If ns: Basic co air handling u mal control m control and sa point reset equence cont Lecture:4	Sur Introl units, netho afety of ch rol, E 5, Tu	of ( VAV ds u interl nilled Bypas	CAV tern sed f ocks wate ss flo I:15,	9+3 systems ninal and or HVAC 9+3 – Chille er suppl w based Total:60
management and         Access control sy         Unit – IV         Typical control l         Sequential split r         room temperatur         systems – Optim         Unit – V         Basic working pri-         energy performa         temperature – S         sequence control         TEXT BOOK:         1.       Shengw         Taylor 8         REFERENCES:	ghting control systems – Systems based on common d lighting control – Basic CCTV components and analog ystems – Burglar alarm systems.           Control and Optimization of Air- Conditioning Sys           oops of the air- conditioning process – Control of CA           ange control of AHU – Control of VAV systems: Control           e control – Outdoor air ventilation control and optimizati           al control of air side systems.           Control and Optimization of Central Chilling System           inciples – Basic components and typical types – Chiller           ince – Optimal control of central chilling systems – Ope           equence control of multiple chiller plants: Temperature	tems AV syster I of VAV on – Opti ms capacity of based se based se	systems – If ns: Basic co air handling u mal control m control and sa point reset equence cont Lecture:4 n, Spon Pres	P sur	veilla of C VAV ds u interl aypas toria	CAV / tern sed f ocks wate ss flo I:15,	9+3 systems ninal and for HVAC 9+3 - Chille sw based Total:60
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COURS On cor			-	ourse, t	he s	tudents v	will be	able to	I						BT Mapı lighest L	
CO1	de	scribe	the fun	ctions i	ntelli	gent build	ing aut	omatior	n syste	em				Unc	lerstandi	ng (K2)
CO2	su	mmariz	ze the	need of	f BAS	S Commu	nicatior	n Stand	ards a	nd Inter	net T	echr	nologies	Unc	lerstandi	ng (K2)
CO3	ex	plain th	ne diffe	rent ligh	nting,	, safety ar	nd secu	rity sys	tems i	n buildin	ig au	Itoma	ation	Und	erstandir	ng (K2))
CO4	int	erpret	the var	ious Co	ontrol	and Optir	nizatio	n of Air-	- Cond	ditioning	Syst	ems		ŀ	Applying	(K3)
CO5	illu	ustrate	the var	ious Co	ontrol	and Opti	mizatio	n of Ce	ntral C	Chilling S	Syste	ms		ŀ	Applying	(K3)
						Маррі	ing of (	COs wi	th PO	s and P	SOs					
COs/P	Os	PO1	PO2	PO3	PO	4 PO5	PO6	P07	PO8	PO9	PC	010	PO11	PO12	PSO1	PSO2
CO1		3	2												2	2
CO2		3	2												2	2
CO3	••	3	3	1	1	1									2	2
CO4		3	3	1	1	1									3	3
CO5	<b>.</b> .	3	3	1	1	1									3	3
1 – Slig	ght, 2	2 – Moo	derate,	3 – Suł	ostar	ntial, BT- E	Bloom's	Taxon	omy							
						ASSE	SSME		TER	N - THEC	ORY					
/ Test Cat	/ Blo tego			ember (K1) %	ing	Understa (K2) <sup>o</sup>	•	Apply (K3)	-	Analyzi (K4) %	-	Eva	luating (K5 %	-	ating 6) %	Total %
	CAT	1		25		75										100
	CAT	2		30		70										100
	CAT	3		10		40		50	)							100
	ESE	-		20		50		30	)							100

Programme & Branch	BE & Electronics and Instrumentation Engineering	Sem.	Category	L	т	Ρ	Credit
Prerequisites	Digital Logic Circuits	5	Honours	3	0	0	3
Preamble	To infer the concepts of hardware and software w and methodologies on a chip	ith the comr	nunication, d	esigr	n flow	/, sul	osystems
Unit – I	System-on-Chip:						9
SoC Architecture Heterogeneous a	Chip Concept -The Cast of Players- SoC Interfaces -Heterogeneous and Distributed Data Processing-He nd Distributed Storage-Hierarchical Control.	eterogeneou					nications
Unit – II	Principles of Hardware/Software Communicatio						9
	Iware and Software-Synchronization Schemes-Sync king and Non-blocking Data-Transfer-Tight and Loose				'ay a	and -	Two-Way
Unit – III	VLSI Sub Systems:						9
	le bit addition-carry propagate addition-subtraction- I	multiplier inp	out addition-M	1agni	tude	com	parators
Binary counters-	Serial Multiplication-low power Static RAMs.						
Unit – IV	VLSI Design Flow :						9
Unit – IV Introduction to In	VLSI Design Flow : tegrated Circuits-Pre-RTL Methodologies-RTL to GD ies-Post-GDS Processes. Chip Planning –Placement						hniques
Unit – IV Introduction to In Testing Techniqu	VLSI Design Flow : tegrated Circuits-Pre-RTL Methodologies-RTL to GD ies-Post-GDS Processes. Chip Planning –Placement						hniques
Unit – IV Introduction to In Testing Techniqu silicon Validation. Unit – V Microprocessor / Design-Platform	VLSI Design Flow : tegrated Circuits-Pre-RTL Methodologies-RTL to GD ies-Post-GDS Processes. Chip Planning –Placement	t-Routing-Ph of Gate arr	ysical Verific	ation	and	Sigr	chniques noff-Post 9
Unit – IV Introduction to In Testing Techniqu silicon Validation. Unit – V Microprocessor / Design-Platform	VLSI Design Flow :         tegrated Circuits-Pre-RTL Methodologies-RTL to GD         ies-Post-GDS Processes. Chip Planning –Placement         Design Methodologies:         DSPs –Programmable Logics-gate Array and Sea         based Design-System on Chip. Mixed Signal and Custor	t-Routing-Ph of Gate arr	ysical Verific	ation	and	Sigr	chniques noff-Post 9
Unit – IV Introduction to In Testing Techniqu silicon Validation. Unit – V Microprocessor / Design-Platform	VLSI Design Flow :         tegrated Circuits-Pre-RTL Methodologies-RTL to GD         ies-Post-GDS Processes. Chip Planning –Placement         Design Methodologies:         DSPs –Programmable Logics-gate Array and Sea         based Design-System on Chip. Mixed Signal and Custor	t-Routing-Ph of Gate arr	ysical Verific	ation	and	Sigr	chniques toff-Post 9 Custon
Unit – IV Introduction to In Testing Techniqu silicon Validation. Unit – V Microprocessor / Design-Platform I Example: Portabl	VLSI Design Flow :         tegrated Circuits-Pre-RTL Methodologies-RTL to GD         ues-Post-GDS Processes. Chip Planning –Placement         Design Methodologies:         DSPs –Programmable Logics-gate Array and Sea         based Design-System on Chip. Mixed Signal and Cust         e Multimedia System- Network On Chip.	of Gate arr tom Design I	ysical Verific ays-Cell base Flow.	ation ed D	and esigr	Sigr n-Full	shniques noff-Post 9 Custon Total:4
Unit – IV Introduction to In Testing Techniqu silicon Validation. Unit – V Microprocessor / Design-Platform I Example: Portabl TEXT BOOK:	VLSI Design Flow :         tegrated Circuits-Pre-RTL Methodologies-RTL to GD         ues-Post-GDS Processes. Chip Planning –Placement         Design Methodologies:         DSPs –Programmable Logics-gate Array and Sea         based Design-System on Chip. Mixed Signal and Cust         e Multimedia System- Network On Chip.	of Gate arr tom Design I	ysical Verific ays-Cell base Flow.	ation ed D	and esigr	Sigr n-Full	shniques noff-Post 9 Custon Total:4
Unit – IV Introduction to In Testing Techniqu silicon Validation. Unit – V Microprocessor / Design-Platform I Example: Portabl TEXT BOOK: 1. Patrick S York, 20 REFERENCES:	VLSI Design Flow :         tegrated Circuits-Pre-RTL Methodologies-RTL to GD         ues-Post-GDS Processes. Chip Planning –Placement         Design Methodologies:         DSPs –Programmable Logics-gate Array and Sea         based Design-System on Chip. Mixed Signal and Cust         e Multimedia System- Network On Chip.	t-Routing-Ph of Gate arr tom Design I	ysical Verific ays-Cell base Flow. sign", 2 <sup>nd</sup> Ec	ation ed D dition	and esigr , Spr	Sigr n-Full	shniques noff-Posi 9 Custor Total:4

COURS On com	-		-	ourse, t	he s	tudents	will be	able to							BT Mapp lighest L	
CO1	rec	all the	basic	concept	s of	System o	on Chip							Und	lerstandi	ng (K2)
CO2	aco	quire th	ne knov	wledge	of the	e commu	nication	archite	ectures	s used in	n Sys	stem	on Chip	Und	lerstandi	ng (K2)
CO3	app	ply data	a path	logic to	desi	gn comb	inationa	l and se	equen	tial circu	its			/	Applying(	(K3)
CO4	ma	ake use	e of the	design	flow	for desig	n of hig	h perfo	rmano	ce circuit	S			/	Applying(	(K3)
CO5	exp	plain th	e vari	ous des	sign r	methodol	ogies fo	r chip c	lesign					Und	lerstandi	ng (K2)
						Марр	ing of (	COs wi	th PO	s and P	SOs					
COs/PO	S	PO1	PO2	PO3	PO	4 PO5	PO6	P07	PO8	PO9	PC	010	PO11	PO12	PSO1	PSO2
CO1		3	1				1		1						2	2
CO2		3	1				1		1						2	2
CO3		3	2	1	1	1	1		1						3	3
CO4		3	2	1	1	1	1		1						3	3
CO5		3	1				1		1						2	2
1 – Sligh	nt, 2	– Moc	lerate,	3 – Suk	ostan	itial, BT-	Bloom's	Taxon	omy						1	
						ASS	ESSME		TER	N - THEC	ORY					
Test / I Cate				emberi (K1) %	ing	Understa (K2)		Apply (K3)		Analyzi (K4) %		Eva	luating (K5) %		ating 6) %	Total %
С	AT1	1		30		7	)									100
С	AT2	2		20		6	)	20	)							100
С	AT	3		20		6	)	20	)							100
E	ESE			20		6	)	20	)							100
* +3% m	av I	be vari	ed (CA	T 1.2 3	- 50	) marks 8	ESE -	100 m	arks)			1				1

22EIH03- INTELLIGENT TECHNOLOGY IN INDUSTRIAL AUTOMA	ΓΙΟΝ
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Programme & Branch	BE & Electronics and Instrumentation Engineering	Sem.	Category	L	Т	Ρ	Credit
Prerequisites	Transducers Engineering	6	Honours	3	1	0	4
Preamble	To impart the significance of intelligent techniques	in measurer	nents and aut	toma	tion.		
Unit – I	Modeling and Linearization of Intelligent Senso	ors:					9+3
model-artificial ne Linearization of p	essification –smart sensors-cogent sensors – soft sensor eural network model. Self adapting sensors - Self valid positive and negative coefficient resistive sensors - am cial neural network based linearization – non-linear ada	ating sensor plifier based	s: functional linearization-	valida inter	ation	–app	olications
Unit – II	Intelligent Technology in Signal Analysis :						9+3
Introduction - ty	pes of test and metering instruments - example of ir	ntelligent ins	trument – str	uctu	re pr	incipl	e of dat
	-simulation of ADC -noise analysis technology -n						
	ncertainty – data processing algorithms – inverse p ment design – intelligent computing – accuracy design ment						
Unit – III	Arduino and MATLAB in Intelligent Instrument	·-					9+3
							510
Instrument: SLAN	ligent Instrument: Predictive maintenance - computer /I –PHM – IoT in intelligent instrument: power instrume	ent in IoT - v	ector networ	k ana	alyse	r in I	oT –Dat
Instrument: SLAN communication te design using Prot	I –PHM – IoT in intelligent instrument: power instrume echnology: IIC bus –SPI bus – EPA bus- blue tooth eus: 7 segment LED and matrix key design – IoT desig	ent in IoT - v communica	vector networ	k ana	alyse	r in I	oT –Dat Indationa
Instrument: SLAM communication te design using Prot Unit – IV	<ul> <li>M –PHM – IoT in intelligent instrument: power instrume echnology: IIC bus –SPI bus – EPA bus- blue tooth eeus: 7 segment LED and matrix key design – IoT desig</li> <li>Sensors with Artificial Intelligence:</li> </ul>	ent in IoT - v communica n by Proteus	vector networ tion technolog	k ana gy in	alyse IoT.	r in I Fou	oT –Dat Indationa 9+3
Instrument: SLAM communication te design using Prot Unit – IV Introduction -Mult	<ul> <li>M –PHM – IoT in intelligent instrument: power instrume echnology: IIC bus –SPI bus – EPA bus- blue tooth eeus: 7 segment LED and matrix key design – IoT desig</li> <li>Sensors with Artificial Intelligence:</li> <li>idimensional intelligent sensors- AI for prognostic instru-</li> </ul>	ent in IoT - v communica n by Proteus umentation -	vector networ tion technolog	k ana gy in intelli	alyse IoT.	r in I Fou sens	oT –Dat Indationa 9+3
Instrument: SLAM communication te design using Prot <b>Unit – IV</b> Introduction -Mult fuzzy logic based	<ul> <li>M –PHM – IoT in intelligent instrument: power instrume echnology: IIC bus –SPI bus – EPA bus- blue tooth eeus: 7 segment LED and matrix key design – IoT desig</li> <li>Sensors with Artificial Intelligence:</li> <li>id imensional intelligent sensors- AI for prognostic instru- intelligent sensors- intelligent sensors standards and p</li> </ul>	ent in IoT - v communica n by Proteus umentation - rotocols:IEE	vector networ tion technolog - ANN based E 1451 stand	k ana gy in intelli	alyse IoT.	r in I Fou sens	oT –Dat Indationa 9+3
Instrument: SLAM communication te design using Prot <b>Unit – IV</b> Introduction -Mult fuzzy logic based communication pr	<ul> <li>M –PHM – IoT in intelligent instrument: power instrume echnology: IIC bus –SPI bus – EPA bus- blue tooth eeus: 7 segment LED and matrix key design – IoT desig</li> <li>Sensors with Artificial Intelligence:</li> <li>a dimensional intelligent sensors- AI for prognostic instru- intelligent sensors- intelligent sensors standards and p rotocol for smart home –J1850 Bus – MI bus-plug-n-pla</li> </ul>	ent in IoT - v communica n by Proteus umentation - rotocols:IEE y smart sens	vector networ tion technolog - ANN based E 1451 stand	k ana gy in intelli	alyse IoT.	r in I Fou sens	oT –Dat indationa 9+3 sors –
Instrument: SLAM communication te design using Prot Unit – IV Introduction -Mult fuzzy logic based communication pr Unit – V State –of -the- ar	<ul> <li>M –PHM – IoT in intelligent instrument: power instrume echnology: IIC bus –SPI bus – EPA bus- blue tooth eeus: 7 segment LED and matrix key design – IoT desig</li> <li>Sensors with Artificial Intelligence:</li> <li>id imensional intelligent sensors- AI for prognostic instru- intelligent sensors- intelligent sensors standards and p</li> </ul>	ent in IoT - v communica n by Proteus umentation - rotocols:IEE y smart sens tolerance of	ector networ tion technologies ANN based E 1451 stand for protocol.	k ana gy in intelli ard –	igent CEB	r in I Fou sens US	oT –Dat indationa 9+3 sors – 9+3 t analysi
Instrument: SLAM communication te design using Prot Unit – IV Introduction -Mult fuzzy logic based communication pr Unit – V State –of -the- ar	<ul> <li>M –PHM – IoT in intelligent instrument: power instrumed echnology: IIC bus –SPI bus – EPA bus- blue tooth eeus: 7 segment LED and matrix key design – IoT desig</li> <li>Sensors with Artificial Intelligence:</li> <li>it dimensional intelligent sensors- AI for prognostic instruintelligent sensors- intelligent sensors standards and p rotocol for smart home –J1850 Bus – MI bus-plug-n-pla</li> <li>Applications of Intelligent Sensor Technology:</li> <li>t instruments of Siemens, Honeywell and ABB – fault</li> </ul>	ent in IoT - v communica n by Proteus umentation - rotocols:IEE y smart sens tolerance of	ector networ tion technologies ANN based E 1451 stand for protocol.	k ana gy in intelli ard – onitor rt car	igent CEB	r in I Fou sens US - faul art U	oT –Dat indationa 9+3 sors – 9+3 t analysi IAV.
Instrument: SLAM communication te design using Prot <b>Unit – IV</b> Introduction -Mult fuzzy logic based communication pr <b>Unit – V</b> State –of -the- ar and diagnosis. We	<ul> <li>M –PHM – IoT in intelligent instrument: power instrumed echnology: IIC bus –SPI bus – EPA bus- blue tooth eeus: 7 segment LED and matrix key design – IoT desig</li> <li>Sensors with Artificial Intelligence:</li> <li>it dimensional intelligent sensors- AI for prognostic instruintelligent sensors- intelligent sensors standards and p rotocol for smart home –J1850 Bus – MI bus-plug-n-pla</li> <li>Applications of Intelligent Sensor Technology:</li> <li>t instruments of Siemens, Honeywell and ABB – fault</li> </ul>	ent in IoT - v communica n by Proteus umentation - rotocols:IEE y smart sens tolerance of	ector networ tion technologies. - ANN based E 1451 stand sor protocol. - condition mo e robot –sma	k ana gy in intelli ard – onitor rt car	igent CEB	r in I Fou sens US - faul art U	oT –Dat indationa 9+3 sors – 9+3 t analys IAV.
Instrument: SLAM communication te design using Prot Unit – IV Introduction -Mult fuzzy logic based communication pr Unit – V State –of -the- ar and diagnosis. Wo TEXT BOOK: 1. Manabe group,	<ul> <li>M – PHM – IoT in intelligent instrument: power instrume echnology: IIC bus –SPI bus – EPA bus- blue tooth reus: 7 segment LED and matrix key design – IoT desig</li> <li>Sensors with Artificial Intelligence:</li> <li>id imensional intelligent sensors- AI for prognostic instru- intelligent sensors- intelligent sensors standards and p rotocol for smart home –J1850 Bus – MI bus-plug-n-pla</li> <li>Applications of Intelligent Sensor Technology:</li> <li>rt instruments of Siemens, Honeywell and ABB – fault earable intelligent instrument – bio-potential measurem</li> </ul>	ent in IoT - v communica n by Proteus umentation - rotocols:IEE y smart sens tolerance of ents – Mobil	ector networ tion technologies. - ANN based E 1451 stand sor protocol. condition mode robot –sma Lecture:4	k ana gy in intelli ard – onitor rt car <b>5, Tu</b> C Pre	igent CEB ing - sm itoria	r in I Fou sens US faul art U al:15,	oT –Dat indationa 9+3 sors – 9+3 t analysi AV. , Total:6 &Franci
Instrument: SLAM communication te design using Prot Unit – IV Introduction -Mult fuzzy logic based communication pr Unit – V State –of -the- ar and diagnosis. Wo TEXT BOOK: 1. Manabe group, 2 Chang	M –PHM – IoT in intelligent instrument: power instrume echnology: IIC bus –SPI bus – EPA bus- blue tooth ieus: 7 segment LED and matrix key design – IoT desig Sensors with Artificial Intelligence: dimensional intelligent sensors- AI for prognostic instru- intelligent sensors- intelligent sensors standards and p rotocol for smart home –J1850 Bus – MI bus-plug-n-pla Applications of Intelligent Sensor Technology: t instruments of Siemens, Honeywell and ABB – fault earable intelligent instrument – bio-potential measurem	ent in IoT - v communica n by Proteus umentation - rotocols:IEE y smart sens tolerance of ents – Mobil	ector networ tion technologies. - ANN based E 1451 stand sor protocol. condition mode robot –sma Lecture:4	k ana gy in intelli ard – onitor rt car <b>5, Tu</b> C Pre	igent CEB ing - sm itoria	r in I Fou sens US faul art U al:15,	oT –Dat indationa 9+3 sors – 9+3 t analys AV. , Total:6 &Franci
Instrument: SLAM communication te design using Prot Unit – IV Introduction -Mult fuzzy logic based communication pr Unit – V State –of -the- ar and diagnosis. Wo TEXT BOOK: 1. Manabe group, 2 Chang	<ul> <li>M – PHM – IoT in intelligent instrument: power instrumed echnology: IIC bus –SPI bus – EPA bus- blue tooth iseus: 7 segment LED and matrix key design – IoT desig</li> <li>Sensors with Artificial Intelligence:</li> <li>it dimensional intelligent sensors- AI for prognostic instruintelligent sensors- intelligent sensors standards and p rotocol for smart home –J1850 Bus – MI bus-plug-n-pla</li> <li>Applications of Intelligent Sensor Technology:</li> <li>t instruments of Siemens, Honeywell and ABB – fault earable intelligent instrument – bio-potential measurem</li> </ul>	ent in IoT - v communica n by Proteus umentation - rotocols:IEE y smart sens tolerance of ents – Mobil	ector networ tion technologies. - ANN based E 1451 stand sor protocol. condition mode robot –sma Lecture:4	k ana gy in intelli ard – onitor rt car <b>5, Tu</b> C Pre	igent CEB ing - sm itoria	r in I Fou sens US faul art U al:15,	oT –Dat indationa 9+3 sors – 9+3 t analys AV. , Total:6 &Franci
Instrument: SLAM communication te design using Prot Unit – IV Introduction -Mult fuzzy logic based communication pr Unit – V State –of -the- ar and diagnosis. Wa TEXT BOOK: 1. Manabe group, 2. Chang Pvt. Ltd REFERENCES: 1. Stuart F	<ul> <li>A –PHM – IoT in intelligent instrument: power instrume echnology: IIC bus –SPI bus – EPA bus- blue tooth ieus: 7 segment LED and matrix key design – IoT desig</li> <li>Sensors with Artificial Intelligence:</li> <li>idimensional intelligent sensors- AI for prognostic instru- intelligent sensors- intelligent sensors standards and p rotocol for smart home –J1850 Bus – MI bus-plug-n-pla</li> <li>Applications of Intelligent Sensor Technology:</li> <li>t instruments of Siemens, Honeywell and ABB – fault earable intelligent instrument – bio-potential measurem</li> </ul>	ent in IoT - v communica n by Proteus umentation - rotocols:IEE y smart sens tolerance of ents – Mobil and Applica ern Approach	<ul> <li>vector networtion technologies</li> <li>ANN based E 1451 standsor protocol.</li> <li>condition mode robot –sma</li> <li>Lecture:4</li> <li>cations", CRC</li> <li>ations", Benther</li> <li>", 2<sup>nd</sup> Edition</li> </ul>	k ana gy in intelli ard – onitor rt car <b>5, Tu</b> Pre nam (	igent CEB ing - sm itoria Scier	r in I Fou sens US - faul art U al:15, aylor ace F Hall	oT –Dat indationa 9+3 sors – 9+3 t analys AV. , Total:6 &Franci Publisher
Instrument: SLAM communication te design using Prot Unit – IV Introduction -Mult fuzzy logic based communication pr Unit – V State –of -the- ar and diagnosis. Wo TEXT BOOK: 1. Manabe group, 2. Chang Pvt. Ltd REFERENCES: 1. Stuart F	<ul> <li>A –PHM – IoT in intelligent instrument: power instrumed echnology: IIC bus –SPI bus – EPA bus- blue tooth iseus: 7 segment LED and matrix key design – IoT desig</li> <li>Sensors with Artificial Intelligence:</li> <li>id imensional intelligent sensors- AI for prognostic instruintelligent sensors- intelligent sensors standards and protocol for smart home –J1850 Bus – MI bus-plug-n-pla</li> <li>Applications of Intelligent Sensor Technology:</li> <li>t instruments of Siemens, Honeywell and ABB – fault earable intelligent instrument – bio-potential measurem</li> </ul>	ent in IoT - v communica n by Proteus umentation - rotocols:IEE y smart sens tolerance of ents – Mobil and Applica ern Approach	<ul> <li>vector networtion technologies</li> <li>ANN based E 1451 standsor protocol.</li> <li>condition mode robot –sma</li> <li>Lecture:4</li> <li>cations", CRC</li> <li>ations", Benther</li> <li>", 2<sup>nd</sup> Edition</li> </ul>	k ana gy in intelli ard – onitor rt car <b>5, Tu</b> Pre nam (	igent CEB ing - sm itoria Scier	r in I Fou sens US - faul art U al:15, aylor ace F Hall	oT –Dat indation: 9+3 sors – 9+3 t analys AV. , Total:6 &Franc Publisher

COURSE On comp		-	ourse, th	e stud	dents will	be abl	e to						(1	BT Map Highest L	
CO1	develop	mode	lling of ins	trume	nt using i	ntelligei	nt techr	nologi	es					Applying	(K3)
CO2	apply th	e intell	igent tecl	nnolog	gies for an	alyzing	the sig	Inal						Applying	(K3)
CO3	interface	e MAT	LAB and A	Arduin	o for intel	ligent s	ensor te	echno	logy and	commu	nication			Applying	(K3)
CO4	understa	and the	e applicati	ons of	artificial i	ntellige	nce an	d its p	orotocols i	n senso	r technolo	ogy	Un	derstandi	ng (K2)
CO5	understa	and the	e recent tr	ends i	n intellige	nt sens	or tech	nolog	y in indus	trial app	lications		Un	derstandi	ng (K2)
					Mappin	g of CC	Os with	POs	and PSC	s					
COs/POs	6 PO1	PO2	PO3	PO4	PO5	PO6	<b>PO7</b>	PO	B PO9	PO10	PO11	P	012	PSO1	PSO2
CO1	3	2	1	1	1									3	3
CO2	3	2	1	1	1									3	3
CO3	3	2	1	1	1									3	3
CO4	3	1												2	2
CO5	3	1												2	2
1 – Slight	, 2 – Moo	derate,	3 – Subs	tantia	l, BT- Bloo	om's Ta	ixonom	у							
					ASSES	SMEN	ΓΡΔΤΤ	FRN	- THEOR	Y					
	Bloom's egory*	6 I	Remembe (K1) ۶	•	Understa (K2)	inding		/ing	Analyzir (K4) %	ng Eval	uating (H %	<b>&lt;</b> 5)	Creat	ing (K6) %	Total %
C	AT1		40		20		40	)							100
C	AT2		40		20		40	)							100
C	CAT3		40		40		20	)							100
	ESE		40		40		20	)							100
* ±3% ma	ay be vari	ied (CA	AT 1,2,3 -	50 m	arks & ES	SE – 10	0 marks	s)							

			22EIH04- EMBEDD	ED IOT					
Programme Branch		& Electronics and ineering	d Instrumentation	Sem	Category	L	т	Р	Credit
Prerequisite	es Mic	rocontroller and i	ts Applications	6	Honours	3	0	0	3
Preamble		mpart basic princip	ples and concepts on l	nternet of Thing	s technologies	and	its rc	ole in	real time
Unit – I	Fun	damentals and A	pplications of IoT:						9
			Characteristics – lo nentals – Challenges o						
Unit – II	loT	Network Protoco	ols and Communicati	on:					9
Application I Near Field C	Protocol – Adv	anced Message C – Wireless HAR	sion 6, Data protocols: Queuing Protocol. Con T – Z–Wave – 6 LoWP	nectivity Techno	logies: RFID -				uetooth
Unit – III			d Cloud Computing:						9
			- Software Defined Ne						n. Clou
			Cloud Models – Service	Model – Servic	e Managemen	t and	Secu	urity.	•
Unit – IV		-	and End Points :					D	9
			Pi Basic Architecture ators with Raspberry P						
Unit – V	App	lications of IoT:							9
	and Smart H		Weather Monitoring Synthesis and American Syn						
Remote Hea			repriorito bacca mornicon						
Remote Hea				<b>- - ·</b> ·					Total:4
Remote Hea	<b>K</b> :								Total:4
TEXT BOOP			A, "Introduction to IoT",	1 <sup>st</sup> Edition, Ca	mbridge: Cam	bridg	e Un	ivers	
TEXT BOOH           1.         M           2         AI	isra, S., Mukh )21. (Unit I,II, I	II, IV,V) a, Vijay Madisetti,	- -		J	0			ity Press
TEXT BOOH           1.         M           2         AI	isra, S., Mukh 21. (Unit I,II, I shdeep Bahga )15. (Unit III, I\	II, IV,V) a, Vijay Madisetti,	A, "Introduction to IoT",		J	0			ity Press
TEXT BOOK1.M 20 202.An 20REFERENC1.O Jo	isra, S., Mukh )21. (Unit I,II, I shdeep Bahga )15. (Unit III, I\ ES: livier Hersent, ohn Wiley and	II, IV,V) a, Vijay Madisetti, /) David Boswarthick Sons Limited, UK 2	A, "Introduction to IoT", "Internet of Things – A and Omar Elloumi, "T	A hands-on app he Internet of Th	roach", 1 <sup>st</sup> Edi ings: Key App	tion, licatio	Univ ons a	ersiti Ind P	ity Press es Press Protocols

COURSE OUTCOMES: On completion of the course, the students will be able to											BT Mappe (Highest Lev						
CO1	understand the basic concepts of IoT and its present developments												Understanding (K2)				
CO2	understand IoT communication protocols for Interfacing												Understanding (K2)				
CO3	acquire knowledge about sensor networks and Cloud Computing													Understanding (K2)			
CO4	implementation on IoT Physical Devices and sensor interfacing													Applying (K3)			
CO5	recognize IoT applications and control												Understanding (K2)				
					Mappin	g of CO	Os with	POs	and PSC	s							
COs/POs	s PO1	PO2	PO3	PO4	4 PO5	PO6	P07	PO	B PO9	PO10	PO11	PO1	2 PSO1	PSO2			
CO1	3	1											2	2			
CO2	3	1											2	2			
CO3	3	1											2	2			
CO4	3	2	1	1	1								3	3			
CO5	3	1											2	2			
1 – Slight	., 2 – Mo	derate,	3 – Subs	tantia				,	- THEOR	v							
Test / Bloom's Category*			emembe (K1) %	-	Jnderstai (K2) %	nding	Applying (K3) %		Analyzing (K4) %		Evaluating (K5) %		Creating (K6) %	Total %			
CAT1			30		60		10							100			
C	CAT2		30		60		10							100			
CAT3			20		60		20							100			
ESE 20					60	20	20						100				
* ±3% ma	ay be vai	ied (C/	T 1,2,3 -	50 m	arks & ES	SE – 10	0 marks	s)									

## 22EIH05- SMART SENSORS AND INTELLIGENT INSTRUMENTATION

Programme & Branch	BE & Electronics and Instrumentation Engineering	Sem.	Category	L		т	Ρ	Credit
Prerequisites	Transducers Engineering	7	Honours	3		1	0	4
Preamble	This course enhances the students to understand all the various unit operations and be able to apply control sch with desired specifications							,
Unit – I	Basics of Smart Sensors and Micromachining:							9+3
systems, integration	hanical-Electronic transitions in sensing, nature of sensor on of micromachining and microelectronics, introduction to n nicromachining, other micromachining techniques. Case stud	nicromac	hining, bulk ı	micro	on			
Unit – II	MCUs and DSPs for Sensor:							9+3
capability, Local v	control, MCUs for sensor interface: Peripherals, Memory, I oltage or current regulation, Modular MCU design. DSP c study for building smart sensors with MCUs and DSPs.							
Unit – III	Sensor Communication and MEMS:							9+3
<b>U</b> 1 1	obes, micro- mirrors, FEDs, communications for smart ser al networks, office and building automation, home automa						, a	
network communie Unit – IV	cations. Packaging, Testing and Reliability of Smart Sensors:							9+3
network communit Unit – IV Introduction, Sem implications, testi	Cations. Packaging, Testing and Reliability of Smart Sensors: iconductor packaging applied to sensors, hybrid packaging, ng smart sensors. Unit Standards for Smart Sensors: Int	packagii troductior	ng for monoli n, setting the	thic a	se	enso	ors, ds t	9+3 reliability or smar
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COURS On com			-	ourse, the	e stude	ents will	be able	to						BT Map (Highest			
CO1	departies the principle of amort concern and process of micromachining in development of											of	Applying (K3)				
CO2	apply the intelligent systems by interfacing the smart sensors to MCUs and DSPs.													Applying (K			
CO3	apply the use of smart sensors in communication, MEMS and automation													Applying (K3)			
CO4	explain the standards of smart sensors by the assessment of reliability testing and packaging													Understanding (K2)			
CO5	discuss the applications of smart sensors in different fields and recent development.												Applying (K3)				
						Mapping	of COs	s with F	POs an	d PSOs							
COs/Po s	D P 1	) P	02	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO1 1	PO12	PSO 1	PSO 2		
CO1	3		1											2	2		
CO2	3		2	1	1	1								3	3		
CO3	3		2	1	1	1								3	3		
CO4	3		1											2	2		
CO5	3		2	1	1	1								3	3		
1 – Sligl	nt, 2 –	Noder	ate,	3 – Subs	tantial,	BT- Bloo	m's Tax	onomy									
						ASSESS	MENT	PATTE	RN - TI	HEORY							
Test / Bloom's Category*			F	Rememb (K1) %	-	Unders (K2		Appl (K3		Analyzing (K4) %		Evaluating (K5) %		reating (K6) %	Total %		
CAT1			10		40		50							100			
CAT2				10		40		5	0						100		
CAT3				10		40	_	50							100		
		ESE 10						50							100		