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 ELECTRICAL AND ELECTRONICS ENGINEERING

DEPARTMENT OF ELECTRICAL AND ELECTRONICS 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.

We are committed to

QUALITY POLICY

- 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 ELECTRICAL AND ELECTRONICS ENGINEERING

VISION

To be a centre of excellence for providing quality education in the frontier areas of Electrical and Electronics Engineering to benefit the society for the nation and beyond.

MISSION

Department of Electrical and Electronics Engineering is committed to:

MS1:	Develop innovative, competent, ethical and quality engineers to contribute for technical
	advancements to meet societal needs.
MS2:	Provide state-of-the-art facilities for continual improvement in teaching-learning process and
	research activities.
MS3:	Enrich the knowledge and skill of the students to cater to the industrial needs and motivate them
	to become entrepreneurs.

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

Graduate of Electrical and Electronics Engineering program will:

PEO1:	Succeed in professional career by utilizing fundamental knowledge of basic sciences and
	engineering.
PEO2:	Design, simulate, analyze and develop Electrical and Electronics Engineering based products
	which are reliable, cost effective and safe.
PEO3:	Demonstrate communication skills, team work, ethics, codes of professional practice as well as
	an aptitude for continuous learning.

MS\PEO	PEO1	PEO2	PEO3
MS1	3	3	2
MS2	2	2	3
MS3	3	3	3

MAPPING OF MISSION STATEMENTS (MS) WITH PEOs

1 -Slight, 2 -Moderate, 3 -Substantial

PROGRAM OUTCOMES (POs)

Graduates of Electrical and Electronics Engineering will:

- **PO1** Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
- **PO2 Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
- **PO3 Design/development of solutions:** 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** Conduct investigations of complex problems: 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** Modern tool usage: 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** The engineer and society: 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** Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
- **PO8** Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
- **PO9** Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
- **PO10** Communication: 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 Project management and finance:** 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 independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES (PSOs)

Gradua	Graduates of Electrical and Electronics Engineering will:							
PSO1	Comprehend and analyse electro dynamic systems using the nuances of electrical and electronics							
	engineering to meet the industrial demands.							
PSO2	Able to apply computational tools for the design, analysis and control of power systems integrated with renewable energy sources and electric vehicle to provide solutions to the real time.							

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

MAPPING OF PEOs WITH POs AND PSOs

1 – Slight, 2 – Moderate, 3 – Substantial

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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

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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:

SNo	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 Machine Learning	BE – Electronics and Communication Engineering
8.	System on Chip Design *	BE – Electronics and Communication Engineering
9.	Electric Vehicles	BE – Electrical and Electronics Engineering
10.	Microgrid Technologies	BE – Electrical and Electronics Engineering
11.	Intelligent Sensors Technology *	BE – Electronics and Instrumentation 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 Engineering *	BTech – Chemical 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 Science
23.	Blockchain	BTech – Artificial Intelligence and Data Science
24.	Internet of Things (IoT)	BTech – Artificial Intelligence and Machine Learning
25.	Blockchain	BTech – Artificial Intelligence and Machine Learning

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*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

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- **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.

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- **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 weightage assigned to theory and practical components.)	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 Holistic Development	100			
5.	Project Work II Phase I / Project Work II Phase II / Internships	50	50		
6.	One / Two credit Course	The distribution of marks shall be			
7.	All other Courses	decided based on the credit weightage assigned			

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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			
1.	Test - II	20	Average of best 2 tests		
	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

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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 (Max. 5	End Semester Examination (Max. 50 Marks)						
Zeroth Review		Review I (Max 20 Marks)		Review II (Max. 30 Marks)		Report Evaluation (Max. 20 Marks)	Viva - V (Max. 30]	/oce Marks)	
Rv. Com	Super visor	Review Committee (excluding supervisor)	Super visor	Review Committee (excluding supervisor)	Super visor	Ext. Exr.	Super visor	Exr.1	Exr.2
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.

	Continuous Assessment (Max. 100 Marks)											
					Review III (Max. 50 Marks)							
Zeroth Review		Review I (Max 20 Marks)		Review II Max 30 Marks)		Report Evaluation (Max. 20 Marks)	Viva - Voce (Max. 30 Marks)					
Review	Super	Review	Super	Review	Super	Review	Super	Review				
Commi	visor	Committee	visor	Committee	visor	Committee	visor	Committee				
ttee		(excluding		(excluding								
		supervisor)		supervisor)								
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 3rd semester vacation and during 4th semester. Phase II training shall be conducted for minimum of 80 hours in 4th semester vacation and during 5th 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.

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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.

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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.

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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:

For all the passed candidates, the relative grading principle is applied to assign the 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	-

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

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- 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 B.E.– Electrical and Electronics Engineering, Regulation, Curriculum and Syllabus – R2022 Page 23

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.

CURRICULUM BREAKDOWN STRUCTURE – R2022 (For the students admitted in the academic year 2022-23)

(For the students admitted in the academic year 2022-25)											
Summary of Credit Distribution											
Category	Semester								Total number of credits	Curric (% of t credits	culum Content otal number of of the program)
	I	П	III	IV	v	VI	VII	VIII			
HS	4	4	2			2	3		15		08.93
BS	8	8		4					20		11.90
ES	8	8	4	4					24		14.28
PC	3	4	15	13	15	8			58	34.50	
PE					3	3	9	3	18		10.71
OE					4	4	3	3	14		08.33
EC				2	2	6	5	4	19		11.30
MC											
Semester wise Total	23	24	21	23	24	23	20	10	168		100
				C	Categor	у					Abbreviation
Lecture hours per week									L		
Tutorial hours per week									т		
Practical, Project work, Internship, Professional Skill Training, Industrial Training hours per week								week	k P		
Credits									С		

	CATEGORISATION OF COURSES											
HUMANITIES AND SOCIAL SCIENCE INCLUDING MANAGEMENT (HS)												
S. No.	Course Code	Course Name L T P C										
1.	22EGT11	Communication Skills I	3	0	0	3	Ι					
2.	22VEC11	Yoga and Values for Holistic Development	1	0	1	1	Ι					
3.	22EGT21	Communication Skills II	3	0	0	3	П					
4.	22EGL31	Communication Skills Development Laboratory	0	0	2	1	Ш					
5.	22GCT31	Universal Human Values	2	0	0	2	VI					
6.	22GCT71	Economics and Management for Engineers	3	0	0	3	VII					
7.	22TAM01	Heritage of Tamils	1	0	0	1	П					
8.	22TAM02	Tamils and Technology	1	0	0	1	III					
		Total Credits to be earned				15						

	BASIC SCIENCE (BS)											
S. No.	Course Code	Course Name	L	т	Ρ	С	Sem					
1.	22MAC11	Matrices and Ordinary Differential Equations	3	1*	2*	4	I					
2.	22PHT15	Physics for Electrical and Electronics Engineering	3	0	0	3	Ι					
3.	22PHL15	Physics Laboratory for Electrical and Electronics Engineering	0	0	2	1	I					
4.	22MAC21	Multivariable Calculus and Complex Analysis	3	1*	2*	4	II					
5.	22CYT24	Chemistry for Electrical and Electronics Engineering	3	0	0	3	II					
6.	22CYL11	Chemistry Laboratory for Electrical Systems	0	0	2	1	II					
7.	22MAT41	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.	20MET11	Engineering Drawing	3	0	0	3	I					
3.	20MEL11	Engineering Practices Laboratory	0	0	2	1	I					
4.	22EET21	Electromagnetic Theory	3	0	0	3	П					
5.	22CSC22	Data Structures using C	3	0	2	4	П					
6.	22EEL21	Electric Circuits Laboratory	0	0	2	1	11					
7.	22ITC31	Java Programming	3	0	2	4						
8.	22ITC41	Programming in Python	3	0	2	4						
	Total Credits to be earned 24											

	PROFESSIONAL CORE (PC)										
S. No.	Course Code	Course Name	L	т	Ρ	С	Sem	Domain/ Stream			
1.	22EET11	Electric Circuit Analysis	3	0	0	3	I	EL			
2.	22EEC21	Electrical Measurements and Instrumentation	3	0	2	4	Ш	CA			
3.	22EET31	DC Machines and Transformers	3	1	0	4	Ш	EM			
4.	22EET32	Analog Electronics	3	0	0	3	Ш	EL			
5.	22EET33	Digital Electronics	3	0	0	3		EL			
6.	22EET34	Generation, Transmission and Distribution	3	0	0	3		PS			
7.	22EEL31	DC Machines and Transformers Laboratory	0	0	2	1	Ш	EM			
8.	22EEL32	Analog and Digital Electronics Laboratory	0	0	2	1		EL			
9.	22EET41	Synchronous and Induction Machines	3	1	0	4	IV	EM			
10.	22EET42	Control systems	3	1	0	4	IV	CA			
11.	22EET44	Microcontrollers and its interfacing	3	0	0	3	IV	EL			
12.	22EEL41	Synchronous and Induction Machines Laboratory	0	0	2	1	IV	EM			
13.	22EEL42	Control System Laboratory	0	0	2	1	IV	CA			
14.	22EET51	Power System Analysis	3	1	0	4	V	PS			
15.	22EET52	Power Electronics	3	0	0	3	V	PE			
16.	22EEC51	Signals and Systems	2	0	2	3	V	EL			
17.	22EET53	Embedded System Design	3	0	0	3	V	EL			
18.	22EEL51	Embedded System Laboratory	0	0	2	1	V	EL			
19.	22EEL52	Power Electronics Laboratory	0	0	2	1	V	PE			
20.	22EET61	Power System Protection and Switchgear	3	0	0	3	VI	PS			
21.	22EET62	Electric Drives and Control	3	0	0	3	VI	PE			
22.	22EEL61	Power System Laboratory	0	0	2	1	VI	PS			
23.	22EEL62	Electric Drives Laboratory	0	0	2	1	VI	PE			
	Тс	otal Credits to be earned				58					

	PROFESSIONAL ELECTIVES (PEs)										
S. No.	Course Code	Course Name	L	т	Ρ	С	Domain/ Stream				
Semester - V											
		Elective – I									
1.	22EEE01	Power Semiconductor Devices	3	0	0	3	PE				
2.	22EEE02	Artificial intelligence applications to power systems	3	0	0	3	PS				
3.	22EEE03	Renewable Energy System	3	0	0	3	ES				
4.	22EEE04	Modeling of Electrical Machines	3	0	0	3	EM				
5.	22EEE05	VLSI Design	3	0	0	3	EL				
6.	22EEE06	Industry 4.0 for Electrical Engineers	3	0	0	3	CA				
		Semester – VI									
		Elective – II	1	1							
7.	22EEE07	Advanced Power Electronic Circuits	3	0	0	3	PE				
8.	22EEE08	Substation Engineering and Automation	3	0	0	3	PS				
9.	22EEE09	Design, Installation and Commissioning of Solar and Wind Energy Systems	3	0	0	3	ES				
10.	22EEE10	Special Electrical Machines	3	0	0	3	EM				
11.	22EEE11	Sensors and Actuators	3	0	0	3	EL				
12.	22EEE12	Avionics	3	0	0	3	CA				
		Semester – VII									
		Elective – III									
13.	22EEE13	Design of Power Converters	3	0	0	3	PE				
14.	22EEE14	Restructured Power System	3	0	0	3	PS				
15.	22EEE15	Energy Storage Systems and Controllers	3	0	0	3	ES				
16.	22EEE16	Advanced Electric Drives and Control	3	0	0	3	EM				
17.	22EEE17	Advanced Embedded Systems	3	0	0	3	EL				
18.	22EEE18	PLC and SCADA System	3	0	0	3	CA				
		Elective – IV									
19.	22EEE19	Pulse Generating Circuits for Power Converters	3	0	0	3	PE				
20.	22EEE20	High Voltage Engineering	3	0	0	3	PS				
21.	22EEE21	Electric Vehicle Technology	3	0	0	3	ES				
22.	22EEE22	Finite Element Analysis of Electrical Machines	3	0	0	3	EM				

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23.	22EEE23	Digital Twin Technology	3	0	0	3	EL
24.	22EEE24	Soft Computing and Intelligent Controllers	3	0	0	3	CA
		Elective - V					
25.	22EEE25	Power Electronic Interfaces to Renewable Energy	3	0	0	3	PE
26.	22EEE26	Smart Grid	3	0	0	3	PS
27.	22EEE27	Microgrid	3	0	0	3	ES
28.	22EEE28	Electrical Machine Design	3	0	0	3	EM
29.	22EEE29	Digital Image Processing and Multi Resolution Analysis	3	0	0	3	EL
30.	22EEE30	Industrial Automation	3	0	0	3	CA
		Semester - VIII					
		Elective - VI					
31.	22EEE31	Power Quality	3	0	0	3	PE
32.	22EEE32	Power System Security	3	0	0	3	PS
33.	22EEE33	Artificial Intelligent Techniques for Electric Vehicles	3	0	0	3	ES
34.	22EEE34	Electrical Machine Control and Maintenance	3	0	0	3	EM
35.	22EEE35	Digital Signal Processing and its Applications	3	0	0	3	EL
36.	22EEE36	Electric Power Utilisation	3	0	0	3	CA
		Total Credits to be earned				18	

* Domain/Stream Abbreviations: PE – Power Electronics, PS – Power System, ES – Energy Storage, EM – Electrical Machines, EL-Electronics, CA – Controller and Automation

	EMPLOYABILITY ENHANCEMENT COURSES (EC)										
S. No.	Course Code	Course Name	L	т	Р	С	Sem				
1.	22GCL41/ 22GCI41	Professional Skills Training – I / Industrial Training – I				2	IV				
2.	22GCL51/ 22GCI51	Professional Skills Training – II / Industrial Training – II				2	V				
3.	22GEP61	Comprehensive Test and Viva				2	VI				
4.	22EEP61	Project Work – I	0	0	8	4	VI				
5.	22EEP71	Project Work – II Phase – I	0	0	10	5	VII				
6.	22EEP81	Project Work – II Phase – II			8	4	VIII				
	Total C	Credits to be earned				19					

	MANDATORY COURSES (EC)										
S. No.	Course Code	Course Name	L	т	Ρ	С	Sem				
1.	22MNT11	Student Induction Program	-	-	-	0	Ι				
2.	22MNT31	Environmental Science	2	0	0	0	Ш				
	Total Credits to be earned 00										

C	OPEN ELECTIVE COURSES OFFERED TO OTHER DEPARTMENTS (OE)											
S. No.	Course Code	Course Name	L	т	Ρ	С	Sem					
1.	22EEO01	Solar and Wind Energy Systems	3	1	0	4	V					
2.	22EEO02	Electrical Wiring and Lighting	3	1	0	4	V					
3.	22EEO03	Programmable Logic Controller and SCADA	3	1	0	4	V					
4.	22EEO04	Analog and Digital Electronics	3	1	0	4	V					
5.	22EEO05	Power Electronics and Drives	3	1	0	4	V					
6.	22EEO06	Introduction to Sensors and Actuators	3	1	0	4	V					
7.	22EEO07	Energy Conservation and Management	3	1	0	4	VI					
8.	22EEO08	Microprocessors and Microcontrollers Interfacing	3	1	0	4	VI					
9.	22EEO09	Electrical Safety	3	1	0	4	VI					
10.	22EEO10	VLSI System Design	3	1	0	4	VI					
11.	22EEO11	Automation for Industrial Applications	3	1	0	4	VI					
12.	22EEO12	Electric Vehicle	3	0	0	3	VII					
13.	22EEO13	E-Waste Management	3	0	0	3	VII					
14.	22EEO14	Embedded System Design	3	0	0	3	VII					
15.	22EEO15	Energy Storage Systems and Controllers	3	0	0	3	VII					
16.	22EEO16	AI Techniques for Engineering Applications	3	0	0	3	VII					
17.	22EEO17	Smart Grid Technologies	3	0	0	3	VIII					
18.	22EEO18	Biomass Energy Systems	3	0	0	3	VIII					
19.	22GEX01	NCC Studies (Army Wing) - I	3	0	2	4	V/VI					

KEC R2022: (22 Batch) SCHEDULING OF COURSES – BE (Electrical and Electronics Engineering) Total Credits: 168

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)	22PHT15 Physics for Electrical and Electronics Engineering (3-0-0-3)	22EET11 Electric Circuit Analysis (3-0-0-3)	22CSC11 Problem Solving and Programming in C (3-0-2-4)	22MET11 Engineering Drawing (3-0-0-3)	22PHL15 Physics Laboratory for Electrical and Electronics Engineering (0-0-2-1)	22MNT11 Student Induction Program (0-0-0-0)	22MEL11 Engineering Practices Lab (0-0-2-1)	22VEC11 Yoga and Values for Holistic Development (0-0-0-1)	23
11	22EGT21 Communication Skills II (3-0-0-3)	22MAC21 Multivariable Calculus and Complex Analysis (3-1*-2*-4)	22CYTT24 Chemistry for Electrical and Electronics Engineering (3-0-0-3)	22EEC21 Electrical Measurements and Instrumentation (3-0-2-4)	22EET21 Electromagnetic Theory (3-0-0-3)	22CSC22 Data Structures using C (3-0-2-4)	22CYL11 Chemistry Laboratory for Electrical Systems (0-0-2-1)	22EEL21 Electric Circuits Laboratory (0-0-2-1)	22TAM01 Heritage of Tamils (1-0-0-1)		24
111	22ITC31 Java Programming (3-0-2-4)	22EET31 DC Machines and Transformers (3-1-0-4)	22EET32 Analog Electronics (3-0-0-3)	22EET33 Digital Electronics (3-0-0-3)	22EET34 Generation, Transmission and Distribution (3-0-0-3)	22MNT31 Environmenta I Science (2-0-0-0)	22EEL31 DC Machines and Transformers Laboratory (0-0-2-1)	22EEL32 Analog and Digital Electronics Laboratory (0-0-2-1)	22EGL31 Communication Skills Development Laboratory (0-0-2-1)	22TAM22 Tamils and Technology (1-0-0-1)	21
IV	22MAT41 Transforms and Partial Differential Equations (3-1*-2*-4)	22ITC41 Python Programming (3-0-2-4)	22EET41 Synchronous and Induction Machines (3-1-0-4)	22EET42 Control systems (3-1-0-4)	22EET44 Microcontrollers and its interfacing (3-0-0-3)	22GCL41/ 22GCl41 Professional Skills Training – I /Industrial Training – I (0-0-2)	22EEL41 Synchronous and Induction Machines Laboratory (0-0-2-1)	22EEL42 Control System Laboratory (0-0-2-1)			23
v	22EET51 Power System Analysis (3-1-0-4)	22EET52 Power Electronics (3-0-0-3)	22EEC51 Signals and Systems (2-0-2-3)	22EET53 Embedded System Design (3-0-0-3)	Professional Elective – I (3-0-0-3)	Open Elective — I (3-1-0-4)	22EEL51 Embedded System Laboratory (0-0-2-1)	22EEL52 Power Electronics Laboratory (0-0-2-1)	22GCL51/ 22GCI51 Professional Skills Training – II / Industrial Training – II (0-0-0-2)		24
VI	22EET61 Power System Protection and Switchgear (3-0-0-3)	22EET62 Electric Drives and Control (3-0-0-3)	Professional Elective – II (3-0-0-3)	Open Elective – Il (3-1-0-4)	22EEL61 Power System Laboratory (0-0-2-1)	22EEL62 Electric Drives Laboratory (0-0-2-1)	22GCT31 Universal Human Values (2-0-0-2)	22GEP61 Comprehensive Test and Viva (2-0-0-2)	22EEP61 Project Work – I (0-0-8-4)		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)	22EEP71 Project Work II Phase I (0-0-10-5)					20
VII	Open Elective IV (3-0-0-3)	Professional Elective VI (3-0-0-3)	22EEP81 Project Work II Phase II (0-0-8-4)								10

Kongu Engineering College, Perundurai, Erode – 638060, India 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	PO11	PO12	PSO1	PSO2
1	22EGT11	Communication Skills I						~			✓	✓	~	✓	~	~
1	22MAC11	Matrices and Ordinary Differential Equations	✓	~	~		~								~	✓
1	22PHT15	Physics for Electrical and Electronics Engineering	~	~	~						~	~		✓	✓	~
1	22EET11	Electric Circuit Analysis	\checkmark	\checkmark	~	~	~				\checkmark			✓	\checkmark	\checkmark
1	22CSC11	Problem Solving and Programming in C	~	~	~	~	~					~		~	~	\checkmark
1	22MET11	Engineering Drawing	~	~	✓		✓					✓			✓	✓
1	22PHL15	Physics Laboratory for Electrical and Electronics Engineering	~	~	~	~					~	~		~	~	~
1	22MNT11	Student Induction Program														
1	22MEL11	Engineering Practices Laboratory	~		~	~	~	~			\checkmark	~		✓	✓	\checkmark
1	22VEC11	Yoga and Values for Holistic Development						~		~	~					
1	22TAM01	Heritage of Tamils						~		~	✓	✓		✓		
1	22GCL12	Foundation Lab –II	~	~	~	~	~	~		~	~	~	✓	~		
2	22EGT21	Communication Skills II						~			~	~	✓	~	~	✓
2	22MAC21	Multivariable Calculus and Complex Analysis	~	~	~		~								~	~
2	22CYT24	Chemistry for Electrical and Electronics Engineering	~	~	~	~			~						~	~
2	22EEC21	Electrical Measurements and Instrumentation	\checkmark	\checkmark	✓	\checkmark					✓			\checkmark	~	✓
2	22EET21	Electromagnetic Theory	~	~	~					~				✓	✓	\checkmark
2	22CSC22	Data Structures using C	~	~	~	~									✓	\checkmark
2	22CYL11	Chemistry Laboratory for Electrical Systems	~	~	~	~			~						~	✓
2	22EEL21	Electric Circuits Laboratory	~	~	~	~								~	~	✓
2	22EET22	Electromagnetic Fields	~	~	~						✓			~	✓	✓
2	22GCL11	Foundation Lab – I	~	~	~		~				~	~		~		
	22TAM02	Tamils and Technology						~		~	✓	~		~		
3	22ITC31	Java Programming	✓	✓	✓	~									~	\checkmark
3	22EET31	DC Machines and Transformers	✓	✓	✓	~	✓		✓		✓			✓	~	~
3	22EET32	Analog Electronics	~	~	~	~	~				✓			✓	~	\checkmark
3	22EET33	Digital Electronics	~	~	~	~	~				✓			✓	~	\checkmark



Sem.	Course Code	Course Title	P01	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
3	22EET34	Generation, Transmission and Distribution	~	~	~	~	~	~						✓	✓	\checkmark
3	22MNT31	Environmental Science	✓	✓	~				✓						~	✓
3	22EEL31	DC Machines and Transformers Laboratory	✓	~	~	✓	~				~			✓	~	✓
3	22EEL32	Analog and Digital Electronics Laboratory	~	✓	~	~	✓	~			~			~	~	✓
3	22EGL31	Communication Skills Development Laboratory									~	~		~	~	~
3	22EET35	Electric Circuit Theory	✓	\checkmark	\checkmark	✓	\checkmark				\checkmark			\checkmark	\checkmark	✓
3	22EET36	Measurements and Instrumentation	~	~	~	~					~			~	~	✓
3	22EEL33	Circuits and Measurements Laboratory	~	~	~	~	✓	~	~		~	✓		~	✓	✓
4	22MAT41	Transforms and Partial Differential Equations	~	~	~										✓	✓
4	22ITC41	Python Programming	~	✓	~	~									~	✓
4	22EET41	Synchronous and Induction Machines	~	✓	~	~	~		~		~			~	~	~
4	22EET42	Control systems	✓	~	~	✓	~	✓			~			✓	~	✓
4	22EET44	Microcontrollers and its interfacing	~	~	~	~	~	~	~	~		✓	✓	✓	✓	✓
4	22GCL41/ 22GCl41	Professional Skills Training – I / Industrial Training – I	~	~				~	~	~	~	~	~	✓	~	~
4	22EEL41	Synchronous and Induction Machines Laboratory	~	~	~	~	~			~				~	~	~
4	22EEL42	Control System Laboratory	\checkmark	\checkmark	\checkmark	✓	\checkmark				\checkmark			\checkmark	\checkmark	✓
4	22EEL43	Microprocessors and Microcontrollers Interfacing Laboratory	~	~	~	~	~	~		~	~	~	~	~	~	~
4	22EET45	Continuous and Discrete Time Signals and Systems	~	✓	~	~	✓				~			~	~	~
5	22EET51	Power System Analysis	\checkmark	\checkmark	\checkmark	✓	\checkmark	✓	✓	\checkmark	\checkmark		\checkmark	\checkmark	\checkmark	✓
5	22EET52	Power Electronics	~	\checkmark	~	~	\checkmark	~			\checkmark		\checkmark	\checkmark	✓	\checkmark
5	22EEC51	Signals and Systems	~	~	~	~	~				~			~	✓	✓
5	22EET53	Embedded System Design	~	~	~	~	~	~	~	~		~	~	~	~	✓
5	22EEL51	Embedded System Laboratory	~	✓	~	~	✓	~		~	~	~	~	~	~	✓
5	22EEL52	Power Electronics Laboratory	~	~	~	~	~	~			~	✓	✓	✓	✓	✓
5	22GCL51/ 22GCl51	Professional Skills Training – II / Industrial Training – II														
6	22EET61	Power System Protection and Switchgear	✓	\checkmark	~	✓	✓	~	~		✓			✓	✓	✓

Sem.	Course Code	Course Title	P01	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
6	22EET62	Electric Drives and Control	✓	✓	✓	✓	~	✓	✓		~	~		~	~	✓
6	22EEL61	Power System Laboratory	~	~	~	✓	~	~	~		~	~	~	~	~	~
6	22EEL62	Electric Drives Laboratory	~	~	~	~	~	~	~		✓	✓		✓	✓	\checkmark
6	22GCT31	Universal Human Values	~	~	~	✓										
6	22GEP61	Comprehensive Test and Viva	~	~	~	~					✓	✓	~		~	\checkmark
6	22EEP61	Project Work – I	~	~	~	~	~	~	~	✓	✓	✓	~	✓	~	✓
6	22EEL63	Power Electronics and Drives Laboratory	~	~	~	~	~	~	~	✓	✓	✓	~	✓	~	✓
6	22EEL64	Power and Energy Laboratory	~	~	~	~	~	~	~		✓	✓	~	✓	~	\checkmark
7	22GCT71	Engineering Economics and Management	~	~	~			~	~	✓	✓	✓	✓	~		
7	22EEP71	Project Work – II Phase – I	~	~	~	~	~	~	~	✓	✓	✓	✓	✓	✓	\checkmark
8	22EEP81	Project Work – II Phase – II	~	~	~	~	~	~	~	~	✓	✓	~	✓	~	✓
		Professional Elective Courses														
5	22EEE01	Power Semiconductor Devices	~	~	~			~						~	~	✓
5	22EEE02	Artificial Intelligence Applications To Power Systems	~	~	~	~	~	~	~	~	~			~	~	~
5	22EEE03	Renewable Energy System	~	~	~	\checkmark			~	~				~	✓	\checkmark
5	22EEE04	Modeling of Electrical Machines	~	~	~	~				~				~	~	\checkmark
5	22EEE05	VLSI Design	~	~	~	~	~				~		~	~	~	✓
5	22EEE06	Industry 4.0 for Electrical Engineers	~	~	~	✓		~	~		~			✓	~	✓
6	22EEE07	Advanced Power Electronic Circuits	~	~	~			~			~			✓	~	✓
6	22EEE08	Substation Engineering and Automation	~	~	~	~	~		~		✓			~	~	\checkmark
6	22EEE09	Design, Installation and Commissioning of Solar and Wind Energy Systems	~	~	~	\checkmark	~	~	~					~	~	~
6	22EEE10	Special Electrical Machines	~	~	~	~		~						~	~	✓
6	22EEE11	Sensors and Actuators	~	~	~		~							~	~	✓
6	22EEE12	Avionics	~	~	~	~		~			✓			~	~	\checkmark
7	22EEE13	Design of Power Converters	~	~	~	~		~			~		✓	✓	~	✓
7	22EEE14	Restructured Power System	~	~	~	~		~	~				~	✓	~	✓
7	22EEE15	Energy Storage Systems and Controllers	~	✓	~				~				✓	✓	~	✓

Sem.	Course Code	Course Title	P01	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
7	22EEE16	Advanced Electric Drives and Control	~	~	~	~		~	~		~	✓		✓	~	✓
7	22EEE17	Advanced Embedded Systems	~	~	~	~	~	~	~	~	~		~	~	~	✓
7	22EEE18	PLC and SCADA System	~	~	~	✓	✓	~	~		✓			~	~	✓
7	22EEE19	Pulse Generating Circuits for Power Converters	~	~	~	~	~						~	~	~	~
7	22EEE20	High Voltage Engineering	\checkmark	\checkmark	~	✓			\checkmark		\checkmark			~	~	\checkmark
7	22EEE21	Electric Vehicle Technology	~	~	~	~		~	~			✓		~	✓	✓
7	22EEE22	Finite Element Analysis of Electrical Machines	~	~	~			~			~			~	~	✓
7	22EEE23	Digital Twin Technology	~	~	~	~	✓	~					✓	✓	~	✓
7	22EEE24	Soft Computing and Intelligent Controllers	~	~	~	~	~	~						✓	~	✓
7	22EEE25	Power Electronic Interfaces to Renewable Energy	~	~	~			~	~		~			~	~	~
7	22EEE26	Smart Grid	~	~	~		~			~				~	~	✓
7	22EEE27	Microgrid	~	~	~	~		~			✓			✓	~	✓
7	22EEE28	Electrical Machine Design	~	~	~	~			~		✓			✓	~	✓
7	22EEE29	Digital Image Processing and Multi Resolution Analysis	~	~	~	~	~						~	~	~	~
7	22EEE30	Industrial Automation	~	~	~	~			~		✓			✓	~	\checkmark
7	22EEE37	Embedded Systems	\checkmark	\checkmark	~	✓	\checkmark	✓	\checkmark	\checkmark		✓	~	~	~	\checkmark
8	22EEE31	Power Quality	~	~	~	~			~	\checkmark				~	✓	✓
8	22EEE32	Power system security	~	~	~	~			~					~	~	✓
8	22EEE33	Artificial Intelligent Techniques for Electric Vehicles	~	~	~	~	~				~			~	~	~
8	22EEE34	Control and Maintenance of Electrical Machines	~	~	~				~	~			✓	✓	✓	~
8	22EEE35	Digital Signal Processing and its Applications	~	~	~		\checkmark				\checkmark		~	~	✓	✓
8	22EEE36	Electric Power Utilization	~	~	~	~			~				✓	~	~	\checkmark
		OPEN ELECTIVE														
5	22EEO01	Solar and Wind Energy Systems	\checkmark	\checkmark	\checkmark			\checkmark	\checkmark					\checkmark		
5	22EEO02	Electrical Wiring and Lighting	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark							\checkmark		

Sem.	Course Code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	P011	PO12	PSO1	PSO2
5	22EEO03	Programmable Logic Controller and SCADA	\checkmark	\checkmark	\checkmark	\checkmark		\checkmark			\checkmark			\checkmark		
5	22EEO04	Analog and Digital Electronics	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark							\checkmark		
5	22EEO05	Power Electronics and Drives	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark			\checkmark					
5	22EEO06	Sensors and Actuators	\checkmark	\checkmark	\checkmark			\checkmark						\checkmark		
6	22EEO07	Energy Conservation and Management	\checkmark	\checkmark	\checkmark				\checkmark	\checkmark	\checkmark			\checkmark		
6	22EEO08	Microprocessors and Microcontrollers Interfacing	\checkmark		\checkmark	\checkmark	\checkmark									
6	22EEO09	Electrical Safety	\checkmark	\checkmark	\checkmark				\checkmark	\checkmark			\checkmark	\checkmark		
6	22EEO10	VLSI System Design	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark				\checkmark		\checkmark	\checkmark		
6	22EEO11	Automation for Industrial Applications	\checkmark	\checkmark	\checkmark	\checkmark			\checkmark		\checkmark			\checkmark		
7	22EEO12	Electric Vehicle	\checkmark	\checkmark	\checkmark	\checkmark		\checkmark	\checkmark		\checkmark			\checkmark		
7	22EEO13	E-Waste Management	\checkmark	\checkmark	\checkmark	\checkmark		\checkmark	\checkmark					\checkmark		
7	22EEO14	Embedded System Design	\checkmark		\checkmark	\checkmark	\checkmark									
7	22EEO15	Energy Storage Systems and Controllers	\checkmark	\checkmark	\checkmark			\checkmark			\checkmark		\checkmark	\checkmark		
7	22EEO16	AI Techniques for Engineering Applications	\checkmark	\checkmark	\checkmark	\checkmark										
8	22EEO17	Smart Grid Technologies	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark			\checkmark				\checkmark		
8	22EEO18	Biomass Energy Systems	\checkmark	\checkmark	\checkmark			\checkmark	\checkmark				\checkmark	\checkmark		
		OPEN ELECTIVE OFFERED BY OTHER DEPARTMENT														
5	22CEX01	Remote Sensing and its Applications	✓	✓	~	✓		✓			✓			✓		
5	22MEX01	Renewable Energy Sources	✓		~	✓	✓	✓	✓	✓	✓					
5	22MTO01	Design of Mechatronics Systems	✓	✓	~	✓	✓							✓		
5	22MTX01	Data Acquisition and Virtual Instrumentation	✓	✓	\checkmark	✓	✓							✓		
5	22MTX02	Factory Automation	1	✓	>	✓	✓				✓	✓		✓		
5	22AUX01	Automotive Engineering	✓	✓	✓			✓	✓		✓	✓		✓		
5	22ECX01	Basics of Electronics in Automation Appliances	✓	✓	✓	✓		✓	✓	✓			✓	✓		
5	22ECX02	Image Processing	✓	✓	✓	✓	✓				✓	✓		✓		
5	22EIO01	Measurements and Instrumentation	✓	✓	✓	✓	✓									
5	22EIO02	Biomedical Instrumentation and Applications	✓	✓	✓	✓	✓	✓		✓						
Sem.	Code	ngineering College, Perundurai Erode – 638060, Indi	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	P011	PO12	PSO1	PSO2
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5	22EIO03	Industrial Automation	✓	✓	✓	✓	✓									
5	22CSX01	Fundamentals of Databases	✓	✓	✓											
5	22CSX02	Data science for Engineers	✓	✓	✓	✓	✓									1
5	22CSX03	Enterprise Application Development Using Java	~	~	~	~	~	~	~	~	~	~	~	~		
5	22CSO01	Computational science for Engineers	✓	✓	✓											
5	22CSO02	Formal Languages and Automata Theory	✓	✓	✓											
5	22ITO01	Artificial Intelligence	✓	✓	✓	✓		✓	✓	✓	✓	1	✓			
5	22ITX01	Next Generation Databases	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			
5	22CDO01	Fundamentals of User Experience Design	✓	✓	✓	✓	✓				✓	✓	✓			
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	~	~	~	~	~									
5	22MAO02	Numerical Computing	✓	✓	✓											
5	22MAO03	Stochastic Processes and Queuing Theory	✓	✓	✓											
5	22MAO04	Statistics for Engineers	✓	✓	✓											
5	22PHO01	Thin Film Technology	✓	✓	1						✓	✓		✓		
5	22PHO02	High Energy Storage Devices	~	~	~						✓	✓		✓		
5	22PHO03	Structural and Optical Characterization of Materials	~	~	~						~	✓		✓		
5	22CYO01	Instrumental Methods of Analysis	✓	✓	✓	✓										
5	22CYO02	Chemistry Concepts for Competitive Examinations	✓	~	✓											
5	22CYO03	Organic Chemistry for Industry	✓	✓	✓	✓										
5	22MBO01	Cost Accounting for Engineers										✓	✓	✓		
6	22CEO01	Disaster Management	✓	✓	✓			✓	✓					✓		

Sem.	Code	ngineering College, Perundurai, Frode – 638060, India	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	P011	PO12	PSO1	PSO2
6	22MEX02	Design of Experiments	✓	✓	✓	✓	✓				✓					
6	22GEO04	Innovation and Business Model Development	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
6	22MTO02	Robotics	✓	✓	✓	✓	✓							✓		
6	22MTO03	3D Printing and Design	✓	✓			✓							✓		
6	22AUO01	Automotive Electronics	✓	✓	✓	✓								✓		
6	22ECX03	PCB Design and Fabrication	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓		
6	22EIO04	PLC Programming with High Level Languages	✓	✓	✓	✓	✓									
6	22EIO05	Virtual Instrumentation	✓	✓	✓	✓	✓									
6	22CSX04	Foundations of Machine Learning	✓	✓	✓											
6	22CSX05	Web Engineering	✓	✓	✓											
6	22ITX02	Advanced Java Programming	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			
6	22ITO02	Internet of Things	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓			
6	22ITO03	Fundamentals of Software Development	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓			
6	22ITO04	Mobile Application Development	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			
6	22CDX01	Fundamentals of User Interactive Design	✓	✓	✓	✓										
6	22ADX01	Data Visualization	✓	✓	✓											
6	22ALX01	Data Exploration and Visualization Techniques	~	~	~											
6	22CHO04	Air Pollution Monitoring and Control	✓	✓	✓			✓	✓							
6	22CHO05	Paints and Coatings	✓	✓	✓				✓							
6	22CHO06	Powder Technology	✓	✓	✓			✓	✓					✓		
6	22FTX02	Processing of milk and milk products	✓	✓	✓		✓	✓		✓	✓	✓		✓		
6	22FTX03	Processing of Fruits and Vegetables	✓	✓	✓		✓	✓		✓	✓	✓		✓		
6	22MAO05	Graph Theory and its Applications	✓	✓	✓											
6	22MAX01	Data Analytics using R Programming	✓	✓	✓	✓	✓									
6	22MAO06	Operations Research	✓	✓	✓											
6	22MAO07	Number Theory and Cryptography	✓	✓	✓		✓									
6	22PHO04	Synthesis, Characterization and Biological Applications of Nanomaterials	✓	✓	✓						~	✓		✓		
6	22PHO05	Techniques of Crystal Growth	✓	✓	✓						✓	✓		✓		

Sem.	Coutongu E	ngineering College, Perundurzi, Erode – 638060, Indi	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
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	✓	✓	✓			✓	✓							
7	22MEO01	Fundamentals of Ergonomics	✓	✓	✓	✓	✓	✓	✓					✓		
7	22MEO02	Principles of Management and Industrial Psychology	✓					✓				✓	~			
7	22MEO03	Waste Heat Recovery System and Storage	✓	✓	✓	✓			✓							
7	22GEO05	Entrepreneurship Development	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
7	22MTO04	Drone System Technology	✓	✓	✓	✓	✓							✓		
7	22AUO02	Vehicle Maintenance	✓	✓			✓		✓					✓		
7	22ECO01	Wearable Devices	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓		
7	22ECX04	Electronic Hardware and Troubleshooting	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓		
7	22EIO06	Introduction to Distributed Control Systems	✓	✓	✓	✓	✓			✓		✓				
7	22EIO07	Instrumentation in Aircraft Navigation and Control	✓	✓	✓	✓	✓									
7	22EIO08	Industry 4.0 with Industrial IoT	✓	✓	✓	✓	✓			✓						
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	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			
7	22ITO06	Introduction to Ethical Hacking	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			
7	22CDO02	Introduction to Mobile Game Design	✓	✓	✓	✓										
7	22CDO03	Introduction to Graphics Design	✓	✓	✓	✓										
7	22ADO02	Neural Networks and Deep Learning	✓	✓	✓	✓										
7	22ALO02	Industrial Machine Learning	✓	✓	✓											
7	22CHO07	Hydrogen Energy	✓	✓										✓		
7	22CHO08	Rubber Technology	✓	✓		Ī		✓	✓					✓		

Sem.	Code	ngineering College, Perundurai, Frode – 638060, India	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	P011	PO12	PSO1	PSO2
7	22FTO02	Principles of Food safety	✓	✓	✓			✓	✓	✓		✓		✓		
7	22FTO03	Fundamentals of Food Packaging and Storage	✓	✓	✓	✓	✓	✓		✓		✓		✓		
7	22MAO08	Non-Linear Optimization	✓	✓	✓											
7	22MAO09	Optimization for Engineers	✓	✓	✓											
7	22CYO07	Waste and Hazardous Waste Management	✓	✓	✓	✓			✓							
7	22CYO08	Chemistry in Every day Life	✓	✓	✓	✓										
7	22MBO03	Marketing Analytics										1	✓	✓		
8	22CEO04	Infrastructure Planning and Management	✓	✓	✓		✓									
8	22CEO05	Environmental Laws and Policy	✓	✓			✓									
8	22MEO04	Safety Measures for Engineers	✓					✓	✓	✓						
8	22MEO05	Energy Conservation in Thermal Equipments	✓		✓		✓	✓	✓					✓		
8	22MEO06	Climate Change and New Energy Technology	✓		✓			✓	✓	✓						
8	22MTO05	Micro and Nano Electromechanical Systems	✓	✓	✓	✓								✓		
8	22AUO03	Public Transport Management	✓	✓				✓	✓	✓				✓		
8	22AUO04	Autonomous Vehicles	✓	✓	✓	✓	✓	✓	✓					✓		
8	22ECO02	Optical Engineering	✓	✓	✓	✓		✓	✓	✓	✓			✓		
8	22EIO12	Environmental Sensors	✓	✓	✓	✓	✓		✓							
8	22EIO13	Pollution Control and Management	✓	✓	✓	✓	✓	✓		✓						
8	22CSO04	Machine Translation	✓	✓	✓											
8	22CSO05	Fundamentals of Blockchain	✓	✓	✓											
8	22ITO07	Business Continuity Planning	✓	✓	✓	✓		✓	✓	✓	✓	1	✓			
8	22CDX02	Virtual Reality and Augmented Reality	✓	✓	✓	✓										
8	22ADO03	Business Analytics	✓	✓	✓	✓										
8	22ALO03	Machine Learning for Smart Cities	✓	✓	✓	✓										
8	22CHO09	Industrial Accident Prevention and Management	~		~	✓		~	~	✓	✓	✓	✓	✓		
8	22CHO10	Electrochemical Engineering	✓	✓	✓											
8	22CHO11	Smart and Functional Materials	✓	✓					✓	✓	✓			✓		
8	22FTO04	Food Ingredients	✓	✓	✓			✓		✓		✓		✓		

Sem.	Code	ngineering College, Perundurai, Erode – 638060, India	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	P011	PO12	PSO1	PSO2
8	22FTO05	Food and Nutrition	✓	✓	✓			✓				✓		✓		
8	22CYO09	Chemistry of Nutrition for Women Health	✓	✓	✓											
		General Open Elective Courses														
ALL	22GEO01	German Language Level 1								✓	✓	~		✓		
ALL	22GEO02	Japanese Language Level 1								✓	✓	✓		✓		
5	22GEO03	Design Thinking for Engineers	✓	✓	✓	✓										
6	22GEO04	Innovation and Business Model Development	✓	✓	✓	✓	✓	✓	✓	✓	~	~	✓	✓		
ALL	22GEO05	German Language Level 2								✓	~	~		✓		
ALL	22GEO06	German Language Level 3								✓	~	~		✓		
ALL	22GEO07	German Language Level 4								✓	✓	~		✓		
ALL	22GEO08	Japanese Language Level 2								✓	~	~		✓		
ALL	22GEO09	Japanese Language Level 3								✓	✓	~		✓		
ALL	22GEO10	Japanese Language Level 4								~	~	~		✓		
ALL	22GEO11	French Language Level 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								~	✓	~		✓		
7	22GEO17	Entrepreneurship Development	✓	✓	✓	✓	✓	✓	✓	✓	~	~	✓	✓		
5/6	22GEX01	NCC Studies (Army Wing) - I	✓	✓	✓	✓	~	✓	✓	~	~	~				
5/6	22GEX02	NCC Studies (Air Wing) - 1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓				
5	22MBO01	Cost Accounting for Engineers										✓	✓	✓		
6	22MBO02	Economic Analysis for Decision Making					✓					~	✓			
7	22MBO03	Marketing Analytics										✓	✓	✓		

SEMESTER	R – I								
Course			Hou We	ırs/ ek		Ма	aximum	Marks	
Code	Course Title	L	т	Ρ	Credit	СА	ESE	Total	Category
Theory/The	eory 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
22PHT15	Physics for Electrical and Electronics Engineering	3	0	0	3	40	60	100	BS
22EET11	Electric Circuit Analysis	3	0	0	3	40	60	100	PC
22CSC11	Problem Solving and Programming in C	3	0	2	4	100	0	100	ES
22MET11	Engineering Drawing	2	1	0	3	40	60	100	ES
Practical /	Employability Enhancement								
22PHL15	Physics Laboratory for Electrical and Electronics 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	to b	oe ear	ned	23				

*Alternate Weeks

SEMESTER	R – II								
Course			Hou We	ırs/ ek		Ма	ximum	Marks	
Code	Course Title	L	Т	Р	Credit	СА	ESE	Total	Category
Theory/The	eory 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
22CYT24	Chemistry for Electrical and Electronics Engineering	3	0	0	3	40	60	100	BS
22EEC21	Electrical Measurements and Instrumentation	3	0	2	4	50	50	100	PC
22EET21	Electromagnetic Theory	3	0	0	3	40	60	100	ES
22CSC22	Data Structures using C	3	0	2	4	50	50	100	ES
22TAM01	Heritage of Tamils	1	0	0	1	100	0	100	HS
Practical /	Employability Enhancement								
22CYL11	Chemistry Laboratory for Electrical Systems	0	0	2	1	60	40	100	BS
22EEL21	Electric Circuits Laboratory	0	0	2	1	60	40	100	ES
	Total Cred			rned	24				

*Alternate Weeks

SEMESTER	2 – 111								
Course		Но	urs / \	Neek		Max	imum	Marks	Cate
Code	Course Title	L	Т	Ρ	Credit	CA	ESE	Total	gory
Theory/The	ory with Practical								
22ITC31	Java Programming	3	0	2	4	50	50	100	ES
22EET31	DC Machines and Transformers	3	1	0	4	40	60	100	PC
22EET32	Analog Electronics	3	0	0	3	40	60	100	PC
22EET33	Digital Electronics	3	0	0	3	40	60	100	PC
22EET34	Generation, Transmission and Distribution	3	0	0	3	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 / I	Employability Enhancement								
22EEL31	DC Machines and Transformers Laboratory	0	0	2	1	60	40	100	PC
22EEL32	Analog and Digital Electronics Laboratory	0	0	2	1	60	40	100	PC
22EGL31	Communication Skills Development Laboratory	0	0	2	1	60	40	100	HS
	Total Cred	its to	be ea	arned	21				

SEMESTER	k − IV								
Course		Но	urs/\	Neek	Cradit	Max	imum	Marks	Cate
Code	Course The	L	Т	Ρ	Credit	СА	ESE	Total	gory
Theory/The	ory 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
22EET41	Synchronous and Induction Machines	3	1	0	4	40	60	100	PC
22EET42	Control Systems	3	1	0	4	40	60	100	PC
22EET43	Microcontrollers and its interfacing	3	0	0	3	40	60	100	PC
Practical /	Employability Enhancement								
22EEL41	Synchronous and Induction Machines Laboratory	0	0	2	1	60	40	100	PC
22EEL42	Control Systems Laboratory	0	0	2	1	60	40	100	PC
22GCL41/ 22GCI41	Professional Skills Training – I / Industrial Training – I *				2	100	0	100	EC
	Total Credi	ts to	be ea	arned	23				

*80 hours of training

SEMESTER	– v								
Course		Но	ours / \	Neek	Cradit	Max	kimum	Marks	Cate
Code	Course The	L	Т	Р	Credit	СА	ESE	Total	gory
Theory/Theo	ory with Practical								
22EET51	Power System Analysis	3	1	0	4	40	60	100	PC
22EET52	Power Electronics	3	0	0	3	40	60	100	PC
22EEC51	Signals and Systems	2	0	2	3	50	50	100	PC
22EET53	Embedded System Design	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/ 50	60/ 50	100	OE
Practical / E	mployability Enhancement								
22EEL51	Embedded System Laboratory	0	0	2	1	60	40	100	PC
22EEL52	Power Electronics Laboratory	0	0	2	1	60	40	100	PC
22GCL51/ 22GCl51	Professional Skills Training – II / Industrial Training – II *				2	100	0	100	EC
	Total Cred	be e	arned	24					

*80 hours of training

SEMESTER	– VI								
Course	Course	Но	ours / V	Neek	Credit	Max	imum	Marks	Cate
Code	Title	L	Т	Р	Creat	СА	ESE	Total	gory
Theory/Theo	ory with Practical								
22EET61	Power System Protection and Switchgear	3	0	0	3	40	60	100	PC
22EET62	Electric Drives and Control	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/ 50	60/ 50	100	OE
Practical / E	mployability Enhancement								
22EEL61	Power System Laboratory	0	0	2	1	60	40	100	PC
22EEL62	Electric Drives Laboratory	0	0	2	1	60	40	100	PC
22GET31	Universal Human Values	2	0	0	2	100	0	100	HS
22GEP61	Comprehensive Test and Viva				2	100	0	100	EC
22EEP61	Project Work – I	0	0	8	4	50	50	100	EC
	Total Cree	dits to	o be e	arned	23				

SEMESTE	R – VII								
Course	Course Title	Но	ours /	Week	Crodit	Max	kimum	Marks	Cate
Code	Course True	L	Т	Р	Credit	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								
22EEP71	Project Work – II Phase – I	0	0	10	5	50	50	100	EC
	Total Cred	dits t	o be e	arned	20				

SEMESTE	R – VIII								
Course Code	Course Title	Hours / Week				Max	ximum	Category	
	Course Title	L	Т	Р	Credit	CA	ESE	Total	
Theory/Th	eory with Practical								
	Open Elective – IV	3	0	0	3	40	60	100	OE
	Professional Elective – VI	3	0	0	3	40	60	100	PE
Practical /	Employability Enhancement								
22EEP81	Project Work – II Phase – II			8	4	50	50	100	EC
	Total Credits to be earned								

Total Credits: 168

	PROFESSIONAL ELECTIVES (PEs)											
S. No.	Course Code	Course Name	L	Т	Ρ	С	Domain/ Stream					
		Semester - V										
		Elective – I										
1.	22EEE01	Power Semiconductor Devices	3	0	0	3	PE					
2.	22EEE02	Artificial Intelligence Applications to Power Systems	3	0	0	3	PS					
3.	22EEE03	Renewable Energy System	3	0	0	3	ES					
4.	22EEE04	Modeling of Electrical Machines	3	0	0	3	EM					
5.	22EEE05	VLSI Design	3	0	0	3	EL					
6.	22EEE06	Industry 4.0 for Electrical Engineers	3	0	0	3	CA					
		Semester – VI	•	•								
		Elective – II										
7.	22EEE07	Advanced Power Electronic Circuits	3	0	0	3	PE					
8.	22EEE08	Substation Engineering and Automation	3	0	0	3	PS					
9.	22EEE09	Design, Installation and Commissioning of Solar and Wind Energy Systems	3	0	0	3	ES					
10.	22EEE10	Special Electrical Machines	3	0	0	3	EM					
11.	22EEE11	Sensors and Actuators	3	0	0	3	EL					
12.	22EEE12	Avionics	3	0	0	3	CA					
		Semester – VII										
		Elective – III										
13.	22EEE13	Design of Power Converters	3	0	0	3	PE					
14.	22EEE14	Restructured Power System	3	0	0	3	PS					
15.	22EEE15	Energy Storage Systems and Controllers	3	0	0	3	ES					
16.	22EEE16	Advanced Electric Drives and Control	3	0	0	3	EM					
17.	22EEE17	Embedded Computing Systems	3	0	0	3	EL					
18.	22EEE18	PLC and SCADA System	3	0	0	3	CA					
		Elective – IV										
19.	22EEE19	Pulse Generating Circuits for Power Converters	3	0	0	3	PE					
20.	22EEE20	High Voltage Engineering	3	0	0	3	PS					

21.	22EEE21	Electric Vehicle Technology	3	0	0	3	ES				
22.	22EEE22	Finite Element Analysis of Electrical Machines	3	0	0	3	EM				
23.	22EEE23	Digital Twin Technology	3	0	0	3	EL				
24.	22EEE24	Soft Computing and Intelligent Controllers	3	0	0	3	CA				
		Elective - V									
25.	25.22EE25Power Electronic Interfaces to Renewable Energy3003PE										
26.	22EEE26	Smart Grid	3	0	0	3	PS				
27.	22EEE27	Microgrid	3	0	0	3	ES				
28.	22EEE28	Electrical Machine Design	3	0	0	3	EM				
29.	22EEE29	Digital Image Processing and Multi Resolution Analysis	3	0	0	3	EL				
30.	22EEE30	Industrial Automation	3	0	0	3	CA				
31.	22GEE01	Fundamentals of Research	3	0	0	3	-				
32.	22GEE02	Total Quality Management	3	0	0	3	-				
		Semester - VIII									
		Elective - VI									
33.	22EEE31	Power Quality	3	0	0	3	PE				
34.	22EEE32	Power System Security	3	0	0	3	PS				
35.	22EEE33	Artificial Intelligent Techniques for Electric Vehicles	3	0	0	3	ES				
36.	22EEE34	Electrical Machine Control and Maintenance	3	0	0	3	EM				
37.	22EEE35	Digital Signal Processing and its Applications	3	0	0	3	EL				
38.	22EEE36	Electric Power Utilisation	3	0	0	3	CA				
		Total Credits to be earned				18					

د المجابعة Engineering College, Perundurai, Erode – 638060, India

* Domain/Stream Abbreviations: PE – Power Electronics, PS – Power System, ES – Energy Storage, EM – Electrical Machines, EL-Electronics, CA – Controller and Automation

C	OPEN ELECTIVE COURSES OFFERED TO OTHER DEPARTMENTS (OE)											
S. No.	Course Code	Course Name	L	т	Р	с	Sem					
1.	22EEO01	Solar and Wind Energy Systems	3	1	0	4	V					
2.	22EEO02	Electrical Wiring and Lighting	3	1	0	4	V					
3.	22EEO03	Programmable Logic Controller and SCADA	3	1	0	4	V					
4.	22EEO04	Analog and Digital Electronics	3	1	0	4	V					
5.	22EEO05	Power Electronics and Drives	3	1	0	4	V					
6.	22EEO06	Introduction to Sensors and Actuators	3	1	0	4	V					
7.	22EEO07	Energy Conservation and Management	3	1	0	4	VI					
8.	22EEO08	Microprocessors and Microcontrollers Interfacing	3	1	0	4	VI					
9.	22EEO09	Electrical Safety	3	1	0	4	VI					
10.	22EEO10	VLSI System Design	3	1	0	4	VI					
11.	22EEO11	Automation for Industrial Applications	3	1	0	4	VI					
12.	22EEO12	Electric Vehicle	3	0	0	3	VII					
13.	22EEO13	E-Waste Management	3	0	0	3	VII					
14.	22EEO14	Embedded Systems and IOT	3	0	0	3	VII					
15.	22EEO15	Energy Storage Systems and Controllers	3	0	0	3	VII					
16.	22EEO16	AI Techniques for Engineering Applications	3	0	0	3	VII					
17.	22EEO17	Smart Grid Technologies	3	0	0	3	VIII					
18.	22EEO18	Biomass Energy Systems	3	0	0	3	VIII					
19.	22GEX01	NCC Studies (Army Wing) - I	3	0	2	4	V/VI					

SEMESTER	R – I									
Course			Hou We	irs/ ek	Crodit	Ма	0			
Code	Course Title	L	Т	Ρ	Credit	CA	ESE	Total	Category	
Theory/The	eory 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	
22PHT15	Physics for Electrical and Electronics 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 / I	Employability Enhancement									
22PHL15	Physics Laboratory for Electrical and Electronics Engineering	0	0	2	1	60	40	100	BS	
22GCL12	Foundation Lab –II	0	0	6	3	100	0	100	ES	
22VEC11	Yoga and Values for Holistic Development	-	-	-	1	100	0	100	HS	
22MNT11	Student Induction Program	-	-	-	0	100	0	100	MC	
	Total Credits	s to k	be ear	ned	23					

*Alternate Weeks

SEMESTER	R – II									
Course		Hours/ Week				Ма	Cate			
Code	Course Title	L	т	Р	Credit	СА	ESE	Total	gory	
Theory/The	eory 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	
22CYT24	Chemistry for Electrical and Electronics Engineering	3	0	0	3	40	60	100	BS	
22CSC22	Data Structures using C	3	0	2	4	50	50	100	ES	
22EET22	Electromagnetic Fields	3	1	0	4	40	60	100	PC	
22TAM02	Tamils and Technology	1	0	0	1	100	0	100	HS	
Practical /	Employability Enhancement									
22CYL11	Chemistry Laboratory for Electrical Systems	0	0	2	1	60	40	100	BS	
22GCL11	Foundation Lab – I	0	0	6	3	100	0	100	ES	
Total Credits to be earned 23										

*Alternate Weeks

SEMESTER	2 – 111								
Course		Но	urs/V	Veek		Maximum Marks			Cate
Code	Course Title	L	Т	Ρ	Credit	СА	ESE	Total	gory
Theory/The	ory with Practical								
22ITC31	Java Programming	3	0	2	4	50	50	100	ES
22EET32	Analog Electronics	3	0	0	3	40	60	100	PC
22EET33	Digital Electronics	3	0	0	3	40	60	100	PC
22EET35	Electric Circuit Theory	3	1	0	4	40	60	100	PC
22EET36	Measurements and Instrumentation	3	0	0	3	40	60	100	PC
22MNT31	Environmental Science	2	0	0	0	100	0	100	MC
Practical / I	Employability Enhancement								
22EEL32	Analog and Digital Electronics Laboratory	0	0	2	1	60	40	100	PC
22EEL33	Circuits and Measurements Laboratory	0	0	2	1	60	40	100	PC
22EGL31	Communication Skills Development Laboratory	0	0	2	1	60	40	100	HS
	Total Credit	s to I	oe ear	ned	20				

SEMESTER	SEMESTER – IV											
Course		Hours / Week				Maximum Marks			Cate			
Code	Course The	L	Т	Ρ	Crean	СА	ESE	Total	gory			
Theory/The	ory with Practical											
22MAT42	Transforms and Partial Differential Equations	3	0	2	4	40	60	100	BS			
22ITC41	Programming in Python	3	0	2	4	50	50	100	ES			
22EET31	DC Machines and Transformers	3	1	0	4	40	60	100	PC			
22EET43	Microcontrollers and its interfacing	3	0	0	3	40	60	100	PC			
22EEC51	Signals and Systems	2	0	2	3	50	50	100	PC			
Practical /	Employability Enhancement											
22EEL31	DC Machines and Transformers Laboratory	0	0	2	1	60	40	100	PC			
22EEL43	Microprocessors and Microcontrollers Interfacing Laboratory	0	0	2	1	60	40	100	PC			
22GCL41/ 22GCl41	Professional Skills Training – I / Industrial Training – I				2	100	0	100	EC			
	Total Credit	s to l	oe ear	ned	22							

*80 hours of training

SEMESTER	– v								
Course		Hours / Week			One alit	Max	Cate		
Code	Course The	L	Т	Р	Credit	СА	ESE	Total	gory
Theory/Theo	ory with Practical								
22EET41	Synchronous and Induction Machines	3	1	0	4	40	60	100	PC
22EET42	Control Systems	3	1	0	4	40	60	100	PC
22EET34	Generation, Transmission and Distribution	3	0	0	3	40	60	100	PC
22EET52	Power Electronics	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/ 50	60/ 50	100	OE
Practical / E	mployability Enhancement								
22EEL41	Synchronous and Induction Machines Laboratory	0	0	2	1	60	40	100	PC
22EEL42	Control Systems Laboratory	0	0	2	1	60	40	100	PC
22GCL51/ 22GCI51	Professional Skills Training – II / Industrial Training – II				2	100	0	100	EC
	Total Credit	ts to I	be ear	ned	25				

*80 hours of training

SEMESTER	– VI								
Course	Course	Hours / Week				Мах	Cate		
Code	Title	L	Т	Ρ	Credit	CA	ESE	Total	yory
Theory/Theo	ory with Practical								
22EET51	Power System Analysis	3	0	0	3	40	60	100	PC
22EET62	Electric Drives and Control	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/ 50	60/ 50	100	OE
Practical / E	Employability Enhancement								
22EEL61	Power System Laboratory	0	0	2	1	60	40	100	PC
22EEL63	Power Electronics and Drives Laboratory	0	0	2	1	60	40	100	PC
22EEP61	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 Credi	ts to	be ear	ned	24				

SEMESTER – VII											
Course		Но	ours /	Week	Cradit	Max	kimum	Marks	Cate		
Code	Course Title	L	Т	Р	Credit	CA	ESE	Total	gory		
Theory/Th	eory with Practical										
22GCT71	Engineering Economics and Management	3	0	0	3	40	60	100	HS		
22EET61	Power System Protection and Switchgear	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										
22EEP71	Project Work – II Phase – I	0	0	12	6	50	50	100	EC		
	Total Credit	s to	be ear	ned	21						

SEMESTE	R – VIII								
Course	Course Title	Hours / Week				Max	kimum	Cate	
Code	Course Title	L	Т	Р	Credit	CA	ESE	Total	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	60	100	OE
Practical /	Employability Enhancement								
22EEP81	Project Work – II Phase – II			8	4	50	50	100	EC
	Total Credits to be earned						•		

Total Credits: 168

PROFESSIONAL ELECTIVES (PEs)												
S. No.	Course Code	Course Name	L	т	Р	С	Domain/ Stream					
		Semester - V										
		Elective – I										
1.	22EEE01	Power Semiconductor Devices	3	0	0	3	PE					
2.	22EEE02	Artificial Intelligence Applications to Power Systems	3	0	0	3	PS					
3.	22EEE03	Renewable Energy System	3	0	0	3	ES					
4.	22EEE04	Modeling of Electrical Machines	3	0	0	3	EM					
5.	22EEE05	VLSI Design	3	0	0	3	EL					
6.	22EEE06	Industry 4.0 for Electrical Engineers	3	0	0	3	CA					
	Semester – VI											
	Elective – II											
7.	22EEE07	Advanced Power Electronic Circuits	3	0	0	3	PE					
8.	22EEE08	Substation Engineering and Automation	3	0	0	3	PS					
9.	22EEE09	Design, Installation and Commissioning of Solar and Wind Energy Systems	3	0	0	3	ES					
10.	22EEE10	Special Electrical Machines	3	0	0	3	EM					
11.	22EEE11	Sensors and Actuators	3	0	0	3	EL					
12.	22EEE12	Avionics	3	0	0	3	CA					
		Semester-VII										
		Elective –III										
13.	22EEE13	Design of Power Converters	3	0	0	3	PE					
14.	22EEE14	Restructured Power System	3	0	0	3	PS					
15.	22EEE15	Energy Storage Systems and Controllers	3	0	0	3	ES					
16.	22EEE16	Advanced Electric Drives and Control	3	0	0	3	EM					
17.	22EEE17	Embedded Computing Systems	3	0	0	3	EL					
18.	22EEE18	PLC and SCADA System	3	0	0	3	CA					
Elective – IV												
19.	22EEE19	Pulse Generating Circuits for Power Converters	3	0	0	3	PE					
20.	22EEE20	3	PS									

21.	22EEE21	Electric Vehicle Technology	3	0	0	3	ES
22.	22EEE22	Finite Element Analysis of Electrical Machines	3	0	0	3	EM
23.	22EEE23	Digital Twin Technology	3	0	0	3	EL
24.	22EEE24	Soft Computing and Intelligent Controllers	3	0	0	3	CA
25.	22EEE25	Power Electronic Interfaces to Renewable Energy	3	0	0	3	PE
26.	22EEE26	Smart Grid	3	0	0	3	PS
27.	22EEE27	Microgrid	3	0	0	3	ES
28.	22EEE28	Electrical Machine Design	3	0	0	3	EM
29.	22EEE29	Digital Image Processing and Multi Resolution Analysis	3	0	0	3	EL
30.	22EEE30	Industrial Automation	3	0	0	3	CA
31.	22GEE01	Fundamentals of Research	3	0	0	3	-
32.	22GEE02	Total Quality Management	3	0	0	3	-
		Semester - VIII					
		Elective - V					
33.	22EEE31	Power Quality	3	0	0	3	PE
34.	22EEE32	Power System Security	3	0	0	3	PS
35.	22EEE33	Artificial Intelligent Techniques for Electric Vehicles	3	0	0	3	ES
36.	22EEE34	Electrical Machine Control and Maintenance	3	0	0	3	EM
37.	22EEE35	Digital Signal Processing and its Applications	3	0	0	3	EL
38.	22EEE36	Electric Power Utilisation	3	0	0	3	CA
		Total Credits to be earned				18	

C	OPEN ELEC	CTIVE COURSES OFFERED TO OTHE	ER D)EP/	ART	MEN	rs (oe)
S. No.	Course Code	Course Name	L	т	Ρ	С	Sem
1.	22EEO01	Solar and Wind Energy Systems	3	1	0	4	V
2.	22EEO02	Electrical Wiring and Lighting	3	1	0	4	V
3.	22EEO03	Programmable Logic Controller and SCADA	3	1	0	4	V
4.	22EEO04	Analog and Digital Electronics	3	1	0	4	V
5.	22EEO05	Power Electronics and Drives	3	1	0	4	V
6.	22EEO06	Introduction to Sensors and Actuators	3	1	0	4	V
7.	22EEO07	Energy Conservation and Management	3	1	0	4	VI
8.	22EEO08	Microprocessors and Microcontrollers Interfacing	3	1	0	4	VI
9.	22EEO09	Electrical Safety	3	1	0	4	VI
10.	22EEO10	VLSI System Design	3	1	0	4	VI
11.	22EEO11	Automation for Industrial Applications	3	1	0	4	VI
12.	22EEO12	Electric Vehicle	3	0	0	3	VII
13.	22EEO13	E-Waste Management	3	0	0	3	VII
14.	22EEO14	Embedded Systems and IOT	3	0	0	3	VII
15.	22EEO15	Energy Storage Systems and Controllers	3	0	0	3	VII
16.	22EEO16	AI Techniques for Engineering Applications	3	0	0	3	VII
17.	22EEO17	Smart Grid Technologies	3	0	0	3	VIII
18.	22EEO18	Biomass Energy Systems	3	0	0	3	VIII
19.	22GEX01	NCC Studies (Army Wing) - I	3	0	2	4	V/VI

	OPEN ELI	ECTIVE COURSES OFFERED BY OTH	HER	DEI	PAR	TME	NTS (OE)				
S. No.	Course Code	Course Name	L	т	Ρ	С	OFFERED BY				
		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.	22EIO01	Measurements and Instrumentation	3	1	0	4	EIE				
10.	22EIO02	Biomedical Instrumentation and Applications	3	1	0	4	EIE				
11.	22EIO03	Industrial Automation	3	1	0	4	EIE				
12.	22CSX01	Fundamentals of Databases	3	0	2	4	CSE				
13.	22CSX02	Data science for Engineers	3	0	2	4	CSE				
14.	22CSX03	Enterprise Application Development Using Java	3	0	2	4	CSE				
15.	22CSO01	Computational science for Engineers	3	1	0	4	CSE				
16.	22CSO02	Formal Languages and Automata Theory	3	1	0	4	CSE				
17.	22ITO01	Artificial Intelligence	3	1	0	4	IT				
18.	22ITX01	Next Generation Databases	3	0	2	4	IT				
19.	22GEX02	NCC Studies (Air Wing) - 1	3	0	2	4	IT				
20.	22CDO01	Fundamentals of User Experience Design	3	1	0	4	CSD				
21.	22ADO01	Data Warehousing and Data Mining	3	1	0	4	AIDS				
22.	22ALO01	Business Intelligence	3	1	0	4	AIML				
23.	22CHO01	Industrial Enzymology	3	1	0	4	CHEM				
24.	22CHO02	Waste to Energy Conversion	3	1	0	4	CHEM				
25.	22CHO03	Applied Nanotechnology	3	1	0	4	CHEM				
26.	22FTX01	Baking Technology	3	0	2	4	FT				

27.	22FTO01	Food Processing Technology	3	1	0	4	FT						
28.	22MAO01	Mathematical Foundations for Machine Learning	3	1	0	4	MATHS						
29.	22MAO02	Numerical Computing	3	1	0	4	MATHS						
30.	22MAO03	Stochastic Processes and Queuing Theory	3	1	0	4	MATHS						
31.	22MAO04	Statistics for Engineers	3	1	0	4	MATHS						
32.	22PHO01	Thin Film Technology	3	1	0	4	PHYSICS						
33.	22PHO02	High Energy Storage Devices	3	1	0	4	PHYSICS						
34.	22PHO03	Structural and Optical Characterization of Materials	3	1	0	4	PHYSICS						
35.	22CYO01	Instrumental Methods of Analysis	3	1	0	4	CHEMISTRY						
36.	22CYO02	Chemistry Concepts for Competitive Examinations	3	1	0	4	CHEMISTRY						
37.	22CYO03	Organic Chemistry for Industry	3	1	0	4	CHEMISTRY						
		SEMESTER VI											
38.	22CEO01	Disaster Management	3	1	0	4	CIVIL						
39.	22MEX02	Design of Experiments	3	0	2	4	MECH						
40.	22MTO02	Robotics	3	1	0	4	MTS						
41.	22MTO03	3D Printing and Design	3	1	0	4	MTS						
42.	22AUO01	Automotive Electronics	3	1	0	4	ECE						
43.	22ECX03	PCB Design and Fabrication	3	0	2	4	ECE						
44.	22EIO04	PLC Programming with High Level Languages	3	1	0	4	EIE						
45.	22EIO05	Virtual Instrumentation	3	1	0	4	EIE						
46.	22CSX04	Foundations of Machine Learning	3	0	2	4	CSE						
47.	22CSX05	Web Engineering	3	0	2	4	CSE						
48.	22ITX02	Advanced Java Programming	3	0	2	4	IT						
49.	22ITO02	Internet of Things	3	1	0	4	IT						
50.	22ITO03	Fundamentals of Software Development	3	1	0	4	IT						
51.	22ITO04	Mobile Application Development	3	1	0	4	IT						
52.	22CDX01	Fundamentals of User Interactive Design	3	0	2	4	CSD						
53.	22ADX01	Data Visualization	3	0	2	4	AIDS						
54.	22ALX01	Data Exploration and Visualization Techniques	3	0	2	4	AIML						

55.	22CHO04	Air Pollution Monitoring and Control	3	1	0	4	CHEM
56.	22CHO05	Paints and Coatings	3	1	0	4	CHEM
57.	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
58.	22MAO05	Graph Theory and its Applications	3	1	0	4	MATHS
59.	22MAX01	Data Analytics using R Programming	3	0	2	4	MATHS
60.	22MAO06	Operations Research	3	1	0	4	MATHS
61.	22MAO07	Number Theory and Cryptography	3	1	0	4	MATHS
62.	22PHO04	Synthesis, Characterization and Biological Applications of Nanomaterials	3	1	0	4	PHYSICS
63.	22PHO05	Techniques of Crystal Growth	3	1	0	4	PHYSICS
64.	22CYO04	Corrosion Science and Engineering	3	1	0	4	CHEMISTRY
65.	22CYO05	Chemistry of Cosmetics in Daily Life	3	1	0	4	CHEMISTRY
66.	22CYO06	Nanocomposite Materials	3	1	0	4	CHEMISTRY
		SEMESTER VII					
67.	22CEO02	Introduction to Smart Cities	3	0	0	3	CIVIL
68.	22CEO03	Environmental Health and Safety	3	0	0	3	CIVIL
69.	22MEO01	Fundamentals of Ergonomics	3	0	0	3	MECH
70.	22MEO02	Principles of Management and Industrial Psychology	3	0	0	3	MECH
71.	22MEO03	Waste Heat Recovery System and Storage	3	0	0	3	MECH
72.	22MTO04	Drone System Technology	3	0	0	3	MTS
73.	22AUO02	Vehicle Maintenance	3	0	0	3	AUTO
74.	22ECO01	Wearable Devices	3	0	0	3	ECE
75.	22ECX04	Electronic Hardware and Troubleshooting	2	0	2	3	ECE
76.	22EIO06	Introduction to Distributed Control Systems	3	0	0	3	EIE
77.	22EIO07	Instrumentation in Aircraft Navigation and Control	3	0	0	3	EIE
78.	22EIO08	Industry 4.0 with Industrial IoT	3	0	0	3	EIE
79.	22EIO09	Industrial Data Communication	3	0	0	3	EIE
80.	22EIO10	Wireless Instrumentation	3	0	0	3	EIE

81.	22EIO11	Instrumentation Techniques in Agriculture	3	0	0	3	EIE						
82.	22CSO03	Nature Inspired optimization techniques	3	0	0	3	CSE						
83.	22ITO05	Fundamentals of Cloud Computing	3	0	0	3	IT						
84.	22CDO02	Introduction to Mobile Game Design	3	0	0	3	CSD						
85.	22CDO03	Introduction to Graphics Design	3	0	0	3	CSD						
86.	22ADO02	Neural Networks and Deep Learning	3	0	0	3	AIDS						
87.	22ALO02	Industrial Machine Learning	3	0	0	3	AIML						
88.	22CHO07	Hydrogen Energy	3	0	0	3	CHEM						
89.	22CHO08	Rubber Technology	3	0	0	3	CHEM						
90.	22FTO02	Principles of Food safety	3	0	0	3	FT						
91.	22FTO03	Fundamentals of Food Packaging and Storage	3	0	0	3	FT						
92.	22MAO08	Non-Linear Optimization	3	0	0	3	MATHS						
93.	22MAO09	Optimization for Engineers	3	0	0	3	MATHS						
94.	22CYO07	Waste and Hazardous Waste Management	3	0	0	3	CHEMISTRY						
95.	22CYO08	Chemistry in Every day Life	3	0	0	3	CHEMISTRY						
		SEMESTER VIII											
96.	22CEO04	SEMESTER VIII Infrastructure Planning and Management	3	0	0	3	CIVIL						
96. 97.	22CEO04 22CEO05	SEMESTER VIII Infrastructure Planning and Management Environmental Laws and Policy	3 3	0	0	3	CIVIL						
96. 97. 98.	22CEO04 22CEO05 22MEO04	SEMESTER VIII Infrastructure Planning and Management Environmental Laws and Policy Safety Measures for Engineers	3 3 3	0 0 0	0 0 0	3 3 3	CIVIL CIVIL MECH						
96. 97. 98. 99.	22CEO04 22CEO05 22MEO04 22MEO05	SEMESTER VIII Infrastructure Planning and Management Environmental Laws and Policy Safety Measures for Engineers Energy Conservation in Thermal Equipments	3 3 3 3	0 0 0 0	0 0 0 0	3 3 3 3	CIVIL CIVIL MECH MECH						
96. 97. 98. 99. 100.	22CEO04 22CEO05 22MEO04 22MEO05 22MEO06	SEMESTER VIII Infrastructure Planning and Management Environmental Laws and Policy Safety Measures for Engineers Energy Conservation in Thermal Equipments Climate Change and New Energy Technology	3 3 3 3 3	0 0 0 0	0 0 0 0 0	3 3 3 3 3	CIVIL CIVIL MECH MECH MECH						
96. 97. 98. 99. 100. 101.	22CEO04 22CEO05 22MEO04 22MEO05 22MEO06 22MTO05	SEMESTER VIII Infrastructure Planning and Management Environmental Laws and Policy Safety Measures for Engineers Energy Conservation in Thermal Equipments Climate Change and New Energy Technology Micro and Nano Electromechanical Systems	3 3 3 3 3 3 3	0 0 0 0 0	0 0 0 0 0 0	3 3 3 3 3 3 3	CIVIL CIVIL MECH MECH MECH MTS						
96. 97. 98. 99. 100. 101. 102.	22CEO04 22CEO05 22MEO04 22MEO05 22MEO06 22MTO05 22AUO03	SEMESTER VIII Infrastructure Planning and Management Environmental Laws and Policy Safety Measures for Engineers Energy Conservation in Thermal Equipments Climate Change and New Energy Technology Micro and Nano Electromechanical Systems Public Transport Management	3 3 3 3 3 3 3 3	0 0 0 0 0 0	0 0 0 0 0 0 0	3 3 3 3 3 3 3 3 3	CIVIL CIVIL MECH MECH MECH MTS ECE						
96. 97. 98. 99. 100. 101. 102. 103.	22CEO04 22CEO05 22MEO04 22MEO05 22MEO06 22MTO05 22AUO03 22AUO04	SEMESTER VIII Infrastructure Planning and Management Environmental Laws and Policy Safety Measures for Engineers Energy Conservation in Thermal Equipments Climate Change and New Energy Technology Micro and Nano Electromechanical Systems Public Transport Management Autonomous Vehicles	3 3 3 3 3 3 3 3 3	0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0	3 3 3 3 3 3 3 3 3 3	CIVIL CIVIL MECH MECH MECH MTS ECE ECE						
96. 97. 98. 99. 100. 101. 102. 103. 104.	22CEO04 22CEO05 22MEO04 22MEO05 22MEO06 22MTO05 22AUO03 22AUO04 22ECO02	SEMESTER VIII Infrastructure Planning and Management Environmental Laws and Policy Safety Measures for Engineers Energy Conservation in Thermal Equipments Climate Change and New Energy Technology Micro and Nano Electromechanical Systems Public Transport Management Autonomous Vehicles Optical Engineering	3 3 3 3 3 3 3 3 3 3	0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0	3 3 3 3 3 3 3 3 3 3 3	CIVIL CIVIL MECH MECH MECH MTS ECE ECE ECE						
96. 97. 98. 99. 100. 101. 102. 103. 104. 105.	22CEO04 22CEO05 22MEO04 22MEO05 22MEO06 22MTO05 22AUO03 22AUO04 22ECO02 22EIO12	SEMESTER VIIIInfrastructure Planning and ManagementEnvironmental Laws and PolicySafety Measures for EngineersEnergy Conservation in ThermalEquipmentsClimate Change and New EnergyTechnologyMicro and Nano ElectromechanicalSystemsPublic Transport ManagementAutonomous VehiclesOptical EngineeringEnvironmental Sensors	3 3 3 3 3 3 3 3 3 3 3 3	0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0	3 3 3 3 3 3 3 3 3 3 3 3	CIVIL CIVIL MECH MECH MECH MTS ECE ECE ECE ECE EIE						
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96. 97. 98. 99. 100. 101. 102. 103. 104. 105. 106. 107.	22CEO04 22CEO05 22MEO04 22MEO05 22MEO06 22MTO05 22AUO03 22AUO04 22ECO02 22EIO12 22EIO13 22CSO04	SEMESTER VIIIInfrastructure Planning and ManagementEnvironmental Laws and PolicySafety Measures for EngineersEnergy Conservation in ThermalEquipmentsClimate Change and New EnergyTechnologyMicro and Nano ElectromechanicalSystemsPublic Transport ManagementAutonomous VehiclesOptical EngineeringEnvironmental SensorsPollution Control and ManagementMachine Translation	3 3 3 3 3 3 3 3 3 3 3 3 3 3	0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0	3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	CIVIL CIVIL MECH MECH MECH MECH MTS ECE ECE ECE EIE EIE EIE EIE						
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110.	22ITO07	Business Continuity Planning	3	0	0	3	IT
111.	22CDX02	Virtual Reality and Augmented Reality	3	0	0	3	CSD
112.	22ADO03	Business Analytics	3	0	0	3	AIDS
113.	22ALO03	Machine Learning for Smart Cities	3	0	0	3	AIML
114.	22CHO09	Industrial Accident Prevention and Management	3	0	0	3	CHEM
115.	22CHO10	Electrochemical Engineering	3	0	0	3	CHEM
116.	22CHO11	Smart and Functional Materials	3	0	0	3	CHEM
117.	22FTO04	Food Ingredients	3	0	0	3	FT
118.	22FTO05	Food and Nutrition	3	0	0	3	FT
119.	22CYO09	Chemistry of Nutrition for Women Health	3	0	0	3	CHEMISTRY

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

SNo	Course Code	Course Title	L	Т	Ρ	с	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

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22EGT11 - COMMUNICATION SKILLS I													
		(Common to All Engineering and Technology Bra	anches)										
Progra Branch	mme & 1	All B.E./B.Tech. Branches	Sem.	Category	L	т	Ρ	Credit					
Prereq	uisites	Nil	I	HS	3	0	0	3					
						1	1						
Preamb	ble	This course is designed to impart required levels of Communication necessary for different professional contexts.	n Skills a	and Proficienc	cy in Ei	nglisl	h lan	guage					
Unit – I		Grammar, Vocabulary, Listening, Speaking, Reading & Writing	9					9					
Grammar: Parts of speech - Tenses - Types of sentences: Assertive, Imperative, Interrogative & Exclamatory – Affirmative & Negative - Gerunds & Infinitives - Vocabulary: Affixes - Synonyms & Antonyms - Listening: Types of listening - Barriers to listening - Listening to short talks - TV shows - Speaking: Verbal & Non-verbal communication - Pair conversation - Role play - Reading: Types of Reading – Intensive: scanning, word by word, survey - Writing: Dialogue writing, Informal Letters - Paragraph writing													
Unit – I	Unit – II Grammar, Vocabulary, Listening, Speaking, Reading & Writing 9												
Gramm listening Readin sentend	Grammar: Voices - Impersonal passives - Vocabulary: Homonyms, Homophones & Homographs - Listening: Importance of listening - Listening to announcements & radio broadcasts - Speaking: Persuasive & Impromptu talks - Narrating a story - Reading: Reading comprehension - Articles from Newspapers/Magazines - Cloze exercises - Writing: Essay writing, Jumbled sentences												
Unit – I		Grammar, Vocabulary, Listening, Speaking, Reading & Writing	J					9					
Gramm Introduc - Form	har: Prepos ction - Rea hal letters: S	itions - Vocabulary: Compound Nouns - Listening: Listening to ding: Extensive: speed, skimming - Identifying lexical & contextual Seeking permission for Industrial visits & Inviting guests	TED Ta meanin	alks, Comme Igs - Writing:	ntaries Instru	- Sp ction	beak i s & V	ing: Self Varnings					
Unit – I	V	Grammar, Vocabulary, Listening, Speaking, Reading & Writing	9					9					
Gramm Listeni Paraph placing	har: Article ng: Listenin rasing & Si orders	s & Determiners - Vocabulary: Technical Vocabulary - Analogy ng to conversations - Speaking: Tongue twisters - Skill Sharing ummarizing - Writing: Recommendations & Suggestions - Busin	- Unscr - N ess lette	ambling word ote-taking - I ers: Enquiry,	ls - L Readin Calling	ogica I g: N g for	al rea lote i quot	asoning - making - ations &					
Unit –	V	Grammar, Vocabulary, Listening, Speaking, Reading & Writing	g					9					
Gramm persona - IELTS	nar: Cause alities - Sp Stype passa	and effect expressions - Vocabulary: Abbreviations & acronyms eaking: Commonly mispronounced words - Welcome address, Chiages - Writing: Preparing transcript for a speech - Interpreting news	, Definit ef guest articles	ions Listenir address & Vo & advertisem	ng: Lis ote of ti ents	tenin hank	ig to s -	eminent Reading					
								Total:45					
TEXT E	BOOK:												
1.	Sanjay Ku	mar & Pushp Lata, "Communication Skills", 2 nd Edition, Oxford Unive	ersity Pr	ess, New Del	hi, 201	8.							
REFER	ENCES:												
1.	1. Ashraf Rizvi, "Effective Technical Communication", 2 nd Edition, McGraw-Hill India, 2017.												
2.	2. S. P. Dhanavel, "English and Communication Skills for Students of Science and Engineering", Orient BlackSwan Publishers, Hyderabad, 2009.												
3.	Jack C. Ri 2014.	chards and Chuck Sandy, "Passages" Student's Book 1, 3 rd Edition,	Cambri	dge Universit	y Press	, Ne	w Yo	rk,					

COUR On co	SE C mple	UTCOM	IES: he course, t	the st	udents will I	be able	e to					B ⁻ (Hig	T Mappe Ihest Lev	d /el)
CO1	use	languag	ge effectively	by ac	quiring voca	bulary	and syntax ir	context				Ар	plying (K	3)
CO2	liste	en and c	omprehend o	differe	nt spoken dis	scourse	es from a var	ety of situati	ons			Ар	plying (K	3)
CO3	spe	ak confi	dently in diffe	erent	professional	context	s and with p	ers				Cr	eating (K	6)
CO4	con	nprehen	d different ge	enres	of texts by ac	lopting	various read	ing strategie	s			Unde	rstanding	(K2)
CO5	writ of v	e legibly vords an	and flawless	sly at	varied profes	sional	contexts prof	iciently with	approp	oriate choi	се	Cr	eating (K	6)
60e/D	Mapping of COs with POs and PSOs													
COS/P	US	POT	P02	PC	03 PO4	PC	05 PU6	P07	PO	8 90	9	P010	PUTT	PU12
CO1	1						2			1		3	1	1
CO2	2									2		3		1
COS	3									2	2	3		2
CO4	4						1					3	1	1
CO5	5											3		2
1 – Slig	ght, 2	2 – Mode	erate, 3 – Sub	ostant	ial, BT- Bloor	n's Ta	xonomy	1		L				
	-													
					ASS	SESSN	IENT PATTE	RN – THEO	RY					
Test Ca	/ Blo tego	om's ry*	Remember (K1) %	ring	Understan (K2) %	ding	Applying (K3) %	Analyziı (K4) %	ng	Evaluatin (K5) %	g	Creating (K6) %	То	tal %
(CAT1				37		30					33		100
(CAT2	2			30		30					40		100
(САТЗ	}			33		34					33		
	ESE				17		63					20		100
* ±3%	may	be varie	d (CAT 1,2,3	- 50	marks & ESE	E – 100) marks)							

		22MAC11 - MATRICES AND ORDINARY DIFFEREN	NTIAL E	QUATIONS				
		(Common to all Engineering and Technology	y branch	nes)				
Progra Branch	mme &	All BE/BTech Branches	Sem.	Category	L	Т	Ρ	Credit
Prereq	uisites	Nil	1	BS	3	1*	2*	4
Pream	ble	To provide the skills to the students for solving different r ordinary differential equations.	eal time	problems by	/ a	pplyir	ng m	atrices and
Unit –		Matrices:						9
Introduc Eigen Orthogo quadra an elas	ction – Cha vectors (wit onal transfo tic form to c tic membrar	racteristic equation – Eigen values and Eigen vectors of a hout proof) – Cayley – Hamilton theorem (Statement and mation of a symmetric matrix to diagonal form – Quadratic for anonical form by orthogonal transformation – Applications of Ene.	real mat applica rm – Nat Eigen va	rix – Properti tions only) - cure of Quadra lues and Eige	es O atic en v	of E rthoge form /ector	igen onal is - F s: S	values and matrices – teduction of tretching of
Introdu	ntion - Sol	utions of First order differential equations: Exact differential	al equat	ions – Leibn	it⁊'	e lin	oor	9 Equation -
Bernou	lli's equation	-Clairaut's equation - Applications: Law of natural growth and	d decay.		πz	5 LII	cai	
Unit –	II	Ordinary Differential Equations of Higher Order:						9
Linear cosax / Euler-C	differential sinax – x' auchy's equ	equations of second and higher order with constant coefficie ¹ – e ^{ax} x ⁿ , e ^{ax} sinbx and e ^{ax} cosbx – x ⁿ sinax and x ⁿ cosax – D uation – Legendre's equation.	ents - Pa ifferentia	articular Integ I Equations w	ral: /ith	s for varia	the t able (ypes: e ^{ax} – coefficients:
Unit –	V	Applications of Ordinary Differential Equations:						9
Method differen given).	l of variatio tial equation	n of parameters – Simultaneous first order linear equations ns: Simple harmonic motion – Electric circuits (Differential eq	s with co uations a	onstant coeffic and associate	cie d d	nts – condit	App ions	lications of need to be
Unit – Y	V	Laplace Transform:						9
Laplace integral functior Convol	e Transform s of transfons ns. Inverse ution theore	a: Conditions for existence – Transform of elementary func- tions –Transforms of derivatives and integrals – Transform of Laplace transform: Inverse Laplace transform of element m (Statement only) – Applications: Solution of linear ODE of s	ctions – of unit s ntary fur econd or	Basic prope tep function nctions – Pa rder with cons	rtie - 7 rtia star	es – Frans Il fra nt coe	Deriv form ction	vatives and of periodic method – ents.
LIST O		IENTS / EXERCISES:						
1.	Introduction	n to MATLAB						
2.	Computatio	on of eigen values and eigen vectors						
3.	Plotting an	d visualizing single variable functions						
4.	Solving firs	t and second order ordinary differential equations						
5.	Solution of	Simultaneous first order ODEs						
6.	Solving see	cond order ODE by variation of parameters						
7.	Determinin	g Laplace and inverse Laplace transform of basic functions						
8.	Solution of	Second order ODE by employing Laplace transforms		- / · ·				5 T (1 0 0
ТЕУТ Б	ROOK.	Lect	ture:45,	I utorials and	d P	racti	cal:1	5, Total:60
1.	Ramana B	V, "Higher Engineering Mathematics", 1 st Edition, Tata Mc	Graw-Hi	II Publishing	Co	mpar	ny Li	mited, New
REFER	ENCES/ M	ANUAL / SOFTWARE:						
1.	Kreyszig E	"Advanced Engineering Mathematics ", 10th Edition, John Wil	ley, New	Delhi, India, 2	20 [,]	16.		
2.	Kandasam Edition 201	y P., Thilagavathy K. and Gunavathy K., "Engineering Math 4, S.Chand and Co., New Delhi.	ematics	For First Ye	ar	B.E/E	B.Teo	ch", Reprint

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3.	Dura Pear	aisamy rson In	C., Ve dia Educ	ngataasal cation, Ne	am S., w Delh	Arun F i, 2018.	Prakash	K. and	d Sure	esh M.,	"Engine	ering Math	nematics	- I", 2 nd	Edition,
4.	Grev	val B.S	S., "Highe	er Engine	ering M	athema	tics" 44tl	nEditio	n, Kha	nna Pub	lishers,	New Delhi,	2018.		
5.	MAT	LAB –	Laborat	ory Manu	al										
	I												1		
COUR	SE O	UTCO	MES:	roo tho	studon		o oblo t						(BT Mapp	ovel)
			the cou	roblome	which n		e able to		200				,,	Applying	(K3)
001	50176	e engi	leening p	JODIEITIS	WHICH H			ipulatic	ліз.					Applying	(K3)
CO2	iden	tify the	appropr	iate meth	od for s	solving fi	rst orde	r ordina	ary diffe	erential e	equation	S.		Арріуінд	(N3)
CO3	solve	e highe	er order l	inear diffe	erential	equatio	ns with c	onstan	t and v	ariable (coefficie	nts.		Applying	(K3)
CO4	appl engi	y the neerin	concept g problei	of ordina ms.	ary diff	erential	equation	ns for	model	ing and	finding	solutions	to	Applying	(K3)
CO5	appl	y Lapla	ace Tran	sform to f	ind solu	utions of	Linear (Ordinar	y Diffe	rential E	quations	6		Applying	(K3)
CO6	unde trans	erstanc sforms	the bas using M	ics of MA ATLAB.	TLAB,	solve or	dinary d	lifferent	tial equ	lations a	ind com	pute Lapla	ce M	Applying (anipulatio	(K3), n (S2)
						Mappin	a of CO	s with	POs a	nd PSO	S				
COs/F	POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO	1	3	3	2											
CO	2	3	3	2											
CO	3	3	3	2											
CO4	4	3	3	2											
CO:	5	3	3	3		2									
1 – Sli	aht 2	– Mod	lerate 3	– Substai	ntial B	З Г- Bloom	i's Taxo	nomv							
	gin, z	mou	iorato, o	Cubola		Bioon		loniy							
					I	ASSES	SMENT	PATT	ERN -	THEOR	Y		I		
Tes	t / Blo	oom's	Re	memberi	ng L	Jndersta	anding %	Apply	ying	Analyzi	ing	Evaluating		reating	Total
0	CAT	1 1		10		20)	7()	- (114)		-		-	100
	CAT	2		10		20)	70)	-		-		-	100
	CAT	3		10		20		70)	-		-		-	100
	ESE			10		20)	70)	-		-		-	100
* ±3%	may b	be varie	ed (CAT	1,2,3 - 50) marks	& ESE	– 100 m	arks)							

*Alternate week

22PHT15 – PHYSICS FOR ELECTRICAL AND ELECTRONICS ENGINEERING

Progra Branch	mme & N		в	E-	Ele	ctr	ic	al	a	۱n	d	E	le	ec	tr	on	ıic	s	Er	nç	gir	ne	ee	ər	in	ายู	g																			S	er	n.			(С	a	te	g	0	y			L		٦	•		Ρ			(CI	re	ed	it	
Prereq	uisites		Ν	I																																											1							B	S					3		C)		0					3	3		
Pream	ble		TI m to	nis ate pic	cou rial s ir	ırs s, ⊨el	e a na lec	aii an ctr	m 10 Tic	s m al	to at	te en	m ria gi	pa als ne	art s ; ee	th an rir	າe id າg	kr oj	no pe	ow era	/le ati	ioi	igi na	e al	0 ;	on ar	m	s np	e pl	n lif	ni Tie	ic e	r	o S	or S.	'n	d I	lu It		ct a	tir als	ng sc	g 5	n (n de	at es	e c	ria rik	als De	s, es		su tł	ib Je	e ;	rc a	o pl	nc oli	Ju Ca	iC ati	tir Ol	ng ns	m C	of	te a	ia o	ls re	, (m	di e	el nt	e	ct on	ri	c d
Unit –			S	em	со	nd	u	cť	in	g	n	na	ite	er	ia	ls	:																																																					ĝ)		
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Unit –	l		S	Jpe	rc	on	dι	JC	ti	nç	gı	m	a	te	ria	als	3:																																																					ĝ)		
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Unit –	IV		Ν	ano	m	ate	ri	al	s:	:																																																												ĉ)		
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Unit –	V		0	pe	ati	on	al	а	m	۱p	lif	fie	er	s:																																																								ĉ)		
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TEXT E	BOOK:																																																																								
1.	Hitendra K. I,II,III,IV)	(. N	Ma	ik	ind	A	.K	. 5	Siı	nç	jh	١,	"E	Ξr	ng	ine	e	rin	١g	P	'n	ys	sic	cs	s",	, 2	2	n	d	E	Ē	d	it	ti	ic	or	n		P	M	lc	G	Gr	а	IV	v-	Η	11	E	c	lι	IC	a	ti	or	۱,	Ν	le	W	D)e	lh	i, :	20	1	8.	(l	Jr	nit	ts			
2.	Murugeshai 2019. (Unit	an it V	∩R V)	ar	d۴	ίrι	ıth	ιig	ja	S	3iv	/a	pr	ra	sa	th	, "	M	00	de	۶rn	n F	Pł	hy	ys	sic	CS	s'	",	1	18	8	tł	h	(e	d	it	iti	io	on	۱,	S	5	C	Cr	a	no	k	A	r	d	(20	or	nţ	a	n	/	Liı	m	te	d,	Ν	le	w	D	e	h	i,			
REFER	ENCES:																																																																								
1.	Charles Kitt	ittel	əl, '	Int	od	ucʻ	tio	'n	tc) {	30	olie	d	S	tat	te	Pł	hy	si	cs	s",	8	} th	۰E	Ξc	dit	ti	io	on	۱,		J	0	bł	h	n	1	V	N	/il	le	y		&	S	0	n	s,I	N	e	w		Je	er	se	y	2	20	0	4.			_			_			_	_			
2.	Pillai S.O. a 2012.	ano	nd	Siv	aka	mi	P	'ill	ai	i, ʻ	'R	lu	di	m	e	nts	30	of I	Ma	ate	er	ia	ls	3 5	So	ci	ie	er	าด	ce	ə'	",	,	3	3'	rd	1	F	Ξ	di	iti	io	n	۱,	٢	١e	ev.	ı A	٩ą	ge	Э	Ir	nt	e	'n	a	io	n	al	Ρ	u	oli	sł	e	ſS	, ľ	١e	ew.	' [De	el	hi	,
3.	Tamilarasar	an I	K.	an	d F	ra	bu	۱k	٢.,	, "	M	at	te	ria	als	; S	Sci	er	٦C	e"	', [′]	1 ^s	st E	Ec	di	iti	0	n	١,	Ν	M	lc)(G	31	ra	a	V	N	ŀ	li	ill	E	E	d	u	ca	ti	01	n	F	٧	t.	L	.to	J.	٢	١e	۶V	/ [De	lh	i,	20)1	9.							

COUR	SE OUTCOMES:	BT Mapped
On co	mpletion of the course, the students will be able to	(Highest Level)
CO1	use the concept of density of states to compute the carrier concentration of extrinsic semiconductors. Also to explain the phenomenon related to formation p-n junction, Hall Effect and the working of solar cell.	Applying (K3)
CO2	apply the concept of Cooper pair to comprehend the properties, types and applications of superconductors.	Applying (K3)
CO3	apply the concept of electric dipole moment and electric polarization to comprehend the different polarization mechanisms in dielectrics, Clausius-Mosotti relation, dielectric loss and to describe its uses in capacitors.	Applying (K3)
CO4	utilize appropriate methods to prepare nanomaterials and also to comprehend their properties and applications.	Applying (K3)
CO5	use the characteristics of operational amplifier to perform addition, subtraction, integration and differentiation and voltage follower.	Applying (K3)

					Mappin	g of Co	s with I	POs an	d PSOs	;				
Cos/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2						2	2		2	2	1
CO2	3	2	2						2	2		2	2	1
CO3	3	2	2						2	2		2	2	1
CO4	3	2	2						2	2		2	2	1
CO5	3	2	2						2	2		2	2	1
1 – Slight, 2	– Mode	erate, 3 –	Substanti	al, BT- I	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	15	40	45				100
CAT2	15	40	45				100
CAT3	15	40	45				100
ESE	10	40	50				100
* ±3% may be varied (C	CAT 1,2,3 – 50 mark	s & ESE – 100 mar	·ks)				

22EET11 - ELECTRIC CIRCUIT ANALYSIS

Progra Brancł	mme & ז	BE – Electrical and Electronics Engineering	Sem.	Category	L	т	Ρ	Credit
Prereq	uisites	Nil	1	PC	3	0	0	3
Pream	ble	This course aims to impart knowledge on analysis of electric A	C and D	C circuits.				
Unit –	I	DC and AC Circuits:						9
 DC CIF Mesh voltage 	CUITS: Type and nodal a triangle and	es of sources- Dependent and Independent sources - Source tra analysis - super mesh and super node analysis. AC CIRCUI power triangle of RL and RC circuits – Mesh and nodal analysis	ansforma I TS :Pow 3.	tion - Current er, power fa	and ctor,	Volta impe	age di edanc	vision rule e triangle,
Unit - I		Network Theorems:						9
DC and Theore	d AC: Superp m - Millman's	osition Theorem – Thevenin's Theorem – Norton's Theorem – N s Theorem-Application to DC and AC circuits.	Maximum	Power Trans	sfer T	Theor	em -F	Reciprocity
Unit - I		Resonance and DC Transients:						9
Reson Basic c	ance circuit concept of sin	s: Resonant Frequency, Current and Voltage Variations, Ban nple parallel resonance circuit. DC Transients: natural and force	dwidth, (ced respo	Q factor for s	eries C ar	s reso id RL	onanc C circ	e circuits-
Unit - I	V	Three Phase Circuits:						9
Star-De Circuit	elta transform – Three wire	ation - Star and Delta systems – Line and Phase Quantities - T and Four wire systems.	hree Pha	ase Power - B	alan	ced a	and U	nbalanced
Unit - V	/	Two-Port Networks and Coupled Circuits:						9
Two-P Circuit	ort Networks s: Mutual ind	s: Impedance Parameter –Admittance Parameter –ABCD Paractance – Dot Convention – Coefficient of Coupling – Analysis of Coupling – Anal	rameters of Simple	 – T and π F Coupled Circ 	Repr cuits.	esen	ation.	Coupled
								Total:45
TEXT E	BOOK:							
1.	Sudhakar A Publishing (a. and Shyammohan S. Palli, "Circuits and networks- Analysis Company, New Delhi, 2017.	and Syn	thesis", 5th E	Editic	on, Ta	ata Mo	cGraw Hill
REFER	RENCES:							
1.	Charles K. / Company, N	Alexander , Matthew N.O. Sadiku , "Fundamentals of Electric C New Delhi, 2022	ircuits", 7	th Edition, Tat	a Mo	Grav	v Hill I	Publishing
2.	AbhijitChak	rabarti, "Circuit Theory Analysis and Synthesis", 7th Revised Ed	lition, Dha	anapat Rai &	Co.,	New	Delhi	, 2018.
3.	Robert L. B	oylestad, "Introductory Circuit Analysis", 13 th Edition, Pearson Ec	ducation,	India, 2018				

COUR On co	SE OUTCOMES: mpletion of the course, the students will be able to	BT Mapped (Highest Level)											
CO1	evaluate electric circuits using dependent and independent sources.	Applying (K3)											
CO2	CO2 analyze DC and AC networks using various theorems. Analyzing (K4)												
CO3	explain resonant and DC transients using R,L,C elements.	Applying (K3)											
CO4	differentiate balanced and unbalanced loads in three phase AC circuits.	Applying (K3)											
CO5	interpret the concept of coupled circuits and two port networks.	Understanding (K2)											
	Mapping of COs with POs and PSOs												

					Mappin	g of CO	s with	POs an	d PSOs	5				
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	2
CO2	2	3	2	2					1			1	3	2
CO3	3	2	1	1					1			1	3	2
CO4	3	2	1	1					1			1	3	2
CO5	3	2	1	1					1			1	3	2

1 – Slight, 2 – Moderate	, 3 – Substantial, BT- B	loom's Taxonomy
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		ASSESSMENT	PATTERN -	THEORY			
Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	10	25	65	-	-	-	100
CAT2	10	20	30	30	-	-	100
CAT3	10	45	40	-	-	-	100
ESE	5	20	57	18	-	-	100
* 12% may be varied (2AT 1 2 2 50 mork	0 8 ESE 100 mor	ko)				

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

		22CSC11 - PROBLEM SOLVING AND PROGRA	MMING	IN C									
	(Co	mmon to All Engineering and Technology branches except	CSE, IT	, CSD, AIDS	& Al	ML)							
Programme Branch	e &	All BE/BTech Engineering & Technology branches , except CSE, IT, CSD, AIDS & AIML	Sem.	Category	L	т	Ρ	Credit					
Prerequisit	es	Nil	1	BS	3	0	2	4					
					11								
Preamble		The course aims to provide exposure to problem-solving fundamental concepts of C Programming. This course provides C	through s adequa	programmir ate knowledge	ng. If e to s	t int solve	roduc e prob	es all the lems using					
Unit – I		Introduction to C and Operators:						9					
The structur Basic data	re of a C Types – `	c program – Compiling and executing C program – C Tokens - /ariables – constants – Input / Output statements – Operators	- Charao	cter set in C	– Ke	ywo	rds –	identifiers-					
Unit – II		Control Statements and Arrays:						9					
Decision-ma dimensional	aking an I arrays a	d looping statements, Arrays: Declaring, initializing and acce and their operations.	essing a	rrays – oper	ation	s or	n arra	ys – Two-					
Unit – III		Functions:						9					
Functions: I to functions:	ntroducti : basic da	on- Using functions, function declaration and definition – functio ata types and arrays – storage classes – recursive functions	n call – ı	eturn statem	ent –	pas	sing p	barameters					
Unit – IV		Strings and Pointers:						9					
Unit – IV Strings and Pointers: 9 Strings: Introduction – operations on strings: finding length, concatenation, comparing and copying – string and characteria manipulation functions, Arrays of strings. Pointers : declaring pointer variables – pointer expression and arithmetic, pointers and arrays, pointers and strings													
Unit – V		User-defined Data Types and File Handling:						9					
User-define enumerated position indi	d data t d data typ icator : fs	ypes: Structure: Introduction – nested structures– arrays of sole. File Handling : Introduction - opening and closing files – reasek(), ftell() and rewind()	structure	 structure writing data 	and to fil	fun es -	ctions Manip	-unions – pulating file					
LIST OF EX	(PERIME	ENTS / EXERCISES:											
1. Pro	ograms fo	or demonstrating the use of different types of format Specifiers											
2. Pro	ograms fo	or demonstrating the use of different types of operators like arithm	netic, log	ical, relationa	ıl, an	d tei	rnary o	operators					
3. Pro	ograms fo	or demonstrating the use of using decision making statements											
4. Pro	ograms fo	or demonstrating the use of repetitive structures											
5. Pro	ograms fo	or demonstrating one-dimensional arrays											
6. Pro	ograms fo	or demonstrating two-dimensional arrays											
7. Pro	ograms to	o demonstrate modular programming concepts using functions	6										
8. Pro	ograms to	demonstrate recursive functions.	-)										
9. Plu 10 Pro	ograms to	b demonstrate strings (Using built-in and user-defined unctions	5)										
10. 110 11 Pro	orams to	illustrate the use of structures and unions											
12 Pro	orams to) implement file Handling											
	3.3.110 10	· · · · · · · · · · · · · · · · · · ·		Lecture:4	5, Pr	acti	cal:30), Total:75					
TEXT BOO	K:				, -								
1. Ree	ema Tha	reja, "Programming in C ", 2nd Edition, Oxford University Press,	New De	lhi, 2018.									

REFE	RENC	ES/ MA	NUAL /	SOFTWA	RE:										
1. Yashavant Kanetkar, "Let us C", 16th Edition, BPB Publications, 2018.															
2.	Sumitabha Das, "Computer Fundamentals and C Programming", 1st Edition, McGraw Hill, 2018.														
3.	Balagurusamy E., "Programming in ANSI C", 7th Edition, McGraw Hill Education, 2017.														
4.	Behrouz A. Forouzan & Richard F.Gilberg, "Computer Science A Structured Programming Approach Using C", 3 rd Edition, Cengage,2017.														
5. https://www.cprogramming.com/tutorial/c-tutorial.html															
COURSE OUTCOMES: BT Mappe On completion of the course, the students will be able to (Highest Lev													ped ₋evel)		
CO1	develop simple programs using input/output statements and operators Approximately and a statements and a statements and operators Approximately and a statements and a stat												(K3), (S3)		
CO2	identify the appropriate looping and control statements in C and develop applications using Applying (K3),												(K3),		
CO3	these statements Precision (S3) develop simple C programs using the concepts of arrays and modular programming Applying (K3),														
CO4	Precision (S3) Applying (K3),												<u>(S3)</u> (K3),		
004	apply the concepts of pointers and develop C programs using strings and pointers Precision (S3) Precision (S3)											(S3) (K3).			
CO5	make use of user-defined data types and file concepts to solve given problems Applying (13), Precision (S3)											(S3)			
00-//		DO 4	DOG	DOD	DO			s with	POs ai		5	DO	DO10	D 004	DQQQ
COS/H	JOS	P01	P02	P03	P04	4 PO5	P06	P07	P08	PO9	P010	P011	P012	P501	P502
CO1		3	2	2	2	1				1	1		1		
CO2		3	2	2	2	1				1	1		1		
00	3	3	2	2	2	1				1	1		1		
00	4 r	3	2	2	2	1				1	1		1		
	5	3 Mada	2	Z Cubatanti) Dia ami'a	Tawana			1	1		1		
1 – 51	gnt, ∠·	- wode	rate, 3 –	Substanti	аі, в і	- Bloom s	Taxono	my							
						Vecee	OMENT	DATT	:DN _ 1						
Test / Bloom's Remembering Understanding Applying Analyzing Evaluating Creating Total									Total						
Categ		egory*		(K1) %		(K2) %		(K3) %		(K4) %		(K5) %		(K6) %	%
CA				10		30		60							100
	CAT			10		30		60							100
	CAR			10		30		00							100
	* + 2% may be veried (CAT 1.2.2. = 50 marks % ESE = 100 marks)														100

22MET11 - ENGINEERING DRAWING															
(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	ble To impart knowledge on orthographic, isometric projections, sectional views and development of surfaces by solving different application oriented problems.														
Unit – I	Unit – I General Principles of Orthographic Projection:														
Importance of Graphics in Engineering Applications - Use of Drafting Instruments - BIS Conventions and Specifications - Size, Layout and Folding of Drawing Sheets - Lettering and Dimensioning - Projections of Points, Lines and Planes - General Principles of Orthographic Projection - First Angle Projection - Layout of Views - Projection of Points Located in all Quadrant and Straight Lines Located in the First Quadrant - Determination of True Lengths and True Inclinations and Location of Traces - Projection of Polygonal 															
Projections of Simple Solids Like Prisms, Pyramids, Cylinder and Cone when the Axis is inclined to One Reference Plane by Change of Position Method.															
Unit – III	Sectioning of Solids:	Sectioning of Solids:													
Sectioning of Solids - Prisms, Pyramids, Cylinder and Cone in Simple Vertical Position by Cutting Planes inclined to One Reference Plane and Perpendicular to the other - Obtaining True Shape of Section.															
Unit – IV Development of Surfaces:							6+3								
Development of Lateral Surfaces of Simple Solids Like Prisms, Pyramids, Cylinders and Cones -Development of Simple Truncated Solids Involving Prisms, Pyramids, Cylinders and Cones.															
Unit – V	Isometric Projection and Introduction to AutoCAD:														
Principles of Isometric Projection - Isometric Scale - Isometric Projections of Simple and Truncated Solids Like Prisms, Pyramids, Cylinders and Cones - Conversion of Isometric Projection into Orthographic Projection - Introduction to AutoCAD.															
Lecture: 30, Tutorial:15, Total:45															
TEXT BOOK:															
1. Natara	Natarajan.K.V. "A Textbook of Engineering Graphics",35 th Edition, Dhanalakshmi Publishers, Chennai, 2022,														
REFERENCES:															
1. Venug	Venugopal K. and Prabhu Raja V., "Engineering Graphics", 16 th Edition, New Age International Publishers, Chennai, 2022.														
2. Basan	Basant Agrawal, Agrawal C.M., "Engineering Drawing", 3 rd Edition, McGraw Hill Education, 2019.														
3. Partha	Parthasarathy N.S., Vela Murali. "Engineering Drawing", 1 st Edition, Oxford University Press, 2015.														
COURSE On comr	COURSE OUTCOMES:BT MappedOn completion of the course, the students will be able to(Highest Level)														
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CO1	interp plane	oret inte	ernational s	tandards	of draw	ings an	d sketch	the pro	jections	of points	s, lines an	d	App	lying (K3)
CO2	draw	the pro	jections of	3D primi	itive obje	ects like	prisms,	pyramic	ds, cylind	ders and	cones		Арр	lying (K3	\$)
CO3	const	ruct the	e various se	ectional	views of	solids li	ke prism	is, pyrar	mids, cyl	inders a	nd cones		Арр	lying (K3)
CO4	devel	op the	lateral surf	aces of s	simple a	nd trunc	ated sol	ids					Арр	lying (K3)
CO5	sketc drawi	h the i ng into	sometric p orthograp	rojection hic proje	s of sin ction	nple an	d trunca	ted soli	ds and	convert	isometric		Арр	lying (K3	3)
	Mapping of COs with POs and PSOs														
Mapping of COs with POs and PSOs															
COS/P	os	P01	P02	P03	P04	P05	P06	P07	804	P09	PO10	P011	P012	PS01	PS02
CO?	1	3	2			2					3		2		
CO2	2	3	2	1		2					3		2		
CO	3	3	2	1		2					3		2		
CO4	4	3	2	1		2					3		2		
COS	5	3	2	1		2					3		2		
1 – Slight	t, 2 – M	oderate	e, 3 – Subs	tantial, E	T- Bloor	n's Tax	onomy						1	I	
					AS	SESSI		ATTERI	N – THE	ORY					
Test / Blo Catego	oom's ory*	Rem (embering K1) %	Unde (rstandi K2) %	ng	Applying (K3) %	g /	Analyzir (K4) %	ng	Evaluat (K5) %	ing %	Creatin (K6) %	g 1	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	ks & ESE	E – 100	marks)	I		I				I	

		_	1										1 1			
Progra Branci	imme ä h	&	BE- E	lectrica	al and E	Electror	nics En	gineeri	ng		Sem.	Category	L	т	Ρ	Credit
Prereq	uisites	s	Nil								1	BS	0	0	2	1
Pream	ble		This o gap, liquid, p-n di relate	course a Hall coe thickne ode, UJ d to soc	ims to i efficient ess of th T and L ietal red	mpart h , specif nin wire _CR circ quireme	ands o ic resis , therm cuit and ent.	n trainir stance, al condi also to	ig in the AC freq uctivity, impart s	determ luency, Young' skills or	nination o velocity s modul n writing	of physical p of ultrasou us and knov coding / dev	aramo nd, c /ledge relopii	eters ompro e on t ng pro	such essibi he wo oject /	as band lity of a prking of product
LIST O	FEXP	PERIN	IENTS	/ EXER	CISES:											
1.	Deter coeff	rmina icient	tion of t of a ma	he banc aterial us	l gap of sing Ha	a giver	n semic arrange	onductir ement.	ng matei	rial usir	ng post-c	office box / D	eterm	inatio	on of t	he Hall
2.	Obse	ervatio	on of the	e I-V cha	aracteri	stics of	a p-n ju	nction o	liode.							
3.	Obse serie	ervations LCF	on of the R circuit	e I-V cha	aracteri	stics of	a uni ju	nction ti	ansistor	r / Stud	ying the	variation of	currer	t and	volta	ge in a
4.	Deter	rmina	tion of t	he spec	ific resi	stance	of the g	iven me	tallic wi	re using	g Carey-	Foster's brid	ge.			
5.	Deter	rmina	tion of t	he frequ	iency o	f alterna	ating cu	rrent us	ing elec	trically	vibrating	tuning fork	(Meld	e's ap	parat	tus).
6.	Determination of the velocity of ultrasonic waves in a liquid and the compressibility of the liquid using ultrasonic interferometer.															
7.	Deter	rmina	tion of t	he thick	ness of	a thin v	vire usi	ng air-w	edge m	ethod.						
8.	Determination of the thermal conductivity of a bad conductor using Lee's disc.															
9.	Determination of the Young's modulus of the material of a given beam using uniform bending method.															
10.	Writir	ng coo	ding for	any one	e of the	above e	experim	nents / d	evelopir	ng a pro	oject / a	product.				
															-	Total:30
REFEF	RENCE	ES/ M	ANUAL	/SOFT	WARE:											
1.	Phys	ics La	aborato	y Manu	al / Rec	ord, De	partme	nt of Ph	ysics, 1 [:]	st Editio	on, 2020.					
COUR	SE OU	тсог	MES:											вт	Мар	ped
On cor	npletio	on of	the cou	urse, th	e stude	ents wil	l be ab	le to		44-2-2-2				(Higl	nest l	_evel)
CO1	resist conce chara variat	mine tance ept of acteris tion of	the ba with te Hall e stics of <u>f curren</u>	nd gap emperati ffect an UJT usi <u>t in a se</u>	of sen ure or d to ob ng the ries LC	to deter to deter tain the concept	cting m rmine t e I-V ch t of reg t.	he Hall haracter ion with	coeffici istics of negativ	ent of a p-n e resis	ncept of a mater diode. T tance or	ial using the	r 9 / 9	App Prec	lying cision	(K3), (S3)
CO2	deter To de forma of inte	mine eterm ation c erfere	the spe ine the of stand nce.	ecific res AC fre ling wav	sistance quency es and	e of a gi and th to deter	ven wir ne velo rmine a	e using city of nd thick	the prin ultrasour ness of	nciple o nd in a a thin f	f Wheats a liquid l ilm using	stone bridge by means o g the concep	f t	App Prec	lying cision	(K3), (S3)
СОЗ	deter throu and b	rmine Igh m Dendir	the the aterials	ermal co and the ent of a	onductiv e Young beam	rity of a g's moo and also	bad co lulus of to writ	onducto a mate te codin	r using erial usir g/ do pro	concep ng the o oject/ do	ot of hea concepts evelop p	at conduction s of elasticity roduct.	1 /	App Pree	lying cision	(K3), (S3)
						Маррі	ng of C	Cos wit	n POs a	nd PS	Os					
COs/P	Os F	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	2 P	SO1	PSO2
CO1		3	2	2	3					2	2		2		2	1
CO2	2	3	2	2	3					2	2		2		2	1
CO3	3	3	2	2	3		·			2	2		2		2	1
1 – Slig	gnt, 2 –	- Mod	erate, 3	- Subs	tantial,	RI-Blo	om's Ta	axonom	У							

22PHL15 - PHYSICS LABORATORY FOR ELECTRICAL AND ELECTRONICS ENGINEERING

				22N	IEL11	- ENGI	NEERIN	IG PRA	CTICES	S LABOI	RATORY				
				(C	ommon	to All E	inginee	ring and	Techn	ology Bra	anches)				
Programm Branch	ie &	All B	E/BTec	h Bran	ches					Sem.	Category	L	т	Р	Credit
Prerequisi	tes	Nil								1/ 2	ES	0	0	2	1
Preamble	XPERIN	This of practi	course ces.	is desiç	ned to	provide	e a han	ids-on e	experier	nce in ba	asic of med	hanic	al and	elect	rical engineering
			/ _/(_/	0.020		PART	- A – MI	ECHAN	ICAL E	NGINEE	RING				
1.	Prepa	re a Sq	uare / F	Rectang	jular / V	-Shape	Projec	tion with	n its Co	unterpar	t for Mating	and F	Perform	n the	Drilling, Tapping,
2.	Prepa	re T / L	. / Lap 、	Joint fro	m give	n Wood	en Wor	k Piece	and M	ake a Bo	ox / Tray ou	t of P	lywood	s. d usin	g Modern Power
3.	Perfor	m the T	Thread I	ormati	on on a	GI/PV0	C Pipe a	and Pre	pare a V	Vater Lir	e from the	Overh	ead T	ank th	at is Leak-Proof.
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.	Activi Mode	ty: Pre	pare a	n Innov	ative M	odel w	ith the	Knowle	dge fro	m Fitting	J / Carpent	ry / P	lumbir	ng / V	/elding Involving
	Wode	PART B – ELECTRICAL AND ELECTRONICS ENGINEERING													
6.	Wiring	Wiring circuit for fluorescent lamp and Stair case wiring													
7.	Wiring	circuit	of Inca	ndesce	nt lamp	using I	mpulse	Relay							
8.	Measu	uremen	t of Ear	th Resis	stance										
9.	Solde	ring of \$	Simple (Circuits	and tro	uble sh	ooting								
10.	Implei	mentati	on of ha	lf wave	and ful	I wave	Rectifie	r using	diodes						
DEFEDEN	050/14		10057												Total:30
REFEREN	CES/M	ANUAL	- /SUFI	WARE	:	lonual									
COURSE C		MES:	ractice	s Laboi	atory iv	ianuai.								BTI	Mapped
On comple	etion of	the co	urse, tł	e stud	ents wi	ll be at	ole to						(High	est Level)
CO1	plan innov	the sec ative ar	quence ticles	of ope	rations	for effe	ective c	ompleti	on of tl	he plann	ed models	/	(Ma	Creatii nipula	ng (K6) ation (S2)
CO2	identi	fy and ately	use app	oropriate	e mode	rn powe	er tools	and co	mplete	the exer	cises/mode	ls	/ Ma		ng (K3) ation (S2)
CO3	perfor	m hous	e wiring	and re	alize th	e impor	tance o	f earthir	ng				IVIC.	Apply	ving (K3),
CO4	solder	ing with	n simple	electro	nics cir	cuits							N	Apply	ring (K3),
CO5	trouble	e shoot	the ele	ctrical a	nd elec	tronic c	ircuits						N Applyi	ng (K	B), Manipulation
	(52) Mapping of COs with POs and PSOs														
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	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	anat- 1	3	2		, _			2	2		3		3	2

		22VEC11 - YOGA AND VALUES FOR HOLIST	IC DEVE	LOPMENT									
(Common to All Engineering and Technology Branches) Programme & All P.E. /P. Tools, Branches, Som Category, L. T. P. Credit													
Progra Branch	n me &	All B.E./B.Tech. Branches	Sem.	Category	L	т	Ρ	Credit					
Prereq	uisites	Nil	1/2	HS	1	0	1	1					
Pream	ble	Yoga or yogasanas are considered as art and science of bring harmony of body and mind for general wellbeing. Yo world by Indians for healthy living. Students in particular are	healthy li ga is cor benefitte	ving by our ar isidered as on d by learning y	ncient (e of the oga.	gurus e gre	atest	s method to t gifts to the					
Unit –	I	Introduction:						2					
The Or Asanas Practic	The Origins of Yoga – Definitions - Concepts - Aims and objectives of Yoga – Yoga is a Science and Art – Rules and Regulations of Asanas – Classifications of Yogasanas – Patanjali's Ashtanga Yoga – Pranayama – Mudras & Bandhas - Shatkarma (Cleansing Practice) - Streams of Yoga – Modern Trends in yoga.												
Unit –	Unit – II Yoga and Mind: 2												
The Na probler	The Nature of Mind - Five Elements and the Mind - Meditation and the Mind - Functions of the Mind - Role of Yoga in Psychological problems: Mood Disorders, Major Depressive Disorder, Cyclothymic Disorder.												
Unit –	Unit – III Yoga and Values, Diet: 2												
Human Diet – S	n Values – S Soothing Di	Social Values – Role of Yoga in Personality Integration - Conc et – Constructive Diet.	epts of N	atural Diet - Na	aturopa	athy I	Diet -	- Eliminative					
Unit –	IV	Asanas:						2					
Prayer Princip	 Starting les of Pract 	& Closing - Preparatory practices – Loosening Practices – icing Asanas. Asanas: Standing – Sitting – Prone – Supine – S	- Meaning Suryanam	g, Definitions a naskar.	and Ol	ojecti	ves	of Asanas -					
Unit –	V	Pranayama and Meditation:						2					
Breathi Nadi Sl	ing Practice huddhi - Ka	es for awareness - Definitions and Objectives of Pranayama apalabathi – Sitali – Sitkari – Bhranari – Ujjayi – Relaxation Te	- Princip chniques	les of Practici – Meditation.	ng Pra	naya	ma.	Pranayama:					
				Lecture	: 10, P	racti	cal:	10, Total:20					
TEXT E	BOOK:												
1.	1. Swami satyananda saraswathi, "Asana pranayama mudra bandha", Bihar school of yoga, 4 th Edition, 1969.												
2.	Swami mu	ukthi Bodhanandha, "Hatha yoga pradipika", Bihar school of yo	oga, 4 th E	dition, 1985.									
REFER	RENCES:												
1.	B.K.S. lye	nkar, "Yoga the path of holistic health", DK Limited, 2 nd Edition	n, 1969.										
2.	Selvarasu	, "Kriya cleansing in yoga", Aruvi yoga, 3 rd Edition, 2002.											

COURS On com	E OUTCOMES: pletion of the course, the students will be able to	BT Mapped (Highest Level)
CO1	realize the importance of yoga in physical health.	Applying (K3)
CO2	realize the importance of yoga in mental health.	Applying (K3)
CO3	realize the role of yoga in personality development and diet.	Applying (K3)
CO4	do the loosening practices, Asanas and realize its benefits.	Applying (K3)
CO5	do the practice of Pranayama, meditation and realize its benefits	Applying (K3)
		1

	Mapping of COs with POs and PSOs												
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	
CO1						3		2	1				
CO2						3		2					
CO3						3		3					
CO4						3		2	3				
CO5						3		3					
1 – Slight, 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	-	-	-	-	-	-	-					
CAT2	-	-	-	-	-	-	-					
CAT3	20	30	50	-	-	-	100					
ESE	-	-	-	-	-	-	-					
* +3% may be	varied (CAT3 – 100	marks)					•					

		22EGT21 - COMMUNICA	TION SK	ILLS II				
		(Common to All Engineering and	Technolo	ogy Branches	5)			
Progra Branci	amme & h	All B.E./B.Tech. Branches	Sem.	Category	L	т	Р	Credit
Prereq	quisites	Communication Skills I	2	HS	3	0	0	3
Pream	ble	This course is designed to equip students with the nece their linguistic and communicative competencies.	essary ski	lls to listen, r	ead,	write	and speak so as to	develop
Unit –	I	Grammar, Vocabulary, Listening, Speaking, Reading	g & Writi	ng				9
Gramn Listen Writing	nar: Sento ing: Spee g: Job app	ence Patterns - Simple, Compound & Complex sentence ches from company CEOs - TV debates Speaking: Just- plication letter with resume – Transcoding	s - Voca -a-minute	bulary: Portr talk - Group	nant disc	eau v ussior	vords - One word s n - Reading : Readi	substitution - ing for Gist -
Unit –		Grammar, Vocabulary, Listening, Speaking, Reading	g & Writi	ng		<u> </u>		9
Gramn about princip	nar: Conc celebrities les of a m	cord - Vocabulary: Phrasal verbs - Idioms & Phrases s - Practicing Pronunciation through web tools - R achine - Writing: Description: Person, Place, Process, P	 Listen eading: roduct ar 	ing: Listenin Company d Picture	g to corre	celeb spond	rity talks - Speaki Jence, technical te	ing: Talking exts/working
Unit –		Grammar, Vocabulary, Listening, Speaking, Readin	g & Writ	ing				9
Gramm guest I Busine	nar: Disco ectures - ess Plans -	 burse markers - Transitional words and phrases - Voca Speaking: Technical & Non-technical presentations - V Writing: a dream job/company - Letter to the Editor – B 	abulary: Vorkshop iography	Commonly of presentation & Autobiogra	onfu ns - I aphy	sed w Readii - Che	vords - Listening: ng: Reputed compa cklist	Listening to any profiles,
Unit –	IV	Grammar, Vocabulary, Listening, Speaking, Reading	g & Writi	ng				9
Gramn Listen comme Techni	mar: Degr ing: List entaries - ical report:	rees of Comparison - Punctuations – Fragments & run rening to global accents - listening to motivational spo Movie Enactment - Reading: Narrative passages - V s	-ons - V eeches - Nriting:	ocabulary: I S peaking: E mail - Age	Britis Nari enda	h & A ating & M	merican - Spelling personal mileston inutes of Meeting	g & words - es - Sports - Special &
Unit –	V	Grammar, Vocabulary, Listening, Speaking, Reading	g & Writi	ng				9
Gramm to sar speech journal	mar: Purp mple HR nes/conve ls Writing	ose and Function - If clause - Error detection - Vocabula Interviews - Speaking: Introduction to phonetics rsations - Giving feedback – Debate - Reading: Key No : Circulars - Critical Appreciation of a non-detailed text - T	iry: Cod - Stre ote speed Fechnical	ing & Decodi ss, rhythm ches - Newsp proposals	ng - & bape	Alpha Intona r repo	bet test - Listenin tion – Guided & rts - short technica	g: Listening & unguided al texts from
								Total:45
TEXT	BOOK:							
1.	Sanjay k	Kumar & Pushp Lata, "Communication Skills", 2 nd Edition,	Oxford L	Jniversity Pre	ess, l	New D	elhi, 2018.	
REFER	RENCES:							
1.	Meena Press,	kshi Raman and Sangeeta Sharma. "Technical Commu New Delhi, 2022.	nication-	Principles an	ıd Pr	actice	". 4 th Edition, Oxfor	d University
2.	Murphy	/ Raymond, "English Grammar in Use", 5 th Edition, Camb	ridge Un	iversity Press	s, Ne	w Yor	k, 2019.	
3.	Jack C.	Richards and Chuck Sandy, "Passages" Student's Book 2	2, 3 rd Edi	tion, Cambric	lge l	Jniver	sity Press, New Yo	rk, 2014.

COURS On con	SE OUTC	OMES: of the co	urse, the	stude	ents will be	able to					BT M (Highe	lapped st Leve	I)
CO1	use fur	nctional g	rammar fo	or impr	oving comm	nunicatio	n skills				Apply	ing (K3)	
CO2	listen a	ind comp	rehend di	fferent	accents an	d infer ir	mplied me	anings			Apply	ing (K3)	
CO3	speak commu	clearly, inicative	initiate a strategies	nd su	istain a dis	cussion	and neg	gotiate usi	ng appro	opriate	Creat	ing (K6)	
CO4	read o evalua	lifferent te them	genres o	f texts	s, infer imp	lied mea	anings ar	nd criticall	y analyz	e and	Understa	anding (ł	<2)
CO5	CO5 produce different types of narrative, descriptive expository texts and understand creative, critical, analytical and evaluative writing Creating (K6)												
	Mapping of COs with POs and PSOs												
COs/P	Os PO	1 PC)2 F	03	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1							2			1	3	1	1
CO2										2	3		1
CO3										2	3		2
CO4							1				3	1	1
CO5											3		2
1 – Slig	ht, 2 – M	oderate, 3	3 – Subst	antial,	BT- Bloom's	s Taxono	my						
					10050				~~~				
Teet / F	Plaam'a	Bomor	nhoring	llnd	ASSES	SMENI	PATTER	Analyzin	(Y	luoting	Croating		
Cate	gory*	Kenner (K	l)%	Una	(K2) %	Арр (K:	3) %	(K4) %	iy Eva (I	K5) %	(K6) %	То	otal %
CA	AT1				37	3	30				33		100
CA	AT2				7	ę	50				43		100
CA	AT3				17	Ę	50				33		100
E	SE				15	4	45				40		100

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

		22MAC21 - MULTIVARIABLE CALCULUS AND COM	IPLEX /	ANALYSIS									
Interference of the colspan="2">Interference of the colspan="2" (Common to CIVIL, MECH, MTS, ECE, EEE, EIE & FT branches) Programme & B.E & Civil, Mech, MTS, ECE, EEE, EIE & FT branches Sem. Category L T P Credit Branch branches Sem. Category L T P Credit													
Progra Branc	amme & h	B.E & Civil, Mech, MTS, ECE, EEE, EIE & FT branches	Sem.	Category	L	т	Ρ	Credit					
Prerec	quisites	Nil	2	BS	3	1*	2 *	4					
Pream	ıble	To impart the knowledge of partial derivatives, evaluation of and analytic functions to the students for solving the disciplines.	f real an problen	d complex in ns related to	tegra o va	ils, ve rious	ector eng	calculus ineering					
Unit –		Functions of Several Variables:						9					
Function Applica	ons of two o ations: Maxiı	r more variables – Partial derivatives – Total differential – Tay na and minima – Constrained maxima and minima – Lagrang	ylor's se ge's mul	eries for funct Itiplier metho	tions d.	of tw	vo va	riables –					
Unit –	I	Multiple Integrals:						9					
Double Triple i	 integration integration ir 	in cartesian coordinates – Change of order of integration - cartesian coordinates – Volume as triple integrals.	– Applie	cation: Area	betw	een	two o	urves –					
Unit –		Vector Calculus:						9					
Direction Solence (without)	ctional derivative – Gradient of a scalar point function – Divergence of a vector point function – Curl of a vector – noidal and Irrotational vectors – Vector Integration: Introduction – Green's, Stoke's and Gauss divergence theorems nout proof) – Verification of the above theorems and evaluation of integrals using them.												
Unit –	- IV Analytic Functions: 9												
Function Riema	ctions of a complex variable – Analytic functions – Necessary and sufficient conditions (excluding proof) – Cauchy- nann equations (Statement only) – Properties of analytic function (Statement only) – Harmonic function – Construction nalytic function – Applications: Fluid flow – Conformal mapping: $w = z + a$, az , $1/z$ – Bilinear transformation.												
or ana		- Applications: Fluid flow - Conformal mapping: w = 2 + a, a.	Z, 1/Z –	Billnear trans	siom	atior	1.	0					
Introdu	v Iction – Cau	complex integration.	Tavlor's	and Laurent	serie	s _ 5	Sinau	9 larities –					
Classif	fication – Ca functions ov	uchy's residue theorem (without proof) – Applications: Evaluation the circular contour.	ation of	definite integ	grals	invol	ving	sine and					
LIST C		IENTS / EXERCISES:											
1.	Finding or	linary and partial derivatives											
2.	Computing	extreme values of function of two variables											
3.	Evaluating	double and triple integrals											
4.	Finding the	e area between two curves											
5.	Computing	gradient, divergence and curl of point functions											
6.	Applying M	lilne-Thomson method for constructing analytic function											
7.	Determina	tion of Mobius transformation for the given set of points											
8.	Finding po	les and residues of an analytic function											
	Lecture:45, Tutorials and Practical:15, Total:60												
TEXT	BOOK:						1.50.9	! N!-					
1.	Ramana B Delhi, 2018	v, "Higher Engineering Mathematics", 1 st Edition, Tata McG 3.	iraw-Hill	Publishing (Jom	bany	Limit	ed, New					
REFE	RENCES/ M	ANUAL / SOFTWARE:											
1.	Kreyszig E	, "Advanced Engineering Mathematics ", 10 th Edition, John W	/iley, Ne	w Delhi, Indi	a, 20	16.							
2.	Kandasam Edition 201	y P., Thilagavathy K. and Gunavathy K., "Engineering Mathe 4, S.Chand and Co., New Delhi	ematics	For First Yea	ar B.I	E/B.T	ech",	Reprint					
3.	Duraisamy Pearson In	C., Vengataasalam S., Arun Prakash K. and Suresh M., " dia Education, New Delhi, 2018.	"Engine	ering Mather	natic	s - I	", 2 nd	Edition,					

4.	Grev	wal B.S	S, "High	er Engin	eering	g Mathem	atics" 44	4thEditi	on, Kh	ianna Pu	blishers	s, New Delh	i, 2018.		
5.	MAT	LAB –	- Labora	atory Mar	nual										
COUR	SE O	UTCO	MES:	uroo tha		lonto will	ha ahla	. 1.0					(BT Map	ped
	mpiet		the co	urse, the	e stuc									Applying	
CO1	com	pute th	ne total o	derivative	es an	d extreme	values	of mult	ivariat	ole function	ons.			ppiying	(110)
CO2	eval	uate m	nultiple i	ntegrals	and a	apply them	to com	pute th	e area	and volu	ume of	the regions.		Applying	(K3)
CO3	appl prob	y the lems.	concep	ts of de	erivativ	ves and	line inte	egrals of	of vec	tor func	tions in	engineerir	ng /	Applying	(K3)
CO4	cons regio	struct a	analytic ler the g	function: iven con	s and forma	l bilinear t al mapping	ransforn J.	nations	and o	determin	e the in	nage of give	en /	Applying	(K3)
CO5	CO5 apply the techniques of complex integration to evaluate real and complex integrals over suitable closed curves. Applying (K3) Image: technique tech														
CO6demonstrateMATLABprogramming to understand the concepts of functions of two variables, vector operators, multiple integrals and complex variables.Applying (K3), Manipulation (S2)															
				1		Mappin	g of CC	s with	POs a	and PSC)s			1	1
COs/P	Os	PO1	PO2	PO3	PO4	4 PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	3	3	2											
CO2	2	3	3	2											
COS	3	3	3												
CO4	1	3	3												
CO5	5	3	3	3											
CO	6					3									
1 – Slig	ght, 2	– Moc	lerate, 3	3 – Subst	tantial	l, BT- Bloc	om's Tax	xonomy	/						
						ASSES	SMENT	PATT	ERN -	THEOR	Y				
Test Ca	t / Blo atego	om's ory*	Rei	member (K1) %	ing	Understa (K2)	anding %	Apply (K3)	ying %	Analyzi (K4) %	ing %	Evaluating (K5) %	Cr (eating <6) %	Total %
	CAT	1		10		30		60)	-		-		-	100
	CAT	2		10		30		60)	-		-		-	100
	CAT	3		10		30		60)	-		-		-	100
	ESE 10 30 60 100														
	LOL	·						•••	,						

*Alternate week

		22CYT24 – CHEMISTRY FOR ELECTRICAL AND ELECTR	ONICS E	ENGINEERIN	G			
Progra Branci	ımme & n	B.E & Electrical and Electronics Engineering	Sem.	Category	L	т	Р	Credit
Prereq	uisites	Nil	2	BS	3	0	0	3
Pream	ble	This course aims to emphasize the engineering students to rea finishing, organic electronic materials, fuels & combustion and	alize the i the need	importance of I for e-waste i	f ele man	ctroc agen	hemis nent.	try, metal
Unit –	1	ELECTROCHEMISTRY						9
Introdu calcula hydrog (redox)	ction – cells tion of cell El en electrode, – conductom	 types – representation of galvanic cell – electrode potential MF from single electrode potential – reference electrodes: constandard calomel electrode, glass electrode – EMF series a petric titrations – mixture of weak and strong acid vs strong base 	– Nerns struction and its a	st equation (, working and applications –	deriv I app - pot	atior olicat centio	n of ce ions o ometrie	ell EMF) – f standard c titrations
Unit –	11	INDUSTRIAL METAL FINISHING						9
Introdu decom of elect – elect manufa	ction – techn position poter trodeposit – e roless nickel acturing of ele	ological importance of metal finishing- methods of metal finishin ntial and overpotential – surface preparation – electroplating: pro- electroplating of chromium and silver-electroless plating: process plating process-advantages of electroless plating- distinction be ectronic component-printed circuit board (PCB) fabrication.	ng - ess ocess – e s – varior etween e	entials of me effect of platin us steps invol electroplating	tal fi Ig va Ived and	nishi riabl in el elec	ng: po es on ectrole troles	plarization, the nature ess plating s plating –
Unit –	111	ORGANIC ELECTRONIC MATERIALS						9
Introdu semico electro LED –c Unit – Introdu – theor varietie petrole numbe Bharat	ction – cond inducting mar spinning, drop organic field-e IV ction – classi retical calcula es – proximat um – manufa r, compressio Stage Emissi	ducting polymers – p-type and n-type organic semiconduc terials – organic dielectric materials – processing and fabrica o casting, templating – organic light emitting diodes – working, t iffect transistors and organic solar cells- working, types and appl FUELS AND COMBUSTION fication of fuels – characteristics of a good fuel – combustion – tion of calorific value by Dulong's formula – flue gas analysis te analysis – significance – metallurgical coke – Otto-Hoffmar cture of synthetic petrol – hydrogenation of coal – bergius proco in ignition engine – cetane number – power alcohol and biodies ion Standard (BSES) system.	ting main ation – s ypes and ications. calorific by Orsat by Drsat byprod ess – kn el – gaso	terials – adv spin coating, d applications values – gros t's method – uct method – ocking: spark eous fuel – w	eva eva s ar solic liqu ater	ages pora ompa d ne l fue uid fi tion gas	t calo t calo s – cu uel – engine – intro	9 sputtering, of LCD vs 9 rific values bal and its refining of e – octane bduction of
Unit –	V	E-WASTE AND ITS MANAGEMENT						9
Introdu and hu – recyc – globa	ction-E- Was man health- r cling of e-was al scenario of	te – definition – sources of e-waste– hazardous substances in need for e-waste management– e-waste handling rules – waste te – disposal treatment methods of e- waste- mechanism of extr E-waste – E-waste in India- case studies.	e-waste minimiza action of	e – effects of ation techniqu precious me	e-w ies f tal fi	aste or ma om l	on er anagir eachir	nvironment ng e-waste ng solution
								10(01.43
TEXT	BOOK:							
1.	Wiley Editor II, IV, V.	ial Board," Wiley Engineering Chemistry", 2 nd Edition, Wiley India	a Pvt. Lte	d, New Delhi,	Rep	orint 2	2019,	for Unit-I,
2.	Palanisamy Edition, Pea	P.N., Manikandan P., Geetha A., Manjula Rani K.& Kowshalya V Irson Education, New Delhi, 2019, for Unit-III, V.	V.N., "Er	vironmental S	Scie	ıce",	Revis	ed
REFEF	RENCES:							
1.	Palanisamy Education P	P.N., Manikandan P., Geetha A.& Manjula Rani K., "Applied Cherrivate Limited, New Delhi, 2019.	emistry",	6 th Edition, T	ata	McG	raw H	ill
2.	Payal B. Jos	shi, Shashank Deep, "Engineering Chemistry", Oxford University	Press, N	New Delhi, 20	19.			
3.	O.G.Palann	a, "Engineering Chemistry", second Edition, McGraw Hill Educat	ion (India	a) Private Lim	nited	, Che	ennai,	2018.

COUR: On cor	SE OUTCOMES: npletion of the course, the students will be able to	BT Mapped (Highest Level)
CO1	apply the principles of electrochemistry for various applications	Applying (K3)
CO2	apply the concept of plating techniques in industrial metal finishing	Applying (K3)
CO3	utilize the organic electronic materials for various applications	Applying (K3)
CO4	apply the concepts of fuels and combustion for engineering applications	Applying (K3)
CO5	utilize the knowledge to handle the e-waste and reduce its impacts on environment	Applying (K3)
	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									2	1
CO2	3	2	1	1									2	1
CO3	3	2	1	1									2	1
CO4	3	2	1	1									2	1
CO5	3	2	1	1			3						2	1

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	25	35	40				100
CAT2	25	35	40				100
CAT3	25	35	40				100
ESE	25	35	40				100

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

		22EEC21 - ELECTRICAL MEASUREMENTS AND INST	RUMEN	TATION		1		
Progra Branci	imme & h	B.E & Electrical and Electronics Engineering	Sem.	Category	L	т	Р	Credit
Prereq	uisites	Nil	2	ES	3	0	2	4
Pream	ble	This course aims in imparting knowledge of Basic principles working principle of different Electromechanical Instruments. It als measurement of Power, Energy, Resistance, Impedance and different energy.	of Elect so aims rent Elec	rical Measur in imparting ctronic measu	eme fund ıring	nts, amer i instr	constr ntal kn rumen	uction and lowledge of ts.
Unit –	l 	Basics of Measurements:						9
Importa Static a	ance of Meas and Dynamic	urement – Purpose of Measurement – Methods of Measurement – F Characteristics. Types of Instruments-Types of Errors – Operating F	orces in	Analog Instr	Mea ume	asure nts.	ment	System –
Unit –	11	Electromechanical Instruments:						9
Perma Voltme – Cons	nent Magnet ter Multipliers struction and	Moving Coil (PMMC): Construction and Working Principle – Torque l s (Simple Problems) – Moving Iron Instruments: General Torque Equ Norking of CT and PT – Calibration	Equatior lation – (n and Probler Classification	ns – – C	Amn onstr	neter S ruction	3hunts – , Working
Unit –		Measurement of Power, Power factor and Energy						9
Electro Single Operat	dynamomete Phase Electro ion – Phantor	r Wattmeter: Construction –Theory- Low Power factor Wattmeter– T odynamometer Power Factor Meter – Single Phase Induction Type E n Loading.	hree Ph Energy N	ase Wattmete /leters: Const	ər – ructi	Powe	er Fac Theoi	tor Meters: y of
Unit –	IV	Measurement of Resistance and Impedance						9
Classif Inducta tester).	ication of Res ance & Capac	sistances – Kelvin's Double Bridge – A.C Bridges: Introduction – Sou sitance: Maxwell's Inductance Bridge – Capacitance Bridge – Scherin	irces and ng Bridg	d Detectors – e – Wien's Bi	Mea Mea	asure ∋ – M	ement eggar	of Self (Earth
Unit –	V	Electronic Measuring Instruments						9
Digital	Multi meters	–Function generators, Weston Type Frequency Meter – Digital Rec	ording S	Systems-digita	al Da	ata A	cquisi	tion system
LIST C	F EXPERIM	ENTS / EXERCISES:						
1.	Calibration	Of DC voltmeter and DC ammeter						
2.	Calibration	of Single phase Energy meter						
3.	Measurem	ent of High AC Currents Using Current Transformer.						
4.	Measurem	ent of High AC Voltage Using Potential Transformer						
5.	Range Exte	ension of DC voltmeter						
6.	Range Exte	ension of DC Ammeter						
7.	Measureme	ent of Medium and Low Resistances using DC bridges						
8.	Measureme	ent of Electrical parameters using Power Quality Analyzer						
				Lecture: 4	5, Pr	actio	al : 30),Total: 75
TEXT	BOOK:							
1.	Sawhney A Delhi, 2021	.K., "Electrical and Electronic Measurements and Instrumentation",	19th Rev	vised Edition,	Dha	anpat	th Rai	& Co., New
REFE	RENCES/ MA	NUAL / SOFTWARE:						
1.	Gupta J.B., Delhi, 2013	"A Course in Electronic and Electrical Measurements and Instrume	entation'	',13th Edition	, S.ł	<.Kat	aria&	Sons, New
2.	Edward Wi Reem Publi	liam Golding and Frederick Charles Widdis, "Electrical Measurem cations, New Delhi, 2011.	nents an	d Measuring	Ins	trume	ents",	6 th Edition,
		· · · · ·						

COURSE OUTCOMES: On completion of the course, the	e students will be able to	BT Mapped (Highest Level)
CO1 explain the functional bloc instruments.	cks of measurement system and the static and dynamic characteristics of	Understanding(K2) Manipulation (S2)
CO2 outline the concepts of diffe	erent measuring Instrument and Calibrate different Instruments.	Applying (K3) Manipulation (S2)
CO3 explain the concepts of ins	struments used for measuring electrical parameters	Understanding(K2) Manipulation (S2)
CO4 make use of the bridges for	or measurement of Resistance, Capacitance and Inductance	Applying (K3) Manipulation (S2)
CO5 identify an appropriate digi	ital instrument for measurement of electrical parameters	Applying (K3) Manipulation (S2)
	Menning of COs with DOs and DCOs	

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

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

		ASSESSMENT I	PATTERN - T	HEORY			
Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	20	60	20				100
CAT2	20	60	20				100
CAT3	20	60	20				
ESE	15	55	30				100
* ±3% may be varied (C	CAT 1,2,3 – 50 marks	& ESE - 100 marks)					

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Scalar system Coulor Intensit	and Vector F . Divergence nb's law an o y Due to Poir	Fie - nd int	bld: D El Cl	s – vei ect	Re ge ric ge	≥vi no ; f , L	e ce ie .in	w T Id	of he I I C	i v eo nt ha	'eo ore : er arç	cte en ns ge	:01 n sit	r a – ty ar	ale C /: nd	ge Jui E J S	eb rl le Su	ora ect	ı. St tric ac	to c c	C C	art e's Sha Ch	s ar	si T rg arç	ia ⁻h je g€	in ie e	D	re T	id m yl	n. pe) 2 2	uı s uti	rv o io	/il of on	ווי י (ח.	n C	e Sh	a na	ar	g	Co Je		oro Di:	dir str	iat ib	es uti	01	Sy n	/S	te C	m Co	u	- (or	Cor nb	าv 's	er: La	sic w	on ' –	of E	i c	o-	-o tri	rd c	in Fi	at el	e d
Unit –	Insity Due to Point Charge, Line Charge and Surface Charge Distribution. 9 Image: Instruction of Flux Density, Gauss's Law and Potential: Electric Flux Density – Gauss's Law – Application of Gauss's Law – Potential prence – Potential – Conservative Property – Potential Gradient 9 ductors, Dielectrics and Capacitors: Conduction Current, Displacement Current – Polarization – Law of Continuity – ndary Condition: Conductor-Dielectric and Dielectric-Dielectric – Capacitors: Parallel Plate, Transmission Line – Poisson's and ace's Equations.																																																																	
Electric Differer Condu Bounda Laplace	c Flux Densi nce – Potentia ctors, Diele ary Condition e's Equations	iity ial ect n: C s.	y, (tric	Sau Co s ndu	ISE ISE an ICT	;'s ∋r∖ d or∙	; L /a -D	tiv a) ie	v ve pa	a P ac	ro itc	d op or	P iei rs: ar	rty s: nc	y - C d I)n Cor Dir	tia Po no	al: ot du lec	: E er ict	Ele nti tic ric	ec ial on c-[ctr I C I C I C	ic Gr Cl	: I ra ur le	Fl ad rr/	lu lie er	ix en nt ic	C nt t, ; -)e C - (n Di: C	s a	it pl	la a	iC C	e e	er to	G m pr	ie s	en :	nt P	s' (Pa	's Ci ira	L ur all	av rei el	v - nt Pl	- A 	γ F ə,	p Do	lic ola Fra	ar ar	ic za	at m	o ior iss	i G I -	aı - I n	uss La Lin	s's w ie	of	av : (Po	v - Co bis	- on ss	Po tii or	ote าน า'ร	en ity s a	ntia y an	al — d
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Conduct Force Current Solenoi	ctors , Circula and Inducta t Carrying Co	ar l and	Lo ce	op : N ctc	– I lag rs	av Ma jne –I	ag eti Ma	ne ic ag	s eti F Jno	c or eti	Fl	e, B	− , ľ 30	_ M	N N N	/la vir da	igr ng ary	ne 1 (1 (s etio Cr Cc	c na on	Fl arç arç	lux ge	x ; i or	in n	וב)e ו s	en a	- I	ity Ma Ma	/ - ag ag	gr gr	re Te	et		er c	rg F		ie ir	Sele	d,	oi , iit	re L	.0	re S	nt elf	z	Fo	oro d	, ce N	α) /Ι	- itu	ia	Fo		e se suc	Be	etv	ve ;e	en –	ר In	Γw nd	/0 uc	F	Pa an	ra ce	ulle e c	el of
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Domes Magnet Electro	t ic– SMPS, t tic resonanc magnetic Spe	far ce ect	ns i tru	in ma m	du gir	cti 1g	or ,	יר מ	co na	igr	kir ne	ng etc	j. Stł	lr he	nd er:	lu : ap	st by	try '.	y: C	G Co	e Su	ne nr	er nı	ra u	ato n	or ic	r, ca	se iti	er o	ns n	:	or	s E	a EN	ar M	n	d	l a w	ac /a	ct av	tu /e	a s	to	rs. in	Т	ra dif	n fe	s	po er	or It	t: t	m Ył	ia(be	jne S	eti of		ev co	ita mi	tic m	on ur	. I nic	M	ec tic	lic on	ca	l:
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1.	Sadiku Matt	tthe	ew	N.	O.,	, "	Pr	rin	ıci	pl	es	6 0	of	fΕ	Ξle	ec	tro	on	na	зg	jn	et	ic	s	;",	, 6	5 th	י E	Ξc	tit	tio	or	n,	, (С)>	xf	fo	orc	d	ι	Jr	ιiν	er	si	y	Pı	re	s	s,	N	e	W	De	lh	i, 2	20	21								
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COUR On co	SE O mplet	UTCON tion of t	IES: the co	ours	se, the st	udent	s will be	able to						(BT Mapp Highest Le	ed evel)
CO1	disti	nguish	the va	ario	us coordir	nate s	ystems ar	nd charg	e distrib	oution					Applying (K3)
CO2	app capa	ly Gaus acitor	s's la	w fo	or the eva	luatior	n of EFI fo	or differe	nt confi	guratio	ns and it	s applica	ation in		Applying (K3)
CO3	infe	r about	the M	Fla	and induc	tance	for differe	nt config	juration	s					Applying (K3)
CO4	reca	ap the e	lectro	ma	gnetic wa	ves ar	nd its para	meters						Un	derstanding	g (K2)
CO5	CO5 recapitulate the sources of EMI and the control techniques to reduce EMI Understanding (K2) Mapping of Cos with Pos and PSOs															
	Mapping of Cos with Pos and PSOs															
		1	1			1	Mappir	ng of Co	s with	Pos ai	nd PSOs	5	1	1	I	
Cos/F	os	PO1	PO	2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO	1	3	2								1			1	2	3
CO	2	3	2		1						1			1	2	3
CO	3	3	2		1						1			1	2	3
CO	4	3	2		1						1			1	2	3
CO	5	3	2								1			1	2	3
1 – Slię	ght, 2	– Mode	erate,	3 –	Substant	ial, B1	- Bloom's	Taxono	my			I			<u> </u>	
							ASSES	SMENT	ράττε	RN –	THEORY	(
Tes	t / Blo	oom's orv*		Re	memberi (K1) %	ng	Understa (K2)	anding %	Apply (K3)	ying %	Analyz (K4) 9	ing I %	Evaluating (K5) %	J Cre	ating (K6) %	Total %
	CAT	1			10		30)	60)						100
	CAT	2			10		40)	50)						100
	CAT	3			20		80)								100
	ESE	Ξ			5		50)	45	5						100
* ±3%	may t	be varie	d (ĊA	T 1	,2,3 – 50	marks	8 & ESE –	100 ma	rks)			1				

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Unit –	I		L	_i	st:																																																																9)		
Data S Linked	tructures - A List – Applica	Abs cati	ost itio	stra on	act : P	Da oly	ata nc	i T om	Гу nia	pe I /	÷S ∖c	() Id	۹E itic	דכ on) า	-	·L	_is	st	A	D	Тά	an	۱d	1	A	۱/	rr	ra	a	ay	у	I	In	n	ıр	olo	le	m	ne	er	nt	ta	tic	on	- 1	-	L	inl	ke	d	L	is	t	-	D	οι	ıbl	y	Lir	۱k	ec	IL	is	st	-	(Ci	rc	u	la	r
Unit –	11		S	St	acl	(a	nd	C	۱	eι	le	s	:			_																																													_								9)		
Stack / Postfix	ADT – Array Expression E	y a Ev	an va	nd alu	Li Jat	nke on	؛d - (L Qı	ist Je	ir ue	np e /	ple AE	əm DT	ne -	۹۲ - ۱	ita Ai	ati rra	ioı ay	n / 2	of an	i S d I	Sta Lir	icł iki	ks e(3 d	- L	Li	A is	A si	\p st	pp t i	in	n n	ic ip	ca ol	at le	tio en	o m	n ie	: n	E nta	3a at	ala tic	an on	ci o	in f	g C	l I Qu	Pa et	re Je	n s	th -	e A	si: pp	s- oli	lı ca	nfi ati	x on	to s	P	os	stfi	х	C	01	n١	/6	er	si	or	۱	-
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Unit –	V		S	Sc	orti	ng	ar	۱d	H	la	sł	niı	١g	:		_	_	_	_		_		_																																						_								9)		
Sorting Chainir	i - Preliminari ng – Open ad	ries Iddr	es dre	es	In sir	ser g.	tio	'n	So	ort	: -	- (λn	ic	:k	S	or	't -	-	M	er	ge	: S	0	rt	t -	_	-	ł	Н	He	ea	a	ιp	S	so	0	ort	t -	_	ŀ	Ha	as	sh	in	g	_	- (Ge	en	er	а		d	ea	. –	- 1	la	sł	۱F	ur	C	tio	n	-	S	56	e p	ba	ra	ite	Э
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8	Evaluate the	he	• P	רים סר	st-	fix	E>		re	55	in	n		sir			St	ta				т				0				u				15	9						•	/ •																														
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REFER	RENCES/ MA	AN	NL	U	٩L	/ S	0	FT	w.	/A	R	E															_			,	, -	_					-					,				_	_									-				-			,			-						
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COUR On cor	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	5						
COs/POs	Mapping of COs with POs and PSOs COs/POs PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO12 PS01 PS02 CO1 3 2 1 1 2 1 CO2 3 2 1 1 2 1 CO2 3 2 1 1 2 1															
CO1	3	2	1	1								PO12 PSO1 PSO 2 1 2 1 2 1 2 1				
CO2	3	2	1	1									2	1		
CO3	3	2	1	1									2	1		
CO4	3	2	1	1									2	1		
CO5	3	2	1	1									2	1		
			.		.	-										

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 50 100													
CAT2	5	35	60				100						
CAT3	5	35	60				100						
ESE	ESE 5 35 60 100												
* ±3% may be varied (CAT 1,2,3 – 50 marks & ESE – 100 marks)													

		22TAM01 - தமிழர் மரபு												
_		(Common to All Engineering and Technology	y Branch	es)			1							
Progra Branci	וmme & ז	All BE / BTech Branches	Sem.	Category	L	т	Р	Credit						
Prereq	uisites	Nil	1/2	HS	1	0	0	1						
Pream	ble	தமிழர்களின் மொழி, இலக்கியம், ஓவியங்கள், க வீர விளையாட்டுக்கள், திணைக் கோட்பாடுகள், பங்களிப்பைப் பற்றிய அறிவை வழங்குவதே இந்த	சிற்பக்ச இந்திட த பாட	லைகள், ப ப பண்பாட் த்தின் நோ	நாட்(.டிற்(க்கம	டுப்பு தத் ாகும்	றக் தமீ ப.	கலைகள், 1ழர்களின்						
ക്കരം	– I	மொழி மற்றும் இலக்கியம்						3						
சேவவிலக்கியங்கள் – சங்க இலக்கியத்தின் சமயச் சார்பற்ற தன்மை – சங்க இலக்கியத்தில் பகிர்தல் அறம் – திருக்குறளில் மேலாண்மைக் கருத்துக்கள் – தமிழ் காப்பியங்கள், தமிழகத்தில் சமண பௌத்த சமயங்களின் தாக்கம் – பக்தி இலக்கியம், ஆழ்வார்கள் மற்றும் நாயன்மார்கள் – சிற்றிலக்கியங்கள் தமிழில் நவீன இலக்கியத்தின் வளர்ச்சி – தமிழ் இலக்கிய வளர்ச்சியில் பாரதியார் மற்றும் பாரதிதாசல ஆகியோரின் பங்களிப்பு. அலகு – 11 மரபு – பாறை ஓவியங்கள் முதல் நவீன ஓவியங்கள் வரை – சிற்பக் கலை 3														
കര	அலகு – II மரபு – பாறை ஓவியங்கள் முதல் நவீன ஓவியங்கள் வரை – சிற்பக் கலை 3 நடுகல் முதல் நவீன சிற்பங்கள் வரை – உற்பொன் சிலைகள் – பமங்குவரினர் மற்றும் அவர்கள்													
நடுகல் முதல் நவீன சிற்பங்கள் வரை – ஐம்பொன் சிலைகள் – பழங்குடியினர் மற்றும் அவர்கள் தயாரிக்கும் கைவினைப் பொருட்கள், பொம்மைகள் – தேர் செய்யும் கலை – சுடுமண் சிற்பங்கள் நாட்டுப்புறத் தெய்வங்கள் – குமரிமுனையில் திருவள்ளுவர் சிலை – இசைக் கருவிகள் – மிருதங்கம் பறை, வீணை, யாழ், நாதஸ்வரம் – தமிழர்களின் சமூக பொருளாதார வாழ்வில் கோவில்களின் பங்கு.														
அலகு – III நாட்டுப்புறக் கலைகள் மற்றும் வீர விளையாட்டுக்கள் 3														
தெருக சிலம்	க்கூத்து, பாட்டம், எ	கரகாட்டம், வில்லுப்பாட்டு, கணியான் கூத்து, வளரி, புலியாட்டம், தமிழர்களின் விளையாட்டுகள்.	രുഥിര	ரட்டம், (தோ	ប់បាត	തഖദ്	ந் கூத்து,						
ക്കരം) – IV	தமிழா்களின் திணைக் கோட்பாடுகள்						3						
தமிழக புறக் கல்வி கடல்க	கத்தின் தா கோட்பாடு 1யும் – சா கடந்த நா(வரங்களும், விலங்குகளும் – தொல்காப்பியம் மற் கள் – தமிழர்கள் போற்றிய அறக்கோட்பாடு– சங் பககால நகரங்களும் துறை முகங்களும் – சங்ககால டுகளில் சோழர்களின் வெற்றி.	றும் சா க கால லத்தில்	ங்க இலக்கி லத்தில் தமி ல ஏற்றுமதி)யத்த)ழகத் மற்	தில் நதில் றும்	அக்ட எழு இற	ம் மற்றும் ஒத்தறிவும் நக்குமதி –						
ച്ചരക	- V	இந்திய தேசிய இயக்கம் மற்றும் இந்திய பண்பாட் பங்களிப்ப	டிற்குத்	தமிழர்க	ரின்			3						
இந்தி। தாக்க கைபெ	ப விடுத ம் – சுயம பழுத்துப்ப	லைப்போரில் தமிழர்களின் பங்கு – இந்தியாவில ரியாதை இயக்கம் – இந்திய மருத்துவத்தில் சித்த டிகள் – தமிழ்ப் புத்தகங்களின் அச்சு வரலாறு.	ன் பிற மருத்)பகுதிகளில துவத்தின் ।	் த பங்கு	یل ب – را	பன் கல்ெ	ன்பாட்டின் வட்டுகள்,						
								Total: 15						
TEXT	BOOK:													
1.	1. ஆ. பூபாலன், தமிழர் மரபு, VRB Publishers Pvt Ltd, 2022.													
REFEF	RENCES:													
1.	தமிழக வ கல்வியி।	ரலாறு- மக்களும் பண்பாடும்- கே கே பிள்ளை (வெளி பல் பணிகள் கழகம்)	யீடு தப	ிழ்நாடு பாட	_நூ	ல் மர	ற்றும்)						
2.	கணினித்	தமிழ் - முனைவர் இல. சுந்தரம் (விகடன் பிரசுரம்)												
3.	கீழடி - ை	வகை நதிக்கரையில் சங்ககால நகர நாகரிகம்.(தொல்	லியல்	துறை வெ	ഩിനു	()								
4.	பொருரை	ந - ஆற்றங்கரை நாகரிகம் (தொல்லியல் துறை வெளி	ிரூடு)											

COUR	SE O വെ (UTCOI மடிக்ச	MES: പെപം	ர், மாண	வர்கள்	'n								BT Map (Highest	ped Level)
CO1	தம் மு	த்த் பெ தயும்.	் பிய	فارور ف	இலக்	கியத்தில	் மதிட	ப்புமிக்	ቴ ቆጡ	த்துக்க ச	ണെ ഖ്	ிளக்க	Und	erstanding	g (K2)
CO2	தமீ	ிழர்க	ரின் ச	ற்பம் மற	ற்றும்	அவர்கள	ரின் ஒ	வியங்	கள் ப	ற்றி வி	ளக்க பு	வுயும்.	Und	erstanding	g (K2)
CO3	தம் கூ	ிழர்க ற முடி	றின் ந .யும்.	ாட்டுப்புர	ற மற்	றும் தற்க	காப்புக்	ക്തல	ക്തണ	ப் பற்றி) சுருக்க	மாகக்	Und	erstanding	g (K2)
CO4	தமீ	ிழர்க	றின் த	ணெக்	கோட்	பாடுகன	ளப் பர	ற்றி வ	ிளக்க	முடிய	ضا.		Und	erstanding	g (K2)
CO5	இர் பங்	ந்திய மே பகளிப்	தேசிய பு பற்ற	இயக்கம்)1 விளக்க	ம் மற் க முடி	றும் இந் டியும்.	திய பல	ன்பாட்	ヰற்கு	த் தமிழ	ர்களின்		Und	erstanding	з (K2)
						Марр	ing of C	COs wit	h POs	and PS	Os				
COs/P	COs/Pos PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO12 PS01 PS02														
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 – Slig	ght, 2	– Mod	erate, 3	3 – Substa	ntial, E	3T- Bloom	's Taxor	nomy							
		<u> </u>		_	-	ASSE	SSMEN		FERN -	- THEO	RY				
Lesi C	t / Bl ateg	oom′s ory*	R	emember (K1) %	ing	Understa (K2)	anding %	Apply (K3)	/ing %	Analyz (K4) 9	ing B %	<pre>_valuating (K5) %</pre>		reating K6) %	Total %
	CAT	1		40		60									100
	CAT	2		40		60									100
	CAT	3		40		60									100
	ESI	=								NA					
* ±3% I	may	be varie	ed (CA	Г1,2&3	– 50 m	narks)									

	22TAM01 - HERITAGE C	F 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 at arts, heroic games, doctrines, contribution of Tamils	bout Tamil langua to Indian culture.	age, literature,	pain	tings	, sculp	otures, folk
UNIT I	Language and Literature						3
Language families sangam literature buddhism & jainis literature in tamil -	s in india - dravidian languages – tamil as a classical – distributive justice in sangam literature - manager m in tamil land - bakthi literature azhwars and nayar contribution of bharathiyar and bharathidhasan.	anguage - classi ment principles in mars - forms of	cal literature i h thirukural - minor poetry	in tan tamil 7 - de	nil – : epic velop	secula s and oment	ar nature of d impact of of modern
UNIT II	Heritage - Rock Art Paintings to Modern Art – Scu	ulpture					3
Hero stone to mo sculptures, village and nadhaswaram	dern sculpture - bronze icons - tribes and their hand deities, thiruvalluvar statue at kanyakumari, making c n - role of temples in social and economic life of tamils.	licrafts - art of te of musical instrum	mple car ma nents - mridha	king angar	m n, pa	assive rai, ve	e terracotta eenai, yazh
UNIT III	Folk and Martial Arts						3
Therukoothu – kai and games of tam	ragattam - villu pattu - kaniyan koothu – oyillattam - lea ils.	ther puppetry – s	ilambattam –	valar	i - tig	er dar	nce - sports
UNIT IV	Thinai Concept of Tamils						3
Flora and fauna education and lite overseas conques	of tamils & aham and puram concept from tholkapp eracy during sangam age - ancient cities and ports of t of cholas.	iyam and sanga f sangam age -	m literature - export and im	arar nport	n coi durin	ncept Ig san	of tamils - Igam age -
UNIT V	Contribution of Tamils to Indian National Moveme	ent and Indian C	ulture				3
Contribution of ta movement - role o	mils to indian freedom struggle - the cultural influence f siddha medicine in indigenous systems of medicine –	ce of tamils over inscriptions & ma	the other pa nuscripts – p	arts c rint hi	of ind story	ia – s of tan	self-respect nil books.
							Total: 15
TEXT BOOK:							
1. S.Muthura	amalingam, M.Saravanakumar, Heritage of Tamils, Yes	Dee Publishing F	Pvt Ltd, 2023.				
REFERENCES:							
1. Historical Tamil Stu	Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. dies).	Thirunavukarasu) (Published b	y : In	iterna	itional	Institute of
2. The Cont Studies).	ribution of Tamil of the Tamils to Indian Culture(Dr.M	.Valarmathi)(Pup	lished by Inte	ernatio	onal	Institu	te of Tamil
3. Keeladi – Tamilnadu	 Sangam City C ivilzation on the banks of river Vaig u Text Book and Educational Services Corporation, Tan 	gai; (Jointly Publi nilnadu).	shed by: Dep	bartm	ent c	of Arcl	haeology &

COUR On co	SE OUTCOMES: mpletion of the course, the students will be able to	BT Mapped (Highest Level)
CO1	explain valuable concepts in language and literature of tamils.	Understanding (K2)
CO2	illustrate about the tamils sculpture and their paintings.	Understanding (K2)
CO3	summarize about the tamils folk and martial arts.	Understanding (K2)
CO4	explain the thinai concept of tamils.	Understanding (K2)
CO5	explain the contribution of Tamils to the Indian National Movement and Indian culture.	Understanding (K2)

Mapping of COs with POs and PSOs															
COs/Pos	COs/Pos PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO12 PS01 PS02														
CO1						3		3	2	2		3			
CO2						3		3	2	2		3			
CO3						3		3	2	2		3			
CO4						3		3	2	2		3			
CO5						3		3	2	2		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	40	60					100						
CAT2	40	60					100						
CAT3	40	60					100						
ESE	ESE NA												
* ±3% may be varied	* +3% may be varied (CAT 1, 2 & 3 – 50 marks)												

			2	2CYL1	1 - CHE	MISTR	Y LABO	DRATO	RY FO		TRICAL	SYSTEMS			
			1		()	Commo	n to EC	E, EEE	and El	E Branc	ches)				
Progra Branch	mme 8 N	k	B.E -	ECE, E	EE & E	IE					Sem.	Category	L	ТР	Credit
Prereq	uisites		Nil								1/2	BS	0	0 2	1
Preamb	ble F F X PI	FRIM	This viscor theret alkalir	course metry, s by, to in hity, Cu ²	aims pectrop mprove ²⁺ and C	to impa hotome the an cr ⁶⁺ in el	art the etric and alytical ectrical	basic d pH m skills. system	concep letry ex This co lis.	ots of perimer ourse a	volumet nts for th Iso aims	ric, conduct ne estimation s to impart	ometri n of g the si	c, potent iven sam gnificance	iometric, ples and of DO,
1			analys			ntent fro	m disc	ardad P	CBs						
1. 2	Volum	otrio					d from			ludgo					
Ζ.	Find t					prepare				suuge.	uctomet	ric based se	asor ol	ectrode	
3.	-	iie ai				presen		givens		Jy conu				ectione.	
4.	Deter	mina	tion of c	concent	ration of	H⁺ ion	in a sol	lution us	sing H ⁺	sensing	electro	de.			
5.	Poten	itiom	etric ap	proach	using a	Pt elect	rode fo	r the es	timatior	of iron	in the gi	ven sample.			
6.	Deter	mina	tion of r	nolecula	ar weigł	nt of a p	olymer	/ liquid	by Ostw	ald viso	cometer.				
7.	Spectrophotometric method for the determination of Iron in steel.														
8.	Assessment of the given water sample for the suitability of drinking / industrial purpose by estimating the calcium, magnesium and total hardness by EDTA method.														
9.	Estim	ation	of alka	linity of	river an	d borev	vell wat	er colle	cted fro	m differe	ent place	es.			
10.	Deter	mina	tion of c	dissolve	d oxyge	n in the	given	wastewa	ater sar	nple.					
11.	Electr	oplat	ing pro	cess (D	emonst	ration).									
12.	Proxir coal (nate Dem	analysi onstrati	s of Coa on).	al- detei	mine m	oisture	, volatile	e matter	and as	h conter	nt of a given	sample	e of	
															Total:30
REFER		S/ M/	ANUAL	/SOFT	WARE:										
1.	Palan Rajag	isam Janap	y P.N., bathy Pu	Manika ublisher	andan F s, Erode	P., Geet e, 2022.	tha A. :	and Ma	njula R	ani K.,	"Chemis	stry Laborate	ory Ma	inual", 1 ^{si}	Edition,
COURS	SE OU	гсог	MES:											BT Map	ped
On con	npletio	on of	the cou	urse, th	e stude	ents wil	l be ab	le to						Highest	
CO1	estima	ate th	ne amou	unt of ha	ardness	, alkalin	ity, DO	, Cu and	d Cr pre	sent in	the give	n sample.		Precision	(N3), I (S3)
CO2	analy	ze th	e amou	nt of ac	ids pres	ent in tl	ne give	n sampl	e using	conduc	tivity and	d pH meter.		Applying Precision	(K3), i (S3)
CO3	demo and V	nstra ′iscor	te the p neter fo	otention or the de	metric a	nd spec ation of	ctrophot molecu	tometric lar weig	methor the of a p	d for the polymer	estimat	ion of Fe		Applying Precisior	(K3), i (S3)
						Маррі	ng of C	Cos wit	h POs a	Ind PS	Os				
COs/Po	Os P	01	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1		3	2	1	3			3						2	1
CO2		3	2	1	3			3						2	1
CO3		3	2	1	3			2						2	1
1 – Slig	ht, 2 –	Mod	erate, 3	– Subs	stantial,	BT- Blo	om's Ta	axonom	ıy						

Progra Brancl	amme h	&	BE –	Electric	al and	Electro	nics Er	ngineer	ing		Sem.	Category	L	ТР	Credit
Prereq	luisite	es	Electr	ic Circ	uit Ana	lysis					2	BS	0	0 2	1
Pream	ble		This simula	course ation as	helps well as	the stu discrete	dents t e compo	o demo	onstrate	currer	nt and	voltage in e	electric	circuits	through
LIST C	F EX	PERIN	IENTS /	'EXERO	CISES:										
1.	Dete	ermina	tion of lo	oop curr	ents in	mesh a	nalysis.	1							
2.	Sim	ulation	of mes	h analys	sis using	g depen	ident so	ources.							
3.	Verit	fication	n of sup	er positi	on theo	rem / m	aximun	n power	transfe	r theore	em.				
4.	Desi softv	ign an ware)	d simula	ation of s	series /	parallel	resona	nce circ	uit for a	given f	requenc	y. (discrete d	compo	nents/sin	ulation
5.	Sim	ulation	of DC t	ransien	ts in RL	/ RC ci	rcuits.								
6.	Sim	ulation	and de	termina	tion of c	ircuit pa	aramete	ers in th	ee pha	se balaı	nced and	d unbalanced	d loads	3.	
7.	Mea	surem	ent of s	elf indu	ctance,	mutual	inducta	nce and	l coeffic	ient of c	oupling				
8.	Determination of Z and Y parameters for the T and π networks. (discrete components/simulation software)														
9.	Con	struct	and sim	ulate th	e passiv	e filters	s using o	open C	V.						
10.	PCB	board	d implen	nentatio	n of DC	AC circ	cuits.								
															Total:30
REFE	RENC	ES/ M	ANUAL	/SOFT	NARE:										
1.	Lab	orator	y Manua	al											
2.	Mult	isim s	oftware												
COUR On cou	SE Ol	JTCO	MES: the cou	urse, th	e stude	ents wil	l be abl	le to						BT Map Highest	ped Level)
CO1	dem	onstra	ite the v	erificatio	on of ne	twork th	neorem	s and m	easurer	ment of	three ph	ase power.		Applying Precision	<u>,</u> (K3), ו (S3)
CO2	desi	gn and	d simula	te resor	nant, tra	nsients	and filt	ers usin	g softwa	are tool	S.		N	Applying Ianipulati	(K3), on (S2)
CO3	desi	gn, sir	nulate a	nd imple	ement v	arious I	DC and	AC circ	uits.					Applying	μ(K3), 1 (S3)
	1					Маррі	ng of C	os with	n POs a	nd PSC	Ds		I		
COs/P	Os	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	P011	PO12	PSO1	PSO2
CO1		3	2	1	1								1	3	2
CO2	2	3	2	1	1								1	3	2
CO3	3	3	2	1 C	1	- וס דס	om's T-						1	3	2

22EEL21 - ELECTRIC CIRCUITS LABORATORY

			22	2EET22 -	- ELEC	TROMA	GNE		LDS						
Progra Branci	nmme &	BE – Electr	ical and Ele	ectronics	s Engin	eering			Sem.	C	ategory	L	т	Р	Credit
Prerec	uisites	Nil							2		PC	3	1	0	4
														1	
Pream	ble	This course applications	explores the	e concept	ts of sta	atic elec	tric, sta	atic ma	gnetic ar	nd ele	ectromag	netic	; field	s and	its
Unit –	l	Introductio	n to Vector	Algebra	and El	lectric F	ields:								9
Scalar system Coulor Intensi	and Vector F a. Divergence mb's law and ty Due to Poir	ields – Revie – Divergence d Electric fie nt Charge, Lin	w of vector a Theorem – I d intensity e Charge ar	algebra. Curl – St Electric d Surface	Cartesi toke's T c Charg ce Charg	ian and Theorem ge – Typ ge Distr	Curvil n. bes of ibution	inear (Charg	Coordinat e Distrib	es S ution	ystem – – Coulc	Conv mb's	versio Law	on of (/ – El	co-ordinate ectric Field
Unit –	<u> </u>	Electrostati	CS:	=			•.								9
Differe Condu Bounda Laplac	c Flux Densi nce – Potentia ictors, Diele ary Condition: e's Equations	al – Conserva ctrics and C : Conductor-D	tive Property apacitors: ielectric and	y – Poten Conducti Dielectri	tial Gra tion Cul c-Diele	adient Irrent, D ectric – (isplac Capaci	- Gaus ement itors: F	s s Law - Current arallel Pl	- Apr – P ate,	olarization olarizatio Transmis	on – ssion	Law Line	of C – Poi	- Potential continuity - isson's and
Unit –	III	Steady Mag	netic Fields	s:											9
Condu Force Curren Soleno	ctors, Circula and Inducta t Carrying Co	ar Loop – Mag ance: Magnet onductors –Magnet	netic Flux – A c Force, Ma agnetic Bour	Magnetic oving Ch ndary Co	c Flux D narge in onditions	a Law - Density - n a Mag s – Mag	– Appi – Ener gnetic gnetic	gy Sto Field, Circuit	red. Lorentz – Self	Forc and I	e – For Mutual Ir	agne ce E iduct	etwe ance	ieia a en Tv – Inc	wo Parallel ductance of
Unit –	IV	Electromag	gnetics:												9
Form a Electro Introdu	varying fields and Integral Fo comagnetic Ra action to EMI a	s: Time Varyi orm – Wave e adiation: Iron and EMC – De	ng Fields – quation. ising and no efinition – Ty	Transforr on – ironis opes – cau	mer and sing rad	d Rotati diation – nd reme	ional E radiati dial m	EMF. N on effe easure	laxwell's ects –radi es	equa ation	ation: M measure	axwe emer	ell's E nts	Equati	on in Point
Unit –	V	Application	of electron	nagnetic	; fields:	: (Block	diagr	am ap	proach)						9
Domes Magne Electro	s tic– SMPS, f tic resonanc magnetic Spe	fans, inductior ce imaging, ectrum	n cooking. Ir magnetothe	ndustry: (erapy. C	Genera Commu	ator, ser I nicatio	nsors a n: EN	and act /I way	uators. T ves in o	rans differ	ent type	ignet es c	ic lev of co	/itatior ommu	n. Medical : nication –
															Total:45
TEXT	BOOK:														
1.	Sadiku Matt	thew N.O., "Pr	inciples of E	lectroma	agnetics	s", 6 th Ec	lition, (Oxford	Universit	ty Pre	ess, New	Dell	ni, 20	21.	
REFER	RENCES:														
1.	HaytJr W.H.	., Buck J.A., J	aleelAkhtar	M., "Engi	ineering	g Electro	omagn	etics" 🤅	9 th Editior	n Mc¢	Graw Hill	Edu	catio	n, Ind	ia, 2020.
2.	Meenakuma	ari,R., Subasri	,R., "Electro	magnetic	c Fields'	5", 2 nd Eo	dition,	New A	ge Intern	ation	al Publis	hers,	, Che	nnai,	2007.

COUR On cor	SE OL mpleti	JTCOM on of t	IES: he cours	se, the st	udents	will be a	able to						(BT Mapped (Highest Level)		
CO1	distir	nguish	the vario	us coordii	nate sys	stems an	d charg	e distrib	oution					Applying (ł	(3)	
CO2	apply capa	y Gaus acitor	s's law fo	or the eva	luation o	of EFI foi	r differe	nt confi	guratior	ns and it	s applica	ation in		Applying (ł	(3)	
CO3	infer	about	the MFI a	and induc	tance fo	or differer	nt config	guration	S					Applying (ł	(3)	
CO4	reca techr	p the el niques	lectroma to reduce	gnetic wa e EMI	ves with	n its para	meters	and the	source	s of EM	I with its	control	Un	derstanding	g (K2)	
CO5	CO5 Describe the applications of EMF in various domains namely domestic, industry, transport, Understanding (K2)															
	Mapping of Cos with Pos and PSOs															
Cos/F	os	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	
CO	1	3	2							1			1	2	3	
CO	2	3	2	1						1			1	2	3	
CO	3	3	2	1						1			1	2	3	
CO	4	3	2	1						1			1	2	3	
CO	5	3	2							1			1	2	3	
1 – Slię	ght, 2 -	– Mode	erate, 3 –	Substant	ial, BT-	Bloom's	Taxono	omy		·	·					
						ASSES	SMENT	PATTE	RN – T	HEOR	(
Tes	t / Blo	om's	Re	memberi	ng L	Indersta	anding	Apply	ying	Analyz	ing E	Evaluating	g Crea	Creating (K6) To		

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	10	30	60				100
CAT2	10	40	50				100
CAT3	20	80					100
ESE	5	50	45				100
* , 20/ may be varied ((rka)				

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

22ITC31 - JAVA PROGRAMMING														
(Common to ECE,EEE,EIE,MTS Engineering Branches) Programme & Category I T P Crodit Sam Category I T P Crodit														
Progra Branch	mme & N	ECE, EEE, EIE, MTS	Sem.	Category	L	т	Ρ	Credit						
Prereq	uisites	Problem Solving and Programming in C	3	ES	3	0	2	4						
					· .									
Preamb	ble	A line course provides the fundamental object-oriented concepts exception handling, multithreading, Generics, and Collections.	s of Java	programmin	ig inclu	ding ini	heritanc	e,						
Unit – I	Unit – I Classes and Objects 9 History and Evolution of Java – An Overview of Java–Data Types, Variables and Arrays– Operators –Control Statements– Classes: 9													
Class Collect	History and Evolution of Java – An Overview of Java–Data Types, Variables and Arrays– Operators –Control Statements– Classes: Class Fundamentals-objects – Assigning Object Reference Variables – Introducing Methods –Constructors – this keyword – Garbage Collection – Stack Class.													
Unit – II Inheritance, Packages, and Interfaces 9														
Overlo and In Hierard Packag	Overloading Methods – Objects as Parameters –Argument Passing – Returning Objects –Recursion–Access Control–Static – Nested and Inner Classes–Command–Line Arguments – Variable Length Arguments. Inheritance – Basics– Super keyword - Multilevel Hierarchy-Method Overriding–Dynamic Method Dispatch –Abstract Classes – final with Inheritance. Packages and Interfaces: Packages and Member Access- Importing Packages – Interfaces.													
Unit – I	ll tion Llondling	Exception Handling and Multithreading		It in Executiv			finad F	9						
Except Multith Thread	readed Prog	plasics – Multiple catch Clauses – Nested try Statements – Ja pramming: Java Thread Model - Creating a Thread and Multip ation- Suspending – Resuming, and Stopping Threads –Multithre	ole Thre ading.	ads – Priorit	ies – C	Jser-de Synchro	fined E onizatio	xception. n – Inter						
Unit – I	IV	I/O and Generics						9						
Enume Files. (erations – Wr Generics: Inti	appers – Auto boxing – Annotation Basics. I/O Basics – Reading roduction – Generic Classes & Methods - Example–Parameters,	g and Wr Constru	iting Console ctors and Inte	e I/O –F erfaces	Reading	g and W	riting						
Unit – V	V	String Handling and Collections						9						
String Strings	Handling: Sti s – String Buf	ring constructors – operations – Character Extraction – String Co ffer. Collection Framework: Overview – Collection Interfaces – Co	ompariso	n – Searchin Classes.	g String	gs – M	odifying							
LIST O	F EXPERIMI	ENTS / EXERCISES:												
1.	Write Java	programs using operators, arrays, and control statements												
2.	Develop a s	stack and queue data structures using classes and objects												
3.	Program to	demonstrate inheritance & polymorphism												
4.	Develop an	application using interfaces by accessing superclass constructor	rs and m	ethods										
5.	Develop ap	plications using packages and exception handling												
6.	Program to	demonstrate thread concepts												
7.	Write Java	program to illustrate file and string manipulations												
8.	Implement .	Java program to illustrate collection frameworks												
				Lect	ure:45,	Pract	ical:30,	Total:75						
TEXT E	BOOK:													
1.	Herbert Sch	ildt, "Java: The Complete Reference", 11 th Edition, McGraw Hill	l Educat	ion, New Del	hi, 2019	9. (Unit	s I - V)							
REFER	ENCES/ MA	NUAL / SOFTWARE:												
1.	Cay S. Hors	stmann, "Core Java Fundamentals", Eleventh Edition, Prentice H	all, 2018	3.										

COUR On co	SE O	UTCON	IES: the cours	se, the st	udents	s will be a	able to						(BT Mapped Highest Lev	t el)
CO1	appl	ly the co	oncepts o	of classes	and ol	ojects to s	solve sin	nple pro	blems					Applying (K	3)
CO2	deve	elop pro	ograms u	sing inhei	ritance,	package	s, and ii	nterface	s					Applying (K	3)
CO3	make use of exception-handling mechanisms and multithreaded models to solve real-world Applying (K3)														
CO4	4 develop Java applications with I/O packages and generics concepts Applying (K3)														
CO5	appl	ly string	handling	g function	s and c	ollection	classes	and inte	erfaces	5				Applying (K	3)
						Марр	oing of (COs wit	h POs	and PS	Os				. <u> </u>
COs/	POs	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	P011	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	erate, 3 –	Substant	tial, BT	- Bloom's	Taxono	omy							
						ASSI	ESSMEI		TERN	- THEO	RY				
Tes	st / Blo Catego	oom's ory*	Re	memberi (K1) %	ing	Understa (K2)	anding %	Apply (K3)	/ing %	Analyz (K4) 9	ing %	Evaluating (K5) %	Creat	ting (K6) %	Total %
	CAT	1		20		40)	40)						100
	CAT	2		10		20)	70)						100
	CAT	3		10		20)	70)						100

70

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

20

ESE

100

22EET31 - DC MACHINES AND TRANSFORMERS

Progra Branch	mme & ז	B.E. & Electrical and Electronics Engineering	Sem.	Category	L	т	Ρ	Credit					
Prereq	uisites	Nil	3/4	PC	3	1	0	4					
			I					1					
Preaml	ble	This course aims in imparting knowledge on construction and in imparting fundamental knowledge of transformer constructi required for electrical engineers.	l working p ion, types	principle of D(, operation an	C ma d tes	chin sting	es. It conce	also aims epts					
Unit –	1	Principles of Electromechanical Energy Conversion:						9+3					
Review and Co Case S	Review of Magnetic Circuits – Magnetic Circuit Calculations and Magnetization Curves – Energy in Magnetic field System: Energy and Co-energy – Field Energy and Mechanical Force – Singly excited and doubly excited system – Forces/Torques Calculation – Case Study: Solenoid with Control Circuit of Automobile Application.												
Unit –	Unit – II DC Generators: 9+3												
Constru Methoo Efficier	uctional Deta Is of Excitation Is and Powe	ils – Working Principle – Types of Armature Winding and Conf ion – Characteristics of Series and Shunt Generators – Ar r Stages in DC Generator – Condition for Maximum Efficiency	figurations mature R – Applicat	 Short Circ leaction and lions. 	uit C Corr	oil – nmut	EMF ation	Equation – – Losses,					
Unit –		DC Motors:						9+3					
Princip Motors Standa	le of Operatio – Applicatio rds – IEC, NI	on – Back EMF and Torque Equations – Types of DC Motors – ns – Starters – Speed Control Methods – Testing of DC Ma EMA.	Characte Ichines –	ristics of Serie Lock Torque	es, S Mea	hun [:] asur	t and (ement	Compound – Testing					
Unit –	IV	Transformers:						9+3					
Constru on No – Savir	uctional Deta Load and Loa ng of Copper	ils – Types – Principle of Operation – EMF Equation – Transfo ad – Equivalent Circuit – OC and SC Test – Regulation and Eff – High Frequency Transformer.	ormation F ficiency –	Ratio – Phaso Parallel Oper	or Dia atior	agrai n – A	m – T Nuto T	ransformer ransformer					
Unit –	V	Transformer Testing and Practice:						9+3					
Losses Sumpn Transfo	and Efficier er's Test – II ormers – Thre	cy in Transformers – Condition for Maximum Efficiency – F EC/IEEE Standard Practices of Testing transformers – Separa ee Phase Transformers – Types of Connections.	Polarity To ation of Lo	est, Load Te sses – All da	st – ly Efl	Pha ficier	ising ncy –	out Test – Instrument					
				Lecture:	45, 1	Tuto	rial:1	5, Total:60					
TEXT	300K:												
1.	Rajput R.K.	"Electrical Machines", 6th Edition, Laxmi Publications, New De	lhi, 2018.										
REFER	RENCES:												
1.	Kothari D.P	. and Nagrath I.J., "Electric Machines", 5 th Edition, Tata McGra	w Hill Pub	lishing Comp	any,	New	/ Delh	i, 2018.					
2.	Bimbhra P.	S., "Electrical Machinery", 7 th Edition, Khanna Publishers, New	Delhi, 202	21.									

COUR	COURSE OUTCOMES: On completion of the course, the students will be able to													BT Mapped (Highest Level)			
CO1	inter	rpret the	e concept	ts of magr	netic circ	uits and	l electro	mechar	nical ene	ergy cor	nversion		Ur	Understanding (K2)			
CO2 demonstrate the construction and working principle of DC machines													Applying (K3)				
CO3 select suitable starters, speed control and testing methods applicable to DC motors												Ur	nderstandir	ng (K2)			
CO4	dete	ermine t	he perfor	mance of	transfor	mers								Applying (K3)			
CO5	exar the i	mine the	e losses a ent transf	and efficie formers fo	ncy of t r releva	ransforn nt powe	ner by a r measu	pplying rement	various needs.	testing	methods	and selec	t	Applying (K3)			
						Mappin	g of CO	s with	POs an	d PSOs	5						
COs/P	os	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2		
CO	1	3	1										1	1	2		
CO	2	3	2	1				1		1			1	2	3		
CO3 3 1 1 1 1												1	2				

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

CO4

CO5

	ASSESSMENT PATTERN - THEORY													
Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %							
CAT1	10	55	35	-	-	-	100							
CAT2	10	55	35	-	-	-	100							
CAT3	20	80	-	-	-	-	100							
ESE	5	60	35	-	-	-	100							
* ±3% may be varied (0	CAT 1,2,3 – 50 mark	s & ESE – 100 mar	·ks)											

22EET32 - ANALOG ELECTRONICS

Progra Branci	amme & h	B.E & Electrical and Electronics Engineering	Sem.	Category	L	т	Р	Credit
Prereq	uisites	Physics	3	PC	3	0	0	3
			1					
Pream	ble	To examine the basic and design knowledge about electronic circu involves feedback, oscillator, high frequency amplifiers and its app	uit analys lications	sis using BJT	and	op-a	mp wl	hich
Unit –		Semiconductor devices and transistor biasing:						9
of Diod Transi Stabilit	onductor De les: Clipper a stor Biasing y Factor: Fixe	vices: Diode Current Equation –Special Purpose Diodes: Zener dic nd Clamper –Operation and Characteristics of UJT – UJT as Relaxa and Stability: VI Characteristics of Common Emitter BJT – Trar ad Bias Circuits and Voltage Divider Bias	ode, Vara ation Osc nsistor B	actor Diode, 1 cillator. siasing- Opera	Tunr ating	iel Di I Poii	ode–A nt – S	Applications
Unit –	II	Differential, Tuned and Power Amplifiers:						9
Differe Charac Amplifi	ential, Tuned cteristics of T ers.	I and Power Amplifiers: Differential Amplifier using BJT- Diff uned Amplifiers – Frequency Response of Single and Double Tuned	ferential I Amplifie	and Commo er –Power Am	on N Iplifi	/lode ers: (Gain Class I	,CMRR - B Push Pull
Unit –	111	Feedback Amplifiers and Oscillators:						9
Feedba Voltage Phase	ack Amplifie e / Current, S Shift and Ha	rs and Oscillators: Principle, Advantages of Negative Feedback Series/ Shunt Feedback –Classification of Oscillators – Stability of tley Oscillators	Amplifie Feedbad	ers – Types o ck Circuits us	of Fe ing	eedba Barkl	ack Co nausei	onnections: n Criteria –
Unit –	IV	Op-amp Applications:						9
Introdu Compa Contro	iction to op- arator – Squa Iled Circuit us	amp – Applications : Instrumentation Amplifier –V/I and I/V C re Wave Generator — Schmitt Trigger – VCO – PLL: Basic princip sing Op-amp as ONOFF - Filters: LPF, HPF (first order).	Converter ple – De	 Voltage sign and Dev 	to fi /elop	reque omen	ency c t of Te	converter – emperature
Unit –	V	Special Purpose Ics:						9
Timer applica Variabl	(IC 555): Fu ation – IC vol le voltage reg	nctional block, Characteristics of 555 Timer – Application (PWN age regulators – LM78XX, LM79XX- Fixed voltage regulators – ap ulators, switching regulator – SMPS.	<pre>V) - AD plication</pre>	0623 Instrum as Linear po	enta wer	tion supp	Amplif oly – L	fier and its .M317, 723
								Total:45
TEXT I	BOOK:							
1.	Sedha R.S.	, "A Textbook of Applied Electronics ", Revised Edition, S.Chand & C	Co. Ltd.,	New Delhi, 2	022.			
REFEF	RENCES:							
1.	Roy Choud	nry D. and Shail Jain, " Linear Integrated Circuit ", 5 th Edition, New A	ge Inter	national, New	Del	hi, 20	018.	
2.	Salivahana New Delhi,	$\ensuremath{^\circ}$ S. and Suresh Kumar N., "Electronic Devices and Circuit ", 4th E 2017.	Edition, T	Tata McGraw	Hill	Pub	ishing	Company,
3.	Sedra and	Smith, "Microelectronics", 7th Edition, Oxford University Press, 2017.						

COUR On co	SE OUTCOMES: npletion of the course, the students will be able to	BT Mapped (Highest Level)
CO1	describe the operation of semiconductor devices, transistor biasing and stability	Understanding (K2)
CO2	explain the working and characteristics of differential, tuned and power amplifiers	Understanding (K2)
CO3	illustrate the operation of feedback amplifiers and oscillators	Understanding (K2)
CO4	design and implement the linear applications of Op-Amp	Applying(K3)
CO5	examine and identify the IC's for various applications	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	2	1	1								1	2	1
CO2	3	2	1	1	2				1			1	2	1
CO3	3	2	1	1	2				1			1	2	1
CO4	2	3	2	1	2				1			1	3	2
CO5	2	3	2	1	2				1			1	3	2
1 _ Slight 2	Mode	vrato 3	Substanti	a BT- BI	oom's Ta	vonomy								

1 – Slight, 2 – Moderate, 3 – S	ubstantial, BT- Bloom's Taxonomy
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	ASSESSMENT PATTERN – THEORY													
Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %							
CAT1	30	70	-	-	-	-	100							
CAT2	30	70	-	-	-	-	100							
CAT3	10	30	60	-	-	-	100							
ESE	5	60	35	-	-	-	100							
* ±3% may be varied (C	CAT 1,2,3 – 50 marks	& ESE – 100 marks)												

22EET33 – DIGITAL ELECTRONICS												
				1			1	1				
Progra Branci	imme & n	B.E & Electrical and Electronics Engineering	Sem.	Category	L	т	Р	Credit				
Prereq	uisites	Nil	3	PC	3	0	0	3				
			u.									
Pream	ble	This course aims to impart knowledge on the design of students to perform the analysis, design of various digit Hardware Description Language in Gate Level modelin	combinational tal electronic ci	and sequenti rcuits and pro	al log ogram	ic circ nming i	uits tha t using	t aids the Verilog				
Unit –	I	Review of Number Systems and Logic Simplificatio	on					9				
Review of number systems – Number Base conversion – Boolean Algebra– Boolean Laws– De Morgan's Theorem– Boolean Equation – SOP and POS representations and conversions – Logic simplification using Boolean Algebra– Four variable K map – Logic Simplification using K Maps – Don't Cares – NAND and NOR implementation– RTL DTL, TTL, ECL and CMOS Gates												
Unit – II Combinational Circuits 9												
Design Gray to	Procedure – Binary, Bina	Binary Addition – Binary Subtraction – Decoders – Encory to gray, BCD to Binary, Binary to BCD – Magnitude con	oders – Multiple mparators: 1 bi	exers – Demu t, 2 bit. SPLD	ultiple s –R	xers – OM– F	Code PLA – P	Conversion: AL.				
Unit –	111	Synchronous Sequential Circuits						9				
Latche Synchr State r	s and Flip-flo onous seque eduction of sy	ps – Conversion of one type of flip-flop to another typ ntial circuits: State Table, State Diagram, State Equation nchronous sequential circuits – Synchronous counters	be – Operating n – Design proc	characterist edure of Syr	ics o Ichro	f Flip-f nous s	flops – equent	Analysis of ial circuits –				
Unit –	IV	Asynchronous Sequential Circuits						9				
Design mode / Essent	procedure of Asynchronous ial Hazards-F	Asynchronous sequential circuits – Fundamental mode sequential circuits – Cycles and Races – Hazards: Statio Ripple Counter.	e sequential cir c Hazards – Dy	cuits – Desig namic Hazar	gn Pr ds –	ocedui Hazaro	e for F d free F	undamental Realization –				
Unit –	V	HDL						9				
Verilog VHDL- Instant Gate le	HDL – Overv Entity Declara iation. evel modeling	iew – Hierarchical Modelling Concepts –Basic Concepts tion – Architecture Body – Configuration Declaration – S of Adders, subtractors, Decoders, Encoders, Multiplexers	 Modules and tructural Model Demultiplexe 	Ports - Gate ing – Compo rs using Veril	level nent log al	l mode Declar nd VHI	ling. ation – DL.	Component				
								Total:45				
ΤΕΧΤΙ	BOOK:											
1.	Soumitra Ku Delhi, 2017,	mar Mandal, "Digital Electronics Principles and Application for Units I, II, III, IV.	ons", Eleventh	Reprint Editic	on, Ta	ita Mo	Graw H	Hill, New				
2.	Samir Palnit for Unit V.	kar, "Verilog HDL: Guide to Digital Design and Synthesis	", Second Edition	on, Pearson I	Educ	ation, I	New De	elhi, 2017				
REFEF	RENCES:											
1.	AnandKuma	r.A, "Fundamentals of Digital Circuits" 4 th Edition, Prentic	e Hall of India,	Chennai, 20 ⁻	16							
2.	Morris Man Education, N	o.M, "Digital Design with an Introduction to the Verilog New Delhi, 2018.	HDL, VHDL,	and System	Veril	og", 6 [°]	^h Editio	on, Pearson				
3.	Jayaram Bh	asker, "A VHDL Primer", PTR Prentice Hall, New Jersey	07632, 2006.									

COUR On co	SE Ol mplet	JTCOM	ES: he cour	se, the st	udents	will be a	able to							BT Mapped (Highest Lev	i el)
CO1	disc expr	uss num ession.	nber sys	tems, Boo	olean ru	les & law	vs, logic	families	and F	Reduce th	he Bool	ean	ι	Jnderstanding	(K2)
CO2	illust	trate cor	mbinatic	nal logic d	circuits	using log	ic gates							Applying (K3	3)
CO3	desi	gn sync	hronous	sequenti	al circui	ts using	flip-flops	6.						Analyzing (K	4)
CO4	CO4 implement asynchronous logic circuits and demonstrate hazards. Applying (K3)														
CO5 develop Verilog and VHDL model of combinational circuits using Gate level modelling. Applying (K3)															
	Manning of Cos with POs and PSOs														
Cos/F	POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO)1	3	2										1	1	2
CO	2	3	2	1						1			1	1	2
CO	3	3	3	2	1					1			1	1	2
CO	4	3	2	1	1					1			1	1	2
CO	5	3	2	1	1	2				1			1	1	2
1 – Sli	ght, 2	– Mode	rate, 3 -	Substant	ial, BT-	Bloom's	Taxono	omy							
						ASSE	ESSMEN		TERN	– THEO	RY				
Tes	st / Blo Catego	oom's ory*	Re	ememberi (K1) %	ng	Understa (K2)	anding %	Apply (K3)	ying %	Analyz (K4) 9	ing %	Evaluating (K5) %	Cre	ating (K6) %	Total %
	CAT	1		10		40		50)	-		-		-	100
	CAT	2		10		30		50)	10		-		-	100
	CAT	3		10		20		70)	-		-		-	100
	ESE 5 20 55 20 100														
* ±3%	may b	e varied	d (CAT 1	,2,3 – 50	marks	& ESE –	100 ma	rks)							

22EET34 - GENERATION, TRANSMISSION AND DISTRIBUTION

B.E & Electrical and Electronics Engineering	Sem.	Category	L	т	Р	Credit					
Electromagnetic Theory	3/5	PC	3	0	0	3					
Preamble This course is aimed to introduce the fundamental concepts and principles in generation, transmission, and distribution of electric power											
- I Generation: 9											
Structure of power system – Indian energy scenario – Load duration curve – Demand factor – Plant capacity – Plant Use factor – Tariff – Types – Conventional source of electrical energy – schematic arrangement of thermal, hydroelectric and nuclear power generation											
Electrical Design of Transmission Lines:						9					
Parameters of Transmission Line – Skin and Proximity Effects – Inductance and Capacitance of Single and Three Phase Transmission Lines with Single Circuit – Double Circuit (Solid conductor): Symmetrical and Unsymmetrical Spacing and Transposition											
Analysis of Transmission Lines:						9					
Equivalent Circuits, Transmission Efficiency and Voltage Regulation of Short Line, Medium Line (PI model) – Ferranti Effect – Surge Impedance – Surge Impedance Loading – Corona: Phenomena of Corona – Factors Affecting Corona – Disruptive Critical Voltage – Visual Critical Voltage											
Unit – IV Mechanical Design of Transmission Lines: 9											
Insulators: Types, Voltage Distribution in Insulator String and Grading, Improvement of String Efficiency – Sag and Tension: Classification of Towers – Towers at Equal Heights – Towers at Unequal Heights											
Distribution Systems:						9					
Components of Distribution System – Types – DC Distribution: DC Distributor – Concentrated and Uniform Loading. AC Distribution: AC Distributor: Concentrated Load – Kelvin's Law – Underground Cables: Constructional Features of LT and HT Cables – Cable Faults and Testing											
Total:45											
TEXT BOOK:											
1. Gupta J.B, "A Course in Power Systems", 11th Edition, S.K.Kataria & Sons, New Delhi, 2015.											
REFERENCES:											
1. Wadhwa C.L., "Electrical Power Systems", 7th Edition, New Age International Publishers, New Delhi, 2017.											
	B.E & Electrical and Electronics Engineering Electromagnetic Theory This course is aimed to introduce the fundamental concepts distribution of electric power Generation: system – Indian energy scenario – Load duration curve – De onventional source of electrical energy – schematic arranger Electrical Design of Transmission Lines: nsmission Line – Skin and Proximity Effects – Inductance s with Single Circuit – Double Circuit (Solid conductor): Analysis of Transmission Lines: Transmission Efficiency and Voltage Regulation of Short Line e Impedance Loading – Corona: Phenomena of Corona – Factoge Mechanical Design of Transmission Lines: Voltage Distribution in Insulator String and Grading, Improviences – Towers at Equal Heights – Towers at Unequal Heights Distribution Systems: tribution System – Types – DC Distribution: DC Distributor – C Incentrated Load – Kelvin's Law – Underground Cables: Cons "A Course in Power Systems", 11th Edition, S.K.Kataria & Sor .L., "Electrical Power Systems", 7th Edition, New Age Internation	B.E & Electrical and Electronics Engineering Sem. Electromagnetic Theory 3 / 5 This course is aimed to introduce the fundamental concepts and princidistribution of electric power Generation: System – Indian energy scenario – Load duration curve – Demand fact onventional source of electrical energy – schematic arrangement of the Electrical Design of Transmission Lines: Insmission Line – Skin and Proximity Effects – Inductance and Ca s with Single Circuit – Double Circuit (Solid conductor): Symmetric Impedance Loading – Corona: Phenomena of Corona – Factors Affectinge Mechanical Design of Transmission Lines: Insufficiency and Voltage Regulation of Short Line, Medium Is Impedance Loading – Corona: Phenomena of Corona – Factors Affectinge Voltage Distribution in Insulator String and Grading, Improvement of wers – Towers at Equal Heights – Towers at Unequal Heights Distribution Systems: Tribution Systems: tribution System – Types – DC Distribution: DC Distributor – Concentrate contrated Load – Kelvin's Law – Underground Cables: Constructional "A Course in Power Systems", 11th Edition, New Age International Publis	B.E & Electrical and Electronics Engineering Sem. Category Electromagnetic Theory 3 / 5 PC This course is aimed to introduce the fundamental concepts and principles in gener distribution of electric power Generation: System – Indian energy scenario – Load duration curve – Demand factor – Plant ca onventional source of electrical energy – schematic arrangement of thermal, hydro Electrical Design of Transmission Lines: nsmission Line – Skin and Proximity Effects – Inductance and Capacitance of s with Single Circuit – Double Circuit (Solid conductor): Symmetrical and Un Analysis of Transmission Lines: Transmission Efficiency and Voltage Regulation of Short Line, Medium Line (PI mode Impedance Loading – Corona: Phenomena of Corona – Factors Affecting Corona – I ge Mechanical Design of Transmission Lines: Voltage Distribution in Insulator String and Grading, Improvement of String Efficience are Towers at Equal Heights – Towers at Unequal Heights Distribution Systems: tribution System – Types – DC Distribution: DC Distributor – Concentrated and Unifor necentrated Load – Kelvin's Law – Underground Cables: Constructional Features of I "A Course in Power Systems", 11th Edition, S.K.Kataria & Sons, New Delhi, 2015. , "Electrical Power Systems", 7th Edition, New Age International Publishers, New D	B.E & Electrical and Electronics Engineering Sem. Category L Electromagnetic Theory 3 / 5 PC 3 This course is aimed to introduce the fundamental concepts and principles in generation distribution of electric power Generation: System – Indian energy scenario – Load duration curve – Demand factor – Plant capacit onventional source of electrical energy – schematic arrangement of thermal, hydroelect Electrical Design of Transmission Lines: Insmission Line – Skin and Proximity Effects – Inductance and Capacitance of Sing s with Single Circuit – Double Circuit (Solid conductor): Symmetrical and Unsym Analysis of Transmission Lines: Intransmission Lines: Transmission Efficiency and Voltage Regulation of Short Line, Medium Line (PI model) – Impedance Loading – Corona: Phenomena of Corona – Factors Affecting Corona – Disruge Mechanical Design of Transmission Lines: Voltage Distribution in Insulator String and Grading, Improvement of String Efficiency wers – Towers at Equal Heights – Towers at Unequal Heights Distribution Systems: Tribution Systems: tribution System – Types – DC Distribution: DC Distributor – Concentrated and Uniform Loccentrated Load – Kelvin's Law – Underground Cables: Constructional Features of LT at "A Course in Power Systems", 11th Edition, S.K.Kataria & Sons, New Delhi, 2015.	B.E & Electrical and Electronics Engineering Sem. Category L T Electromagnetic Theory 3/5 PC 3 0	B.E & Electrical and Electronics Engineering Sem. Category L T P Electromagnetic Theory 3 / 5 PC 3 0 0 This course is aimed to introduce the fundamental concepts and principles in generation, transmissi distribution of electric power Generation: System – Indian energy scenario – Load duration curve – Demand factor – Plant capacity – Plant U onventional source of electrical energy – schematic arrangement of thermal, hydroelectric and nucleonventional source of electrical energy – schematic arrangement of thermal, hydroelectric and nucleonventional source of electrical energy – schematic arrangement of and Unsymmetrical Sp Electrical Design of Transmission Lines: Inductance and Capacitance of Single and Th s with Single Circuit – Double Circuit (Solid conductor): Symmetrical and Unsymmetrical Sp Analysis of Transmission Lines: Transmission Efficiency and Voltage Regulation of Short Line, Medium Line (Pl model) – Ferranti Effection [model] – Ferranti [model] – Ferranti [model] – Ferranti [model] – Fer					

COURSE OUTCOMES: On completion of the course, the students will be able to							(BT Mapped (Highest Level)							
CO1	CO1 explain the various types of generation systems								Ur	Understanding (K2)					
CO2	CO2 calculate the transmission network parameters for various configurations										Applying (K3)				
CO3 analyze the performance characteristics of the given transmission line and explain the effect of corona									Applying (K3)						
CO4	CO4 calculate string efficiency of the insulators and Sag of a overhead line for various conditions								Applying (K3)						
CO5 calculate the voltage at a point on the given type of distribution system and explain the constructional features of cables								Applying (K3)							
	· · · · · · · · · · · · · · · · · · ·														
	Mapping of COs with POs and PSOs														
COs/F	' Os	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO	1	3	1				1						1	2	3
CO	2	3	2	1		1	1						1	1	1
CO	3	3	2	1	2	1	1						1	3	1
CO	4	3	2	1			1						1	1	2
CO	5	3	2	1			1						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	60	30	-	-	-	100			
CAT2	10	30	60	-	-	-	100			
CAT3	10	30	60	-	-	-	100			
ESE	5	35	60	-	-	-	100			
* ±3% may be varied (CAT 1,2,3 – 50 marks & ESE – 100 marks)										

22MNT31 - ENVIRONMENTAL SCIENCE											
(Common to All Engineering and Technology Branches)											
Progra Branch	imme & ז	All B.E/B.Tech Branches	т	Ρ	Credit						
Prereq	uisites	Nil	3/6	MC	2	0	0	0			
Preamble This course provides an approach to understand the various natural resources, ecosystem, bio-diversity, pollution control & monitoring methods for sustainable life and also to provide knowledge and to create awareness for engineering students on biological sciences.											
Unit –	t – I Environmental Studies and Natural Resources 5										
Introdu resourc	ction to Envir	ronmental Science – uses, over-exploitation and conservation o dies	of forest,	water, miner	al, fo	ood, e	energ	y and land			
Unit –	11	Ecosystem and Biodiversity						5			
Ecosystems: concept and components of an ecosystem -structural and functional features – Functional attributes (Food chain and Food web only). Biodiversity: Introduction – Classification – Bio geographical classification of India- Values of biodiversity – Threats and Conservation of biodiversity - case studies.											
Unit –	111	Environmental Pollution						5			
Environmental Pollution: Definition – causes, effects and control measures of: (a) Air pollution - Climate change, global warming, acid rain, ozone layer depletion (b)Water pollution (c) Soil pollution - Role of an individual in prevention of pollution - case studies.											
Unit –	IV	Environmental Monitoring						5			
Sustainability -three pillars of sustainability- factors affecting environmental sustainability-approaches for sustainable development - Introduction to EIA - objectives of EIA - environment protection act – air (prevention and control of pollution) act – water (prevention and control of pollution) act.											
Unit –	Init – V Introduction to Biological Science 5										
Functions of Carbohydrates, lipids, proteins and nucleic acids - Cells and its organelles - plasma membrane, mitochondria and nucleus- Heredity and DNA - organization of DNA in cells - Genes and chromosomes- Cell division -Types of cell division- mitosis & meiosis - Cell cycle and molecules that control cell cycle.											
Total:25											
ТЕХТ ВООК:											
1. Anubha Kaushik, and Kaushik C.P., "Environmental Science and Engineering", 6th Multicolour Edition, New Age International Pvt. Ltd., New Delhi, 2018, for Unit-I, II, III, IV.											
2. Rastogi.SC, "Cells and Molecular Biology", 2 nd Edition, reprint, New Age International (P) Limited Publishers, New Delhi, 2008, for Unit-V.											
REFERENCES:											
Palanisamy P.N., Manikandan P., Geetha A., Manjula Rani K., Kowshalya V.N., "Environmental Science", Pearson Education, New Delhi, Revised Edition 2019.											
2.	2. Mukhtar Ahmad, "Text book of modern biochemistry", Volume I & II, Oxford & IBH Publishing Co. Pvt. LTD, Delhi, 1995.										
COUR On co	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)									

	Mapping of COs with POs and PSOs														
COs/POs	COs/Pos PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO12 PS01 PS02														
CO1	2	1					3						2	1	
CO2	2	1					3						2	1	
CO3	3	2	1				3						2	1	
CO4	3	2	1				3						2	1	
CO5	3	1											2	1	

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 25 35 40 100														
CAT2	25	35	40				100							
CAT3	NA													
ESE	ESE NA													
* ±3% may be varied (0	* ±3% may be varied (CAT 1, 2 – 50 marks)													

B.E.– Electrical and Electronics Engineering, Regulation, Curriculum and Syllabus – R2022

	22TAM02 – தமிழரும் தொழில்	நுட்பமுப்	נ				
	(Common to All Engineering and Techno	logy Brai	nches)				
Programme & Branch	All BE/BTech Branches	Sem.	Category	L	т	Ρ	Credit
Prerequisites	Nil	2/3	HS	1	0	0	1
முன்னுரை	தமிழ் கலாச்சாரத்தோடு ஒன்றிய தொழில் நுட	பங்கலை	ள பற்றிப் எ	டுத்	ക്വത	ரத்த	ທ່
அலகு – I	நெசவு மற்றும் பானை தொழில்நுட்பம்						3
சங்க காலத்தில் கீறல் குறியீடுக	் நெசவு தொழில் – பானைத் தொழில்நுட்பம் க ள்	கருப்பு சி	ിഖப்பு பாൽ	ரடம்	பகள்	- L	௱ண்டகளில்
ച്ച ക്രെ – 11	வடிவமைப்பு மற்றும் கட்டிடத் தொழில்நுட்பம்						3
வடிவமைப்பு – அமைப்பு பற்ர பெருங்கோயில் மாதிரிகட்டமை மஹால் – செப் அலகு – III கப்பல் கட்டும் வரலாற்றுச்சான் உருவாக்கும் செ மணிகள் – எலு அலகு – IV அணை, ஏரி, கு கால்நடைகளுக் செயல்பாடுகள் பண்டைய அறிவ அலகு – V அறிவியல் தமி மென்பொருட்கன் தமிழ் அகராதிக	 சங்க காலத்தில் கட்டுமான பொருட்களும் றிய விவரங்கள் – மாமல்லபுரச்சிற்பங்களும் கள் மற்றும் பிற வழிபாட்டுத் தலங்கள் ப்புகள் பற்றி அறிதல், மதுரை மீனாட்சி அம்ம டிநாட்டு வீடுகள் – பிரிட்டிஷ் காலத்தில் சென்ன உற்பத்தித் தொழில்நுட்பம் கலை – உலோகவியல் – இரும்புத் தொழிற் எறுகளாக செம்பு மற்றும் தங்க நாணயங்கள் தொழிற்சாலைகள் – கல்மணிகள் – கண்ணாடி ம்புத்துண்டுகள் – தொல்லியல் சான்றுகள் – சிலட வளாண்மை மற்றும் நீர்ப்பாசனத் தொழில்நுட வளங்கள், மதகு – சோழர்கால குமிழித் தூம்பின் காக வடிவமைக்கப்பட்ட கிணறுகள் – வேள – கடல்சார் அறிவு – மீன்வளம் – முத்து மற்றுப வு – அறிவுசார் சமூகம். அறிவியல் தமிழ் மற்றும் கணினித்தமிழ் ழின் வளர்ச்சி – கணினிதத்தமிழ் வளர்ச்சி – தமி ள உருவாக்கம் – தமிழ் இணையக் கல்விக்கழகம ள் சொற்குவைத் திட்டம். 	நடுகல் ஓ நடுகல் ஓ , கோ , கோ , நா ன் ஆல ன இந்தே சாலை – நா மணிக ப்பதிகாரத	தால் தல் லில்களும் யக்கர் க யம் மற்று தா–சாரோவெ – இரும்னை னயங்கள் ன் – சுடும த்தில் மணி த்தில் மணி	, பெ ப்ப சனி சனி பா சனி பா களி களி களி களி களி பை களி களி	அட்ட பு திகா திரு திக் க திரு க் திரு க் திரு க் க் க க க க க க க க க க க க க க க க	ரத்தீ சாழா கோ ட்டிட ட்டிட ட்டிட ட்டிட ட்டிட ட்டிட ட்டிட ட்டிட ட்டிட ட்டிட குத தை தை தை தை தை குத கை கை கை கை கை கை கை கை கை கை கை கை கை	பொருட்கள் பெடை ப் கோலத்து யில்கள் – ல நாயக்கர் _க் கலை.
							Total:15
TEXT BOOK:							
தமிழக வர 1. கல்வியில்	ஸாறு – மக்களும் பண்பாடும் – கே கே பிள்ளை _பணிகள் கழகம்), உலகத் தமிழாராய்ச்சி நிறுவன	(வெளிய ம், சென்	1ீடு தமிழ்நா னை, 2002	ſĢ I	יחור	நூல்	மற்றும்
2. கணினித்த	மிழ் முனைவா் இல. சுந்தரம், விகடன் பிரசுரம், 2	2016					
REFERENCES:							
1. கீழடி–வை	கை நதிக்கரையில் சங்ககால நகர நாகரிகம்.(தொ	ல்லியல்	துறை வெ	ເຄງແ	ገ ር)		
2. பொருநை-	ஆற்றங்கரை நாகரிகம் (தொல்லியல் துறை வெ	៣៣ភូ)					
3. Social Life of	Tamils (Dr.K.K.Pillay) A joint Publication of TNTB & ESC and	d RMRL –	(in print)				
4. Social Life of	the Tamils – The Classical Period (Dr.S.Sigaravelu) (Publish	ned by: Int	ernational Inst	titute	of Ta	amil S	Studies).
5. Historical He Tamil Studie	ritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunav s)	ukarasu) (Published by	: Inte	ernati	onal	Institute of

I Engineering College, Perundurai, Erode – 638060, India

	6. The Contribution of the Tamil to Indian Culture (Dr.M.Valarmathi) (Puplished 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). Keeladi – 'Sangam City Civilzation on the banks of river Vaigai; (Jointly Published by: Department of Archaeology & 														
7.	Keeladi – 'S Tamilnadu	Sangam C Text Book	ity Civi and E	Ization on ducationa	the bar <u>I Servic</u>	nks of riv es Corp	er Vaio oration	gai; (Join , Tamilna	tly Pub adu)	lished by	: Depar	tment of	Archaec	logy &	
8.	Studies in t	he History	of Ind	ia with Spe	ecial Re	eference	to Tan	nilnadu (l	Dr.K.K	.Pillay) (F	Publishee	d by: The	Author)		
9.	Porunai Civ Corporation	vilization (. n, Tamilna	lointly du)	Published	by: De	partmen	t of Arc	haeology	y & Tai	milnadu T	Fextbool	k and Edu	ucational	Service	S
10.	Journey of	Civilizatio	n Indus	to Vaigai	(R.Bala	akrishna	n) (Put	lished by	y: RMF	RL) – Ref	erence E	Book.			
COU	COURSE OUTCOMES: BT Mapped படிப்பை முடிக்கவுடன், மாணவர்கள் (Highest Level)														
படிட	படிபபை முடித்தவுடன, மாணவர்கள் (Highest Level) குறிம் தலாச்சாயம் மற்றும் கறிம் சமூகத்தினையுட நெசல் மற்றும் பானை														
CO1	CO1 தமழ கலாசசாரம் மற்றும் தமழ் சமூகத்துனுடைய நெச்வு மற்றும் பானை தொழல்நுட்பம் பற்றி விளக்க முடியும்.														
CO2	CO2 தமிழர்களின் வடிவமைப்பு மற்றும் கட்டிடத் தொழில்நுட்ப ஆற்றல் பற்றி விளக்க முடியும்.														
் முடியும். CO3 தமிழர்களின் உற்பத்தித் தொழில்நுட்பம் பற்றி சுருக்கமாகக் கூற முடியும். Understanding (K2)															
CO4 தமிழர்களின் வேளாண்மை மற்றும் நீர்ப்பாசனத் தொழில்நுட்பம் பற்றி விளக்க Understanding (K2) முடியும்.															
முடியும். CO5 தமிழர்களின் அறிவியல் தமிழ் மற்றும் கணினித்தமிழ் பற்றி விளக்க முடியும். Understanding (K2)															
					Марр	ing of (COs w	ith POs	s and	PSOs					
C	Os/POs	PO1	PO2	PO3	PO4	PO5	PO6	P07	P08	PO9	PO10	PO11	PO12	PSO1	PSO2
	CO2						<u>১</u>		<u>১</u>	2	2		<u>১</u>		
	CO3						3		3	2	2		3		
	CO4						3		3	2	2		3		
	CO5						3		3	2	2		3		
1 – S	light, 2 – Mo	derate, 3	- Subs	tantial, BT	- Bloon	n's Taxo	nomv		U	-	-		U		
			0000		2.000										
					ASS	ESSME	NT PA	TTERN -	- THE	ORY					
Test	/ Bloom's C	ategory*	Rer	nemberin (K1) %	g Un	derstan (K2) %	ding	Applyir (K3) %	ng A	nalyzing (K4) %	Eva	luating (5) %	Crea (K6	ting) %	Total %
	CAT1			40		60									100
	CAT2			40		60									100
	CAT3			40		60									100
	ESE								N	IA					
* ±3%	% may be va	ried (CAT	1,2,3	– 50 mark	(s)										

		22TAM02 - TAMILS AND TECHNO	LOGY										
		(Common to All Engineering and Technology	ogy Brand	:hes)									
Programm Branch	e &	All BE/BTech Branches	Sem.	Category	L	т	Ρ	Credit					
Prerequisi	es	Nil	2/3	HS	1	0	0	1					
Preamble		This course aims to impart the essential knowledge on the tamil of	culture and	related techno	loav								
UNIT – I		WEAVING AND CERAMIC TECHNOLOGY						3					
Weaving In	dustr	y during Sangam Age – Ceramic technology – Black and Red War	e Potteries	s (BRW) – Graff	iti on	Potte	eries.						
UNIT – II		DESIGN AND CONSTRUCTION TECHNOLOGY		. ,				3					
Designing stones of Temples of Nayakar M	and Sang Sang Cho ahal -	Structural construction House & Designs in household materials am age – Details of Stage Constructions in Silappathikaram – S and other worship places – Temples of Nayaka Period – Typ – Chetti Nadu Houses, Indo – Saracenic architecture at Madras du	during Sa Sculptures pe study (ring British	ngam Age – B and Temples Madurai Meena Period.	uilding of Ma akshi	g ma amal Temj	aterial lapura ole) -	s and Hero am – Great Thirumalai					
UNIT – III		MANUFACTURING TECHNOLOGY						3					
Art of Ship Minting of (evidences -	Buile Coins - Gei	ding – Metallurgical studies – Iron industry – Iron smelting, steel – Beads making – industries Stone beads – Glass beads –Terrac m stone types described in Silappathikaram.	 Copperent Output Copperent Output Output<	r and gold – Co s –Shell beads/	oins a bone	s so beat	urce s – Ai	of history – cheological					
UNIT – IV		AGRICULTURE AND IRRIGATION TECHNOLOGY						3					
Dam, Tank Agriculture Specific So	UNIT – IV AGRICULTURE AND IRRIGATION TECHNOLOGY 3 Dam, Tank, ponds, Sluice, Significance of Kumizhi Thoompu of Chola Period, Animal Husbandry – Wells designed for cattle use – Agriculture and Agro Processing – Knowledge of Sea – Fisheries – Pearl – Conche diving – Ancient Knowledge of Ocean – Knowledge Specific Society.												
UNIT – V		SCIENTIFIC TAMIL & TAMIL COMPUTING						3					
UNIT - V SCIENTIFIC TAMIL & TAMIL COMPUTING 3 Development of Scientific Tamil – Tamil computing – Digitalization of Tamil Books – Development of Tamil Software – Tamil Virtua Academy – Tamil Digital Library – Online Tamil Dictionaries – Sorkuvai Project. 3													
								Total:15					
TEXT BOC	K:												
1. Socia	l Life	of Tamils (Dr.K.K.Pillay) A joint Publication of TNTB & ESC and R	MRL – (in	print)									
2. Socia	l Life	e of the Tamils – The Classical Period (Dr.S.Sigaravelu) (Published	by: Intern	ational Institute	of Tar	mil S	tudie	s).					
REFEREN	CES:												
1. தமிழ பன	₽க ச ிகஎ்	வரலாறு - மக்களும் பண்பாடும் - கே கே பிள்ளை (வெளி 1 கழகம்), உலகத் தமிழாராய்ச்சி நிறுவனம், சென்னை,	யீடு தமி 2002	ழ்நாடு பாடர	ால் ம	ற்ற	யம் ச	ல்வியில்					
2. கண	ിണി	த்தமிழ் முனைவர் இல. சுந்தரம், விகடன் பிரசுரம், 2016											
3. கீழ	ചെ	வகை நதிக்கரையில் சங்ககால நகர நாகரிகம்.(தொல்ல	ியல் துல	றை வெளியீடு	9)								
4. பொ	ന്രത	றை ஆற்றங்கரை நாகரிகம் (தொல்லியல் துறை வெளியீ(թ										
5. Histo Studi	Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukarasu) (Published by : International Institute of Tamil Studies)												
6. The C	Contr	ibution of the Tamils to Indian Culture (Dr.M.Valarmathi)(Puplished	by Interna	ational Institute	of Tan	nil St	udies).					
7. Keela Text	, 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. Studi	es in	the History of India with Special Reference to Tamilnadu (dr.K.K.P	illay) (Pub	lished by : The	Autho	r)							
9. Poru Corp	nai C pratic	ivilization (Jointly Published by: Department of Archaeology & Tam on, Tamilnadu)	ilnadu Tex	tbook and Educ	cation	al Se	ervice	S					
10. Jourr	ey o	f Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL	.) – Refere	ence Book.									

COUR On co	SE OUTCOMES: mpletion of the course, the students will be able to	BT Mapped (Highest Level)
CO1	explain weaving and ceramic technology in tamil culture and tamil society.	Understanding (K2)
CO2	Illustrate about the design and construction technology.	Understanding (K2)
CO3	summarize about the manufacturing technology.	Understanding (K2)
CO4	explain the agriculture and irrigation technology.	Understanding (K2)
CO5	explain the significance of tamil in scientific and computing.	Understanding (K2)
	Mapping of COs with POs and PSOs	

					mappin	90.000			000					
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1						3		3	2	2		3		
CO2						3		3	2	2		3		
CO3						3		3	2	2		3		
CO4						3		3	2	2		3		
CO5						3		3	2	2		3		
1 – Slight, 2	2 – Mode	erate, 3 –	Substant	tial, BT- E	Bloom's Ta	axonomy								
					ASSES	SMENT	PATTER	N – THE	ORY					
Test / Bloo	om's	Rememb	pering	Unders	standing	Ap	plying	Ana	alyzing	Eval	uating	Crea	ting	Total

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	40	60					100
CAT2	40	60					100
CAT3	40	60					100
ESE				NA			
* ±3% may be va	ried (CAT 1,2,3 – 5	i0 marks)					

				22EEL	31 – DC		INES A	AND TR	ANSFO	DRMER	S LABO	RATORY			
Progra Branci	amme h	&	B.E &	Electri	cal and	l Electro	onics E	Enginee	ering		Sem.	Category	L	ТР	Credit
Prereq	uisite	s	Nil								3/4	PC	0	0 2	1
Pream	ble		This Ia and D suitab apply	aborato C mach le DC e the star	ry gives nines th electrica ndard te	a prac at are u I mach sting pr	tical ex ised no ines foi ocedure	posure wadays r an ap es of D(to the s in elect plication C machi	students trical sy based ines and	s to lean stems. on its o transfo	n the charac The students characteristic rmers	cterist s also cs and	cs of tran learn to s d they car	sformers elect the able to
LISTO	OF EXF		IENTS /		CISES:										
1.	Load	d chara	acteristic	cs of DC	c series	motor.									
2.	Spee	ed con	trol of D	C shun	t motor.										
3.	Oper	n circu	iit and lo	bad cha	racterist	tics of D	C shun	nt gener	ator.						
4.	Swin	nburne	's test.												
5.	Perfo	orman	ce test o	on DC C	Compou	nd moto	or.								
6.	OC and SC test of1-phase transformers.														
7.	Separation of losses in 1-phase Transformer.														
8.	Sum	ipner's	test.												
9.	Load	d test c	on three	phase	transfor	mer.									
10.	Com	puter	aided a	nalysis	of electi	ical ma	chines.								
															Total:30
REFEF	RENC	ES/ M/	ANUAL	/SOFT	NARE:										
1.	Labo	oratory	Manua	I											
2.	ANS	YS So	oftware												
COUR: On cor	SE OL mpleti	JTCOI ion of	MES: the cou	urse, th	e stude	ents wil	l be ab	le to						BT Map (Highest	ped Level)
CO1	exec	cute the	e variou	is metho	ods of s	peed co	ontrol in	DC ma	chines					Applying Precisior	(K3),) (S3)
CO2	perfo	orm su	itable te	ests and	analyz	e the pe	erforma	nce of r	otating	machine	es and tr	ansformers	1	Applying Manipulati	(K3), on (S2)
CO3	anal	yze the	e machi	nes and	l estima	ite the p	aramet	ers usir	ng comp	outer aic	led tools			Applying Precisior	(K3), n (S3)
						Маррі	ng of C	cos with	n POs a	nd PSC	Ds				
COs/P	Os	P01	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	P012	PSO1	PSO2
CO1		3	2	1	1					1			1	3	2
CO2	2	2	3	2	2	1				1			1	3	2
	3	2 - Mod	3 erate 3	2 – Subs	2 tantial	1 BT- Blo	om's Tr	axonom	V	1			1	3	2

Progra Branch	imme - h	&	B.E &	Electri	cal and	Electro	onics E	Inginee	ring		Sem.	Category	L	ТР	Credit
Prereq	uisite	s	Nil								3	PC	0	0 2	1
Pream	ble		This I chara	aborato cteristic	ry give s and a	s a pra oplicatio	actical e	exposur nalog a	e to the nd digita	e stude al circui	ents to c ts.	lesign, imple	ement	and a	alyze the
LIST O	F EXP	PERIN	IENTS	EXER(CISES:										
1.	Desig Simu	gn and Ilation	d impler softwa	nentatio re)	on of clip	oper and	d clamp	er circu	it using	PN juno	ction dio	de (Discrete	comp	onents/	
2.	Desię softw	gn of a /are)	audio ar	nplifier	using co	ommon	emitter	BJT wit	h voltag	je divide	er bias (l	Discrete com	ponei	nts/ Sim	ulation
3.	Desię	gn of l	RC pha	se shift	oscillato	ors using	g BJT.								
4.	Desię	gn of i	integrate	or and d	ifferenti	ator cire	cuit usir	ng op-ar	np.						
5.	Desi	gn a n	nonosta	ble mult	tivibrato	r using	Op-Am	ps /IC 5	55						
6.	Desię	gn of a	active fi	ters for	the give	en speci	ification	s and o	btain th	eir frequ	uency re	sponse chara	acteris	stics	
7.	Design and implementation of adders and subtractors (Discrete components/Verilog HDL/VHDL).														
8.	Simulation of code converters and flip-flops using Verilog HDL/ VHDL.														
9.	Desię	gn an	d impler	nentatio	on of syr	nchrono	ous up a	ind dow	n count	ers usir	g flip flo	os.			
10.	Study	y of in	nplemer	ntation c	of combi	nationa	l/seque	ntial cire	cuit usin	ig FPG/	۹.				
															Total:30
REFER	RENCE	ES/ M	ANUAL	/SOFT	WARE:										
1.	Labo	ratory	Manua	I											
2.	Xilinx	k vivad	do desig	gn tool											
COUR	SE OU	тсо	MES:											BT Ma	apped
On cor	npleti	on of	the cou	urse, th	e stude	nts wil	l be abl	le to					Ur	derstar	t Level) Idina (K2).
CO1	build	and e	execute	oscillato	ors and	multivib	prators u	using B.	JT					Imitati	on(S1)
CO2	const	truct a	and impl	lement t	he linea	ar and n	onlinea	r applic	ations o	f op-am	ips		Ν	Applyii Anipula	ig(K3), ition (S2)
CO3	desig	gn and	d simula	te the c	ombinat	tional ar	nd sequ	iential c	ircuits u	sing Lo	gic gate	s and HDL.	١	Analyzi /Ianipula	ng (K4), ation(S2)
						Маррі	ng of C	os with	n POs a	nd PSC	Ds				
COs/P	Os I	P01	PO2	PO3	PO4	PO5	P06	P07	PO8	PO9	PO10	PO11	PO12	PSO	1 PSO2
CO1		3	2	1	1					1				2	3
CO2	2	3	2	1	1					1				2	3
CO3	3	2	3	2	2		2			1				2	3

22EEL32 - ANALOG AND DIGITAL ELECTRONICS LABORATORY

			22EGL31 -	сомми	NICATION		VELOP		ABORATO	RY				
			(C	common te	o All Engin	eering and T	echnolog	gy Bran	ches)					
Program Branch	me &	All B.E.	/B.Tech Bı	ranches			Se	em.	Categor	y L	т	Р	С	redit
Prerequi	sites	Nil					3	/ 4	HS	0	0	2		1
Preamble	;	This co profess	urse is desi ional comm	gned to in unication	npart nece: skills.	ssary skills to	o listen, s	speak, r	ead and wri	te in oi	rder to	obtain t	oetter	
LIST OF	EXPERIN	IENTS / E	XERCISES	:										
1.	Self	Introductio	n & Mock Ir	nterview										
2.	Job	Applicatio	n letter with	Resume										
3.	Pres	entation: A	Technical	topic / Pro	oject report	& a Case st	udy							
4.	Situa	ational Dial	ogues / Tel	ephonic C	Conversatio	ons								
5.	Grou	ip Discussi	ion											
6.	Read	Reading Aloud												
7.	Liste	Listening Comprehension												
8.	Writi	Writing Company Profiles												
9.	Prep	Preparing reviews of a book/product/movie												
10.	Pron	unciation 7	Fest											
													Tot	al: 30
REFERE	NCES/ M	ANUAL /S	OFTWARE	:										
1.	Lab	oratory Ma	anual											
2.	Ore	ell Digital L	anguage La	ab Softwa	re									
COURSE On comm	OUTCO	MES: the cours	e the stud	lents will	he able to						BT (High	Mappe	d vel)	
						·				l	Jnders	tanding	(K2),	
001	enna	ince effect	ive listening	and read	ing skills						Imita	ation (Š	51)	
CO2	acqu	ire profess	ional skills	required f	or workpla	ce/higher ed	ucation				Appl Natura	ying (K lization	3), (S5)	
CO3	3 use English language skills effectively in various situations Applying (K3), Articulation (S4)													
()e()	Mapping of COS with POS and PSOS													
POs	PO1	PO2	P03	PO4	PO5	PO6	P07	PO8	PO9	PO10	P011	PO12	1	2
CO1									2	3		3	2	1
CO2									2	2		2	2	1
CO3									2	2		2	2	1
1 – Sliaht	2 Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z													

22EET35 - ELECTRIC CIRCUIT THEORY

Progra Branci	imme & h	BE – Electrical and Electronics Engineering	Sem.	Category	L	т	Ρ	Credit				
Prereq	uisites	Nil	3	PC	3	1	0	4				
		1										
Pream	ble	This course aims to impart knowledge on analysis of electric	AC and D	C circuits.								
Unit –	I	DC Circuits and Graph Theory:						9				
DC CIF - Mesh cut-set	RCUITS: Typ and nodal a matrix.	es of sources- Dependent and Independent sources - Source nalysis. Graph Theory: Introduction - Tree and Co-tree - Tw	transforma <i>i</i> igs and Li	ition - Current inks - Inciden	t and ce N	Volta Iatrix	age di (A)-T	vision rule ïe-set and				
Unit - I	nit - II Single Phase and Three Phase Circuits: 9											
Single and no Three I	ngle Phase Circuits : Power, power factor, impedance triangle, voltage triangle and power triangle of RL and RC circuits – Mesh Id nodal analysis. Three Phase Circuits : Star-Delta transformation - Star and Delta systems – Line and Phase Quantities - Inree Phase Power - Balanced and Unbalanced Circuit – Three wire and Four wire systems.											
Unit - I	nit - III Network Theorems: 9											
DC and Theore	d AC: Superp em - Millman's	osition Theorem – Thevenin's Theorem – Norton's Theorem – s Theorem-Application to DC and AC circuits.	- Maximum	Power Trans	sfer	Theo	rem -F	Reciprocity				
Unit - I	V	Resonance and DC Transients:						9				
Reson Basic c	ance circuit concept of sin	s: Resonant Frequency, Current and Voltage Variations, Banple parallel resonance circuit. DC Transients: natural and for the parallel resonance circuit.	ndwidth, (rced respo	Q factor for sonse of RL, R	eries C an	s res d RL	onanc C circi	e circuits- uits				
Unit - V	V	Two-Port Networks and Coupled Circuits:						9				
Two-P Circuit	ort Network s: Mutual inc	s: Impedance Parameter –Admittance Parameter –ABCD P luctance – Dot Convention – Coefficient of Coupling – Analysis	arameters s of Simple	– T and π I Coupled Circ	Repr cuits.	esen	tation.	Coupled				
								Total:45				
TEXT I	BOOK:											
1.	I. Sudhakar A. and Shyammohan S. Palli, "Circuits and networks- Analysis and Synthesis", 5th Edition, Tata McGraw Hill Publishing Company, New Delhi, 2017.											
REFEF	RENCES:											
1.	Charles K. Company, I	Alexander , Matthew N.O. Sadiku , "Fundamentals of Electric New Delhi, 2022	Circuits", 7	th Edition, Tat	a Mo	Grav	N Hill	Publishing				
2.	AbhijitChak	rabarti, "Circuit Theory Analysis and Synthesis", 7th Revised E	dition, Dha	anapat Rai &	Co.,	New	Delhi	, 2018.				
3.	Robert L. B	oylestad, "Introductory Circuit Analysis", 13 th Edition, Pearson I	Education,	India, 2018								

	COURSE OUTCOMES: BT Mapped														
COURS On con	SE OU npleti	JTCOM on of t	IES: he cours	se, the st	udents	will be a	able to							BT Mapp Highest L	oed .evel)
CO1	evalu	uate DC	C electric	circuits u	sing dep	pendent	and ind	epende	nt sourc	ces.				Applying	(K3)
CO2	differ	rentiate	balance	d and uni	balanced	d loads i	n three	phase A	C circu	its.				Applying	(K3)
CO3	analy	yze DC	and AC	networks	using va	arious th	eorems							Analyzing	(K4)
CO4	CO4 explain resonant and DC transients using R,L,C elements Applying (K3)														
CO5	CO5 interpret the concept of coupled circuits and two port networks. Understanding (K2)														
						Mappin	g of CC	s with	POs an	d PSO	S				
COs/P	Os	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1		3	2	1	1	1				1			1	3	2
CO2	2	3	2	1	1					1			1	3	2
CO3	3	2	3	2	2					1			1	3	2
CO4	ł	3	2	1	1					1			1	3	2
CO5	CO5 3 2 1 1 1 3 2														
1 – Slig	ht, 2 -	- Mode	rate, 3 –	Substant	ial, BT-	Bloom's	Taxono	my							
	ASSESSMENT PATTERN - THEORY														

		ACCECCMENT									
Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %				
CAT1	10	25	65	-	-	-	100				
CAT2	10	20	30	30	-	-	100				
CAT3	10	45	40	-	-	-	100				
ESE	5	20	57	18	-	-	100				
* ±3% may be varied (0	±3% may be varied (CAT 1,2,3 - 50 marks & ESE – 100 marks)										

	22EET36 - MEASUREMENTS AND INSTRUMEN		N									
Programme & Branch	B.E & Electrical and Electronics Engineering	Sem.	Category	L	т	Ρ	Credit					
Prerequisites	Nil	3	PC	3	0	0	3					
	· · · · · · · · · · · · · · · · · · ·											
Preamble	This course aims in imparting knowledge of Basic principles working principle of different Electromechanical Instruments. It als measurement of Power, Energy, Resistance, Impedance and diffe	of Electi so aims rent Elec	rical Measure in imparting f ctronic measu	emer ⁱ unda iring	nts, o amen instro	constru Ital kno uments	uction and owledge of s.					
Unit – I	Basics of Measurements:						9					
Importance of Meas Static and Dynamic	surement – Purpose of Measurement – Methods of Measurement – F Characteristics. Types of Instruments-Types of Errors – Operating F	unctiona orces in	al blocks of a Analog Instru	Mea umer	surei nts.	ment S	System –					
Unit – II	Electromechanical Instruments:						9					
Permanent Magnet Moving Coil (PMMC): Construction and Working Principle – Torque Equation and Problems – Ammeter Shunts – Voltmeter Multipliers (Simple Problems) – Moving Iron Instruments: General Torque Equation – Classification – Construction, Working – Construction and Working of CT and PT – Calibration												
Unit – III Measurement of Power, Power factor and Energy												
Electrodynamomete measurement by tw Induction Type Ene	er Wattmeter: Construction – Theory- Low Power factor Wattmeter – T o wattmeter method - Power Factor Meters: Single Phase Electrodyr rgy Meters: Construction – Theory of Operation – Phantom Loading.	hree Phamome	ase Wattmete ter Power Fa	er –T ctor	'hree Mete	phase r – Sir	e power Igle Phase					
Unit – IV	Measurement of Resistance and Impedance						9					
Classification of Re Inductance & Capa tester).	sistances – Kelvin's Double Bridge – A.C Bridges: Introduction – Sou citance: Maxwell's Inductance Bridge – Capacitance Bridge – Scheri	irces and ng Bridg	d Detectors – e – Wien's Br	Mea idge	isure – Me	ment o eggar	of Self (Earth					
Unit – V	Electronic Measuring Instruments						9					
Digital Multi meters -Single Phase Digit	-Function generators, Weston Type Frequency Meter - Digital Rec al Energy Meter-Intelligent Panel Meters.	ording S	Systems-digita	al Da	ta Ao	cquisit	ion system					
							Total: 45					
TEXT BOOK:												
1. Sawhney A Delhi, 2021	.K., "Electrical and Electronic Measurements and Instrumentation",	19th Rev	vised Edition,	Dha	npat	h Rai8	Co., New					
REFERENCES:												
1. Gupta J.B. Delhi, 2013	"A Course in Electronic and Electrical Measurements and Instrume	entation"	,13th Edition	, S.K	.Kata	aria& \$	Sons, New					
2. Edward Wi Reem Publ	lliam Golding and Frederick Charles Widdis, "Electrical Measurem ications, New Delhi, 2011.	nents an	d Measuring	Inst	rume	ents", 6	6 th Edition,					

COUR	COURSE OUTCOMES:BT MappedOn completion of the course, the students will be able to(Highest Level)														
CO1	expl	ain the	function	al blocks	of meas	surement sy	stem ar	nd the s	tatic a	ind dyna	mic char	acteristics	of Ui	nderstandin	g(K2)
CO2	outli	ruments	concepts	of differe	nt meas	urina Instru	ment an	d Calibi	ate di	fferent In	strument	s		Applying (I	<3)
002	outin				in moue						otramon		1.0	nderstandin	a(K2)
CO3	expl	ain the	concepts	s of instrur	ments u	sed for mea	suring e	lectrica	l parar	neters			0		9(12)
CO4	mak	ke use o	f the bric	lges for m	easurei	ment of Res	istance,	Capaci	tance	and Indu	ctance			Applying (I	<3)
CO5	iden	ntify an a	appropria	ate digital	instrum	ent for meas	suremen	t of elec	ctrical	paramete	ers			Applying (I	<3)
Mapping of COs with POs and PSOs															
COs/P	COs/POs PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO12 PS01 PS02														
CO	1	3	2	1									2	3	1
CO2	2	3	1	2	2								2	3	1
CO	3	3	2							1			2	2	1
CO4	4	3	2	1	1								2	3	2
CO	5	3	2	2	2					1			2	3	3
1 – Slig	ght, 2	– Mode	erate, 3 -	Substant	ial, BT-	Bloom's Ta	xonomy								
						ASSESS		PATTER	RN - T	HEORY					
Tes C	t / Blo atego	oom's ory*	R	emember (K1) %	ing	Understa (K2) 9	nding %	Apply (K3)	ying %	Analyz (K4) ^c	ing l %	Evaluating (K5) %	Cre	ating (K6) %	Total %
	CAT	1		20		60		20)						100
	CAT	2		20		60		20)						100
	CAT	3		20		60		20)						100
	ESE	Ξ		15		55		30)						100
* ±3% ı	may b	e varie	d (CAT 1	,2,3 – 50	marks &	& ESE – 100) marks)								

Progra Branci	amme h	&	BE –	Electric	al and	Electro	nics Er	ngineer	ing		Sem.	Category	L	т	Р	Credit
Prerec	luisite	es	Nil								3	PC	0	0	2	1
Pream	ble		This of var	ourse h ious ele	elps the ctrical p	e studer aramet	its to de ers.	emonstr	ate curr	ent and	voltage	in electric c	ircuits	an	d measi	urement
LIST C	FEX	PERIN	IENTS	EXER(CISES:											
1.	Veri	fication	n of sup	er positi	on theo	rem / m	aximun	n power	transfe	r theore	em.					
2.	Dete	ermina	tion of T	Three ph	ase po	wer mea	asurem	ent by t	wo watt	meter m	nethod					
3.	Desi softv	ign an ware)	d simula	ation of s	series /	parallel	resona	nce circ	uit for a	i given f	requenc	y. (discrete	comp	one	ents/sim	ulation
4.	Mea	surem	ent of s	elf indu	ctance,	mutual	inducta	nce and	l coeffic	ient of c	oupling.					
5.	Calil	bratior	of Ene	rgy Mete	ər											
6.	Exte	ension	of DC v	oltmete	r and D	C amme	eter rang	ges								
7.	Calil	bratior	of curr	ent trans	sformer	and po	tential t	ransforr	ner							
8.	Mea	surem	ent of D	C resis	tance by	y Whea	tstone a	and Kelv	/in doub	ole bridg	je					
9.	Measurement of inductance and capacitance using Maxwell's bridge															
10.	PCB	3 board	d implen	nentatio	n of DC	AC circ	cuits.									
															٦	otal:30
REFE	RENC	ES/ M	ANUAL	/SOFT	WARE:											
1.	Lab	orator	y Manua	al												
2.	Mult	isim s	oftware													
COUR On co	SE Ol mpleti	UTCO	MES: the cou	urse, th	e stude	nts wil	l be abl	e to						E (Hi	BT Map ighest L	ped _evel)
CO1	dem	ionstra	ite the v	erificatio	on of ne	twork th	neorems	s and m	easurer	ment of	three ph	ase power.		A	pplying((K3),
CO2	desi vario	gn and ous D0	d simula C and A	te resor C circuit	nant and s.	transie	ents usii	ng softv	vare too	ls as we	ell as imp	olement		A Mai	pplying nipulatic	(K3), n (S2)
CO3	Demonstrate the measurement of R,L and C parameters using bridges and calibrate Applying(K3), Precision (S3)															
						Маррі	ng of C	os with	n POs a	nd PSC	Ds					
COs/P	Os	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	2	PSO1	PSO2
CO1		3	2	1	1	2		1		2	1		1		3	2
CO2	2	3	2	1	1	3		1		2	1		1		3	2
COS	3	3	2	1	1		1	1		2	1		1		3	2
1 – Slig	ght, 2 ·	– Mod	erate, 3	 Subs 	tantial,	BI-Blo	om′s Ta	axonom	у							

		22MAT42 – TRANSFORMS AND PARTIAL DIFFERENT	TIAL EQU	JATIONS										
	(Common to Electrical and Electronics Engineering & Electronics and Instrumentation Engineering Branches)													
Progra Branch	mme & ז	BE - Electrical and Electronics Engineering & Electronics and Instrumentation Engineering Branches	Sem.	Category	L	т	Р	Credit						
Prereq	uisites	Nil	4	BS	3	1	0	4						
Pream	ble	To provide the skills for handling discrete and continuous time Transform and impart knowledge in partial differential equations and	signals b d express	by applying For functions in te	ourier erms	tran	sform urier s	and Z- eries.						
Unit – I Fourier Series: 9+3														
Dirichle series -	Dirichlet's conditions – General Fourier series – Change of interval – Odd and even functions – Half range Sine series – Half range Cosine series – Harmonic analysis.													
Unit – II Fourier Transform: 9+3														
Fourier Integral theorem (without proof) – Fourier transform pair – Properties (without proof) – Transforms of simple functions – Fourier Sine and Cosine transforms – Properties (without proof) – Convolution theorem and Parseval's identity (Statement and applications only).														
Unit –		Z –Transform:						9+3						
Definiti	on – Z-transfo	orm of some basic functions – Elementary properties – Inverse Z-tran	sform: Pa	artial fraction m	netho	d – R	lesidu	e method –						
Convol	ution theorem	– Applications of Z-transforms: Solution of difference equations.												
Unit –	IV	Partial Differential Equations:						9+3						
Format of hom	ion of partial ogeneous line	differential equations by elimination of arbitrary constants and arbitrar ear partial differential equations of higher order with constant coefficient	y functior nts.	ns – Lagrange'	s line	ear eq	uatior	n – Solution						
Unit –	v	Applications of Partial Differential Equations:						9+3						
Classifi heat ec	ication of sec quation – Stea	ond order quasi linear partial differential equations – Solutions of or dy state solution of two dimensional heat equation (excluding insulate	ne-dimen ed edges)	sional wave e	quati	on –	One c	limensional						
				Lectur	e:45	, Tuto	orial:1	5, Total:60						
TEXT E	TEXT BOOK:													
1.	1. Ramana B V, "Higher Engineering Mathematics", 1 st Edition, Tata McGraw-Hill Publishing Company Limited, New Delhi, 2018.													
REFER	RENCES:													
1.	Veerarajan	T., "Transforms and Partial Differential Equations", 3 rd Edition, Tata M	lc Graw H	lill Education F	vt. L	td., N	ew De	lhi, 2013.						
2.	Erwin Kreys	zig, "Advanced Engineering Mathematics", 10 th Edition, John Wiley &	Sons, Lir	mited, 2019.										
3.	 Grewal B S, "Higher Engineering Mathematics", 44th Edition, Khanna Publishers, New Delhi, 2015. 													

COURS On cor	SE Ol npleti	JTCOM ion of th	ES: he cours	e, the stud	lents wi	ill be able	e to							BT Mapp (Highest Le	ed evel)
CO1	expi	ress the	given fur	nction or da	ata in tei	ms of Fo	urier seri	es.						Applying (K3)
CO2	und and	erstand solve p	the conc hysical pr	ept of Four	rier trans enginee	sform and ring.	d its prop	erties w	hich wi	ll provide	e the at	pility to formula	ite l	Jnderstandin	g (K2)
CO3	pos	sess kno	owledge	of Z transfo	orm to a	nalyze lin	ear time	invariar	nt syste	ms.				Applying (K3)
CO4	form	nulate ai	nd solve ł	nigher orde	r partial	differenti	al equati	ons.						Applying (K3)
CO5	app dim	ly Fouri ensiona	ier series I wave eq	technique	es in so	olving on	e and ty	wo dime	ensiona	l heat fl	ow pro	blems and o	ne	Applying (K3)
	Mapping of COs with POs and PSOs														
COs/P	COs/POs PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO12 PS01 PS02														
CO	1	3	2	1										2	1
CO2	2	3	3	2										3	1
CO	3	3	3	2											1
CO4	4	3	2	1										1	1
CO	5	3	3	2										1	1
1 – Slig	ht, 2	– Modei	rate, 3 – S	Substantial	, BT- Bl	oom's Ta	xonomy	4	1	-	1	L	1		
			1			ASSE	SSMEN		ERN - T	HEORY					1
Tes	st / Bl Catego	oom's ory*	Re	ememberii (K1) %	ng	Understa (K2)	anding %	Apply (K3)	ying %	Analyz (K4) 9	ing %	Evaluating (K %	5) Cr	eating (K6) %	Total %
	CAT	1		10		30		60)	-		-		-	100
	CAT	2		10		30		60)	-		-		-	100
	CAT3 10 30 60 100														
	ESE	Ξ		10		35		55	5	-		-		-	100
* ±3% r	mav b	e varied	CAT 1.2	2.3 – 50 m	arks & F	SE - 100) marks)	1					1		1

	22ITC41 - PROGRAMMING IN PYTHON	hranah	oc)				
Programme -	ECE, EEE, EIE, MTS	Sem.	Category	L	т	Р	Credit
Prerequisites	Problem Solving and Programming in C	4	ES	3	0	2	4
			· ·				
Preamble	This course introduces the core Python programming. It emphasizes functions, classes, objects, and NumPy	s develop	oing Python p	rogram	ns witl	h alld	ata types,
Unit – I	Introduction:						9
Problem-so identifiers - Control Sta statements	ving strategies – program design tools – Types of errors – Testing and data types - input operation – comments – reserved words – indenta ements: Introduction – conditional statement – iterative statements – – else in loops.	d Debug ation – C - Nesteo	ging- Basics Operators an d Loops – bi	: Litera d Expr reak, c	ils – v ressic contin	varial ons – ue a	bles and Decision nd pass
Unit – II	Lists, Tuples and Dictionary:	a - Tu	le: Create	utility	2000	29 III	y ydate delete
operations, a delete, sort, lo	signments, returning multiple values, nested tuples, index, and count me oping, nested, built-in methods — list vs tuple vs dictionary.	ethod - [Dictionary: Cr	eate, a	acces	s, ad	d and modify,
Unit – III	Strings and Regular Expressions:						9
Strings: Cor operation – finditer func	catenation, append, multiply on strings – Immutable – formatting operator unctions – operators – comparing – iterating – string module – Regular ons – flag options.	⁻ – Built-i r Expres	n string meth sions – matc	ods ar h, sea	id fun rch, s	ctions sub, fi	s – slice ndall and
Unit – IV	Functions and Modules:						9
Functions: documenta function red	htroduction - definition – call – variable scope and lifetime – return state on strings – programming practices recursive function- Modules: Modu finition.	ment – f iles – pa	unction argu ackages – sta	ments andard	– lan libra	nbda ry me	function – ethods –
Unit – V	Object Orientation:						9
Class and O private data n	jects: Class and objects – class methods and self – constructor – cla ember. NumPy: NumPy Arrays – Computation on NumPy Arrays. Matplo	iss and t Lib: Lin	object variab e plots – Sca	les – (tter Plo	destro ots	uctor	 public and
	ERIMENTS / EXERCISES:						
1. Prog	ams using conditional and looping statements						
2. Imple	nentation of list and tuple operations						
3. Imple	nentation of dictionary operations						
4. Perfo	m various string operations						
5. Use	egular expressions for validating inputs						
6. Dem	nstration of different types of functions and parameter passing						
7. Deve	op programs using classes and objects						
8. Perfo	m computation on NumPy arrays						
9. Draw	different types of plots using Matplotlib						
			Lect	ure:45	, Pra	ctica	1:30, Total:75
TEXT BOOK							
1. Reen 2017	a Thareja., "Python Programming using problem solving approach", 3 rd i	mpressio	on, Oxford Ur	niversit	y Pre	ss., N	lew Delhi,
REFERENCE	S/ MANUAL / SOFTWARE:						
1. Nag	eswara Rao, "Core Python Programming", 2 nd Edition, DreamTech Press,	New De	lhi, 2018.				
2. Jak	Vander Plas," Python Data Science Handbook Essential Tools for Working	g with Da	ata", O'Reilly	publish	ers,1	st Edi	tion, 2016.

COURS On con	E OUT	COME n of th	ES: ne cours	se, the stu	dents	will be ab	le to							BT Map (Highest	oped Level)
CO1	use b	basic F	Python c	onstructs t	o build	simple pro	ograms							Applying Precision	g (K3), (S3)
CO2	apply	/ list, tu	uple, an	d dictionar	y to har	idle a vari	ety of da	ita.						Applying Precision	g (K3), (S3)
CO3	apply	/ string	gs and re	egular expi	ressions	s for searc	hing an	d retrieva	al					Applying Precision	g (K3), (S3)
CO4	solve	e the pi	roblems	using fund	tions a	nd module	es.							Applying Precision	g (K3), (S3)
CO5	apply	/ objec	ct-oriente	ed concept	s and p	erform ba	sic data	science	operatio	ons usiną	g Python			Applying Precision	g (K3), (S3)
	Menning of COo with DOo and DSOo														
0.0 /0.0		••				Mapp	oing of (COs with	n POs a		S		2010	2001	
COs/PC	Os PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO12 PS01 PS02														
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 – Slig	ht, 2 – M	Moder	ate, 3 –	Substantia	al, BT- E	Bloom's Ta	axonomy	/							
						ASS	ESSME	NT PAT	FERN - T	THEOR	(
Test Ca	/ Bloon tegory*	m's ,*	Rem	embering %	(K1)	Understa (K2)	anding %	Apply (K3)	ying %	Analyz (K4) 9	ing %	Evaluating (K5) %	Cre (K	eating (6) %	Total %
	CAT1 10 15 75 100														
	CAT2			10		15		75	5						100
	CAT3			10		15		75	5						100
	ESE			10		15		75	5						100
* ±3% n	nay be v	varied	(CAT 1	, 2, 3 – 50	marks	& ESE – 1	00 mark	(s)							

22EET41 – SYNCHRONOUS AND INDUCTION MACHINES

Progra Branci	mme & ז	B.E & Electrical and Electronics Engineering	Sem.	Category	L	т	Ρ	Credit					
Prereq	uisites	DC Machines and Transformers	4/5	PC	3	1	0	4					
			1		1			-					
Pream	ble	This course aims in imparting knowledge on construction and special electrical machines. It also explores on various method	working p ds of spe	orinciple of AC	C ma AC n	ichir nach	nes an nines.	d some					
Unit –	I	Alternator:						9+3					
Introdu EMF E Synchr Input –	Introduction to Rotating MINF – Construction and Operation Details – Types of Rotors – Concentrated and Distributed Winding EMF Equation – Synchronous Reactance – Armature Reaction – Voltage Regulation: EMF, MMF and ZPF Method Synchronizing and Parallel Operation – Synchronizing Power – Power Output Equations – Change of Excitation and Mechar Input – Case Study: Integrated Starter Generator for Hybrid Electric Vehicle – Claw Pole Alternator												
Unit –	Unit – II Synchronous Motor: 9+3												
Principle of Operation – Torque Equation – Starting Methods – Operation on Infinite Bus bars – V and Inverted V Curves – and Output Power Equations – Power/Power Angle Relations – Hunting – Causes & Prevention –Applications: Synchro Condenser – Power factor correction.													
Unit –	Unit – III Three Phase Induction Motor: 9+3												
Constru Charac Separa	uction and O steristics – Lo ation of No Lo	peration Details – Types of Rotors – Squirrel Cage and Slip sses and Efficiency – Load Test – No Load and Blocked Roto ad Losses – Crawling and Cogging – Double Cage Rotors – Ind	Ring – S - Tests - luction G	Slip –Torque - Equivalent (enerator – Su	Equ Circu Ibme	iatio iit – ersib	ns – S Circle le Mot	Slip Torque Diagram – or.					
Unit –	IV	Starting and Speed Control of Three Phase Induction Moto	or:					9+3					
Need f Varying	or Starters – g Voltage, Fre	 Types of Starters – Rotor Resistance, Autotransformer, Sta equency, V/F Control, Poles and Rotor Resistance – Slip Power 	r-Delta a Recover	and DOL Sta y Scheme.	rters	- 3	Speed	Control by					
Unit –	V	Single Phase Induction Motors and Special Machines:						9+3					
Constru Split Pl	uction and O nase, Capacit	peration Details – Double Revolving Field Theory – Equivaler or Start, and run, Shaded Pole – Applications – Servo Motor, St	nt Circuit tepper Mo	 Simple Protect otor and Univ 	oblei ersa	ms S I Mo	Startin tor	g Methods:					
	Lecture:45, Tutorial:15, Total:60												
TEXT B	TEXT BOOK:												
1.	Rajput R.K.	"Electrical Machines", 6th Edition, Laxmi Publications, New Dell	hi, 2018.										
REFEF	RENCES:												
1.	Kothari D.P	and Nagrath I.J, "Electric Machines", 5th Edition, Tata McGraw	/ Hill Pub	lishing Comp	any,	Nev	v Delh	i, 2018.					
2.	2. Gupta J.B., "Electrical Machines", 4th Edition, S.K. Kataria& Sons, New Delhi, Reprint 2014.												

COUR On co	SE OUTCOMES: mpletion of the course, the students will be able to	BT Mapped (Highest Level)
CO1	explain the constructional, working and behavior of alternator	Applying (K3)
CO2	compute the constructional, working performance of synchronous motor	Applying (K3)
CO3	analyze the operation and performance characteristics of induction machines	Applying (K3)
CO4	apply starting and speed control methods to AC motors	Applying (K3)
CO5	demonstrate the operation of single phase induction machine and special electrical machines	Understanding (K2)

					Mappin	g of CC)s with	POs ar	nd PSO	s				
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1										1	1	2
CO2	3	2	1	1			1		1			1	2	3
CO3	2	3	2	2	1		1		1			1	3	2
CO4	3	2	1	1								1	2	3
CO5	3	2	1	1								1	2	3
4 0			<u> </u>			-								

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	55	35	-	-	-	100
CAT2	10	55	35	-	-	-	100
CAT3	10	65	25	-	-	-	100
ESE	5	60	35	-	-	-	100
* 12% may be veried (AT 1 2 2 50 more		iko)			·	

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

		22EET42 – CONTROL SYSTEMS						
Progra Branch	imme & n	B.E & Electrical and Electronics Engineering	Sem.	Category	L	Т	Р	Credit
Prereq	uisites	Nil	4/5	PC	3	1	0	4
			Ļ			1		
Pream	ble	The aim of the subject is to give an adequate exposure to compensator, controller design and PLC programming.	transf	er function	mod	el, s	tability	analysis,
Unit –	I	Systems and Representation:						9+3
Basic E variable Diagrar	Elements in (e) of Electrica m Reduction	Control Systems: Open and Closed Loop Systems – Transfer Fur I and Mechanical Systems with single and two degree of freedom – Techniques using Signal Flow Graphs.	etion m Electroi	nodels and s mechanical s	state syste	spac ms-G	e moo Gear tra	dels(phase ains- Block
Unit –	II	Time Domain Analysis:						9+3
Standa of Addi exampl	rd Test Signa ition of Poles le -Routh Hur	als – Steady State Error and Error Constants – Type and Order of Sy and Zeros – Dominant Poles – Concept of stability-Bounded - Ir witz Stability Criterion.	stems - put Bo	- Time Doma unded Outpu	ain S ut St	pecif abilit	cation y with	s – Effects pendulum
Unit –	111	Frequency Response:						9+3
Freque Time D	ency Domain Iomain	Specifications - Bode Plot – Polar Plot – Nyquist Stability Criterion	 Corre 	lation betwe	enFr	eque	ncy D	omain and
Unit –	IV	Controller and Compensator Design:						9+3
Control Locus I	llers – P,PI& Plots.	PID - Root Locus Plots of Typical Systems – Root Locus Analysis -	Design	of Lag, Leac	d Coi	mper	sator	using Root
11.14								
Unit –	V	Introduction to Programmable Logic Controller						9+3
Overvie and Inte	V ew of Program ernal relay in:	Introduction to Programmable Logic Controller mmable Logic Controller - Architecture-Fundamentals of Logic – Pr structions – Entering the Ladder diagram-Programming Timers – Pro	ogram s grammi	Scan– Relay ng Counter	′-Тур	e Ins	structic	9+3 Ins-Branch
Overvie and Inte	V ew of Progra ernal relay in:	Introduction to Programmable Logic Controller mmable Logic Controller - Architecture-Fundamentals of Logic – Pr structions – Entering the Ladder diagram-Programming Timers – Pro	ogram : grammi	Scan– Relay ng Counter Lecture	-Тур ::45,	e Ins Tuto	structic	9+3 ons-Branch 5, Total:60
Overvie and Inte	V ew of Program ernal relay in: BOOK:	Introduction to Programmable Logic Controller mmable Logic Controller - Architecture-Fundamentals of Logic – Pr structions – Entering the Ladder diagram-Programming Timers – Pro	ogram : grammi	Scan– Relay ng Counter Lecture	-Тур ::45 ,	e Ins Tuto	structic	9+3 ns-Branch 5, Total:60
Unit – Overvie and Inte TEXT E	V ew of Progra ernal relay in: BOOK: Nagarath, I. Units I,II,III i	Introduction to Programmable Logic Controller mmable Logic Controller - Architecture-Fundamentals of Logic – Pr structions – Entering the Ladder diagram-Programming Timers – Pro J. &Gopal, M., "Control Systems Engineering", 7 th Edition, New Age I and IV.	ogram s grammi	Scan– Relay ng Counter Lecture ional Pvt.Ltd,	∕-Typ ::45,	oe Ins Tuto	structic	9+3 Ins-Branch 5, Total:60
Unit – Overvie and Inte TEXT E 1. 2.	V ew of Progra ernal relay in: BOOK: Nagarath, I. Units I,II,III a Frank D. Pe	Introduction to Programmable Logic Controller mmable Logic Controller - Architecture-Fundamentals of Logic – Pr structions – Entering the Ladder diagram-Programming Timers – Pro J. &Gopal, M., "Control Systems Engineering", 7 th Edition, New Age I and IV.	ogram s grammi Internati Edition	Scan– Relay ng Counter Lecture ional Pvt.Ltd, , New Delhi,	-Typ : :45, , Nev 2019	v Del	hi, 202	9+3 Ins-Branch 5, Total:60 21 for
TEXT E 1. 2. REFER	V ew of Progra ernal relay in: BOOK: Nagarath, I. Units I,II,III a Frank D. Pe RENCES:	Introduction to Programmable Logic Controller mmable Logic Controller - Architecture-Fundamentals of Logic – Pr structions – Entering the Ladder diagram-Programming Timers – Pro J. &Gopal, M., "Control Systems Engineering", 7 th Edition, New Age I and IV.	ogram i grammi Internati Edition	Scan– Relay ng Counter Lecture ional Pvt.Ltd, , New Delhi,	r-Typ ::45, , Nev 2019	v Del	hi, 202	9+3 Ins-Branch 5, Total:60 21 for
TEXT E 1. 2. REFER	V ew of Progra ernal relay in BOOK: Nagarath, I. Units I,II,III a Frank D. Pe RENCES: Katsuhiko C	Introduction to Programmable Logic Controller mmable Logic Controller - Architecture-Fundamentals of Logic – Pr structions – Entering the Ladder diagram-Programming Timers – Pro J. &Gopal, M., "Control Systems Engineering", 7 th Edition, New Age I and IV. truzella, "Programmable Logic Controllers", 5th Edition, McGraw-Hill	ogram i grammi Internati Edition New De	Scan– Relay ng Counter Lecture ional Pvt.Ltd, , New Delhi,	7-Typ ::45, , Nev 2019	v Del	hi, 202	9+3 Ins-Branch 5, Total:60
Unit –Overvie and InteTEXT E1.2.REFER1.2.	V ew of Progra ernal relay in BOOK: Nagarath, I. Units I,II,III Frank D. Pe RENCES: Katsuhiko C Norman S. I	Introduction to Programmable Logic Controller mmable Logic Controller - Architecture-Fundamentals of Logic – Pr structions – Entering the Ladder diagram-Programming Timers – Pro J. &Gopal, M., "Control Systems Engineering", 7 th Edition, New Age I and IV. truzella, "Programmable Logic Controllers", 5th Edition, McGraw-Hill Ogata, "Modern Control Engineering", 5 th Edition, Pearson Education, I Nise, "Control Systems Engineering", 4 th Edition, Wiley India Ed, 2018	ogram a grammi Internati Edition New De	Scan– Relay ng Counter Lecture ional Pvt.Ltd, , New Delhi,	7-Typ ;: 45 , , New 2019	Tutc	hi, 202	9+3 Ins-Branch 5, Total:60 21 for

2005.

COUR On cor	SE Ol nplet	UTCON ion of t	IES: the cours	se, the st	udents	will be able	e to							BT Mappe (Highest Le	ed vel)
CO1	deve	elop ma	thematic	al model o	of elect	rical, mecha	anical sy	stems						Applying (ł	(3)
CO2	anal	yze var	ious stea	ady state e	errors a	nd time dom	nain spe	cificatio	ns for	the conti	nuous s	ystems		Analyzing(K4)
CO3	exar	nine the	e stability	of the sy	stems ı	using various	s technic	ques						Analyzing(K 4)
CO4	desi	gn appi	ropriate c	compensa	tor and	controller fo	or the giv	en spe	cificati	ons				Applying (ł	(3)
CO5	deve	elop PL	C ladder	logic prog	Irammii	ng for indust	rial prob	lems						Applying (ł	(3)
	Mapping of COs with POs and PSOs														
COs/Pos P01 P02 P03 P04 P05 P06 P07 P08 P09 P010 P011 P012 PS01 PS02															
CO	1	3	1							1			1	2	1
CO	2	3	2	1	1	1				1			1	3	2
CO	3	3	2	1	1	1	1			1			1	3	2
CO	4	3	2	1	1	1				1			1	3	2
CO	5	3	1				1			1			1	2	1
1 – Slię	ght, 2	– Mode	erate, 3 –	Substant	ial, BT-	Bloom's Ta	xonomy								
						ASSESS		PATTER	RN - T	HEORY					
Tes C	t / Blo atego	oom's ory*	Re	ememberi (K1) %	ing	Understa (K2) 9	nding %	Apply (K3)	ving %	Analyz (K4) ^c	ing %	Evaluating (K5) %	g Cro	eating (K6) %	Total %
	CAT	1		5		30		30)	35		-		-	100
	CAT	Γ2 5 30 30 35 -			-	100									
	CAT	3		10		30		60)			-		-	100
	ESE			5		30		30)	35		-		-	100
* ±3%	may b	e varie	d (CAT 1	,2,3 – 50	marks	& ESE – 100) marks)								

	22EET43 - MICROCONTROLLERS AND ITS IN	TERFAC	ING				
Programme & Branch	B.E – Electrical and Electronics Engineering	Sem.	Category	L	т	Р	Credit
Prerequisites	Digital Electronics	4	PC	3	0	0	3
Preamble	To get acquaintance with the architecture of 8085 process programming concepts for interfacing peripherals with the co microcontrollers	or and a ontroller	8051 controll and to under	er, a stan	apply d the	the appl	embedded ications of
Unit – I	8085 Microprocessor:						9
Introduction to Diagrams – Me	085 Microprocessor – Architecture – Pin configuration – Interrupts nory Interfacing – Simple Assembly Language Programs for arithme	 Instruc tic opera 	tion Set – Ad tions.	dres	sing	Mode	s – Timing
Unit – II	8051 Microcontroller:						9
Introduction to register – Stack	051 Microcontroller – Archite0ure – Memory Organization–Special – Instruction set – Addressing modes.	Function	Registers –	Pro	gram	Coun	ter – PSW
Unit – III	8051 Programming:						9
I/O Ports – Ti Embedded C: programming.	ner (Mode1) / Counter – Serial Communication – Interrupt (Tim I/O port programming –Timer programming-Counter programm	ner, Seria ning – S	al communica Serial port p	ation rogi) – amm	Progra iing -	amming in - Interrupt
Unit – IV	Interfacing I/O Peripherals with 8051:						9
Programming i segments LED	Embedded C: LED – Push button switch – Necessity of Relay - A/D and D/A converters – Temperature sensor - DC Motor – Stepp	and Op er motor	to-coupler –	Key	pad -	- LCE) – Seven
Unit – V	Case Study Applications:						9
Microcontroller MAX 232 for I/ Street Light cor controlled ROB	based Washing machine Control – Central Heating System Using b text message communication – Microcontroller based Calculator trol system, Water Level Indicator and Burglar Alarm System – Hom DT (Block diagram with programming approach).	a Super with exte e Automa	Loop – RS23 anded feature ation & Secur	32 S s us ity s	erial sing N ysten	comn MAX2: ns Mo	nunication: 32. Simple bile phone
							Total:45
TEXT BOOK:							
1. Soumit 8085,8	a Kumar Mandal, "Microprocessors and Microcontrollers Arch 86 and 8051", McGraw Hill Education , ISBN- 13 978-0071329200,	nitecture, , 2017 fo	Programmir r Unit I.	ng a	and	Syste	m Design
2. Muham Using /	mad Ali Mazidi, Janice Gillispie Mazidi & Rolin D. McKinlay, "The ssembly and C", 2nd Edition, Pearson Education, New Delhi, 2013 f	8051 Mi for Units	crocontroller II, III, IV and V	and /.	Emb	edde	d Systems
REFERENCES							
1. Manish 2017.	K. Patel, "The 8051 Microcontroller based Embedded systems", Ta	ata McG	raw Hill Educ	atior	n (Inc	lia) P	/t. Limited,
2. Subrata Educat	Ghoshal, "8051 Microcontrollers, 2/e: Internals, Instructions, Proon, 2014.	ogrammir	ng &Interfacir	ıg",	2 nd E	Editior	n, Pearson

COUR On cor	SE OL mpleti	JTCOM	IES: he cours	se, the stu	udents	will be a	ble to							BT Mapped (Highest Level)		
CO1	expla	ain the	basic cor	ncepts of 8	3085 mi	croproce	essor						Ur	nderstandir	ıg (K2)	
CO2	sum	marize	the basic	concepts	of 805	1 microc	ontrolle	r					Ur	nderstandir	ıg (K2)	
CO3	CO3 develop embedded c programs for 8051													Applying (K3)		
CO4 interface peripheral devices with 8051 microcontroller														Applying (K3)	
CO5	reco	gnize n	nicrocont	roller base	ed case	study ap	oplicatio	ns						Applying (K3)		
						Mappin	g of CO	s with	POs an	d PSOs	5					
COs/P	POs	P01	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	
CO1 3 2 1 1 1 1 1												1	3	3		
CO2 3 2 1 2 2												1	3	3		
CO	3	3	2	1	1	1	1		1		1	1	1	1	3	

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

CO4

CO5

	ASSESSMENT PATTERN - THEORYTest / Bloom's Category*Remembering (K1) %Understanding (K2) %Applying (K3) %Analyzing (K4) %Evaluating (K5) %Creating (K6) %Total %CAT12080100CAT2104050100													
Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %							
CAT1	20	80	-	-	-	-	100							
CAT2	10	40	50	-	-	-	100							
CAT3	10	30	60	-	-	-	100							
ESE	10	40	50	-	-	-	100							
* ±3% may be varied (0	CAT 1,2,3 – 50 mark	s & ESE – 100 mai	rks)											

			1										r r			
Progra Branci	amme h	&	B.E &	Electri	cal and	Electro	onics E	Inginee	ring		Sem.	Category	L	т	Р	Credit
Prereq	uisite	s	Nil								4/5	PC	0	0	2	1
Pream	ble		This la Motor motor	aborator s and S . Also th	y gives Synchro ley can	a pract nous M able to	tical exp lotors. utilize tl	posure f The stu he softw	to the st dents le vare for	tudents earn to analysi	to gain perform s of AC r	knowledge o the speed machines.	on Alto contr	ernate ol of	ors, Ir an In	duction duction
LIST C	F EXF	PERIM	IENTS /	EXERO	CISES:											
1.	Regu	ulation	of three	e-phase	alterna	tor by E	MF me	thod.								
2.	Regu	ulation	of three	e-phase	alterna	tor by N	/MF me	ethod.								
3.	Load	d test c	on Alterr	nator.												
4.	Sync	chroniz	zing and	l load/po	ower sh	aring of	alterna	itors.								
5.	V an	d inve	rted V c	urves o	f three p	ohase s	ynchror	nous ma	otor.							
6.	Load	d test c	on single	e phase	and thr	ee phas	se cage	inductio	on moto	ors.						
7.	Spee	ed con	trol of th	nree pha	ase indu	uction m	otor.									
8.	No lo	oad an	d block	ed rotor	test on	inductio	on moto	ors (1Φ	equivale	ent circu	uit) — Virt	ual Lab.				
9.	No load and blocked rotor test on induction motors (1Φ equivalent circuit) – Virtual Lab. Performance study of induction generator.															
10.	Analy	ysis of	f AC ma	chines (using so	oftware	tools.									
															Т	otal:30
REFE	RENCE	ES/ M/	ANUAL	/SOFT\	NARE:											
1.	Labo	oratory	Manua	1												
2.	Virtu	al Lab	oratory													
COUR	SE OU	JTCO	MES:											BT	Марр	oed
On co	mpleti	ion of	the cou	urse, the	e stude	nts will	be abl	le to						(Higł	nest L	.evel)
CO1	evalu curve	uate th es of A	le perfo	rmance hines	and sel	ect the	rotating) machir	nes base	ed on th	eir chara	acteristic	ſ	Anal Manip	yzing oulatio	(K4), n (S2)
CO2	predi	ict the	regulat	ion and	demon	strate th	ie syncł	hronizat	ion of tv	vo alter	nators fo	r its power		App	lying ((K3),
	snari	ing												App	lying ((S3) (K3),
CO3	utilize	e the l	knowled	ige on c	ompute	r-aided	engine	ering de	esign of	AC mad	cnines		I	Manip	ulatio	n (S2)
						Mappi	ng of C	Os with	n POs a	nd PSC	Ds					1
COs/P	Os I	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	P	SO1	PSO2
CO1		2	3	2	2	1				1			1		3	2
CO2	2	3	2	1	1					1			1		2	3
COS	3	3	2	1	1					1			1		2	3
1 – Slig	ght, 2 -	– Mod	erate, 3	- Subs	tantial,	BT- Blo	om's Ta	axonom	y							

22EEL41 - SYNCHRONOUS AND INDUCTION MACHINES LABORATORY

					22EE	L42 - C	ONTR	OL SYS	TEMS	LABOR	ATORY					
Progra	amme	&	B.E &	Electri	cal and	l Electro	onics E	Inginee	ering		Sem.	Category	L	т	Р	Credit
Prerec	uisite	S	Nil								4/5	PC	0	0	2	1
Pream	ble		This c freque	ourse is ency dor	design main.	ied to in	npart pr	actical I	knowled	lge abo	ut the ar	alysis of co	ntrol s	yste	ems in	time and
LIST C	OF EXF	PERIN	IENTS /	EXER	CISES:											
1.	Dete	rmina	tion of ti	ransfer f	unction	parame	eters of	DC ser	vomoto	r.						
2.	Dete	rmina	tion of ti	ransfer f	unction	parame	eters of	AC ser	vomoto	r.						
3.	DC s	servo r	notor po	osition c	ontrol u	ising PI	D contro	oller.								
4.	DC n	notor	position	control	using le	ead and	lag cor	mpensa	tor.							
5.	Strai	n mea	sureme	ent using	strain	gauge.										
6.	PLC	ladde	r logic d	liagram	for DOL	starter										
7.	Logio	cal pro	gramm	ing, time	er and c	ounter	function	ns of PL	С							
8.	Ladd	ler log	ic based	d conve	yer belt	control	using p	orogram	mable I	ogic coi	ntroller					
9.	Anal	ysis o	f time ar	nd frequ	ency do	omain a	nalysis	using N	1ATLAB	-						
10.	Desi	gn an	d impler	nentatio	n of co	mpensa	tors via	root loo	cus usir	g MATI	_AB.					
																Total:30
REFE	RENCE	ES/ M	ANUAL	/SOFT	NARE:											
1.	Labo	oratory	Manua	1												
COUR	SE OU	лтсоі	MES:											В	Т Мар	ped
On co	mpleti	on of	the cou	urse, the	e stude	ents wil	l be ab	le to			<u> </u>			(Hig	ghest	Level)
CO1	detei parai	rmine meter:	the tran s using :	sfer fun sensors	ction of	AC and	d DC se	ervo mot	or and	measur	e various	s physical	Ν	Ana ∕Ian	alyzing	ı (K4), on (S2)
CO2	deve	elop, c	ompile a	and deb	ug basi	c and a	dvance	d PLC p	orogram	S			Ν	Ana Man	alyzing	j (K4), on (S2)
CO3	analy	yze tin	ne doma	ain and	frequen	cy dom	ain spe	cificatio	ns.				Ν	Ana Man	alyzing	j (K4), on (S2)
	1					Mappi	ng of C	Os witl	h POs a	nd PS	Os				•	
COs/P	Os	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	2	PSO1	PSO2
CO1	1	3	2	1	1		1			1			1		2	3
CO2	2	2	3	2	2	1	1			1			1		3	2
COS	3	2	3	2	2	2	1			1			1		3	2

	22GCL41 - PROFESSIONAL SKILLS TRA	AINING -	I												
(Common to All BE/ BTech Engineering and Technology branches) Programme & All BE/ BTech Engineering and Technology branches Sem. Category L T P Credit															
Programm Branch	e & All BE/ BTech Engineering and Technology branches	Sem.	Category	L	т	Ρ	Credit								
Prerequisi	tes Nil	4	EC	0	0	80	2								
Preamble	reamble This subject is to enhance the employability skills and to develop career competency														
Unit – I	Jnit - I Soft Skills - I : 20														
Soft skills and its importance: Pleasure and pains of transition from an academic environment to work environment-Need for change- Fear, stress and competition in the professional world-Importance of positive attitude- Self motivation and continuous knowledge up gradation-Self-confidence. Professional grooming and practices: Basics of corporate culture-Key pillars of business Etiquette- Basics of etiquette-Introductions and greetings-Rules of the handshake, earning respect, business manners-Telephone etiquette- Body Language. Unit – II Quantitative Aptitude and Logical Reasoning – I: 30 Problem solving level I: Number System-LCM &HCF-Divisibility test-Surds and indices-Logarithms- Ratio-proportions and Variation-Partnership-Time speed and distance-Data interpretation-data representation. Logical reasoning: Family tree-															
Deductions	-Logical connectives-Binary logic Linear arrangements- Circular and co	mplex a	rrangement				,								
Grammar: I Spelling tes Speaking : slurs and f sentences skills for IE	Parts of speech - Tenses - Articles and Prepositions - Vocabulary: Sy st - Cloze test - Concord - Spotting Errors - Listening: Listening to Mock Interviews - Personality traits - Better pronunciation - Extempo illers - Soft skills - Writing: Job application letter & resume - Video - Professional e-mail writing - Business letters - One page essay - ELTS	nonyms o TED t ore talk - resume Report v	& Antonym talks, ESL & Reading: R – Different t writing - Editin	is - ESC eadir types ng &	Analo DL Vic ng wit s of w proof	gies - Syleos - Po leos - Po h stress vriting - reading	yllogism - odcasts - , pauses, Jumbled – Writing								
							Total:45								
TEXT BOO	PK:														
1. R.S	S. Aggarwal, "Quantitative Aptitude", 7 th Edition, S. Chand Publication, 2	2022.													
2. R.S	S. Aggarwal, "A Modern Approach to Logical Reasoning", S. Chand Pub	olication,	2022 edition												
3. Ed Se	gar Thorpe and Showick Thorpe, "Objective English for Competitive Exa rvices Pvt Ltd, 2017.	aminatio	n", 6th Editio	n, Pe	earsor	n India E	ducation								
REFEREN	CES:														
1. Ste	ephen Bailey, "Academic Writing: A practical guide for students", Routle	dge, Nev	w York, 2011.												
2. Me Un	enakshi Raman and Sangeeta Sharma. "Technical Communication- Pr iversity Press, New Delhi, 2022.	inciples a	and Practice"	. 4th	Editio	on, Oxfo	rd								

COURSE OUTCOMES: On completion of the course, the students will be able to														BT Mapped (Highest Level)		
CO1	deve indiv	elop the viduala	e soft sk nd as a t	ills of lea team	arners to	suppor	rt them	work eff	ficiently	in an c	organizati	on as an		Applying (k Precision ((3), S3)	
CO2	solv	e real t	ime prob	olems usi	ng nume	erical ab	ility and	logical	reasoni	ng				Applying (k Precision ((3), S3)	
CO3	CO3 apply English language skills for various academic and professional purposes Applying (K3), Precision (S3)															
						Марр	ing of C	Os wit	h POs a	and PS	Os					
COs/P	Os	P01	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	P011	PO12	PSO1	PSO2	
CO	1	3	2				3	3		3		3	2	2	1	
CO2	2	3	2				3	3		3		3	2	2	1	
COS	CO3 2 3 3 3 3 3 2 1															
1 – Slię	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	50	30				100						
CAT2		50	50				100						
CAT3		50	50				100						
Assessment Test 50 50 100													
* ±3% may be varied (CAT 1,2,3 - 50 marks & Assessment Test – 100 marks)													

22EEL43 – MICROPROCESSORS AND MICROCONTROLLERS INTERFACING LABORATORY															
imme n	&	B.E &	Electri	cal and	Electro	onics E	inginee	ering		Sem.	Category	L	т	Р	Credit
uisite	s	Nil								4	PC	0	0	2	1
ble		This la microo	aborato controlle	ry gives ersto inte	a prace c	ctical ex off-chip	kposure periphe	in des rals.	igning a	and dev	eloping inte	rfacin	g circ	uits f	or 8051
FEXF	PERIN	IENTS /	EXER	CISES:											
Arith	metic	operatio	ons usin	g 8085	micropi	ocesso	rs.								
Emb Arith	edded metic	C Prog	rammin ons usin	g and ir g KEIL	nterfacir compile	ng using er	g 8051 l	Microco	ntroller:						
Inter	facing	of swite	ches and	d LEDs	with 80	51 Micr	ocontro	ller.							
Inter	facing	of seve	n segm	ent LED) with 8	051 Mic	rocontr	oller.							
Inter	facing	of keyp	ad matr	ix with 8	8051 M	icrocont	roller.								
Interfacing of Relay and LCD with 8051 Microcontroller.															
Interfacing of DC Motorwith 8051 Microcontroller system.															
Interfacing of Stepper Motor with 8051 Microcontroller system.															
Case	e study	/1: Desi	gn and	develop	a simp	le proje	ct using	g 8051 l	Microco	ntroller.					
Case	e study	/2: Desi	gn and	develop	a simp	le close	ed loop	applicat	ion usir	ng 8051	Microcontrol	ler.			
															Fotal:30
RENCE	ES/ M	ANUAL	/SOFT	WARE:											
Labo	oratory	Manua	Ι.												
Micro	ocontr	oller Pro	ogramm	ing Soft	ware fo	or 89C5	1 Micro	controlle	er and D	oumper k	kits.				
SE OL	лтсог	MES:											BT	Мар	ped
npleti	ion of	the cou	urse, the	e stude	nts wil	l be abl	e to						(Hig Ann	hest I	Level)
dem	onstra	te the ir	nstructio	ns in 80)85 mic	roproce	ssors.						Pre	cision	(IS3) (S3)
deve	elop int	erfacing	g circuit	s for inte	erfacing	periphe	erals wi	th 8051	microc	ontroller			App Pre	lying cision	(K3), (S3)
desię	gn anc	l develo	p micro	controlle	er base	d embe	dded sy	stems f	or real t	time app	lications.		App Pre	lying cision	(K3), (S3)
				1	Маррі	ng of C	os with	n POs a	nd PSC	Ds					
Os	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	P011	PO12	2 P	SO1	PSO2
	3	2	1	3	1	2		1	2	3	2	1		1	3
2	3	2	1	3	1	2		1	2	3	2	1		1	3
3	3 Mad	3 oroto 2	2	3	2 PT PI-	2	Vonassi	1	2	3	2	1		2	3
	22EE mme uisite ble FEXI Arith Emb Arith Inter Inter Inter Inter Inter Case Case Case Case Case Case Case Case	22EEL43 - mme & uisites ble F EXPERIM Arithmetic Embedded Arithmetic Interfacing Interfacing Interfacing Interfacing Interfacing Case study Case study Case study Case study EENCES/ M/ Laboratory Microcontre SE OUTCOI npletion of demonstra develop int design and Cos PO1 3 3 3	22EEL43 - MICR mme & B.E & uisites Nil ble This I microof FEXPERIMENTS / Arithmetic operation Fexperiments / Arithmetic operation Interfacing of sever Interfacing of sever Interfacing of sever Interfacing of sever Interfacing of Step Case study1: Desi Case study2: Desi Case study2: Desi SEOUTCOMES: mpletion of the cout demonstrate the in develop interfacing develop 05 PO1 PO2 3 2 3 2 3 3	22EEL43 - MICROPROO mme & B.E & Electri uisites Nil ble This laborato microcontrolle F EXPERIMENTS / EXERCE Arithmetic operations usin Arithmetic operations usin Embedded C Programmin Arithmetic operations usin Interfacing of seven segm Interfacing of keypad matr Interfacing of Relay and L Interfacing of DC Motorwit Interfacing of Stepper Mot Case study1: Design and Case study2: Design and Case study2: Design and Microcontroller Programm SE OUTCOMES: mpletion of the course, the demonstrate the instructio develop interfacing circuits design and develop micro 3 0s PO1 PO2 PO3 3 2 1 3 2 1	22EEL43 – MICROPROCESSO mme & ble This laboratory gives microcontrollersto interfactions using 8085 FEXPERIMENTS / EXERCISES: Arithmetic operations using 8085 Embedded C Programming and ir Arithmetic operations using KEIL Interfacing of seven segment LED Interfacing of seven segment LED Interfacing of Relay and LCD with Interfacing of Stepper Motor with 4 Interfacing of Stepper Motor with 4 Case study1: Design and develop Case study2: Design and develop Case astudy2: Design and develop Case study2: Design and develop Case study2: Design and develop Case astudy3: Design and develop Case astudy3: Design and develop Case astudy2: Design and develop Bilterion of the course, the stude demonstrate the instructions in 80 develop interfacing circuits for interfacing and develop asta 2 1 asta 2 1 asta 3	22EEL43 - MICROPROCESSORS AN mme & B.E & Electrical and Electrical uisites Nil ble This laboratory gives a prace microcontrollersto interface of FEXPERIMENTS / EXERCISES: Arithmetic operations using 8085 micropp Embedded C Programming and interfacin Arithmetic operations using KEIL compile Interfacing of seven segment LED with 80 Interfacing of Relay and LCD with 8051 Microco Interfacing of DC Motorwith 8051 Microco Interfacing of Stepper Motor with 8051 Microco Case study1: Design and develop a simp Case study2: Design and develop a simp Case study2: Design and develop a simp Gemonstrate the instructions in 8085 mic Gemonstrate the instructions in 8085 mic develop interfacing circuits for interfacing design and develop microcontroller base Mappi 3	22EEL43 - MICROPROCESSORS AND MIC mme & B.E & Electrical and Electronics E uisites Nil ble This laboratory gives a practical eximicrocontrollersto interface off-chip FEXPERIMENTS / EXERCISES: Arithmetic operations using 8085 microprocesso Arithmetic operations using 8085 microprocesso Embedded C Programming and interfacing using Arithmetic operations using KEIL compiler Interfacing of switches and LEDs with 8051 Microcont Interfacing of seven segment LED with 8051 Microcont Interfacing of Relay and LCD with 8051 Microcont Interfacing of DC Motorwith 8051 Microcont Interfacing of DC Motorwith 8051 Microcont Interfacing of Stepper Motor with 8051 Microcont Case study1: Design and develop a simple proje Case study2: Design and develop a simple close EENCES/ MANUAL /SOFTWARE: Laboratory Manual. Microcontroller Programming Software for 89C5: SE OUTCOMES: mpletion of the course, the students will be able demonstrate the instructions in 8085 microproce develop interfacing circuits for interfacing periphe design and develop microcontroller based embe 0 3 2 1 3 1 2 3 2 1 3 1 2 3 2 2	22EEL43 - MICROPROCESSORS AND MICROCC mme & B.E & Electrical and Electronics Engineer uisites Nil ble This laboratory gives a practical exposure microcontrollers interface off-chip peripher F EXPERIMENTS / EXERCISES: Arithmetic operations using 8085 microprocessors. Embedded C Programming and interfacing using 8051 Microcontrol Interfacing of switches and LEDs with 8051 Microcontrol Interfacing of seven segment LED with 8051 Microcontroller. Interfacing of Relay and LCD with 8051 Microcontroller. Interfacing of Relay and LCD with 8051 Microcontroller. Interfacing of DC Motorwith 8051 Microcontroller system Interfacing of Stepper Motor with 8051 Microcontroller sing Case study2: Design and develop a simple project using Case study2: Design and develop a simple closed loop EENCES/ MANUAL /SOFTWARE: Laboratory Manual. Microcontroller Programming Software for 89C51 Microconsors. develop interfacing circuits for interfacing peripherals will design and develop microcontroller based embedded sy Mapping of Cos with Os P01 P02 P03 P04 P05 P06 P07 3 2 3 2 2 2 2	22EEL43 - MICROPROCESSORS AND MICROCONTROMING mme & B.E & Electrical and Electronics Engineering uisites Nil ble This laboratory gives a practical exposure in des microcontrollers interface off-chip peripherals. F EXPERIMENTS / EXERCISES: Arithmetic operations using 8085 microprocessors. Embedded C Programming and interfacing using 8051 Microcontroller. Interfacing of switches and LEDs with 8051 Microcontroller. Interfacing of seven segment LED with 8051 Microcontroller. Interfacing of Relay and LCD with 8051 Microcontroller. Interfacing of DC Motorwith 8051 Microcontroller system. Interfacing of Stepper Motor with 8051 Microcontroller system. Case study1: Design and develop a simple project using 8051 Microcontroller system. Case study2: Design and develop a simple closed loop applicat SEOUTCOMES: mpletion of the course, the students will be able to demonstrate the instructions in 8085 microprocessors. develop interfacing circuits for interfacing peripherals with 8051 design and develop microcontroller based embedded systems 1 develop interfacing circuits for interfacing peripherals with 8051 design and develop microcontroller based embedded systems 1 design and develop microcontroller based embedded systems 1 design and develop mi	Set EL43 - MICROPROCESSORS AND MICROCONTROLLER mme & B.E & Electrical and Electronics Engineering uisites Nil ble This laboratory gives a practical exposure in designing a microcontrollers interface off-chip peripherals. FEXPERIMENTS / EXERCISES: Arithmetic operations using 8085 microprocessors. Embedded C Programming and interfacing using 8051 Microcontroller: Interfacing of switches and LEDs with 8051 Microcontroller. Interfacing of seven segment LED with 8051 Microcontroller. Interfacing of Relay and LCD with 8051 Microcontroller. Interfacing of DC Motorwith 8051 Microcontroller system. Case study1: Design and develop a simple project using 8051 Microcontroller and D Case study2: Design and develop a simple closed loop application using the students will be able to demonstrate the instructions in 8085 microprocessors. develop interfacing circuits for interfacing peripherals with 8051 microcontroller and D SE OUTCOMES: mpletion of the course, the students will be able to demonstrate the instructions in 8085 microprocessors. develop interfacing circuits for interfacing peripherals with 8051 microcontroller design and develo	B.E & Electrical and Electronics Engineering Sem. uisites Nil 4 ble This laboratory gives a practical exposure in designing and develop microcontrollersto interface off-chip peripherals. Sem. FEXPERIMENTS / EXERCISES: Arithmetic operations using 8085 microprocessors. Embedded C Programming and interfacing using 8051 Microcontroller: Arithmetic operations using KEL compiler Interfacing of switches and LEDs with 8051 Microcontroller. Interfacing of seven segment LED with 8051 Microcontroller. Interfacing of Relay and LCD with 8051 Microcontroller. Interfacing of C Motorwith 8051 Microcontroller. Interfacing of DC Motorwith 8051 Microcontroller. Interfacing of Stepper Motor with 8051 Microcontroller system. Case study1: Design and develop a simple project using 8051 Microcontroller. Case study2: Design and develop a simple closed loop application using 8051 Set POTOMES: mpletion of the course, the students will be able to develop interfacing circuits for interfacing peripherals with 8051 microcontroller Intercontroller Gesign and develop microcontroller based embedded systems for real time app Gos with PO3 PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 G <td>B.E & Electrical and Electronics Engineering Sem. Category uisites Nil 4 PC ble This laboratory gives a practical exposure in designing and developing intermicrocontrollers to interface off-chip peripherals. PC ble This laboratory gives a practical exposure in designing and developing intermicrocontrollers interface off-chip peripherals. PC ble This laboratory gives a practical exposure in designing and developing intermicrocontrollers interfacing using 8051 Microcontroller: PC Arithmetic operations using 8085 microprocessors. Embedded C Programming and interfacing using 8051 Microcontroller. Interfacing of switches and LEDs with 8051 Microcontroller. Interfacing of seven segment LED with 8051 Microcontroller. Interfacing of Relay and LCD with 8051 Microcontroller. Interfacing of DC Motorwith 8051 Microcontroller system. Case study1: Design and develop a simple project using 8051 Microcontroller. ENCES/ MANUAL /SOFTWARE: Laboratory Manual. Microcontroller Programming Software for 89C51 Microcontroller and Dumper kits. SE OUTCOMES: mpletion of the course, the students will be able to demonstrate the instructions in 8085 microprocessors. demonstrate the instructions in 8085 microprocessors. develop interfacing circuits for interfacing peripherals with 8051 microcontr</td> <td>Category L Mil 4 PC 0 Die This laboratory gives a practical exposure in designing and developing interfacing microcontrollers to interface off-chip peripherals. Sem. Category L Die This laboratory gives a practical exposure in designing and developing interfacing microcontrollers to interface off-chip peripherals. Sem. Category L FEXPERIMENTS / EXERCISES: Arithmetic operations using 8085 microprocessors. Embedded C Programming and interfacing using 8051 Microcontroller: Arithmetic operations using KEIL compiler Interfacing of switches and LEDs with 8051 Microcontroller. Interfacing of seven segment LED with 8051 Microcontroller. Interfacing of Relay and LCD with 8051 Microcontroller. Interfacing of Relay and LCD with 8051 Microcontroller system. Interfacing of Stepper Motor with 8051 Microcontroller system. Interfacing of Stepper Motor with 8051 Microcontroller system. Case study1: Design and develop a simple project using 8051 Microcontroller. EENCES/ MANUAL /SOFTWARE: Interfacing circuits for interfacing peripherals will be able to demonstrate the instructions in 8085 microprocessors. Interfacing circuits for interfacing peripherals with 8051 microcontroller. Gase and develop microcontroller based embedded systems for real time applications. Interfacing circuits for interfacing periphe</td> <td>Sem. Category L T Mile A PC 0 0 Disities Nil 4 PC 0 0 0 Disities Nil 4 PC 0 0 0 0 Disities Interfacing of controllers interface off-chip peripherals. Embedded C Programming and interfacing using 8051 Microcontroller. Interfacing of switches and LEDs with 8051 Microcontroller. Interfacing of seven segment LED with 8051 Microcontroller. Interfacing of Relay and LCD with 8051 Microcontroller. Interfacing of C Motorwith 8051 Microcontroller system. Interfacing of Stepper Motor with 8051 Microcontroller system. Case study1: Design and develop a simple closed loop application using 8051 Microcontroller. EENCES/ MANUAL /SOFTWARE: Eatoratory Manual. Microcontroller Rogramming Software for 89C51 Microcontroller and Dumper kits.</td> <td>222EEL43 - MICROPROCESSORS AND MICROCONTROLLERS INTERFACING LABORATORY microPROCESSORS AND MICROCONTROLLERS INTERFACING LABORATORY microPROCESSORS AND MICROCONTROLLERS INTERFACING LABORATORY Mil This laboratory gives a practical exposure in designing and developing interfacing circuits f microcontrollersto interface off-chip peripherals. Sem. Category L T T</td>	B.E & Electrical and Electronics Engineering Sem. Category uisites Nil 4 PC ble This laboratory gives a practical exposure in designing and developing intermicrocontrollers to interface off-chip peripherals. PC ble This laboratory gives a practical exposure in designing and developing intermicrocontrollers interface off-chip peripherals. PC ble This laboratory gives a practical exposure in designing and developing intermicrocontrollers interfacing using 8051 Microcontroller: PC Arithmetic operations using 8085 microprocessors. Embedded C Programming and interfacing using 8051 Microcontroller. Interfacing of switches and LEDs with 8051 Microcontroller. Interfacing of seven segment LED with 8051 Microcontroller. Interfacing of Relay and LCD with 8051 Microcontroller. Interfacing of DC Motorwith 8051 Microcontroller system. Case study1: Design and develop a simple project using 8051 Microcontroller. ENCES/ MANUAL /SOFTWARE: Laboratory Manual. Microcontroller Programming Software for 89C51 Microcontroller and Dumper kits. SE OUTCOMES: mpletion of the course, the students will be able to demonstrate the instructions in 8085 microprocessors. demonstrate the instructions in 8085 microprocessors. develop interfacing circuits for interfacing peripherals with 8051 microcontr	Category L Mil 4 PC 0 Die This laboratory gives a practical exposure in designing and developing interfacing microcontrollers to interface off-chip peripherals. Sem. Category L Die This laboratory gives a practical exposure in designing and developing interfacing microcontrollers to interface off-chip peripherals. Sem. Category L FEXPERIMENTS / EXERCISES: Arithmetic operations using 8085 microprocessors. Embedded C Programming and interfacing using 8051 Microcontroller: Arithmetic operations using KEIL compiler Interfacing of switches and LEDs with 8051 Microcontroller. Interfacing of seven segment LED with 8051 Microcontroller. Interfacing of Relay and LCD with 8051 Microcontroller. Interfacing of Relay and LCD with 8051 Microcontroller system. Interfacing of Stepper Motor with 8051 Microcontroller system. Interfacing of Stepper Motor with 8051 Microcontroller system. Case study1: Design and develop a simple project using 8051 Microcontroller. EENCES/ MANUAL /SOFTWARE: Interfacing circuits for interfacing peripherals will be able to demonstrate the instructions in 8085 microprocessors. Interfacing circuits for interfacing peripherals with 8051 microcontroller. Gase and develop microcontroller based embedded systems for real time applications. Interfacing circuits for interfacing periphe	Sem. Category L T Mile A PC 0 0 Disities Nil 4 PC 0 0 0 Disities Nil 4 PC 0 0 0 0 Disities Interfacing of controllers interface off-chip peripherals. Embedded C Programming and interfacing using 8051 Microcontroller. Interfacing of switches and LEDs with 8051 Microcontroller. Interfacing of seven segment LED with 8051 Microcontroller. Interfacing of Relay and LCD with 8051 Microcontroller. Interfacing of C Motorwith 8051 Microcontroller system. Interfacing of Stepper Motor with 8051 Microcontroller system. Case study1: Design and develop a simple closed loop application using 8051 Microcontroller. EENCES/ MANUAL /SOFTWARE: Eatoratory Manual. Microcontroller Rogramming Software for 89C51 Microcontroller and Dumper kits.	222EEL43 - MICROPROCESSORS AND MICROCONTROLLERS INTERFACING LABORATORY microPROCESSORS AND MICROCONTROLLERS INTERFACING LABORATORY microPROCESSORS AND MICROCONTROLLERS INTERFACING LABORATORY Mil This laboratory gives a practical exposure in designing and developing interfacing circuits f microcontrollersto interface off-chip peripherals. Sem. Category L T T

22EET51- POWER SYSTEM ANALYSIS													
Progra Branci	nmme &	B.E & Electrical and Electronics Engineering	Sem.	Category	L	т	Р	Credit					
Prereq	uisites	Generation, Transmission and Distribution,	5/6	PC	3	1	0	4					
			I.				1						
Pream	ble	This course imparts knowledge about the modeling of powe stability analysis. The course also describes the various types	r system of faults	n components occurs in pov	s, loa ver s	ad flo yster	ow an m	alysis and					
Unit –		Modeling of Power System:						9+3					
Introdu compo machir	Introduction-per unit quantities -selection of base quantities-changing the base of per unit quantities-Modelling of power system components-one line diagram- impedance and reactance diagram-per unit impedances of a generator, transformer, synchronous machines, transmission lines, motor-per phase representation- introduction to smart grid, micro grid and power market.												
Unit –	II	Load Flow studies:						9+3					
Format load flo (upto th	Formation of Bus admittance matrix, network incidence matrix and Y-bus, node elimination, classification of buses-Formulation of load flow problem-, Gauss-Siedel method-Newton- Raphson method, Numerical solution of power flow problem by GS method (upto three buses),												
Unit –	111	Symmetrical Faults in Electrical systems:						9+3					
Need Symme Fault le	for short cire etrical fault an evel-short circ	cuit study –Types of faults- Bus Impedance matrix - Bus I nalysis through bus impedance matrix- fault calculation using T cuit MVA	building 'hevenin'	algorithm (w 's Theorem –	/itho Posi	ut m t faul	utual t bus	coupling)- voltages –					
Unit –	IV	Unsymmetrical Faults in Electrical systems:						9+3					
Synthe transm to- grou	sis of unsyr ission lines a und fault.	mmetrical phasors from their symmetrical components- seq nd transformers - sequence network of power system. single line	uence i e-to -gro	mpedance o und fault, line	f sy -to-	nchro line fa	onous ault, d	machine, ouble line-					
Unit –	v	Stability Analysis:						9+3					
Introdu stability swing o	ction to pow /-applications curve-transie	er system stability –Rotor dynamics and the Swing equation- s of equal area criterion-multimachine stability studies: classicant stability studies-factors affecting transient stability.	-power a al repres	angle equatic sentation step	on-eo o by	ual : step	area (solut	criterion of tion of the					
	Lecture : 45, Tutorial : 15, Total:60												
TEXT I	BOOK:												
1.	Grainger Jo	hn J. & Stevenson W.D, "Power System Analysis", 1 st Edition, T	ata McG	raw- Hill, Nev	v De	lhi, 2	017.						
REFEF	RENCES:												
1.	Nagrath I.J.	& Kothari D.P, "Modern Power System Analysis", 5th Edition, Ta	ata McGr	aw- Hill, New	Del	hi, 20)22.						
2.	2. Wadhwa C.L, "Electrical Power Systems", 6 th Edition, New Age International Publishers Pvt. Ltd, New Delhi, 2018.												

COUR On co	SE OUTCOMES: mpletion of the course, the students will be able to	BT Mapped (Highest Level)
CO1	Model various power system components	Applying (K3)
CO2	Evaluate the bus powers, line flows and line losses using various power flow methods	Applying (K3)
CO3	Calculate the symmetrical fault currents	Applying (K3)
CO4	Analyze the different types of unsymmetrical faults	Applying (K3)
CO5	Predict the stability of the power system	Understanding (K2)

Mapping of COs with POs and PSOs															
COs/POs	COs/Pos PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO12 PS01 PS02														
CO1	3	3	2			1	1	1				1	2	2	
CO2	3	2	3	3	2	1	1	1				1	3	3	
CO3	3	2	2	2	3	1	1	1	1			1	3	3	
CO4	3	2	2	2	2	1	1	1	1			1	3	2	
CO5	3	2	3	3	2	1	1	1	1			1	2	2	
		-	<u> </u>			_									

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	20	70				100							
CAT2	10	20	70				100							
CAT3	10	40	50				100							
ESE	ESE 10 20 70 100													
* ±3% may be varied (CAT 1, 2 & 3 – 50 marks & ESE – 100 marks)														

		22EET52 – POWER ELECTRONICS						
Progra Branc	imme& n	B.E & Electrical and Electronics Engineering	Sem.	Category	L	т	Ρ	Credit
Prerec	uisites	Analog Electronics	5	PC	3	0	0	3
Pream	ble	This course is designed to impart knowledge about the cha working principle of rectifier, chopper, DC to AC converter and	Aracteris AC to A	tics of power C converter	ser	nicor	ducto	or devices,
Unit –		Unit Title: Power Semi-Conductor Devices:						9
Introdu Princip commu	ction – Powe le of operation utation methor	er Diode – Power BJT – Power MOSFET - GaN, SiC Devices on, Static and Dynamic characteristics - Thyristor Protection – ds – Data sheet interpretation	–IGBT Series a	- SCR- TRIA and parallel c	C –	GTO ectior	- Co ns of	onstruction, thyristors -
Unit –	11	Unit Title: AC to DC Converters:						9
Single Estima improv	phase and th tion of perfor ement – PWN	nree phase controlled rectifiers with R, RL Loads- multi pulse or mance parameter: RMS load voltage, RMS load current, Pow A Rectifier- Battery charging circuits.	diode re ver Facto	ctifiers– Effeo or and Distor	ct of tion	sour Facto	ce ind or- po	ductance – ower factor
Unit –	111	Unit Title: DC to DC Converters:						9
Princip four qu	le of Step Up adrant DC Cl	and Down Chopper – Chopper Control Strategies – Quadrant o noppers –Switch mode Voltage regulators: Buck, Boost, Buck –	f Operat Boost –	tion: single qu Cuk Regulato	iadra or – S	int, tv SMPS	vo qu S.	adrant and
Unit –	IV	Unit Title: DC to AC Converters:						9
Single inverte CSI: Si	Phase Bridge r - PWM Inve ingle phase C	e Inverters – Three Phase Bridge Inverters: 180° and 120° Mode rters: Single, Sinusoidal and Multiple PWM technique – Reductio SI – Introduction to MLI - UPS.	e of oper on of hai	ration – voltag rmonics in the	ge co e invo	ontrol erter	of sii outpu	ngle phase it voltage –
Unit –	V	Unit Title: AC Voltage Controllers and Cycloconverters:						9
Princip Voltage down a	le of AC volt e Controllers and step up , I	age controller – Control Strategies: Phase control, PWM cont – Cycloconverters: Principle of cycloconverter (operation) – Sing Midpoint and Bridge – Three Phase to Single Phase Cycloconve	trol, Inte le Phase rter – Ol	gral cycle co e to Single Pł LTC.	ntrol nase	– S Cycl	ingle oconv	Phase AC /erter: step
								Total:45
TEXT	BOOK:							
1.	Bimbhra P.S	S., "Power Electronics", 6th Edition, Khanna Publishers, New De	lhi, 2018	3				
REFER	RENCES:							
1.	Singh M.D.	and Khanchandani, "Power Electronics", 2nd Edition, Tata McG	raw-Hill,	New Delhi, 2	017.			
2.	Rashid M.H	., "Power Electronics: Circuits Devices and Applications", 4th Ed	lition, Pe	arson Educat	tion,	New	Delhi	, 2017.

COURSE OUTCOMES:BT MappedOn completion of the course, the students will be able to(Highest Level)															
CO1	choc char	ose vai acterist	rious po ics	wer semi	condu	ctor devi	ces ba	sed on	their	constru	ction, op	peration a	nd Ur	nderstandi	ng (K2)
CO2	expla perfo	ain the ormanc	e workin e param	g principl eter	e of :	single ph	ase an	d three	e pha	se rectif	er and	compute	its	Applying	(K3)
CO3	class	sify and	l explain	the opera	tion of	DC to DC	C convei	rters					Ur	nderstandii	ng (K2)
CO4	CO4 inspect the operation of different type of inverters Applying (K3)														
CO5 categorize different type of AC voltage controllers and cycloconverters Understanding (K2)															
						Manala			DO						
COc/E	206	PO1	PO2	PO3	PO4						5 PO10	PO11	PO12	DSO1	DSO2
	-05	2	FU2	PU3	PU4	FUS	FU0	FUI	FUG	FU9	FUIU	PUTT	FUIZ	-301	F302
	1	3	2	3	1	4				1				3	2
00	2	3	2	3	1	1	1			1			1	2	3
CO	3	3	1	3	1	1	1			1			1	2	3
CO	4	3	2	3	1	1	1			1			1	1	3
CO	5	3	1	3	1	1	1			1			1	2	3
1 – Slię	ght, 2 ·	– Mode	rate, 3 -	Substant	ial, BT	- Bloom's	Taxono	my							
						ASSES	SMENT	PATTE	ERN -	THEORY	, 				
Tes C	atego	oom's ory*	Re	memberi (K1) %	ng	Understa (K2)	anding %	Apply (K3)	ying %	Analyz (K4) 9	ing %	Evaluating (K5) %		reating (K6) %	Total %
	CAT	1		20		60		20)						100
	CAT2 20 50 30 100														
	CAT3 20 50 30 100														
	ESE 20 50 30 100														
* ±3%	may b	e varie	d (CAT 1	, 2 & 3 – 5	50 mai	ks & ESE	– 100 r	marks)	1				u.		·

22EET53 – EMBEDDED SYSTEM DESIGN													
Programme & Branch	B.E & Electrical and Electronics Engineering	Sem.	Category	L	т	Р	Credit						
Prerequisites	Microcontrollers and Its Interfacing	5	PC	3	0	0	3						
	1		I										
Preamble	This course imparts knowledge about the Building Bloc networking protocolsand provides a brief idea of IoT architect IoT infrastructure.	ks of E ture and	mbedded S its related pr	yster otoco	n alo ols tov	ong wi wards	th various building an						
Unit – I	Introduction to Embedded Systems:						9						
Introduction to Eml Memory managem Hardware Debuggi	bedded Systems – Structural units in Embedded processor, selvent methods – Timer and Counting devices, Watchdog Timeng.	ection of r, Real	processor & Time Clock,	mer In ci	nory (ircuit	device: emula	s – DMA – tor, Target						
Unit – II	Embedded Networking Protocols:						9						
Embedded Networl RS 485 – CAN Bus	king: Introduction, I/O Device Ports & Buses – Serial Bus comm – Serial Peripheral Interface (SPI) – Inter Integrated Circuits (I2)	iunicatior C) – Nee	n protocols: F d for device	RS23 drive	2 sta rs.	ndard	– RS422 –						
Unit – III	ARM Processor and Programming:						9						
ARM7 Processor - - Data alignment ar – Architectural sup	Introduction - RISC features - Levels in architecture, Functional on byte ordering - ARM Instruction Set Architecture (ISA) - pipelin port: High Level Languages - System development – Operating s	descriptio ning – Si systems.	on - processo mple Assemi	or and bly La	d mer angua	nory or age Pro	rganization ogramming						
Unit – IV	ARM7TDMI based SoC:						9						
LPC2148: Peripher Nested vectored in modes of operation	als, Memory mapping for data, code and peripherals, pin cont terrupt controller & Interrupts in LPC2148 - ADC, DAC and RTC s.	figuration in LPC2	i, pin connec 2148 - Timer	t blo in LF	ock, G PC214	PIO P 18 and	eripheral - its various						
Unit – V	ARM7 protocols and Operating Systems:						9						
LPC2148: UART p its implementation scheduling models System Design	rotocol and its implementation in LPC2148 - SPI protocol and its in LPC2148. RTOS Introduction: RTOS Necessity - Operating - OS security issues - Design cycle in the development phase	s implem g system for an ei	entation in L services - (mbedded sys	PC2 CPU stem	148 - metri - Issu	I2C pr cs - R Jes in	otocol and TOS Task Embedded						
							Total:45						
TEXT BOOK:													
1. Kamal R, " Delhi, 2017	Embedded systems: architecture, programming and design", se	cond edi	tion, Tata Mo	Grav	v-Hill	Educa	tion, New						
2. Wayne Wolf, "Computers as Components: Principles of Embedded Computing System Design", Morgan Kaufman Publishers, San Francisco, second edition, 2008, for Units III, IV V.													
REFERENCES:	REFERENCES:												
1. Furber SB,	"ARM system-on-chip architecture", second edition, Pearson Ec	lucation;	2000.										
2. Chattopad	nyay S, "Embedded System Design", second edition, PHI Learnin	ng Pvt. L	td.; 2013.										
3. UM10139	- lpc214x User manual - https://www.nxp.com/docs/en/user-guid	e/UM101	I 39.pdf										

COURSE OUTCOMES:BT MappedOn completion of the course, the students will be able to(Highest Level)															
CO1	expla	ain the	basic bui	lding bloc	ks of er	nbeddeo	d system	ıs.					Ur	nderstandin	g (K2)
CO2	ident	tify and	distingui	sh the va	rious co	mmunic	ation pro	otocols	of embe	edded s	ystem.			Applying (H	(3)
CO3	unde	erstand	the arch	itecture o	f ARM7	process	or and i	ts progr	amminę	g.			Ur	nderstandin	g (K2)
CO4 Interface the peripherals of ARM7 processor with the external world. Applying (K3)															
CO5 Understand various on chip communication protocols of ARM7 and RTOS concepts. Understanding (K2)															
						Марріі	ng of CO	Os with	POs a	nd PSC)s				
COs/F	POs	P01	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO	1	3	1	2	1	1	1		1		1	1	1	1	2
CO	2	3	2	1	1	1	1	2				2	1	2	3
CO	3	3	1	2	1	1	1		1		1	1	1	1	1
CO	4	3	2	2	2	1	1	2				2	1	3	2
CO	5	3	1	2	1	1	1		1		1	1	1	1	2
1 – Slig	ght, 2 -	– Mode	erate, 3 –	Substant	ial, BT-	Bloom's	Taxono	omy							
	ASSESSMENT PATTERN - THEORY														
Taa	+ / DIa	om?o	Da	mamharl	n		n din a	Ammly	dina	Analym	ina E			ating $(V_{\rm C})$	Total

	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	30	50	20				100					
	ESE	10	55	35				100					
1													

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

		22EEC51 – SIGNALS AND SYSTEMS	5				I							
Programn Branch	mme& B.E & Electrical and Electronics Engineering Sem. Category L T P Credit													
Prerequis	ites	NIL	5/4	PC	2	0	2	3						
Preamble		This course helps the students to impart the knowledge on w mathematical representations, various transformation technique	arious ty ues and	/pes of signal	s an tions	d sy	/stem	s with their						
Unit - I		Continuous Time Signals and Systems						6						
Standard of Classificat	continuous ion of contir	time signals –Classification of continuous time signals -Mathe	matical o	operation on	conti	nuo	us tin	ne signals-						
Unit - II		Discrete Time Signals and Systems						6						
Standard of discrete tir	discrete time ne systems	e signals-Classification of discrete time signal-Mathematical ope – Linear convolution of discrete time signals using matrix meth-	eration o od-Circu	n discrete tim lar convolutio	e sig n usi	nal- ng r	Clas matrix	sification of method.						
Unit - III		Z Transform						6						
Z-transforr partial frac	n of DT sig tion method	nals and systems – Region of convergence – Properties of Z t d - Relation between Laplace transform and Z transform.	ransform	and ROC- Ir	nvers	se Z	trans	form using						
Unit - IV		Fourier Transform						6						
Fourier tra Properties	nsform of (of DTFT –	CT signals – Relation between Fourier and Laplace transform Relation between Fourier transform and Z-transform.	– Fourie	er transform c	of dis	cret	tim	e signals –						
Unit - V		DFT and FFT						6						
Discrete F In Frequer	ourier Tran ncy (DIF) ra	sform of discrete time signals – Fast Fourier Transform – Decir dix-2 FFT – computation of DFT and inverse DFT using FFT.	mation In	n Time (DIT) n	adix-	2 F	FT –	Decimation						
List of Ex	periments:													
1.	Generation	n and analysis of continuous time signals using MATLAB.												
2.	Generation	n and analysis of discrete time signals using MATLAB.												
3.	Verification	n of sampling theorem using MATLAB.												
4.	Verification	n of linear and time varying system using MATLAB.												
5.	Verification	n of linear convolution using MATLAB.												
6.	Verification	n of circular convolution using MATLAB.												
7.	Determina	tion of FFT of a discrete time signal using MATLAB.												
8.	Simulation	of any real time signal processing applications using MATLAB.												
				Lecture: 30	, Pra	ctic	al :30), Total: 60						
TEXT BOO	DK:													
1.	Nagoor Ka	ani. A, "Signals and Systems", 2nd Reprint, Tata McGraw-Hill E	ducation	, New Delhi, 2	2010	-								
REFEREN	ICES:													
1.	Salivahan	an. S, "Digital Signal Processing", 4 th Edition, Tata McGraw Hill	Education	on, New Delhi	, 201	9								
2.	John. G.P Pearson E	roakis, Dimitris. G. Manolakis, "Digital Signal Processing: Princi Education, India, 2021.	iples, Alg	jorithms and A	Applio	catio	ons",	5 th Edition,						
3.	Laborator	y Manual												
4.	MATLAB	software												

COURSE On comp	BT Mapped (Highest Level)	
CO1	classify the various types of continuous signals and systems with mathematical background	Applying (K3) Manipulation (S2)
CO2	compare various types of discrete time signals and systems and execute various signals and signal processing algorithms using MATLAB	Applying (K3) Manipulation (S2)
CO3	interpret the importance of Z-transform in DT signal processing and verify sampling theorem using MATLAB	Understand (K2) Manipulation (S2)
CO4	discuss CT and DT signals in frequency domain and simulate MATLAB code for any real time signal processing applications	Understand (K2) Precision (S3)
CO5	apply DFT using FFT on various discrete time signals	Applying (K3) Manipulation (S2)
1		

Mapping of COs with POs and PSOs														
COs/POs	P01	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	1	3				1			1	2	3
CO2	3	2	1	1	3				1			1	2	3
CO3	3	2	1	1	3				1			1	2	3
CO4	3	2	1	1	3				1			1	3	2
CO5	3	2	1	1	3				1			1	2	3

1 – Slight, 2 – Moderate, 3 – Subs	antial, BT- Bloom's Taxonomy
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ASSESSMENT PATTERN - THEORY										
Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %			
CAT1	10	30	60				100			
CAT2	10	30	60				100			
CAT3	10	60	30				100			
ESE	5	50	45				100			

* ±3% may be varied (CAT 1, 2 & 3 – 50 marks & ESE – 100 marks)
| | | | | - | | | | | | /\ | | | | | | |
|------------------|---|----------------|-----------------|----------------------|-----------------------|--------------------|----------------------|-----------|-----------|-----------|-----------|--------------|--------|-----------|-----------------|---------------|
| Progra
Branci | imme
h | & | B.E & | Electri | cal and | l Electr | onics E | Inginee | ering | | Sem. | Category | L | т | Р | Credit |
| Prereq | uisite | S | Micro | contro | lers an | d Its In | terfacir | ng | | | 5 | PC | 0 | 0 | 2 | 1 |
| Pream | ble | | This I
micro | aborato
controlle | ry gives
er and fo | s a pra
or LPC1 | ctical ex
24X pro | xposure | in des | signing a | and dev | eloping inte | rfacin | g cii | cuits f | for 8051 |
| LIST O | FEXF | PERIN | IENTS | EXER(| CISES: | | | | | | | | | | | |
| 1. | Arith | metic | operatio | ons usin | ig 8085 | micropi | rocesso | rs. | | | | | | | | |
| 2. | Interf | facing | of swite | ches an | d LEDs | with 80 | 51 Micr | ocontro | ller. | | | | | | | |
| 3. | Interf | facing | of seve | en segm | ent LED | 0 with 8 | 051 Mic | crocontr | oller. | | | | | | | |
| 4. | Interf | facing | of keyp | ad/LCD |) with 80 | 051 Mic | rocontro | oller. | | | | | | | | |
| 5. | Interf | facing | of DC I | Motor/St | tepper N | Motor w | ith 8051 | Microc | controlle | er syster | n. | | | | | |
| 6. | Interf | facing | of swite | ches an | d LEDs | with AF | RM LPC | 214X p | rocesso | or. | | | | | | |
| 7. | Interf | facing | of DC I | Motor/S | tepper N | Motor w | ith ARN | ILPC21 | 4X pro | cessor. | | | | | | |
| 8. | Interf | facing | of Seria | al comm | nunicatio | on with | ARM LF | PC214X | proces | sor. | | | | | | |
| 9. | Case | e study | y1: Des | ign and | develop | o a simp | ole proje | ect using | g 8051 l | Microco | ntroller. | | | | | |
| 10. | Case | e study | y2: Des | ign and | develop | o a simp | ole proje | ct with | ARM LF | PC214X | proces | sor. | | | | |
| | | | | | | | | | | | | | | | - | Total:30 |
| REFEF | RENCE | ES/ M | ANUAL | /SOFT | WARE: | | | | | | | | | | | |
| 1. | Labo | oratory | Manua | ıl. | | | | | | | | | | | | |
| 2. | Micro | ocontr | oller Pr | ogramm | ing Sof | tware fo | or 89C5 ⁻ | 1 Micro | controlle | er and L | .PC 2148 | 8 processor | and D |)ump | er kits | |
| COUR:
On cor | SE OU
npleti | JTCOI
on of | MES:
the cou | urse. th | e stude | ents wil | l be abl | e to | | | | | | B
(Hic | T Map
hest l | ped
Level) |
| CO1 | demo | onstra | te the ir | nstructio | ons in 80 |)85 mic | roproce | ssors. | | | | | | Ap
Pr | plying | (K3),
(S3) |
| CO2 | desig | gn inte | erfacing | circuits | with 80 | 51 micr | ocontro | ller and | with AF | RM LPC | 214X pr | ocessor. | | Ар | plying | (K3), |
| CO3 | deve | lop m | icrocon | troller ba | ased en | nbeddeo | d systen | ns for re | eal time | applica | tions. | | | Ap | plying | (K3), |
| | | -1 | | | | | | | | | | | | Pre | ecision | (\$3) |
| 00.17 | 0 | | DCC | DCC | | Mappi | ng of C | os with | n POs a | IND PSC | | DOIL | DO | | 2004 | DOOC |
| COS/P | Us | 201 | PO2 | PO3 | PO4 | P05 | PO6 | P07 | P08 | P09 | PO10 | P011 | 1012 | 2 | -501 | PS02 |
| 001 | <u> </u> | ა
ი | 2 | 1 | 3 | 1 | 2 | | 1 | 2 | 3 | 2 | 1 | + | 1 | 3 |
| 002 | <u>-</u> | ა
ი | 2 | 1 | 3 | 1 | 2 | | 1 | 2 | ა
ი | 2 | 1 | _ | ו
ר | 3 |
| | <u>, , , , , , , , , , , , , , , , , , , </u> | 3 | 3 | | 3 | | | | | 2 | 3 | ۷ | I | | 2 | 3 |

22EEL51 - EMBEDDED SYSTEM LABORATORY

	22EEL52 – POWER ELECTRONICS LABORATORY														
Progra Branci	imme& h	8	B.E &	Electri	cal and	Electro	onics E	Inginee	ring		Sem.	Category	L	ТР	Credit
Prereq	uisites	S	Nil								5	PC	0	0 2	1
Pream	ble		This of conve	course i rters an	s desig d contro	ned to ollers.	impart	practica	l knowl	edge at	oout the	various dev	vices,	Power el	ectronics
LIST O	F EXP	PERIM	IENTS	EXER	CISES:										
1.	Stead	dy sta	te chara	acteristi	cs of SC	R.									
2.	Singl	e Pha	ise half	controll	ed and f	fully cor	ntrolled	rectifier	s with R	and RL	loads				
3.	Three	e Pha	se fully	controll	ed rectif	iers wit	h motor	load							
4.	Step	down	and ste	ep-up co	onverter										
5.	5. Three Phase inverters – 180° and 120° mode of operation.														
6.	6. Three Phase AC voltage controller with R and RL loads														
7.	7. Simulation of DC converters (Single phase, three phase-controlled converters and choppers).														
8.	Simu	lation	of AC o	converte	ers (Inve	erter and	d AC vo	ltage re	gulator)).					
9.	PWN	1 signa	al genei	ration us	sing DS	PACE.									
10.	Desig	gn of d	converte	er											
															Total:30
REFEF	RENCE	ES/ M/	ANUAL	/SOFT	WARE:										
1.	Labo	ratory	Manua	I											
2.	MATI	LAB S	Software	;											
3.	DSP/	ACE,	PSIM s	oftware	and Po	wer qua	lity ana	lyzer							
COUR	SF OU	ITCOL	MES											BT Mar	ned
On cor	npleti	on of	the cou	urse, th	e stude	nts wil	l be abl	e to						(Highest	Level)
CO1	exam	nine a	nd estin	nate the	perform	nance o	of AC ar	nd DC c	onverte	rs				Analyzing Manipulati) (K4), on (S2)
CO2	demo	onstra	te and e	execute	the per	formand	ce of Inv	/erter ar	nd AC v	oltage c	controlle			Analyzing Manipulati	j (K4), on (S2)
CO3	desig	n and	l build a	suitable	e power	conver	ter							Applying Manipulati	(K3), on (S2)
														in in print	
C0~/P			BOJ	DO3	PO4		ng of C					PO11	DO1		DE02
COS/P		2	۲U2	2	2	1	FUO	FU/	1	2	2	3	2	- F3U	2
CO2	>	2	3	2	2	1			1	2	3	3	2	3	3
CO3	3	3	2	- 1	- 1	•			1	2	3	3	2	2	3
1 – Slic	aht, 2 –	- Mod	erate, 3	– Subs	tantial,	BT- Blo	om's Ta	axonom	V		_				

		22GEL51 - PROFESSIONAL SKILLS TRA	INING - I	I				
		(Common to All BE/ BTech Engineering and Techr	ology bra	anches)				
Progra Branc	amme & h	All BE/ BTech Engineering and Technology branches	Sem.	Category	L	т	Ρ	Credit
Prerec	uisites	Nil	5	EC	0	0	80	2
Pream	ble	This subject is to enhance the employability skills and to devel	op caree	r competency				I
Unit –	<u> </u>	Soft Skills – II :						20
Group of a te Facing Comm intervie	discussions am, why tea an interviev unication sk ews.	Advantages of group discussions-Structured GD- Team work: m-Elements of leadership, disadvantages of a team, stages o v: Foundation in core subject- industry orientation / knowledge ills-Activities before Interview, upon entering interview room	Value of f team fo e about th n, during	rmation- Gro rmation- Gro ne company- the intervie	n org up d prof w ar	janiz evelc essic nd a	ations- Lopment a ponal pers t the ei	Definition activities. sonality- nd Mock
Unit –		Quantitative Aptitude and Logical Reasoning – II:						30
Proble and p Probat reason reason	m solving le olynomial e bility-Statistic ing: Conditio ing- Quant b	vel II: Money related problems-Mixtures-Symbol base probler quations-Special, equations-Inequalities-Sequence and serie s-Data sufficiency- Geometry-Trigonometry-Heights and distan mality and grouping-Sequencing and scheduling- Selections-N ased reasoning-Flaw detection- Puzzles-Cryptarithms.	n-Clocks s-Set th ces-Co-c etworks:-	and calenda eory-Permuta ordinate geon Codes; Cube	ars-S ations netry es-Ve	imple an Men nn d	e-linear-o d comb suration liagram	inations- . Logical in logical
Unit –	III	Reading & Speaking Skills						30
Readin Identif compr of an Readin Sharin Presen Speak Teleph	ng: Reading ying and lo ehension / s argument – ng notices a g of Real T ntation on Va ing; Pair Dis nonic Conver	comprehension– Effective Reading strategies – Descriptive, Ir cating factual information within a text – global reading/ski canning for specific information – detailed comprehension / inte identifying the writer's attitude and opinions – Reading news nd book reviews –Interpreting graphic data & Advertisements. "ime Experience; Conversational Practices –Role Play – Sh rious Topics – Technical / Non-Technical Topics – Project Rev cussion – Group Discussion – The process of Group Discussion sations & Skills – Negotiating Skills.	nferential mming f ansive rea articles i Speaking nort Talks view Pres n – Strate	, & Argumen or general u ading – under in business r g: Mock Inter s / TED Tal entation – O egies to be ac	tative inder stan naga views ks – rator lopte	e rea stand ding zines zines s –So Exter y and d – S	ding pas ding – the deve s, newsj elf-Introo mpore; d Effectiv Skills As	ssages – selective elopment bapers – duction – Giving a ve Public sessed –
								Total:45
TEXT	BOOK:							
1.	Edgar Tho Services P	pe and Showick Thorpe, "Objective English for Competitive Exa vt Ltd, 2017.	mination	", 6th Edition	Pea	rson	India Eo	lucation
REFE	RENCES:							
1.	Aruna Kon	eru, "Professional Speaking Skills," Oxford University Press Indi	a, New D	elhi, 2015.				
2.	Thorpe, Sh	owick and Edgar Thorpe, "Winning at Interviews," 5th edition, P	earson E	ducation, Ind	ia, 20)13.		
3.	Rizvi, Ashr	af M, "Effective Technical Communication," 2nd Edition, McGrav	v Hill Edu	ication India,	2017	7.		

COUR On co	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 ar	nd PSO	s				
COs/POs	P01	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		

		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)					

		22EET61 – POWER SYSTEM PROTECTION AND	SWITCH	IGEAR					
Progra Branc	amme & h	B.E & Electrical and Electronics Engineering	Sem.	Category	L	٦	т	Р	Credit
Prerec	quisites	Generation, Transmission and Distribution	6/7	PC	3	(0	0	3
Pream	ble	This course covers the power system protection and switchge the various types of relays, circuit breakers and protective sci motor, transformer and transmission lines. It also covers the m	ar termir hemes a lodern ar	nologies and g dapted for th nd advanced	gives e pro relay	a ote	brie ectio yste	ef ins on of ems.	sight about alternator,
Unit –	l time Delever	Introduction:	a atta ba ar	Т				N	9
Protec Relay: – Diffe	tive Relays: Electromagn rential Relays	Need for Protection – Zones of Protection – Power System E etic Relays, Over Current Relays – Over Voltage Relays – Dista – Negative Phase Sequence Relay – Relay Coordination.	artning - ance Rela	ay: Impedanc	e, Re	ig ead	– C ctar	nce, l	Ification of Mho Relay
Unit –	11	Protection of Power Equipment:							9
Genera Protec Protec Protec protec	ator protection tion. Rotor F tion: Protection tion: Incipien tion.	h: Stator Protection: Percentage Differential Protection – Stator I rotection: Earth Fault Protection – Loss of Excitation – Rote on of Feeder and Ring Main System – Pilot Wire Protection: Fault Protection – Differential Protection – Over Fluxing Pr	nter-turn or Overh n – Carr otection.	Protection neating Prote ier Current F HVDC Prote	Stat ction Prote ectio	tor cti n:	· Ov Trar ion DC	erhe nsmi – Tr 2 and	ating ssion Line ransformer d AC side
Unit –	111	Theory of Circuit Interruption:							9
Physic Restrik Chopp	s of arc Phe king Voltage a ing –Interrupt	nomena and arc Interruption – Methods of arc Extinction – and Recovery Voltage – Expression for Restriking Voltage and ion of Capacitive Currents – Resistance Switching.	Theories Rate of	s of arc Inter f Rise of Res	rupti trikir	ion ng	י – Vol	Arc tage	Voltage – – Current
Unit –	IV	Circuit Breakers:							9
Classif Select – Indir	fication of Cir ion of C.B. – ect Testing.	cuit Breakers – Circuit Breaker Operating Mechanism: Oil, Ai Comparative Merits of Different Circuit Breakers – Testing of C.	r Blast, S B: Type	SF6, Vacuum Test and Rou	i – E tine	DC Te	Cii est –	rcuit - Dire	Breaker – ect Testing
Unit –	V	Advanced Relays:							9
Introdu Relays diagra Relays	uction of Micr s using Static m of Digital S s –Green Swit	pprocessor Based Protective Relay – Static Relays – Phase, A Comparators – Block Diagram of Numerical Relay: Power Syst gnal Processing based relay – Role of DSP in relaying – Sampli chgear.	Amplitude tem Data ing Theo	e Comparator a flow – Autor rem – Anti-ali	rs – nate asing	Sy d S g fi	nth Sub ilter	esis statio ing –	of Various on – Block - Arc Flash
		5							
		<u> </u>							Total:45
TEXT	BOOK:	v							Total:45
TEXT 1.	BOOK: Gupta J.B,	A Course in Power Systems", 11 th Edition, S.K.Kataria & Sons,	New Del	hi, 2017.					Total:45
TEXT 1. REFE	BOOK: Gupta J.B, RENCES:	A Course in Power Systems", 11 th Edition, S.K.Kataria & Sons,	New Del	hi, 2017.					Total:45
TEXT 1. REFE 1.	BOOK: Gupta J.B, RENCES: Paithankar Limited, 20	A Course in Power Systems", 11 th Edition, S.K.Kataria & Sons, Y.G & Bhide S.R, "Fundamentals of Power System Protectio 0	New Del n", 2 nd E	hi, 2017. Edition, Prenti	ce–F	РН	II Le	earni	Total:45
TEXT 1. REFEI 1. 2.	BOOK: Gupta J.B, RENCES: Paithankar Limited, 20 ⁻ Badri Ram 2011.	A Course in Power Systems", 11 th Edition, S.K.Kataria & Sons, Y.G & Bhide S.R, "Fundamentals of Power System Protectio 0 & Vishwakarma D.N, "Power System Protection and Switchgea	New Del n", 2 nd E ar", 2nd	hi, 2017. Edition, Prenti Edition, Tata	ce–F McG	PH	II Le aw F	earni Hill, N	Total:45 ng Private New Delhi,
TEXT 1. REFEI 1. 2. 3.	BOOK: Gupta J.B, RENCES: Paithankar Limited, 20' Badri Ram 2011. Madhava R	A Course in Power Systems", 11 th Edition, S.K.Kataria & Sons, Y.G & Bhide S.R, "Fundamentals of Power System Protectio 0 & Vishwakarma D.N, "Power System Protection and Switchgea ao T.S, "Digital/Numerical Relays", 1st Edition, Tata McGraw Hil	New Del n", 2 nd E ar", 2nd I, 2005.	hi, 2017. Edition, Prenti Edition, Tata	ce–F McG	PH	II Le	earni Hill, N	Total:45 ng Private New Delhi,

COUR: On cor	SE OUTCOMES: npletion of the course, the students will be able to	BT Mapped (Highest Level)
CO1	Understand the basic concepts of earthing and working of various protective relays.	Understand (K2)
CO2	Apply and select the various protective schemes for generator, motor, transformer and transmission line protections.	Apply (K3)
CO3	Analyze the phenomenon of arc, interruption and restriking voltages.	Analyze (K4)
CO4	Explain, compare and select the various types of circuit breakers for specific applications.	Understand (K2)
CO5	Understand the different types of advanced relays and protective systems.	Understand (K2)

					Mappin	g of CO	s with	POs an	d PSOs	5		PO12 PSO1 PS 1 3 1 1 3 2 1 3 2 1 3 2 1 3 2 1 3 2 1 2 1					
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2			
CO1	3	1				1			1			1	3	1			
CO2	3	2	1	1	1	1			1			1	3	2			
CO3	3	2	1	1	1	1			1			1	3	2			
CO4	3	1	1	1		1			1			1	2	1			
CO5	3	1			1	1	1		1			1	2	1			
						_											

		ASSESSMENT	PATTERN -	THEORY			
Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	10	60	25				100
CAT2	10	40	25	20			100
CAT3	20	80					100
ESE	10	50	20	20			100
* ±3% may be varied (C	CAT 1, 2 & 3 – 50 m	arks & ESE – 100 n	narks)				

22EET62 - ELECTRIC DRIVES AND CONTROL

Programme& Branch B.E & Electrical and Electronics Engineering Sem. Category L T P Credit Prerequisites Synchronous and Induction Machines, Power Electronics, Control Systems 6 PC 3 0 0 3 Preamble This course aims in imparting knowledge about various DC and AC drives and selection of two system – speed torue conventions applications 9 9 Elements of Electrical drives – Choice of Electrical drives - Torque balance equation of Drive system – speed torue conventions and multi quadrant operation – components of load torque – nature and classification of load torque – Modes of operation – Speed control and drive classification – classes of motor duty – determination of motor rating – Braking Methods 9 Init – II Converter/Chopper Fed DC Motor Drives: 9 Introduction to DC motor and their performance - Speed Control of DC Motors – Ward-Leonard Scheme – Drawbacks – single phase and three phase half. & fully controlled rectific recontrol of de separately excited motor – Dual converter fed DC separately excited motor fed from fully controlled rectific recontrol of de separately excited DC drives. 9 Three phase induction motor. Induction Motor Drives: 9 Three phase induction motor. Synchronous Motor Drives: 9 Types-synchronous motor variable speed drives – variable frequency control – modes of variabl													
Prerequisites Synchronous and Induction Machines, Power Electronics, Control Systems 6 PC 3 0 0 3 Preamble This course aims in imparting knowledge about various DC and AC drives and selection of drives for various applications This course aims in imparting knowledge about various DC and AC drives and selection of drives for various applications 9 Elements of Electrical drives - Choice of Electrical drives - Torque balance equation of Drive system – speed torque conventions and multi quadrant operation – classes of motor duty – determination of motor rating - Braking Methods 9 Unit - II Converter/Chopper Fed DC Motor Drives: 9 Introduction to DC motor and their performance -Speed Control of DC Motors – Ward–Leonard Scheme – Drawbacks – single phase and three phase half & fully controlled rectifier control of dc separately excited motor – Dual converter fed DC Separately excited motor fed from fully controlled rectifier – Class A, B, C, D & E chopper controlled separately excited DC drives. 9 Three phase induction motor Stator voltage control – Variable frequency control and slip power recovery schemes of Three phase induction motor. 9 Types-synchronous motor drive employing load commutated thyristor inverter – self-controlled synchronous motor drive employing a cycloconverter – Permanent magnet stepper motor Drives – Solar and Battery powered Drives – Drives for specific applications: EV Drives - Wind mill - textile mills – cranes and hoist drives – Steel rolling mills. 9 Types-synchronous motor drive permones -	Progra Branci	imme& า	B.E & Electrical and Electronics Engineering	Sem.	Category	L	т	Р	Credit				
Preamble This course aims in imparting knowledge about various DC and AC drives and selection of drives for various applications Unit - I Introduction to Electric Drives: 9 Elements of Electricial drives - Choice of Electrical drives - Torque balance equation of Drive system – speed torque conventions and multi quadrant operation – components of load torque – nature and classification of load torque – Modes of operation – Speed control and drive classification – classes of motor duty – determination of motor rating - Braking Methods 9 Unit - II Converter/Chopper Fed DC Motor Drives: 9 Introduction to DC motor and their performance -Speed Control of DC Motors – Ward–Leonard Scheme – Drawbacks – single phase and three phase half & fully controlled rectifier control of dc separately excited motor – Dual converter fed DC separately excited motor is phase induction motor Stator voltage control – Variable frequency control of phase induction motor: VSI based V/f control, CSI based control and converter rating– Rotor resistance control and slip power recovery schemes of Three phase induction motor. 9 Unit - IV Synchronous Motor Drives: 9 Types-synchronous motor variable speed drives – variable frequency control – modes of variable frequency control – self-controlled synchronous motor drive employing load commutated thyristor inverter – self-controlled synchronous motor drive employing load commutated thyristor inverter – self-controlled synchronous motor drive end permanent magnet stepper motor Drives – Solar and Battery powered Drives – Drives – Drives for specific applications: EV Drives - Wind mill - textile mills – cranes and hoist drives – Steel rol	Prereq	uisites	Synchronous and Induction Machines, Power Electronics, Control Systems	6	PC	3	0	0	3				
Preamble This course aims in imparting knowledge about various DC and AC drives and selection of drives for various applications unit -1 Introduction to Electric Drives: 9 Elements of Electrical drives - Choice of Electrical drives - Torque balance equation of bad torque – Modes of operation – Speed control and drive classification or load torque – Modes of operation – Speed control and drive classification - classes of motor duty – determination of motor rating - Braking Methods 9 Unit -1 Converter/Chopper Fed DC Motor Drives: 9 Introduction to DC motor and their performance -Speed Control of DC Motors – Ward–Leonard Scheme – Drawbacks – single phase and three phase half & fully controlled rectifier - Class A, B, C, D & E chopper controlled sparately excited motor – Dual converter fed DC Separately excited motor – Dual converter fed DC Separately excited motor – Dual converter recovery schemes of Three phase induction motor Stator voltage control – Variable frequency control of phase induction motor: VSI based V/f control, CSI based control – otosed loop speed control and converter rating– Rotor resistance control and slip power recovery schemes of Three phase induction motor. 9 Types-synchronous motor variable speed Mirves – variable frequency control – modes of variable frequency control – Self-controlled synchronous motor drive employing load commutated thyristor inverter – self-controlled synchronous motor variable speed drives – Variable frequency control – modes of variable frequency control – Self-controlled synchronous motor drive employing a cycloconverter – Permanent magnet synchronous motor (PMSM) drives - Electric Traction drive components. 9 Burshl													
Unit - I Introduction to Electric Drives: 9 Elements of Electrical drives - Choice of Electrical drives - Torque balance equation of Drive system – speed torque conventions and multi quadrant operation – components of load torque – nature and classification of load torque – Modes of operation – Speed control and drive classification – classes of motor duty – determination of motor rating - Braking Methods 9 Unit - II Converter/Chopper Fed DC Motor Drives: 9 Introduction to DC motor and their performance -Speed Control of DC Motors – Ward–Leonard Scheme – Drawbacks – single phase and three phase half & fully controlled rectifier control of dc separately excited motor – Dual converter fed DC separately excited motor fed from fully controlled rectifier on Class A, B, C, D & E chopper controlled separately excited DC drives. 9 Three phase induction motor Stator voltage control – Variable frequency control of phase induction motor: VSI based V/f control, CSI based control – closed loop speed control and converter rating – Rotor resistance control and slip power recovery schemes of Three phase induction motor. 9 Unit - IV Synchronous Motor Drives: 9 Types-synchronous motor variable speed drives – variable frequency control – modes of variable frequency control - Self-controlled synchronous motor drive employing load commutated thyristor inverter – self-controlled synchronous motor drive employing load commutated thyristor inverter – self-controlled synchronous motor drive employing load commutated thyristor inverter – Solar and Battery powered Drives – Drives for specific applications: EV Drives - Wind mill - textile mills – cranes and hoist drives – Ste	Pream	ble	This course aims in imparting knowledge about various DC ar applications	nd AC driv	ves and selec	tion	of dr	ives fo	or various				
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Unit – II Converter/Chopper Fed DC Motor Drives: 9 Introduction to DC motor and their performance -Speed Control of DC Motors – Ward–Leonard Scheme – Drawbacks – single phase and three phase half & fully controlled rectifier control of dc separately excited motor – Dual converter fed DC separately excited motor fed from fully controlled rectifier – Class A, B, C, D & E chopper controlled separately excited DC drives. 9 Unit – III Induction Motor Drives: 9 Three phase induction motor Stator voltage control – Variable frequency control of phase induction motor: VSI based V/f control, CSI based control – closed loop speed control and converter rating– Rotor resistance control and slip power recovery schemes of Three phase induction motor. 9 Unit – IV Synchronous Motor Drives: 9 Types-synchronous motor variable speed drives – variable frequency control – modes of variable frequency control – self-controlled synchronous motor drive employing load commutated thyristor inverter – self-controlled synchronous motor drive employing load commutated thyristor inverter – self-controlled synchronous motor drives – Variable requency control PMSM) drives - Electric Traction drives – Variable requency control (PMSM) drives - Steel rolling mills. 9 Bushless DC motor drives – Variable requence and permanent magnet stepper motor Drives – Solar and Battery powered Drives – Drives for specific applications: EV Drives - Wind mill - textile mills – cranes and hoist drives – Steel rolling mills. 9 Inter V BLDC, Stepper Motor Drives", 2nd Edition, Narosa Publishing House, New Delhi, 2019. 9	Elemer and mu control	nts of Electric ulti quadrant of and drive cla	al drives– Choice of Electrical drives -Torque balance equatic operation – components of load torque – nature and classificati ssification – classes of motor duty – determination of motor rati	on of Driv on of load ng - Brak	re system – s torque – Mo ing Methods	spee des	d tor of op	que co eratio	onventions on – Speed				
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Types-synchronous motor variable speed drives – variable frequency control – modes of variable frequency control – self-controlled synchronous motor drive employing load commutated thyristor inverter – self-controlled synchronous motor drive employing a cycloconverter – Permanent magnet synchronous motor (PMSM) drives - Electric Traction drive components. Unit – V BLDC, Stepper Motor Drives and Applications: 9 Brushless DC motor drives – Variable reluctance and permanent magnet stepper motor Drives – Solar and Battery powered Drives – Drives for specific applications: EV Drives - Wind mill - textile mills – cranes and hoist drives – Steel rolling mills. Total:45 TEXT BOOK: 1. Dubey G.K. "Fundamentals of Electrical Drives", 2nd Edition, Narosa Publishing House, New Delhi, 2019. REFERENCES: 1. Vedam Subrahmanyam "Electric Drives: Concepts and Applications", 2nd Edition, McGraw-Hill, New Delhi, 2010. 2. Singh M.D. and Kanchandani, "Power Electronics", 2nd Edition, Tata McGraw-Hill, New Delhi, 2016.	Unit –	IV	Synchronous Motor Drives:						9				
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	2.	Singh M.D.	and Kanchandani, "Power Electronics", 2nd Edition, Tata McGr	aw-Hill, N	lew Delhi, 20	16.							

COUR On cor	SE OU mpletio	TCOM on of t	IES: he cours	se, the st	udent	s will be a	able to						(BT Mapp Highest L	oed evel)
CO1	Analy	yze the	motor lo	ad charad	cteristi	cs								Applying	(K3)
CO2	Apply	y powe	r conver	ters for sp	eed co	ontrol of D	C drives	6						Applying	(K3)
CO3	Unde	erstand	the ope	ration and	contro	ol of Induc	tion mo	tor drive	es				Ur	nderstandir	ng (K2)
CO4	Analy	yze the	perform	ance of sy	/nchro	nous mote	or drives	3						Applying	(K3)
CO5	Unde	erstand strial ap	the ope	ration of s	pecial	electrical	machine	es and o	control	scheme	s for vari	ous		Applying	(K3)
<u> </u>			DO2	DO1	DO	Mapping	g of CO	s with	POs a	nd PSOs	5	D014	DO42	DCO1	DCOO
COS/P	'Us	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012	P501	P502
CO	1	3	2	1	1	1	1	1		1			1	2	3
CO2	2	3	2	1	1	1	1	1		1	1		1	2	3
CO	3	3	2	1		1							1	1	2
CO	4	3	2	1	1	1	1	1		1	1		1	2	3
CO	5	3	2	1	1	1							1	2	3
1 – Sliç	ght, 2 -	- Mode	rate, 3 –	Substant	ial, BT	- Bloom's	Taxono	my							
						ASSES	SMENT	PATTE	ERN -	THEORY	·				
Tes C	t / Blo atego	om's ry*	Re	memberi (K1) %	ng	Understa (K2)	anding %	Apply (K3)	ying %	Analyz (K4) 9	ing l %	Evaluating (K5) %	C	reating (K6) %	Total %
	CAT1			20		40		40)						100
	CAT2	2		20		40		40)						100
	CAT3	3		20		40		40)						100
	ESE			20		40		40)						100
* ±3% I	may be	e varie	d (CAT 1	, 2 & 3 – 5	50 mai	rks & ESE	– 100 r	narks)	L.		1		1		

					228	EEL61 -	- POW	ER SYS	TEM L	ABORA	TORY					
Progra	mma	2														
Brancl	h	ĸ	B.E &	Electri	cal and	l Electr	onics E	Enginee	ering		Sem.	Category	L	Т	P	Credit
Prereq	uisites	5	Gene Syste	ration 1 m Anal	Fransm ysis	ission	and Dis	stributio	on, Pow	/er	6	PC	0	0	2	1
Pream	ble		This c and c	ourse is arryout	s desigr various	ed to ir power :	npart pi system	ractical studies	knowled	lge abo	ut the va	arious transm	nissio	n lir	ne comp	onents
LIST C	F EXP	ERIM	IENTS	EXER(CISES:											
1.	Expe	rimen	ital ana	lysis of t	transmi	ssion lir	ne.									
2.	Analy	/sis of	f Ferrar	iti effect	•											
3.	Analy	/sis of	f Surge	impeda	nce loa	ding for	mediu	m transı	mission	line.						
4.	Form	ation	of bus a	admittar	nce mat	rix.										
5.	Load	flow a	analysis	s using (Gauss S	Seidal n	nethod.									
6.	IDMT Characteristics of over current relay/overvoltage relay.															
7.	Characteristics of Negative sequence/Differential relay.															
8.	Measurement of breakdown voltage of liquid dielectric.															
9.	Experimental Investigation of Dielectric Constants in Liquid Insulators.															
10.	Meas	surem	ent of i	nsulatio	n resista	ance.										
															-	Fotal:30
REFE	RENCE	S/ M/	ANUAL	/SOFT	WARE:											
1.	Labo	ratory	Manua	al												
2.	ΜΑΤΙ	LAB, I	Mi-pow	er Softw	are											
COUR	SE OU	TCON	MES:					• .							BT Map	ped
On col	mpletic	on of	the cou	urse, th	e stude	ents wil	l be ab	le to						н) А	pplying	_evel) (K3),
001	Com	pute t	ne line	parame	ters and	i evalua	ate the p	Senorma	anceind	lices.				Ma	nipulatio	on (S2)
CO2	Deter	rmine	the tim	e currer	nt chara	cteristic	s of an	alog/dig	ital/num	nerical r	elays.			Ma	nipulatio	(R4), on (S2)
CO3	Analy	/ze th	e perfo	rmance	of vario	us liqui	d dieleo	ctrics.						A Ma	pplying	(K3), on (S2)
						Маррі	ing of C	Cos wit	h POs a	nd PS	Os					
COs/P	Os F	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	P011	PO12	2	PSO1	PSO2
CO1		3	2	3	3		1	1		1	1	2	1		3	2
CO2	2	3	3	2	2	2	1	1		1	1	3	1	-	2	3
1 – Slic) ght, 2 –	ও · Mode	∠ erate, 3	T – Subs	tantial.	BT- Blo	1 om's Ta	1 axonom	y	1	1		1		3	2

Progra Branci	amme h	&	B.E &	Electri	cal and	Electro	onics E	Inginee	ring		Sem.	Category	L	т	Р		Credit
Prereq	luisite	es	Nil								6	PC	0	0	2		1
Pream	ble		This o	course	is desig	ned to	impar	t know	ledge	about t	he vario	ous drives.					
LIST O	F EXI	PERIM	IENTS /	EXER(CISES:												
1.	Simu	ulation	of close	ed loop	control	of conve	erter feo	d DC mo	otor driv	ve using	MATLA	B software.					
2.	Simu	ulation	of close	ed loop	control	of chop	per fed	DC mot	or drive	using I	MATLAB	software.					
3.	Simu	ulation	of VSI	fed Thre	e phas	e induct	tion mot	tor drive	using I	MATLA	3 softwa	re.					
4.	Simu	ulation	of Thre	e phase	e synchi	onous i	motor d	rive usir	ng MAT	LAB so	ftware.						
5.	Spee	ed con	trol of D	OC moto	r drive (using Th	nree ph	ase Red	ctifier.								
6.	Spee	ed con	trol of T	hree ph	ase ind	uction r	notor dı	rive usir	ng PWM	1 inverte	er.						
7.	FPG	A base	ed drive	e for indu	uction m	notor.											
8.	DSP	based	d Speed	l control	of BLD	C moto	r drive.										
9.	Speed control of PMSM Drive in open and closed loop.																
10.	DSP based chopper drive for DC Motor (Programming and Implementation).																
	DSP based chopper drive for DC Motor (Programming and Implementation). Total:30																
REFER	RENC	ES/ M/	ANUAL	/SOFT	WARE:												
1.	Labo	oratory	Manua	l													
2.	MAT	LAB S	Software)													
COUR	SE OL	JTCO	MES:												BT M	app	bed
On cor	mpleti	ion of	the cou	urse, th	e stude	nts wil	be abl	e to						(H A	i gne : nalvz	st L ina	evel) (K4)
CO1	exar	nine th	ne perfo	rmance	of DC a	and AC	drives u	using so	ftware t	001				Ma	nipul	atio	n (S2)
CO2	dem	onstra	te the s	peed co	ontrol of	DC and	d AC mo	otor usir	ng conv	entional	techniq	ues		A Ma	pplyi nipul	ng (atio	(K3) n (S2)
CO3	exec and	cute the specia	e mode Il electri	rn digita cal mac	l contro hines	l techni	ques fo	r the sp	eed cor	ntrol of E	DC moto	r, AC motor		A Ma	pplyi nipul	ng atio	(K3) n (S2)
						Маррі	ng of C	os with	n POs a	nd PSC	Ds						
COs/P	Os	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	P011	PO12	2	PSC	01	PSO2
CO1		3	3	2	2	1	1	1		1	1				3		3
CO2	2	3	2	1	1		1	1		1	1				2		3
CO3	3	3	2	1	1		1	1		1	1				2		3
1 – Slig	ght, 2 ·	– Mode	erate, 3	– Subs	tantial,	BT- Blo	om's Ta	axonom	у								

	22GCT31- UNIVERSAL HUMAN VALU	IES	A											
Programme &	(Common to All Engineering and Technology E	Sam	Cotogony		Ŧ	П	Cradit							
Branch	All BE/Biech Branches	Sem.	Category	L	1	P	Credit							
Prerequisites	Nil	3/6	BS	2	0	0	2							
Preamble	To make the student to know what they 'really want to be	in thei	r life and pro	ofes	sion,	unde	rstand the							
	meaning of happiness and prosperity for a human being. Also	o to faci	litate the stud	lents	s to u	Inders	tanding of							
	harmony at all the levels of human living, and live accordingly													
Unit – I	Introduction:						6							
Need and Basic Gu Exploration – Conte Aspirations – Contir Human Aspirations	idelines of Value Education – Content and Process of Value E ent and Process of Self exploration – Natural Acceptance – R nuous Happiness and Prosperity – Exploring Happiness and Pro – Relationships – Physical Facilities – Right Understanding	ducatior ealizatio osperity	n – Self Explo n and Under – Basic Requ	orati stan uirer	on – ding nent	purpo – Bas for Fu	se of self- sic Human Ifillment of							
Unit – II	Harmony in the Self and Body:						6							
Human Being and E	Body – Understanding Myself as Co-existence of Self ('I') and E	Body, Ne	eds of the Se	elf a	nd B	ody, A	ctivities in							
the Self and Body, S	Self ('I') as the Conscious Entity, the Body as the Material Entity	– Exerci	se – Body as	an I	nstru	ment-	- Harmony							
in the Self ('I) – Und	erstanding Myself – Harmony with Body.													
Unit – III Harmony in the Family and Society: Harmony in the Family – Justice – Feelings (Values) in Human Relationships – Relationship from Family to Society – Identif														
Harmony in the Fan	nily – Justice – Feelings (Values) in Human Relationships – Rela	ationship	from Family	to S	ociet	y – Ide	entification							
of Human Goal – Fi	if Human Goal – Five dimensions of Human Endeavour.													
Unit – IV Harmony in Nature and Existence:														
Conformance – International Conformance	nterconnectedness – Understanding the Four order – Innatene roduction to Space – Co-existence of units of Space – Limit	ed and	unlimited –	teris Activ	lic — Ve ar	Basic nd No	ACTIVITY –							
Existence is Co-exis	stence.		armined	, toti	c ui		activity							
Unit – V	Implications of the above Holistic Understanding of Harmo	ony on F	Professional	Ethi	cs:		6							
Values in different of Identification of Con Professional Ethics	limensions of Human Living – Definitiveness of Ethical Human (nprehensive Human Goal – Humanistic Education – Universa	Conduct Il Humar	-Implications	s of mpe	Value etenc	e base e and	ed Living – Issues in							
Trofessional Ethics.							Total:30							
TEXT BOOK:														
1. Gaur R.R.,	Sangal R., Bagaria G.P., "A Foundation Course in Human Value	s and Pr	ofessional Et	nics'	', 1 st	editior	n, Excell							
REFERENCES:	Ltd., New Deini, 2016.													
1. Ivan Illich. "	Energy & Eguity". The Trinity Press. USA, 1974.													
2. Schumache	r E.F., "Small is Beautiful: a study of economics as if people mat	tered". E	Britain, 1973.											
		,												
COURSE OUTCOM	ES:				E	BT Ma	pped							
On completion of t	he course, the students will be able to				(Hi	ghest	Level)							
CO1 restate the scenario in	meaning of happiness and prosperity and do a correct appraisal the society	of the cu	irrent		A	pplyin	g (K3)							
CO2 distinguish CO2	between the Self and the Body, understand the meaning of Harm ce of Self and Body	nony in tl	he Self, the		A	pplyin	g (K3)							
CO3 infer the val feelings in h	ue of harmonious relationship based on trust, respect and other numan-human relationships and explore their role in ensuring a h	naturally harmonic	acceptable		A	pplyin	g (K3)							
CO4 transform th	emselves to co-exist with nature by realising interconnectedness	s and fou	ur order of		A	pplyin	g (K3)							
CO5 distinguish better living	between ethical and unethical practices, and extend ethical and r	moral pra	actices for a		A	pplyin	g (K3)							

					Mapping	g of CO	s with	POs ar	nd PSOs	5					
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	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 <th< td=""></th<>															
CO5															
1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy															
ASSESSMENT PATTERN - THEORY															
Test / Bl Catego	ASSESSMENT PATTERN - THEORY Test / Bloom's Remembering Understanding Applying Analyzing Evaluating Creating Total Category* (K1) % (K2) % (K3) % (K4) % (K5) % (K6) % %														
CAT	1		25		75									100	
CAT	2		25		75									100	
ESE			NA											100	
* ±3% may b	be varie	d (CAT 1	& 2 - 60	marks	& ESE –	100 ma	rks)								

						228	EP61 -	- PROJ	ECT W	ORKI						
Progra Branci	amme h	8	B.E &	Electri	cal and	Electro	onics E	inginee	ring		Sem.	Category	L	т	Ρ	Credit
Prereq	luisite	es	Nil								6	EC	0	0	8	4
															Т	otal:120
COUR	SE O	UTCO	MES:											В	вт Мар	ped
On cor	mplet	ion of	the cou	urse, the	e stude	nts will	be abl	e to						(Hig	ghest L	.evel)
CO1identify a real-world problem and develop the design solutionsCO2select the proper components as per requirements of the design/system														A	oplying	(K3)
CO2 select the proper components as per requirements of the design/system														Ap	oplying	(K3)
CO3 apply the new tools, algorithms, methodologies that contribute to obtain the solution of the													е	An	alyzing	(K4)
	proj	ect														
CO4	ana	lyze th	e finding	gs and e	execute	the proj	ect with	develo	ped pro	ototype	as a tear	n		An	alyzing	(K4)
CO5	defe	end the	finding	s and co	onclude	with ora	al/writte	n repor	ts.					Eva	aluating	j (K5)
						Маррі	ng of C	os with	n POs a	nd PSC	Ds					
COs/P	Os	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	P012	2	PSO1	PSO2
CO1	l	3	2	3	2		3	2	3	2		2	1		2	2
CO2	2	3	2	3	2	2	3	2	3	2		2	1		2	2
CO3	3	3	3	2	3	3	2	1	2	3	2	3	2		1	1
CO4	ļ ļ	3	3	2	2	1	1	1	2	3	2	3	2		1	1
CO5	5	1		1	1				3	3	3	3	3		2	2
1 – Slig	ght, 2	– Mod	erate, 3	– Subs	tantial,	BT- Blo	om's Ta	ixonom	у			·				

				22EEL	.63 – P	OWER	ELECT	RONICS	S AND I	DRIVES		RATORY			
Progra Branch	imme8 h	2	B.E &	Electri	cal and	Electro	onics E	Inginee	ring		Sem.	Category	L	ТР	Credit
Prereq	uisites	S	Nil								5	PC	0	0 2	1
Preaml	ble		This c contro	ourse is Illers an	s desigr d variou	ned to in us drive:	npart pi s	ractical	knowled	dge abo	ut the va	arious Powe	er Elec	tronics c	onverters,
LIST O	F EXP	PERIM	IENTS /	EXER	CISES:										
1.	Simul	lation	of closed	l loop co	ntrol of	converte	er/ chopp	er fed D	C motor	drive us	sing softw	vare.			
2.	Simul	lation	of VSI fe	ed Three	phase ir	nduction	motor/ s	synchron	ious mot	or drive	using sof	tware.			
3.	Speed	l contr	ol of DC	motor c	lrive usi	ng Three	phase F	Rectifier.							
4.	Speed	l contr	ol of Th	ree phase	e inducti	on moto	r drive u	ising PW	'M inver	ter in 18	0° and 12	20° mode of	operati	on	
5.	Step d	down a	and step-	up conv	erter										
6.	Single	e Phas	e half co	ntrolled	and full	y control	led recti	ifiers wit	h R and	RL load	s				
7.	FPGA	A based	d drive fo	or induct	tion mot	or.									
8.	DSP b	based S	Speed co	ontrol of	BLDC r	notor dri	ve.								
9.	Speed control of PMSM Drive in open and closed loop.														
10.	PWM signal generation using DSPACE.														
															Total:30
REFER	RENCE	ES/ M/	ANUAL	/SOFT	WARE:										
1.	Labo	ratory	Manua	I											
2.	MATL	LAB S	oftware	•											
3.	DSPA	ACE,	PSIM so	oftware	and Po	wer qua	lity ana	lyzer							
COUR	SE OU	TCO	MES											BT M:	nned
On cor	npletic	on of	the cou	urse, th	e stude	ents will	l be ab	le to						(Highes	t Level)
CO1	exam	nine ai	nd estim	nate the	perform	nance o	of AC ar	nd DC co	onverte	rs				Analyziı Manipula	ıg (K4), tion (S2)
CO2	demo	onstra	te the s	peed co	ontrol of	DC and	d AC mo	otor usir	ng conve	entional	techniq	ues		Analyziı Manipula	ig (K4), tion (S2)
CO3	exect	ute the	e modei	rn digita	l contro	l techni	ques fo	r the sp	eed con	ntrol of E	DC moto	r, AC motor		Applyin	g (K3), tion (S2)
			. 0.0011						DC						
			PO2	BO 2	PO4	маррі	ng of C	os with		na PSC		PO11	DO11		
COS/P		2	3	2	2	1	1	1	1	2	2	3	2	2 730	2
CO2	>	<u>د</u> ع	3	2	2	1	1	1	1	2	3	3	2	3	2
CO3	- 3	3	2	1	1		1	1	1	2	3	3	2	2	3
1 – Slic	, aht, 2 –	- Mod	- erate, 3	- Subs	tantial.	BT- Blo	om's Ta	, axonom	v		5	, v	-	-	

		22GCT71 – ENGINEERING ECONOMICS AND M	ANAGE	MENT										
		(Common to All BE/BTech branches	5)											
Progra Branci	imme & n	All BE/BTech branches	Sem.	Category	L	т	Ρ	Credit						
Prereq	uisites	Nil	7	HS	3	0	0	3						
_														
Pream	ble	economics, national income, marketing, operations management,	nageme , accoun	nt by introduc ting principles	etc.	once	epts III	<e< td=""></e<>						
Unit –		Micro Economics						9						
Econor Equilib	nics – Bas rium – Circ	ics Concepts and Principles – Demand and Supply – Law of deman sular Flow of Economic Activities and Income.	nd and S	Supply – Dete	rmin	ants	– Mar	ket						
Unit – II Macro Economics, Business Ownership and Management concepts 9 National Income and its Measurement Techniques. Inflation - Causes of Inflation – Controlling Inflation – Business Cycle - Forr 9														
Nationa Busine Skills -	al Income a ss – Owne Levels of I	and its Measurement Techniques. Inflation - Causes of Inflation – C rship Types. Management concepts: Taylor and Fayol's Principles Management - Roles of Manager.	Controllin – Functi	ig Inflation – E ons of Manag	Busir Jeme	ess (ent - N	Cycle Manae	- Forms of gerial						
Unit –		Marketing Management						9						
Market Produc	ing - Core t Life Cycl	Concepts of Marketing - Four P's of Marketing - New Product Deve e - Pricing Strategies and Decisions.	elopment	t – Intellectua	Pro	perty	Righ	ts (IPR),						
Unit –	IV	Operations Management						9						
Operat and Co	ions Mana ontrol - Inve	gement - Resources - Types of Production System - Site Selection, entory - EOQ Determination.	, Plant L	ayout, Steps	n Pr	oduc	tion F	Planning						
Unit –	V	Financial Management						9						
Accour Even A	nting Princi Analysis – (ples – Financial Statements and its Uses – Depreciation - Straight Capital Budgeting - Significance – Traditional and Discounted Cash	Line and Flow Me	d Diminishing hods.	Bala	nce l	Metho	od – Break						
								Total:45						
TEXT	BOOK:													
1.	Compileo Engineer	I by Department of Management Studies, Kongu Engineering Colle s", 1 st Edition, McGraw Hill Education, Noida, 2013.	ege, "Ecc	pnomics and N	/lana	gem	ent fo	r						
REFER	RENCES:													
1.	Geetika,	Piyali Ghosh and Purba Roy Choudhury, "Managerial Economics",	3 rd Editi	on, McGraw-I	Hill, M	lew l	Delhi,	2018.						
2.	William J	. Stevenson, "Operations Management", 14 th Edition, McGraw-Hill	Educatio	on, 2021.										
3.	William G Educatio	6. Nickels, James M. McHugh, Susan M. McHugh, "Understanding n, New York, 2019.	Busines	s", 12 th Edition	n, Mo	Grav	w-Hill							

COUR: On con	SE O	UTCON on of th	IES: e cours	e, the stude	ents wi	l be able	to						BT (Hig	Mapped ghest Lev	/el)
CO1	iden	tify ma	rket equ	ilibrium an	d interp	ret natio	nal incor	ne calcu	ulations	and inf	lation iss	ues		Applying	(K3)
CO2	choo	ose a si	uitable k	ousiness ov	wnersh	p for the	r enterp	rise and	l illustra	ate mana	agerial fu	Inctions		Applying	(K3)
CO3	infer	r marke	ting ma	nagement	decisio	ns							U	nderstand	ing (K2)
CO4	appl	ly appro	opriate o	peration m	nanage	ment con	cept in b	ousines	s situat	ions				Applying	(K3)
CO5	inter	rpret fin	ancial a	nd accoun	ting sta	tements	and eva	luate ne	w prop	osals				Applying	(K3)
	Mapping of COs with POs and PSOs														
	Mapping of COs with POs and PSOs COs/POs PO1 PO1 PO1 PS01 PS01 PS02														
COs/P	COs/POs PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO12 PS01 PS02 CO1 1 1 2 3 2 2 3 2 2														
CO	CO1 1 2 3 2 2 3 2 2 3 2 2 3 2 3 2 3 2 3 2 3 2 3 2 3 2 3 2 3 2 3 2 3 2 3 2 3 2 3 2 3 2 3 2 3 2 3														
CO2	CO1 1 1 2 3 2 2 2 3 2 CO2 1 2 2 2 2 2 2 3 2														
COS	3	1	2	1			2		2	2	2	3	2		
CO4	4	1	2	1			2		2	2	2	3	2		
COS	5	2	2				2		2	2	2	3	2		
1 – Slig	ght, 2	– Mode	erate, 3	 Substant 	ial, BT∙	Bloom's	Taxono	my							
						ASSES	SMENT	PATTE	ERN - T	HEORY	·				
Tes C	t / Blo atego	oom's ory*	R	ememberi (K1) %	ng	Understa (K2)	anding %	Apply (K3)	/ing %	Analyz (K4) 9	ing %	Evaluating (K5) %) Cro (M	eating (6) %	Total %
	CAT	1		20		40)	40)						100
	CAT	2		20		40)	40)						100
	CAT	3		20		40)	40)						100
	ESE	E		20		40)	40)						100
* ±3% ı	may b	e varie	d (CAT	1, 2 & 3 –	50 mar	ks & ESE	E – 100 r	narks)							

22EEP71 – PROJECT WORK – II PHASE – I

Programme & Branch	B.E & Electrical and Electronics Engineering	Sem.	Category	L	т	Ρ	Credit
Prerequisites	Nil	6	EC	0	0	10	5

Total:150

COURS On cor	SE Ol npleti	UTCOI	MES: the cou	urse, th	e stude	ents will	l be abl	e to					(۲	BT Mapp lighest L	oed evel)
CO1	iden	tify a r	eal worl	d proble	em and	develop	the de	sign sol	utions					Applying	(K3)
CO2	sele	ct the	proper o	compon	ents as	per req	uiremer	nts of th	e desig	n/syster	n			Applying	(K3)
CO3	appl proje	y the r ect	new tool	s, algor	ithms, n	nethodo	logies t	hat con	tribute t	o obtair	n the solu	ition of the	ŀ	Analyzing	(K4)
CO4	D4 analyze the findings and execute the project with developed prototype as a team D5 defend the findings and execute with eval/written reports														(K4)
CO5	CO5 defend the findings and conclude with oral/written reports.														(K5)
1															
						Маррі	ng of C	os with	n POs a	nd PSC	Ds				
COs/P	Os	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1		3	2	3	2		3	2	3	2		2	1	2	2
CO2	2	3	2	3	2	2	3	2	3	2		2	1	2	2
CO3	;	3	3	2	3	3	2	1	2	3	2	3	2	1	1
CO4	-	3	3	2	2	1	1	1	2	3	2	3	2	1	1
CO5	;	1		1	1				3	3	3	3	3	2	2

22EEP81 - PROJEC	r work –	II PHASE – II
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Progra Branci	imme h	&	B.E &	Electri	cal and	Electro	onics E	inginee	ring		Sem.	Category	L	т	Ρ	Credit
Prereq	uisite	es	Nil								6	EC	0	0	8	4
															Т	otal:120
COUR	SE Ol	UTCOI	MES:											В	вт Мар	ped
On cor	mpleti	ion of	the cou	urse, th	e stude	nts will	be abl	e to						(Hi	ghest L	_evel)
CO1 identify a real world problem and develop the design solutions														Ap	pplying	(K3)
CO2 select the proper components as per requirements of the design/system														A	pplying	(K3)
CO3	CO3 apply the new tools, algorithms, methodologies that contribute to obtain the solution of the project Analyzing (K4)															
CO4	anal	lyze the	e finding	gs and e	execute	the proj	ect with	n develo	ped pro	ototype	as a tear	n		An	nalyzing	(K4)
CO5	defe	end the	finding	s and co	onclude	with ora	al/writte	n repor	s.					Eva	aluating	j (K5)
	1															
						Маррі	ng of C	os with	n POs a	nd PSC	Ds					
COs/P	Os	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	2	PSO1	PSO2
CO1		3	2	3	2		3	2	3	2		2	1		2	2
CO2	2	3	2	3	2	2	3	2	3	2		2	1		2	2
CO3	3	3	3	2	3	3	2	1	2	3	2	3	2		1	1
CO4	L I	3	3	2	2	1	1	1	2	3	2	3	2		1	1
CO5	5	1		1	1				3	3	3	3	3		2	2
1 – Slig	ght, 2 ·	– Mod	erate, 3	– Subs	tantial,	BT- Blo	om's Ta	ixonom	y	I	I	I				1

22EEE01 – POWER SEMICONDUCTOR DEVICES

Program Branch	me&	B.E & Electrical and Electronics Engineering	Sem.	Category	L	т	Р	Credit
Prerequis	sites	Nil	5	PE	3	0	0	3
					1	1		
Preamble	!	The objective of this course is to study and analyze the charac course also provides working operation of various firing and provides w	teristics otecting	of power sem circuits and it	icon s sig	ducto	or dev ation.	ices. This
Unit – I		Power Semiconductor Diodes:						9
Introductio – perform	on– power ance para	diode characteristics – power diode types: General purpose dio meters – Effects of forward and reverse recovery time – series c	odes, fas onnecteo	st recovery die d diodes –par	odes allel	and conr	scho lected	ttky diodes I diodes.
Unit – II		Power Transistors:						9
Introduction parameter transforme	on – Bipo rs, Gate o ers and op	blar junction transistor: performance parameters, based driv lrive – series and parallel operation – di/dt and dv/dt limitatic tocouplers – GaN, SiC Devices.	ve contr on – Isol	ol – Power lation of gate	MC an	SFE d ba	T: Pe se dri	erformance ves: pulse
Unit – III		Power Thyristors:						9
Introduction thyristors, controlled	on – two tr Gate tur Frectifiers	ansistor model of thyristor – di/dt and dv/dt protection – Thyristo n Off thyristors, Bidirectional Triode Thyristors, Reverse con - Performance parameters: SCR and GTO – series and parallel	r types: ducting operation	Phase contro thyristors an n of thyristors	l thy d lig	ristor ght a	s, fas ctivat	t switching ed silicon-
Unit – IV		Thyristors Firing and Commutation Techniques:						9
Thyristors commutat capacitors	s firing circ tion, comp s.	uits – natural commutation – forced commutation: self-commu lementary commutation, load side and line side commutation	tation, in – comn	npulse comm nutation circu	iutati iit de	ion, r esign	esona – co	ance pulse mmutation
Unit – V		Protection of Power Electronics Devices and Circuits:						9
Introduction protection with DC se	on – coolir i by seleni ource.	ng and heat sinks – snubber circuits – reverse recovery transier um diodes and metal oxide varistors – current protections: fusin	nts – sup g – fault	oply and load current with	side AC s	e tran sourc	sients e – fa	s – voltage ault current
								10101.40
TEXT BO	OK:							
1. R	Rashid M.H	., "Power Electronics Circuits, Devices and Applications ", 3rd Ed	dition, Pe	earson Educa	tion.	, Nev	v Delł	ni, 2003.
REFEREN	NCES:							
1. B	. Jayant B td , 2017.	aliga, "Gallium Nitride and Silicon Carbide Power Devices", New	Edition,	World Scient	ific F	Publis	shing	Co Pte
2. N	led Mohan ons, 2007	, Undeland and Robbin, "Power Electronics: converters, Applicat	ion and	design", 3rd E	Editio	on, Jo	ohn W	/iley and
3. T	sunenobu)evices, an	Kimoto and James A. Cooper, Fundamentals of Silicon Carbide d Applications, First Edition, John Wiley and sons, 2014	Techno	logy: Growth	, Ch	aract	erizat	ion,

COUR On co	SE OUTCOMES: mpletion of the course, the students will be able to	BT Mapped (Highest Level)
CO1	explain the basic principle and operation of Diode.	Understanding (K2)
CO2	explain the basic principle and operation of transistor	Understanding (K2)
CO3	explain the principle and operation of power thyristors	Understanding (K2)
CO4	Select the thyristor firing and commutation techniques	Applying (K3)
CO5	Develop firing and protection circuits of power semiconductor	Applying (K3)

	Mapping of COs with POs and PSOs													
COs/POs	PO1	PO2	PO3	PO4	PO5	P06	P07	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2				1						1	3	3
CO2	3	2				1						1	2	2
CO3	3	2	2			1						1	2	2
CO4	3	2	2			1						1	2	2
CO5	3	3	2			1						1	2	2

	ASSESSMENT PATTERN - THEORY												
Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %						
CAT1	20	80					100						
CAT2	20	60	20				100						
CAT3	20	60	20				100						
ESE	20	40	40				100						
* ±3% may be varied (C	±3% may be varied (CAT 1, 2 & 3 – 50 marks & ESE – 100 marks)												

22EEE02 - ARTIFICIAL INTELLIGENCE APPLICATIONS TO POWER SYSTEMS

Program Branch	nme &	B.E & Electrical and Electronics Engineering	Sem.	Category	L	т	Р	Credit
Prerequi	isites	Power System Analysis	5	PE	3	0	0	3
Preamble	e	This course explores the concepts of application of artificial i	ntelligenc	e to power sy	stem	prot	olems	
Unit – I		Introduction to power system operation:						9
Introduct problem	ion to term with smooth	ninologies: Reactive power planning, Generation Planning, n cost functions – Equal incremental cost – lambda iteration me	load shed ethod with	dding, Econo and without I	mic oss	load	dispa	atch – ED
Unit – II		Introduction to AI:						9
Artificial genetic a	intelligence algorithm – p	e, computational intelligence, Evolutionary algorithms - evolu particle swarm optimization	itionary pi	rogramming -	- evo	olutio	nary	strategy -
Unit – III		Evolutionary algorithm for Reactive Power Planning:						9
Optimal r	reactive pov	ver planning problem – Objective function – P – Q decompositi	ion – Flow	chart – case	stud	у		
Unit – IV	1	Particle Swarm Optimisation for ED problem:						9
Nature ir problem	nspired tecl - updation	hniques – ED problem with smooth cost functions – Modific of parameters – case study	ation in P	SO with rega	ard to	eco	onomi	c dispatch
Unit – V		Applications:						9
Radial Ba	asis functio	n – RBFNN for distribution system automation - decision tree for	or DSA – o	case study				
								Total:45
TEXT BO	DOK:							
1. ^E	Edited by M Artificial Inte	lircea Eremia, Chen-ching Liu and Abdelaty Edris, Advanced S elligence, IEEE press series on Power Engineering, 2016.	olutions ir	Power Syste	ems -	- HV	DC, F	ACTS and
REFERE	NCES:							
1. \	Weerakorn	Ongsakul and Dieu Ngoc Vo, Artificial intelligence in Power Sy	stem optir	mization — C	RC F	ress	, 201:	3
2. \	Wolfgang E	rtel, Introduction to Artificial Intelligence, Springer Cham- 2 nd E	dition, 201	8				

COUR On co	SE OL mpleti	JTCOM on of t	IES: he cour	se, the stu	udents	will be a	able to						(BT Mapp Highest L	oed .evel)
CO1	Desc	cribe th	e variou	s power sy	stem o	peration							Ur	nderstandii	ng (K2)
CO2	Disc	uss the	artificia	intelligend	ce tech	niques							Ur	nderstandii	ng (K2)
CO3	Appl	y evolu	tionary t	echnique t	o powe	er system	probler	n						Applying	(K3)
CO4	Perc	eive the	e nature	inspired te	echniqu	ie and its	applica	tion to e	econor	nic dispa	itch prot	olem		Applying	(K3)
CO5	Unde	erstand	the AI t	echniques	to sim	ole powe	r system	n proble	ms				Ur	nderstandi	ng (K2)
00.0		DQ (Dee	504	Mappin						5044	DO10	5004	2000
COs/H	JOS	P01	P02	PO3	P04	P05	P06	P07	P08	P09	PO10	P011	P012	PS01	PS02
CO	1	3	2	1	1		1			1			1	3	2
CO	2	3	2	1		1	1			1			1	2	1
CO	3	1	3	2			1	1	1	1			1	3	1
CO	4	3	1	2		1	1	1	1	1			1	1	3
CO	5	3	2	1		1	1			1			1	3	1
1 – Slig	ght, 2 -	– Mode	rate, 3 -	Substanti	al, BT-	Bloom's	Taxono	my			I			1	
						40000	OMENT	D 4 7 7			,				
						ASSES	SWIENI	PAILE	- KN -	THEORY					
Tes	st / Blo Catego	om's ory*	Re	memberii (K1) %	ng	Understa (K2)	anding %	Appl (K3)	ying) %	Analyzi (K4) 9	ing %	Evaluating (K5) %		reating (K6) %	Total %
	CAT	1		25		75									100
	C A T	`		20		40			`						100

CAT2	20	40	40		100
CAT3	10	45	45		100
ESE	5	60	35		100
* +3% may be varied (C	CAT 1, 2 & 3 – 50 ma	arks & ESE – 100 n	narks)		

B.E.– Electrical and Electronics Engineering, Regulation, Curriculum and Syllabus – R2022

					2	22EE	EEC	03 -	– R	REN	NEV	NA	BL	E	EN	ER	GY	S	YSI	ЕМ										
Programme Branch	8	B.E	& Elec	ctrica	l and	d Ele	lect	tron	nics	s E	Ingi	ine	er	ing	J					Sen	۱.	С	ateg	jory	L	т	F	2	С	redit
Prerequisite	es	Nil																		5			PE		3	0	()		3
Preamble		This ener	course gy sou	e con rces a	ifers and v	the vario	e ne ous	ew i s nua	me ianc	etho ces	odol s be	log ehir	jies nd i	s ar ren	nd iew	reo ab	cen le e	nt te ene	ech rgy	nolog conv	jies ers	fo	r eff pro	ectiv	/e ut s.	ilizati	on	of r	ene	wable
Unit – I		Prin	ciples	of re	newa	able	e en	nerg	gy																					9
Introduction- Design and energy scen	 Energy develop ario of c 	gy and pment, conver	sustaii Types itional a	nable of RE and R	dev E sou E so	elop urces ource	ome es, L es.	ent Limi	- F nitati	Fun tion:	ndai ns o	me of R	enta RE :	als sou	l - Jrce	mp es,	oort teo	anc chn	ce (lical	of rei impl	nev ica	/ab tion	le s s- F	rese	es o ent In	f ene dian	and	Sı int	usta erna	iinable ational
Unit – II		Sola	r Ener	gy																										9
Solar radiat collectors. S	ion at t olar ele	the ea ectric p	rth's s ower ge	urface enera	e – tion:	Sola Sola	ar r Iar F	radi Pho	liatio oto-	ion -Vol	me oltai	eas ics	sure – A	em App	ent olica	s– atic	So Sns	olar of	r er sola	nergy ar en	cc erg	olleo y: s	tors olar	: fla pun	it pla nping	te a and	nd (sola	con ar c	cen ook	trating ing.
Unit – III	Unit – III Vind Energy 9																													
Basic compo machines – systems – S	onents o Perform afety sy	of a wi mance systems	nd ene of winc – Envi	ergy c l mac ronm	onve hines ental	ersio s– G I asp	on s Gen pec	syst nera cts.	tem ating	n – ng s <u>y</u>	Cla syst	ass tem	sific n —	cati En	ion. nerg	.W gy:	/ing sto	g Ei rag	ner e –	ду Со Арр	olle ica	cto tion	rs: h is of	oriz win	ontal d En	axis ərgy	anc – In	l ve terc	ertica conr	al axis nected
Unit – IV	Unit – IV Bioenergy, Geothermal Energy and Ocean Energy 9																													
Bioenergy: Geothermal power–Com	Biomas: Energy: ponents	ss con y: Geot ts – Op	version hermal eration	tech sourc meth	nnolo ces – iods,	ogies - Prii Oce	s – ime ean	- B emo nwa	Biog love ave	gas ers f es –	i g∉ for - Er	ene ge ner	era oth gy	nerr an	n – mal id p	- C l er	Clas nerg /er	ssifi gy (fror	icat con m w	ion versi vaves	of I on.	oiog Oc	gas ean	plar Ene	nts – ergy:	Eth Basi	ano c pri	l p ncip	rodu ole d	uction. of tidal
Unit – V		Add	itional	Alter	nate	e En	nerg	gy S	Sou	urce	es	an	d (Che	emi	ica	ΙE	ner	rgy	Sou	rce	s								9
MHD power Transportati	r gener on and i	eration I utilizat	– The ion – H	rmoel ydrog	lectri gen a	ic po as ar	oowe in al	er Iteri	ger rnati	enera tive	ratio e fue	on. el fe	C or	chei mo	mic tor	cal ve	er hic	les	gy : – F	souro ^T uel c	es: ell	- P	ydro rinc	gen ple	pro – Typ	ducti es.	on -	- 5	Stor	age –
																													То	otal:45
TEXT BOOK	K :																													
1. Rai	1. Rai G.D., "Non-Conventional Energy Sources", 6th Edition, Khanna Publishers, New Delhi, 2017.																													
REFERENC	ES:																													
1. Kotł Lea	hari D.P rning P∖	P, Sing Pvt. Ltd.	al K.C , New I	& Ra Delhi,	akesh 201	h Ra 1.	anja	an.	"Re	Rene	ewa	able	еE	Ene	ergy	/ S	oui	rces	s ai	nd E	mei	gin	g Te	echr	olog	es",	2nd	Ec	litior	n, PHI
2. Joh	n Twide	ell & To	ny We	r. "Re	enew	vable	e Er	ner	rgy	Re	esou	urc	es'	", 3	srd	Ed	itio	n, F	Rou	tledg	e, I	Vev	/ Yo	rk, 2	015.					
3. Sho	bh Nath	th Singh	n, "Non	-conv	entic	onal	l En	nerg	gy re	reso	ouro	ces	s" F	Pea	arsc	on I	Edu	ıca	tion	, 201	5.									

COUR On co	SE OUTCOMES: mpletion of the course, the students will be able to	BT Mapped (Highest Level)
CO1	understand the various renewable Energy Sources and technologies.	Understanding (K2)
CO2	understand the working and applications of solar energy systems	Understanding (K2)
CO3	explain the working and applications of wind energy systems	Understanding (K2)
CO4	express the principle of the bio-energy production techniques and operation of geothermal energy and ocean energy sources	Understanding (K2)
CO5	explain the operation of additional alternate energy sources	Applying (K3)
1		

	Mapping of COS with POS and PSOS													
COs/POs	P01	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2			1	1					1	2	3
CO2	3	2	2			1	1					1	2	3
CO3	3	2	2			1	1					1	2	3
CO4	3	2	2			1	1					1	3	2
CO5	3	2	1	1		1	1					1	3	2
1 – Slight, 2	– Mode	rate, 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	20	80					100						
CAT2	20	80					100						
CAT3	20	60	20				100						
ESE	20	60	20				100						
* ±3% may be varied (0	±3% may be varied (CAT 1, 2 & 3 – 50 marks & ESE – 100 marks)												

		22EEE04 – MODELING OF ELECTRICAL MA		6						
Programm Branch	ne &	B.E & Electrical and Electronics Engineering	Sem.	Category	L	т	Ρ	Credit		
Prerequisi	ites	Synchronous and Induction Machines, Control Systems	5	PE	3	0	0	3		
Preamble		This course aims in imparting knowledge on Modeling of AC ar	nd DC M	achines base	d or	n gene	eralize	ed theory		
Unit – I		Principles of Electromechanical Energy Conversion						9		
Introduction Forces/Tor Electromec	n – Enerç ques in chanical S	gy in Magnetic System – Field Energy and Mechanical Force system with permanent Magnets –Energy Conversion vi ystems.	– Multip ia Elect	ole Excited N rric Field –	lagr Dy	ietic F namio	Field C Equ	Systems – uations of		
Unit – II		Generalized Theory						9		
Basic two p Transforma Machines	pole mach ation from	nines – Kron's Primitive Machine- Invariance of Power – Trans Rotating axes to Stationary axes - Electrical Torque– Restr	formatio iction of	ns from Thre the General	e P izec	hase I The	to Tw ory of	o Phase – f Electrical		
Unit – III		DC Machines						9		
Separately Leonard Sy	Excited	D.C Generators and Motors – Steady State and Transient An Speed Control - Transfer Function of D.C Series, Shunt, Compou	alysis - und Macl	Interconnecti hines.	on	of Ma	ichine	s – Ward-		
Unit – IV		Poly-phase Synchronous Machines						9		
General Ma - Concepts	achine Eq of Synch	uations-Three Phase Synchronous Machine - Steady state anal ronous machine reactance – Concepts of Synchronous Machine	lysis– Tr 9 Dynami	ansient analy ics.	sis	(quali	tative	Approach)		
Unit – V		Induction Machines						9		
Transforma Induction M	ations - pe /lachine D	erformance equations – Steady State Analysis – Analysis of Eq ynamics- Introduction to Ansys software and design of induction	uivalent motor	Circuit - Toro	que	Slip (Chara	cteristics -		
								Total:45		
TEXT BOC	DK:									
1. Bir	mbhra P.S	S., Generalized Theory of Electrical Machines∥, 5th Edition, Khar	nna Publ	ishers Ltd., 2	021					
REFERENCES:										
1. Kri	ishnan R.	Electric Motor Drives: Modeling, Analysis, and Controll, 1st Edi	ition, PH	I Learning, 20)15.					
2. Ko	othari D.P.	, Nagrath I.J., Electrical Machinesll, 4th Edition, McGraw Hill Boo	ok Comp	any, 5th Rep	rint	2012.				
3. Bir	mal K. Bo	se, Modern Power Electronics and AC DrivesII, 1st Edition, PHI L	Learning	, 2017.						

COURS On cor	COURSE OUTCOMES: On completion of the course, the students will be able to													BT Mapped (Highest Level)			
CO1	appl	y the ba	asic princ	iples of e	lectrome	echanica	al energy	/ conve	rsion					Applying	(K3)		
CO2	dete	ermine t	he equiva	alent circu	iit param	neters ar	nd mode	el the ele	ectrical	machin	es			Applying	(K3)		
CO3	anal	yze the	steady s	tate and t	ransient	t charact	teristics	of DC n	nachine	S				Analyzing	(K4)		
CO4	CO4 design the mathematical model of polyphase synchronous machines Applying (K3)																
CO5	CO5 analyze the steady state characteristics of induction machines Analyzing (K4)																
						Mappin	g of CO	s with	POs an	d PSO	S			-			
COs/P	Os	P01	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2		
CO	1	3	1	1	2					1			1	1	3		
CO	2	3	3	2	2					1			1	2	3		
CO	3	3	3	2	2					1			1	3	3		
CO4	4	3	3	3	2					1			1	3	3		
CO	5	3	3	2	2					1			1	3	3		
1 – Slig	ht, 2	– Mode	erate, 3 –	Substanti	al, BT- I	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 20 40 40 100														
CAT2	10	40	40	10			100							
CAT3	10	40	40	10			100							
ESE 10 20 50 20 100														
* ±3% may be varied (CAT 1, 2 & 3 – 50 marks & ESE – 100 marks)														

		22EEE05 – VLSI DESIGN										
Progra Branch	mme &	B.E & Electrical and Electronics Engineering	Sem.	Category	L	т	Ρ	Credit				
Prereq	uisites	Digital Electronics	5	PE	3	0	0	3				
Preamb	ble	To expose the knowledge of VLSI System Design in terms of r logic circuits with its fabrication techniques and programmin Hardware Description Language in different modeling	modeling ng vario	g of MOS trar us digital log	isisto gic c	ors, c circuit	lesign ts usi	ing CMOS ng Verilog				
Unit – I		Introduction						9				
CMOS	Logic – CMC	S Fabrication and Layout – Physical Design – Design Verification	on – Fab	rication, pack	agir	ig an	d Tes	ting				
Unit – I		MOS Transistor Theory						9				
Introduo charact	ction – MOS eristics	S transistor operating regions – Long Channel VI characteri	istics –	Non ideal I-	∙V e	ffects	s - D	C transfer				
Unit – I	11	CMOS Processing Technology						9				
Introduo Techno	ction – CMO logy related	S technologies – Stick Diagram – Layout diagram – Layout De CAD Issues – Manufacturing Issues	esign Ru	les – CMOS	Pro	cess	Enha	ncement –				
Unit – I	V	VERILOG HDL-I						9				
VLSI D Types - controls	esign Flow - – Dataflow r s – Condition	 Dataflow modelling – Continuous Assignments – Delays – nodelling Examples – Behavioural modelling – Structured Pr al statements - Multiway branching -Loops - Behavioural modelli 	Expressi ocedure ing Exan	ions, operato s - Procedui nples	rs, c al A	opera Assigi	ands - nment	- Operator s –Timing				
Unit – V	V	VERILOG HDL-II						9				
Tasks a level me	and Function odelling Elem	s – Difference between tasks and functions – Tasks – Functionents - Switch level modelling Examples	ons – Us	eful Modellin	g Te	echni	ques	 Switch 				
								Total:45				
TEXT E	300K:											
1.	Neil H. E. W Pearson ed	/este & David Money Harris, "CMOS VLSI Design A Circuits and ucation, New Delhi, 2017, for Units I, II, III	I System	is Perspective	e" Fo	ourth	Editic	'n,				
2.	Samir Palni 2017, for Ur	tkar, "Verilog HDL: Guide to Digital Design and Synthesis", Seco nits IV, V.	ond Edition	on, Pearson I	Educ	atior	n, New	/ Delhi,				
REFER	ENCES:											
1.	1. Pucknell, Douglas A & Eshragian, K., "Basic VLSI Design", Third Edition, Prentice Hall India, Pvt Ltd, 2015.											
2.	A.Albert Ra	& T.Latha, "VLSI Design", Prentice Hall India Learning Private I	Limited,	2008.								

COUR On cor	SE O mplet	UTCON ion of t	IES: he cou	Irse, the st	udent	s will be	able to						(BT Mapp Highest L	oed evel)
CO1	Com	npreher	nd the p	rinciples of	СМО	S Logic ar	nd its ph	iysical d	lesign	process.			Ur	derstandi	ng (K2)
CO2	Exp	lain MO	S trans	sistor chara	cterist	ics.								Applying	(K3)
CO3	Des	cribe C	MOS fa	brication te	echniq	ues, layou	t desigr	rules a	nd dif	ferent ma	nufactur	ing issues	Ur	Iderstandi	ng (K2)
CO4	App beha	ly Verilo avioural	og HDL I mode	modeling f ling.	or diff	erent digita	al logic (circuits	in data	aflow mod	delling ar	nd		Applying	(K3)
CO5	Mod	lel diffei	rent dig	ital logic ci	rcuits	using Veril	log HDL	in Swit	ch lev	el modeli	ng.			Applying	(K3)
	Mapping of COs with POs and PSOs														
COs/F	POs	PO1	PO2	PO3	PO	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO	COS/FOS FOI FO2 FO3 FO4 FO3 FO6 FO7 FO6 FO3 FO10 FO11 FO12 FS01 FS02 CO1 3 2 1 1 1 1 1 1 2														
CO	2	3	2	1	1	1							1	3	1
CO	3	3	2	1	1	1							1	3	1
CO	4	3	3	3	1	3				2		2	2	3	3
CO	5	3	3	3	1	3				2		2	2	3	3
1 – Slię	ght, 2	– Mode	erate, 3	- Substan	ial, B	- Bloom's	Taxono	omy							
						ASSES	SMENT	PATTE	ERN -	THEORY	,				
Tes C	t / Blo atego	oom's ory*	F	ememberi (K1) %	ng	Understa (K2)	anding %	Apply (K3)	ying %	Analyz (K4) 9	ing %	Evaluating (K5) %) C	reating (K6) %	Total %
	CAT	1		10		70		20)						100
	CAT	2		10		60		30)						100
	CAT3 10 30 60 100														
	ESE 10 40 50 100 100														
* ±3%	may b	e varie	d (CAT	1, 2 & 3 –	50 ma	rks & ESE	E – 100 I	marks)							

		22EEE06 – INDUSTR	Y 4.0 FOR ELECTRICAL	ENGINE	ERS				
Progra Branc	amme& h	B.E & Electrical and Electronics I	Engineering	Sem.	Category	L	т	Ρ	Credit
Prerec	uisites	NIL		5	PE	3	0	0	3
Pream	ble	To impart basic idea in Industry4.0. 4.0 Systems for various application smart vehicular applications.	To provide students with a Learn the design and a	good dep nalysis o	th of knowled f Industry 4.0	ge o sys	f de: ems	signin s for E	g Industrial Energy and
Unit –		INTRODUCTION TO INDUSTRY 4	.0						9
Introdu contrib Roboti	uction, Histori ute to its devization and au	cal Context, General framework, Ap lopment, Artificial intelligence, The Ir omation, Current situation of Industry	oplication areas, Dissemin nternet of Things and Indu y 4.0. Introduction to Indus	nation of strial Inte stry 4.0 to	Industry 4.0 rnet of Things Industry 5.0	and s, Ad Adva	the ditiv nce:	disc e mar s	iplines that nufacturing,
Unit –		CYBER PHYSICAL SYSTEM							9
Introdu Emerg	iction to Cyb ing applicatio	er Physical Systems (CPS), Archit as in CPS in different fields. Security	ecture of CPS- Compon and utility.	ients, Da	ta science a	nd t	echi	nolog	y for CPS,
Unit –		SMART ENERGY SOURCES AND	ADVANCES						9
Energy Energy	/ Storage for / Storage: V2	Aitigating the Variability of Renewable Capacity Estimation. Model based	e Electricity Sources-Type Engineering.	s of elect	ric energy sto	rage	. Ele	ectric '	Vehicles as
Unit –	IV	SMART GRID							9
Smart grid an	grid definition d Industry 4.0	and development Smart Grid, Under	standing the Smart Grid, S	Smart grid	d solutions, De	esigr	ı cha	alleng	es of smart
Unit –	V	SMART APPLICATIONS							9
Unders Smart	standing Sma Cars, Self-Dr	rt Appliances -Smart Operation-Sm ving Cars, Introducing Google's Self-	art Monitoring-Smart Ene Driving Car.	ergy Savi	ngs-Smart M	ainte	nan	ce, C	ase study-
									Total:45
TEXT	BOOK:								
1.	Jean-Claud	André, Industry4.0, Wiley-ISTE, July	2019, ISBN: 7817863048	27, 2019	for Units I, II.				
2.	Diego Gala Francis,202	 Pascual, Pasquale Daponte, Uda b. for Units III, IV, V. 	y Kumar, -Handbook of	Industry	4.0 and SMA	RT	Sys	tem,	Taylor and
REFE	RENCES:								
1.	Miller M, Th Education, 1	einternet of things: How smart TVs, s 015, ISBN:9780134021300.	mart cars, smart homes, a	and smart	cities are cha	Ingin	g th	e wor	ld, Pearson
2.	Pengwei De resources \	and Ning Lu, —Energy storage for ERs, Academic Press, 2018, Reprint	⁻ smart grids: planning an edition, ISBN-13:978-012	d operati 8100714	on for renew	able	and	varia	able energy
3.	Hossam A.	Gabbar, —Smart Energy Grid Engine	ering, Academic Press, 20	017, ISBN	N 978- 0-12-8	0534	3-0.		

COUR On cor	COURSE OUTCOMES: On completion of the course, the students will be able to													BT Mapped (Highest Level)		
CO1	Und	erstand	the basic	c concept	s of Indu	ustry 4.0) and the	e other i	elated f	ields			Ur	nderstandir	ng (K2)	
CO2	Und	erstand	cyber ph	nysical sy	stem an	d the en	nerging	applicat	ions				Ur	nderstandir	ng (K2)	
CO3	Ana	lyze the	different	energy s	torage s	systems								Applying	(K3)	
CO4	CO4 Analyze a smart grid system Applying (K3)															
CO5	CO5 Implement the industry 4.0 to solve engineering problems Applying (K3)															
						Mappin	g of CO	s with	POs an	d PSOs	5					
COs/F	Os	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	
CO	1	3	1				1	1		1			1	1	3	
CO	2	3	2	1	1		1	1		1			1	2	3	
CO	3	3	2	1	1		1	1		1			1	2	3	
CO	4	3	1				1	1		1			1	1	3	
CO	5	3	2	1	1		1	1		1			1	2	3	
1 – Slię	– 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	80					100						
CAT2	10	70	20				100						
CAT3	10	60	30				100						
ESE	10	70	20				100						

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

		22EEE07 – ADVANCED POWER ELECTR		JITS				
Programm Branch	le&	B.E & Electrical and Electronics Engineering	Sem.	Category	L	Т	F	P Credit
Prerequisi	tes	Power Electronics	6	PE	3	0) (3
Preamble		This course is designed to impart knowledge about the conconverter for power electronics circuits.	figuration, co	ontrol strategies	and	bad	ck to	back
Unit - I		Configuration of Power Electronics Circuit						9
Neutral po converter -	int clamp - PWM In	ed configuration: Three level and Five level configurations aplementation of single and two H bridge converter – flying ca	 cascade apacitor conf 	configuration: iguration: three	sing phas	le a se F	and t C co	wo H bridge nverter.
Unit - II		Optimized PWM approach						9
Introduction modulation converter.	n – two – other	leg and three leg converter Model, PWM implementation, configuration with CPWM: three leg and four converter –	Analog and Nonconven	d digital impler tional topologie	nenta es wi	tion th (n – s CPW	space vector M: Z-Source
Unit - III		Control strategies for Power Converters						9
Introduction linear contr	n – basic ol with ac	control principles – hysteresis control – linear control with variable – cascade control strategies: rectifier circuit for volt	DC variable age and cur	e: P, PI and PII rent control.	D cor	ntro	oller f	or RL load –
Unit - IV		Single Phase to Single Phase Back-to-Back Converters	5					9
Introduction PWM strate	n – Full I egies - To	Bridge converter: Model, PWM strategy, control approach – poologies with increased number of switches: converter in ser	topology wi	th component allel.	coun	t re	ducti	on: Model –
Unit – V		Design of converter						9
Introduction topology w back-to-bac	n – Full E rith comp ck conve	Bridge converter: Model, PWM strategy, control approach, D0 onent count reduction – Topologies with increased number rters.	C link capac of switches	itor voltage, and converter in s	d cap series	aci ar	itor band pa	ank design – rallel - other
								Total:45
TEXT BOC	DK:							
1. Eu	zeli dos S	Santos, Edison R. da Silva, "Advanced Power Electronics Co	nverters", 1 ^s	Edition, John	Niley	an	d sor	is, 2014
REFEREN	CES:							
1. Ra	shid M.H	., "Power Electronics Circuits, Devices and Applications ", 4th	n Edition, Pe	arson Educatio	n., N	ew	Delh	, 2014.
2. Ne	ed Mohan hn Wiley	, Tore M. Undeland & William P.Robbins, "Power Electronics and sons, 2007	: converters,	Application an	d Des	sigr	n", 3ro	d Edition,
3. ME) Singh a	nd K.B Khanchandani, "Power Electronics", 2nd Edition, McG	Graw Hill, 20	13.				

COUR On co	SE Ol mplet	UTCON ion of t	IES: he cour	se, the st	udents	will be	able to						(BT Mapp Highest Le	ed evel)
CO1	Clas	sify diff	erent co	nfiguratior	n of pow	ver electi	ronics ci	ircuit					Ur	derstandin	g (K2)
CO2	Expl	lain vari	ious PW	M topolog	ies for p	ower co	nverters	6					Ur	derstandin	g (K2)
CO3	Expl	lain the	Control	strategies	of pow	er conve	rters						Ur	derstandin	g (K2)
CO4	Con	struct V	arious s	ingle phas	se to sin	gle phas	se back-	to-back	conve	rter				Applying (I	<3)
CO5 Build different types of switched mode converters Applying (K3)												<3)			
Manning of COs with POs and PSOs															
COs/F	POs	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	P011	PO12	PSO1	PSO2
CO	1	3	2				1			1		_	1	3	1
CO	2	3	2				1			1			1	1	2
CO	3	3	2	2			1			1			1	2	1
CO	4	3	2	2			1			1			1	2	2
CO	5	3	3	2			1			1			1	2	1
1 – Sli	ght, 2	– Mode	erate, 3 –	Substant	ial, BT-	Bloom's	Taxono	omy		- L		, , , , , , , , , , , , , , , , , , ,			
						1000	SOMEN		TEDN	THEOD	v				
Тор	t/Blo	om'e	Po	mombori	na I	A33E					ing F	valuating (K5)	Cro	ating (K6)	Total
C	Catego	ory*	ite	(K1) %		(K2)	%	(K3)	%	(K4)	%	%	Cie	%	%
	CAT	1		20		80									100
	CAT	2		20		80									100
	CAT	3		20		60		20)						100

40

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

ESE

40

100

		22EEE08 – SUBSTATION ENGINEERING AND A		TION				
Progra Branci	imme & n	B.E & Electrical and Electronics Engineering	Sem.	Category	L	т	Ρ	Credit
Prereq	uisites	Generation, Transmission & Distribution	6	PE	3	0	0	3
Pream	ble	The course aims in imparting knowledge of substation and its of	compone	ents				
Unit –	I	Introduction						9
Genera selectio	al background on and Acquis	 Need Determination – Budgeting – Financing – Traditisition – Design, Construction and Commissioning Process 	ional an	d Innovative	Sub	statio	n De	sign – Site
Unit –	11	Gas and Air Insulated Substations						9
Sulphu Installa Ring bu	r Hexafluoric ition, Operatio us arrangeme	le – Construction and Service life : Circuit breaker, CT's a on and Interlocks - Air Insulated Substations: Single Bus arra ent – comparison of configurations	and PT's ingemen	s, Surge arre t – Double b	ester us bi	, gro eake	undin r arra	g, Testing, angement –
Unit –	111	High Voltage Switching Equipment						9
Introdu – Circu	ction – Ambie it Switchers	ent Conditions – Disconnect switches – Load break switches – – Circuit Breakers	High Spe	ed Groundin	g sw	itche	s – Po	ower Fuses
Unit –	IV	High Voltage Power Electronic Substations						9
HVDC System	Converters - n – Losses an	 FACTS Controllers – Converter Technologies: For smart po d Cooling – Civil Works – Reliability and Availability – Outlook a 	wer and nd Futur	l grid access e Trends	– C	ontro	l and	Protection
Unit –	V	Substation Integration and Automation						9
Open : compo	systems - O nents - Cyber	perational vs Non-operational data – Dataflow – Dataflow – security – Automation applications – Protocol fundamentals – S	Asset n Synchro p	nanagement phasors	– R	edun	dancy	y – System
								Total: 45
TEXT	BOOK:							
1.	John D. Mc	Donald, "Electric Power Substations Engineering ", CRC Press	Third ec	lition, 2012.				
REFEF	RENCES:							
1.	S.Rao, "Ele 2015.	ctrical Substation Engineering and Practice EHV-AC, HVDC and	d SF6 – (GIS", Khanna	Pub	lisher	s, Thi	rd Edition,
2.	James A. M 2007.	omoh, "Electric Power Distribution, Automation, Protection, and	Control"	, CRC Press,	Taylo	or an	d Frar	ncis Group,

COURS On con	RSE OUTCOMES: completion of the course, the students will be able to												BT Mapped (Highest Level)				
CO1	Revi	iew the	basics of	fsubstatio	ons and	its comp	onents						Und	derstanding	g (K2)		
CO2	Disc	uss the	different	types of	substati	ons							Und	derstanding	g (K2)		
CO3	CO3 Infer high voltage switching equipment.													derstanding	g (K2)		
CO4 Discuss the different types of Power Electronic Converters in Substations Understanding (K2)													g (K2)				
CO5 Develop the different controls and Automation in substations														Applying (K3)			
-																	
						Mappin	ng of CC	Os with	POs ar	nd PSO	S						
COs/P	Os	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2		
CO1		3	2					1		1			1	2	1		
CO2	CO2 3 2 1 1 1												1	2	1		
CO3	3	3	2					1		1			1	2	1		
CO4	CO3 3 2 1 1 1 1 CO4 3 2 1 1 1 1 1													1 3 2			

ASSESSMENT PATTERN

3

CO5

2

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %					
CAT1	30	70					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 – 100 marks)												

1

1

1

2

1

Programme & Branch B.E & Electrical and Electronics Engineering Sem Categ ory ory L T P Cred Prerequisites Applied Physics 6 PE 3 0 0 3 Preamble This course aims in imparting the concepts and nuances of solar and wind energy systems along with its design procedures. 9 Unit – 1 Solar PV Design and Integration: 9											
Prerequisites Applied Physics 6 PE 3 0 0 3 Preamble This course aims in imparting the concepts and nuances of solar and wind energy systems along with its design procedures. Image: Concept and Concept a											
Preamble This course aims in imparting the concepts and nuances of solar and wind energy systems along with its design procedures. Unit – I Solar PV Design and Integration: 9											
Unit – I Solar PV Design and Integration: 9											
Types of solar PV systems: stand alone, grid connected and hybrid systems. Design methodology for solar PV system: Approximate design of solar PV system- solar PV system design chart – Look up table for solar PV system design.											
Unit – II Stand Alone Solar PV Systems: 9											
Introduction – Parameters of batteries: Terminal voltage-SoC and DoD, C-rating – Battery efficiency – Temperature – Life cycle – Shelf life - Selection of battery- Battery bank installation and commissioning- Charge controllers – Wire sizing – Junction box.											
Unit – III Grid Connected Solar PV Systems: 9											
Array Combiner Box - DC Cabling - DC Distribution Box - Grid-connected Inverter - AC Cabling - AC Distribution Box. Grid-connected PV System Design for Small Power Applications - Steps of System Design.											
Power output from an ideal turbine – Aerodynamics – Power output from practical turbines – Energy production and capacity factor Methods of generating synchronous power – DC shunt generator with battery load – AC generators											
Unit – V Installation and Commissioning of WECS: 9											
Site preparation – Methods of generating synchronous power - Synchronous generator- Electrical network – Selection of low volta and distribution voltage equipments: Circuit breakers, Wire sizes, Transformers, Voltage drop – Losses- Wind farm costs.											
Total											
TEXT BOOK:											
Chetan Singh Solanki, "Solar Photovoltaic Technology and Systems – A Manual for Technicians, Trainees a Engineers", 1 st Edition, PHI learning Private Limited, New Delhi, 2013 for Units I, II, III.											
2. Gary L. Johnson, "Wind Energy Systems", Electronic Edition, Manhatan, KS, 2006 for Units IV, V.											
REFERENCES:											
1. Chetan Singh Solanki, "Solar Photovoltaics – Fundamentals, Technologies and Applications", 2 nd Edition, PHI learning Private Limited, New Delhi, 2011.											
 Spera, D.A., "Wind Turbine Technology: Fundamental concepts of Wind Turbine Engineering", 2nd Edition, ASME, Net York, 2009. 											

COURSE O On comple	BT Mapped (Highest Level)						
CO1	apply the design procedures for solar PV systems towards installation	Applying (K3)					
CO2	outline the components of standalone PV systems and its installation	Applying (K3)					
CO3	outline the configuration of grid connected PV systems and its installation	Understanding (K2)					
CO4	analyze the design considerations for WECS	Understanding (K2)					
CO5	identify the installation methods for WECS	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	1				1	1					1	3	3
CO2	2	3	2	2	1	1	1					1	3	3
CO3	3	2	1	1		1	1					1	3	3
CO4	2	3	2	2	1	1	1					1	3	3
CO5	3	2	1	1		1	1					1	3	3

ASSESSMENT PATTERN - THEORY											
Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applyin g (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %				
CAT1	20	50	30				100				
CAT2	20	60	20				100				
CAT3	30	70	-				100				
ESE	10	60	30				100				
* ±3% may be varied (CAT 1, 2 & 3 – 50 marks & ESE – 100 marks)											
		22EEE10 - SPECIAL ELECTRICAL MACI	HINES								
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Prograr Branch	nme &	B.E & Electrical and Electronics Engineering	Sem.	Category	L	т	Ρ	Credit			
Prerequ	uisites	Synchronous and Induction Machines	6	PE	3	0	0	3			
Preamb	le	This course imparts knowledge about the construction and wor machines and provides brief idea about their applications.	king prir	ciple of vario	us s	pecia	l elec	trical			
Unit – I		Permanent Magnet Synchronous Motors:						9			
Perman Phasor vehicles	ent Magnet diagram – s.	Motors – Classifications – PMSM: Constructional features - Prine Locus diagram and torque speed characteristics – Closed lo	ciple of c oop cont	peration – El rol - Applica	MF a tions	ind to : PM	orque ISM f	equations– or Railway			
Unit – II		Permanent magnet brushless D.C Motors:						9			
Principle equatior in Electr	e of operatio ns – Sensors ric Vehicles.	n – Types – Comparison between conventional DC and PMBLD s for Rotor position – Closed loop control – Motor characteristic)C – Ele s and co	ctronic comm ontrol – Applic	utati catio	on – ns: P	EMF MBL[and torque C for Plug			
Unit – II	II	Synchronous Reluctance Motors:						9			
Constru Charact Magnet	ctional featu eristics – co vernier moto	res – Synchrel – Types: Axial and Radial motors – Operating pr ntrol of synchrel motor – Applications: SRM for Electric ships pr.	inciple – 5 – Intro	Reluctance t duction to Ve	orqu ernie	ie – F r mot	Phaso or –	r diagram - Permanent			
Unit – ľ	V	Switched Reluctance Motors:						9			
Constru topologi Applicat	ctional featu ies used – C tions: SRM fo	res – Principle of operation – Torque prediction – Inductance pro urrent control schemes – Torque Speed Characteristics – Hyste or Hybrid electric vehicles.	ofile –Ty eresis an	pes of Power d PWM contr	ol –	trolle Close	rs an ed loo	d converter p control –			
Unit – V	1	Stepper Motors:						9			
Constru – Theor Comput	ctional featu y of torque p er printers –	res – Principle of operation – Variable reluctance motor – Hybri predictions – Linear and non-linear analysis – Characteristics – Microprocessor based control.	d motor Drive cii	– Single and rcuits – Appli	mult catio	ti stao ns: S	ck cor teppe	nfigurations er Motor for			
								Total:45			
TEXT B	00K:										
1.	Janardanan	E.G, "Special Electrical Machines", 1st Edition, PHI Learning Pr	ivate Lto	l, New Delhi,	2014	4.					
REFER	ENCES:										
1.	Kenjo T, "St	epping Motors and Their Microprocessor Controls", 3rd Edition,	Oxford L	Iniversity Pre	ss, N	lew [Delhi,	2009			
1. 2.	Kenjo T, "St Miller T.J.E, 1989.	epping Motors and Their Microprocessor Controls", 3rd Edition, "Brushless Permanent Magnet and Reluctance Motor Drives", 1	Oxford L	Jniversity Pre n, Clarendon	ss, N Pre	lew E ss, U	Delhi, nited	2009 States,			
1. 2. 3.	Kenjo T, "St Miller T.J.E, 1989. Kenjo T. and	epping Motors and Their Microprocessor Controls", 3rd Edition, "Brushless Permanent Magnet and Reluctance Motor Drives", 1 d Nagamori S., —Permanent Magnet and Brushless DC MotorsI	Oxford U st Editic	Jniversity Pre n, Clarendon lition, Clarend	ss, N Pre Ion F	lew [ss, U Press	Delhi, nited , Lono	2009 States, don, 1988.			

COUR On cor	SE OUTCOMES: npletion of the course, the students will be able to	BT Mapped (Highest Level)
CO1	explain the construction, operation and performance of permanent Magnet synchronous motor.	Understanding (K2)
CO2	identify and distinguish the conventional DC and PMBLDC motors based on its performance	Applying (K3)
CO3	distinguish Synchrel and switched reluctance motors based on its performance	Applying (K3)
CO4	demonstrate the performance of stepper motor and characterize its curves	Applying (K3)
CO5	choose special drives for specific applications	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				1						1	1	2	
CO2	3	2	1	1		1						1	2	3	
CO3	3	2	1	1		1						1	2	3	
CO4	3	2	1	1		1						1	2	3	
CO5	3	2	1	1		1						1	2	3	

ASSESSMENT 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	20	50	30				100					
CAT3	20	50	30				100					
ESE	10	30	60				100					

		22EEE11 – SENSORS AND ACTUA	TORS									
Program Branch	me &	B.E & Electrical and Electronics Engineering	Sem.	Category	L	т	Ρ	Credit				
Prerequis	sites	Electrical Measurements and Instruments	6	PE	3	0	0	3				
				-1								
Preamble		This course helps the students to impart the knowledge to interapplications.	erface vario	ous sensors ar	nd acti	uators	in emb	edded				
Unit – I		Inductive Transducers						9				
Introduct sensors – Inductive variable re	ion: Diffe Environme transduce eluctance t	erence between sensor, and transducer- Principles- Classificat ental parameters – Characterization ers: - Principle of operation, construction details, characteristic ransducer- Inductive proximity sensor	ion of sens s and appli	ors- Static and cations of LVE	d Dyna DT, Inc	amic c ductior	haracte n poten	eristics of tiometer,				
Unit – II		Capacitive & Radiation Sensors						9				
Capacitiv Electro sta Radiatior Cell- Phot	ve transdu atic transdu Sensors: tovoltaic an	cers: - The parallel plate Capacitive sensor – Serrated plate ucer Types of photosensistors/photo detectors: The Photo emissiv d Photo junction Cells - Position-sensitive Cell. Fibre optic ser	e Capacitive e Cell and nsors: Liqui	e sensor – Va the Photomulti d level sensing	riable plier - g – Flu	Perm The F uid flov	ittivity \$ Photoco w sensi	Sensor – onductive ng				
Unit – III		Thermal and Magnetic Sensors						9				
Thermal	Sensors:	Gas Thermometric Sensors - Acoustic Temperature Sensor	- Resistan	ce Change Ty	pe Th	ermor	metric S	Sensors-				
Thermoer Magnetic	nf Sensors Sensors:	Sensors and the principles – Magneto Resistive sensors –	Hall effect	Sensors - Ind	ductar	nce an	nd Eddy	/ current				
Unit – IV	Angulai/R	Smart sensors and Applications of sensors						9				
Smart Se MEMS Sensors Sensors f	ensors: Int Application	roduction, Primary Sensors, Excitation, Amplification, Filters, ons: On-Board Automobile Sensors – Home Appliance senso nental monitoring.	Converter ors-Aerosp	s, Standards f ace sensors-N	for Sn Iedica	nart Se Il Diag	ensor I Inostic	nterface, sensors-				
Unit – V		Actuators						9				
Thermo M principles	lechnaical -BLDC Mot	Actuators -Optical Actuators - Capacitive Actuators -Magneto tors-AC motors-Stepper Motors-Linear Motors-Piezo electric ac	strictive A strictors	ctuators -Moto	ors as	actua	tors: C	Operation				
								Total:45				
TEXT BO	т воок:											
1.	Patranabis, Sensors and Transducers, 2nd Edition, PHI, 2022, for Units I, II, III and IV.											
2.	Nadhan Io	a, Sensors, Actuators, and Their Interfaces: A Multidisciplinary	/ Introduction	on, Sci Tech P	ublish	ing, 20	013 for	Unit V.				
REFERE	NCES:											
1.	De Silva a	and Clarence W, Sensors and Actuators Engineering System Ir	nstrumenta	tion, 2 nd Edition	n, CR(C Pres	s, 2018	5.				
2.	Jacob Fra	den, Handbook of Modern sensors: Physics, Design and Appli	cations, 5 th	Edition, Sprin	ger, 2	015.						

COURSE On com	E OUT oletio	TCOM on of t	ES: he cou	ırse,	the stude	nts wi	ll be able	e to							BT Ma (Highest	pped : Level)
CO1	expl	lain th	e theoi	ry and	d working	behind	the indu	ctive tra	nsducer	S					Understan	ding (K2)
CO2	Des	scribe	the cor	nstruc	ction and w	vorking	of Capa	citive an	nd Radia	tion se	nsors				Understan	ding (K2)
CO3	Elat	borate	the va	rious	types of th	nerma	and mag	gnetic se	ensors a	nd its p	orinciple of	of operat	ion		Understan	ding (K2)
CO4	dem	nonstra	ate the	work	king of vari	ous ty	pes of se	nsors us	ed in re	al worl	d applica	tions			Applyin	g (K3)
CO5	Illus	strate t	he wor	king	principle o	f Actu	ators and	electric	al actuat	ing sys	stems				Understan	ding (K2)
00.00		DO 1			200	504	Mapping	of COs	with P	Os and	PSOs	DO (0	2011	DO 40	5004	DQQQ
COS/PC	COs/POs PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO12 PS01 PS02															
CO1	CO1 3 2 1 1 1 3 2															
CO2		3	2		1			1						1	3	2
CO3		3	2		1			1						1	3	2
CO4		3	2		1			1						1	3	2
CO5		3	2		1			1						1	3	2
1 – Sligh	t, 2 –	Mode	rate, 3	– Su	bstantial, E	BT- Blo	om's Ta	konomy								
	,				,											
							ASSESS	MENT I	PATTER	N - T⊦	IEORY					
Tes C	t / Blo atego	oom's ory*		Re	memberir (K1) %	ng	Understa (K2)	anding %	Apply (K3)	ing %	Analyzin (K4) %	g E	valuating (K5) %	g C (reating K6) %	Total %
	CAT	1			15		85									100
	CAT	2			15		85									100
	CAT	3			10		60		30							100
	ESE	Ξ			10		70		20							100
* ±3% m	av be	varied	I (CAT	1.2	& 3 – 50 m	harks &	ESE – 1	00 mar	ks)	I		I		I		

		22EEE12 – AVIONICS						
Programm Branch	ne &	B.E & Electrical and Electronics Engineering	Sem.	Category	L	Т	Р	Credit
Prerequis	sites	Nil	6	PE	3	0	0	3
								1
Preamble		This course aimed to introduce the fundamental concepts and	principle	es of avionic s	syste	ms		
Unit – I		Introduction To Avionics:						9
History -F advisory a	lying blind agencies-N	I -Radio comes to age - Beginning of the National Airspace Sy lational air space systems.	stems -l	Navigation Pr	incip	les	-Reg	ulatory and
Unit – II		Terrestrial Enroute Radio Navigation:						9
Non direct	tional bea	con and direction finding – direction finding receivers - Automatic	c Directi	on Finding -E	rrors	in OD	Direc	tion Finding
VOR Rece	eiver - VO	R Test Equipment- DME: Distance Measuring Equipment- DME	Ground	Station	(- V	JR	Glou	no Station -
Unit – III		Terrestrial Landing Aids						9
ILS: Instru ILS and M	ument Lan ILS - Rada	ding System – Marker Beacons- Glide Slope -ILS Errors - Micro ar Altimeter - FM CW Radar Altimeter - Ground Proximity Warnin	owave L Ig Syste	anding Syste m	m (N	ILS)- Coi	nparison of
Unit – IV		Satellite Navigation						9
Introductio GPS Rece	on -GPS: (eivers -GP	Global Positioning System -GPS Clocks - Earth Model -Space Vo S Accuracy - GPS Navigation	ehicle - (GPS Signals	- GP	s s	Signal	s in Space -
Unit – V		Airborne Communications Systems						9
Introduction SELCAL - Modes	on - VHF -Search a	AM Communications - VHF Communications Hardware - Hi nd Rescue Beacons - Digital Communications and Networkin	gh Freq 1g -VHF	uency Comn Digital Com	nunic muni	cation cat	ons – ions –	ACARS – Data Link
								Total:45
TEXT BO	OK:							
1. A	lbert Helfr	ick.D., Principles of Avionics, Avionics Communications Inc., 4th	Edition,	2017.				
REFEREN	NCES:							
1. C	ollinson.R	.P.G. Introduction to Avionics, Springer; 3rd ed. 2014						
2. M	liddleton, I	D.H., Ed., Avionics systems, Longman Scientific and Technical, I	Longma	n Group UK L	td., I	Eng	land,	1989
3. S	pitzer, C.F	R. Avionics Development and Implementation, CRC Press, 1st E	dition, 20	018				

COUR: On cor	SE O mplet	UTCON	/IES: the coui	se, the st	udent	s will be a	able to						(BT Mapp Highest L	oed .evel)
CO1	App	ly the b	asics of	avionics s	ubsys	tems archi	tecture.	i.					Ur	nderstandi	ng (K2)
CO2	Dist	inguish	betweer	n the need	s of ci	vil and mil	itary avi	ionics s	ystems	3			Ur	nderstandi	ng (K2)
CO3	Acq	uire kno	owledge	on display	v techr	ologies.							Ur	nderstandi	ng (K2)
CO4	Buil	d Digita	al avionic	s architec	ture.									Applying	(K3)
CO5	Des	ign and	l analyze	e navigatio	n and	air data sy	/stem							Applying	(K3)
		564	-			Mapping	g of CO	s with	POs a	nd PSOs	5		2010		
COs/P	os	P01	PO2	PO3	PO4	PO5	P06	P07	PO8	PO9	PO10	P011	PO12	PSO1	PSO2
CO	1	3	2	1	1		1			1			1	1	2
CO2	2	3	3	2	2		1			1			1	2	2
COS	3	3	2	1	1		1			1			1	1	2
CO4	4	3	3	2	1		1			1			1	1	1
COS	5	3	2	2	2		1			1			1	2	2
1 – Slig	ght, 2	– Mode	erate, 3 -	- Substant	ial, BT	- Bloom's	Taxono	my			1		1		
						ASSES	SMENT	PATTE	RN - 1	THEORY	,				
Tes C	t / Blo atego	oom's ory*	Re	ememberi (K1) %	ng	Understa (K2)	nding %	Apply (K3)	ying %	Analyz (K4) 9	ing l %	Evaluating (K5) %	C	reating (K6) %	Total %
	CAT	1		20		80									100
	CAT	2		20		80									100
	CAT	3		20		60		30)						100
	ESE	=		20		60		30)						100
* +3%	mav h	oe varie	d (CAT	1 2 & 3 -	50 ma	rks & ESE	- 100	marks)			I		1		1

		22EEE13 – DESIGN OF POWER CONVE	RTERS					
Progra Branci	amme & h	B.E & Electrical and Electronics Engineering	Sem.	Category	L	т	Р	Credit
Prereq	uisites	Power electronics	7	PE	3	0	0	3
						1		
Pream	ble	This course is designed to impart knowledge about the chara devices, working principle, design calculation and implementa converters.	cteristics ation chall	of selection of enges in the f	f pov field	ver s of po	emico ower e	electronic
Unit - I		AC to DC converter						9
Introdu analysi	iction– Desig is of CCM and	n calculation of: Half bridge controlled rectifier with R load - d DCM – surge protection circuit – load short protection circuit	- Full Brid	lge Controlle	d re	ctifie	r with	RL load -
Unit - I		Isolated converters						9
Buck C CCM 8 Flybac & DCM	Converter: Du & DCM – Outp k converter: 0 1 in closed loc	ty cycle determination – Open Loop CCM to DCM transition – out capacitor sizing – case study Open Loop CCM & DCM duty cycle determination – calculation op – Peak current mode CCM & DCM in closed loop - Output c	- calculati of critical apacitor s	on of critical i inductance – izing – case s	nduc Pea study	tanc k vo [,] .	e – C Itage r	Closed loop
Unit - I	11	Non-Isolated converters		V				9
Boost in CCN Factor	Converter: // & DCM - DO – case study	Duty-Cycle Determination- Critical Inductance - Peak CM Output Capacitor Size - CCM Output Capacitor Size - Effec	Current ts of Conv	Mode Clos verter Non-ide	ed-L ealitie	oop es - :	Ste Switch	ady State Utilization
Unit - I	V	DC to AC converters						9
Practic system implem	al aspects in protection nentation: gat	building three phase Inverter : design calculation – selection management – reduction of common mode EMI – t e driver faults – dead time control	on of pow thermal r	er devices nanagement	– p –	roteo carr	ction c ier ba	ircuits – ised PWM
Unit - V	V	Parallel and Interleaved Power Converters						9
Compa Gate C Power	arison betwee Control Desigr Converters -	en High-Power Devices & Multiple Parallel Lower-Power Devices ns for Equal Current Sharing - Advantages and Disadvantages Circulating Currents - Selection of the PWM Algorithm	s - Hard ^y of Paralle	ware Constra ling Inverter	ints i - Inte	n Pa erlea	aralleli ved O	ng IGBTs - peration of
								Total:45
TEXT	BOOK:							
1.	Keng. C. W	u, "Switch Mode Power Converters",1 st Edition, Elsevier Acade	mic Press	s, UK, 2006 fo	r Un	its I,	II, III.	
2.	Dorin O. Ne V.	eacsu, "Power Switching Converters-Medium and High Power",	1 st Editio	n, CRC Press	s, US	SA, 2	2006 f	or Units IV,
REFE	RENCES:							
1.	Issa Batars	eh & Ahmad Harb, "Power electronic circuit analysis and design	n", 2 nd Edi	tion, Springer	Pub	licat	ions, 2	2018

COUR On co	SE OL mpleti	JTCOM on of t	IES: he cours	se, the st	udents	will be a	able to						(BT Mapp Highest L	oed evel)
CO1	desi	gn recti	fier circu	it with pro	tection of	circuits.								Applying	(K3)
CO2	desię	gn isola	ted conv	verters wit	h capac	itor sizin	ig in CC	M & DC	M oper	ation				Applying	(K3)
CO3	desię	gn non-	isolated	converter	s with c	apacitor	sizing ir	n CCM 8	& DCM	operatio	on			Applying	(K3)
CO4	anal	yze the	practica	l aspects	in invert	er desig	n						Ur	nderstandii	ng (K2)
CO5	unde	erstand	the para	Illeling cor	icepts o	fpower	converte	ers.					Ur	nderstandii	ng (K2)
	Mapping of COs with POs and PSOs														
00.15			DOO	DOO	504	DOF	DOG	007	DOO	DOO	DO 40	D044	DO 40	D004	DOOO

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2				1			1		1	1	3	2
CO2	3	2	1	1		1			1		1	1	2	3
CO3	3	1				1			1		1	1	2	3
CO4	3	2	1	1		1			1		1	1	1	2
CO5	3	1				1			1		1	1	2	3
	Mada	mata 0	Culture at a reat			Tavana								•

	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	20	40	40				100						
CAT3	40	60					100						
ESE	ESE 20 40 40 100												
* ±3% may be varied (0	* ±3% may be varied (CAT 1, 2 & 3 – 50 marks & ESE – 100 marks)												

22EEE14 - REST	RUCTURED P	OWER SYSTEM
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	B.E & Electrical and Electronics Engineering	Sem.	Category	L	т	Р	Credit
Prerequisites	Generation, Transmission and Distribution, Power System Analysis	7	PE	3	0	0	3
Preamble	The objective of the course is to impart knowledge about markets, pricing of transmission network and reforms in Indi the differences between the conventional power system oper	the restrian power to and	ructured pow sector. The the restructur	ers cour	ysten se wi	n, ele ill also syste	ctric utility bring out em.
Unit – I	Overview Of Key Issues in Electric Utilities Restructuring						9
Introduction-Restr Market Operations Congestion	ucturing Models-Independent System Operator (ISO)-Power s-Market Power-Stranded Costs-Transmission Pricing-Congestic	Exchange on Pricing	e (PX)-Marke -Managemen	t Clo t of	earin Inter-	g Prio Zonal	ce (MCP)- /Intrazonal
Unit – II	ELECTRIC UTILITY MARKETS IN THE UNITED STATES &	OUTSID	E THE UNITE	ED S	TAT	ES	9
California Markets Power Exchange)	s-New York Market-PJM Interconnection-ERCOT ISO-New Eng -Australia National Electricity Market-Restructuring In Canada-Ele	land ISO ectricity In	-Midwest ISC idustry in Eng)- No land	ord P and	ool (1 Wale:	The Nordic
Unit – III	OASIS: OPEN ACCESS SAME-TIME INFORMATION SYST	ЕМ					9
Introduction-FERO OASIS-Transmiss	C Order-Structure of OASIS-Implementation of OASIS Phases ion Services-Methodologies to Calculate ATC-Experiences with (-Posting DASIS in	of Information	on-Tr cturii	ansfe ng Me	er Ca odels	pability on
Unit – IV	TAGGING ELECTRICITY TRANSACTIONS & TRANSACTION		RMATION SY	STE	М		0
Introduction-Defin		- ·					3
Elements of a Ta Transactions	ition of Tagging-Historical Background on Tagging-How Does a g-Communication during Failure Recovery-Transaction States-Ir	nplement	Process Wo ation, Curtailr	rk?-I nent	denti , and	fying I Cano	Tags-Data cellation of
Elements of a Ta Transactions Unit – V	ition of Tagging-Historical Background on Tagging-How Does a g-Communication during Failure Recovery-Transaction States-Ir	nplement	Process Wo ation, Curtailr	rk?-I nent	denti , and	fying I Cano	Tags-Data cellation of
Elements of a Ta Transactions Unit – V Introduction-Esser Energy Trading-P	ition of Tagging-Historical Background on Tagging-How Does a g-Communication during Failure Recovery-Transaction States-Ir ELECTRIC ENERGY TRADING nce of Electric Energy Trading-Energy Trading Framework: Th ortfolio Management-Energy Trading Hubs-Brokers in Electricity	n Tagging nplementa ne Qualify Trading-G	Process Wo ation, Curtailr ving Factors-I Green Power 1	rk?-I ment Deriv Fradi	denti , and /ative ng	fying I Cano e Instr	Tags-Data cellation of 9 uments of
Elements of a Ta Transactions Unit – V Introduction-Esse Energy Trading-P	ition of Tagging-Historical Background on Tagging-How Does a g-Communication during Failure Recovery-Transaction States-Ir ELECTRIC ENERGY TRADING nce of Electric Energy Trading-Energy Trading Framework: Th ortfolio Management-Energy Trading Hubs-Brokers in Electricity	nplement: ne Qualify Trading-G	Process Wo ation, Curtailr ving Factors-I Green Power T	rk?-Ι ment Deri\ Γradi	denti , and /ative ng	fying I Cano e Instr	Tags-Data cellation of 9 cuments of Total:45
Elements of a Ta Transactions Unit – V Introduction-Esse Energy Trading-P TEXT BOOK:	ition of Tagging-Historical Background on Tagging-How Does a g-Communication during Failure Recovery-Transaction States-Ir ELECTRIC ENERGY TRADING nce of Electric Energy Trading-Energy Trading Framework: Th ortfolio Management-Energy Trading Hubs-Brokers in Electricity	nplementa	Process Wo ation, Curtailr ving Factors-I Green Power T	rk?-I ment Deri\ Γradi	denti , and /ative ng	fying I Cano e Instr	Tags-Data cellation of 9 ruments of Total:45
Elements of a Ta Transactions Unit – V Introduction-Esse Energy Trading-P TEXT BOOK: 1. Mohamm Volatility"	ition of Tagging-Historical Background on Tagging-How Does a g-Communication during Failure Recovery-Transaction States-Ir ELECTRIC ENERGY TRADING nce of Electric Energy Trading-Energy Trading Framework: Th ortfolio Management-Energy Trading Hubs-Brokers in Electricity ad Shahidehpour, Muwaffaq Alomoush, "Restructured Electri , 1st Edition, Taylor & Francis , New York, 2015.	nplementa ne Qualify Trading-G	Process Wo ation, Curtailr ving Factors-I Green Power T er Systems:	rk?-I ment Deriv Fradi	denti , and /ative ng	fying I Cano e Instr n, Tra	Tags-Data cellation of 9 ruments of Total:45
Elements of a Ta Transactions Unit – V Introduction-Esse Energy Trading-P TEXT BOOK: 1. Mohamm Volatility" REFERENCES:	ition of Tagging-Historical Background on Tagging-How Does a g-Communication during Failure Recovery-Transaction States-Ir ELECTRIC ENERGY TRADING nce of Electric Energy Trading-Energy Trading Framework: Th ortfolio Management-Energy Trading Hubs-Brokers in Electricity ad Shahidehpour, Muwaffaq Alomoush, "Restructured Electri , 1st Edition, Taylor & Francis , New York, 2015.	nplementa	Process Wo ation, Curtailr ving Factors-I Green Power T er Systems:	rk?-I ment Deriv Fradi	denti , and /ative ng eratio	fying Cano I Cano Instr n, Tra	Tags-Data cellation of guments of Total:45
Elements of a Ta Transactions Unit – V Introduction-Esse Energy Trading-P TEXT BOOK: 1. Mohamm Volatility" REFERENCES: 1. Loi Lei La	ition of Tagging-Historical Background on Tagging-How Does a g-Communication during Failure Recovery-Transaction States-Ir ELECTRIC ENERGY TRADING Ince of Electric Energy Trading-Energy Trading Framework: The portfolio Management-Energy Trading Hubs-Brokers in Electricity ad Shahidehpour, Muwaffaq Alomoush, "Restructured Electric 1st Edition, Taylor & Francis, New York, 2015. i, "Power System Restructuring and Deregulation", 1st Edition, Jo	ical Powe	Process Wo ation, Curtailr ving Factors- Green Power T er Systems: and Sons, No	rk?-I Deriv Deriv Gradi	denti , and /ative ng eratio	fying I Cano e Instr n, Tra 2018.	Tags-Data cellation of 9 uments of Total:45

COUR On co	JRSE OUTCOMES: completion of the course, the students will be able to											(BT Mapped (Highest Level)				
CO1	expl	ain the	key issue	es in elect	ric utilitie	es restru	ucturing						Ur	nderstandir	ng (K2)		
CO2	disc	uss the	concept	of electric	utility n	narkets v	world wi	de						Applying	(K3)		
CO3	discuss the concept of open access same-time information system											Ur	Understanding (K2)				
CO4	deso	cribe Tr	ansactior	n Informat	ion Syst	em							Understanding (K2)				
CO5	Inter	rpret an	d analyze	e the Elec	tric Ene	rgy Trad	ling						Understanding (K2)				
													L				
						Mappin	g of CO	s with	POs an	d PSOs	6						
COs/F	os	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2		
CO	1	3	1	2	2		1	1				1	1	1	2		

CO1	3	1	2	2		1	1				1	2
CO2	3	3	3	2		1	1		1	1	2	3
CO3	3	2	1	2		1	1		1	1	3	2
CO4	3	1	2	2		1	1		1	1	1	3
CO5	3	2	1	1		1	1		1	1	2	2
1 – Slight, 2	– Mode	erate, 3 –	Substanti	al, BT- I	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	20	80					100						
CAT2	20	70	10				100						
CAT3	20	80					100						
ESE	20	80					100						
* ±3% may be varied (CAT 1, 2 & 3 – 50 marks & ESE – 100 marks)													

		22EEE15 – ENERGY STORAGE SYSTEMS AND C	ONTRO	LLERS							
Programme Branch	&	B.E & Electrical and Electronics Engineering	Sem.	Category	L	т	Ρ	Credit			
Prerequisite	5	Nil	7	PE	3	0	0	3			
		· · · · · · · · · · · · · · · · · · ·		1	1						
Preamble		This course aimed to introduce the fundamental concepts and that aids in various real time applications.	principle	s of various e	ner	gy sto	orage	systems			
Unit – I		Introduction to Energy Storage Systems						9			
Overview of technologies and Energy	energy - Batte	r storage systems (ESS) - Historical context of ESS - Drivers ry: Components of Cells and Batteries – Classification - Operation	for ES on of a C	S deploymen ell - Theoretic	t - (cal C	Class Cell V	ificatio oltage	on of ESS e, Capacity			
Unit – II		Battery Design and Selection of Batteries						9			
Designing to Design of Re	Elimir charge	nate Potential Safety Problems - Battery Safeguards when Usin able Batteries - Major Considerations in Selecting a Battery - Bat	ng Discr ttery App	ete Batteries blications	- B	attery	/ Con	struction –			
Unit – III Secondary Batteries 9											
Introduction - Performance, charging and discharging- storage density, energy density, classical batteries -Lead Acid, Nicke Cadmium- Lithium Battery: Construction, operation and Working Principle of Lithium-ion, Lithium/Iron Sulphide Batteries											
Unit – IV		Other Energy Storage Technologies						9			
Ultracapacito Membrane Fu	rs: Fea iel Cel	tures- Basic Principles of Ultracapacitors - Hydrogen Storage S Is, Alkaline Fuel Cells, Molten Carbonate Fuel Cells, and phosph	ystems: oric fuel	Types of fue cell	l cel	ls - F	roton	Exchange			
Unit – V		Controllers for Energy Storage Systems						9			
Principles of Systems (BM controllers	charge S): Pri	controllers -Types of charge controllers-Charging strategies for nciples of BMS-Functions and components of BMS-Battery safe	energy ty and p	storage syste erformance-B	ms, MS	Batte integ	ery Ma ration	nagement with other			
								Total:45			
TEXT BOOK											
1. David	l Linde	n, Thomas B. Reddy, "Handbook of Batteries", 4th Edition, McG	raw-Hill,	New Delhi, 2	011						
REFERENCES:											
1. Mehr New	dad Eh Delhi, :	nsani, YiminGao, Ali Emadi, "Modern Electric, Hybrid Electric and 2018.	I Fuel C	ell Vehicle", 2	nd E	ditio	n, CR	C Press,			
2. Nihal Elsei	Kulara vier, 20	atna, Kosala Gunawardane, "Energy Storage Devices for Renew 021	able Ene	ergy-Based S	yste	ms",	2nd E	dition,			
3. Sand	eep DI	nundhara, Yajvender Pal Verma , "Energy Storage for Modern Po	ower Sy	stem Operatio	ons"	Wile	y, 202	21			

COUR On co	SE O mplet	UTCON	IES: he cour	se, the st	udent	s will be a	able to							BT Mapp Highest L	ed evel)
CO1	und	erstand	the basi	cs of ener	gy sto	rage syste	ems and	battery	<i>'</i> .				Ur	nderstandir	ng (K2)
CO2	sum	marize	the cons	struction a	nd sel	ection of b	attery.						Ur	nderstandir	ng (K2)
CO3	dese	cribe the	e constru	uction and	worki	ng principl	e of sec	ondary	batteri	es.			Ur	nderstandir	ng (K2)
CO4	expl	ain the	construc	tion and w	/orkinę	g principle	of Ultra	capaci	tor and	l Fuel ce	II			Applying (K3)
CO5	iden mar	itify the aging th	differer he flow c	it types o of energy.	f cont	rollers us	ed in e	nergy s	storage	e system	ns and t	heir roles	in Ur	nderstandir	ng (K2)
		1		1	T	Mappin	g of CO	s with	POs a	nd PSOs	5	1			
COs/F	s/POs PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO12 PS01 PS02														
CO	1	3	2	1				1				1	1	3	2
CO	2	3	2	2				1				1	1	3	2
CO	3	2	1	3				1				1	1	3	2
CO	4	3	2	1				1				1	1	3	3
CO	5	2	1	3				1				1	1	3	2
1 – Slig	ght, 2	– Mode	rate, 3 -	Substanti	al, BT	- Bloom's	Taxono	my			1	L	1	L	
						ASSES	SMENT	PATTE	ERN - T	THEORY	·				
Tes C	st / Blo Catego	oom's ory*	Re	memberi (K1) %	ng	Understa (K2)	anding %	Apply (K3)	ying %	Analyz (K4) 9	ing l %	Evaluating (K5) %		reating (K6) %	Total %
	CAT	1		30		70		-		-		-		-	100
	CAT	2		30		70		-		-		-		-	100
	CAT	3		30		50		20)	-		-		-	100
	ESE	=		10		70		20)	-		-		-	100
* ±3%	may b	e varie	d (CAT 1	, 2 & 3 – 5	50 ma	rks & ESE	– 100 r	narks)							

		22EEE16 – ADVANCED ELECTRIC DRIVES AN	D CONT	ROL									
Progra Branci	imme & n	B.E & Electrical and Electronics Engineering	Sem.	Category	L	т	Ρ	Credit					
Prereq	uisites	Microcontrollers and its interfacing, Electric Drives and Control	7	PE	3	0	0	3					
Pream	ble	This course aimed to introduce advanced control techniques to	o optimiz	e the perform	ance	e of e	lectric	drives					
Unit –	1	Control of Electrical Drives:						9					
and speed control – Closed loop speed control of multi motor drives – Speed sensing – Current sensing – Phase-locked-loop (PL control – Closed-loop position control.													
Unit –	11	Control Techniques for Electrical Drives:						9					
Basic Features of an Electric Drive – Block Diagram Representation of Drive Systems – Transfer Functions of armature and field control DC motor – Transient Response of Closed Loop Drive Systems – Frequency Response Approach – Stability of Controlled Drives – Performance indices of control system and Compensation.													
Unit – III Microprocessors Based Control Techniques: 9													
Dedica Techno	ted Hardware blogy – Contr	e Systems versus Microprocessor Control – Application Areas ar ol of Electric Drives Using Microprocessors for induction motor a	nd Functi Ind DC m	ions of Microp notor.	oroce	essor	s in D	rive					
Unit –	IV	Traction Drives:						9					
Electric of Trac and AC	c Traction Sel tion Drive Ra C Traction driv	rvices – Electric trains – Nature of Traction Load – Main Line and ting and Energy Consumption – Important Features of Traction I ves – Diesel Electric Traction.	d Suburb Drives –	an Train Con Traction Moto	figur ors –	ation Con	s – Ca ventio	alculations nal DC					
Unit –	V	Energy Conservation in Electrical Drives:						9					
Measu Use of and Co	res for Energ Variable Spe omponents	y Conservation in Electrical Drives – Use of Efficient Semicondu ed Drives – Energy Efficient Operation of Drives – Improvement	ctor Con of Powe	verters – Use er Factor – Ele	e of E ectric	Efficie cal Dr	nt mo ive Sy	otors – vstems					
								Total:45					
TEXT	BOOK:												
1.	Dubey G.K,	"Fundamentals of Electrical Drives", 2nd Edition, Narosa Publis	hing Hou	use, New Dell	ni, 20	019 fo	or Unit	ts I, IV, V.					
2.	Vedam Sub II, III.	rahmanyam, "Electric Drives: Concepts and Applications", 2nd E	Edition, N	/IcGraw-Hill, I	Vew	Delhi	, 2010) for Units					
REFEF	RENCES:												
1.	Krishnan.R.	, Electric Motor Drives: Modeling, Analysis & Control, 1st Edition	, PHI Pvi	t. Ltd, New De	elhi,	2015							
2.	Bose B.K, " Ltd., New D	Power Electronics and Variable Frequency Drives: Technology a elhi, 2013.	and Appli	ications", 1st	Editi	on, V	/iley li	ndia Pvt.					

COUR On co	SE O mplet	UTCON	IES: the cour	se, the st	udent	s will be a	able to						(BT Mapp Highest L	oed evel)
CO1	Und	erstand	I the con	trol requir	ement	of open a	nd close	ed loop	electri	c drives			Ur	derstandir	ng (K2)
CO2	Mak	e use c	of control	system c	oncept	s for drive	es contro	ol techn	iques					Applying	(K3)
CO3	Forr	nulating	g the con	trol stage	s for m	icroproce	ssor ori	ent cont	rol me	thods			Ur	Iderstandir	ng (K2)
CO4	Expl	lain the	control o	of Tractior	Drives	3								Applying	(K3)
CO5	Und	erstand	l energy	consumpt	ion at a	all stages	of elect	ric drive	es				Ur	derstandir	ng (K2)
				1		Mappin	g of CC	s with	POs a	nd PSO	S	1	1	1	1
COs/F	POs	P01	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	P011	PO12	PSO1	PSO2
CO	1	3	2	1			1	1		1			1	2	3
CO	2	3	2	1			1	1		1	1		1	2	3
CO	3	3	3	1									1	3	2
CO	4	3	2	1	1		1	1		1	1		1	2	3
CO	5	3	2	1	1								1	2	3
1 – Slię	ght, 2	– Mode	erate, 3 -	Substant	ial, BT	- Bloom's	Taxono	omy							
						ASSES	SMENT	PATT	ERN -	THEORY	/				
Tes C	atego	oom's ory*	Re	memberi (K1) %	ng	Understa (K2)	anding %	Apply (K3)	ying %	Analyz (K4) 9	ing l %	Evaluating (K5) %		reating (K6) %	Total %
	CAT	1		20		40		40)						100
	CAT	2		20		40		40)						100
	CAT	3		20		40		40)						100
	ESE	E		20		40		40)						100
* ±3%	may b	e varie	d (CAT 1	, 2 & 3 –	50 mar	ks & ESE	E – 100 i	marks)			<u>.</u>				

	22EEE17- EMBEDDED COMPUTING SYST	TEMS					
Programme & Branch	B.E & Electrical and Electronics Engineering	Sem.	Category	L	т	Ρ	Credit
Prerequisites	Nil	7	PE	3	0	0	3
Preamble	This course imparts knowledge to the students about the software, system design, development, implementation and	concept testing	ts of embe J	dde	d sy	sterr	n hardware,
Unit – I	Introduction to Embedded Systems:						9
A review of emb design concepts embedded syste	edded system concepts, Current Technologies, Integration in system D software development, processor in an embedded system and other m design concepts.	esign, E hardwar	mbedded sy e units, intro	sterr duct	i des ion to	ign flo o proo	ow, hardware cessor based
Unit – II	Embedded System Hardware						9
Embedded har performance, E performance. E performance, Be	ware building blocks, Embedded Processors – ISA architecture bard Memory – ROM, RAM, Auxiliary Memory, Memory Managem nbedded board Input / output – Serial versus Parallel I/O, interfac ard buses – Bus arbitration and timing, Integrating the Bus with other b	models, nent of ing the loard cor	Internal pro External Me I/O compon mponents, Bu	nces mory ents us pe	sor (/, Bo , I/O erforn	desig bard com nance	n, processor Memory and ponents and e
Unit – III	Embedded System Software						9
Device drivers, Explanation abo Memory Manag packages, Midd	Device Drivers for interrupt-Handling, Memory device drivers, On- ut above drivers with suitable examples. Embedded operating systement, I/O and file system management, OS standards example – PO aware and Application Software – Middle ware, Middleware examples,	-board t ems – ľ SIX, OS Applicat	ous device of Multitasking performance ion layer soft	drive and e gui ware	rs, E proc delin e exa	Board ess 1 les, E mple:	I/O drivers, Management, Joard support s.
Unit – IV	Embedded System Design, Development, Implementation an	d Testin	g				9
Embedded syst embedded softv	m design and development lifecycle model: creating an embedded sy are, Debugging tools, System Boot-Up	/stem ar	chitecture (U	pto :	stage	e 4) ir	ntroduction to
Unit – V	Embedded System Design-Case Studies						9
Case studies- F Embedded syst Controller	rocessor design approach of an embedded system – Power PC Proc m design on Xilinx platform-NiosII Processor based Embedded syste	essor ba m desig	ased and Mi In on Altera,	cro E -Sof	3laze tware	e Proc e Coc	cessor based ding of a PID
							Total:45
TEXT BOOK:							
1. Tamm (Singa	Noergaard "Embedded Systems Architecture: A Comprehensive Guide ore) Pvt. Ltd. Publications, 2012 for Units I, II, III and IV.	e for Eng	gineers and F	Progr	amm	ners",	Elsevier
2. Frank Inc.200	ahid, Tony D. Givargis, "Embedded system Design: A Unified Hardwar 2 for Unit V	re/Softwa	are Introducti	on",	John	Wily	& Sons
REFERENCES							
1. Peter M	arwedel, "Embedded System Design", Science Publishers, 2007.						
2. Chatto	adhyay S, "Embedded System Design", second edition, PHI Learning	Pvt. Ltd.	; 2023.				
3. Kamal Delhi, :	R, "Embedded systems: architecture, programming and design", secon 011.	d edition	, Tata McGra	aw-H	ill Ec	lucati	on, New

COURS On cor	SE OU npletio	TCOM	ES: ne cours	e, the stude	ents v	vill be abl	e to							BT Maı (Highest	oped Level)
CO1	expla	ain the	basic con	cept of emb	edde	d system o	design o	verflow					U	nderstand	ling (K2)
CO2	unde etc.	erstand	the hard	ware units u	ıtilizeo	l for embe	dded sy	stem de	esign na	amely m	emory, I	O devices	U	nderstand	ling (K2)
CO3	Illust syste	trate the	e concep	ts of device	drive	rs and ope	rating s	ystem u	sed in	designin	g the em	bedded	U	nderstand	ling (K2)
CO4	expla testi	ain the ng	concepts	involved in	embe	edded syst	em desi	gn, dev	elopme	ent, imple	ementati	on and	U	nderstand	ling (K2)
CO5	appl	y the er	mbedded	design con	cepts	for develo	ping va	rious rea	al time	applicati	ons.			Applying	g (K3)
						Mapping	g of CO:	s with F	POs an	d PSOs					
COs/P	POs	PO1	PO2	PO3	PO	4 PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO	1	3	1				1		1		1	1	1	1	2
CO	2	3	2	1	1		1	2				2	1	2	3
CO	3	3	1			1	1		1		1	1	1	1	2
CO	4	3	2	1	1	1	1	2				2	1	2	3
CO	5	3	1				1		1		1	1	1	1	2
1 – Slig	ght, 2 –	- Moder	rate, 3 – \$	Substantial,	BT- E	Bloom's Ta	xonomy	,			I	I		I	
						ASSESS	SMENT	PATTE	RN - T	HEORY					
Tes C	t / Bloo ategoi	om's ry*	Rem	embering (%	K1)	Understa (K2)	anding %	Appl (K3)	ying %	Analyz (K4) 9	ing I %	Evaluating (K5) %) Ci (reating K6) %	Total %
	CAT1	-		20		80)			. /			`		100
	CAT2			20		80)								100
	CAT3			20		40		40)						100

20

70

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

ESE

100

	22EEE18 – PLC AND SCADA SYSTE	М								
Programme & Branch	B.E & Electrical and Electronics Engineering	Sem.	Category	L	Т	FF	, c	Credit		
Prerequisites	Nil	7	PE	3	0) ()	3		
	I		L			1	1			
Preamble	This course imparts knowledge about basic concepts of p languages, advanced PLC programming, process of SCAD develop automation system in industrial applications.	orogramr A syste	mable logic o m and also	contr appl	olle y t	ers, p this k	orogra nowle	mming dge to		
Unit – I	PLC Overview							9		
Introduction to Prog I/O Specifications programming langua	rammable Logic Controller – Architecture – Principle of operati – CPU – Memory design and types – Programming device ages. Introduction to Human Machine Interfaces (HMI).	on – I/O es – Re	Modules: Dis ecording and	scret Ret	e, riev	Analo ving	og, Sp data -	ecial – – PLC		
Unit – II	Basic PLC Programming:							9		
Fundamentals of Lo Entering the Ladde mechanically operat	gic – Program Scan – Relay-Type Instructions – Instruction addu r diagram – Electromagnetic Control relays – Contactors – Mo red switches.	ressing - otor Star	- Branch and ters – Manua	Inter al op	na era	l relagated s	/ instru witche	uctions es and		
Unit – III	Advanced PLC Programming:							9		
Programming Timer VFD based motor co	s – Programming Counters – Math Instructions – Sequencer an ontrol system – Traffic light control system	d Shift R	tegister Instru	ction	IS.	PLC	Applic	ations:		
Unit – IV	SCADA:							9		
Introduction to SCA system components	DA – A brief history of SCADA – Real-time systems – Remo – protocol-modems – Remote terminal units (RTUs) – Master te	ote contr erminal u	ol – Commur inits (MTUs)	nicati	ion	IS: CO	mmun	nication		
Unit – V	Applications of SCADA:							9		
Applications: Real Applications – SCAI	time Revisited – Accounting and grade of data – Scannin DA for Power Utility Network	g and o	communicatio	ns -	- 4	Autom	atic c	control.		
							Тс	otal:45		
TEXT BOOK:										
1. Frank D. Pe	etruzella, "Programmable Logic Controllers", 5th Edition, Tata Mo	:Graw-Hi	ill , New Delhi	, 201	191	for U	nits I, I	II, III.		
2. Stuart A. Boyer, "SCADA: Supervisory Control and Data Acquisition", 4th Edition, ISA Press, USA, 2016 for Units IV, V.										
REFERENCES:										
1. Webb John Private Lim	W & Reis Ronald A, "Programmable Logic Controllers - Principle ited, New Delhi, 2002.	es and \overline{A}	pplications", {	5th E	dit	tion, F	'HI Le	arning		
2. Bolton W, "	Programmable Logic Controllers", 5th Edition, Elsevie , New York	k, 2009								

COUR On co	COURSE OUTCOMES: On completion of the course, the students will be able to							
CO1	identify the PLC hardware and programming languages for various applications	Understanding (K2)						
CO2	develop PLC ladder logic programming for industrial problems	Applying (K3)						
CO3	design a PLC system, component, or process to meet a set of specifications	Applying (K3)						
CO4	impart the knowledge about SCADA and understand the components of SCADA	Understanding (K2)						
CO5	apply PLC and SCADA in real time applications to meet industrial automation	Applying (K3)						

	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									2	3
CO2	3	2	1	1	1							1	2	3
CO3	3	2	1	1	1	1						1	2	3
CO4	3	1							1				1	3
CO5	3	2	1	1		1	1					1	2	3

ASSESSMENT 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	20	50	30				100						
CAT3	10	50	40				100						
ESE	10	50	40				100						

22EEE19 - PULSE GENERATING CIRCUITS FOR POWER CONVERTERS

Progra Branch	mme & n	B.E & Electrical and Electronics Engineering Sem. Category L T											
Prereq	uisites	Power Electronics	7	PE	3	0	0	3					
				1	1								
Preamb	Preamble This course brings the fundamentals of pulse width modulation techniques and the various types. It is certainly needed for the development of pulses required for the power converters.												
Unit –		Fundamentals of PWM:						9					
Fundar – Natur	nental Conce ally Sampled	epts of PWM – Evaluation of PWM Schemes – Double Fourier I I PWM – PWM Analysis by Duty Cycle Variation – Regular Sam	ntegral Ar npled PW	nalysis of a Tu M – Direct mo	vo-Le odula	evel tion	PWM	waveform					
Unit –	1	Modulation of Single Phase VSI:						9					
Topolog – Sideb	gy of a Single band Modulat	Phase Inverter – Three level Modulation of a Single Phase Inverter – Three level Modulation of a Single Phase Inversion – Switched Pulse Sequence.	/erter – A	nalytic Calcul	ation	of H	larmo	nic Losses					
Unit – III Modulation of Three Phase VSI:													
Topolog Analytic	gy of a Three c Calculation	Phase VSI – Three Phase Modulation with Sinusoidal Referen of Harmonic Losses – Discontinuous Modulation Strategies – 1	ices – Thi Friplen Ca	rd Harmonic I Irrier Ratios a	Refei nd S	renc ub h	e Inje armor	ction – nics.					
Unit –	IV	Space Vector Modulation Strategies:						9					
Space SVM – Place Solution	Vector Modu ement of the 2 ns for Discon	lation – Phase Leg References – Naturally Sampled SVM – Ana Zero Space Vector – Discontinuous Modulation – Phase Leg Re tinuous PWM – Single Edge SVM	alytical So eferences	blution for SVI for Discontin	M Ha uous	rmo PW	onic Lo /M – A	osses for Inalytical					
Unit –	V	Programmed Modulation Strategies and Multilevel Conve	rters:					9					
Optimiz PWM –	zed spaced v - Multilevel co	ector PWM – Harmonic elimination PWM – Performance index onverter alternatives – Harmonic Elimination applied to multileve	for optima el inverter	ality – optimur s – Minimum	n PV Harn	/M - noni	- Minii c disto	mum loss ortion.					
								Total:45					
TEXT E	BOOK:												
1.	Grahame H Press Serie	olmes.D & Thomas A. Lipo, "Pulse Width Modulation for Power s on Power Engineering, Wiley, 2003.	Converte	ers: Principles	and	Pra	ctice",	IEEE					
REFER	ENCES:												
1.	Mohammeo USA , 2004	H. Rashid, "Power Electronics: Circuits, Devices and Applicatio.	ons", 4th∣	Edition, Easte	ern E	cond	omy E	dition,					
2.	Dorin O. Ne	eacsu, "Power-Switching Converters: Medium and High Power",	2nd Editi	on, CRC Pres	ss, U	nite	d Stat	es,2006.					
1													

COUR On co	COURSE OUTCOMES: On completion of the course, the students will be able to						
CO1	explain the fundamental concepts of pulse width modulation techniques	Understanding (K2)					
CO2	make use of inverter topologies in applying PWM techniques for single phase VSI	Understanding (K2)					
CO3	make use of inverter topologies in applying PWM techniques for three phase VSI	Understanding (K2)					
CO4	summarize the space vector modulation techniques and its advantages	Understanding (K2)					
CO5	explain the strategies involved for harmonic elimination using PWM	Applying (K3)					

	Mapping of COs with POs and PSOs													
COs/POs	P01	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2		1							1	2	2
CO2	3	2	2		1						1	1	2	1
CO3	3	2	2		1						1	1	2	1
CO4	3	2	2	1	1						1	1	2	1
CO5	3	2	2	1							1	1	2	1

ASSESSMENT PATTERN - THEORY													
Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %						
CAT1	40	60					100						
CAT2	40	60					100						
CAT3	40	40	20				100						
ESE	26	54	20				100						

Progra Branci	amme & h	B.E & Electrical and Electronics Engineering	rical and Electronics Engineering Sem. Category L T P											
Prereq	luisites	Electromagnetic Theory & Generation, Transmission and Distribution	7	PE	3	0	0	3						
Pream	reamble The course is designed to understand various phenomena related to breakdown study and withstand characteristics of insulating materials. The course also describes the generation and measurement of DC, AC and Impulse voltages as well various testing techniques.													
Unit – I Overvoltage Phenomenon in Power Systems: 9														
Causes other a	s for over vol abnormal cond	tages – lightning phenomenon, lightning arrester - Over voltage ditions- Travelling waves on transmission lines (lines terminated v	es due t with ope	o switching s n-end, short-	urge circu	es, Sy iited e	/stem end, a	faults and pparatus).						
Unit –	11	Electrical Breakdown in Gases, Solids and Liquids:						9						
Ionization processes – Townsends Criterion - Paschen's law- Breakdown in non-uniform fields, corona discharge and its effects– Vacuum breakdown. Conduction and breakdown in pure and commercial liquids. Intrinsic breakdown in solids - Electromechanical breakdown - Thermal breakdown - Breakdown in composite dielectrics.														
Unit – III Generation of High Voltages and High Currents:														
Genera Genera	Generation of high DC voltages, alternating voltages, impulse voltages and impulse currents – Tripping and control of Impulse Generators.													
Unit –	IV	Measurement of High Voltage and High Currents:						9						
High R Voltme in high	Resistance wi eters – Capac voltage meas	th series ammeter – Dividers, Resistance, Capacitance and litance Voltage Transformers, Electrostatic Voltmeters – Sphere surement.	Mixed d Gaps –	ividers – Pea High current s	ak V shun	'oltme its- D	eter, (igital t	Generating echniques						
Unit –	V	High Voltage Testing of Electrical Power Apparatus:						9						
Testing measu and co	g of Insulato rement, Radi mpatibility.	r, Bushings, Isolators, Transformers, and Surge Diverters – o interference measurement -International and Indian Standard	Partial Is. Introc	Discharge n luction to ele	neas ctror	nagn	ent - etic in	-Tan delta iterference						
								Total:45						
TEXT I	BOOK:													
1.	Naidu M.S.	and Kamaraju V, "High Voltage Engineering", 6th Edition, McGra	aw-Hill, I	New York, 20	20.									
REFEF	RENCES:													
1.	Kuffel E, Za Burlington,	engl, W.S. and Kuffel J, "High Voltage Engineering Fundamenta 2008.	lls", 2nd	Edition, Butte	erwol	rth-H	einem	ann,						
2.	Wadhwa C.	L, " High Voltage Engineering", 3rd Edition, New Age Publishers	, New D	elhi, 2012.										
3.	Ravindra A	ora, Bharat Singh Rajpurohit , "Fundamental of High Voltage En	gineerin	g", 1st Editior	n, Wi	iley, 2	2019.							

COUR On co	OURSE OUTCOMES: In completion of the course, the students will be able to									
CO1	explain the concepts of over voltage phenomenon	Understanding (K2)								
CO2	discuss the conduction and breakdown in gases, liquids and solid dielectrics	Understanding (K2)								
CO3	model the various generation circuits of high voltage and high currents.	Applying (K3)								
CO4	identify the various measurement techniques of high voltage and high currents.	Applying (K3)								
CO5	explain the testing procedure of power apparatus	Understanding (K2)								
	Mapping of COs with POs and PSOs									

	mapping of cos with r os and r oos													
COs/POs	P01	PO2	PO3	PO4	PO5	P06	P07	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1					1		1			1	1	3
CO2	3	1					1		1			1	1	3
CO3	3	2	1	1			1		1			1	2	3
CO4	3	2	1	1			1		1			1	2	3
CO5	3	1					1		1			1	1	3
			.		<u>.</u>	-								

ASSESSMENT PATTERN - THEORY													
Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %						
CAT1	20	80					100						
CAT2	20	50	30				100						
CAT3	20	50	30				100						
ESE	20	50	30				100						

		22EEE21 – ELECTRIC VEHICLE TECHNO	LOGY											
Program Branch	nme &	B.E & Electrical and Electronics Engineering	Sem.	Category	L	т	Ρ	Credit						
Prerequ	isites	Nil	7	PE	3	0	0	3						
Preamble	eamble This course is aimed to introduce the fundamental concepts and principles of various Electric Vehicles a Hybrid Electric Vehicles with an insight into Power electronic converters for battery charging.													
Unit – I		Electric and Hybrid Electric Vehicles:						9						
Configura Transmis Drive Tra	ation of E ssion requir ains, Archite	lectric Vehicles, Performance of Electric Vehicles, Traction ement, Vehicle performance, Tractive effort in normal driving, E ecture of Hybrid Electric Drive Trains, Series Hybrid Electric Drive	n motor Energy co e Trains,	characterist onsumption C Parallel hybr	ics, conc id el	Trac ept o ectric	ctive If Hyb c drive	effort and rid Electric trains.						
Unit – II		Design of Electric and Hybrid Electric Vehicles:						9						
Series H traction r parallel H engine p	lybrid Elect motor, powe hybrid drive ower capac	ric Drive Train Design: Operating patterns, control strategies, er rating of engine/generator, design of PPS; Parallel Hybrid El- train, Maximum State-of-Charge of Peaking Power Source (N ity, design of electric motor drive capacity, transmission design,	Sizing o ectric Dr Aax. SO energy s	of major com ive Train Des C-of-PPS) Co storage design	pone sign: ontro n.	ents, Con I Stra	powe trol st ategy,	r rating of rategies of design of						
Unit – III		Energy storage for EV and HEV:						9						
Electroch Fuel Cell	hemical Bat I Technolog	teries, Battery Technologies, Ultracapacitors, Ultra-High-Speec ies: Proton Exchange Membrane Fuel Cells, Alkaline Fuel Cells,	l Flywhe , Fuel Sι	els, Hybridiza ıpply.	ation	of E	nergy	Storages,						
Unit – IV	1	Power Electronic Converter for Battery Charging:						9						
Charging Design o	g methods f of Z converte	or battery, Termination methods, charging from grid, The Z-con er for battery charging, High-frequency transformer based isolate	iverter, la ed charge	solated bidire er topology.	ctior	nal D	C-DC	converter,						
Unit – V		Electric Propulsion:						9						
EV cons Brushles	ideration, D s DC Motor	C motor drives and speed control, chopper control of DC Motor Drives, Switch Reluctance Motor Drive for Electric Vehicles, Co	ors, Indu onfigurati	ction motor d on and contro	rives I of	, Per Drive	rmane s.	ent Magnet						
								Total:45						
TEXT BO	OOK:													
1. l	M. Ehsani, ` and Design'	Y. Gao, S. Gay and Ali Emadi, "Modern Electric, Hybrid Electric, ', 1st Edition, CRC Press, USA, 2010.	and Fue	l Cell Vehicle	s: Fi	undai	menta	lls, Theory						
REFERE	INCES:													
1.	lqbal Hussa	in, "Electric and Hybrid Vehicles: Design Fundamentals", 2nd Ed	dition, Cl	RC Press, US	A, 2	011.								
2.	Sheldon S. Springer Ne	Williamson, " Energy Management Strategies for Electric and Pl w York Heidelberg Dordrecht London, 2013.	ug-in Hy	brid Electric \	/ehio	les "	, 1st E	Edition,						

COUR On co	SE OUTCOMES: mpletion of the course, the students will be able to	BT Mapped (Highest Level)
CO1	evaluate the various aspects and performance of Electric and Hybrid Electric vehicles.	Understanding (K2)
CO2	conceptualize the principles of Energy storage for EV and HEVs.	Understanding (K2)
CO3	illustrate the concepts & Principles of Electric propulsion.	Understanding (K2)
CO4	design and develop the electric vehicles with suitable control strategies	Applying (K3)
CO5	interpret different power converter topologies used for electric vehicle application.	Applying (K3)

	Mapping of COs with POs and PSOs													
COs/POs	P01	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2		1			1					1	1	3
CO2	3	2											1	3
CO3	3	2								1			1	3
CO4	3	2	2			1	1						1	3
CO5	3	2	1	1			1					1	2	3
1 – Slight, 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	20	80					100						
CAT2	20	80					100						
CAT3	10	50	40				100						
ESE	10	50	40				100						

Progra Branch	mme & ז	B.E & Electrical and Electronics Engineering	Sem.	Category	L	т	Р	Credit				
Prereq	uisites	Nil	7	PE	3	0	0	3				
Preaml	ble	This course provides an in-depth understanding of finite eleme The students will learn the fundamental principles of FEA and behavior of electrical machines.	ent analys how it ca	sis as applied in be used to	to e simu	lectri Ilate	cal m and a	achines. nalyze the				
Unit –	1	Outline of Electromagnetic Fields and Principles of Finite	Element	Methods				9				
Vector for the	Vector Analysis - Electromagnetic Fields - Fundamental Equations. Field Problems with Boundary Conditions - Classical Metho for the Field Problem Solution - Classical Residual Method - Classical Variational Method - The Finite Element Method											
Unit –	11	Analysis and Applications of the Finite Element Method to	Two-Di	mensional F	ields	6		9				
Reduct Applica	ion of the Fi ations: Introdu	eld Problem to a Two-Dimensional Problem - Boundary Cond ction - Linear Interpolation of the Function φ- Simple Description	ditions - ns of Ele	Computation ctromagnetic	of Field	the S Is -	Solvec	Structure				
Unit –		The Single-Phase Transformer						9				
The Sin of the N	The Single-Phase Transformer - Equivalent Electric Circuit of the Transformer - Computation of the No-Load Inductances - Effect of the Nonlinear B-H Curve - Estimation of the Iron Losses - Determination of the Leakage Inductances											
Unit –	IV	Synchronous Generators						9				
Introdu Quadra Compu	ction - Comp ature Axis Inc atation of the I	butation of the No-Load Characteristic - Computation of the luctance - Self- and Mutual Inductances - Saturation Effect - C Machine Characteristics	Direct-A Computat	xis Inductant tion of Ld ar	ce - nd Lo	Con wi ע	nputat th any	ion of the Current -				
Unit –	v	Self-Starting Single-Phase Synchronous Motors						9				
Introdu Dynam	ction - Definit ic Performan	ion of the Motor Model - Computation of the Electrical Paramete ce - Two-Dimensional Linear Interpolation	ers - Com	putation of th	e To	orque	- Ana	lysis of the				
								Total:45				
TEXT E	300K:											
1.	Nicola Bian	chi, "Electrical Machine Analysis Using Finite Elements", 1st Edit	tion, CR	C Press, Tayl	or ar	nd Fr	ancis,	2017				
REFER	RENCES:											
1.	S. J. Salon,	"Finite Element Analysis of Electrical Machine", Kluwer Academ	ic Publis	hers, Boston,	MA	, 200	9.					
2.	P. P. Silves Press, Cam	ter, R. L. Ferrari, "Finite Element Analysis and Design of Electron bridge, England, 3rd Edition, 2006.	magnetic	Devices", Ca	ambr	idge	Unive	ersity				
3.	J. P. A. Bas	tos, N. Sadowsky, "Electromagnetic Modelling By Finite Elemen	t Method	s", Marcel-De	ecke	r, 200	03.					
1												

22EEE22 - FINITE ELEMENT ANALYSIS OF ELECTRICAL MACHINES

COUR On co	SE OUTCOMES: mpletion of the course, the students will be able to	BT Mapped (Highest Level)
CO1	Apply basic electromagnetic field equations to electrical machine design	Understanding (K2)
CO2	Learn the importance of finite element method through field equations	Understanding (K2)
CO3	Determine various losses in Single phase transformer	Applying (K3)
CO4	Compute various parameters of synchronous generator	Applying (K3)
CO5	Compute various parameters of synchronous motor	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	2			1			1			1	2	1
CO2	3	3	2			1			1			1	2	1
CO3	3	3	2			1			1			1	2	1
CO4	3	3	2			1			1			1	2	1
CO5	3	3	2			1			1			1	2	1

ASSESSMENT PATTERN - THEORY													
Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %						
CAT1	20	80					100						
CAT2	10	50	40				100						
CAT3	10	50	40				100						
ESE	10	50	40				100						

22EEE23 – DIGITAL TWIN TECHNOLOGY

Programme & Branch	B.E & Electrical and Electronics Engineering	Sem.	Category	L	т	Ρ	Credit
Prerequisites	Nil	7	PE	3	0	0	3
Preamble	This course aim to impart knowledge on digital twin manufacturing, production and process industry.	concepts, a	advantages a	and	their	appl	ications in
Unit – I	Introduction						9
Digital twin – Defin service industries, ł	ition, types of Industry and its key requirements, Important listory of Digital Twin, DTT role in industry innovation, Techr	ce, Application nologies/tools	on of Digital enabling Dig	Twin jital	in p Twin	roces	s, product,
Unit – II	Manufacturing and Production						9
Introduction to the i and anomaly detect	mpact of the digital twin, cyber-physical systems, process a tion on the manufacturing ecosystem and its application	utomation an	id optimizatio	n, pr	edict	ive ma	aintenance
Unit – III	Digital Twin in a Process Industry						9
Basics of Process plant, Digital Threa simulation, Digital E	Industry, Trends in the process industry, control system re id in process Industry, Data collection and analysis for pre- interprise	quirements in rocess impro	n a process i ovements, pro	ndus	stry, l s saf	Digital fety, <i>A</i>	Twin of a Automation
Unit – IV	Healthcare						9
Introduction to hea bioreactors and bio radiotherapy system	althcare and bioengineering applications of digital twins. omanufacturing, hospital administration in industry 4.0, epic ns	The bioproc dermic contro	ess and its ol prediction,	pote and	ntial, clou	indu: Id con	strial-scale
Unit – V	Advantages of Digital Twin						9
Improvement in pr	oduct quality, production process, process Safety, ident	ify bottlenec	ks and impr	ove	effici	iency,	achieving
flexibility in producti	on, continuous prediction and tuning of production process t	through Simu	lation, reduci	ng th	ie tim	ne to n	narket.
							Total:45
TEXT BOOK:							
1. Andrew Ye States, 201	h Chris Nee, Fei Tao, and Meng Zhang, "Digital Twin Driven 9	Smart Manu	facturing", Els	sevie	er Sci	ience.	, United
REFERENCES:							
1. Alp Ustund Manufactur	ag and Emre Cevikcan, "Industry 4.0: Managing The Digital ing., Switzerland, 2017	Transformati	on", Springer	Seri	es in	Adva	nced
2. Alasdair Gi	Ichrist, "Industry 4.0: The Industrial Internet of Things", Apres	ss., United S	2015, tates				
3. Ibrahim Ga Springer., S	rbie, "Sustainability in Manufacturing Enterprises, Concepts, Switzerland, 2016	, analyses an	d assessmen	ts fo	r Ind	ustry 4	4.0",
l .							

COUR On co	SE OL mpleti	JTCOM on of t	ES: he cour	se, the stu	udents	will be a	able to						(BT Mapped (Highest Level)					
CO1	Acqu	uire kno	wledge	on digital t	win and	l its impo	ortance.						Ur	Understanding (K2)					
CO2	Unde	erstand	the impa	act of digit	al twin i	n indust	rial sect	ors					Ur	Iderstandir	ng (K2)				
CO3	B Explore the use of digital twin in process industries							Ur	Understanding (K2)										
CO4	Anal	yse the	use of c	ligital twin	in healt	hcare a	nd medi	cine					Ur	Understanding (K2)					
CO5	Disc	over the	e advant	ages of dig	gital twi	n.							Ur	derstandir	ng (K2)				
	Mapping of COs with POs and PSOs																		
00-/5	00-		DOD	DOD	DO4	DOF	DOC	DO7	DOO	DOO	DO40	D044	DO40	0004	DCOO				

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

ASSESSMENT PATTERN - 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	80					100						
ESE	20	80					100						
* ±3% may be varied (CAT 1, 2 & 3 – 50 marks & ESE – 100 marks)													

Programme & Branch B.E & Electrical and Electronics Engineering Sem. Category L T P Credit Prerequisites Nil 7 PE 3 0 0 3 Preamble This course serves as a guide to explore computer methodology and algorithms that improves automatically through experience. 9 Unit - I ARTIFICIAL NEURAL NETWORKS - I 9 Introduction to Soft computing – Neural Networks – Model – activation functions – Linear separability. Supervised learning: Architecture and algorithm - Perceptrons – Adaline and Madaline – Back propagation algorithm – Radial Basis Function Networks. Unit - II ARTIFICIAL NEURAL NETWORKS - II 9 Unsupervised Learning and Other Neural Networks – Competitive Learning Networks – Kohonen Self Organizing Networks – Learning Vector Quantization – Hebbian Learning – Deep neural networks – Applications: Neural network classifier. 9 Introduction to Fuzzy Logic - Classical Sets and Fuzzy Sets - Fuzzy Relations- Membership functions – Fuzzification – Defuzzification - Fuzzy if-then Rules – Fuzzy Reasoning – Fuzzy Inference Systems – Mandani Fuzzy Models –Sugeno Fuzzy Models – Comparison between Mandani and Sugeno method – Fuzzy logic control systems 9 Unit – IV GENETIC ALGORITHM - I 9 Simple genetic algorithm – Operators of Genetic Algorithm (GA): Encoding- selection – crossover – mutation. Stopping condition
Prerequisites Nil 7 PE 3 0 0 3 Preamble This course serves as a guide to explore computer methodology and algorithms that improves automatically through experience. 9 Unit - I ARTIFICIAL NEURAL NETWORKS - I 9 Introduction to Soft computing - Neural Networks - Model - activation functions - Linear separability. Supervised learning: Architecture and algorithm - Perceptrons - Adaline and Madaline - Back propagation algorithm - Radial Basis Function Networks. Unit - II ARTIFICIAL NEURAL NETWORKS - II 9 Unsupervised Learning and Other Neural Networks - Competitive Learning Networks - Kohonen Self Organizing Networks - Learning Vector Quantization - Hebbian Learning - Deep neural networks - Applications: Neural network classifier. 9 Introduction to Fuzzy Logic - Classical Sets and Fuzzy Sets - Fuzzy Relations- Membership functions - Fuzzification - Defuzzification - Fuzzy if-then Rules - Fuzzy Reasoning - Fuzzy Inference Systems - Mamdani Fuzzy Models -Sugeno Fuzzy Models - Comparison between Mamdani and Sugeno method - Fuzzy logic control systems 9 Unit - IV GENETIC ALGORITHM - I 9 Simple genetic algorithm - Operators of Genetic Algorithm (GA): Encoding- selection - crossover - mutation. Stopping condition of CAD Brokima and bugerithm - Scheare theorem. 9
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Unit – IV GENETIC ALGORITHM - I 9 Simple genetic algorithm – Operators of Genetic Algorithm (GA): Encoding- selection – crossover – mutation. Stopping condition 9
Simple genetic algorithm – Operators of Genetic Algorithm (GA): Encoding- selection – crossover – mutation. Stopping condition
Applications of GA - Genetic algorithm tools for control systems engineering -Genetic algorithm based fuzzy controller for speed control of brushless DC Motor
Unit – V GENETIC ALGORITHM - II 9
Advanced Operators and Techniques in Genetic Algorithm: Diploidy, Dominance and Abeyance – Multiploid - Inversion and Reordering –introduction to Multi objective GA -Parallel and Distributed Genetic Algorithm - Hybrid Genetic Algorithm (HGA) – Adaptive Genetic Algorithm – Fast Messy Genetic Algorithm - Independent Sampling Genetic Algorithm - Genetic Programming-Primitives-Attributes-Steps-Applications.
Total:45
TEXT BOOK:
Sivanandam S.N., Deepa S.N., "Principles of soft computing", 2 nd Edition, Wiley India Pvt Ltd, New Delhi, 2018. for Units I,II,III.
2. Sivanandam S.N., Deepa S.N., "Introduction to Genetic Algorithms", Urheberrechtlich Geschutztes material, Springer- Verlag, Berlin Heidelberg,2008 for Units IV,V.
REFERENCES:
1. Yegnanarayana, "Artificial Neural Networks", Eastern economy, PHI learning Pvt Ltd, New Delhi, 2012.
2. Timothy J Ross, "Fuzzy Logic with engineering applications", 4th Edition, John Wiley & Sons, UK, 2016.

COUR: On cor	SE OUTCOMES: npletion of the course, the students will be able to	BT Mapped (Highest Level)
CO1	Recognize neural networks to build intelligent systems.	Understanding (K2)
CO2	Apply neural networks to solve classification and regression problems.	Applying (K3)
CO3	Apply fuzzy principles to deal with vulnerability and tackle real time issues.	Applying (K3)
CO4	Apply genetic algorithms to obtain optimized results for a particular problem.	Applying (K3)
CO5	Apply advanced genetic operators and genetic programing to solve real world problems	Applying (K3)

Mapping of COs with POs and PSOs														
PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	
3	2	2	2	2	1						1	2	3	
3	2	1	1	2	1						1	3	2	
3	2	1	1	2	1						1	3	2	
3	2	1	1	2	1						1	2	3	
3	2	1	1	2	1						1	3	2	
	PO1 3 3 3 3 3 3 3	PO1 PO2 3 2 3 2 3 2 3 2 3 2 3 2 3 2 3 2 3 2 3 2 3 2	PO1 PO2 PO3 3 2 2 3 2 1 3 2 1 3 2 1 3 2 1 3 2 1 3 2 1 3 2 1	PO1PO2PO3PO432223211321132113211	PO1 PO2 PO3 PO4 PO5 3 2 2 2 2 3 2 1 1 2 3 2 1 1 2 3 2 1 1 2 3 2 1 1 2 3 2 1 1 2 3 2 1 1 2 3 2 1 1 2	Mapping of CC PO1 PO2 PO3 PO4 PO5 PO6 3 2 2 2 2 1 3 2 1 1 2 1 3 2 1 1 2 1 3 2 1 1 2 1 3 2 1 1 2 1 3 2 1 1 2 1 3 2 1 1 2 1 3 2 1 1 2 1	Mapping of COs with PO1 PO2 PO3 PO4 PO5 PO6 PO7 3 2 2 2 2 1 1 3 2 1 1 2 1 1 3 2 1 1 2 1 1 3 2 1 1 2 1 1 3 2 1 1 2 1 1 3 2 1 1 2 1 1 3 2 1 1 2 1 1 3 2 1 1 2 1 1	Mapping of COs with POs an PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 3 2 2 2 2 1	Mapping of COs with POs and PSO PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 3 2 2 2 2 1 <	Mapping of COs with POs and PSOs PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 3 2 2 2 1 PO10 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 <td>Mapping of COs with POs and PSOs PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 3 2 2 2 1 1 2 1 <td< td=""><td>Mapping of COs with POs and PSOs PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO12 3 2 2 2 2 1 1 3 2 1 1 2 1 1 3 2 1 1 2 1 1 3 2 1 1 2 1 1 3 2 1 1 2 1 1 3 2 1 1 2 1 1 3 2 1 1 2 1 1 3 2 1 1 2 1 </td></td<><td>Mapping of COs with POs and PSOs PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO12 PS01 3 2 2 2 1 1 2 1 1 2 3 2 1 1 2 1 1 2 1 3 2 1 3 2 1 3 2 1 3 3 3 2 1 2 1 3 3 3 3 1 3 3 3 3 1 3 3 3 1 3 3 3 1 1 2 1 1 3 3 3 1 1 2 1 1 3 3 1 1 3 3 1 1 3 3 1 1 3 3 1 1 3 3 3 1 1</td></td>	Mapping of COs with POs and PSOs PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 3 2 2 2 1 1 2 1 <td< td=""><td>Mapping of COs with POs and PSOs PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO12 3 2 2 2 2 1 1 3 2 1 1 2 1 1 3 2 1 1 2 1 1 3 2 1 1 2 1 1 3 2 1 1 2 1 1 3 2 1 1 2 1 1 3 2 1 1 2 1 1 3 2 1 1 2 1 </td></td<> <td>Mapping of COs with POs and PSOs PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO12 PS01 3 2 2 2 1 1 2 1 1 2 3 2 1 1 2 1 1 2 1 3 2 1 3 2 1 3 2 1 3 3 3 2 1 2 1 3 3 3 3 1 3 3 3 3 1 3 3 3 1 3 3 3 1 1 2 1 1 3 3 3 1 1 2 1 1 3 3 1 1 3 3 1 1 3 3 1 1 3 3 1 1 3 3 3 1 1</td>	Mapping of COs with POs and PSOs PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO12 3 2 2 2 2 1 1 3 2 1 1 2 1 1 3 2 1 1 2 1 1 3 2 1 1 2 1 1 3 2 1 1 2 1 1 3 2 1 1 2 1 1 3 2 1 1 2 1 1 3 2 1 1 2 1	Mapping of COs with POs and PSOs PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO12 PS01 3 2 2 2 1 1 2 1 1 2 3 2 1 1 2 1 1 2 1 3 2 1 3 2 1 3 2 1 3 3 3 2 1 2 1 3 3 3 3 1 3 3 3 3 1 3 3 3 1 3 3 3 1 1 2 1 1 3 3 3 1 1 2 1 1 3 3 1 1 3 3 1 1 3 3 1 1 3 3 1 1 3 3 3 1 1	

	ASSESSMENT PATTERN - THEORY													
Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %							
CAT1	10	70	20				100							
CAT2	10	70	20				100							
CAT3	10	70	20				100							
ESE	10	70	20				100							
* ±3% may be varied (0	CAT 1, 2 & 3 – 50 m	arks & ESE – 100 r	narks)	1 1			_1							

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Progra Branc	amme& h	B.E & Electr	ical and El	ectroni	ics Eng	gineer	ring			Ser	n.	Cat	egory	L	Т	Р		Credit
Prerec	uisites	Power Electr	onics							7			PE	3	0) 0		3
Pream	ble	This course a renewable en hybrid system	ims to impa ergy. The c າ.	art the st course co	tudents, overs d	s, in de design	epth kinn of so	nowle lar ph	edge a notovo	about t oltaic, c	he ir desig	nporta jn of p	ince of p ower co	power	coi er fo	nverte or wine	rs ir d ar	n nd
Unit -	l	Photovoltaic	Inverter S	tructure	es													9
Introdu Inverte	r Structures -	ter Structures I Three-Phase F	Derived from PV Inverters	m H-Bri s - Contr	idge To rol Struc	opolog ctures	gy - In s.	nverte	er Stru	uctures	s De	rived	from NI	PC To	pol	logy -	Ту	pical PV
Unit -	I	Grid Synchro	onization i	n Single	e-Phase	e Pow	ver Co	onvei	rters.									9
Introdu Based	iction - Grid S on In - Quad	Synchronization rature Signal G	Technique eneration -	s for Sir PLLs Ba	ngle-Ph ased on	nase S n Adap	Systen ptive F	ns - F Filteri	Phase ng.	e Detec	ction	Base	d on In	Quadı	atu	ure Sig	nal	s - PLLs
Unit -	111	Grid Convert	ter Structu	res and	I require	remen	nts for	r Win	d Tu	rbine S	Syste	ems						9
Introdu Norma	iction - WTS I Operation -	Power Configur Active Power C	ations - Gri control in No	id Power ormal Op	r Conve peration	erter T n - Re	Topolo eactive	ogies e Pow	- WT /er Cc	S Cont ontrol ir	trol - n No	Frequ rmal C	iency ar Operatio	nd Vol n.	tag	le Dev	iatio	on under
Unit -	IV	Grid Synchro	onization in	n Three	-Phase	e Pow	er Co	nver	ters									9
Introdu Refere PLL: T	iction - The T nce Frame F he Double Sy	hree Phase Vo LL under Unb nchronous Ref	ltage Vecto alanced an erence Frar	or under d Distor me - Rel	r Grid Fa rted Gri lationsh	aults: id Cou hip bet	: Unba Indition Indition	alance ns - ⁻ n the l	ed Gr The [DSO(id Volt Decoup 31 and	ages bled the l	durin Doubl DDSR	g a Grio e Syncl F.	d Faul hronoi	t - us	The S Refere	ync ence	hronous e Frame
Unit - Y	V	Grid convert	er control	for WTS	S													9
Introdu alone,	iction – Mode Micro-grid, D	I of the convert roop Control an	er – AC vol Id Grid Sup	tage and porting.	d DC vo	oltage	e contr	rol - \	/oltag	e orier	nted	contro	l and di	rect p	owe	er con	trol	- Stand-
																	-	Total:45
TEXT	BOOK:																	
1.	Remus Teo Edition, Wil	odorescu, Marco ey, New Delhi, :	DLiserre, Po 2011.	edro Ro	driguez	z, "Grio	d Con	verte	ers for	Photo	volta	iic and	l Wind F	ower	Sy	stems	",1s	it
REFE	RENCES:																	
1.	Chetan Sing Ltd, New D	gh Solanki, "So elhi, 2015.	lar Photovo	ltaics: F	undame	entals	s, Tecl	hnolo	ogies a	and Ap	plica	ations"	, 3 rd Ed	ition, F	PHI	l Learr	ing	Pvt.
2.	Mukund R I 2005.	Patel, "Wind and	d Solar Pov	ver Syst	tems: De	esign,	, anal	ysis a	and op	peratio	n", 2	2nd Eo	dition, C	RC PI	ess	s, Boc	a R	aton,
3.	B.H.Khan, "	'Non-conventio	nal Energy	sources	s", 2nd E	Editior	n,Tata	a McG	Graw-I	hill Put	olishi	ng Co	mpany,	New	Del	lhi, 200)9	
1																		

22EEE25 - POWER ELECTRONIC INTERFACES TO RENEWABLE ENERGY

COUR On co	SE OUTCOMES: mpletion of the course, the students will be able to	BT Mapped (Highest Level)
CO1	Classify various type of photovoltaic inverter structure	Understanding (K2)
CO2	explain the grid synchronization for single phase converter	Understanding (K2)
CO3	explain the grid synchronization in for three phase converter	Understanding (K2)
CO4	Select the grid converter structures and requirements for wind turbine systems	Applying (K3)
CO5	Build the grid controlled converter for wind turbine systems	Applying (K3)
	·	

	Mapping of COs with POs and PSOs														
COs/POs	P01	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	
CO1	3	2				1	1		1			1	3	1	
CO2	3	2				1	1		1			1	1	2	
CO3	3	2	2			1	1		1			1	2	1	
CO4	3	2	2			1	1		1			1	2	2	
CO5	3	3	2			1	1		1			1	2	1	
	Mada	mata 0	Culturations			Tavana									

	ASSESSMENT PATTERN - THEORY													
Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %							
CAT1	30	70					100							
CAT2	20	80					100							
CAT3	20	60	20				100							
ESE	20	40	40				100							

			22EE	E26 – SMART	GRID						
Programme 8 Branch	B.E & Electr	ical and Electro	nics Er	ngineering		Sem.	Category	L	т	Ρ	Credit
Prerequisites	Generation, Electronics	Transmission	and	Distribution,	Power	7	PE	3	0	0	3
Preamble	The aim of t electronics a	he course is to oplications of sma	provide art grid.	e basic concep	ots, various	s control	and automa	ation	Tech	inolog	ies, power
Unit – I	Introduction	:									9
Introduction: N Data Commun	eed for implementin ication: Switching te	g smart grid-Early chniques – Comr	y Smar nunicat	t Grid Initiatives	-Overview Layered a	/ of the te architectu	chnologies re	equir ols.	ed fo	r the S	Smart Grid-
Unit – II	Information	and Communica	ation To	echnologies:							9
Communicati security for sm	on Technologies: art grid: Encryption	Introduction–Co and decryption–A	ommun uthenti	ication techno	logies–sta ecurity sta	ndards Indards.	for informati	on	excha	ange-l	nformation
Unit – III	Sensing, Me	asurement and	Contro	ol:							9
Introduction-Si Communicatio	mart Metering-Evoluns infrastructure and	tion of electricity	meterin art met	ng-Key compon tering-Demand	ents of sm side integ	art mete ration.	ring-An overv	view	of the	hard	ware used-
Unit – IV	Automation	Technologies:									9
Distribution a Distribution ma	utomation equipment anagement system: I	nt: Substation a Data sources and	utomat extern	tion equipmen al systems-Mo	t–Faults in delling and	n the d d analysi	istribution sy s tools– Appli	vsterr icatio	n–Vol ons.	tage	regulation-
Unit – V	Power electronic elect	onics and energ	y stor	age in Smart (Grid:						9
Power electro Energy storage	nics: Introduction–R e: Introduction-Energ	enewable energy gy storage techno	/ gene logies-	ration–Fault cu -Case study.	rrent limiti	ing–Shur	nt compensat	ion–	Serie	s com	pensation.
											Total:45
TEXT BOOK:											
1. Janak Applic	a Ekanayake, Kiths ations",1st Edition, J	iri Liyanage, Jiar ohn Wiley& Sons	اzhong Ltd, U	Wu, Akihiko Yu Inited Kingdom	okoyama 8 2012.	& Nick J	enekins, "Sm	art (Grid:	Techr	nology and
REFERENCES	S:										
1. James Canad	Mamoh, "Smart G la, 2012.	Brid Fundamenta	ls of C	Design and An	alysis", 1s	t Edition	, IEEE Pres	s, Jo	ohn V	Viley	and Sons,
2. Richa USA,	d DeBlasio; Cherry 2008, pp. 1-7, doi: 1	Tom, "IEEE Sta 0.1109/ENERGY	ndards .2008.4	for the Smart 4780988.	Grid," 200	8 IEEE	Energy 2030	Con	feren	ce, A	tlanta, GA,
3. "NIST http://	Framework a vww.nist.gov/public	nd Roadmap _affairs/relea ses/	for smartg	· Smart (jrid_interoperat	Grid Inte ility_final.p	eroperab od	ility Stand	lards	i, I	Relea	se 1.0,"

COUR On cor	SE O mple ^r	UTCON tion of t	IES: the cour	rse, the st	udents	s will be a	able to						(BT Mapp Highest Le	ed evel)
CO1	Exp	lain the	need fo	r impleme	nting sr	nart grid	and trar	nsmissio	on syste	em opera	ation		Un	derstandin	g (K2)
CO2	lder	ntify the	informa	tion and co	ommun	ication te	chnolog	ies in sr	mart gr	id			Un	derstandin	g (K2)
CO3	Арр	bly the s	ensing, I	measurem	ent and	d control	techniqu	les for s	smart g	rid applic	cations			Applying (K3)
CO4	Eva	luate th	e autom	ation tech	nologie	s in smar	t grid							Applying (K3)
CO5	CO5 Analyse the applications of power electronics and energy storage in smart grid Analyzing (K4)														
	Mapping of COs with POs and PSOs														
COs/P	'Os	PO1	PO2	PO3	PO4	PO5	P06	P07	PO8	PO9	PO10	P011	PO12	PSO1	PSO2
CO1	1	3		2		2							2	3	3
CO2	2	3		2		2							2	1	2
COS	3	3	3	2		2			3				2	2	2
CO4	4	3	2	2		2			2				2	2	2
COS	5	3	3	3		3			3				2	2	2
1 – Sliç	ght, 2	– Mode	erate, 3 -	- Substant	ial, BT-	Bloom's	Taxono	my		_		·			
						ASSES	SMENT	ΓΡΑΤΤΙ	ERN -	THEORY	(
Tes C	t / Blo atego	oom's ory*	Re	memberii (K1) %	ng	Jndersta (K2)	inding %	Apply (K3)	/ing) %	Analyzi (K4) 9	ing %	Evaluating (K5) %	Crea	ating (K6) %	Total %
	CAT	1		30		70									100
	CAT	2		30		40		30)						100
	CAT	3		20		50		20)	10					100
	ESF	=		20		50		20)	10					100
* ±3% !	mav ł	oe varie	d (CAT ·	1.2&3-	50 mar	ks & ESE	– 100 r	marks)					1		

		22EEE27 – MICROGRID						
		-	I	1		T		T
Program Branch	mme &	B.E & Electrical and Electronics Engineering	Sem.	Category	L	т	Р	Credit
Prerequ	uisites	Generation, Transmission and Distribution, Power Electronics	7	PE	3	0	0	3
Preamb	ble	The objective of the course is to impart knowledge about t types and issues associated in their practical realization. Th control and operational strategies used for practical microgri	he renewat ne course w ids.	ole energy ba ill also elabor	sed ate t	micro he va	grid te irious	echnology, protection,
Unit – I		The Microgrids Concept						9
Introduc Microgri	ction-The Mic ids-Status Q	crogrid Concept-Clarification of the Microgrid Concept-Opera uo and Outlook of Microgrid Applications	ation and C	ontrol of Mic	rogri	ds-Ma	arket I	Models for
Unit – I		Microgrids Control Issues						9
Introduc and Dec	ction-Control centralized C	Functions-The Role of Information and Communication Tecl ontrol-Forecasting-Centralized Control-Decentralized Control-	hnology-Mic State Estim	rogrid Contro	ol Ar	chited	cture-C	Centralized
Unit – I	11	Intelligent Local Controllers						9
Parame Stability	eters on Free	quency and Voltage Droop Concepts-Development and Ev	aluation of	Innovative L	ocal	Con	trols t	o Improve
Unit – I	V tion Ohellen	Microgrid Protection			(I		D.	9
Islanded	d Operation-I	ges for Microgrid Protection-Adaptive Protection for Microgrid Fault Current Limitation in Microgrids	ds-Fault Cu	rrent Source	tor I	ITECT	ive Pr	otection in
Unit – \	V	Case studies of Microgrid Projects						9
Introduc Projects	ction-Overvie s-Overview o	w of Microgrid Projects in Europe-Overview of Microgrid Pro f Microgrid Projects in China-An Off-Grid Microgrid in Chile an	ojects in the d India.	USA-Overvi	ew c	f Jap	anese	Microgrid
								Total:45
TEXT B	BOOK:							
1.	Nikos Hatzia	argyriou, "Microgrids: Architectures and Control," 1st Edition, V	Viley-IEEE	Press, USA, I	Marc	h 201	4.	
REFER	ENCES:							
1.	Magdi S. Ma Butterworth-	ahmoud, "Microgrid: Advanced Control Methods and Renewa Heinemann Publisher,United Kingdom, 2016	able Energy	System Inte	grati	on",Ill	ustrat	ed edition,
2.	Sharkh S.M – IEEE Pres	., Abu-Sara M.A., Orfanoudakis G.I. &Hussain B., "Power Elec ss, USA, June 2014	ctronic Conv	verters for Mid	crogr	ids,"	1 st Edi	tion, Wiley

COUR On co	SE OL mpleti	JTCOM on of th	ES: he cours	e, the stu	udents	will be a	ble to						(BT Mapp Highest Le	ed evel)
CO1	know	v the ba	sic conce	ept of mic	rogrid	and its op	eration						Ur	derstandin	g (K2)
CO2	ident	tify the v	various m	nicrogrid c	ontrol	issues							Ur	Iderstandin	g (K2)
CO3	desię	gn the ir	ntelligent	local con	trollers	for micro	grid							Applying (I	≺3)
CO4	ident	tify and	describe	various p	orotecti	on schem	es suita	ble for r	nicrog	rid			Ur	derstandin	g (K2)
CO5	analy	yze the	various o	ase studi	es of n	nicrogrid p	orojects							Analyzing (K4)
	1					Mannin	a of CC)s with	POs a	nd PSOs					
COs/F	POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	P08	PO9	PO10	PO11	PO12	PSO1	PSO2
CO	1	3	2	-			1			1			1	2	2
CO	2	3	2				1			1			1	2	2
CO	3	3	2	1	1		1			1			1	2	2
CO	4	3	2				1			1			1	3	2
CO	5	3	2	1	1		1			1			1	2	3
1 – Slig	ght, 2 -	– Modei	rate, 3 –	Substanti	al, BT-	Bloom's	Taxonor	ny		L.					
Тос	+ / Pla		Po	mombori	na	ASSES	SMENT		RN –	THEORY		Svaluating	Cro	oting (K6)	Total
	Catego	ory*	Re	(K1) %	ng	(K2)	naing %	(K3)	%	(K4) %	ng i %	(K5) %	Crea	%	10tai %
	CAT	1		20		80									100
	CAT	2		20		40		40)						100
	CAT	3		20		40		30)	10					100
	ESE			20		40		30)	10					100
* ± 3%	may be	e variec	I (CAT 1,	2&3-5	50 marl	ks & ESE	– 100 m	narks)							
		22EEE28 – ELECTRICAL MACHINE DES	SIGN												
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Progra Branch	mme & N	B.E & Electrical and Electronics Engineering	Sem.	Category	L	т	Р	Credit							
Prereq	uisites	Synchronous and Induction Machines	7	PE	3	0	0	3							
Preamb	ble	This course aims in imparting knowledge to the students about different parameters for proper design of static and rotating do	fundam and ac e	ental aspects electrical rotat	and ing n	con: nach	sidera ines.	tion of							
Unit – I		Introduction:						9							
Major c and Ma Standa	considerations agnetic loadin rd specificati	s in Electrical Machine Design – Electrical Engineering Materials gs – Thermal considerations – Heat flow – Temperature rise ar ons	s – Spac nd Insula	e factor – Ch ating Material	oice s – F	of S Ratin	pecifion g of m	c Electrical nachines –							
Unit – I	I	DC Machines :						9							
Output Coeffici commu	Equation – N ient – Net len tator and bru	lain Dimensions – Choice of Specific Electric and Magnetic Loac gth of Iron – Real & Apparent flux densities –Selection of numbe shes – performance prediction using design values.	ling – Ma er of pole	agnetic Circui s – Design of	ts Ca Arm	alcul: atur	ations e – De	– Carter's esign of							
Unit – I		Transformers:						9							
Output Equation – Main Dimensions – kVA output for single and three phase transformers – Window space factor – Design of co															
and wir	nding – Over	all dimensions – Operating characteristics – No load current –	Tempera	ature rise in T	Frans	form	ners –	Design of							
Tank –	Methods of c	ooling of Transformers.						1							
Unit –	IV	Induction Motors:						9							
Output	equation of I	nduction motor – Main dimensions – Choice of Average flux de	ensity –	Length of air	gap	- Ru	les to	r selecting							
rotor si	ots of squiffe	a cage machines - Design of rotor bars & slots - Design of e	ena rings	- Design of	WOU Cuit	ina i curr	otor -	- Magnetic							
charact	eristics-1 oss	es and Efficiency	, current		cuit	cum		Operating							
Unit – V	V	Synchronous Machines:						9							
Output	equation - cl	noice of Electrical and Magnetic Loading – Design of salient pole	e machin	es – Short ci	rcuit	ratio	– sha	ape of pole							
face -	Armature de	sign – Armature parameters – Estimation of air gap length –	Design (of rotor –Des	ign (of da	mper	winding –							
Determ	ination of full	load field MMF - Design of field winding - Design of turbo altern	nators –	Rotor design.	•		•								
								Total:45							
TEXT E	BOOK:														
1.	Sawhney A.	K., "Electrical Machine Design", 3rd Edition, Dhanpat Rai& Co., I	New Del	hi, 2017											
REFER	ENCES:														
1.	Mittle V.N. 8	Mittle A., "Design of Electrical Machines", 4thEdition, Standard I	Publicati	ons and Distr	ibutc	rs, N	lew D	elhi, 2005.							
2.	Agarwal R.k	., "Principles of Electrical Machine Design", 4thEdition, S.K.Kata	ria& Sor	is, New Delhi	, 201	3.									

COUR: On cor	SE O mplet	UTCOM ion of t	IES: he cour	se, the st	udent	s will be a	able to							BT Mapp (Highest Lo	ed evel)
CO1	clas	sify and	l compa	e the vario	ous fur	ndamental	aspect	s and m	ateria	ls used fo	or electri	cal machin	e U	nderstandin	ig (K2)
CO2	iden	tify the	design p	arameter	of dc r	motor by c	onsideri	ing load	requi	rement				Applying (K3)
CO3	iden	tify the	design p	arameter	of tran	sformer b	y consid	lering lo	ad rec	quiremen	t			Applying (K3)
CO4	CO4 identify the design parameter of induction motor by considering load requirement Applying (K3)														
CO5	CO5 identify the design parameter of Synchronous machines by considering load requirement Applying (K3)														
						Mappin	g of CO	s with	POs a	nd PSOs	5	<u>.</u>			
COs/POs PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO12										PSO1	PSO2				
CO	1	3						1		1			1	3	2
CO	2	3	1	1				1		1			1	2	3
CO	3	3	2	1	1			1		1			1	2	3
CO	4	3	2	1	1			1		1			1	2	3
CO	5	3	2	1	1			1		1			1	2	3
1 – Slig	ght, 2	– Mode	erate, 3 -	Substant	ial, BT	- Bloom's	Taxono	my	•	•					
						ASSES	SMENT	PATTE	ERN -	THEORY	,				
Tes	st / Blo	oom's	R	ememberi	ng	Understa	anding	Apply	ying	Analyz	ing	Evaluating	Cre	eating (K6)	Total
c	atego	ory*		(K1) %	_	(K2)	%	(K3)	%	(K4) 9	%	(K5) %		%	%
	CAT	1		10		40		50)						100
	CAT	2		10		40		50)						100
	CAT	3		10		40		50)						
	ESE	=		10		40		50)						100
* ±3%	may b	e varie	d (CAT	, 2 & 3 – 5	50 ma	rks & ESE	– 100 r	narks)							

22EEE29 – DIGITAL IMAGE PROCESSING AND MULTI RESOLUTION ANALYSIS													
Programme & Branch	B.E & Electrical and Electronics Engineering	Sem.	Category	L	т	Ρ	Credit						
Prerequisites	Signals and systems	7	PE	3	0	0	3						
		1		1	1								
Preamble	This course enables the students to learn and apply the variou time images.	s Digital	Image Proces	ssin	g tecl	nnique	es on real						
Unit – I	Digital Image Fundamentals:						9						
Elements of digital i effect, Image samp image quantization	mage processing systems, Elements of visual perception– Brigh ling– Quantization, Basic relationship between pixels, Color ima	tness– C age funda	ontrast– Hue amentals – R	– Sa GB-	aturat - HSI	ion– N mode	/lach band els- Colour						
Unit – II	Image Transforms:						9						
Need for transforms and SVD.	b, DFT and its Properties: Separable – Spatial shift – Periodicity -	-Scaling	– Orthogonal	ity -	- Rota	ation, I	DCT, KLT,						
Unit – III	Image Enhancement and Image Restoration:						9						
Image Enhancement: Basic intensity transformations – Piecewise linear transformation functions, Histogram equalization, Spatial													
flitering: Smootning	and snarpening Filters, Frequency domain filtering: Smootning a	ind snarp	ening filters -	- H0	mom	orphic	: filters						
Image Restoration mean filters – Order ISNR-Applications	: Degradation model – Noise distributions– Median – Geometr r Statistics filters – Inverse and wiener filtering – Constrained lea	ic mean st square	 Harmonic filtering- Per 	mea forn	n – (nance	Contra e metri	harmonic cs-BSNR-						
Unit – IV	Image Segmentation, Representation & Description:						9						
Point, line and edge and merging, Image	e detection – Basics of intensity thresholding – Region based se e representation: Chain codes, – Boundary descriptors – Regiona	egmentat al descrip	ion: Region g otors	Irow	ing –	Regio	on splitting						
Unit – V	Wavelets And Multiresolution Processing:						9						
Subband coding –	The Haar Transform – Multiresolution Expansion – Series Expansion	nsion – S	Scaling Funct	ion	- Wa	velet l	-unction –						
Wavelet Transform Wavelet Transform Image fusion-Stega	in One Dimension- The Wavelet Series Expansion – The D – The Fast Wavelet Transform – Wavelet transform in two d nography	iscrete V limensior	Vavelet Trans ns- Applicatio	sfor ons	m — in im	The C age d	continuous enoising -						
							Total:45						
TEXT BOOK:													
1. Rafael C G	onzalez and Richard E Woods, "Digital Image Processing",4th Eo	dition, Pe	arson Educa	tion	Che	nnai,2	016.						
REFERENCES:													
1. Jayaraman Delhi,2016	S, Esakkirajan S and Veerakumar T, "Digital Image Processing"	,1 st Editio	on 17 th reprint	, Ta	ta Mo	Graw	Hill, New						
2. Chanda B,	Dutta Majumder D, "Digital Image Processing and analysis", 2nd	Edition,	PHI learning,	Nev	/ Dell	ni,201	1.						

COUR: On cor	SE O	UTCOM tion of t	IES: he cour:	se, the stu	udents	s will be a	able to							BT Mapp Highest L	oed evel)
CO1	Illus moc	trate the	e fundarr	iental cond	cepts o	of digital in	nage pr	ocessin	g, 2D	sampling	and Col	our image		Applying	(K3)
CO2	Арр	ly DFT,	DCT, KL	T, SVD a	nd Haa	ar transfo	rmations	s on an i	image					Applying	(K3)
CO3	Impl	lement t	the imag	e enhance	ment	& image r	estoratio	on techr	niques					Applying	(K3)
CO4	Exp	lain ima	ige segm	entation, r	epres	entation a	nd desc	ription t	echnic	ques for i	mage cla	assification	Ur	nderstandir	ng (K2)
CO5 Apply the multi resolution processing over images using wavelet transform. Applying (K3)															
				1		Mappin	g of CO	s with I	POs a	nd PSOs	5	1	1	1	
COs/POs PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO12 PS01 PS02															
CO	1	3	2	1	1							1	1		
CO2	2	3	2	1	1							1	1		
CO	3	3	3	3	1	2						1	1		
CO4	4	3	3	3	1	2						1	1		
CO	5	3	2	1	1							1	1		
1 – Slig	ght, 2	– Mode	rate, 3 –	Substanti	al, BT	- Bloom's	Taxono	my			1	1			
	-							-							
						ASSES	SMENT	PATTE	RN -	THEORY	,				
Tes C	t / Blo atego	oom's ory*	Re	memberii (K1) %	ng	Understa (K2)	anding %	Apply (K3)	/ing %	Analyz (K4) 9	ing l %	Evaluating (K5) %		reating (K6) %	Total %
	CAT	1		10		20		70)						100
	CAT	2		10		20		70)						100
	CAT	3		10		20		70)						100
	ESE	=		10		20		70)						100
* ±3% I	may b	oe varie	d (CAT 1	, 2 & 3 – 5	50 mar	ks & ESE	– 100 r	narks)					· · ·		

	22EEE30 – INDUSTRIAL AUTOMA	TION					
Programme & Branch	B.E & Electrical and Electronics Engineering	Sem.	Category	L	т	Р	Credit
Prerequisites	Electrical Measurements and Instrumentation	7	PE	3	0	0	3
		1			1		
Preamble	This course is aimed to impart knowledge on the technologie	s used for	the automatio	n in ir	ndusti	ies.	
Unit – I	Introduction:						9
Architecture of the b Control level for pro systems – DAS and	basic three level Integrated Industrial Automation Systems – F cess and motion control functions, Distributed control system SCADA for Management functions - Integrated automation thre	Field level - Supervis ough bus s	for sensors ac ory level for D structure at the	ctuato ata lo diffe	ors an ogging rent le	d sma g and evels.	art devices, Acquisition
Unit – II	Field Level Equipment-Sensors:						9
Field level equipmer	nt – Sensors and measurement systems for Temperature, Pres t techniques – Measurement of level, humidity, pH.	ssure, Ford	ce, Displacem	ent a	nd sp	eed m	easurement
Unit – III	Field Level Equipment- Actuators:						9
Introduction to Actu Components and S Systems using Sma	ators – solenoids, on/off valves-Proportional Flow Control V symbols – Pumps, fans and Motors – Pneumatic Control S rt sensors, Hart communication protocol.	/alves – H systems –	lydraulic Actu System Com	ator pone	Syste nts-In	ms – tegrat	Principles, ed Control
Unit – IV	Process Controls:						9
Introduction to proc Modeling of Process – Selective Control Variable Control.	ess control – Automatic Process Control – Need for Autor ses – First, Second and Higher Order Process Systems – Feed Systems – Split-Range Control – Adaptive Controls – Infere	natic Proc Forward (ntial Contr	ess Control i Control – Casc rol – Interactir	n Inc ade (ng Co	lustry Contro ontrol	– Ma ol – Ra Syste	athematical atio Control ms – Multi
Unit – V	PLC and HMI Controls:						9
Introduction to PLC- I/O modules-power s Ladder logic, functio Arithmetic and other	s, PLC-s and Relay controls – PLC processor modules -input/c supplies for I/O modules – Selection of PLC based on I/O cour anal block diagram-On/ Off logic functions, timer / counter, Reg Math instructions – sequencer Instructions.	output mod its and Sca jister funct	ules – Paralle an times, PLC ions – control	l /Loc prog instru	al and ramm uction	d Seria ing La s – Pl	al / Remote anguages – D controls,
							Total:45
TEXT BOOK:							
1. Krishnasv	vamy K, "Process Control", 2nd Edition, New Age International(P) Ltd, Ne	wDelhi, 2015	for Ur	nits I,	II, III,	IV
2. Frank D. I	Petruzella, "Programmable Logic Controllers", 5th edition, McG	raw Hill, N	ew Delhi, 201	9 for	Unit V	′ .	
REFERENCES:							
1. NPTEL w	eb book on Industrial Automation and controls by Mr. S.Mukho	padhyay a	nd Mr.S.Sen o	of IIT,	Khara	agpur.	
2. Bill Drury,	"The Control Techniques Drives and Controls Handbook", 2nd	Edition, IE	ET Power and	Ener	gy Se	ries, 2	2009.
3. Lukas, Mie	chael P., — Distributed Control SystemsII, Van Nostrand Reinfo	old Compa	ny, 2002.				

COURS On com	E OUTCOMES: pletion of the course, the students will be able to	BT Mapped (Highest Level)
CO1	understand the integrated industrial automation system	Understanding (K2)
CO2	utilize the Field level equipment-sensors for different industrial applications	Applying (K3)
CO3	utilize the Field level equipment-Actuators for different industrial applications	Applying (K3)
CO4	understand the Process controls in Industries	Understanding (K2)
CO5	apply the concepts of PLC in control oriented Industrial applications	Applying (K3)

	Mapping of COs with POs and PSOs													
COs/POs	P01	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1					1		1			1	1	3
CO2	3	2	1	1			1		1			1	2	3
CO3	3	2	1	1			1		1			1	2	3
CO4	3	1					1		1			1	1	3
CO5	3	2	1	1			1		1			1	2	3
1 – Slight, 2	– Moder	ate, 3 – S	Substantia	l, BT- Bl	oom's T	axonon	ıy							

	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	40	40				100							
CAT3	10	50	40				100							
ESE	20	50	30				100							
* ±3% may be varied (CA	* ±3% may be varied (CAT 1, 2 & 3 – 50 marks & ESE – 100 marks)													

B.E.– Electrical and Electronics Engineering, Regulation, Curriculum and Syllabus – R2022

	22EEE31 – PO	WER QUALITY										
Programme & Branch	B.E & Electrical and Electronics Enginee	ering	Sem.	Category	L	т	Р	Credit				
Prerequisites	Power electronics		8	PE	3	0	0	3				
Preamble	This course would make the students aware techniques available to improve the quality of	about the various is of power	sues a	ffecting the p	owe	r qua	lity as	s well as				
Unit – I	Introduction to Power Quality:							9				
Definitions – po variations, transi - Computer Busi	er quality, voltage quality – power quality is hts, waveform distortion, voltage imbalance, volt https://www.executions.com/ https://wwww.executions.com/ https://wwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwww	ssues: short duration age fluctuation, powe EMA) curve – ITI cur	on volta ver freq rves.	age variation uency variatio	s, lo ons -	ng c - pov	luratio ver qu	on voltage ality terms				
Unit – II	Voltage Sag and Over Voltages:							9				
Introduction – s solutions at end voltage protectio switching.	Irces of sag and interruption – estimating vol- Iser level- motor starting sags. Transients: De – devices for over voltage protection – capacito	tage sag performane finition– sources of or switching transient	ice – f transie ts –ligh	undamental ent over volta htning transie	princ ages nts -	iples – pr tran	of pi incipl sients	rotection – es of over s from load				
Unit – III	Short Interruptions and Long Interruption	is:						9				
Short Interruptions: Introduction – Origin of short interruptions: Voltage magnitude events due to re-closing, Voltage during the interruption – Monitoring of short interruptions, Adjustable speed drives, Electronic equipments – Single phase tripping: Voltage during fault and post fault period, Current during fault period. Long Interruptions: Definition – Failure, Outage, Interruption – Origi of interruptions – Causes of long interruptions – Principles of regulating the voltage – Voltage regulating devices.												
Introduction – d	inition and terms – harmonics, harmonics indi	ces inter harmonics	a notal	hing – voltag			ront c	listortion –				
harmonics Vs tr filters for harmor	isients – sources and effects of harmonic dist reduction.	ortion – mitigation a	and co	ntrol techniqu	les -	- pas	sive	and active				
Unit – V	Power Quality Monitoring and Solutions:							9				
Introduction – Po and power cond power quality - a	ver quality monitoring, Monitoring consideration oning equipments - Spectrum analyzers, harmo olication of intelligent systems – basic design of	ns – brief introduction nic analyzers and Sr expert system - Pow	n to po mart po ver qua	ower quality n ower quality r Ility: Monitorir	neas noni ng st	urem tors - anda	ient e - asse rds	quipments essment of				
								Total:45				
TEXT BOOK:												
1. Roger C New Yo	Dugan, Mark F. McGranaghan, H. Wayne Beaty , Reprint 2013	ν, "Electrical Power S	System	s Quality", 3r	d Ed	ition,	McG	raw-Hill,				
REFERENCES:												
1. Kenned	Barry W., "Power Quality Primer", 1st Edition, M	cGraw-Hill, New Yor	rk, 200	0.								
2. Bollen M York, 20	th H.J., "Understanding Power Quality Problem 1.	s: Voltage Sags and	d Interro	uptions", 1st l	Editi	on, IE	EE P	Press, New				
3. Sankara	C., "Power Quality", 1st Edition, CRC Press, W	ashington D.C., 2019	9.									

COUR On co	SE OUTCOMES: mpletion of the course, the students will be able to	BT Mapped (Highest Level)
CO1	understand the power quality issues in electrical distribution network	Understanding (K2)
CO2	evaluate the severity of voltage sag, voltage swell and transients over voltages in distribution networks	Understanding (K2)
CO3	Interpret the effect of short and long Interruptions	Applying (K3)
CO4	identify the harmonic problems and design circuits to mitigate harmonic issues	Applying (K3)
CO5	understand the importance of PQ monitoring and select equipment to measure power quality	Applying (K3)

	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	
CO2	3	2					1					1	1	2	
CO3	3	2	1	1			1					1	2	3	
CO4	3	2	1	1			1					1	2	3	
CO5	3	2	1	1			1					1	2	3	

ASSESSMENT PATTERN - THEORY													
Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %						
CAT1	20	80					100						
CAT2	20	60	20				100						
CAT3	20	60	20				100						
ESE	20	60	20				100						

22EEE32 – POWER SYSTEM SECURITY													
Programme & Branch	B.E & Electrical and Electronics Engineering	Sem.	Category	L	т	Р	Credit						
Prerequisites	Power System Protection and Switch gear & Power System Analysis	8	PE	3	0	0	3						
Preamble	This course covers the power system security analysis and giv and power system Deregulations.	ves a bri	ef insight abo	ut the	e opt	timal p	oower flow						
Unit – I	Operations in Power System Security:						9						
Introduction – Factors affecting power system security – Contingency Analysis: Overview of security analysis – Linear Sensiti factors – AC Power Flow security Analysis - AC Power Flow security Analysis with Contingency – Concentric Relaxatio Boundary area method.													
Unit – II State Estimation 9													
Introduction – Methods of Least squares: Simple DC circuits – Maximum Likelihood Weighted Least Square Estimation: Mat formulation – State Estimation by Orthogonal State Estimation: Orthogonal decomposition Algorithm – Detection and identificati of Bad measurements – Network Observability and Pseudo measurements.													
Unit – III	Jnit – III Optimal Power Flow: 9												
Optimal Power Flow Formulation: Economic Load Dispatch (ELD), Optimal reactive Power Dispatch, Economic Emission Dispatc Security Constrained Optimal Power Flow – Optimal Power Flow solution techniques – Lagrange Multiplier method – Lines Programming OPF – Interior Point Method.													
Unit – IV	Unit Commitment and Economic Dispatch:						9						
Unit Commitment: I Reserve, Thermal Methods: Priority Lis Solution by Direct an	ntroduction – Need for Unit Commitment – Objective Functions unit Constraints, Fuel Constraints and Other Constraints, Hyd at Method, Dynamic Programming methods – Economic Dispatc and λ iteration method.	s – Cons dro Cons sh – Incre	straints in Un straints, – U emental cost	it Co nit C withc	ommi omm out a	tment nitmer nd wit	: Spinning nt Solution h losses –						
Unit – V	Power System Restructuring and Cyber Security – an Over	rview					9						
Introduction – Motiv Basic Terminologies Introduction and ini security in power sy	ation for Restructuring of Power System – Electricity Markets Er s – Deregulation – International Scenario – Milestones of Der tiatives – Areas Vulnerable to Cyber Attacks – issues in cybe stem – Classification of Cyber security on Load Frequency Contri	ntities ar egulation er securi rol.	nd Models – E n – Cyber Se ity – Organiz	Benef ecurit ation	its o y in stru	f Dere Powe icture	egulation – er System: for Cyber						
							Total:45						
TEXT BOOK:													
1. P.Venkatesh, B.V.Manikandan, S.Charles Raja and A.Srinivasan, "Electrical Power Systems: Analysis, Security and Deregulations, 1st Edition, PHI India Private Limited, 2012.													
REFERENCES:													
1. Hassan Hae Best Practic	1.Hassan Haes Alhelou, Nikos Hatziargyriou and Zhao Yang Dong, "Power Systems Cyber security Methods, Concepts, and Best Practices", 1st Edition, Springer Cham, 2023.												
2. Hassan Ha Security, 1s	es Alhelou, Almoataz Y. Abdelaziz, and Pierluigi Siano, "Wide t Edition, Springer Cham, 2021.	e Area P	ower System	Sta	bility	, Prot	ection and						
3. Anuradha Press Inc, 2	Anuradha Tomar and Ritu Kandari, "Advances in Smart Grid Power Systems: Network, Control and Security, Academic Press Inc, 2020 (Edited).												

COUR On co	SE OUTCOMES: mpletion of the course, the students will be able to	BT Mapped (Highest Level)
CO1	Understand the various operations in power system security.	Understanding (K2)
CO2	Apply different state estimation techniques used for power system security analysis.	Applying (K3)
CO3	Understand and conduct optimal power flow analysis and provide the suitable solutions.	Understanding (K2)
CO4	Apply dynamic approaches for solving unit commitment and economic dispatch problems.	Applying (K3)
CO5	Explain the key issues in electric utilities restructuring	Understanding (K2)
		*

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						1				1	3	1
CO2	3	2	1	1			1	1				1	3	2
CO3	3	2	1	1			1	1				1	3	2
CO4	3	1	1	1				1				1	2	1
CO5	3	1					1	1				1	2	1

	ASSESSMENT PATTERN - THEORY													
Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %							
CAT1	10	60	30				100							
CAT2	20	50	30				100							
CAT3	20	60	20				100							
ESE	10	60	30				100							

22EEE33 – ARTIFICIAL INTELLIGENT TECHNIQUES FOR ELECTRIC VEHICLES													
Programme & Branch	B.E & Electrical and Electronics Engineering	Sem.	Category	L	т	Ρ	Credit						
Prerequisites	Nil	8	PE	3	0	0	3						
			I	1									
Preamble	This course will provide an introduction to the basic concepts a explore their application in different areas of EV development.	and princ	iples of AI teo	hniq	ues f	or EV	s, and						
Unit – I	IoT-Based Battery Management System for Hybrid Electric	c Vehicle	9				9						
Introduction of Elect of Artificial Intellige Blocks of Battery N	etric Vehicle - Advantages of Electric Vehicle - Artificial Intelligence nce in Electric Vehicle. Battery configuration - Types of batteries lanagement Systems - IoT based BMS.	ce - Basic for HEV	s of Artificial I and Electric V	ntell 'ehic	igeno les (l	e - Ao ∃V) - I	dvantages Functional						
Unit – II	Brushless Direct Current Motor Drive Using Artificial Intel	ligence					9						
Brushless DC Mo Controller - Fuzzy - BLDC Motor Spe	tor - Mathematical Representation Brushless DC Motor - Clo Control - Auto-Tuning Type Fuzzy PID Controller - Genetic Algori ed Controller with ANN Based PID Controller - Analysis of Differe	sed-Loop ithm - Art ent Speed	o Model of E ificial Neural I Controllers.	SLDC Netw	C Mo ork-E	tor D Based	rive - PID Controller						
Unit – III Small-Signal Modeling and Magnetic Bearing System 9													
Overall System Mo an Active Magnetic	deling - The Small-Signal Model of the System. Magnetic Bearin Bearing (AMB) - Active Magnetic Bearing in Electric Vehicles Sy	ng Systen /stem - C	n: Introductior ontrol Strateg	n - B jies f	asic (or Al	Comp //B in	onents of EVs.						
Unit – IV	Energy Management and Intelligent Hybrid Battery Manag	jement S	lystem				9						
Introduction - Prob System: Energy St	lem Description and Formulation - Modeling of HESS and its A orage System - Battery Management System - Intelligent Battery	nalysis. Manage	Intelligent Hyt ment System	orid	Batte	ry Ma	inagement						
Unit – V	Power Semiconductor Devices and Induction Motor Contr	rol Schei	mes				9						
Introduction - Con Component - Relia Resistor Control. S	ventional Methods for Prediction of Reliability for Power Conv bility Prediction for MOSFETs - Reliability Prediction for Power S chemes of IM: Scalar Control - Vector Control - Modeling of Indu	verters - Semicond ction Mad	Calculation F luctor Device chine - Contro	Proce - Re oller	ess o liabili Desig	f the ity Pre jn	Electronic ediction for						
							Total:45						
TEXT BOOK:													
1. Chitra A., and Hybrid	Sanjeevikumar Padmanaban, Jens Bo Holm-Nielsen, S. Himavat I Electric Vehicles", Wiley, 2020.	hi, "Artific	cial Intelligent	Tec	hniqu	ies foi	Electric						
REFERENCES:													
1. James Lai	minie and John Lowry, "Electric Vehicle Technology Explained",	John Wile	ey & Sons, 20)12.									
2. Kevin P. M	lurphy, "Machine Learning: A Probabilistic Perspective", MIT Pres	ss, 2012.											
3. Salah Kan	nel and Khaled Seddik, "Electric Vehicle Integration into Modern F	Power Ne	etworks", Sprir	nger	, 201	9.							

COUR On co	SE O mplet	UTCON ion of t	IES: the c	cours	se, the stu	udent	s will be a	able to							BT Mapp (Highest L	oed .evel)
CO1	disc	uss loT	Bas	sed B	attery Ma	nager	ment Syste	em and	type of I	batteri	es.			U	nderstandi	ng (K2)
CO2	expl	ain the	AI B	lased	BLDC dr	ive fo	r optimum	operatio	on of E\	/.					Applying	(K3)
CO3	moc Bea	lel and ring sys	ana stem	alyse	three ph	ase c	converters	for EV	applica	ations	and Exp	lain Acti	ive Magne	tic	Applying	(K3)
CO4	mod	lel and	anal	yse tl	he Energy	/ stora	age and m	anagem	ent sys	tem					Applying	(K3)
CO5	expl sche	ain the emes	reli	ability	y predicti	on of	power se	emicond	uctor d	evices	and inc	luction r	notor cont	rol	Applying	(K3)
	Mapping of COs with POs and PSOs															
COs/F	POs	P01	P	02	PO3	PO	4 PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO	1	3		2	3	3	2				1			1	2	3
CO	2	3		2	3	3	2				1			1	2	3
CO	3	3		2	3	3	2				1			1	2	3
CO	4	3	2	2	3	3	2				1			1	2	3
CO	5	3	2	2	3	3	2				1			1	2	3
1 – Slig	ght, 2	– Mode	erate	, 3 –	Substanti	al, B1	- Bloom's	Taxono	my							
							ASSES		DATT		TUEODV	,				
Tes	st / Blo	oom's		Rei	memberi	na	Understa	andina	Apply	vina	Analyzi	ina	Evaluating		Creating	Total
C	atego	ory*			(K1) %	.9	(K2)	%	(K3)	%	(K4) 9	%	(K5) %		(K6) %	%
	CAT	1			20		80									100
	CAT	2			20		40		40)						100
	CAT	3			20		60		20)						100
	ESE	Ξ			10		60		30)						100

22EEE34 - CONTROL AND MAINTENANCE OF ELECTRICAL MACHINES

Programme& Branch	B.E & Electrical and Electronics Engineering	Sem.	Category	L	Т	Ρ	Credit
Prerequisites	Electrical Machines I and II	8	PE	3	0	0	3
			1	1		1	
Preamble	Objective of the course is to understand the construction and industrial controls used in various applications. To provide fur installation, testing and troubleshooting measures for DC and	l operatior ndamenta d AC mach	ns of control c I knowledge i nines.	ircuit n ma	com inter	nponei nance,	nts and
Unit – I	Control Circuit Components:						9
Introduction – Fus Valves – Pressur Components	es – Contactors and its Rating – Control Circuit Relays – Time e Switch – Temperature Switch – Float Switch – Push Butt	Delay Re on and S	elays – Phase Selector Swite	e Faι ch –	ilt Re Syn	elays - nbols	 Solenoid of Control
Unit – II	Industrial Control:						9
Automatic Control Conveyor System	for a Water Pump – Lifting Magnet – Electrical Oven – Overhe – Starter: Two and Three-Point Starter – Star/Delta Starter – Ro	ead Crane tor Resist	e – Battery Tr ance Starter	olley	– A	ir Cor	npressor –
Unit – III	Maintenance, Installation and Testing:						9
Importance of Ele Machines, Transfe Vibration - Installa	ectrical Maintenance - Types of Maintenance - Preventive Ma ormer - Factor Affecting the Preventive Maintenance - Install tion and Commissioning of Transformer - Testing of Motor and T	aintenanc ation and ransforme	e for Inductio Commissior er	on M ning	otor of Ir	, Alten Inductio	rnator, DC on Motor -
Unit – IV	Troubleshooting of AC Machines:						9
Significance of Tr Rotating Electrica Maintenance	ouble shooting - Types of Faults and Precaution - Instrumen I Machines - Abnormal Conditions - Trouble Shooting of A	ts for Ma C Machir	intenance - (nes - Noise	Class and	ifica Vib	tions ration	of Fault in - Bearing
Unit – V	Troubleshooting of DC Machines and Transformer:						9
Trouble Shooting Troubleshooting c Resistance using I	of DC Motors - Commutator and Brushes - Transformer Ty of Power and Distribution Transformer - Repairing of Transfo Megger	/pes - De rmer - In	etermination of spection - M	of Tr easu	ansfe reme	ormer ent of	Defects - Insulation
							Total:45
TEXT BOOK:							
1. S. K. Bhat 2006.	ttacharya and Brijinder Singh, "Control of Machines", New Age Ir	nternationa	al Publishers,	2 nd E	Editic	on, Ne	w Delhi,
REFERENCES:							
1. Madhvi G Sons, Nev	uptha, Installation, Maintenance and Repair of Electrical Machine v Delhi, 2014.	es and Eq	uipments, 2 nd	Edit	ion,	S.K. K	(ataria&
2. Sunil S. R New Delh	ao, Testing Commissioning Operation & Maintenance Of Electric	cal Equipn	nents, 6 th Edit	ion,	Khar	nna Pu	ublishers,

COURS On cor	COURSE OUTCOMES: On completion of the course, the students will be able to												(BT Mapped (Highest Level)		
CO1	Unde	erstand	the cons	struction a	nd oper	ation of	various	control	circuit o	compon	ents		Ur	Understanding (K2)		
CO2	O2 Analyze the power and control circuit operation involved in the modern industries													Applying (K3)		
CO3	3 Explain the maintenance, Installation and Testing procedure for AC and DC machines												Ur	derstandir	ng (K2)	
CO4	Confidently troubleshoot the faults concerned in high power AC machines											Ur	Understanding (K2)			
CO5	Conf	fidently	troublesh	noot the fa	ults in h	nigh pow	/er DC n	nachine	es and T	ransfor	mer		Ur	Understanding (K2)		
						Mappin	g of CO	s with	POs an	d PSOs	5					
COs/P	Os	P01	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	
CO1	1	3	1	1				1	1			1	1	2	2	
CO2	2	3	1	2				1	1			1	1	3	3	
COS	3	3	2	1				1	1			1	1	2	2	
CO4	CO4 3 1										1	3	1			

CO5

	ASSESSMENT PATTERN – THEORY													
Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %							
CAT1	10	80	20				100							
CAT2	10	80	20				100							
CAT3	20	80					100							
ESE	10	70	20				100							

22EEE35 - DIGITAL SIGNAL PROCESSING AND ITS APPLICATIONS

Programm Branch	B.E & Electrical and E	Electronics Engineering	Sem.	Category	L	т	Р	Credit
Prerequisi	es Signals and Systems		8	PE	3	0	0	3
			Ŀ					
Preamble	This course helps the digital filters, multirate	students to impart the knowledge or DSP techniques and apply the signal	n design of F processing	IR and IIR File	lters, F variou	Realize ıs fields	the st	tructure of
Unit – I	FIR Filters:							9
Introduction Linear Pha	- Difference between analog filters e FIR filters – FIR filter design usin	and digital filters -Magnitude and Pr g Windowing Techniques: Rectangul	nase respons ar Window, H	e of Digital fil Iamming Win	ters -F dow, F	-requer Ianning	ncy re g Wind	sponse of low.
Unit – II	IIR Filter:							9
Introduction Frequency	 – IIR filter design by approximation Fransformation –Butterworth filters 	n of derivatives – Impulse invariant tra –Chebyshev filters	ansformation	method- Bilir	near tra	ansform	nation	method –
Unit – III	Realisation of Digital	filters:						9
Introduction Realisation Realisation	 Block diagram and signal flow Parallel Realisation. Basic structu of linear phase FIR system 	graph realization – Basic structure ares for FIR systems: Direct form re	es for IIR sy ealization, Ca	stems: Direct ascade form	t form realiza	Realis ition, La	ation, attice	Cascade structure,
Unit – IV	Multirate digital signa	al processing:						9
Introduction graphs, Filt	 Sampling – Sampling rate conve Structure: FIR direct form structure 	rsion: Decimation, Interpolation - Sar re, IIR direct form structure, Structure	npling rate c for FIR deci	onversion by a mators and Ir	a ratio nterpol	nal fact ator	or – S	Signal flow
Unit – V	Applications of DSP:							9
Introduction signals , Si	 DSP in biomedical engineering: b band coding – Radar signal proc 	Removal of artifacts, ECG, EEG – essing – Image processing – Vibratio	Voice proces on Analysis	ssing: Speech	ı signa	als, Ana	llysis	of speech
								Total:45
TEXT BOO	К:							
1.	S.Salivahanan, " Digital signal Proce	essing", fourth edition, McGraw hill P	ublication, 20)19. ISBN (13): 978-	-93-531	6-742	2-4
REFEREN	ES:							
1.	John.G.Proakis, Dimitris.G.Manolak Education, India, 2021	is, "Digital Signal Processing: Princip	oles, Algorithi	ms and Applic	ations	", 5th E	dition	, Pearson
2.	Nagoor Kani. A ,"Signals and Syste	ms", 2nd Reprint, Tata McGraw-Hill E	Education, Ne	ew Delhi, 201	0			
3.	Dr.Sanjay Sharma , " Digital signal F	Processing (with MATLAB programs)", 7th Editior	n, S.K. Kataria	a &Sor	ns, New	/delhi,	2016.

COURS On com	E OUTCOMES: pletion of the course, the students will be able to	BT Mapped (Highest Level)
CO1	Design a digital FIR filter using window techniques	Applying (K3)
CO2	Design a digital and analog IIR filters	Applying (K3)
CO3	Realize FIR and IIR filter structures	Applying (K3)
CO4	Understand the concepts of multirate digital signal processing systems	Understanding (K2)
CO5	Understand the various signal processing techniques used in real time applications	Understanding (K2)
Monnin		,

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	2		1				1		1	1	3	3
CO2	3	2	2		1				1		1	1	3	3
CO3	3	2	2		1				1		1	1	3	3
CO4	3	2	1		1				1		1	1	2	2
CO5	3	2	2		1				1		1	1	3	3

ASSESSMENT 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	20	80					100					
ESE	10	40	50				100					
	4 0 8 0 50		L									

	22EEE36 – ELECTRIC POWER UTILISA	TION					
Programme & Branch	B.E & Electrical and Electronics Engineering	Sem.	Category	L	т	Ρ	Credit
Prerequisites	Nil	8	PE	3	0	0	3
Preamble	The course aims in imparting knowledge on Electric heat Pumps, and Lighting systems	ing, Elec	tric Welding,	Ele	ctric	Tract	ion, Fans,
Unit - I	Electric Heating:						9
Electric Heating; A heating element - A Heating	dvantages - Methods of Electric heating – Resistance heating Arc furnaces – Induction heating - Core type Induction Furnace	- requirer and Core	ment of a hea eless Inductio	ating n fui	eler nace	nent - e – Ec	 design of ldy current
Unit - II	Electric Welding:						9
Welding - Welding with motor-generat Welding, Projection	processes - Electrodes for metal arc welding - Arc Welding mach or set - AC Welding Machines, Types of Welding – TIG, MIG, Welding and Electron Beam Welding	hines – V , MAG, re	I characterist esistance We	cs - Iding	DC v I, Spo	veldin ot We	g machine elding, Butt
Unit - III	Electric Traction:						9
Introduction – requ average and crest calculation of speci	irements of an ideal traction system – supply systems –speed speed of various services - mechanics of train movement – fic energy consumption on a level track	time curv tractive e	ves for train n effort – specif	nove ic ei	ment	: - cal / con:	culation of sumption -
Unit - IV	Fans and Pumps						9
Fans – Types, Ch Opportunities in fai opportunities in Pur	aracteristics and Typical applications, Fan curves - Fan Law ns - Pumps – Types, System Characteristics, Pump curves - nps	rs - Flow Flow con	Control Strategies	ategi s – I	es – Enerę	Ener gy Co	gy Saving Inservation
Unit – V	Lighting Systems:						9
Basic Parameters commonly used lui lighting systems	and Terms in Lighting systems - Light sources and Lamp Typ minaries - Methods of calculating illuminance - Lighting design	oes - Lun n for Inte	ninous perfor riors - Energ	man y sa	ce C ving	harac oppo	teristics of rtunities in
							Total:45
TEXT BOOK:							
1. Gupta J.B, Unit I, II, III	"Utilization of Electric Power and Electric Traction", S.K. Kataria	& Sons,	New Delhi,10	th Ec	lition	Repr	rint 2018
2. Energy Effi Auditors, 4	ciency in Electrical Utilities, Guide Book for National Certificatior th Edition, Bureau of Energy Efficiency,2015 Unit IV, V.	n Examina	ation for energ	gy m	anag	ers a	nd
REFERENCES:							
1. Taylor E. C	penshaw, "Utilization of Electrical Energy", Universities Press, H	lyderabad	d, 2012				
2. Chakrabar Co., New D	i A., Soni M.L., Gupta P.V. and Bhatnagar U.S., "A Textbook on Delhi, 2013	Power S	ystem Engine	ering	g", Dl	nanpa	at Rai&

COUR On co	SE OUTCOMES: mpletion of the course, the students will be able to	BT Mapped (Highest Level)
CO1	discuss the applications of electrical energy for heating	Understanding (K2)
CO2	outline the applications of electrical energy for welding	Understanding (K2)
CO3	discuss electric traction systems and their performance	Applying(K3)
CO4	discuss fans and blowers and appraise the energy saving opportunities in them	Understanding (K2)
CO5	describe the lighting systems, lighting design and appraise the energy saving opportunities in them	Applying(K3)

					Mapping	g of CO	s with I	POs an	d PSOs	5				
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1					1				1	1	2	1
CO2	3	1					1				1	1	2	1
CO3	3	3	2	2			1				1	1	2	3
CO4	3	1					1				1	1	2	1
CO5	3	1					1				1	1	2	1
1 Clight 2	Mada	roto 2	Substanti		Plaam'a	Toyono	mu							

1 – Slight, 2 – Moderate,	3 – Substantial,	BT- Bloom's	Taxonomy
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		ASSESSMENT	PATTERN -	THEORY			
Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	20	80					100
CAT2	20	40	40				100
CAT3	20	40	40				100
ESE	20	50	30				100
* ±3% may be varied (C	CAT 1, 2 & 3 – 50 ma	arks & ESE – 100 n	narks)				

		22GEE01 - FUNDAMENTALS OF RESEA	RCH									
		(Common to All BE/BTech branches)										
Progra Branch	mme & ז	All BE/BTech branches	Sem.	Category	L	т	Ρ	Credit				
Prereq	uisites	Nil	7	GE	3	0	0	3				
Pream	ble	This course familiarizes the fundamental concepts/techniques also disseminate the process involved in collection, consolidat a presentable form using latest tools.	adopted ion of pu	d in research, blished literat	prol ure	olem and r	formu ewriti	Ilation and ng them in				
Unit –	I	Introduction to Research						9				
Introdu Charac	ction to Rest teristics of a	search: Types and Process of Research - Outcomes of R Good Research Problem - Errors in Selecting a Research Proble	Research em - Imp	- Sources ortance of Ke	of F ywo	Resea rds.	arch	Problem -				
Unit –	11	Literature Review						9				
Literatu	ure Review: L	iterature Collection - Methods - Analysis - Citation Study - Gap A	Analysis	- Problem For	mula	ation	Techi	niques.				
Unit –	Interature Review: Literature Collection - Methodos - Analysis - Citation Study - Gap Analysis - Problem Formulation Techniques.Jnit – IIIResearch Methodology9											
Resear Experir Limitati	rch Methodol mental Metho ions.	ogy: Appropriate Choice of Algorithms/Methodologies/Methods ods and Result Analysis - Investigation of Solutions for Re	 Data esearch 	Collection – Problem - Ir	Prim nterp	nary pretat	Data ion -	Analysis – Research				
Unit –	IV	Journals and Papers						9				
Journal Types of	ls and Paper of Research I	s: Journals in Science/Engineering - Indexing and Impact factor Papers - Original Article/Review Paper/Short Communication/Ca	of Journ	nals. Plagiari /.	sm a	and F	lesea	rch Ethics.				
Unit –	V	Reports and Presentations						9				
How to Sub-He PPTs. I	Write a Rep eadings - Foo Research To	ort - Language and Style - Format of Project Report - Title Page otnotes - Tables and Figures - Appendix - Bibliography etc - Di ols.	e - Abstra fferent F	act - Table of Reference For	Con mate	tents s. Pre	- Hea esenta	adings and ation using				
								Total:45				
TEXT E	BOOK:											
1.	Walliman, N	licholas. "Research Methods: The basics". 2 nd edition, Routledge	e, 2017.,	for Units I, II,	III, I	V & V	/					
REFER	FERENCES:											
1.	Mishra, S.B	. and Alok, S. "Handbook of research methodology" Educreation	Publish	ing, 2017								
2.	Kumar, Rar	jit. "Research Methodology: A step-by-step guide for beginners"	. SAGE	Publications L	.imite	ed, 2	019.					
3.	Nayak, J.K. Distributors	and Singh, P. "Fundamentals of Research Methodology Probler , 2021.	ms and F	Prospects". SS	SDN	Publ	ishers	s &				

COUR	SE OL	JTCON	IES:											BT Mapp	bed
On cor	npleti	ion of t	he cour	se, the st	udents	will be a	able to						(Highest L	evel)
CO1	list th	he vario	ous stage	es in resea	arch an	d catego	rize the	quality	of jourr	nals				Applying	(K3)
CO2	form	ulate a	researcl	n problem	from p	ublished	literature	e/journa	l pape	rs			I	Evaluating	(K5)
CO3	write	e, prese	ent a jour	nal paper/	projec	t report ir	n proper	format						Creating	(K6)
CO4	sele	ct suital	ble journ	al and sub	omit a r	esearch	paper							Applying	(K3)
CO5	com	pile a re	esearch	report and	the pre	esentatio	n							Applying	(K3)
						Mappin	g of CO	s with	POs a	nd PSO:	5				
COs/P	Os	PO1	PO2	PO3	PO4	PO5	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
CO2	2	3	3	3	3	2	1	1	3	3	3	3	3	3	3
COS	3	3	3	3	3	3	1	1	3	3	3	1	3	3	3
CO4	4	3	2	1	1	2	1	1	3	2	1	1	3	3	3
COS	5	3	3	2	2	3	1	1	3	3	3	1	3	3	3
1 – Slig	ght, 2 ·	– Mode	erate, 3 -	Substant	ial, BT-	Bloom's	Taxono	my							
						ASSES	SMENT	PATTE	ERN - T	THEORY	,				
Tes C	t / Blo atego	oom's ory*	Re	ememberi (K1) %	ng	Jndersta (K2)	anding %	Apply (K3)	ying %	Analyz (K4) 9	ing %	Evaluating (K5) %		reating (K6) %	Total %
	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
* ±3% r	may b	e varie	d (CAT 1	,2,3 – 50	marks a	& ESE –	100 ma	rks)			·				

(Common to All BE/BTech branches) Programme & Branch All BE/BTech branches Sem. Category L T P Credit Prerequisites Nii 7 PE 3 0 0 3 Preamble This course deals with quality concepts and Total Quality Management (TGM) principles focusing on process quality for customer perspective. It also deals with the basic and modern quality management tools including ISO standards 9 Unit - I Quality Concepts and Principles 9 9 Definition of Quality - Dimensions of Quality - Quality Assurance and Control - Quality Couscil - Quality Cost with Case Studies - Elements / Principles of TOM - Historical Review - Leadership – Qualities / Habits - Quality Cost with Case Studies - Elements / Timplementation - Case Studies - Deming Philosophy - Barriers to TQM Implementation - Cases with TQM Success and Failures. 9 Unit - II TQM-Principles and Strategies 9 9 Customer Satisfaction - Customer Perception of Quality - Customer Complaints - Customer Retention, Employee Involvement - Motivation - Empowerment - Teams - Recognition and Reward - Performance Appraisal, Continuous Process Improvement - Supplier Rating - Relationship Development, Performance Measures – Purpose – Methods - Cases. 9 Basic Seven Tools of Quality and its Role in Quality Control, Statistical Fundamentals - Measures of Central Tendency and Dispersion,		22GEE02 - TOTAL QUALITY MANAGE	EMENT					
Programme & Branch All BE/BTech branches Sem. Category L T P Credit Prerequisites Nil 7 PE 3 0 0 3 Preamble This course deals with quality concepts and Total Quality Management (TOM) principles focusing on process quality for customer perspective. It also deals with the basic and modern quality management tools including ISO standards 9 Definition of Quality - Dimensions of Quality - Quality Planning - Quality Assurance and Control - Quality Costs with Case Studies - Elements / Principles and Strategies 9 Unit - II TOM-Principles and Strategies 9 Customer Stafaction - Customer Perception of Quality - Customer Complaints - Customer Retention, Employee Involvement - Motivation - Empowerment - Teams - Recognition and Reward - Performance Appraisal, Continuous Process Improvement - Murvaris Tirolgy - PDSA Cycle - 5S - Kaizen, Supplier Patnership - Patnering - Sourcing - Supplier - Supplier - Relationship Development, Performance Measures - Purpose – Methods - Cases. 9 Unit - III Control Charts for Process Control 9 Basic Seven Tools of Quality and its Role in Quality Control, Statistical Fundamentals - Measures of Central Tendency and Dispersion, Population and Sample - Normal Curve - Control Charts for Variables and Attributes - Process Capability - Case Studies, Introduction to Taguchi's Robust Design - Quality Loss Function - Design of Experiments (DCE), Total Productive Maintenance (TPM) - Uptime Enhancement, Failure Mode		(Common to All BE/BTech branche	es)					
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Unit - I Quality Concepts and Principles 9 Definition of Quality - Dimensions of Quality - Quality Planing - Quality Assurance and Control - Quality Costs with Case Studies - Elements / Principles of TOM - Historical Review – Leadership – Qualities / Habits - Quality Council - Quality Statements, Strategic Planning – Importance - Case Studies - Deming Philosophy - Barriers to TQM Implementation – Cases with TQM Success and Failures. Unit - II TQM-Principles and Strategies 9 Customer Satisfaction - Customer Perception of Quality - Customer Complaints - Customer Retention, Employee Involvement - Motivations - Empowement - Teams - Recognition and Reward - Performance Appraisal, Continuous Process Improvement - Juran's Trilogy - PDSA Cycle - SS - Kaizen, Supplier Partnership - Partnering - Sourcing - Supplier Selection - Supplier Rating - Relationship Development, Performance Measures - Purpose - Methods - Cases. 9 Basic Seven Tools of Quality and its Role in Quality Control, Statistical Fundamentals - Measures of Central Tendency and Dispersion, Population and Sample - Normal Curve - Control Charts for Variables and Attributes - Process Capability - Case Study - Introduction to Six Sigma. 9 New Seven Tools of Quality, Benchmarking - Need - Types and Process, Quality Function Deployment - Heaver (TPM) - Uptime Enhancement, Failure Mode and Effect Analysis (FMEA) - Risk Priority Number (RN) - Process - Case Studies. 9 New Seven Tools of Quality, Senchmarking - Need - Types and Process, Quality Function Deployment - House of Quality System - Sto 9000 and Other Quality Systems - Sto 9000 and Other Quality System Sto 9000 and Other Quality System - Sto 9000 and Other	Preamble	This course deals with quality concepts and Total Quality Ma quality for customer perspective. It also deals with the basic ISO standards	nagement and mode	t (TQM) princip ern quality mai	oles fo nager	ocusi nent	ng or tools	n process including
Definition of Quality - Dimensions of Quality - Quality Planning - Quality Assurance and Control - Quality Costs with Case Studies - Elements / Principles of TQM - Historical Review - Leadership - Qualities / Habits - Quality Council - Quality Networks, Strategic Planning - Importance - Case Studies - Deming Philosophy - Barriers to TQM Implementation - Cases with TQM Unit - II Vonit - II TQM-Principles and Strategies 9 Customer Satisfaction - Customer Perception of Quality - Customer Complaints - Customer Retention, Employee Involvement - Mativation - Empowerment - Teams - Recognition and Reward - Performance Appraisal, Continuous Process Improvement - Supplier Rating - Relationship Development, Performance Measures - Purpose - Methods - Cases. 9 Dunit - III Control Charts for Process Control 9 Basic Seven Tools of Quality, Benchmarking - Normal Curve - Control Charts for Variables and Attributes - Process Capability - Case Study - Introduction to Six Sigma. 9 New Seven Tools of Quality, Benchmarking - Need - Types and Process, Quality Function Deployment - House of Quality (HQQ) Construction - Case Studies. 9 New Seven Tools of Quality Systems Neg Process - Case Studies. 9 Need for ISO 9000 and Other Quality Systems - ISO 9000: 2015 Quality System - Elements - Implementation of Quality Systems - ISO 9000: 1SO 21000 - ISO 21001. Process of Implementing ISO - Barriers in ISO Implementation. 9 Need for ISO 90000 and Other Quality Systems - ISO 9000: 2015 Quality System - El	Unit – I	Quality Concepts and Principles						9
Unit – II TQM-Principles and Strategies 9 Customer Satisfaction - Customer Perception of Quality - Customer Complaints - Customer Retention, Employee Involvement - Motivation - Empowerment - Teams - Recognition and Reward - Performance Appraisal, Continuous Process Improvement - Juran's Trilogy - PDSA Cycle - 5S - Kaizen, Supplier Partnership - Partnering - Sourcing - Supplier Selection - Supplier Rating - Relationship Development, Performance Measures – Purpose – Methods - Cases. 9 Basic Seven Tools of Quality and its Role in Quality Control, Statistical Fundamentals - Measures of Central Tendency and Dispersion, Population and Sample - Normal Curve - Control Charts for Variables and Attributes - Process Capability - Case Study - Introduction to Six Sigma. 9 Unit - IV TQM-Modern Tools 9 New Seven Tools of Quality, Benchmarking - Need - Types and Process, Quality Function Deployment - House of Quality (HOQ) Construction - Case Studies, Introduction to Taguch's Robust Design - Quality Loss Function - Design of Experiments (DOE), Total Productive Maintenance (TPM) - Uptime Enhancement, Failure Mode and Effect Analysis (FMEA) - Risk Priority Number (RPN) – Process - Case Studies. 9 Unit - V Quality Systems - ISO 9000: 2015 Quality System - Elements - Implementation of Quality System - Documentation - Quality Auditing, Introduction to ISO 14000 - IATF 16949 - TL 9000-IEC 17025 - ISO 18000 - ISO 20000 - ISO 22000 - ISO 21001. Process of Implementing ISO - Barriers in ISO Implementation. 9 1. Besterfield Dale H., Besterfield Carol, Besterfield Glen H., Besterfield Mary, Urdhwareshe Hemant, Urdhwareshe Rashmi. "Total	Definition of Qu Studies - Elemen Strategic Planni Success and Fai	ality - Dimensions of Quality - Quality Planning - Quality Assu tts / Principles of TQM - Historical Review – Leadership – Qualitie ng – Importance - Case Studies - Deming Philosophy - Barrie Jures.	urance ar es / Habits ers to TQ	nd Control - C - Quality Cou M Implementa	Quality ncil - ation	/ Co Quali – Ca	sts w ity Sta ses v	vith Case atements, with TQM
Customer Satisfaction - Customer Perception of Quality - Customer Complaints - Customer Retention, Employee Involvement - Motivation - Empowerment - Teams - Recognition and Reward - Performance Appraisal, Continuous Process Improvement - Supplier Rating - Relationship Development, Performance Measures – Purpose – Methods - Cases. Unit - III Control Charts for Process Control 9 Basic Seven Tools of Quality and its Role in Quality Control, Statistical Fundamentals - Measures of Central Tendency and Dispersion, Population and Sample - Normal Curve - Control Charts for Variables and Attributes - Process Capability - Case Study - Introduction to Six Sigma. Unit - IV TQM-Modern Tools 9 New Seven Tools of Quality, Benchmarking - Need - Types and Process, Quality Function Deployment - House of Quality (HOQ) Construction - Case Studies, Introduction to Taguchi's Robust Design - Quality Loss Function - Design of Experiments (DOE), Total Productive Maintenance (TPM) - Uptime Enhancement, Failure Mode and Effect Analysis (FMEA) - Risk Priority Number (RPN) – Process - Case Studies. 9 Need for ISO 9000 and Other Quality Systems - ISO 9000: 2015 Quality System - Elements - Implementation of Quality System - Decumentation - Quality Auditing, Introduction to ISO 14000 - IATF 16949 - TL 9000-IEC 17025 - ISO 18000 - ISO 20000 - ISO 20000 - ISO 2000	Unit – II	TQM-Principles and Strategies						9
Unit - III Control Charts for Process Control 9 Basic Seven Tools of Quality and its Role in Quality Control, Statistical Fundamentals - Measures of Central Tendency and Dispersion, Population and Sample - Normal Curve - Control Charts for Variables and Attributes - Process Capability - Case Study - Introduction to Six Sigma. Unit - IV TQM-Modern Tools 9 New Seven Tools of Quality, Benchmarking - Need - Types and Process, Quality Function Deployment - House of Quality (HOQ) Construction - Case Studies, Introduction to Taguchi's Robust Design - Quality Loss Function - Design of Experiments (DOE), Total Productive Maintenance (TPM) - Uptime Enhancement, Failure Mode and Effect Analysis (FMEA) - Risk Priority Number (RPN) – Process - Case Studies. 9 Need for ISO 9000 and Other Quality Systems - ISO 9000: 2015 Quality System - Elements - Implementation of Quality System - Documentation - Quality Auditing, Introduction to ISO 14000 - IATF 16949 - TL 9000-IEC 17025 - ISO 18000 - ISO 20000 - ISO 22000 - ISO 21001. Process of Implementing ISO - Barriers in ISO Implementation. 9 Total 2000 Elements - Implementing ISO - Barriers in ISO Implementation. Total:45 Total 2000 Figure 2000 - ISO 21001. Process of Implementing ISO - Barriers in ISO Implementation. Total:45 Total 2000 Figure 2000 - ISO 22000 - ISO 2000 - ISO 22000 - ISO 2000 - ISO 22000 - ISO 2000	Customer Satist – Motivation - E Juran's Trilogy Supplier Rating	action - Customer Perception of Quality - Customer Complaints mpowerment - Teams - Recognition and Reward - Performance - PDSA Cycle - 5S - Kaizen, Supplier Partnership - Pa - Relationship Development, Performance Measures – Purpos	s - Custor Appraisa artnering se – Meth	ner Retention al, Continuous - Sourcing ods - Cases.	, Emp Proc - Su	oloye ess I pplie	e Inv mpro r Se	olvement vement - lection -
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Unit - IV TQM-Modern Tools 9 New Seven Tools of Quality, Benchmarking - Need - Types and Process, Quality Function Deployment - House of Quality (HOQ) Construction - Case Studies, Introduction to Taguchi's Robust Design - Quality Loss Function - Design of Experiments (DOE), Total Productive Maintenance (TPM) - Uptime Enhancement, Failure Mode and Effect Analysis (FMEA) - Risk Priority Number (RPN) – Process - Case Studies. 9 Vinit - V Quality Systems 9 Need for ISO 9000 and Other Quality Systems - ISO 9000: 2015 Quality System - Elements - Implementation of Quality System - Documentation - Quality Auditing, Introduction to ISO 14000 - IATF 16949 - TL 9000-IEC 17025 - ISO 18000 - ISO 20000 - ISO 22000 - ISO 21001. Process of Implementing ISO - Barriers in ISO Implementation. Total:45 Total:45 Text BOOK: 1. Besterfield Dale H., Besterfield Carol, Besterfield Glen H., Besterfield Mary, Urdhwareshe Hemant, UrdhwaresheRashmi. "Total Quality Management", 5 th Edition, Pearson Education, Noida, 2018. REFERENCES: 1. Subburaj Ramasamy, "Total Quality Management", McGraw Hill Education, New Delhi, 2017. 2 2. James R. Evans and William M. Lindsay, "The Management for Organizational Excellence: Introduction to Total Quality", 8 th Edition, Pearson, 2017. 3. David Goetsch & Stanley Davis, "Quality Management for Organizational Excellence: Introduction to Total Quality", 8 th Edition, Pearson, 2017.	Basic Seven To Dispersion, Popu Introduction to Si	bls of Quality and its Role in Quality Control, Statistical Funda lation and Sample - Normal Curve - Control Charts for Variables a K Sigma.	amentals and Attribu	 Measures o ites - Process 	f Cer Capa	ntral bility	Tend - Cas	ency and se Study -
New Seven Tools of Quality, Benchmarking - Need - Types and Process, Quality Function Deployment - House of Quality (HQQ) Construction - Case Studies, Introduction to Taguchi's Robust Design - Quality Loss Function - Design of Experiments (DOE), Total Productive Maintenance (TPM) - Uptime Enhancement, Failure Mode and Effect Analysis (FMEA) - Risk Priority Number (RPN) – Process - Case Studies. Unit - V Quality Systems 9 Need for ISO 9000 and Other Quality Systems - ISO 9000: 2015 Quality System - Elements - Implementation of Quality System - Documentation - Quality Auditing, Introduction to ISO 14000 - IATF 16949 - TL 9000-IEC 17025 - ISO 18000 - ISO 20000 - ISO 22000 - ISO 21001. Process of Implementing ISO - Barriers in ISO Implementation. Total:45 Total Polyce KE 1. Besterfield Dale H., Besterfield Carol, Besterfield Glen H., Besterfield Mary, Urdhwareshe Hemant, UrdhwaresheRashmi. "Total Quality Management", 5 th Edition, Pearson Education, Noida, 2018. REFERENCES: 1. Subburaj Ramasamy, "Total Quality Management", McGraw Hill Education, New Delhi, 2017. 2 2. James R. Evans and William M. Lindsay, "The Management and Control of Quality", 8 th Edition, Cengage Learning, 2012. 3. David Goetsch & Stanley Davis, "Quality Management for Organizational Excellence: Introduction to Total Quality", 8 th Edition, Pearson, 2017.	Unit – IV	TQM-Modern Tools						9
Unit - V Quality Systems 9 Need for ISO 9000 and Other Quality Systems - ISO 9000: 2015 Quality System - Elements - Implementation of Quality System - Documentation - Quality Auditing, Introduction to ISO 14000 - IATF 16949 - TL 9000-IEC 17025 - ISO 18000 - ISO 20000 - ISO 22000 - ISO 22000 - ISO 21001. Process of Implementing ISO - Barriers in ISO Implementation. Total:45 Total:45 TEXT BOOK: 1. Besterfield Dale H., Besterfield Carol, Besterfield Glen H., Besterfield Mary, Urdhwareshe Hemant, UrdhwaresheRashmi. "Total Quality Management", 5 th Edition, Pearson Education, Noida, 2018. REFERENCES: 1. Subburaj Ramasamy, "Total Quality Management", McGraw Hill Education, New Delhi, 2017. 2012. 3. David Goetsch & Stanley Davis, "Quality Management for Organizational Excellence: Introduction to Total Quality", 8 th Edition, Pearson, 2017.	New Seven Too (HOQ) Construc (DOE), Total Pro Number (RPN) -	ols of Quality, Benchmarking - Need - Types and Process, Quation - Case Studies, Introduction to Taguchi's Robust Design - oductive Maintenance (TPM) - Uptime Enhancement, Failure M Process - Case Studies.	uality Fun Quality Lo ode and	ction Deployn oss Function - Effect Analysis	nent Des s (FM	- Hou ign c 1EA)	use c of Exp - Ris	of Quality periments k Priority
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Total:45 Text BOOK: 1. Besterfield Dale H., Besterfield Carol, Besterfield Glen H., Besterfield Mary, Urdhwareshe Hemant, UrdhwaresheRashmi. "Total Quality Management", 5 th Edition, Pearson Education, Noida, 2018. REFERENCES: 1. Subburaj Ramasamy, "Total Quality Management", McGraw Hill Education, New Delhi, 2017. 2. James R. Evans and William M. Lindsay, "The Management and Control of Quality", 8 th Edition, Cengage Learning, 2012. 3. David Goetsch & Stanley Davis, "Quality Management for Organizational Excellence: Introduction to Total Quality", 8 th Edition, Pearson, 2017.	Need for ISO 9 System - Docum 20000 - ISO 220	000 and Other Quality Systems - ISO 9000: 2015 Quality S nentation - Quality Auditing, Introduction to ISO 14000 - IATF 1 00 - ISO21001. Process of Implementing ISO - Barriers in ISO Imp	ystem – 6949 - Ti plementatio	Elements - In L 9000-IEC 17 on.	nplem 7025	entat	ion c 0 180	of Quality 100 - ISO
TEXT BOOK: 1. Besterfield Dale H., Besterfield Carol, Besterfield Glen H., Besterfield Mary, Urdhwareshe Hemant, UrdhwaresheRashmi. "Total Quality Management", 5 th Edition, Pearson Education, Noida, 2018. REFERENCES: 1. Subburaj Ramasamy, "Total Quality Management", McGraw Hill Education, New Delhi, 2017. 2. James R. Evans and William M. Lindsay, "The Management and Control of Quality", 8 th Edition, Cengage Learning, 2012. 3. David Goetsch & Stanley Davis, "Quality Management for Organizational Excellence: Introduction to Total Quality", 8 th Edition, Pearson, 2017.								Total:45
1. Besterfield Dale H., Besterfield Carol, Besterfield Glen H., Besterfield Mary, Urdhwareshe Hemant, UrdhwaresheRashmi. "Total Quality Management", 5 th Edition, Pearson Education, Noida, 2018. REFERENCES: 1. Subburaj Ramasamy, "Total Quality Management", McGraw Hill Education, New Delhi, 2017. 2. James R. Evans and William M. Lindsay, "The Management and Control of Quality", 8 th Edition, Cengage Learning, 2012. 3. David Goetsch & Stanley Davis, "Quality Management for Organizational Excellence: Introduction to Total Quality", 8 th Edition, Pearson, 2017.	TEXT BOOK:							
I. "Total Quality Management", 5 th Edition, Pearson Education, Noida, 2018. REFERENCES: 1. Subburaj Ramasamy, "Total Quality Management", McGraw Hill Education, New Delhi, 2017. 2. James R. Evans and William M. Lindsay, "The Management and Control of Quality", 8 th Edition, Cengage Learning, 2012. 3. David Goetsch & Stanley Davis, "Quality Management for Organizational Excellence: Introduction to Total Quality", 8 th Edition, Pearson, 2017.	_ Besterf	eld Dale H., Besterfield Carol, Besterfield Glen H., Besterfield Ma	ary, Urdhv	wareshe Hema	nt, U	rdhwa	aresh	eRashmi.
REFERENCES: 1. Subburaj Ramasamy, "Total Quality Management", McGraw Hill Education, New Delhi, 2017. 2. James R. Evans and William M. Lindsay, "The Management and Control of Quality", 8 th Edition, Cengage Learning, 2012. 3. David Goetsch & Stanley Davis, "Quality Management for Organizational Excellence: Introduction to Total Quality", 8 th Edition, Pearson, 2017.	T. Total C	Quality Management", 5 th Edition, Pearson Education, Noida, 2018						
 Subburaj Ramasamy, "Total Quality Management", McGraw Hill Education, New Delhi, 2017. James R. Evans and William M. Lindsay, "The Management and Control of Quality", 8th Edition, Cengage Learning, 2012. David Goetsch & Stanley Davis, "Quality Management for Organizational Excellence: Introduction to Total Quality", 8th Edition, Pearson, 2017. 	REFERENCES:							
 James R. Evans and William M. Lindsay, "The Management and Control of Quality", 8th Edition, Cengage Learning, 2012. David Goetsch & Stanley Davis, "Quality Management for Organizational Excellence: Introduction to Total Quality", 8th Edition, Pearson, 2017. 	1. Subbur	aj Ramasamy, "Total Quality Management", McGraw Hill Education	n, New De	elhi, 2017.				
3. David Goetsch & Stanley Davis, "Quality Management for Organizational Excellence: Introduction to Total Quality", 8 th Edition,Pearson, 2017.	2. James	R. Evans and William M. Lindsay, "The Management and Control c	of Quality"	, 8 th Edition, Co	engag	ge Le	arning	g, 2012.
	3. David 0 Edition	Goetsch & Stanley Davis, "Quality Management for Organization Pearson, 2017.	al Excelle	ence: Introduct	ion to	o Tota	al Qu	ality", 8 th

COURS On com	SE OU	TCOME n of the	S: course,	the stude	ents will	be able	e to						()	BT Mapp lighest Le	ed evel)
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	Λ						Un	derstandin	g (K2)
CO3	use	control c	harts ar	nd identif	y proce	ss capal	bility of	a proces	S					Applying (I	K 3)
CO4	appl	y variou:	s quality	tools an	d techni	iques in	both m	anufactu	ring ar	nd service	industry			Applying (I	K 3)
CO5	choc	ose appr	opriate o	quality st	andards	s and im	plemen	t them in	the re	spective	industry			Applying (I	K3)
								00 ///							
C0c/	POs	PO1	PO2	PO3	PO4	Марр						PO11	PO12	DSO1	BSO2
003/1	103		F02	FUS	F04	FUJ	F00	F0/	FUC	FO3	FOIU	FOIT	1	F301	r302
00	71 N2	2	2				1						1		3
	<u>12</u> 13	2	2				1						1		3
00 00) <u>/</u>)/1	2	2				1						1		3
00 CO)5	1	1				1						1		3
1 – Sligi	ht, 2 –	Modera	ate, 3 –	Substar	tial, BT	- Bloon	ı's Tax	onomy				1			
					,	ASSE	ESSME	NT PATT	FERN	- THEOR	Y				
Test Ca	/ Bloo tegory	m's /*	Remei (K	mbering 1) %	Und	derstan (K2) %	ding	Applyin (K3) %	g A	Analyzing (K4) %	J Eval (K	uating 5) %	Creat (K6)	ing %	Total %
(CAT1		2	25		45		30							100
(CAT2		2	20		40		40							100
(CAT3		2	25		45		30							100
	ESE		2	20		40		40							100
* ±3% r	may be	e varied	(CAT 1,	2&3-	50 mark	s & ESE	E – 100	marks)				1			

		22EEO01 – SOLAR AND WIND ENERGY	SYSTEM	S				
		(Offered by Department of Electrical and Electro	onics Eng	ineering)				
Progra Branc	amme & h	All BE/BTech Branches Except EEE	Sem.	Category	L	т	Ρ	Credit
Prerec	quisites	Nil	5	OE	3	1	0	4
Pream	ble	This course aims in imparting the concepts and nuances of detailed design procedures and analysis.	solar and	wind energy sy	stem	s aloi	ng wit	h its
Unit –	1	Introduction to Solar PV:						9+3
Solar o arrays	cell – Paramete – Factor affect	rs of solar cell – Solar PV module – Ratings and parameters ing electricity generation by a solar cell and solar PV module.	– Measuri	ng module par	amet	ers –	Sola	PV module
Unit –	II	Types of PV Systems:						9+3
Stand Inverte	alone, grid con ers – MPPT – C	nected and hybrid systems – Battery parameters – Battery s components of grid connected PV systems.	selection –	Charge contro	ollers	– DC	C-DC	converters –
Unit –	111	Solar PV System Design:						9+3
Desigr solar F	n methodology PV system desig	for solar PV system: Approximate design of solar PV system gn – Installation and troubleshooting of solar PV power plants.	– Solar P	V system desig	gn ch	art –	Look	up table for
Unit –	IV	Introduction to WECS:						9+3
Power Metho	output from ar	n ideal turbine – Aerodynamics – Power output from practical g synchronous power – DC shunt generator with battery load -	l turbines · – AC gene	 Energy prode rators. 	uctior	n and	сара	city factor -
Unit –	V	Wind Power Plant Design:						9+3
Site pr	eparation – Ele	ctrical network - Selection of low voltage and distribution volta	age equipr	nent – Losses	– Wir	nd far	m cos	sts.
				Lectu	re:45	, Tute	orial:	15, Total:60
TEXT	BOOK:							
1.	Chetan Singh Edition, PHI le	Solanki, "Solar Photovoltaic Technology and Systems – A Ma earning Private Limited, New Delhi, 2013 for Units I, II and III.	anual for T	echnicians, Tra	ainee	s and	l Engi	neers", 1st
2.	Gary L.Johns	on, "Wind Energy Systems", Electronic Edition, Manhatan, KS	, 2006 for	Units IV,V.				
REFE	RENCES:							
1.	Chetan Singh Limited, New	Solanki, "Solar Photovoltaics – Fundamentals, Technologies Delhi, 2011.	and Applic	ations", 2nd E	dition	, PHI	learn	ing Private
2.	Spera, D.A., " 2009.	Wind Turbine Technology: Fundamental concepts of Wind Tu	rbine Engi	neering", 2nd E	Editio	n, AS	ME, I	New York,

COUR On co	RSE O	UTCOM	IES: the co	urse	e, the st	udents	s will be a	ble to								BT Mapp (Highest L	ed evel)
CO1	outli	ne the p	baram	eters	and rat	tings of	solar cell	and mo	dules						ι	Inderstandir	ng (K2)
CO2	mak	e use o	f vario	us c	ompone	ents inte	ended for s	solar PV	' system	ı desigi	า					Applying (K3)
CO3	appl	y the de	esign p	proce	edures f	or sola	⁻ PV syste	ms towa	ards inst	allatior	ı					Applying (K3)
CO4	iden	tify the	require	ed co	ompone	nts for	wind energ	gy conve	ersion s	ystem					L	Inderstandir	ng (K2)
CO5	exar	nine the	e desig	gn ar	nd instal	lation p	rocedures	s for WE	CS							Applying (K3)
							Mapp	ing of C	Os with	n POs a	and PSOs		1	1		[
COs/I	POs	P01	PO	2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO	12	PSO1	PSO2
CO	1	3	2		3			1	1					1			
CO	2	3	3		2			1	1					1			
CO	3	3	3		2			1	1					1			
CO	4	3	2		3			1	1					1			
CO	5	3	3		2			1	1					1			
1 – Sli	ight, 2	– Mode	erate, 3	3 – S	Substant	tial, BT	- Bloom's	Taxonor	my								
							ASSE	SSMEN	ΙΤ ΡΑΤΊ	ERN -	THEORY						
Те	est / B Categ	loom's jory*		Rer	nembeı (K1) %	ring	Understa (K2)	nding %	Apply (K3)	ying) %	Analyzin (K4) %	g Eva	aluating (%	(K5)	Cr	eating (K6) %	Total %
	CA	T1			40		40		20)							100
	CA	T2			20		40		40)							100
	CA	T3			20		40		4()							100
	ES	Ε			30		40		30)							100
* ±3%	may l	oe varie	d (CA	T 1, :	2&3-	50 mar	ks & ESE	– 100 m	harks)								·

		22EEO02 – ELECTRICAL WIRING AND LIG	HTING												
		(Offered by Department of Electrical and Electroni	cs Engii	neering)											
Progra Branch	ımme & n	All BE/BTech Branches Except EEE	Sem.	Category	L	т	Ρ	Credit							
Prereq	uisites	Nil	5	OE	3	1	0	4							
			L.			1									
Preaml	ble	Lighting becomes one of the essential requirements for the necessary to educate an engineer in the aspects of Domestic is to educate the electrical engineers on the aspect of Introdu Installations, Light and Luminaires and Light sources.	humans and Indu uction to	s on day-to-d ustrial Lighting Wiring and it	lay a g. Th is De	activit ne ide esign	ties. I ea of cons	Hence it is the subject siderations,							
Unit –	1	Introduction:						9+3							
Electric Appliar materia	c supply syst nces and acc als – Fuse Ca	tem – List of Electrical Symbols and its interpretation – Ele essories – Example circuits – Panel Boards – Earthing – Differe Iculation and Circuit breakers – Wiring Tools – IE rules for wiring	ectrical [ent types]	Diagrams – S s of wires, wir	Syste ing s	em c syste	of cor m, me	nection of ethods and							
Unit –	11	Domestic Wiring:						9+3							
Three p Types Guideli	ohase four wi of Loads – nes for instal	re distribution system – Protection – General requirements of el Service connections – Service mains – Sub-Circuits – Loca lation of fittings – Voltage drop and size of wires – safety	lectrical i ition of	installations - main board a	- Tes and	ting Distr	of ins ibutic	tallations – n board –							
Unit –	111	Industrial Wiring:		9+3 Solved examples for residential buildings with											
Electric Probler	cal installatior ms – Electrica	n for residential buildings - Estimating and costing of material – al installations for commercial buildings –Electrical installations fo	Solved or small i	examples for industries	resi	denti	al bui	Idings with							
Unit –	IV	Illumination:	and costing of material – Solved examples for residential buildings with = –Electrical installations for small industries 9+3												
Introdu Lighting Lighting	ction – Terms g Schemes - g	s & Definitions – Laws of Illumination – Polar curves – Photomet - Design of Lighting Schemes – Methods of Lighting calculat	ry – Bas tion with	ic principles o Problems –	of Lig Fac	tory,	ontrol Stre	 Types of et & Flood 							
Unit –	V	Light Sources:						9+3							
History pressu	of the electri re mercury va	c lamp – Arc lamps – Incandescent Lamps – Gaseous discharg apour discharge lamp, Mercury iodide lamp, Neon lamp, Fluores	je lamps cent Tub	: Sodium vap es, CFL – LE	our o D's	disch	arge	lamp, High							
				Lecture:	45, -	Tuto	rial:1	5, Total:60							
TEXT E	BOOK:														
1.	Raina K.B & 2017 for Un	Bhattacharya S.K, "Electrical Design Estimating and Costing", 2 it I, II, III.	2nd Editi	on, New Age	Inte	rnatio	onal F	ublishers,							
2.	Gupta J.B, '	Utilization of Electric Power and Electric Traction", 10th Edition,	S.K. Kat	taria & Sons,	2012	2 for	Unit I	V, V.							
REFER	RENCES:		_				_								
1.	Pritchard D.	C, "Lighting", 6th Edition, Routledge, 2016													
2.	Ronald N. H 1980	lelms, "Illumination Engineering for energy efficient luminous env	vironmer	nts", 1st Editio	n, P	rentio	ce–Ha	all, Inc,							

COUR	SE OUTCOMES: mpletion of the course, the students will be able to	BT Mapped (Highest Level)
CO1	discuss the various methods in wiring	Understanding (K2)
CO2	infer the different design considerations in Domestic wiring	Understanding (K2)
CO3	demonstrate the various Electrical Installations	Applying (K3)
CO4	describe the various lighting and its controls	Understanding (K2)
CO5	demonstrate the various types of light sources	Applying (K3)

					Mappin	g of CO	s with	POs an	d PSOs	5				
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	1							1		
CO4	3	2	1									1		
CO5	3	2	1	1	1							1		
1 Clight 0	Mada	aroto 2	Cubatant		Dia am'a	Tayana	ma 1 /							

		ASSESSMENT	PATTERN -	THEORY			
Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	40	60					100
CAT2	20	50	30				100
CAT3	20	50	30				100
ESE	20	40	40				100
* ±3% may be varied (C	CAT 1, 2 & 3 – 50 m	arks & ESE – 100 r	narks)				

		22EE003 - PROGRAMMABLE LOGIC CONTROLLE	R AND	SCADA				
		(Offered by Department of Electrical and Electronic	cs Engi	neering)				
Progra Branci	imme & h	All BE/BTech Branches except EEE	Sem.	Category	L	т	Р	Credit
Prereq	uisites	Nil	5	OE	3	1	0	4
Pream	ble	This course imparts knowledge about basic concepts of p languages, advanced PLC programming, process of SCAD develop automation system in industrial applications.	orogram A syste	mable logic m and also	contr appl	oller: y thi	s, pro s kno	ogramming owledge to
Unit –		Introduction to Programmable Logic Controller:						9+3
Overvie Specifi langua	ew of Prograr cations – CP ges.	nmable Logic Controller – Parts of PLC – Principle of operation U – Memory design and types – Programming devices – Reco	- I/O Mo ording ar	odules: Discre nd Retrieving	ete, A data	Analc ι –PL	og, Sp .C pro	becial – I/O ogramming
Unit –	11	Basic PLC Programming:						9+3
Fundar addres Motor \$	mentals of L sing – Branch Starters – Ma	ogic – Hardwired logic versus Programmed Logic - Program and Internal relay instructions – Entering the Ladder diagram – nual operated switches and mechanically operated switches.	Scan– Electro	Relay-Type magnetic Cor	Instr trol i	uctio elay:	ns - s – Co	Instruction ontactors –
Unit –	111	Advanced PLC Programming:						9+3
Progra Counte filling s	mming Time ers – Program ystem –Traffi	rs: On delay timer and off delay timer instruction – retentive Control Instructions - Math Instructions – Sequencer and Shift c light control system	e and ca Registe	ascade timer r Instructions	fund PLC	ctions C App	s- Pro olicati	ogramming ons: Bottle
Unit –	IV	PLC Installation and Troubleshooting:						9+3
PLC E Progra Pump	nclosures – E mming and N with Level Co	Electrical Noise – Leaky Inputs and Outputs – Grounding – Volta Ionitoring – Preventive Maintenance – Connecting PC and PL ntrol Sensor and Tank.	ige Varia .C. Appl	ations and Su ication: PLC	rges Base	– Pr ed VF	ograr D Dr	n Editing – ive for AC
Unit –	v	SCADA and its application:						9+3
Introdu system Revisit	ction to SCA components ed - Scanning	DA – A brief history of SCADA –Real-time systems – Remo – protocol-modems- Remote terminal units (RTUs) – Master g and communications.	te contr termina	ol – Commu I units (MTUs	nicat) Ap	ions: plica	com tions:	munication Real time
				Lecture	45, 1	Tuto	rial:1	5, Total:60
TEXT I	BOOK:							
1.	Frank D. Pe and IV.	truzella, "Programmable Logic Controllers", 5th Edition, Tata Mc	Graw-H	ill, New Delhi	201	9.for	Units	; I, II, III
2.	Stuart A. Bo	yer, "SCADA: Supervisory Control and Data Acquisition", 4th Ed	lition, IS	A Press, USA	., 20 ⁻	16.fo	r Unit	V.
REFER	RENCES:							
1.	Webb John Learning Pr	W and Reis Ronald A, "Programmable Logic Controllers - Princi ivate Limited, New Delhi, 2002.	ples and	d Applications	", 5tł	n Edi	tion, F	PHI
2.	Bolton W, "I	Programmable Logic Controllers", 5th edition, ELSEVIER, New Y	′ork, 200)9				

COUR On co	SE O mplet	UTCON	IES: the cou	rse, the st	udent	s will be a	able to							BT Mapı (Highest L	oed .evel)		
CO1	ider	ntify the	PLC ha	rdware and	d prog	ramming I	anguage	es for va	arious	application	ons		U	nderstandi	ng (K2)		
CO2	dev	elop PL	C ladde	r logic prog	gramm	ing for inc	lustrial p	oroblem	S					Applying	(K3)		
CO3	CO3 design a PLC system, component, or process to meet a set of specifications											Applying	(K3)				
CO4	inst	all and t	roubles	hoot the Pl	LC in r	eal time								Applying (K3)			
CO5	app	Iy SCAI	DA in re	al time app	licatio	ns to mee	t industr	rial auto	matior	ı			U	nderstandi	ng (K2)		
						Mappin	a of CC)s with	POs a	nd PSO:	S						
COs/	POs	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2		
CO	1	3	2	1	1		1			1			1				
CO	2	3	2	1	1		1			1			1				
CO	3	3	2	1	1		1			1			1		-		
CO	4	3	1				1			1			1				
CO	5	3	2	1	1		1			1			1				
1 – Sli	ght, 2	– Mode	erate, 3	- Substant	ial, BT	- Bloom's	Taxono	my									
						ASSES	SMENT	PATTE	ERN -	THEORY	,						
Tes	st / Bl Catego	oom's ory*	R	ememberi (K1) %	ing	Understa (K2)	anding %	Appl (K3)	ying) %	Analyz (K4) 9	ing %	Evaluating (K5) %) (Creating (K6) %	Total %		
	CAT	1		30		50		20	C						100		
	CAT	2		30		50		20	C						100		
	CAT	3		40		40		20	C						100		
	ESE	Ξ		40		40		20	C						100		
* ±3%	may t	be varie	d (CAT	1,2&3-	50 ma	rks & ESE	– 100 r	marks)									

		22EE004 – ANALOG AND DIGITAL ELECT	RONICS	peoring)				
Progra	amme &	All B.E/B.Tech Branches Except EEE	Sem.	Category	L	т	Р	Credit
Prerec	luisites	Nil	5	OE	3	1	0	4
Pream	ble	This course aims to impart knowledge on the analog and digita the design and analysis of various electronic and digital logic c	I electro ircuits	nics that aids	the s	stuc	lents	to perform
Unit –	l	Bipolar Junction Transistor:						9+3
Constr CC co circuits	uction and op nfigurations– and Voltage-	eration of a Transistor – Currents in transistor – Input and Outp Current gain in CE, CB and CC configurations – Operating p divider bias - Hybrid model of BJT.	out chara oint – S	cteristics of a tability and s	tran tabili	sist ty f	or in actor	CE, CB and : Fixed bias
Unit –	II	FET, MOSFET and UJT:						9+3
Constr charac and ch	uction and classified teristics of Management aracteristics of Management	haracteristics of JFET – Parameters of JFET – FET in CS, DSFET in Depletion and Enhancement mode – Applications of of UJT – UJT as relaxation oscillator.	CD an f MOSFE	d CG Config ET – Constru	jurati ction	ons , th	eory	Construction, of operation
Unit –	111	Combinational Circuits:						9+3
Design Conve	Procedure - rsion: Gray to	 Binary Addition – Binary Subtraction – Decoders – Encod Binary, Binary to gray, BCD to Binary, Binary to BCD – Magnitu 	lers – N de comp	Iultiplexers – parators: 1 bit	Der , 2 bi	nul [:] t.	iplex	ers – Code
Unit –	IV	Sequential Circuits:						9+3
Latche Operat	s and Flip-flo ing character	ps – SR, JK, D, T Flip-flops – Master slave Flip-flop - Conve stics of Flip-flops – counters – Shift registers – Universal Shift re	rsion of egisters.	one type of f	lip-flo	op 1	o an	other type –
Unit –	٧	Logic Families and Memory devices:						9+3
Transis Oxide RAMs EEPR(stor Transisto Semiconducto (SRAMs) - [DM.	r Logic (TTL): Two-input TTL NAND Gate – Emitter Coupled or (CMOS) Logic – Comparison of Logic families for their perform Dynamic RAMs (DRAMs). Read-Only Memory (ROM) organiz	Logic (E nance. M zation –	ECL) - Inverte lemory Types Types of RC	er: C S: Me DMs:	omj mo PF	oleme ry De ROM,	entary Metal vices: Static EPROM &
TEYT	BOOK			Lecture.	45, 1	uu	nai.	15, 10(a).00
1	Sedha R S	"A Textbook of Applied Electronics " 4th Edition S Chand & Co	b. Ltd. N	lew Delhi 20'	14 fo	r I Ir	nite I	
2.	Soumithra k	Kumar Mandal, "Digital Electronics Principles and Applications", E	Eleventh	Reprint Edition	on, T	ata	Mc (Graw Hill,
REFE	RENCES:							
1.	Salivahanar Company, N	n S. and Suresh Kumar N., "Electronic Devices and Circuit ", 4 th lew Delhi, 2017.	Edition,	Tata McGraw	Hill I	Pub	lishin	ıg
2.	Anand Kum	ar.A, "Fundamentals of Digital Circuits" 4th Edition, Prentice Hall	of India,	Chennai, 20 ⁻	16			
3.	Salivahanar 2012.	n, S and Arivazhagan, —Digital Circuits and DesignII, 4th Edition	, Vikas F	Publishing Ho	use F	Pvt.	Ltd.,	New Delhi,
[
COUR On co	SE OUTCOM	ES: he course, the students will be able to				(H	BT M lighe	lapped st Level)
CO1	Analyse the	characteristics and stability of BJT					Apply	ing (K4)
CO2	acquire kno	wledge about the operation and characteristics of FET and UJT			1	Jnc	lersta	anding (K2)
CO3	Illustrate co	mbinational logic circuits using logic gates.				ŀ	Apply	ing (K3)
CO4	Design cour	nters and shift registers using flip-flops.				A	nalyz	zing (K3)

B.E.– Electrical and Electronics Engineering, Regulation, Curriculum and Syllabus – R2022

identify the logic families and memory devices

CO5

Understanding (K2)

					Mappin	g of CO	s with	POs ar	nd PSOs	5				
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1										1		
CO2	3	2	2	1	1							1		
CO3	3	3	2	1	1							1		
CO4	3	2	2	1	1							1		
CO5	3	2	1		1							1		
1 – Slight, 2	- Mode	rate, 3 –	Substanti	al, BT	- Bloom's	Taxono	my							
					ASSES	SMENT	PATTE	ERN - T	HEORY	,				
Test / BI Categ	oom's ory*	Re	memberi (K1) %	ng	Understa (K2)	nding %	Apply (K3)	ying %	Analyzi (K4) %	ing I %	Evaluating (K5) %) C	reating (K6) %	Total %
CAT	1		10		50		40)						100
CAT	2		10		30		60)						100
CAT	3		10		30		40)	20					100
ES	E		5		35		40)	20					100

		22EEO05 - POWER ELECTRONICS AND D	RIVES					
		(Offered by Department of Electrical and Electronic	cs Engiı	neering)				
Progra Branci	mme& ז	All B.E/B.Tech Branches Except EEE	Sem.	Category	L	т	Ρ	Credit
Prereq	uisites	Nil	5	OE	3	1	0	4
Pream	ble	This course is designed to impart knowledge about the cha working principle of rectifier, chopper, DC to AC converter and	aracteris AC to A	tics of power C converter	ser	nicon	ducto	r devices,
Unit –		Power Semi-Conductor Devices:						9+3
Introdu charac	ction – Pow teristics - Thy	er BJT – Power MOSFET - IGBT – SCR - Construction, ristor Protection – Series and parallel connections of thyristors.	Principl	e of operati	on,	Statio	and	Dynamic
Unit –		AC Converters:						9+3
Single control down a	phase control ler - Single P ind step up.	Iled rectifiers with R, RL Loads: Estimation of RMS load voltage hase AC Voltage Controllers - Principle of cycloconverter - Sing	and RMS gle Phase	S load curren e to Single Ph	t - Pi nase	rincip Cyclo	le of A oconv	AC voltage erter: step
Unit –	111	DC Converters:						9+3
Princip Single,	le of Step Up Sinusoidal P	and Down Chopper – Chopper Control Strategies – SMPS - S WM technique - UPS	Single Ph	ase Bridge Ir	nvert	ers -	PWM	Inverters:
Unit –	IV	DC Drives:						9+3
Elemer rectifie	nts of Electric r control of dc	al drives - Speed Control of DC Motors – Ward Leonard Schem separately excited motor – chopper controlled separately excite	e – Drav ed DC dri	vbacks – sir ives.	igle	ohase	e fully	controlled
Unit –	V	AC and Special Machine Drives:						9+3
Three load co applica	phase induction mmutated th tions: Textile	ion motor Drive: V/f control - Synchronous Motor Drives: self- yristor inverter - Brushless DC motor drives - permanent mag mills – Steel rolling mills.	controlle net step	d synchronou per motor Dr	is m ives	otor – Dr	drive ives fo	employing or specific
				Lecture: 4	45, T	utori	al :15	, Total:60
TEXT I	BOOK:							
1.	Bimbhra P.S	S., "Power Electronics", 6th Edition, Khanna Publishers, New De	lhi, 2018	6 for Units I, II	, III			
2.	Dubey G.K.	"Fundamentals of Electrical Drives", 2nd Edition, Narosa Publis	hing Hou	use, New Dell	ni, 20)19 fc	or Unit	ts IV, V
REFER	RENCES:							
1.	Singh M.D.	and Khanchandani, "Power Electronics", 2nd Edition, Tata McG	raw-Hill,	New Delhi, 2	017.			
2.	Vedam Sub	rahmanyam "Electric Drives: Concepts and Applications", 2nd E	dition, M	lcGraw-Hill, N	lew l	Delhi,	2010	

COUR On cor	SE O mplet	UTCON	IES: the cour	se, the st	udent	s will be a	able to							BT Mapı (Highest L	oed .evel)
CO1	choo chai	ose va racterist	rious po tics	wer sem	icondu	ictor devi	ces ba	sed on	their	constru	ction, op	peration a	^{ind} U	nderstandi	ng (K2)
CO2	expl	lain the	working	principle o	of ac c	onverter a	and com	pute its	perfor	mance p	aramete	r	U	nderstandi	ng (K2)
CO3	Clas	ssify an	d explain	the work	ing pri	nciple of d	lc conve	rters					U	nderstandi	ng (K2)
CO4	Арр	ly powe	r conver	ters for sp	beed c	ontrol of D	C drive	S						Applying	(K3)
CO5	Und vario	lerstanc ous ind	I the ope ustrial ap	ration of plications	AC Dr	ive and sp	pecial m	achines	s Drive	es and its	s control	schemes	for	Applying	(K3)
						Mappin	g of CO	s with	POs a	nd PSOs	5				
COs/F	04 Apply power converters for speed control of DC drives Applying (K3) 05 Understand the operation of AC Drive and special machines Drives and its control schemes for various industrial applications Applying (K3) Mapping of COs with POs and PSOs OS/POS PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO12 PS01 PS02 CO1 3 2 3 1														
CO	1	3	2	3	1					1					
CO	2	3	2	3	1	1	1			1					
CO	3	3	1	3	1	1	1			1					
CO.	4	3	2	3	1	1	1			1					
CO	5	3	1	3	1	1	1			1					
1 – Slię	ght, 2	– Mode	erate, 3 -	Substant	ial, BT	- Bloom's	Taxono	omy							
						ASSES	SMENT	PATTE	ERN - '	THEORY	·				
Tes C	st / Blo Catego	oom's ory*	Re	memberi (K1) %	ng	Understa (K2)	anding %	Apply (K3)	ying %	Analyz (K4) 9	ing %	Evaluating (K5) %	g (Creating (K6) %	Total %
	CAT	1		20		80									100
	CAT	2		20		80									100
	CAT	3		20		50		30)						100
	ESE	Ξ		20		50		30)						100
* ±3%	may b	be varie	d (CAT 1	, 2 & 3 –	50 ma	rks & ESE	E – 100 r	marks)							

		22EE006 – INTRODUCTION TO SENSORS A	ND ACTUA	TORS				
		(Offered by Department of Electrical and Electr	onics Engi	neering)				
Programi Branch	me &	All B.E/B.Tech Branches Except EEE	Sem.	Category	L	Т	Р	Credit
Prerequis	sites	Nil	5	OE	3	1	0	4
Preamble		This course helps the students to impart the knowledge to interplications.	erface vario	ous sensors ar	nd act	uators	s in emb	edded
Unit – I		Inductive Transducers:						9+3
Introduct sensors – Inductive variable re	ion: Diffe Environme transduce eluctance t	erence between sensor, and transducer- Principles- Classificat ental parameters – Characterization ers: - Principle of operation, construction details, characteristic ransducer- Inductive proximity sensor	ion of sense s and appli	ors- Static and cations of LVE	l Dyna DT, Ind	amic d ductio	characte n potent	ristics of tiometer,
Unit – II		Capacitive & Radiation Sensors:						9+3
Capacitiv Electro sta Radiation Cell- Phot	ve transdu atic transdu n Sensors : tovoltaic ar	cers: - The parallel plate Capacitive sensor – Serrated plate ucer Types of photosensistors/photo detectors: The Photo emissiv Id Photo junction Cells - Position-sensitive Cell. Fibre optic ser	e Capacitive e Cell and t nsors: Liqui	e sensor – Va he Photomulti d level sensing	riable plier - g – Fli	Perm The luid flo	Photoco w sensi	Sensor – Inductive
Unit – III		Thermal and Magnetic Sensors:						9+3
Thermoer Magnetic sensors –	mf Sensors Sensors Angular/R	Sensors and the principles – Magneto Resistive sensors – otary movement sensors – Switching magnetic sensors	Hall effect	Sensors – Ind	ductar	nce ar	nd Eddy	current
Unit – IV		Smart sensors and Applications of sensors:						9+3
Smart Se MEMS Sensors Sensors for	Applicatic	roduction, Primary Sensors, Excitation, Amplification, Filters, ons: On-Board Automobile Sensors – Home Appliance sense nental monitoring.	Converters	s, Standards f ace sensors-N	or Sn Iedica	nart S al Diag	ensor li gnostic	nterface, sensors-
Unit – V		Actuators:						9+3
I hermo M principles	lechnaical -BLDC Mot	Actuators -Optical Actuators - Capacitive Actuators -Magneto tors-AC motors-Stepper Motors-Linear Motors-Piezo electric ac	strictive A	ctuators -Moto	ors as	actua	ators: C	peration
				Lecture	e: 45,	Tutor	ial :15,	Total:60
ТЕХТ ВО	OK:							
1.	Patranabi	s, Sensors and Transducers, 2nd Edition, PHI, 2022. For Units	I, II, III, IV.					
2.	Nadhan Io	a, Sensors, Actuators, and Their Interfaces: A Multidisciplinary	/ Introductio	on, Sci Tech P	ublish	ing, 2	013 for	Unit V.
REFERE	NCES:							
1.	De Silva a	and Clarence W, Sensors and Actuators Engineering System Ir	nstrumentat	ion, 2 nd Editior	n, CR	C Pre	ss, 2015	5.
2.	Jacob Fra	den, Handbook of Modern sensors: Physics, Design and Appli	cations, 5 th	Edition, Sprin	ger, 2	015.		

COURS On com	E OU	JTCOM	ES: ne cour	rse, th	ne stude	nts wi	ill be able	to							BT Ma (Highes	pped t Level)
CO1	ex	plain the	e theory	/ and ·	working	behind	d the induc	ctive tra	nsducer	S				L	Inderstan	ding (K2)
CO2	De	escribe t	he con	structi	on and v	vorking	g of Capa	citive an	d Radia	tion se	ensors			ι	Inderstan	ding (K2)
CO3	Ela	aborate	the var	ious ty	pes of tl	nerma	I and mag	netic se	ensors a	nd its p	orinciple	of operat	ion	L	Inderstan	ding (K2)
CO4	de	monstra	ate the v	workir	ng of vari	ous ty	pes of ser	nsors us	ed in re	al worl	d applica	itions			Applyin	g (K3)
CO5	IIIu	ustrate t	he work	king pr	rinciple o	f Actu	ators and	electric	al actua	ting sy	stems			ι	Inderstan	ding (K2)
							Mapping	of COs	with P	Os and	d PSOs					
COs/P	Os	PO1	PO2	2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1		3	2		1			1						1		
CO2		3	2		1			1						1		
CO3	6	3	2		1			1						1		
CO4		3	2		1			1						1		
CO5	i	3	2		1			1						1		
1 – Sligl	ht, 2 -	– Modei	rate, 3 -	- Subs	stantial, E	BT- Bl	oom's Tax	onomy								
							ASSESS	MENT		RN - TH	IEORY					
Te: (st / B Categ	loom's gory*		Rem (emberir (K1) %	ng	Understa (K2)	nding %	Apply (K3)	ing %	Analyzir (K4) %		valuating (K5) %	g Cr (i	eating (6) %	Total %
	CA	T1			15		85									100
	CA	T2			15		85									100
	CA	Т3			10		60		30							100
	ES	SE			10		70		20							100

22EE007 – ENERGY CONSERVATION AND MANAGEMENT													
(Offered by Department of Electrical and Electronics Engineering)													
Programme & Branch	All B.E/B.Tech Branches Except EEE	т	Ρ	Credit									
Prerequisites	Nil	6	OE	3	1	0	4						
Preamble This course aims in imparting the procedures of energy audit, energy management and financial management. Also it aims to impart knowledge on energy conservation opportunities in thermal utilities, electrical system, lighting Systems and in buildings													
Unit – I Introduction: 9+3													
Classification of Energy - Energy Scenario - Energy Needs of Growing Economy - Energy Pricing in India – Energy and Environment - Energy Conservation Act. Energy Audit: Types and Methodology - Energy Audit Instruments - Role of energy managers and auditors													
Unit – II Thermal Utilities: 9+3													
Steam – Introduction, Properties of steam, Steam distribution systems, Boilers- Types and Classification- Performance Evaluation of Boilers – Losses in Boiler – Energy Conservation opportunities in boilers, Waste heat recovery - Classification and benefits													
Unit – III Electrical and Lighting System: 9+3													
Introduction to Electric Power Supply Systems - Electrical Load Management and Maximum Demand Control- Power factor improvement and its benefit, Basic Parameters and Terms in Lighting systems - Luminous performance Characteristics of commonly used luminaries and Energy saving opportunities in lighting systems													
Unit – IV Energy Conservation in Buildings and ECBC: 9+3													
About ECBC – Building Envelope, Fenestrations, Insulation, HVAC, Lighting, Water pumping, Inverter – Elevators and Escalators – Star Labeling for existing buildings													
Unit – V Financial Management: 9+3													
Investment – need, Appraisal and criteria, financial analysis techniques – Simple payback period – Return on investment – Net present value – Internal rate of return – Cash flows, Risk and sensitivity analysis – Financing options – Energy performance contracting and role of ESCOs.													
Lecture:45, Tutorial:15, Total:60													
TEXT BOOK:													
1. Guide Books for National Certification Examination for energy managers and Auditors, 3rd Edition, Bureau of Energy Efficiency,2010													
REFERENCES:													
1. Wayne C. Turner & Steve Doty, "Energy Management Handbook", 6th Edition, The Fairmont Press, GA,2006													
2. Barny L. Capehart, Wainey C. Turner, William J. Kennedy, "Guide to Energy Management", 7th Edition, The Fairmont Press, GA, 2012													

COURSE OUTCOMES: On completion of the course, the students will be able to									(BT Mapped (Highest Level)					
CO1	O1 interpret the importance of energy, energy conservation and energy audit										Un	Understanding (K2)			
CO2	CO2 appraise the energy saving opportunities in thermal systems										Un	Understanding (K2)			
CO3	CO3 predict the energy saving opportunities in lighting systems											Applying (K3)			
CO4	204 appraise the energy conservation in buildings and ECBC										Un	Understanding (K2)			
CO5 analyze the different financial management techniques											Analyzing (K4)				
Mapping of COs with POs and PSOs															
COs/P	Os	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO	1	3	1					1	1	1			1		
CO2	2	3	1					1	1	1			1		
CO	3	3	2	1				1	1	1			1		

CO4

CO5

ASSESSMENT PATTERN - THEORY												
Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %					
CAT1	40	60					100					
CAT2	20	40	40				100					
CAT3	20	40	30	10			100					
ESE	20	40	30	10			100					
		22EE008- MICROPROCESSORS AND MICROCONTROL	LERSI	NTERFACIN	G							
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		(Offered by Department of Electrical and Electroni	ics Engi	ineering)								
Progra Branch	mme & ז	All BE/BTech Branches except EEE	Sem.	Category	L	т	Ρ	Credit				
Prereq	uisites	Nil	6	OE	3	1	0	4				
Pream	ble	To get acquaintance with the architecture of 8085 processor an programming concepts for interfacing peripherals with the cont	nd 8051 troller an	controller, ap d to understa	oply t and th	he err ne app	nbedd olicati	ed ons of				
Unit –	1	8085 Microprocessor:						9+3				
Introdu Diagrar	ction to 808 ms–Memory	5 Microprocessor - Architecture - Pin Configuration – Interrup Interfacing –Simple Assembly Language Programs for arithmetic	ots–Instr c operati	uction Set – ons.	Addro	essinę	g Moo	des-Timing				
Unit –		8051 Microcontroller:						9+3				
Introdu register	ction to 8051 r –Stack – Ins	Microcontroller – Architecture – Memory Organization–Special struction set –Addressing modes	Functio	n Registers -	- Pro	gram	Cour	nter – PSW				
Unit –		8051 Programming:						9+3				
I/O Po Embed	rts – Timer ded C: I/O po	(Mode 1) / Counter– Serial Communication –Interrupt (Tim ort programming–Timer programming-Counter programming-Ser	ier, Seri ial port p	al communio programming	catior -Inter	n) – rupt p	Progra progra	amming in mming.				
Unit –	IV	Peripheral Interfacing with 8051:						9+3				
Prograi – Servo	mming in Em o motor.	bedded C: Keypad –LCD – Seven segment LED –Sensors–A/D	and D/A	A converters-	-DC I	Notor	– Ste	pper motor				
Unit –	V	Applications of Microcontrollers:						9+3				
Smart of (only bl	card reader, <i>i</i> lock diagram	Automated meter reading system, Washing machine, Speedome approaches)	eter, 3D	printers, Hea	lthca	re mo	nitorir	ng systems				
				Lectur	e:45,	Tuto	rial:1	5, Total:60				
TEXT E	300K:											
1.	Muhammac Using Asse	l Ali Mazidi, Janice Gillispie Mazidi, Rolin D. McKinlay, "The 805? mbly and C", 2nd Edition, Pearson Education, New Delhi, 2013,	1 Microc for Units	ontroller and II,III, IV,V.	Emb	eddeo	d Syst	tems				
2.	Soumitra Ku and 8051",	umar Mandal, "Microprocessors and Microcontrollers Architecture 8th Edition, McGraw Hill Education (India) Pvt. Ltd, New Delhi, 2	e, Progra 013, for	amming and Unit I.	Syste	em De	esign	8085,8086				
REFER	RENCES:											
1.	Senthil Kum Press, New	nar N., Saravanan M., Jeevananthan S, "Microprocessor and Mic Delhi, 2015	crocontro	oller", 12 th Im	press	sion, C	Oxforc	I University				
2.	Krishna Kar 8096", 2nd	nt, "Microprocessors and Microcontrollers: Architecture, program edition_PHL earning Pyt_Ltd_New Delhi_2012	ming an	d system des	ign 8	085,	8086,	8051,				

COUR	SE OUTCOMES:	BT Mapped
On co	mpletion of the course, the students will be able to	(Highest Level)
CO1	explain the basic concepts of 8085 microprocessor	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 microcontrollers	Applying(K3)
CO5	recognize microcontroller-based 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	1				1		1		1	1	1		
CO2	3	1				1	2				2	1		
CO3	3	2	1	1	1	1		1		1	1	1		
CO4	3	2	1	1	1	1	2				2	1		
CO5	3	1				1		1		1	1	1		
1 – Slight, 2	– Mode	erate, 3 –	Substant	ial, BT-	Bloom's	Taxono	my							
					ASSES	SMENT		ERN - T	HEOR	Y				

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	15	85					100
CAT2	10	45	45				100
CAT3	10	45	45				100
ESE	5	55	40				100

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

	22EEO09 – ELECTRICAL SAFETY						
	(Offered by Department of Electrical and Electronic	cs Engir	neering)				
Programme & Branch	All B.E/B.Tech Branches Except EEE	Sem.	Category	L	т	Р	Credit
Prerequisites	Nil	6	OE	3	1	0	4
		I	L.	1		1	1
Preamble	This course imparts the knowledge about the electrical hazards	s and its	safety measu	ures	in ele	ectrica	al systems.
Unit – I	Hazards of Electricity:						9+3
Introduction: Objec Hazards – Hazards blast. Shock: Impa energy input – Arcir	tive of safety - Safety Oath, National safety day – Types of sa s associated with electrical current and voltage – Electrical safe ct of electric shock – Influencing factors. Arc – Initiation of Ar ng voltage – incident energy – measurement – copper calorimete	afety – 0 ty. Defin c – Impa r – Stoll	Common safe ition of terms acts of Arc – curve.	ety n s: Ele Arc	neas ectric ene	ures - shoc rgy re	- Types of k, Arc and elease: Arc
Unit – II	Personnel Protection Equipment (PPE):						9+3
Flash and thermal breakthrough (EBT guidelines for selec glasses, goggles – thumb rule. Arm a leg protection and r	protection: Glossary of terminologies – flame resistant, arc) – ASTM standard for clothing materials – choice of clothing tion – Flash Suit. Head Protection: Hard hats – ANSI Z 89.1 star selection - Face shield. Hearing Protection – Requirement –ear nd Hand Protection: Rubber gloves – ASTM standards – leather espiratory protection.	therma – flame ndard – E r plugs a protectiv	I performance and non-fla Eye Protectio and ear muffs re glove – leve	e va ime n - re – N el of	alue resis equir oise prote	(ATP tant r emen reduc ection	V), energy naterials – ts of safety tion ratio – . Foot and
Unit – III	Electrical Safety Equipment:						9+3
Voltage measuring Insulating equipment – hot sticks – che extinguishers – fire	instruments: Safety voltage measurement – contact and non-c nt: Rubber mats, blankets, covers, line hoses and sleeves – Insp rry picker – standards for tools – safety barriers and signs – safety against electrical fire – types of extinguishers.	ontact ty bection to safety	/pe testers – echniques – s tags, lock ar	sele stand nd Ic	ction dards ocking	criter 5. Insu g dev	ia. Rubber Ilated tools ices. Fire
Unit – IV	Safety Earthing Practices:						9+3
Step potential, touc – Functional requir Device -composition	h potential – types of grounding- advantages- Distinction betwee ement of earthing systems – earth electrodes – types. – Eart n of RCD-operation- advantages.	en syster h resista	m grounding a ance measure	and emer	equip nts- F	oment Residu	grounding Jal Current
Unit – V	First Aid and Rescue:						9+3
First Aid: First aid heat stroke and sna space rescue and g	against electric shock, choking, poisoning, wounds and bleeding ake bite. Rescue: Primary rescue methods – American Red Cro round level rescue. Regulatory Bodies: Functionality – IEEE, IEC), burns a oss meth C, ASTM,	and scalds, fi od. Types: e , NFPA and C	actu eleva SH/	res a ated i A.	and di rescue	slocations, e, confined
			Lecture	45,	Tuto	rial:1	5, Total:60
TEXT BOOK:							
1. John Cadd Publishers,	ick., Mary Capelli Schellpfeffer& Dennis Neit zell., "Electrical Safe 2012.	ety Hand	book" , 4th E	ditio	n, Mo	Graw	Hill
REFERENCES:							
1. Rao.S, Jair Publishers,	n R.K &Saluja H.L., "Electrical Safety, Fire Safety Engineering an 1997.	d Safety	Managemen	t", 2r	nd Ec	lition,	Khanna
2. Peter E. Su Jersy, Marc	utherland., "Principles of Electrical Safety" IEEE Press Series on I ch 2018.	Power Ei	ngineering, Jo	ohn \	Wiley	and and	Sons, New

COUR On co	SE OI mplet	UTCON	IES: the cour	se, the st	udent	s will be a	able to							BT Mapp Highest L	oed .evel)
CO1	unde	erstand	the varie	ous termin	ologie	s and haz	ards rela	ated to	electric	al safety	/		ι	Jnderstand	1 (K2)
CO2	iden	tify and	l apply th	e personr	el pro	tection eq	uipment	for a ty	pical in	dustry				Applying	(K3)
CO3	appl	y the va	arious m	easuring a	nd ins	sulating ec	luipmen	ťs for e	lectrica	l safety				Applying	(K3)
CO4	appl	ly the sa	afety ear	thing prac	tices f	or LV and	HV syst	tem						Applying	(K3)
CO5	understand the functionality of international regulatory bodies, first-aid and rescue procedures Understand (K2)														
Mapping of COs with POs and PSOs															
COs/POsPO1PO2PO3PO4PO5PO6PO7PO8PO9PO10PO11PO12PS01PS02															
CO	1	3	2	1				1	1			1	1		
CO	2	3	1	2				1	1			1	1		-
CO	3	3	1	2				1	1			1	1		
CO	4	2	1	3				1	1			1	1		
CO	5	1	2	3				1	1			1	1		
1 – Slię	ght, 2	– Mode	erate, 3 -	- Substant	al, BT	- Bloom's	Taxono	my							
						ASSES	SMENT	PATTE	ERN - T	HEORY	,				
Tes	at / Blo Catego	oom's ory*	Re	ememberi (K1) %	ng	Understa (K2)	anding %	Appl (K3)	ying)%	Analyzi (K4) %	ing l %	Evaluating (K5) %) C	reating (K6) %	Total %
	CAT	1		20		80									100
	CAT2 20			80									100		
	CAT	3		20		80									100
	ESE	E		20		80									100
* ±3%	may b	e varie	d (CAT 1	, 2 & 3 –	50 ma	rks & ESE	– 100 r	narks)							

		22EEEO10 – VLSI SYSTEM DESIGN	1										
		(Offered by Department of Electrical and Electronic	cs Engi	neering)									
Progra Branci	nmme &	All BE/BTech Branches except EEE	Sem.	Category	L	т	Ρ	Credit					
Prereq	luisites	Nil	6	OE	3	1	0	4					
Pream	ble	To expose the knowledge of VLSI System Design in terms of r logic circuits with its fabrication techniques and programmi Hardware Description Language in different modeling	modeling ng vario	g of MOS trar ous digital log	isisto gic o	ors, d ircuit	esigni s usir	ing CMOS ng Verilog					
Unit –	l Logio CM4	Introduction:	an Fak	riantian maal				9+3					
CMOS Logic – CMOS Fabrication and Layout – Physical Design – Design Verification – Fabrication, packaging and Testing													
Unit –	II	MOS Transistor Theory:						9+3					
Introdu charac	Introduction – MOS transistor operating regions – Long Channel VI characteristics – Non ideal I-V effects - DC transfer characteristics												
Unit –		CMOS Processing Technology:						9+3					
Introdu Techno	ction – CMC plogy related	DS technologies – Stick Diagram – Layout diagram – Layout De CAD Issues – Manufacturing Issues	esign Ru	les – CMOS	Pro	cess	Enhai	ncement –					
Unit –	IV	VERILOG HDL-I:						9+3					
VLSI E Types control	Design Flow – Dataflow s – Condition	 Dataflow modelling – Continuous Assignments – Delays – modelling Examples – Behavioural modelling – Structured Pr nal statements - Multiway branching -Loops - Behavioural modelling 	Express ocedure ing Exar	ions, operato s - Procedui nples	ors, o ral A	opera ssigr	nds - nment	- Operator s –Timing					
Unit –	V	VERILOG HDL-II:						9+3					
Tasks level m	and Function odelling Eler	ns – Difference between tasks and functions – Tasks – Function ments - Switch level modelling Examples	ons – Us	seful Modellin	ig Te	echni	ques	- Switch					
				Lecture:	45, ⁻	Tuto	ial:15	, Total:60					
ΤΕΧΤΙ	BOOK:												
1.	Neil H. E. V Pearson eo	Veste & David Money Harris, "CMOS VLSI Design A Circuits and ducation, New Delhi, 2017 Unit I, II, III	d System	ns Perspective	e" Fo	ourth	Editio	n,					
2.	Samir Paln 2017. Unit	itkar, "Verilog HDL: Guide to Digital Design and Synthesis", Seco IV, V	ond Editi	on, Pearson I	Educ	ation	, New	[/] Delhi,					
REFEF	RENCES:												
1.	Pucknell, D	Douglas A & Eshragian, K., "Basic VLSI Design", Third Edition, Pr	entice H	lall India, Pvt	Ltd,	2015							
2.	A.Albert Ra	aj & T.Latha, "VLSI Design", Prentice Hall India Learning Private I	Limited,	2008.									

00110		ITOON	150												
On co	SE OU	ion of t	ies: he cour:	se, the st	udent	s will be	able to						(BT Mapp Highest L	bed .evel)
CO1	Corr	npreher	nd the pri	nciples of	СМО	S Logic ar	nd its ph	ysical d	lesign	process.			Ur	nderstandi	ng (K2)
CO2	Expl	ain MC	S transis	stor chara	cterist	ics.								Applying	(K3)
CO3	Des	cribe C	MOS fab	rication te	chniq	ues, layou	t design	rules a	nd dif	erent ma	nufactur	ing issues	Ur	nderstandi	ng (K2)
CO4	App beha	ly Verilo avioura	og HDL n I modellir	nodeling f na.	or diffe	erent digita	al logic o	circuits i	in data	flow mod	lelling ar	nd		Applying	(K3)
CO5	CO5 Model different digital logic circuits using Verilog HDL in Switch level modeling. Applying (K3)														
						Mannin	a of CO	e with	POs a	nd BSO					
COs/F	205	PO1	P02	PO3	PO4		PO6	PO7	POS a	PO9	PO10	PO11	PO12	PSO1	PSO2
CO	1	3	2	1	1	1							1		
CO	2	3	2	1	1	1							1		
CO	3	3	2	1	1	1							1		
CO	4	3	3	3	1	3				2		2	2		
CO	5	3	3	3	1	3				2		2	2		
1 – Slig	ght, 2	– Mode	erate, 3 –	Substant	ial, BT	- Bloom's	Taxonc	my							÷
						ASSES	SMENT	PATTE	ERN -	THEORY	,				
Tes C	t / Blo atego	oom's ory*	Re	memberi (K1) %	ng	Understa (K2)	anding %	Apply (K3)	ying %	Analyzi (K4) %	ing I %	Evaluating (K5) %) C	reating (K6) %	Total %
	CAT	1		10		70		20)					<u> </u>	100
	CAT	2		10		60		30)						100
	CAT	3		10		30		60)						100
	ESE 10 40 50 100														
* ±3%	may b	e varie	d (CAT 1	, 2 & 3 –	50 ma	irks & ESE	E – 100 i	marks)							

	22EE011 – AUTOMATION FOR INDUSTRIAL A	PPLICAT	TIONS										
	(Offered by Department of Electrical and Electron	nics Engi	neering)										
Programme & Branch	All BE/BTech Branches except EEE	Sem.	Category	L	т	Ρ	Credit						
Prerequisites	Nil	6	OE	3	1	0	4						
Preamble	This course is aimed to impart knowledge on the technologies	used for t	he automatio	n in ir	ndustr	ies.							
Unit – I	Introduction:						9+3						
Architecture of the Control level for pro systems – DAS an pyramid	basic three level Integrated Industrial Automation Systems – Fie ocess and motion control functions, Distributed control system - Ind SCADA for Management functions - Integrated automation the	eld level f Supervisc hrough bu	or sensors ac ory level for D us structure a	ctuato ata lo it the	ors and ogging differ	d sma and ent le	art devices, Acquisition vels.ISA95						
Unit – II	Field Level Equipment-Sensors:				<u> </u>		9+3						
Field level equipment – Sensors and measurement systems for Temperature, Pressure, Force, Displacement and speed measurement - Flow measurement techniques – Measurement of level, humidity, pH. Retro reflective sensor applications in conveyors													
Unit – III	Unit - IIIField Level Equipment- Actuators:9+3												
Introduction to Act Components and Systems using Sma	Introduction to Actuators – solenoids, on/off valves-Proportional Flow Control Valves – Hydraulic Actuator Systems – Principles, Components and Symbols – Pumps, fans and Motors – Pneumatic Control Systems – System Components-Integrated Control Systems using Smart sensors, Hart communication protocol.												
Unit – IV	Process Controls:						9+3						
Introduction to pro Modeling of Proces – Selective Contro Variable Control.St	cess control – Automatic Process Control – Need for Autom ses – First, Second and Higher Order Process Systems – Feed F I Systems – Split-Range Control – Adaptive Controls – Inferen ack light control and its sequence operations based on machine s	atic Proce Forward C tial Contre status	ess Control i control – Casc ol – Interactir	n Ind ade (ng Co	lustry Contro ontrol	– Ma ol – Ra Syste	athematical atio Control ms – Multi						
Unit – V	PLC and IIoT						9+3						
Introduction to PLC I/O modules-power Ladder logic, functi	-s, PLC-s and Relay controls – PLC processor modules -input/ou supplies for I/O modules – Selection of PLC based on I/O counts onal block diagram-On/ Off logic functions, timer / counter Introdu	itput modu s and Sca iction to P	ules – Paralle In times, PLC Irofibus, Profin	l /Loc prog net, N	al and rammi lodbu:	l Seria ing La s and	al / Remote inguages – MQTT						
			Lectur	re:45,	Tuto	rial:1	5, Total:60						
TEXT BOOK:													
1. Krishnas	wamy K, "Process Control", 2nd Edition, New Age International(P) Ltd, Nev	wDelhi, 2015	for Ur	nits I, I	II, III, I	IV						
2. Frank D.	Petruzella, "Programmable Logic Controllers", 5th edition, McGra	aw Hill, Ne	ew Delhi, 201	9 for I	Jnit V	-							
REFERENCES:													
1. NPTEL v	veb book on Industrial Automation and controls by Mr. S.Mukhopa	adhyay ar	nd Mr.S.Sen o	of IIT,	Khara	agpur.							
2. Bill Drury	2. Bill Drury, "The Control Techniques Drives and Controls Handbook", 2nd Edition, IET Power and Energy Series, 2009.												
3. Lukas, M	ichael P., — Distributed Control Systemsll, Van NostrandReinfold	l Compan	y, 2002.										

COURS	E OUTCOMES:	BT Mapped
On com	pletion of the course, the students will be able to	(Highest Level)
CO1	understand the integrated industrial automation system	Understanding (K2)
CO2	utilize the Field level equipment-sensors for different industrial applications	Applying (K3)
CO3	utilize the Field level equipment-Actuators for different industrial applications	Applying (K3)
CO4	understand the Process controls in Industries	Understanding (K2)
CO5	apply the concepts of PLC in control oriented Industrial applications	Applying (K3)

	Mapping of COs with POs and PSOs														
COs/POs	P01	PO2	PO3	PO4	PO5	P06	P07	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	
CO1	3	1					1		1			1			
CO2	3	2	1	1			1		1			1			
CO3	3	2	1	1			1		1			1			
CO4	3	1					1		1			1			
CO5	3	2	1	1			1		1			1			
1 Clight 2	Modor	into 2 C	Substantia		oom'o T	ovenen									

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	50	30				100						
CAT2	20	40	40				100						
CAT3	10	50	40				100						
ESE	20	50	30				100						
* ±3% may be varied (CA	AT 1, 2 & 3 – 50 ma	rks & ESE – 100 m	arks)										

	22EEO12 – ELECTRIC VEHICLE														
	(Offered by Department of Electrical and Electro	nics Engi	neering)												
Programme & Branch	All BE/BTech Branches except EEE	Sem.	Category	L	т	Р	Credit								
Prerequisites	Nil	7	OE	3	0	0	3								
	· · · · · · · · · · · · · · · · · · ·														
Preamble	This course is aimed to introduce the fundamental concepts technologies with an insight into configuration, propulsion systemicles	and princi stem, enei	oles of variou gy sources a	s Ele nd hy	ctric /brid	Vehic electr	le ic								
Unit – I	Introduction to EVs:						9								
Importance of Different Transportation Development Strategies to Future Oil Supply - History of EVs - General Description of Vehicle Movement - Configurations of EVs - Performance of EVs: Traction Motor Characteristics - Tractive Effort and Transmission Requirement - Vehicle Performance - Tractive Effort in Normal Driving - Energy Consumption. Importance - Tractive Effort and Transmission Unit – II Electric Propulsion Systems: 9															
Unit – II	Jnit – II Electric Propulsion Systems: 9 nduction Motor Drives: Basic Operation Principles of Induction Motors - Power Electronic Control - Field Orientation Control - Voltage Source Investor for EOC 9														
Induction Motor Drives: Basic Operation Principles of Induction Motors - Power Electronic Control - Field Orientation Control - Voltage Source Inverter for FOC - Permanent Magnetic BLDC Motor Drives: Basic Principles of BLDC Motor Drives - BLDC Machine Construction and Classification - SRM Drives: Basic Magnetic Structure - Modes of Operation - Sensor less Control.															
Unit – III Power Sources and Energy Storages: 9															
Unit – III Power Sources and Energy Storages: 9 Electrochemical Batteries: Electrochemical Reactions - Thermodynamic Voltage - Specific Energy - Specific Power - Energy Efficiency - Battery Technologies - Lead–Acid Battery - Nickel-Based Batteries - Lithium-Based Batteries – Ultracapacitors - Ultra-High-Speed Flywheels - Hybridization of Energy Storage.															
Unit – IV	Hybrid Electric Vehicles:						9								
Concept of Hybrid E Coupling) - Paralle Coupling.	Electric Drive Trains - Architectures of Hybrid Electric Drive Tra Hybrid Electric Drive Trains (Mechanical Coupling) - Hyb	ins: Series orid Drive	Hybrid Elect Trains with	ric D Both	rive T Tore	Frains que a	(Electrical nd Speed								
Unit – V	Fuel Cell Hybrid Electric Drive Train:						9								
Operating Principles Electric Drive Train	s of Fuel Cells - Fuel Cell System Characteristics - Fuel Cel Design: Configuration - Control Strategy - Parametric Design.	I Technolo	ogies - Fuel \$	Supp	ly - F	Fuel C	Cell Hybrid								
							Total:45								
TEXT BOOK:															
1. MehrdedEh and Design	nsani, YiminGao& Ali Emadi, "Modern Electric, Hybrid Electric, a ", 2nd Edition, CRC Press, USA, 2010.	and Fuel (Cell Vehicles:	Fund	dame	entals,	Theory								
REFERENCES:															
1. IqbalHussa	in, "Electric and Hybrid Vehicles: Design Fundamentals", 2nd E	Edition, CF	RC Press, US	A, 20	11.										
2. Chris Mi, A Perspective	AbulMasrur M & David WenzhongGao, "Hybrid Electric Vehi es" 1st Edition Wiley Publication UK 2011	icles Princ	ples And A	oplica	ations	s With	Practical								

COUR On co	SE O mplet	UTCON	IES: the cour	se, the st	udents	s will be a	able to							BT Map (Highest L	ped .evel)
CO1	expl	ain the	importai	nce and dif	ferent	configura	tions of	electric	vehicl	es			l	Jnderstandi	ng (K2)
CO2	disti	nguish	the char	acteristics	of vari	ious moto	r drives	for EVs	i				l	Jnderstandi	ng (K2)
CO3	iden	tify the	importa	nce of ene	rgy sto	orage syst	ems in E	EVs						Applying	(K3)
CO4	illus	trate the	e concep	ot of hybrid	electr	ic drive tra	ains							Applying	(K3)
CO5 demonstrate the concept of fuel cell drive train in Hybrid EVs Understanding (K2)															
	Mapping of COs with POs and PSOs														
COs/F	COs/POs PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11													PSO1	PSO2
CO	1	3	2	1	1		1	1		1			1		
CO	2	3	2	1	1		1	1		1			1		
CO	3	2	3	1	1		1	1		1			1		
CO	4	3	2		1		1	1		1			1		
CO	5	3	2	1	1		1	1		1			1		
1 – Slig	ght, 2	– Mode	erate, 3 -	- Substanti	al, BT	- Bloom's	Taxono	my							
						ASSES	SMENT	PATTE	ERN - ⁻	THEORY	,				
Tes C	st / Blo Catego	oom's ory*	Re	ememberi (K1) %	ng	Understa (K2)	anding %	Apply (K3)	ying) %	Analyz (K4) ^c	ing %	Evaluating (K5) %	I	Creating (K6) %	Total %
	CAT	1		40		60									100
	CAT	2		30		40		30)						100
	CAT	3		20		40		40)						100
	ESE	Ξ		30		40		30)						100
* ±3%	may b	oe varie	d (CAT [·]	,2&3-5	50 mar	'ks & ESE	– 100 r	narks)					·		

		22EEO13 – E-WASTE MA	ANAGEMENT											
	(Offered by	Department of Electrical ar	nd Electronics Eng	neering)										
Programm Branch	e & All BE/BTech Branc	hes except EEE	Sem.	Category	L	т	Ρ	Credit						
Prerequis	tes Nil		7	OE	3	0	0	3						
	I				1		1							
Preamble	This course covers va along with recycling v waste and domestic h	arious aspects of Waste from vith an integrated approach. I nazardous waste.	Electrical and Elect t also gives an insig	ronic Equipme ht into the ma	ent, nag	E-was emen	ste dis t of sp	sposal becial						
Unit – I	Introduction							9						
Waste Ele	trical and Electronic Equipmen	t (WEEE) - The Scale of the	e Problem - Electro	nics Recycling	g - T	Freatr	nent (Options for						
WEEE - N	aterial Composition of WEEE -	Socio-economic Factors - Ir	nternational Perspec	tive - Barriers	s to	Recy	cle - H	lealth and						
Safety Imp	ications - Influence factors - N	Naterials Used in Manufactur	ing Electrical and E	lectronic Pro	duct	s - So	olderir	ng and the						
Move to Le	ad-free Assembly - Printed Circo	uit Board Materials - Mobile F	Phones – Television	s - WEEE Eng	inee	ering ⁻	Therm	oplastics.						
Unit – II Waste Disposal and Recycling 9 Introduction - Landfill - Pollution from Landfills - Landfill Gas - Landfill-site Construction – Burning - Energy Recovery/Energy from														
Introduction - Landfill - Pollution from Landfills - Landfill Gas - Landfill-site Construction – Burning - Energy Recovery/Energy from Waste (EFW) - Advanced Thermal Processing - Pollution from Incineration – Recycling and recovery: Separation and Sorting – Treatment - Outputs and Markets - Emerging Technologies – Separation – Treatments – Extraction. Unit – III Integrated Approach to F-waste Recycling														
Treatment - Outputs and Markets - Emerging Technologies – Separation – Treatments – Extraction. Unit – III Integrated Approach to E-waste Recycling 9														
Onit - InIntegrated Approach to E-waste Recycling9Introduction - Recycling and Recovery Technologies - Sorting/Disassembly - Crushing/Diminution - Separation - Emerging Recycling and Recovery Technologies - Automated Disassembly - Comminution - Separation - Thermal Treatments - Hydrometallurgical Extraction - Dry Capture Technologies - Biotechnological Capture - Sensing Technologies - Design for Recycling and Inverse Manufacturing - Printed Circuit Boards - Recycling - Characteristics of PCB Scrap - Emerging Technologies - Sector-based Eco-design9Unit - IVRecycling of Display Devices and ERP9Introduction - Overview of Liquid Crystals - Classification - Architecture - Liquid Crystal Displays Based on Nematic Mesophase - Manufacturing Process - Environmental Lifecycle Analysis - Toxicity of LCD Constituents - Recycling. European Recycling														
Unit – V	Special Waste & Do	mestic Hazardous Waste M	anagement					9						
Introductio Hierarchy Battery Wa	Plastic Waste - Bio-medical Waste - Action Points for Awarenes	agement of wastes - Guidan aste - Slaughterhouse Waste ss Generation.	ce from the Integra e – E-Waste Manage	ted Solid Wa ement rules 2	ste 016	Mana - Wa	geme ste Ty	nt (ISWM) res - Lead						
								Total:45						
TEXT BOO	К:													
1. He	ster R.E., Harrison R.M., "Elec mbridge-UK, 2009	tronic waste management",	1st Edition, Royal S	Society of Che	emis	stry (F	RSC)	oublishers,						
2. "N	unicipal Solid waste Manageme w Delhi, 2016	nt Manual Part II", 1st Edition	i, CPHEEO, Ministry	of Urban Dev	elop	oment	i, Gov	t. of. India,						
REFEREN	CES:													
1. Jo Pr	nri R., "E-waste: implications, re ess, New Delhi, 2008.	gulations, and management i	n India and current	global best pra	actic	es", 1	st Ed	ition, TERI						
2. To	nobanoglous G., Theisen H., nagement issues". 1st Edition. 7	Viquel S.A., "Integrated S Tata McGraw Hill Publishing	Solid Waste Mana Company Ltd., New	gement: Eng Delhi. 2014.	inee	ering,	Princ	ples and						

COUR On co	SE O mplet	UTCON	IES: he cour	se, the st	udent	s will be a	able to							BT Mapı (Highest L	oed Level)
CO1	und recy	erstand cling it.	the chal	lenges an	d issu	es of E-wa	astes ar	nd its so	ource c	of emergi	ng with i	ts barriers f	or Ui	nderstandi	ng (K2)
CO2	infei	r handlii	ng and p	rocessing	the E	wastes ar	nd its dis	sposal 8	k recov	very.			U	nderstandi	ng (K2)
CO3	appl	ly the tr	eatment	methods f	or the	E waste r	ecycling	technc	logies	6.				Applying	(K3)
CO4	und sche	erstand eme	the recy	cling proc	edure	s of LCD	devices	and inf	er the	Europea	an Recyc	ling Platfor	m Ui	nderstandi	ng (K2)
CO5	CO5 utilize the waste disposal management rules and guidance for handling the special wastes and domestic hazardous waste management. Applying (K3)														
	Mapping of COs with POs and PSOs														
COs/POs PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO12 PS01 F															PSO2
CO	1	3	1				1						1		
CO	2	3	1				1	2					1		
CO	3	3	2	1	1		1						1		
CO	4	3	1				1	2					1		
CO	5	3	2	1	1		1						1		
1 – Slię	ght, 2	– Mode	erate, 3 -	Substant	ial, BT	- Bloom's	Taxono	my							
						ASSES	SMENT	PATTE	ERN -	THEORY	/				
Tes C	t / Blo atego	oom's ory*	Re	ememberi (K1) %	ng	Understa (K2)	anding %	Apply (K3)	ying) %	Analyz (K4) ^c	ing %	Evaluating (K5) %	C	Creating (K6) %	Total %
	CAT	1		50		50									100
	CAT	2		30		50		20)						100
	CAT	3		30		50		20)						100
	ESE	Ξ		30		50		20)						100
* ±3%	may b	e varie	d (CAT 1	, 2 & 3 –	50 mai	'ks & ESE	– 100 r	narks)							

	22EEO14 - EMBEDDED SYSTEMS AN	D IOT												
	(Offered by Department of Electrical and Electron	ics Eng	ineering)											
Programme& Branch	All BE/BTech Branches except EEE	Sem.	Category	L	т	Ρ	Credit							
Prerequisites	Nil	7	OE	3	0	0	3							
	T	1	1											
Preamble	This course imparts knowledge about the Building Blocks of E networking protocols and provides a brief idea of IoT architect an IoT infrastructure.	mbedde ure and	d System alo its related pro	ng w otoco	ith va Is tow	rious ⁄ards b	ouilding							
Unit – I	Introduction to Embedded Systems:						9							
Introduction to Emb Memory managem Hardware Debuggir	edded Systems – Structural units in Embedded processor, sele ent methods – Timer and Counting devices, Watchdog Time ng.	ection of r, Real	processor & Time Clock,	mer In c	nory o ircuit	devices emulat	s – DMA – tor, Target							
Unit – II	Embedded Networking Protocols:						9							
Embedded Networking: Introduction, I/O Device Ports & Buses – Serial Bus communication protocols: RS232 standard – RS422 – RS 485 – CAN Bus – Serial Peripheral Interface (SPI) – Inter Integrated Circuits (I2C) – Need for device drivers. 9 Unit – III Evolution of Internet of Things: 9														
RS 485 – CAN Bus – Serial Peripheral Interface (SPI) – Inter Integrated Circuits (I2C) – Need for device drivers. Unit – III Evolution of Internet of Things: 9 Enabling Technologies IoT Architectures & its Security appacts: appM2M_IoT Mortd Forum 9														
Unit – III Evolution of Internet of Things: 9 Enabling Technologies – IoT Architectures & its Security aspects: oneM2M, IoT World Forum IoTWF) and Alternative IoT models – Simplified IoT Architecture and Core IoT Functional Stack – Fog, Edge and Cloud in IoT – Functional blocks of an IoT ecosystem – Sensors, Actuators, Smart Objects and Connecting Smart Objects – Case study: Role of IoT in the implementation of Smart cities.														
Unit – IV	IoT Access Technologies:						9							
Physical and MAC Network Layer: IP v over Low Power a Layer Protocols: Co	layers, topology and Security of IEEE 802.15.4, 802.15.4g, a versions, Constrained Nodes and Constrained Networks – Optim nd Lossy Networks – Application Transport Methods: Supervi DAP and MQTT.	802.15.4 nizing IP sory Co	e, 1901.2a,8 for IoT:From ntrol andDat	6L0 6L0 a Ac	1ah a WPAN quisiti	nd Lo N to 6L on – J	RaWAN – .o, Routing Application							
Unit – V	Design Methodology:						9							
Embedded comput programming – Ras	ing logic – Microcontroller, System on Chips - IoT system pberry Pi – Interfaces and Raspberry Pi with Python Programmi	building ng.	blocks – Ar	duin	o –Bo	ard d	etails, IDE							
							Total:45							
TEXT BOOK:														
1. KamalR,"E HillEducation	mbeddedsystems:architecture,programminganddesign",second e on,NewDelhi,2011 for Units I, II	edition,T	ataMcGraw-											
2. Hanes D, S Use Cases	algueiro G, Grossetete P, Barton R & Henry J, "IoT Fundamenta for Internet of Things", 1st Edition, Cisco Press, United States, 2	als: Netw 2017 for	orking Techr Units III, IV a	nolog Ind V	ies, P	rotoco	ls and							
REFERENCES:														
1. Hersent O, Sons, Unite	Boswarthick D &Elloumi O, "The Internet of Things – Key appliced States, 2012.	ations a	nd Protocols"	, 1st	Editio	n, Wile	ey &							
2. Margolis M Edition, O'F	, Jepson B & Weldin N.R, "Arduino cookbook: recipes to begin, e Reilly Media. United States. 2020.	expand, a	and enhance	your	proje	cts", 3	rd							

COUR On co	SE O mplet	UTCON	IES: the co	urse, the	studen	ts will be	able to							BT Mappe (Highest Le	ed vel)
CO1	exp	lain the	basic	building bl	ocks of	embedde	d systen	ns.					U	Inderstandin	g(K2)
CO2	Ider	ntify and	l distin	guish the v	various	communi	cation pr	otocols	of em	bedded :	system.			Applying(K	(3)
CO3	exp	lain the	conce	pt of IoT a	nd role	of smart of	objects ir	n loT.					U	Inderstandin	g(K2)
CO4	sele	ect vario	us pro	otocols for e	establis	shing loT i	nfrastruc	ture.						Applying(k	(3)
CO5	CO5 design and build an IoT system using Rasperry Pi/Arduino. Applying(K3)														
						Маррі	ng of C(Os with	n POs :	and PSC	Ds		·		
COs/I	POs	PO1	PO	2 PO3	PO	4 PO5	PO6	PO7	PO8	PO9	P010) PO11	PO12	PSO1	PSO2
CO	1	3	1	2	1	1									
CO	2	3	2	2	2	1									
CO	3	3	1	3	2	1									
CO	4	3	2	3	2	1									
CO	5	3	1	3	2	2									
1 – Sli	ght, 2	– Mode	erate, 3	3 – Substa	ntial, B	T- Bloom's	s Taxono	omy							
					- 1	ASSE	SSMEN	T PATT	ERN -	THEOR	Y				
Tes	Test / Bloom's Rememberin Category* (K1) %					Underst (K2)	anding %	Appl (K3	ying) %	Analyz (K4) ^o	ing %	Evaluating (K5) %	g Cre	eating (K6) %	Total %
	CAT	1		10		60)	30	0						100
	CAT	2		10		50)	4(0						100
	CAT	3		10		40)	50	0						100
	ESE	Ξ		10		40)	50	0						100

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

		22EEO15 - ENERGY STORAGE SYSTEMS AND CO	ONTRO	LLERS											
		(Offered by Department of Electrical and Electronic	cs Engiı	neering)											
Progra Branc	imme& h	All BE/BTech Branches except EEE	Sem.	Category	L	т	Ρ	Credit							
Prerec	uisites	Nil	7	OE	3	0	0	3							
						1		-							
Pream	ble	This course aimed to introduce the fundamental concepts and that aids in various real time applications.	principle	s of various e	energ	gy sto	orage	systems							
Unit –		Introduction to Energy Storage Systems:						9							
Overvi techno Capaci	ew of energy logies - Batte ity, and Energ	storage systems (ESS) - Historical context of ESS - Drivers ery: Components of Cells and Batteries – Classification - Op ly	for ES peration	S deploymen of a Cell -	it - (Theo	Class	ificati al Ce	on of ESS ell Voltage,							
Unit –	11	Electrochemical and Mechanical Energy Storage Technolo	gies:					9							
Elect state Mech Comp	Electrochemical Energy Storage Systems: Construction, operation and Working Principle of Lithium-ion, Solid-state batteries Mechanical Energy Storage Systems: Construction, operation and Working Principle of Pumped Hydro Storage (PHS) - Compressed Air Energy Storage (CAES) - Flywheel Energy Storage Systems (FESS) Unit – III Other Energy Storage Technologies: 9 Ultracapacitors: Features- Basic Principles of Ultracapacitors - Hydrogen Storage Systems: Types of fuel cells -hydrogen oxygen														
Unit –	Mechanical Energy Storage Systems: Construction, operation and Working Principle of Pumped Hydro Storage (PHS) Compressed Air Energy Storage (CAES) - Flywheel Energy Storage Systems (FESS) Unit – III Other Energy Storage Technologies: 9														
Other Energy Storage Technologies: 9 Ultracapacitors: Features- Basic Principles of Ultracapacitors - Hydrogen Storage Systems: Types of fuel cells -hydrogen oxygen cells, hydrogen air cell, alkaline fuel cell, and phosphoric fuel cellThermal Energy Storage using Phase Change Materials (PCM)															
Unit –	Unit – IV Energy Storage Applications: 9 Orid code Energy Storage Applications: 5 5 5														
Grid-s Integra Distrib Micro g	Unit – IV Energy Storage Applications: 9 Grid-scale Energy Storage Applications: Load Shifting, Frequency Regulation, Voltage Support, Peak Shaving, Renewable Integration, Black Start 9 Distributed Energy Storage Applications: Residential Energy Storage, Commercial Energy Storage, Electric Vehicles Charging Micro grids 9														
Unit –	V	Controllers for Energy Storage Systems:						9							
Princip Systen control	les of charge ns (BMS): Prii lers	controllers -Types of charge controllers-Charging strategies for nciples of BMS-Functions and components of BMS-Battery safe	energy s ty and p	storage syste erformance-B	ms, BMS	Batte integ	ery Ma ratior	anagement with other							
								Total:45							
TEXT	BOOK:														
1.	David Linde	n, Thomas B. Reddy, "Handbook of Batteries", 4th Edition, McG	raw-Hill,	New Delhi, 2	2011.										
REFE	RENCES:														
1.	Mehrdad Eh New Delhi, 2	nsani, YiminGao, Ali Emadi, "Modern Electric, Hybrid Electric and 2018.	Fuel Co	ell Vehicle", 2	nd E	ditio	n, CR	C Press,							
2.	Nihal Kulara Elseivier, 20	atna, Kosala Gunawardane, "Energy Storage Devices for Renewa 121	able Ene	ergy-Based S	yste	ms",	2nd E	dition,							
3.	Sandeep Dł	nundhara, Yajvender Pal Verma, "Energy Storage for Modern Po	wer Sys	tem Operatio	ns",	Wile	y, 202	21							

COUR On co	SE O mplet	UTCON	IES: the cou	rse, the st	udent	s will be a	able to							(BT Mapp Highest L	oed evel)
CO1	und	erstand	the bas	ics of ener	gy sto	rage syste	ems and	l battery	<i>'</i> .					Ur	derstandir	ng (K2)
CO2	sum	marize	the con	struction a	nd sel	ection of t	battery.							Ur	nderstandi	ng (K2)
CO3	des	cribe th	e constr	uction and	worki	ng princip	le of sec	ondary	batteri	es.				Ur	nderstandi	ng (K2)
CO4	expl	lain the	constru	ction and v	vorkin	g principle	of Ultra	capaci	tor and	I Fuel ce	11				Applying	(K3)
CO5	iden mar	ntify the naging t	e differe he flow	nt types of energy.	of con	trollers us	ed in e	energy s	storage	e systen	ns and t	heir roles	in	Ur	nderstandi	ng (K2)
	Mapping of COs with POs and PSOs															
COs/F	COs/POs PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11											P	012	PSO1	PSO2	
CO	1	3	2	1			1			1		1		1		
CO	2	3	2	2			1			1		1		1		
CO	3	2	1	3			1			1		1		1		
CO	4	3	2	1			1			1		1		1		
CO	5	2	1	3			1			1		1		1		
1 – Slig	ght, 2	– Mode	erate, 3	 Substant 	ial, BT	- Bloom's	Taxono	my								
-						ASSES	SMENT		ERN - 1	THEORY	•	-				-
C	atego	oom′s ory*	ĸ	ememberi (K1) %	ng	Understa (K2)	anding %	(K3)	ying %	Analyz (K4) ^o	ing %	Evaluating (K5) %	g		(K6) %	l otal %
	CAT	1		30		70)	-		-		-			-	100
	CAT	2		30		70)	-		-		-			-	100
	CAT	3		30		50)	20)	-		-			-	100
	ESE	Ξ		10		70)	20)	-		-			-	100
* ±3%	may t	be varie	d (CAT	1, 2 & 3 –	50 ma	rks & ESE	E – 100 r	marks)								

		22EE016 – AI TECHNIQUES IN ENGINEERING AF	PPLICA	TIONS											
		(Offered by Department of Electrical and Electronic	cs Engiı	neering)											
Progra Branch	mme & 1	All BE/BTech Branches except EEE	Sem.	Category	L	т	Ρ	Credit							
Prereq	uisites	Nil	7	OE	3	0	0	3							
					1	1									
Pream	ble	This course enables the students to learn and apply the applications.	Artificial	Intelligence	tech	nique	es on	real time							
Unit –		Robotics in Engineering:						9							
Introduction to Robotics and AI integration - Evolution of Robotics in Engineering- Types of Robots and their Applications - AI Algorithms for Robot Control - Collaborative Robotics and Human-Robot Interaction Image: Type of Robots and their Applications - AI Unit – II AI in Manufacturing: 9															
Unit – II AI in Manufacturing: 9 Introduction to AI in Manufacturing - Enhancing Production Processes with AI - Quality Control and Defect Detection using AI - AI- 9															
Introduction to AI in Manufacturing - Enhancing Production Processes with AI - Quality Control and Defect Detection using AI - AI- driven Supply Chain Optimization - Predictive Maintenance and Cost Reduction in Manufacturing															
Unit –	Unit – III Logistics and Supply Chain Management (SCM) With AI: 9														
Overview of Logistics and SCM- AI Applications in Transportation and Route Optimization - Demand Forecasting and Inventory Management using AI - AI for Predicting Delays and Improving Efficiency - Case Studies: AI Implementation in Supply Chains															
Unit –	IV	Autonomous Systems and Applications:						9							
Unders Applica	tanding Auto itions of AI in	nomous Systems and AI- AI in Self-Driving Vehicles and Robotic Autonomous Systems - Safety and Ethical Considerations for Au	cs- AI in utonomo	Autonomous	Dro	nes a	and Sp	bacecraft -							
Unit –	V	AI in Civil and Aerospace Engineering:						9							
AI for Aerody Engine	Structural De namics - Au ering	esign and Optimization - Predictive Analysis for Civil Enginee tonomous Aircraft and Spacecraft using AI - Case Studies	ering Pro : Al Imp	ojects - AI in plementation	Ae in (rospa Civil	ace D and <i>I</i>	esign and Aerospace							
								Total:45							
TEXT E	BOOK:														
1.	Akhileshwar 2019.	r P. Tiwari and Pankaj K. Agarwal, Artificial Intelligence in Engine	eering: S	Systems and a	Appl	icatio	ns, C	RC Press,							
REFER	RENCES:														
1.	Akhileshwa	r P. Tiwari and Pankaj K. Agarwal, Machine Learning for Civil En	gineerin	g, CRC Press	s, 20	19.									
2.	Nikolaus Co MIT Press,2	prrell, Bradley Hayes, Introduction to Autonomous Robots: Mecl	hanisms	s, Sensors, Ad	ctuat	ors,	Algori	thms" The							

COUR On co	SE O mplet	UTCON tion of t	IES: the cours	se, the st	udent	s will be a	able to						(BT Mapp Highest L	oed .evel)
CO1	und	erstand	the basi	c concept	s of ro	botics and	l artificia	ıl intelliç	gence				Ur	nderstandi	ng (K2)
CO2	expl	lain how	/ AI can I	be used to	o enha	nce produ	ction pr	ocesses	6.				Ur	nderstandi	ng (K2)
CO3	des	cribe the	e differer	it ways the	at AI c	an be use	d in logi	stics ar	nd sup	ply chain	manage	ement.	Ur	nderstandi	ng (K2)
CO4	lder dror	ntify the nes, and	different spacec	applicatic raft.	ons of <i>i</i>	AI in autor	nomous	system	s, suc	h as self·	driving v	vehicles,		Applying	(K3)
CO5	CO5 Analyze case studies of AI implementation in civil and aerospace engineering. Applying (K3)														
						Mappin	g of CO	s with	POs a	Ind PSO:	5				
COs/I	IS/POS PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PC														PSO2
CO	1	3	2	1	1										
CO	2	3	3	2	2										
CO	3	3	2	1	1										
CO	4	3	3	2	1										
CO	5	3	2	2	2										
1 – Sli	ght, 2	– Mode	erate, 3 –	Substant	ial, BT	- Bloom's	Taxono	my					-		
						ASSES	SMENT	PATTE	ERN -	THEORY	,				
Tes	st / Blo Catego	oom's ory*	Re	memberi (K1) %	ng	Understa (K2)	anding %	Appl (K3)	ying) %	Analyz (K4) ^o	ing %	Evaluating (K5) %	g C	reating (K6) %	Total %
	CAT	1		20		80									100
	CAT	2		20		80									100
	CAT	3		20		40		4()						100
	ESE	Ξ		10		60		30)						100
* ±3%	may t	be varie	d (CAT 1	, 2 & 3 –	50 ma	rks & ESE	– 100 r	narks)							

		22EE017 – SMART GRID TECHNOLOGII	ES											
		(Offered by Department of Electrical and Electronic	cs Engi	neering)										
Progra Branci	imme & h	All BE/BTech Branches except EEE	Sem.	Category	L	т	Р	Credit						
Prereq	uisites	Nil	8	OE	3	0	0	3						
Pream	ble	The course content is designed to study about micro grid technologies, information and communication technologies. It and control of smart grid systems. The course also aims in in energy storage.	standal is used mparting	one autonom to get familiar knowledge o	nous rized on po	sys with ower	tem, smar elect	smart grid t metering ronics and						
Unit –		Microgrid Concept:						9						
Introdu Structu	iction – Rene ire – Operatic	wable Power Generation – Grid Connected Wind Power – Grid (n Modes.	Connect	ed PV Power	– M	icrog	rid Co	oncept and						
Unit – II Microgrid Planning and Energy Management: 9														
Introduction – Microgrid planning- Forecasting techniques – Energy Management – Emission reduction and Economical Optimization – Robust Energy Consumption Scheduling in Interconnected Microgrids. Unit – III Smart Grid and Communication Technologies 9														
Unit - III Smart Grid and Communication Technologies 9														
Unit – III Smart Grid and Communication Technologies 9 Introduction to Smart grid – Smart grid initiatives – Overview of technologies required for smart grid – Information and communication technologies – Data communication – Communication technologies for smart grid – Information security for smart grid.														
Unit –	IV	Sensing, Measurement, Control and Automation Technology	gies:					9						
Smart Transn	metering an nission syster	d demand side integration – Distribution automation equipr n operation.	ment –	Distribution	mana	agen	nent s	systems –						
Unit –	V	Power Electronics and Energy Storage:						9						
Power	electronic co	nverters – Power electronics in smart grid – Power electronics fo	r bulk po	ower flows – E	nerg	gy sto	orage.							
								Total:45						
TEXT	BOOK:													
1.	Hassan Bev	rrani, Bruno Francois &Toshifumilse, "Microgrid Dynamics and C	ontrol",	1st Edition, W	ïley,	2017	7 for L	Jnits I, II.						
2.	Janaka Eka Applications	nayake, Nick Jenkins, Kithsiri Liyanage, Jianzhong Wu, Akihiko ` ", 1st Edition, Wiley & Sons Ltd, 2012 for Units III, IV, V.	Yokoyar	na, "Smart Gr	id: T	echn	ology	and						
REFE	RENCES:													
1.	Chowdhury Engineering	S, Chowdhury S.P &Crossley P, "Microgrids and Active Distrib and Technology, 2009.	oution Ne	etworks", 1st	Editi	on, T	he In	stitution of						
2.	Tony Flick 2011.	& Justin Morehouse, "Securing the Smart Grid Next Generation	on Powe	r Grid Securi	ty", <i>'</i>	1st E	dition	, Elsevier,						

COURS On cor	SE Ol nplet	UTCON ion of t	IES: the co	ours	se, the st	udent	s will be	able to						(BT Mapp Highest L	oed evel)
CO1	unde	erstand	the c	conc	epts of mi	cro g	rid.							Ur	nderstandi	ng (K2)
CO2	asse	ess the	micro	o grie	d planning	and	energy ma	anageme	ent					Ur	nderstandi	ng (K2)
CO3	anal	lyze the	sma	rt gr	id and its	comn	nunication	technol	ogies.						Applying	(K3)
CO4	inter	pret the	e sens	sing	, measure	ment	, control a	nd autor	mation t	echnol	ogies.				Applying	(K3)
CO5	exar	mine ab	out th	ne p	ower elec	tronic	s in smart	grid and	d energy	y stora	ge.				Applying	(K3)
	Mapping of COs with POs and PSOs															
COs/P	Mapping of COs with POs and PSOs COs/POs PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO12 PS01 PS02															
003/1										2	1001	1002				
00	1	3	1													
CO2	2	3	1				2							2		
COS	3	3	2		1	1	2			3				2		
CO4	4	3	2				2			2				2		
COS	5	3	2				3			3				2		
1 – Slig	ght, 2	– Mode	erate,	3 –	Substanti	al, BT	- Bloom's	Taxono	my	I		L			1	
							ASSES	SMENT	PATTE	RN - 1	THEORY	,				
Tes C	t / Blo atego	oom's ory*		Re	memberi (K1) %	ng	Understa (K2)	anding %	Apply (K3)	/ing %	Analyz (K4) 9	ing %	Evaluating (K5) %		reating (K6) %	Total %
CAT1 40							60)								100
	CAT	2			30		60)	10)						100
	CAT	3			20		60)	20)						100
	ESE				20		60)	20)						100
* ±3% r	may b	e varie	d (CA	T 1	, 2 & 3 – 5	50 ma	rks & ESE	– 100 r	narks)							

		22EEO18 – BIOMASS ENERGY SYSTE	MS										
		(Offered by Department of Electrical and Electronic	cs Engiı	neering)									
Progra Branch	ımme & 1	All BE/BTech Branches except EEE	Sem.	Category	L	т	Ρ	Credit					
Prereq	uisites	Nil	8	OE	3	0	0	3					
Preaml	ble	Biomass energy has evolved through chemical, biological and of learning the nuances of biomass has become significantly in need of biomass, biogas and bio diesel in a comprehensive ma Introduction:	thermal nportant anner.	conversion pr and in fact, th	oces nis si	s. Th ubjec	ne req t addi	uirement esses the 9					
Biomass energy usage – Overall energy needs – Sources of biomass available – Units and conversions – Problems and issues – Advantages and disadvantages in use of biomass as energy source.													
Unit –		Biomass Conversion Process						9					
Overvie Applica	Overview – Chemical and biological conversion processes – Thermal conversion process – Hybrid conversion process – Application of biomass conversion products.												
Unit –		Biogas Production:						9					
Introdu Biogas	ction – Biom conversion p	ass parameters in anaerobic digestion – Advantages and dis process and digester designs – Design of biogas digester – Bioga	advanta as utiliza	ges of anaer tion.	obic	dige	stion	process –					
Unit –	IV	Bio-Diesel Production:						9					
Introdu – Oil re	ction – Veget fining proces	able oil and animal fat characteristics – Fatty acid composition – s – Transesterification - Engine performance and exhaust emiss	- Basic o ions.	il properties –	- Oil	Extra	iction	processes					
Unit –	V	Biomass Combustion						9					
Introdu issues	ction – Type with agricultu	s of biomass combustion systems – Co-combustion of biomass ral biomass – Determining melting point of biomass ash pellets -	and co- Applica	firing with co ations of biom	al – ass	Slag comb	ging a oustio	and fouling n systems.					
								Total:45					
TEXT E	BOOK:												
1. Sergio Capareda., "Introduction to Biomass Energy Conversions", 1st Edition, CRC press, India, 2013.													
REFER	RENCES:												
1.	Kothari D.P	., Singal K.C., Rakesh Ranjan., "Renewable Energy Sources and t_t_tdNew Delbi_2011	d Emerg	ing Technolog	gies"	, 2nd	Editio	on, PHI					
2	John Twide	IL Tony Weir., "Renewable Energy Resources", 3rd Edition Rout	tledae N	lew York, 201	5.								
۷.	Ibrohim Co	high "Sustainability in Manufacturing Enterprises Concerts, and		d accordent	o fo	Indi	ictry /	1.0"					
3.	Springer., S	witzerland, 2016	iyses an	u assessmen	5 10	mat	ı∋uy ²	+.U ,					

COURS On con	SE OL npleti	JTCOM on of t	IES: he cours	se, the stu	udents	will be a	able to						(BT Mapp Highest L	oed .evel)	
CO1	expla	ain the	nature ar	nd principl	e of bio	mass er	nergy ex	traction	system	IS			Un	derstandii	ng (K2)	
CO2	CO2 illustrate various biomass conversion process												Un	Understanding (K2)		
CO3	CO3 interpret biogas production and digester design													Applying (K3)		
CO4	CO4 categorize various techniques for bio-diesel refining process													Applying	(K3)	
CO5	CO5 access different types of biomass combustion process												Applying	(K3)		
						Mappin	g of CO	s with	POs an	d PSOs	6					
COs/P	Os	P01	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	
CO1		3	2	2			1	2				1	1			
CO2	2	2	3	2			1	1				1	1			
CO3	O3 2 2 3 1 1 1 1											1				
CO4	Ļ	2	2	3			1	1				1	1			
CO5	5	2	2	3			1	1				1	1			

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	30	70					100						
CAT2	20	60	20				100						
CAT3	20	60	20				100						
ESE 20 60 20 100													
* ±3% may be varied (CAT 1, 2 & 3 – 50 marks & ESE – 100 marks)													

	22GEO01 - GERMAN LANGUAGE LEV	/EL 1									
	(Offered by Department of Electronics and Communic	ation Engi	neering)								
Programme& Branch	All BE/BTech Engineering and Technology Branches	Sem.	Category	L	т	Ρ	Credit				
Prerequisites	Nil	All	OE	4	0	0	4				
Dreemble	This serves comes as as introduction to the Company loss was		n and towards	0.0	life						
Preamble	cultural aspects of Germany and German speaking countries. C the basic day to day vocabulary. On keen learning one would b be able to reciprocate to basic questions	and aware One can lea e able to u	ness towards arn to introduce nderstand the	e one sente	self a nce s	nd ab	and le to gain ire and				
Unit – I	Good Day (Guten Tag)						12				
Greetings, Self- Simple sentence	introduction and introducing others, Numbers, Alphabets, Countries es, Verb conjugation and personal pronoun.	and langua	ages spoken.	Gram	mar	– W d	questions,				
Unit – II	Friends & Colleague (Freund und Kollegen):						12				
Hobbies, Profession, Week, Months, Season and Generate Profile. Grammar – Articles, Plural, Verbs – have and to be, Yes/No questions.											
Unit – III	n the City (In der Stadt):						12				
Name of places Negation article	/buildings in the city, asking for directions, Understanding means of trans and Imperative	ansport. G	rammar – defi	nite a	nd ind	definit	e articles,				
Unit – IV	Food and Appointment (Essen und Termin):						12				
Food, Shopping Understanding articles- <i>mein</i> , d	g, initiate conversations to understand and do shopping. Gramn ime and reciprocating, Appointments, Asking excuse, Family. Gramn lein Modal verbs- <i>müssen, können, wollen</i>	nar – Acc mar – Prep	cusative case, positions: <i>am,</i>	Verl um, N	os w ′on	ith Ao bis, P	ccusative. ossessive				
Unit – V	Socializing (Zeit mit Freunden):						12				
Planning togeth with Accusative	er, Birthday, Invitation, Restaurant, looking for specific information in case, Past tense of have and to be, Personal pronoun with Accusative	i texts. Gra e.	ammar – Sepa	arable	verb	os, Pre	epositions				
							Total:60				
TEXT BOOK:											
1. Stefanie und Glo	e Dengler, Paul Rusch, Helen Schmitz, Tanja Sieber, "Netzwerk Deu ssar with 2 CDs", Goyal Publishers, Delhi, 2015.	utsch als F	remdsprache	A1–u	rsbu	ch, Ar	beitsbuch				
REFERENCES											
1. https://d	ocw.mit.edu – Massachusetts Institute of Technology Open Coursewa	е									
2. https://v	www.dw.com/en/learn-german - Deutsche Welle, Geramany's Internat	ional Broad	lcaster								

COUR On cor	SE OL npleti	JTCOM	ES: he cou	se, the st	udents	will be a	ble to							BT Mapı (Highest L	ped .evel)
CO1	unde	erstand	structur	e of langu	age and	l introduci	ng each	other					Re	membering	g (K1)
CO2	unde	erstand	vocabu	ary on sea	asons a	nd basic v	verbs						Un	derstanding	g (K2)
CO3	ask f	for direc	tions in	a new pla	ce and	avail trans	sport as	required	1				Un	derstanding	g (K2)
CO4 understand food habits of German and ask for appointments. Understanding (K2)													g (K2)		
CO5 learn to socialize in a German speaking country Understanding (K2)													g (K2)		
						Маррі	na of C	Os with	POs a	nd PSOs					
COs/P	Os	P01	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1	0 PO11	PO12	PSO1	PSO2
CO	1								1	2	3		3		
CO2	2								1	2	3		3		
COS	3								1	2	3		3		
CO4	4								1	2	3		3		
COS	5								1	2	3		3		
1 – Slig	ght, 2 -	– Mode	rate, 3 -	- Substant	ial, BT-	Bloom's T	Taxonom	iy					·		
		_			. 1	ASSE	SSMEN		ERN -	THEORY	. 1				
Tes C	atego	oom's ory*	R	emember (K1) %	ng	Understa (K2)	inding %	Apply (K3)	ying) %	Analyzi (K4) 9	ing %	Evaluating (K %	(5) C	reating (K6) %	Total %
	CAT	1		75		25									100
	CAT	2		25		75									100
	CAT	3		25		75									100
	ESE			25		75									100
* ±3% ı	may b	e varied	I (CAT	1,2,3 – 50	marks a	& ESE – 1	00 mark	s)							

	22GEO02 - JAPANESE LANGUAGE LE	VEL 1											
(Offered by Department of Electronics and Communication Engineering) Programme& All BE/BTech Engineering and Technology Branches Sem, Category I T P Credit													
Programme& Branch	All BE/BTech Engineering and Technology Branches	Sem.	Category	L	т	Ρ	Credit						
Prerequisites	Nil	All	OE	4	0	0	4						
Preamble	The basic level of Japanese which provides understanding of one to greet, introduce oneself and other person and also pre conversations	Hiragana	a, Katakana ar e ability to und	id 55 ersta	Kanj nd ba	is also asic d	o enables ay to day						
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 sounded vocabularies for each chart.													
Unit – II Introduction to Nouns, various particles and usages: 12													
Forming simple sentences, asking questions, positioning differentiation and owning fundamentals – new particles and usages													
Unit – III	Introduction of Verbs, time and place markers:						12						
Usage of action wo particles in a sente	rds in sentences and framing them – place and time markers us nce.	ages – gi	ving and receiv	ving -	- omi	ssion	of certain						
Unit – IV	Introduction of Adjectives, Adverbs and usages:						12						
Describing nouns introduction of the l	and verbs and framing them to relate day to day conversatior ikes and dislikes expressions	ns- positiv	e and negativ	ve en	ding	of the	e same –						
Unit – V	Introduction to Counters and Kanji:						12						
How to use number and quantifiers – 5	rs-How to use quantifiers-Present form of adjectives and Nouns 5 kanji characters	s-Other ne	ecessary partic	les-F	low t	o use	numbers						
							Total:60						
TEXT BOOK:													
1. "MINNA NO NIHONGO–Japanese for Everyone", 2 nd Edition, Goyal Publishers & Distributors Pvt. Ltd., New Delhi, 2017.													
REFERENCES:													
1. Margherita	Pezzopane, "Try N5", 2 nd Edition, Tankobon Softcover, Japan, 2	017.											
2. Sayaka Ku	rashina, "Japanese Word Speedmaster", 2 nd Edition, Tankobon S	Softcover,	Japan, 2018.										

COUR On cor	SE OL npleti	JTCON on of t	IES: the cou	rse, the s	tudent	s will be	able to						(BT Mapp Highest L	oed .evel)
CO1	read	and ur	nderstar	nd typical	express	ion in Hir	agana a	nd Katal	kana				Ren	nembering	յ (K1)
CO2	gree	t and ir	ntroduce	oneself a	and oth	er							Unc	lerstandin	g (K2)
CO3	comr	munica	te day t	o day con	versatio	ons – bas	ic level						Unc	lerstandin	g (K2)
CO4 understand the Kanjis in Japanese Script Understanding (K2)															
CO5 comprehend concept of numbers, days, months, time and counters Understanding (K2)															
						Manni	ng of C(De with	POs a						
COs/P	Os	PO1	PO2	PO3	PO4	PO5	PO6	PO7	POS a	PO9	PO10	P011	PO12	PSO1	PSO2
CO1									1	2	3		3		
CO2	2								1	2	3		3		
COS	3								1	2	3		3		
CO4	1								1	2	3		3		
COS	5								1	2	3		3		
1 – Slig	ght, 2 -	– Mode	erate, 3	- Substar	tial, BT	- Bloom's	Taxono	my		·					
						ASSE	SSMEN		ERN - 1	HEORY					
Les C	t / Blo atego	om′s ory*	Re	emember (K1) %	ing	Understa (K2)	anding %	Apply (K3)	/ing %	Analyz (K4) 9	ing %	Evaluating (K5) %	(reating K6) %	l otal %
	CAT1	1		75		25									100
	CAT2	2		25		75									100
	CAT	3		25		75									100
	ESE			25		75									100
* ±3% ı	may b	e varie	d (CAT	1,2,3 – 50) marks	& ESE –	100 mai	'ks)							

	22GE003 - DESIGN THINKING FOR EN	GINEERS					
	(Offered by Department of Computer Science a	nd Engineerir	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 creation and stakeholder feedback to unlock creativity idea/solutions.	which empha and innovati	asize on emp on, to devise	athy es fe	asib	abora le ar	ation, co- nd viable
Unit – I	Design Thinking and Explore:						9+3
Building for Design Mapping – Opportu Unit – II Empathize: Metho	Thinking – Explore: Methods & Tools – STEEP Analysis – S nity Framing. Empathize ds & Tools – Field Observation – Deep User Interview – Emp	Strategic Prior	user Journey	y Sys	stem	– Sta	9+3 Finding –
User Insights - Use	r Persona Development.						
Unit – III	Experiment						9+3
Experiment: Methodology Journey – Prototypi	ods & Tools – Ideation – SCAMPER – Analogous Inspiration ing– Idea Refinement.	 Deconstru 	uct & Reconst	ruct	– Us	er E	xperience
Unit – IV	Engage						9+3
Engage : Methods Users.	& Tools – Story Telling – Art of Story Telling – Storyboarding -	- Co-Creatior	n with Users -	- Col	lect F	eed	back from
Unit – V	Evolve						9+3
Evolve : Methods & Viability Analysis –	Tools – Concept Synthesis – Strategic Requirements –Evolve Innovation Tools using User Needs, CAP, 4S – Change Manag	ed Activity Sy Jement - Quic	rstems – Activ k Wins.	ity S	yster	n Inte	egration –
			Lecture:4	5, Τι	ıtoria	al:15,	Total:60
TEXT BOOK:							
1. Lee Chong	Hwa, "Design Thinking The Guidebook", Design Thinking Mast	ter Trainers o	f Bhutan, 201	7. (E	-Boo	k)	
REFERENCES:							
Jeanne Lie1.Press, 201	dtka and Tim Ogilvie, "Designing for Growth: A Design Thin 1.	king Tool Kit	for Manager	s", C	olum	ibia l	Jniversity
2. Jeanne Lie 2. Columbia L	dtka, Tim Ogilvie, and Rachel Brozenske, "The Designing for Juliversity Press, 2014.	Growth Fieldl	Book: A Step-	by-S	tep F	Projec	ct Guide",
I							

COUR On cor	SE O nple	UTCO tion of	MES: the cou	rse, the	studen	ts will	be ab	le to						BT Maj (Highest	oped Level)
CO1	Cor	struct	design ch	nallenge	and ref	rame th	ne des	ign challe	enge in	to design op	portunity.			Applying	g (K3)
CO2	Inte unc	rview t over th	he user, a le deep u	and kno ser insig	w the fe hts and	elings o I needs	of user	rs to foste	er deep	user unders	tanding and	be able to	1	Applying	g (K3)
CO3	Dev	velop id	leas and	prototyp	es by b	rain sto	rming	using the	e ideati	on tools.				Applying	g (K3)
CO4 Organize the user walkthrough experience using ideal user experience journey. Applying (K3)															
CO5 Develop smart strategies & implementation plan that will deliver/achieve the idea/solution deduced from Applying (K3) Applying (K3)															
		•													
		DO	1			Ма	pping	of COs	with P	Os and PSO	S				
COs/P	Os	1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	I I														
CO2	2	3	3	3	1					3	2	1		3	1
CO3	3	3	3	3	1					3	2	1		3	1
CO4	ļ	3	3	3	1					3	2	1		3	1
CO5	5	3	3	3	1					3	2	1		3	1
1 – Slig	ght, 2	– Mod	lerate, 3 -	- Substa	ntial, B	T- Bloo	m's Ta	axonomy	,						
						AS	SESS	MENT P	ATTER	N - THEOR	Y				
Те	ests		Rememi (K1)	oering %	Unde (erstanc (K2) %	ling	Apply (K3)	/ing %	Analyzin g (K4) %	Evaluati ng (K5) %	Creati (K6) %	ing %	Total	%
CA	\T 1		10			20		70)					100)
CA	AT 2		10			15		75	;					100)
CA	AT 3		10			15		75	;					100)
E	SE		10			15		75	5					100)
* ±3%	may l	be vari	ed (CAT	1,2,3 – 5	50 mark	s & ES	E – 10	0 marks)						

	22GE004 - INNOVATION AND BUSINESS MODEL	DEVELC	PMENT								
	(Offered by Department of Mechatronics Eng	(ineering)									
Programme & Branch	All BE/BTech Engineering and Technology Branches	Sem.	Category	L	т	Ρ	Credit				
Prerequisites	Nil	6	OE	3	1	0	4				
Preamble	This course will inspire the students to think innovation concept	ots and id	eas for busine	ess n	nodel	deve	elopments.				
Unit - I	Innovation and Design Thinking:	innovatio		nt 7	0000	orno	9+3				
Design Thinking tools: Analogies	and Entrepreneurship – Design Thinking Stages: Empathize – Def - Brainstorming – Mind mapping	ine – Idea	ate – Prototyp	e – 1	Test.	Desi	gn thinking				
Unit - II	User Study and Contextual Enquiry:						9+3				
Explanatory reserved research – focus customer needs	arch – primary and secondary data – classification of secondary groups – depth interviews – analysis of qualitative data – survey –organize needs into a hierarchy –establish relative importance of	data – se methods the needs	ources of sec – observatior s- Establish ta	onda ns- P rget	ry da roce spec	ata – ss of ificati	qualitative identifying ons				
Unit - III Product Design: 9+3											
Techniques and tools for concept generation, concept evaluation – Product architecture –Minimum Viable Product (MVP)- Product prototyping – tools and techniques– overview of processes and materials – evaluation tools and techniques for user-product interaction											
Unit - IV	Business Model Canvas (BMC):						9+3				
Lean Canvas an Reasons and rer	d BMC - difference and building blocks- BMC: Patterns – Design nedies	 Strateg 	gy – Process–	Busi	ness	mod	el failures:				
Unit - V	IPR and Commercialization:						9+3				
Need for Intelle Indications, Trad	ctual Property- Basic concepts - Different Types of IPs: Copy e Secrets and Industrial Design- Patent Licensing - Technology Co	y Rights,	Trademarks	, Pa ovatio	tents on Ma	, Ge arketi	ographical ng				
			Lecture:	45, T	utor	ial:1	5, Total:60				
TEXT BOOK:											
1. Rishikes	ha T.Krishnan, "8 Steps To Innovation: Going From Jugaad To Exc	cellence",	Collins India,	2013	3.						
REFERENCES:	REFERENCES:										
1. Peter Drucker, "Innovation and Entrepreneurship", Routledge CRC Press, London, 2014.											
2. Epping	er, S.D. and Ulrich, K.T. "Product design and development", 7 th edi	tion, McG	Graw-Hill High	ər Ec	lucat	ion, 2	2020.				
3. Alexan	der Osterwalder, "Business model generation: A handbook for vis	ionaries,	game change	ers, a	and o	challe	ngers", 1 st				
edition	John Wiley and Sons; 2010										
4. Indian	nnovators Association, "Patent IPR Licensing – Technology Comr	nercializa	tion – Innovat	ion I	Marke	eting:					
Guide	Guide Book for Researchers, Innovators", Notion Press, Chennai, 2017										

COUR On co	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)

Mapping of COs with POs and PSOs														
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1			2			2						3		
CO2	3	3	3	3	2	2	2	2	3	3	3	3		
CO3	2	2	3	3	3	3	3	3	3	3	3	3		
CO4				3	2	2	2	3	3	3	3	3		
CO5				3	2	2		3	2	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	30	40	10			100
CAT2	20	30	40	10			100
CAT3	30	30	40				100
ESE	20	30	30	20			100
* ±3% may be varied (CAT 1,2,3 – 50 mar	ks & ESE – 100 ma	rks)	· · · · ·		<u>.</u>	<u>.</u>

22GEO05 - GERMAN LANGUAGE LEVEL 2															
		(Offered by Department of Electronics and Communic	cation Eng	gineering)											
Progra Branci	amme& h	All BE/BTech Engineering and Technology Branches	Sem.	Category	L	т	Ρ	Credit							
Prereq	uisites	German Language Level 1	All	OE	4	0	0	4							
Pream	Preamble This course aims to help the learner to acquire the vocabulary as per the Common European framework of German language A1 level competence. This course will help to assimilate the basic grammar structures and gai vocabulary to understand and reciprocate in daily life situations on a broader sense. A thorough learner will be able to gain a comprehensive understanding of the German grammar and confidently articulate in day today situations Unit – I Contacts(Kontakte): 12														
Unit –	Jnderstanding Letters, simple instructions, speaking about language learning, finding specific information in text. Acknowledging the														
Understanding Letters, simple instructions, speaking about language learning, finding specific information in text, Acknowledging the theme and understanding conversations, Making appointments. Grammar – Preposition with Dative, Articles in Dative and Accusative possessive articles.															
Unit – II Accomodation(Die Wohnung):															
Unders feeling	Understanding Accommodation advertisements, describing accommodation and directions, responding to an invitation, Expressing feelings, Colours. Grammar – Adjective with to be verb, Adjective with <i>sehr/zu</i> , Adjective with Accusative, prepositions with Dative														
Unit – III Are you Working?(Arbeiten Sie):															
Daily Schedule, speaking about past, understanding Job openings advertisements, Opinions, Telephonic conversations, Speaking about Jobs. Grammar – Perfect tense, Participle II – regular and irregular verbs, Conjunctions – <i>und, oder, aber</i>															
Unit –	IV	Clothes and Style(Kleidung und mode):						12							
Clothes Gramm Dative,	s, Chats on s nar – Interrog Verbs with D	shopping clothes, reporting on past, Orienting oneself in Supe ative articles and Demonstrative articles, Partizip II – separable ative	ermarkets, e and no	, Information ; n-separable v	and 1 erbs,	resea Pers	rch al onal p	pout Berlin. pronouns in							
Unit –	V	Health and Vacation(Gesundheit und Urlaub):						12							
Person <i>du/lhr</i> , in hote <i>Schl</i>	al information Modal verbs I, Tourist dest	n, Human Body parts, Sports, Understanding instructions and – sollen, müssen, nicht dürfen, dürfen. Suggestions for travel, F inations. Grammar – Pronoun: <i>man</i> , Question words – <i>Wer, Wer</i>	prompts, Path, Post <i>n, Was, W</i>	health tips. (tcards, weathe <i>'em</i> , Adverbs -	Gram er, Tra - <i>Zue</i>	mar - avel r erst, d	- Imp eports ann, S	erative with s, Problems Später, Zum							
								Total:60							
ΤΕΧΤΙ	BOOK:														
1.	Stefanie De und Glossar	ngler, Paul Rusch, Helen Schmitz, Tanja Sieber, "Netzwerk De with 2 CDs", Goyal Publishers, Delhi, 2015.	utsch als	Fremdsprach	e A1	–ursb	uch, /	Arbeitsbuch							
2.															
REFER	RENCES:														
1.	https://ocw.u	nit.edu – Massachusetts Institute of Technology Open Coursewa	ire												
2.	https://www	dw.com/en/learn-german - Deutsche Welle , Geramany's Interna	ational Bro	oadcaster											

COUR: On cor	SE Ol npleti	UTCOM ion of t	IES: he c	ours	e, the st	uden	ts will be	able to							BT Map Highest	ped Level)
CO1	unde	erstand	lette	ers ar	nd simple	etexts								R	ememberi	ing (K1)
CO2	2 assimilate vocabulary on Accommodation and invitation Understanding (K													ing (K2)		
CO3	CO3 comprehend concept of time, telephonic conversation and job-related information Understanding (K													ing (K2)		
CO4	04 understand how to do shopping in a German store Understanding (K													ing (K2)		
CO5	CO5 understand body parts and how to plan personal travel Understanding (K2)												ing (K2)			
Mapping of COs with POs and PSOs																
COs/P	Os	PO1	PC) 2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1									1	2	3		3		
CO2	2									1	2	3		3		
CO3	3									1	2	3		3		
CO4	1									1	2	3		3		
COS	5									1	2	3		3		
1 – Slig	ght, 2	– Mode	rate,	3 –	Substant	tial, B	T- Bloom's	Taxonoi	my			1			I	
	-															
							ASS	ESSMEN	NT PATI	FERN -	THEOR	Y				
Tes C	t / Blo atego	oom's ory*		Ren	nemberi (K1) %	ng	Underst (K2)	anding %	Apply (K3)	/ing %	Analyz (K4) 9	ing %	Evaluating (K5) %	Cr (I	eating <6) %	Total %
	CAT	1			75		2	5								100
	CAT	2			25		75									100
	CAT	3			25		7	5								100
	ESE	=			25		7	5								100
* ±3% I	may b	e varied	d (C/	AT 1,	2,3 – 50	mark	s & ESE –	100 mar	ks)			ľ		,		

		22GEO06-GERMAN LANGUAGE LEVE	L 3											
		(Offered by Department of Electronics and Communicat	tion Engir	neering)										
Progra Branc	amme& h	All BE/BTech Engineering and Technology Branches	Sem.	Category	L	т	Ρ	Credit						
Prerec	luisites	German Language Level 2	All	OE	3	0	0	3						
Pream	amble I his course provides enriching information about various everyday situations in personal and professional life and enhances the vocabulary and speaking ability to respond to and also seek information in those situations. It also equips one to express opinions and negotiate appointments. With diligent learning one can capture all basic grammatical structure to answer confidently in everyday situations.													
Unit –	t – I All about food (Rund Ums Essen): 9													
Understand information about person, Speak about food, Introduce self and others, Understand and explain a picture base story, To justify something, To speak about feelings, To express opinions, To answer questions on a text, To describe a restaurant. Grammar: Possessive Articles in Dative, Yes/No questions, Reflexive verbs, Sentence with 'weil'														
Unit –	t – II School days (Nach der Schulzeit): 9													
Understand School reports, Speak and write comments about schooldays, To speak about habits, Understand and provide City-Tipps, To Understand School types in Germany and speak about it. Grammar: Modal verbs in Past tense, Positional Verbs, Two-way prepositions in Dativ and Akkusativ.														
Unit –	Unit – III Media in everyday life (Medien in Alltag): 9													
To speak about advantages and disadvantages of Media, formulate comparisons, Express your own opinion, Talk about Movies, Understand and Write Movie reviews. Grammar: Comparative degree, Comparative Sentences with 'Als' and 'Wie', Subordinate clause with 'dass'. Superlative degree.														
Unit –	IV	Feelings and expressions (Gefühle):						9						
Expres city, E 'Wenn	s thanks and xpress joy an , Adjectives to	congratulations, Talk about feelings, To understand information a d regrets, Understand and write Blog entries, Write appropriate be used along with definite articles.	about fest e heading	ivals and spea . Grammar:	ak ab Subo	out it, rdina	, To d te Cla	escribe a ause with						
Unit –	V	Profession and Travel (Beruf und Reisen):						9						
To have career information the wa indefin writing	ve a conversa preferences, ation, Express y to work, Des ite articles, P , speaking and	tion at ticket counter, To talk about leisure activities, To gather in Ideate the dream job, To prepare and make telephone calls, T uncertainty, Understand and give directions, Understand a news scribe a statistic, Understand information about a trip, Talk about to repositions, verb – 'werden', Subordinate clause – indirect quest I listening.	formation To unders spaper ar ravel. Gr tions, All	from Texts, li stand text abo ticle, Say your ammar: Adject units will inclu	ntrodu out W own tive to ide e	ice p orkpl opin beι emer	eople lace. ion, T used a nts fo	, Express Ask for alk about along with r reading,						
								Total:45						
TEXT	BOOK:													
1.	Stefanie De und Glossar	ngler, Paul Rusch, Helen Schmitz, Tanja Sieber, "Netzwerk Deut with 2 CDs", Goyal Publishers, Delhi, 2015	sch als F	remdsprache	A1–u	rsbuo	ch, Ar	beitsbuch						
2.														
REFE	RENCES:													
1.	Rosa-Maria	Dallapiazza , Eduard von Jan, Till Schonherr, "Tangram 2 (Germa	n)" , Goya	l Publishers, D	Delhi,	2011								
2.	https://www.	dw.com/en/learn-german - Deutsche Welle , Geramany's Internatio	onal Broa	dcaster										
	1													

COUR On cor	SE O mplet	UTCOM ion of t	ES: he co	urse, th	e stu	dents	will be al	ble to							BT Map (Highest	ped Level)		
CO1	und	erstand	Germa	an food	style,	restau	rant and	be able	express	onesel				F	Remembering (K1)			
CO2	understand German school system and discuss about habits and provide City-Tipps Understanding (K2)																	
CO3	analyze and compare media in everyday life. Understanding (K2)																	
CO4	express feelings, describe a city and write blog entries. Understanding (K2)														ng (K2)			
CO5	25 seek and provide information in a professional setup, give directions to others and talk about travel Understanding (K2)																	
Mapping of COs with POs and PSOs																		
COs/P	POs	PO1	PO	2 P(03	PO4	PO5	PO6	P07	PO8	PO9	PO1	0 PO11	1 PO12		PSO2		
CO	1									1	2	3		3	3			
CO2	2									1	2	3		3				
COS	3									1	2	3		3				
CO4	4									1	2	3		3				
CO	5									1	2	3		3				
1 – Slig	ght, 2	– Mode	rate, 3	– Subs	tantia	I, BT- I	Bloom's T	Faxonom	iy		-1				l	- I		
	-								-									
							ASSE	SSMEN ⁻	T PATTI	ERN - 1	HEORY							
Tes C	st / Ble Catego	oom's ory*	I	Remem (K1	berin) %	g l	Jndersta (K2)	nding %	Apply (K3)	/ing %	Analyzi (K4) 9	ing %	Evaluating (K %	(5)	Creating (K6) %	Total %		
	CAT	1		7	5		25									100		
	CAT	2		2	5		75									100		
	CAT	3		2	5		75									100		
	ESE	1		2	5		75									100		
* ±3% I	may b	e varied	d (CAT	- 1,2,3 -	- 50 m	arks &	ESE – 1	00 mark	s)					·				

Offered by Department of Electronics and Communication Engineering) Very and the programme is and the properties of the properies of the properties of the propreprintes of the properties of the properties of the properime o		22GE007-GERMAN LANGUAGE LEVE	L 4											
Programme& Branch All BE/BTech Engineering and Technology Branches Sem. Category L T P Credit Prerequisites German Language Level 3 All OE 3 0 0 3 Preamble This course imparts knowledge about interacting with external world, understanding various cultural aspects, behaviour and addressing relationships in personal and professional front. It helps one to understand reports from various media and at work. Enhance learner's grammatical exposure and cover the core basic grammatical concepts which would lay the foundation to have a better hold of the language. With focused learning one should be able to read and respond to reports, write simple formal and informal letters and text messages and be able to engage in simple conversations in known situations. 9 Understanding and describing learning problems, Understanding a radio report, Understanding and making a mini-presentation. Grammar: Conjunctions - denn, weil, Konjuntiv II: Solite(suggestions), Genitive, Temporal prepositions – bis, über + Akkusativ, ab-dativ 9 Unit – II Lativing Together (Zusammen Leben): 9 To complain, apologize & give in, As for something, Understanding and experience reports, Report on the past, Talk about pers, Respond to information. Write and correct a story. Grammatik: Konjuntivi II: Solite(subcenthaltung): 9 To complain, apologize & give in, As for something, Understand experience reports, Report on the past, Talk about pers, Respond to information. Write and correct a story. Grammatik: Konjuncivi II: könnte,		(Offered by Department of Electronics and Communicat	tion Engir	neering)										
Prerequisites German Language Level 3 All OE 3 0 0 3 Preamble This course imparts knowledge about interacting with external world, understanding various cultural aspects, behaviour and addressing relationships in personal and professional from. It helps one to understand reports from various media and at work. Enhance learner's grammatical exposure and cover the core basic grammatical concepts which would lay the foundation to have a better hold of the language. With focused learning one should be able to read and respont to reports, write simple formal and informal letters and text messages and be able to engage in simple conversations in known situations. 9 Unit - I Learning (Lernen): 9 Understanding and describing learning problems, Understanding and giving advice, Giving reasons, Understanding reports about everyday work life. Talking about everyday working life. Understanding and writing fan comments, Formulating follow-ups, Making suggestions and reacting, Making an appointment, Understanding and writing fan comments, Formulating follow-ups, Making suggestions and reacting. Making an appointment, Understanding and experience reports, Report on the past, Talk about pets, Respont to information. Write and correct a story. Grammatik: Konjunctiv II: Konjuctiv III: Konjuctiv III: Konjuctiv II: Konjuctiv III: Konjuctiv I	Programme& Branch	All BE/BTech Engineering and Technology Branches	Sem.	Category	L	т	Ρ	Credit						
Preamble This course imparts knowledge about interacting with external world, understanding various cultural aspects, behaviour and addressing relationships in personal and professional front. It helps one to understand reports from various media and at work. Enhance learner's grammatical exposure and cover the core basic grammatical concepts which would lay the fundation to have a better hold of the language. With focused learning non-should be able to read and respond to reports, write simple formal and informal letters and text messages and be able to engage in simple conversations in known situations. Unit - I Learning (Lerren): 9 Understanding and describing learning problems, Understanding and giving advice, Giving reasons, Understanding reports about everyday work life, Talking about everyday working life. Understanding and oreport, Understanding and mining about everyday working about everyday working life, Understanding and reports. Formulating of life.understanding and mining and uriting fan comments, Formulating of allow-ups, Making a mappointment, Understanding a report about an excursion, Understanding difficult texts, Introducing a tourist attraction. Grammar: Conjunctions – deshalb, trotzdem, Verbs with Datit and Akkusativ 9 To complain, apologize & give in, As for something, Understand experience reports, Report on the past, Talk about pets, Respond to information, Write and correct a story. Grammatik: Konjunctiv II: könnte, Subordinate clauses – als and Wenn. 9 Talk about music style, Buy concert tickets, Introduce a musician / band, Understand newspaper reports, Give more detailed information about a person, Understand information about painting, Understand description of a picture. Describe a picture. Grammatik: Interrogative Articles: Was further and/gen	Prerequisites	German Language Level 3	All	OE	3	0	0	3						
everyday work life, Talking about everyday working life, Understanding a radio report, Understanding and making a mini-presentation. Grammar: Conjunctions- denn, weil, Konjuntiv II: Sollte(suggestions), Genitive, Temporal prepositions – bis, über + Akkusativ, ab+dativ Unit – II Athletic (Sportlich): 9 Expressing enthusiasm, hope, disappointment, Understanding and writing fan comments, Formulating follow-ups, Making suggestions and reacting, Making an appointment, Understanding ar eport about an excursion, Understanding difficult texts, Introducing a tourist attraction. Grammar: Conjunctions – deshalb, trotzdem, Verbs with Dativ and Akkusativ Unit – III Living Together (Zusammen Leben): 9 To complain, apologize & give in, As for something, Understand experience reports, Report on the past, Talk about pets, Respond to information, Write and correct a story. Grammatik: Konjunctiv II- könnte, Subordinate clauses – als and Wenn. Unit – IV Good Entertainment (Gute Unterhaltung): 9 Talk about music style, Buy concert tickets, Introduce a musician / band, Understand newspaper reports, Give more detailed information about a person, Understand information about painting, Understand description of a picture, Describe a picture. Grammatik: Interrogative Articles: Was fuer eine?, Pronouns – man/jemand/niemand and alles/etwas/nichts, Relative sentences in Nominativ Unit – V Passage of time and Culture (Zeitablauf & Kultur): 9 Talk about wishes, Express wishes, Give Suggestions, Understand a conversation, Plan something together, To ask others something, Understand a text, Exchange information, Talk about proverbs, write a story. Understand information about other cultures, Discuss about behavior, Express intentions, Use the appropriate salutation, Understand fips in a text, Talk about offers addressing and listening. Grammatik: Konjunctiv II (Wishes, Suggestions), Verbs with prepositions, W- questions with prepositions, Relative sentences in Akkusativ, Subordinate clauses with damit and UmZu. Total:45	Preamble This course imparts knowledge about interacting with external world, understanding various cultural aspects, behaviour and addressing relationships in personal and professional front. It helps one to understand reports from various media and at work. Enhance learner's grammatical exposure and cover the core basic grammatical concepts which would lay the foundation to have a better hold of the language. With focused learning one should be able to read and respond to reports, write simple formal and informal letters and text messages and be able to engage in simple conversations in known situations. Unit – I Learning (Lernen): 9													
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Unit - III Living Together (Zusammen Leben): 9 To complain, apologize & give in, As for something, Understand experience reports, Report on the past, Talk about pets, Respond to information, Write → Correct a story. Grammatik: Konjunctiv II- könnte, Subordinate clauses – als and Wen. 9 Unit - IV Good Entertainment (Gute Unterhaltung): 9 Talk about music style, Buy concert tickets, Introduce a musician / band, Understand newspaper reports, Give more detailed information about a person, Understand information about painting, Understand description of a picture, Describe a picture. Grammatik: Interrogative Articles: Was fuer eine?, Pronouns – man/jemand/niemand and alles/etwas/nichts, Relative sentences in Nominativ 9 Talk about wishes, Express wishes, Give Suggestions, Understand a conversation, Plan something together, To ask others something, Understand a text, Exchange information, Talk about proverbs, write a story. Understand information about other cultures, Discuss about behavior, Express intentions, Use the appropriate salutation, Understand tips in a text, Talk about forms of addressing others, Give more information, Discus about off., Verbs with prepositions, W- questions with prepositions, Relative sentences in Akkusativ, Subordinate clauses with damit and UmZu. Total:45 1. Stefanie Dengler, Paul Rusch, Helen Schmitz, Tanja Sieber, "Netzwerk Deutsch als Fremdsprache A1–ursbuch, Arbeitsbuch", Goyal Publis-ers, Delhi, 2015. Total:45 REFERENCES: Image: Addressing Addressin	Expressing enthusiasm, hope, disappointment, Understanding and writing fan comments, Formulating follow-ups, Making suggestions and reacting, Making an appointment, Understanding a report about an excursion, Understanding difficult texts, Introducing a tourist attraction. Grammar: Conjunctions – deshalb, trotzdem, Verbs with Dativ and Akkusativ													
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Initiation, while and conect a study. Grammatik: Konjunctiv in Konjunctiv Konjunctiv Konjunctiv in Konjunctiv in Konjunctiv K	To complain, apologize & give in, As for something, Understand experience reports, Report on the past, Talk about pets, Respond to													
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Tassage of time and culture (zeriability reference). Tassage of time and culture (zeriability reference). Talk about wishes, Express wishes, Give Suggestions, Understand a conversation, Plan something together, To ask others something, Understand a text, Exchange information, Talk about proverbs, write a story. Understand information about other cultures, Discuss about behavior, Express intentions, Use the appropriate salutation, Understand tips in a text, Talk about forms of addressing others, Give more information, Discuss about clichés and write about them. All units will include elements for reading, writing, speaking and listening. Grammatik: Konjunctiv II (Wishes, Suggestions), Verbs with prepositions, W- questions with prepositions, Relative sentences in Akkusativ, Subordinate clauses with damit and UmZu. Total:45 TEXT BOOK: 1. Stefanie Dengler, Paul Rusch, Helen Schmitz, Tanja Sieber, "Netzwerk Deutsch als Fremdsprache A1–ursbuch, Arbeitsbuch", Goyal Publishers, Delhi, 2015. REFERENCES:	Talk about music sty about a person, Ur Interrogative Articles	le, Buy concert tickets, Introduce a musician / band, Understand no iderstand information about painting, Understand description of : Was fuer eine?, Pronouns – man/jemand/niemand and alles/etwa Passage of time and Culture (Zeitablauf & Kultur):	ewspaper f a pictur as/nichts	reports, Give e, Describe a , Relative sent	more pict ence	detai ure. s in N	led in Gr omina	formation ammatik: ativ						
Total:45 TEXT BOOK: 1. Stefanie Dengler, Paul Rusch, Helen Schmitz, Tanja Sieber, "Netzwerk Deutsch als Fremdsprache A1–ursbuch, Arbeitsbuch", Goyal Publishers, Delhi, 2015. REFERENCES:	Unit – V Passage of time and Culture (Zeitablauf & Kultur): 9 Talk about wishes, Express wishes, Give Suggestions, Understand a conversation, Plan something together, To ask others something, Understand a text, Exchange information, Talk about proverbs, write a story. Understand information about other cultures, Discuss about behavior, Express intentions, Use the appropriate salutation, Understand tips in a text, Talk about forms of addressing others, Give more information, Discuss about clichés and write about them. All units will include elements for reading, writing, speaking and listening. Grammatik: Konjunctiv II (Wishes, Suggestions), Verbs with prepositions, W- questions with prepositions, Relative sentences													
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1. Stefanie Dengler, Paul Rusch, Helen Schmitz, Tanja Sieber, "Netzwerk Deutsch als Fremdsprache A1-ursbuch, Arbeitsbuch", Goyal Publishers, Delhi, 2015. REFERENCES:	TEXT BOOK:													
REFERENCES:	1. Stefanie De Goyal Publis	ngler, Paul Rusch, Helen Schmitz, Tanja Sieber, "Netzwerk Deuts shers, Delhi, 2015.	sch als Fr	emdsprache A	1–urs	sbuch	n, Arbe	eitsbuch",						
	REFERENCES:													
1. Rosa-Maria Dallapiazza, Eduard von Jan, Till Schonherr, "Tangram 2 (German)", Goyal Publishers, Delhi, 2011.	1. Rosa-Maria	Dallapiazza, Eduard von Jan, Till Schonherr, "Tangram 2 (German	ı)", Goyal	Publishers, De	elhi, 2	011.								
2. https://www.dw.com/en/learn-german - Deutsche Welle, Geramany's International Broadcaster	2. https://www.	dw.com/en/learn-german - Deutsche Welle, Geramany's Internatio	nal Broad	lcaster										

COUR: On cor	SE O nplet	UTCOM ion of t	ES: he co	ourse	e, the st	udents	will be a	ble to							B (Hig	T Mapp ghest L	ed evel)
CO1	leve	rage lea	arning	, in V	Vorkplac	e, unde	erstanding	reports	and mak	e prese	entation.			F	Remembering (K1)		
CO2	reci	procate	to diff	feren	nt situatio	ons, ma	ke appoin	tment ar	nd under	stand te	exts.			L	Understanding (K2)		
CO3 handle relationships and respond appropriately to exchange information Unc													Understanding (K2)				
CO4	familiarize to various channels of entertainment													ι	Understanding (K2)		
CO5	O5 know about various cultural aspects, usage of proverbs and cliches. Understanding (K2												g (K2)				
Mapping of COs with POs and PSOs																	
COs/P	Os	PO1	PO)2	PO3	PO4	PO5	PO6	P07	PO8	PO9	P010) PO11	PO1	2	PSO1	PSO2
CO	1									1	2	3		3	3		
CO2	2									1	2	3		3	3		
CO	3									1	2	3		3			
CO4	4									1	2	3		3			
CO	5									1	2	3		3			
1 – Slig	ght, 2	– Mode	rate, 3	3 – 8	Substanti	ial, BT-	Bloom's 1	Faxonom	y								
							ASSE	SSMEN	ΓΡΑΤΤΙ	ERN - T	HEORY						
Tes C	atego	oom's ory*		Ren	nemberi (K1) %	ng	Understa (K2)	nding %	Apply (K3)	/ing %	Analyzi (K4) %	ing %	Evaluating (K %	(5)	Crea (K6	ating 6) %	Total %
	CAT	1			75		25										100
	CAT	2			25		75										100
	CAT	3			25		75										100
	ESE	=			25		75										100
* ±3% I	may b	e varied	d (CA	T 1,2	2,3 – 50	marks a	& ESE – 1	00 mark	s)								
		22GEO08 - JAPANESE LANGUAGE LE	EVEL 2														
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		(Offered by Department of Electronics and Communic	cation Engir	neering)													
Progra Branci	amme& h	All BE/BTech Engineering and Technology Branches	Sem.	Category	L	т	Ρ	Credit									
Prereq	luisites	Japanese Language Level 1	All	OE	4	0	0	4									
Pream	ble	The basic level of Japanese which provides understanding of H the ability to understand basic conversations and also enables Casual form	Hiragana, K one to requ	atakana and 1 lest other pers	10 Ka on ar	anjis a 1d als	and pr o und	ovides erstand									
Unit –	l	Introduction to groups of verbs:						12									
tai forn action-	n-Verb group nouns-Basic	s-te form-Give and ask permission to do an action-Present cor Questions	ntinuous foi	m-Restrict oth	ner pe	erson	from	doing an									
Unit –	II	Introduction to Casual Form:						12									
nai forr Casual	m-Dictionary	form-ta form-Polite style and Casual style differences-Conversat	ion in plain	style-Place of	usag	e of l	Polite	style and									
Unit –	111	Express opinions and thoughts:						12									
Introdu is right	ction to new -Noun modifi	particle-Express someone one's thought-Convey the message o ications	f one perso	n to another-A	sk so	omeo	ne if s	something									
Unit –	IV	Introduction to If clause and remaining Kanjis:						12									
lf claus 50 Kan	se tara form-E ijis	Express gratitude for an action done by other person-Hypothetica	I situation-I	Particles to use	e in c	ase o	f Moti	on verbs-									
Unit –	V	Introduction to giving and receiving with te form and "whe	n, even if"	usages:				12									
Providi	ng to and get	tting from differences - Understanding of situations and framing se	entences us	ing when and	even	ifeto) .										
								Total:60									
TEXT	BOOK:																
1.	"MINNA NC	NIHONGO–Japanese for Everyone", 2 nd Edition, Goyal Publishe	ers & Distrib	utors Pvt. Ltd.	, New	ı Delh	ni, 201	7									
REFE	RENCES:																
1.	Margherita	Pezzopane, "Try N5", 2 nd Edition, Tankobon Softcover, Japan, 20	17.														
2.	Sayaka Kur	ashina, "Japanese Word Speedmaster", 2 nd Edition, Tankobon So	oftcover, Ja	pan, 2018.													
	L																

COUR: On cor	SE OI mplet	UTCOM ion of tl	ES: he cou	rse, the st	udents	will be a	ble to						(BT Mapp Highest L	oed evel)
CO1	diffe	erentiate	groups	s of verbs a	and its f	orms							Ren	nembering	(K1)
CO2	unde	erstand	Polite f	orm and C	asual fo	orm of Jap	anese						Und	erstanding	g (K2)
CO3	com	prehend	d perso	nal commu	inicatio	n and expi	ress gree	etings					Und	erstanding	g (K2)
CO4	unde	erstand	the Ka	njis in Japa	inese S	cript and I	f clause						Und	erstanding	g (K2)
CO5	com	prehenc	d conce	ept of "ever	n if", "wh	ien" and jo	ob-relate	d inform	ation				Und	erstanding	g (K2)
	Mapping of COs with POs and PSOs														
	Mapping of COs with POs and PSOs Cos/Pos PO1 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO12 PS01 PS02														
COs/P	COS/POs PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO12 PS01 PS02														
CO ²	1								1	2	3		3		
CO2	2								1	2	3		3		
COS	3								1	2	3		3		
CO4	4								1	2	3		3		
COS	5								1	2	3		3		
1 – Slig	ght, 2	– Mode	rate, 3	- Substant	ial, BT-	Bloom's 1	Faxonom	iy			1		1		I
								2							
						ASSE	SSMEN	Τ ΡΑΤΤΙ	ERN - 1	HEORY					
Tes C	st / Blo Catego	oom's ory*	F	emember (K1) %	ing	Understa (K2)	nding %	Apply (K3)	/ing %	Analyz (K4) 9	ing %	Evaluating (K5) %	C (reating K6) %	Total %
	CAT	1		75		25									100
	CAT	2		25		75									100
	CAT	3		25		75									100
	ESE	Ξ		25		75									100
* ±3% I	may b	e varied	d (CAT	1,2,3 – 50	marks	& ESE – 1	00 mark	s)			1		1		

		22GEO09 - JAPANESE LANGUAGE LE	EVEL 3					
		(Offered by Department of Electronics and Communic	cation Engi	neering)				
Progra Branci	imme& n	All BE/BTech Engineering and Technology Branches	Sem.	Category	L	т	Ρ	Credit
Prereq	uisites	Japanese Language Level 2	All	OE	3	0	0	3
Pream	ble	The intermediate level of Japanese which provides understand which includes 150 Kanji's and provides the ability to comprehe	ing of all fo end convers	rms ofverbs, a sations encour	dverb ntered	os, co I in da	njunc aily life	tions, etc.
Unit –	l	Introduction to Potential verbs:						9
Causes Form-C	s and Reaso Customary Ac	ns-Favouring Expressions-Expressing a State-Potential Verb tions-Nouns-Basic Questions and Kanji's.	Sentences	-Simultaneous	acti	ons-\	/erb	Groups-te
Unit –	11	Introduction to Transitive and Intransitive verbs:						9
Consee Basic C	quence of ver Questions and	rbs- Embarrassment about Facts- Consequence of Verbs with a like like and the like	an Intentior	ns-Affirmative	Sente	nces	- Con	junctions-
Unit –	111	Introduction to Volitional forms:						9
Expres	sions of Spea	kers Intention-Expressing Suggestion or Advice-Usage of Advert	os and Qua	ntifiers-Basic (Quest	ions	and ka	anji's.
Unit –	IV	Introduction to Imperative and Prohibitive verbs:						9
Comma States	anding perso Basic Questic	n- Interrogatives-Expressions of Third Person-Actions and its C ons and Kanji's.	ocurrence	- Possibilities	of an	Actio	on-Ch	anging of
Unit –	V	Introduction to Conditional form and Passive verbs:						9
Descrip Questio	otion of Requ	uirement and Speaker's Judgement, HabitualActions, Direction 's.	s and sug	gestions-Passi	ive fo	orms	of Ve	rbs-Basic
								Total:45
TEXT I	BOOK:							
1.	"MINNA NO	NIHONGO–Japanese for Everyone", 2 nd Edition, Goyal Publishe	ers & Distrib	outors Pvt. Ltd.	, New	/ Delh	ni, 201	7.
REFEF	RENCES:							
1.	Margherita I	Pezzopane, "Try N5", 2 nd Edition, Tankobon Softcover, Japan, 20	17.					
2.	Sayaka Kur	ashina, "Japanese Word Speedmaster", 2 nd Edition, Tankobon So	oftcover, Ja	pan, 2018.				

COUR On cor	SE O mplet	UTCOM	ES: he cou	se, the st	udents	will be a	ble to						(BT Mapp Highest L	oed evel)
CO1	read	d and un	derstar	d BasicVo	cabular	ies.							Re	ememberir	ng (K1)
CO2	und	erstand	Conver	sations us	ed in da	ily life.							Ur	Iderstandi	ng (K2)
CO3	com	prehend	d perso	nal commu	nicatior	and exp	ress gree	etings.					Ur	Iderstandi	ng (K2)
CO4	und	erstand	the Kar	iji's in Japa	anese S	cript.							Ur	Iderstandi	ng (K2)
CO5	com	prehend	d Coher	ent convei	sations	in everyd	ay situat	ions.					Ur	Iderstandi	ng (K2)
	Manning of COo with BOo and BSOo														
	Mapping of COs with POs and PSOs Oper/Doc Doc Doc														
COs/POs PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO12 PS01 PS01														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	rate, 3 -	- Substant	ial, BT-	Bloom's T	Faxonom	iy						1	I
						ASSE	SSMEN ⁻	Γ ΡΑΤΤΙ	ERN - 1	HEORY					
Tes C	st / Bl Catego	oom's ory*	R	ememberi (K1) %	ng	Understa (K2)	inding %	Apply (K3)	/ing %	Analyzi (K4) 9	ing E %	valuating (K %	(5) C	reating K6) %	Total %
	CAT	1		75		25									100
	CAT	2		25		75									100
	CAT	3		25		75									100
	ESE			25		75									100
* ±3%	may b	be varied	d (CAT	1,2,3 – 50	marks &	& ESE – 1	00 mark	s)	P		·				

		22GEO10 -JAPANESE LANGUAGE LE	VEL 4					
		(Offered by Department of Electronics and Communica	ation Engir	eering)				
Progra Branc	amme& h	All BE/BTech Engineering and Technology Branches	Sem.	Category	L	т	Ρ	Credit
Prerec	quisites	JAPANESE LANGUAGE LEVEL 3	All	OE	3	0	0	3
				-				
Pream	ble	The intermediate level of Japanese provides understanding of e which also includes 150 Kanji's and also provides the ability to u	xpressions Inderstanc	s of verbs, its p I relationship a	atter mong	n, Re g the	lation: peopl	ships e.
Unit –		Introduction to Reasoning:		L. L				9
Cause	s and Sequen	ces-Causes and Effects-Interrogative Patterns-Adjective as a Nou	n -Basic C	uestions and	Kanji'	s		
Unit –	11	Introduction to Exchanging of things:						9
Expres Questi	ssions for Givi ons and kanji'	ing and Receiving of Things-Polite Expression of Request-Indicates.	ting a Pur	pose of Action	s-Ba	sic Q	uantifi	ers-Basic
Unit –	III	Introduction to States of an Action:						9
Senter kanji's	nce Pattern to	Indicate Appearance-Degree of Action and State-Adjectives as A	dverbs- Co	onvey informa	tion -I	Basic	Ques	tions and
Unit –	IV	Introduction to Causative Verbs:						9
Causa Questi	tive Forms of ons and Kanji	Verbs-Asking Opportunity to do something-Hypothetical Questi 's.	ions-Judge	ement and Co	ourse	of a	n acti	ons-Basic
Unit –	V	Introduction to Relationship in Social Status:						9
Honori	fic expression	s- Respectful expressions- Humble expressions-Polite expression	s-Basic Q	uestions and k	(anji's	5.		
								Total:45
TEXT	BOOK:							
1.	"MINNA NO	NIHONGO–Japanese for Everyone", 2 nd Edition, Goyal Publisher	s & Distrib	utors Pvt. Ltd.	, New	Delh	ni, 201	7.
REFE	RENCES:							
1.	Margherita I	Pezzopane, "Try N5", 2 nd Edition, Tankobon Softcover, Japan, 201	7.					
2.	Sayaka Kur	ashina, "Japanese Word Speedmaster", 2 nd Edition, Tankobon Sol	ftcover, Ja	pan, 2018.				

COUR: On cor	SE Ol nplet	JTCOM ion of t	ES: he co	ourse	e, the st	udents	will be a	ole to							BT Map (Highest L	oed .evel)
CO1	read	I and Ur	nderst	tand	Relation	ship of	a Person							R	emembering	j (K1)
CO2	unde	erstand	Conv	/ersa	tions Us	ed in E	veryday A	ctivities.						U	nderstandin	g (K2)
CO3	com	prehend	d Con	ntents	s at Neai	r Natur	al Speed.							U	nderstanding	g (K2)
CO4	unde	erstand	the K	(anji's	s in Japa	inese S	Script							U	nderstanding	g (K2)
CO5	com	prehend	d Ora	lly Pr	resented	Mater	als.							U	nderstanding	g (K2)
	Mapping of COs with POs and PSOs															
COs/P	COs/Pos PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO12 PS01 PS02															
CO	COS/FOS FO1 FO2 FO3 FO4 FO5 FO6 FO7 FO3 FO3 FO11 FO12 FS01 FS02 CO1 1 2 3 3 <td></td>															
CO2	2									1	2	3		3		
CO	3									1	2	3		3		
CO4	4									1	2	3		3		
COS	5									1	2	3		3		
1 – Slig	ght, 2	– Mode	rate, 3	3 – S	Substanti	al, BT-	Bloom's T	Taxonom	y	1				1	I	
							ASSE	SSMEN	ΓΡΑΤΤΙ	ERN - 1	HEORY					
Tes C	atego	oom's ory*		Ren	nemberi (K1) %	ng	Understa (K2)	nding %	Apply (K3)	/ing %	Analyzi (K4) %	ing %	Evaluating (K %	(5)	Creating (K6) %	Total %
	CAT	1			75		25									100
	CAT	2			25		75									100
	CAT	3			25		75									100
	ESE	E			25		75									100
* ±3% I	may b	e varied	d (CA	T 1,2	2,3 – 50	marks	& ESE – 1	00 mark	s)							

		22GE011 - FRENCH LANGUAGE LEVE	EL 1					
		(Offered by Department of Electronics and Communica	tion Engir	neering)				
Progra Branc	amme& h	All BE/BTech Engineering and Technology Branches	Sem.	Category	L	т	Ρ	Credit
Prerec	quisites	Fundamentals of French Language	All	OE	4	0	0	4
Pream	ble	This course provides a foundation of the French language as we lifestyle of France and other French-speaking nations. The stude and acquire basic everyday vocabulary. By following the structur learning process, one can comprehend the structure of sentence	II as an ui int will be ed curricu is and res	nderstanding c learning how t ilum and pract pond to basic	of the o intro icing	Frend oduce the sa	ch cult e him/ ame a ations	ture and herself s per the
Unit –	1	Introduction						12
French	and French o	culture, alphabets, pronunciation, accents, rules, and terms for pror	nunciation	(mas-fem), Sa	alutat	ions,	numb	ers.
Unit –	II	Daily Life						12
Subjec	t Pronoun, Fra	ancophonie's, adjectives – colors, week, months, seasons.						
Unit –	111	Articles and Verbs						12
Articles	s - Indefinite, o	definite, partitive, and contracted, (examples), introductions to verba	s, 1 st grou	ip of verb				
Unit –	IV	In the City		<i>(</i> 4 .				12
expres	oup of verbs, sions)	irregular verbs (avoir, etre, faire) present yourself & nega	ative sent	ences. (faire	and .	Jouer	verb	with the
Unit –	V	Food and Culture						12
Prepos (recent	sitions – prepo t future)	osition of places (country, cities and etc), Imperative mode, invit	ations, cu	Ilture – food (wine,	chee	ese) Future
								Total:60
TEXT	BOOK:							
1.	A1 – saison							
REFE	RENCES:							
1.	Apprenons I	es francais – 0 and 1						
2.	Grammaire	– langue et de civilization francaises – Mauger G, Les idees – 0 an	d 1					

COURS On cor	SE OL mpleti	JTCOM	ES: he co	urse, the	studer	ts will be a	ble to						(1	BT Mapp Highest L	oed evel)
CO1	Unde	erstand	the g	rammatic	al struct	ure of the la	anguage a	and intro	duce s	elf to oth	ers.		Rem	embering	(K1)
CO2	Unde	erstand	basic	verbs an	d appro	priate vocal	oulary.						Und	erstanding	g (K2)
CO3	Ask	for dired	ctions	and arra	ge for t	ransportatio	on, etc, a	s neede	d.				Und	erstanding	g (K2)
CO4	Unde	erstand	the fo	od habits	of Frar	ce and ask	for appo	intments	;				Und	erstanding	g (K2)
CO5	Lear	n to soc	cialize	in Frencl	-speak	ing countrie	s						Und	erstanding	g (K2)
	Mapping of COs with POs and PSOs														
COs/P	Cos/POs PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO12 PS01 PS02														
CO1	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 – Slig	ght, 2 -	– Mode	rate, 3	B – Subst	intial, B	T- Bloom's	Taxonom	iy				1		1	
-	-							-							
						ASSE	ESSMEN	T PATT	ERN - 1	HEORY					
Tes C	st / Blo Catego	oom's ory*		Rememb (K1)	ering %	Underst (K2)	anding %	Apply (K3)	ying %	Analyz (K4) S	ing %	Evaluating (K5) %	Cı (eating K6) %	Total %
	CAT	1		75		25	5								100
	CAT	2		25		75	5								100
	CAT	3		25		75	5								100
	ESE			25		75	5								100
* ±3% ı	may b	e varied	d (CAT	1,2,3 –	50 mark	s & ESE –	100 mark	s)	1						

		22GEO12 -FRENCH LANGUAGE LEVE	EL 2					
		(Offered by Department of Electronics and Communica	ation Engi	neering)				
Progra Branci	amme& h	All BE/BTech Engineering and Technology Branches	Sem.	Category	L	Т	Ρ	Credit
Prerec	uisites	Fundamentals of French Language	All	OE	4	0	0	4
Pream	ble	This course is designed to assist students in developing vocabule Framework of Reference for Languages at the A2 level. This constructures as well as the acquisition of vocabulary necessary to circumstances. The learner will be able to develop a thorough confidently express themselves in everyday circumstances.	Ilary in ac urse will a comprehe ompreher	cordance with aid in the integ end and respo nsion of Frenc	the (ratioi nd in h gra	Comn n of b ever mma	non E basic g yday r and	uropean jrammar
Unit –	l .	French and You		. –			• •	12
World,	, Strengths 8 Verbs (Regu	Weakness, Recommendations, Sentiments, Motivations, about f lars and irregulars), Reflexive Verbs, Prepositions	favorite fil	ms and Types	s of s	creer	ns in t	he movie
Unit –	II	Eat and Repeat						12
Favorit pronou	e foods, Re ins, Present	copies, Types of meals, Describing House and Kitchen, Presen continuous tense, Simple conditional form	tation of	the recipe, Co	ompa	rative	es, Po	ssessive
Unit –		Vacation						12
Invitati Recom	ons, presei imendations	ntation, Greetings, Goodbyes, Activities on vacation, pa on various tours, Past perfect, Past imperfect tense	st expei	riences, Des	cribir	ig fa	avorite	e place,
Unit –	IV	Likes and Views						12
Favorit Tourist	e persons &	things, Giving advice, Experience, Moods, Illness, Discomforts, S & Patient), Past perfect, Past indefinite, Imperative	Symptom	s, Roleplay (D	octor	& Pa	atient,	Guide &
Unit –	V	Then and Now						12
Habits, Past pe	, customs, ci erfect and Pr	rcumstances of the past and present, Debates on past and prese esent comparatives.	ent situatio	ons and feeling	gs. P	ast in	nperfe	ect tense,
								Total:60
TEXT	BOOK:							
1.	A2 – Saiso	n						
REFER	RENCES:							
1.	Apprenons	les francais – 0 and 1						
2.	Grammaire	e – langue et de civilization francaises – Mauger G .Les idees – 0	and 1					

COUR On co	SE O mplet	UTCON tion of t	/IES: the co	ours	e, the st	udents	will be a	able to						()	BT Mapp Highest L	oed evel)
CO1	Und	lerstand	d the I	Fren	ch langua	age in c	leep and	its usag	е					Ren	nembering	g (K1)
CO2	Pre	paratior	n of th	eir F	avorite r	ecipes,	Know the	e Object	s used ir	n Kitch	en and h	ouse.		Und	erstandin	g (K2)
CO3	Con	iverse a	about	their	vacatior	n, their F	avorite E	Destinati	on					Und	erstandin	g (K2)
CO4	Und	lerstand	d com	plex	verbs ar	nd be at	ole to con	nmunica	te about	their p	ast expe	riences		Und	erstandin	g (K2)
CO5	Kno	w the d	liffere	nce	between	Past ar	nd Preser	nt and Co	ompare	them.				Und	erstandin	g (K2)
	Manning of COa with BOa and BSOa															
	Mapping of COs with POs and PSOs															
COs/P	COs/POs PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO12 PS01 PS02															PSO2
CO1	1									1	2	3		3		
CO2	2									1	2	3		3		
CO3	3									1	2	3		3		
CO4	4									1	2	3		3		
COS	5									1	2	3		3		
1 – Slig	ght, 2	– Mode	erate,	3 –	Substant	ial, BT-	Bloom's	Taxonoi	ny		1	1		1		1
									•							
							ASSES	SMENT	PATTE	ERN - T	HEORY					
Tes	st / Bl Categ	loom's ory*		Rei	memberi (K1) %	ing I	Understa (K2)	nding %	Apply (K3)	/ing %	Analyz (K4) 9	ing %	Evaluating (K5) %	Cr (I	eating K6) %	Total %
CAT1 75 25													100			
	CAT	Г2			25		75									100
	CAT	ГЗ			25		75									100
	ES	E			25		75									100
* ±3%	may t	oe varie	d (CA	ΔT 1,	2,3 – 50	marks	& ESE –	100 mar	ks)							

		22GEO13- FRENCH LANGUAGE LE	VEL 3					
		(Offered by Department of Electronics and Communi	ication Engir	neering)				
Progra Branc	Interior Previous and Communication Engineering) Programme& Branch All BE/BTech Engineering and Technology Branches Sem. Category L T P (I Prerequisites Fundamentals of French Language All OE 3 0 0 Prerequisites Fundamentals of French Language All OE 3 0 0 Prerequisites This course gives knowledge regarding a variety of personal and professional circumstances, as well as improving vocabulary and speaking abilities to reply to and seek information in those settings. It also gives y the ability to articulate yourself and arrange appointments. With perseverance, one can master all of the essigrammatical structures needed to respond confidently in everyday circumstances. It almost gives you an ide how Natives communicate. Jnit - I Start Over Jse of periphrases, Discuss a day in life, work, problems in the world, Predictions about the future (actions and situations), Hypot ituations, Imperfect and future tense. Jnit - I Prohibitions and More			Credit				
Prerec	quisites	Fundamentals of French Language	All	OE	3	0	0	3
Pream	nble	This course gives knowledge regarding a variety of personal a improving vocabulary and speaking abilities to reply to and se the ability to articulate yourself and arrange appointments. Wit grammatical structures needed to respond confidently in every how Natives communicate.	and profession ek information th persevera yday circums	onal circumsta on in those set ance, one can i stances. It alm	nces, tings naste ost gi	as w It als er all ves y	vell as so give of the vou an	es you essential idea of
Unit –		Start Over	hout the fut	ro (actions on	d citu	otion	<u>с) Цу</u>	9
situatio	ons, Imperfec	t and future tense.		ine (actions an	u situ	allon	5), i iy	politielicai
Unit –	11	Prohibitions and More						9
Prohib life, De	itions, Obliga bate on book	tions, Habits to change, social customs, Use of the subjunctive, s vs movies, usage of connectors, Object Direct and Indirect.	, Describe s	ynopsis of Mo	vie ai	nd its	relati	on to real
Unit –	III	Let's be Creative						9
Write a Create	a letter by de an Advertise	escribing the problem, talk about desires and Necessities, properties of Object Direct	ose solution ct, and Indire	s, Recommen ect	datio	ns an	id Sug	gestions,
Unit –	IV	Travel and Communication						9
Talk al and G	bout Tours, T uide, Tourists	ypes of tourism and communication, Send messages, petitions, and Travel agents), Past Pluscumperfect, All Past tenses.	Talk to peop	ple on the tele	phon	e, Ro	leplay	(Tourists
Unit –	V	Let's Talk						9
Expres superla	ssion of Inter atives, Exclar	rests, Sentiments, Feelings, Sensations, Manias etc. Certain natory phrases, subjunctives.	suggestions	s to make a	bette	r futu	ire, th	ne use of
								Total:45
TEXT	BOOK:							
1.	B1 – Saiso	n						
REFE	RENCES:							
1.	Apprenons	les francais – 0 and 1						
2.	Grammaire	– langue et de civilization francaises – Mauger G Les idees – 0 a	and 1					
			-					

COURS On cor	SE OU npleti	ITCOM on of tl	ES: he cours	se, the st	udents	will be a	ble to						()	BT Mapp Highest L	oed .evel)
CO1	Lean	n on Fu	ture tens	se.									Rem	embering	j (K1)
CO2	Unde	erstand	Permiss	ions and	Prohibi	tions.							Und	erstanding	g (K2)
CO3	Knov	ving ab	out Lette	er writing,	Creatir	ng Ads, Ex	pressing	Desires	s, and li	nstructing	g Others.		Und	erstandin	g (K2)
CO4	Unde	erstandi	ing rules	for travel	and E	nhancing o	communi	cations.					Und	erstanding	g (K2)
CO5	Expre	essing	the feelir	ngs and e	motion	s using ad	vanced g	gramma	r				Und	erstanding	g (K2)
	Mapping of COs with POs and PSOs														
COs/P	Mapping of COs with POs and PSOs COs/POs PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO12 PS01 PS02														
CO	1								1	2	3		3		2
CO2	2								1	2	3		3		2
COS	3								1	2	3		3		2
CO4	1								1	2	3		3		2
COS	5								1	2	3		3		2
1 – Slig	ht, 2 -	- Mode	rate, 3 –	Substant	ial, BT-	Bloom's	Taxonom	iy		·					
-						ASSE	SSMEN		ERN - 1	THEORY	• • •	-			T (1)
C	t / Blo atego	om′s ry*	Re	(K1) %	ing	Understa (K2)	inding %	Apply (K3)	ying) %	Analyz (K4) 9	ing %	Evaluating (K5) %	Cr (I	reating K6) %	l otal %
	CAT1	1		75		25									100
	CAT2	2		25		75									100
	CAT	3		25		75									100
	ESE			25		75									100
* ±3% I	may be	e variec	l (CAT 1	,2,3 – 50	marks	& ESE – 1	00 mark	s)							

	22GEO14 - SPANISH LANGUAGE LEVE	EL 1													
	(Offered by Department of Electronics and Communica	tion Engir	neering)												
Programme& Branch	All BE/BTech Engineering and Technology Branches	Sem.	Category	L	Т	Ρ	Credit								
Prerequisites	Fundamentals of Spanish Language	All	OE	4	0	0	4								
Preamble	This course provides a foundation of the Spanish language as and lifestyle of Spain and other Spanish-speaking nations. him/herself and acquire basic everyday vocabulary. By follow same as per the learning process, one can comprehend the communications.	well as a The stud ing the si e structur	n understandi ent will be le tructured curri e of sentence	ng of arnin culun es an	the 3 g ho n and d res	Spanis w to I prac spond	sh culture introduce ticing the to basic								
Unit – I Greetings and Good byes (Los Saludos y Despidirse): 12 Greetings.Self-Introduction Formal and Informal ways of introducing oneself and others. Alphabets& Numbers. Countries and															
Unit – I Greetings and Good byes (Los Saludos y Despidirse): 12 Greetings,Self-Introduction , Formal and Informal ways of introducing oneself and others, Alphabets& Numbers, Countries and Languages Spoken, Parts of Grammar – Noun, Personal Pronoun, Describe surroundings and its vocabulary 12															
Unit – II	Vida Cotidiana (Daily Life):						12								
Time of the day, Da physical description,	Unit – II Vida Cotidiana (Daily Life): 12 Time of the day, Days of the week, Months of the year, Seasons, Verb (To be, To Have), Adverbs, Likes and Dislikes, Personality and physical description, simple sentences 12														
Unit – III	Friends and Family (Amigos y La Familia):						12								
Vocabulary of family Regular and Irregula	y, Animals, Professions, Parts of the body, Opinions on family cul ar verbs.	tures, Art	icles – Definite	e and	Inde	finite,	Hobbies,								
Unit – IV	In the City (En la Cuidad):						12								
Buildings in the city, Transport, Gramma	Name of the places, asking for directions, Helping each other, De r - Possessive articles, prepositions	escription	of house and i	ts co	mpon	ents,	Modes of								
Unit – V	Food and Culture(La comida y cultura):						12								
Food (types and va customeretc.) Pas	arieties), shopping, ordering at a restaurant, inviting to parties, F at tense (all three tenses-Past Participle, Indefinite past and past im	Roleplay	(as diner and to be and to ha	custo ave)	omer,	sales	man and								
							Total:60								
TEXT BOOK:															
1. Chicos	cas Libro de Alumno nivel 1, Ma Angeles Palomino , edelsa, GRU RID(ESPANA).	JPO DIDA	SCALIA, S.A.	, plaz	a cui	dad d	e salta,3-								
REFERENCES:															
1. <u>https://nuev</u>	adelhi.cervantes.es/en/spanish courses/students/spanish general	courses/	spanish cours	ses_le	evel_a	a1.htn	<u>n</u>								

COURS On cor	SE Ol mplet	JTCOM ion of th	ES: he co	ourse	e, the st	udents	will be a	ble to						(BT Mapp Highest L	oed .evel)
CO1	unde	erstand	the gr	ramr	matical s	tructure	e of the lar	nguage a	and intro	duce se	elf to othe	ers.		Rem	nembering	(K1)
CO2	unde	erstand	basic	vert	bs and a	opropri	ate vocab	ulary.						Und	erstanding	з (К2)
CO3	ask	for direc	tions	and	arrange	for trai	nsportatio	n, etc, as	s needeo	ł.				Und	erstanding	3 (K2)
CO4	unde	erstand	the fo	od h	nabits of	Spain a	and Latin o	countries	and as	k for ap	pointmer	nts		Und	erstanding	ว (K2)
CO5	learı	n to soci	alize	in S	panish s	peakin	g countrie:	S						Und	erstanding	3 (K2)
	Mapping of COs with POs and PSOs															
COs/P	COs/POs PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO12 PS01 PS02															
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 – Slig	ght, 2	– Modei	rate, 3	3 – 8	Substanti	al, BT-	Bloom's T	Taxonom	ıy							
				_			ASSE	SSMEN		ERN - 1	HEORY					
Tes C	atego	oom's ory*		Ren	nemberi (K1) %	ng	Understa (K2)	inding %	Apply (K3)	ying %	Analyzi (K4) %	ng ⁄a	Evaluating (K5) %	Ci (eating K6) %	Total %
	CAT	1			75		25									100
	CAT	2			25		75									100
	CAT	3			25		75									100
	ESE	=			25		75									100
* ±3% ı	may b	e varied	d (CA	T 1,2	2,3 – 50	marks	& ESE – 1	00 mark	s)							

		22GEO15 - SPANISH LANGUAGE LE	VEL 2											
		(Offered by Department of Electronics and Communi	cation Engir	neering)										
Programn Branch	ne&	All BE/BTech Engineering and Technology Branches	Sem.	Category	L	Т	Р	Credit						
Prerequis	ites	Fundamentals of Spanish Language	All	OE	4	0	0	4						
Preamble Unit – I Habits, St	rengths &	This course aims to help the Learner to acquire the vocabulary level competence. This course will help to assimilate the basic understand and reciprocate in daily life situations on a broader comprehensive understanding of the Spanish grammar and co Spanish and You (El Español y tú) Weakness, Recommendations, Sentiments, Motivations, Abou	y as per the grammar st r sense. A th onfidently ar t favorite fil	framework of S ructures and g horough learne ticulate in day ms and Types	spanis ain vo r will today	sh lar ocabu be at situa	nguage ulary to ble to g ations.	e A2 o gain a 12 he movie						
Habits, Strengths & Weakness, Recommendations, Sentiments, Motivations, About favorite films and Types of screens in the movie world, Verbs(Regulars and irregulars), Reflexive Verbs, Prepositions														
Unit – II		Eat and Repeat (Comer y repetir)						12						
Favorite for Present co	oods, Reci ontinuous	ipies, Types of meals, Describing House and Kitchen, Presentat tense, Simple conditional form	tion of recip	e, Comparative	es, Po	osses	sive p	pronouns,						
Unit – III		Its Vacation Time (Tiempo de vacaciones)						12						
Invitations on various	, presenta tours, Pa	tion, Greetings, Goodbyes, Activities on vacation, past experients st perfect, Past imperfect tense, Usage of Todavia or No	nces, Desci	ribing favorite	place	, Rec	comme	endations						
Unit – IV		Likes and Views (Gustasyvistas)						12						
Favorite p Tourist, Ph	ersons & harmacist	things, Giving advices, Experience, Moods, Illness, Discomforts & Patient), Past perfect, Past indefinite, Imperative	s, Symptom	s, Roleplay (D	octor	& P	atient,	Guide &						
Unit – V		Then and Now(Antes y Ahora)						12						
Habits, cu Past perfe	stoms, cir	cumstances of the past and present, Debates on past and pre- esent comparatives.	esent situati	ons and feelin	gs. P	ast ir	nperfe	ect tense,						
								Total:60						
TEXT BO	OK:													
1. Al	ULA INTE istributors	RNACIONAL 2 (A2) Jaime Corpas, AgusinGarmendia, Nuria Pvt LTD, 86, UB Jawahar Nagar, Kamla Nagar, Delhi-110007.	Sanchez,	Carmen Soria	no G	oyal	Publis	shers and						
REFEREN	ICES:													
1. <u>ht</u>	tps://nuev	adelhi.cervantes.es/en/spanish_courses/students/spanish_gener	ral courses	spanish_cours	ses_le	evel_	a1.htn	<u>n</u>						

COUR: On cor	SE Ol mpleti	UTCOM ion of tl	ES: he cou	urse, the s	tudent	s will be a	ble to						(BT Mapp Highest L	oed evel)
CO1	unde	erstand	the Sp	anish lang	uage ir	deep and	its usage	e					Rem	nembering	(K1)
CO2	prep	are for	their F	avorite reci	pes, K	now the Ob	ojects use	ed in Kit	chen a	nd house			Und	erstanding	g (K2)
CO3	conv	verse ab	out th	eir vacatior	n, their	Favorite De	estinatior	า					Und	erstanding	g (K2)
CO4	unde	erstand	compl	ex verbs ar	nd be a	ble to com	municate	e about t	heir pa	st experie	ences		Und	erstanding	g (K2)
CO5	knov	w the dif	ferenc	e between	Past a	nd Present	and Cor	mparing	them.				Und	erstanding	g (K2)
	Mapping of COs with POs and PSOs														
COs/P	COs/POs PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO12 PS01 PS02														
CO	CO1 I														
CO2	2								1	2	3		3		2
CO	3								1	2	3		3		2
CO4	4								1	2	3		3		2
CO	5								1	2	3		3		2
1 – Slig	ght, 2	– Mode	rate, 3	- Substan	tial, BT	- Bloom's T	Taxonom	iy	1		1				
	-							-							
						ASSE	SSMEN	T PATTI	ERN -	THEORY					
Tes C	st / Blo Catego	oom's ory*	F	Remember (K1) %	ing	Understa (K2)	nding %	Apply (K3)	ying %	Analyz (K4) 9	ing %	Evaluating (K5) %	Cı (reating K6) %	Total %
	CAT	1		75		25									100
	CAT	2		25		75									100
	CAT	3		25		75									100
	ESE	Ξ		25		75									100
* ±3% I	may b	e varied	d (CAT	1,2,3 – 50	marks	& ESE – 1	00 mark	s)							

		22GEO16 - SPANISH LANGUAGE LE	EVEL 3												
		(Offered by Department of Electronics and Communi	ication Engin	eering)											
Progra Branc	amme& h	All BE/BTech Engineering and Technology Branches	Sem.	Category	L	Т	Ρ	Credit							
Prerec	uisites	Fundamentals of Spanish Language	All	OE	3	0	0	3							
Pream	ble	This course provides enriching information about various every enhances the vocabulary and speaking ability to respond to and equips one to express opinions and negotiate appointments. W grammatical structure to answer confidently in everyday situation speak.	day situation d also seek ii ith diligent le ons. It almost	s in personal a nformation in tl arning one car gives a basic	ind pr nose n capi idea	ofess situat ture a on ho	sional tions. all bas ow Na	life and It also sic tives							
Unit – I Start Over(Volver a Empezar) 9 Use of periphrases, Discuss a day in life, work, problems in the world, Predictions about future (actions and situations),Hypothetical															
Use of situation	Unit – I Start Over(Volver a Empezar) 9 Use of periphrases, Discuss a day in life, work, problems in the world, Predictions about future (actions and situations), Hypothetical situations, Imperfect and future tense. 9														
situations, Imperfect and future tense. Unit – II Prohibitions and More(Prohibiciones y mas) 9															
Unit – II Prohibitions and More(Prohibiciones y mas) 9 Prohibitions, Obligations, Habits to change, social customs, Use of subjunctive, Describe synopsis of Movie and its relation to real life, Debate on books vs movies, usage of connectors, Object Direct and Indirect. 9															
Unit –		Let's be Creative (Seamoscreatives)						9							
Write a Create	a letter by de an Advertise	escribing the problem,talk about desires and Necessities, propo ement, Give Instructions, Imperative negative, Use of Object Direct	ose solutions ct and Indired	, Recommend ct.	lation	s and	d Sug	gestions,							
Unit –	IV	Travel and Communication (Viajar y comunicar)						9							
Talk at Guide,	oout Tours, 1 Tourists and	Types of tourism and communication, Send messages, petitions, I Travel agents), Past Pluscumperfect, All Past tenses.	Talk to peop	le on telephon	e, Ro	le pla	ιγ(Τοι	urists and							
Unit –	V	Let's Talk(Hablemos)						9							
Expres Exclan	sion of Inter natory phrase	ests, Sentiments, Feelings, Sensations, Manias etc. Certain sugg es, subjunctive.	jestions to m	ake a better fu	iture,	use o	of sup	erlatives,							
								Total:45							
TEXT	BOOK:														
1.	Aula Intern Distributors	ational 3 (B1) [Paperback] Jaime Corpas, Agusin Garmendia, Nu s Pvt LTD, 86, UB Jawahar Nagar, Kamla Nagar, Delhi-110007.	ria Sanchez,	Carmen Soria	ano G	oyal	Publis	shers and							
REFE	RENCES:														
1.	https://nuev	vadelhi.cervantes.es/en/spanish_courses/students/spanish_gene	ral_courses/s	spanish_cours	es_le	vel_a	1.htm	<u>1</u>							

COUR On cor	SE O mplet	UTCON tion of t	IES: he co	urse,	, the stud	lents v	/ill be ab	le to						(1	BT Mapp Highest L	oed evel)
CO1	lear	n on Fu	ture te	nse.										Ren	nembering	g (K1)
CO2	und	erstand	about	Perm	nissions a	and Pro	hibitions.							Und	erstandin	g (K2)
CO3	knov	wing ab	out Le	tter w	riting, Cr	eating	Ads, Expr	essing D	Desires a	and Inst	ructing (Others.		Und	erstandin	g (K2)
CO4	und	erstandi	ing rule	es for	r travel ar	nd Enha	ance com	municati	ons.					Und	erstandin	g (K2)
CO5	expi	ressing	the fee	elings	and emo	otions u	ising adva	anced gr	ammar					Und	erstandin	g (K2)
I																
Mapping of COs with POs and PSOs																
COs/P	COs/POs PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO12 PS01 PS02															
CO1	1									1	2	3		3		2
CO2	2									1	2	3		3		2
COS	3									1	2	3		3		2
CO4	1									1	2	3		3		2
COS	5									1	2	3		3		2
1 – Slig	ght, 2	– Mode	erate, 3	3 – Si	ubstantial	, BT- B	loom's Ta	axonomy	,							
							ASSES	SMENT	PATTE	RN - TH	IEORY					
Те	est / E Cate	Bloom's gory*		Rei	memberi (K1) %	ng	Understa (K2)	nding %	Apply (K3)	/ing %	Analyz (K4) 9	ing %	Evaluating (K5) %	Cı (reating K6) %	Total %
	CA	.T1			75		25									100
	CA	T2			25		75									100
	CA	Т3			25		75									100
	ES	SE			25		75									100
* ±3%	may t	be varie	d (CAT	Г 1,2,	3 – 50 m	arks &	ESE – 10	0 marks)							

		22GEO17 - ENTREPRENEURSHIP DEVELO	PMENT	1											
		(Offered by Department of Mechatronics Eng	jineering	g)											
Program Branch	me &	All BE/BTech Engineering and Technology Branches	Sem.	Category	L	т	Ρ	Credit							
Prerequis	sites	Engineering Economics & Management	7	OE	3	0	0	3							
Preamble		The purpose of this course to create entrepreneurial awareness	s among	engineering	stude	nts.									
Unit – I	aurahin 0	Entrepreneurship Concepts:			<u></u>	1 :: 1	ام مر م	9							
- Entrepret	eneurship viation of D	vs Intrapreneurship- Entrepreneurial Motivation factors – Ty	pes of	Entrepreneur	ship	& E	Entrep	preneurs -							
		Entrepreneurial Ventures and opportunity assessment:						٥							
	turo oron	Entrepreneurial ventures and opportunity assessment.	Franck			ontu	ring	Vonturo							
New venture creation – Bootstrapping, Minipreneurship, Start-ups, Acquiring, Franchising & Social venturing - Venture development stages - Models of market opportunity- Opportunity assessment: Critical Factors In Opportunity Assessment, Idea vs Opportunity, Evaluation process, Global opportunities for entrepreneurs. Unit – III Business Plan: 9															
Unit – III	Opportunity, Evaluation process, Global opportunities for entrepreneurs. 9														
Unit – III Business Plan: 9 Designing Business Model- Business Model Canvas- Objectives of a Business Plan - Business Planning Process - Structure of a Business Plan - Technical, Marketing, Financial Feasibility assessment - Competitive analysis - Common errors in Business Plan formulation - Presentation of the Business Plan: The 'Pitch'- case studies															
Unit – IV		Financing and accounting:						9							
Forms of financing: investors, analysis,	entreprei Initial Pu Micro-fir Taxation-l	eurial capital – Sources of Financial capital: debt financing- (blic offering (IPO), Private placement - Venture capitalists - An ancing, Peer-to-Peer Lending, Crowd funding - Natural capit Direct and indirect taxes, Insolvency and Bankruptcy- Case Study	Commer ngel inve al. Prep	cial banks ar estors-New fo paring Financ	nd of rms ial E	her of fir Budg	sourc nancir et, B	es, equity ng: Impact reak even							
Unit – V		Small Business Management:						9							
Definition Indian Sta Scale Ent Contractin	of Small S artup Ecos terprises	Scale Industries: Strengths and Weaknesses, Sickness in Small E ystem – Institutions supporting small business enterprises, Busin - Growth Strategies in small industry – Expansion, Diversific	Enterpris ness Incu cation, J	es: Symptom: ubators – Gov Joint Venture,	s -Ca vernn Me	nuses nent rger,	s and Polic <u>y</u> FDI	remedies- y for Small and Sub-							
								Total:45							
ТЕХТ ВО	OK:														
1. D	onald F. I	Curatko,"Entrepreneurship: Theory, Process, Practice", 11 th Edition	n, Ceng	age Learning,	Bos	ton, 2	2020.								
REFEREN	NCES:														
1. R H	obert D. I lill, Noida.	lisrich, Michael P. Peters & Dean A. Shepherd, Sabyasachi Sinha 2020.	a "Entrep	oreneurship",	11 th	Edit	on, N	lcGraw							
2. C	harantima ducation,	th Poornima .M, "Entrepreneurship Development and Small Busin Noida, 2018.	ness En	terprises", 3 rd	Editi	on, l	Pears	on							
3. G	ordon E 8	Natarajan K, "Entrepreneurship Development", 6 th Edition, Hima	laya Pul	blishing House	e, Mu	imba	i, 201	17.							

COUR: On cor	SE O mplet	UTCON tion of t	IES: he cour	se, the st	udents	will be	able to							BT Mapı (Highest L	ped .evel)
CO1	und	erstand	the impo	ortance of	entrep	eneursh	ip and c	lemonst	rate th	ne traits c	of an ent	repreneur	Арр	olying (K3)	
CO2	ider	ntify suit	able enti	epreneuri	ial ventu	ures and	busines	s oppoi	rtunity				Арр	olying (K3)	
CO3	asse	ess the	compon	ents of bu	siness	olan							Ana	lyzing (K4)
CO4	арр	raise the	e source	s of finan	ce and i	nterpret	account	ing stat	ement	S			Арр	lying (K3)	
CO5	inte	rpret the	e causes	of sickne	ss of sn	nall scale	e enterp	rises an	d its r	emedies			Und	lerstanding	g (K2)
	Mapping of COs with POs and PSOs														
	Mapping of COs with POs and PSOs COs/POs PO1 PO3 PO4 PO5 PO6 PO7 PO8 PO10 PO11 PO12 PS01 PS02														
COs/P	/POs PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO12 PS01 PS02														
CO1	1						2	2	1	1		3	2		
CO2	2	1	2	2	2		2	2	1	1		3	2		
COS	3	2	2	2	2	2	2	2	2	2	2	3	2		
CO4	4	1	1	2	1		2	1	1	1	2	3	2		
COS	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	1	1			1	1	1
						ASSES	SMENT		ERN -	THEOR	(
Tes C	t / Blo atego	oom's ory*	Re	memberi (K1) %	ng L	Indersta (K2)	nding %	Apply (K3)	/ing %	Analyz (K4)	ing %	Evaluating (K5) %		reating (K6) %	Total %
	CAT	1		20		40		40)						100
	CAT	2		20		30		30)	20					100
	CAT	3		30		30		40)						100
	ESE	Ξ		10		30		40)	20					100
* ±3% I	may t	be varie	d (CAT 1	,2,3 – 50	marks	& ESE –	100 ma	rks)			ł		ł		

		22GEX01 – NCC STUDIES (ARMY WING	G) – I												
		(Offered by Department of Electrical and Electroni	ics Engiı	neering)											
Progra Branci	amme & h	All BE/BTech Engineering and Technology Branches	Sem.	Category	L	т	Ρ	Credit							
Prereq	luisites	Nil	5/6	OE	3	0	2	4							
Pream	ble	This course is designed especially for NCC Cadets. This course discipline, secular outlook, the spirit of adventure, sportsman s cadets by working in teams, learning military subjects including	se will he spirit and g weapor	lp develop ch ideals of self n training.	larac less	ter, c servio	amar ce am	aderie, iongst							
Unit - I		NCC Organisation & National Integration						9							
NCC C advant Nationa Nationa	Drganisation - ages of NCC al Integration al Integration	 History of NCC- NCC Organisation- NCC Training- NCC Ur Training- NCC badges of Rank- Honours and Awards – Incentiv Unity in diversity- contribution of youth in nation building- natio 	niform – ves for No mal integ	Promotion of CC cadets by ration counci	f NC cen I- Im	C ca tral a ages	dets - nd sta and S	 Aim and ate govt. Blogans on 							
Unit - I	Unit - II Basic physical Training & Drill 9 Basic physical Training – various exercises for fitness(with Demonstration)-Food – Hygiene and Cleanliness 9														
Basic p Drill- W saluting WITH I	Unit - II Basic physical Training & Drill 9 Basic physical Training – various exercises for fitness(with Demonstration)-Food – Hygiene and Cleanliness. Drill- Words of commands- position and commands- sizing and forming- saluting- marching- turning on the march and wheeling-saluting on the march- side pace, pace forward and to the rear- marking time- Drill with arms- ceremonial drill- guard mounting. (WITH DEMONSTRATION) Unit - III Weapon Training														
WITH DEMONSTRATION) Unit - III Weapon Training 9															
Unit - III Weapon Training 9 Main Parts of a Rifle- Characteristics of 5.56mm INSAS rifle- Characteristics of .22 rifle- loading and unloading – position and holding- safety precautions – range procedure- MPI and Elevation- Group and Snap shooting- Long/Short range firing(WITH PRACTICE SESSION) - Characteristics of 7.62mm SLR- LMG- carbine machine gun. 9															
Unit - I	V	Social Awareness and Community Development						9							
Aims c preven NSAP- childre	of Social serv tive measure PMGSY-Terr n from sexual	rice-Various Means and ways of social services- family plann s- NGO and their activities- Drug trafficking- Rural developr orism and counter terrorism- Corruption – female foeticide -dow offences act- civic sense and responsibility	ning – H ment pro rry –child	IV and AIDS grammes - I abuse-RTI A	- Ca MGN ct- R	INCER REG TE A	its ca A-SG .ct- Pr	auses and SY-JGSY- rotection of							
Unit - V	V	Specialized Subject (ARMY)						9							
Basic s forces-	structure of A	med Forces- Military History – War heroes- battles of Indo-Pak and interviews-Fieldcraft and Battlecraft-Basics of Map reading	war- Para g includin	am Vir Chakr g practical.	a- C	areer	in the	e Defence							
				Lecture :4	15, P	racti	cal:30), Total:75							
TEXT	BOOK:														
1.	National Ca	det Corps- A Concise handbook of NCC Cadets by Ramesh Pu	blishing I	House, New [Delhi	, 201	4								
REFER	RENCES:														
1.	Cadets Har	dbook – Common Subjects SD/SW published by DG NCC, New	v Delhi.												
2.	Cadets Har	dbook- Specialized Subjects SD/SW published by DG NCC, Ne	w Delhi												
3.	NCC OTA F	Precise published by DG NCC, New Delhi.													

COUR: On cou	SE O	UTCO	MES: the cour	se, the st	udent	s will be a	able to							BT Mapp Highest I	oed evel)
CO1	disp	lay sei tribute	nse of pat	riotism, se	cular	values and	d shall k ional un	e trans	formed social o	into mo	tivated y	outh who v	vill	Applying	(K3)
CO2	dem dev	nonstra elop th	te Health e quality o	Exercises of immedia	, the s	ense of d d implicit c	iscipline bedien	, improv	ve bear ders	ing, sma	artness, t	turnout,		Applying	(K3)
CO3	basi	ic knov	vledge of	weapons	and th	eir use an	d handli	ing.						Applying	(K3)
CO4	und and	erstand ways t	ding abou to eradica	t social ev te such ev	ils and /ils	l shall inc	ulcate s	ense of	whistle	blowing	g against	such evils		Applying	(K3)
CO5	acq abo	uaint, e ut expa	expose & ansion of <i>l</i>	provide kr Armed Fo	iowled	ge about ervice sul	Army/Na bjects a	avy/ Air nd impo	force a	ind to ac attles.	quire inf	ormation		Applying	(K3)
	Mapping of COs with POs and PSOs														
COs/P	COs/POs PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO12 PS01 PS02														
CO	1						3	3	3	3	3				
CO	2					3									
CO	3	3	2	1	1										
CO	4	3	2	1	1										
CO	5	3	2	1	1										
1 – Slig	ght, 2	– Mod	erate, 3 -	Substant	al, BT	- Bloom's	Taxono	my					-1	1	
						ASSES	SMENT	PATTE	ERN - T	HEORY	,				
/ Test Cate	Bloo egory	m's /*	Remem	bering (M %	(1)	Understa (K2)	anding %	Apply (K3)	ying %	Analyz (K4) 9	ing %	Evaluating (K5) %	g C	reating (K6) %	Total %
С	AT1			-		-		-		-		-		-	-
С	AT2			-		-		-		-		-		-	-
С	AT3			-		-		-		-		-		-	-
E	ESE		The exar includes	nination a all K1 to k	nd aw (6 kno to 100	ard of mai wledge le [:]) marks	rks will k vels. Th	be done e maxin	by the	Ministry arks for	of Defe	nce, Gover Semester I	rnment of Examinat	India whic ion is 500	h marks.

		22GEX02 - NCC STUDIES (AIR WI	NG) – I											
		(Offered by Department of Information T	echnolo	gy)										
Program Branch	nme &	All BE/BTech Engineering and Technology Branches	Sem.	Category	L	т	Ρ	Credit						
Prerequi	isites	Nil	5/6	OE	3	0	2	4						
						L		l						
Preamble	e	This course is designed especially for NCC Cadets. This co discipline, secular outlook, the spirit of adventure, sportsman cadets by working in teams, honing qualities such as self-dis of labour in the cadets.	urse will n spirit a scipline,	help develop chand ideals of selfle self-confidence,	aract ess s self-	er, c servio relia	amara ce am nce al	aderie, ongst nd dignity						
Unit–I		NCC Organization and National Integration						9+3						
NCC Or advantag History a contribut	ganization ges of NCC and Organ tion of youtl	– History of NCC- NCC Organization- NCC Training- NCC Training - NCC badges of Rank - Honors' and Awards – Inc ization of IAF - Indo-Pak War-1971 - Operation Safed S h in nation building - national integration council - Images and	Uniform centives f Sagar. Na Slogans	 Promotion of for NCC cadets I ational Integrational Integrational Integration on National Integration 	NC by ce on - egrat	C ca entra Unit ion.	dets I and ty in	 Aim and state govt. diversity - 						
Contribution of youth in nation building - national integration council - Images and Slogans on National Integration. Unit–II Drill and Weapon Training 9+3 Drill Norde of commonde, position and commonde, sizing and forming, solution, marching, turning on the march of whether in the second se														
Drill- Words of commands - position and commands - sizing and forming - saluting - marching - turning on the march and wheeling - saluting on the march - side pace, pace forward and to the rear - marking time - Drill with arms - ceremonial drill - guard mounting.(WITH DEMONSTRATION). Main Parts of a Rifle - Characteristics of .22 rifle - loading and unloading – position and holding - safety precautions – range procedure - MPI and Elevation - Group and Snap shooting - Long/Short range firing (WITH PRACTICE SESSION).														
Unit-III		Principles of Flight						9+3						
Laws of Aircraft r	motion-For ecognition.	ces acting on aircraft – Bernoulli's theorem - Stalling - Primary	y control	surfaces – seco	ndar	y cor	ntrol s	urfaces -						
Unit-IV		Aero Engines						9+3						
Introduct trends.	tion of Aerc	engine -Types of engine - piston engine - jet engines - Turbo	o prop en	gines-Basic Flig	ht In	strun	nents	- Modern						
Unit-V		Aero Modeling						9+3						
History c Radio Co	of aeromode	eling - Materials used in Aero-modeling - Types of Aero-mode els - Building and Flying of Aero-models.	els – Stat	ic Models - Glide	ers -	Cont	rolline	e models -						
				Lecture:	45. 1	Tuto	rial:30	0. Total:75						
TEXT BO	DOK:				,			,						
1. '	"National C	adet Corps - A Concise handbook of NCC Cadets", Ramesh	Publishir	ig House, NewD	elhi,	2014	ŀ.							
REFERE	NCES/ MA	NUAL / SOFTWARE:												
1.	"Cadets Ha	andbook – Common Subjects SD/SW", DGNCC, New Delhi.												
2.	"Cadets Ha	andbook – Specialised Subjects SD/SW", DGNCC, New Delhi												
3.	"NCCOTA	Precise", DGNCC, New Delhi.												

COUR: On cor	SE OI mplet	UTCON ion of t	IES: he cour	se, the st	udent	s will be a	able to							BT Mapp (Highest L	oed evel)	
CO1	buil carr	d sense y out na	of patrie	otism, secu Iding throu	ular va gh na	alues and a	shall be y and so	transfo cial col	rmed ir nesion.	nto motiv	ated you	uth who will		Applying	(K3)	
CO2	den thei	nonstrat r use ar	e the se nd handl	nse of disc ing	cipline	with smai	rtness a	nd have	e basic	knowled	lge of we	apons and		Applying	(K3)	
CO3	illus	trate va	rious for	ces and m	iomer	nts acting o	on aircra	ıft						Applying	(K3)	
CO4	outl	ine the	concepts	s of aircraf	t engi	ne and roo	ket prop	oulsion						Applying	(K3)	
CO5	des	ign, bui	d and fly	/ chuck gli	ders/r	nodel air p	lanes a	nd displ	ay stat	ic model	s.			Applying	(K3)	
	Mapping of COs with POs and PSOs															
COs/P	Os	PO1	PO2	PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO12 PS01 I												
CO,	1						3	3	3	3	3					
CO	2					3										
CO	3	3	2	1	1											
CO4	4	3	2	1	1											
CO	5	3	2	1	1											
1 – Slig	ght, 2	– Mode	rate, 3 -	Substanti	al, BT	- Bloom's	Taxono	my								
						ASSES	SMENT	PATTE	ERN - 1	HEORY	,					
Tes C	t / Blo atego	oom's ory*	Re	memberi (K1) %	ng	Understa (K2)	anding %	Apply (K3)	ying %	Analyzi (K4) 9	ing l %	Evaluating (K5) %		Creating (K6) %	Total %	
	CAT1											-		-	-	
	CAT	2		-		-		-		-		-		-	-	
	CAT	3		-		-		-		-		-		-	-	
	ESE		The incl mai	e examinat udes all K rks. It will b	ion ar 1 to K be cor	nd award c 6 knowled nverted to	of marks ge level 100 mai	will be s. The r rks.	done b naximi	y the Mi um mark	nistry of s for the	Defence, C End Seme	Bovernm ster Exa	ent of India mination is	which 500	

22MB001 - COST ACCOUNTING FOR ENGINEERS												
	(Offered by Department of Management	Studies)										
Programme& Branch	All BE/BTech Engineering and Technology Branches	Sem.	Category	L	т	Р	Credit					
Prerequisites	NIL	5	OE	3	1	0	4					
Preamble	To provide an In-depth study of the Cost Accounting principles a classification of costs components to facilitate decision Making.	and techn	iques for iden	tifica	tion, a	analys	is and					
Unit – I	Introduction to Cost Accounting						9 + 3					
accounting and management accounting- cost centres – cost units – Elements of cost – classification of cost – preparation of cost sheet.												
Unit - II Cost Ascertainment - Elements of cost 9 + 3												
Material Costs: Labour Costs: incentive schem Overheads: Co	Procurement of materials – Inventory management and control – Time Keeping, Time booking and payroll – Labour turnover es. Ilection, classification and apportionment and allocation of overhea	scrap, sp – principl ads.	oilage, defect es and meth	ives iods	and w of re	/astag mune	je ration and					
Unit – III	Basic Costing Methods						9 + 3					
Operating Costing - Meaning - Preparation of Operating Cost Sheet - Transport Costing - Power Supply Costing - Hospital Costing.												
Unit – IV Advanced Costing Methods 9 + 3												
Features of Job Process Loss - I	Costing - Batch Costing - Preparation of Cost Sheet Under Job C Normal and Abnormal Loss.	osting, an	d Batch Costi	ng -	Proce	ess Co	osting -					
Unit – V	Cost Accounting Techniques						9 + 3					
Budget and Bu classification of Standard Costi costing as a ma variances – Sale	dgetary Control: Budgetary control as a management Tool – Inst budgets – Fixed and Flexible Budgeting. ng and Variance Analysis: Budgetary control and standard costi nagement Tool – Cost variances – Direct material cost variances - es variance.	tallation of ing – Suita – Direct la	f Budgetary c ability of stand bour cost var	ontro Jard iance	l syste costin es – C	em g – St Iverhe	andard ad					
			Lecture:	45,	Tutor	ial: 15	5, Total:60					
TEXT BOOKS												
1. Jawaha Educati	rLal, SeemaSrivastava, Manisha Singh, " Cost Accounting, Text, I on, New Delhi, 2020.	Problems	and Cases", (6th E	dition	, McG	raw Hill					
2. William Educati	Lanen, Shannon Anderson and Michael Maher, "Fundamentals of on, New Delhi, 2020.	f cost Acc	ounting",7th E	Editio	n, Mc	Graw	Hill					
REFERENCES												
1. M.N.Arc	ora and PriyankaKatyal, "Cost Accounting", 5th Edition, Vikas publ	ishing Ho	use, New Del	hi, 20)23.							
2. Ravi M.	Kishore, " Cost and Management Accounting", 6th Edition, Taxma	ann, New	Delhi, 2021									
3. M.N.Arora, "Cost and Management Accounting",11th Edition, Vikas Publishing, New Delhi, 2021.												

COURSE OUTCOMES: On completion of the course, the students will be able to													BT Mapped (Highest Level)						
CO1	und	lerstand	d the con	ceptual fra	me wor	k of cos	t acco	unting						Understand	ding (K2)				
CO2	unde	erstand	the basi	c concepts	and pr	ocess ir	deter	mination of	of cost	of produ	ict and se	ervices		Understand	ding (K2)				
CO3	use	the bas	sic costin	g methods	in diffe	rent bus	iness	situation						Applyin	g (K3)				
CO4	dem	onstrat	e the adv	vanced cos	ting me	ethods ir	n vario	us decisio	on maki	ing situa	ition			Applyin	g (K3)				
CO5	CO5prepare various types of budgets and determine variance in different situations.Applying (K3)																		
	Mapping of COs with POs and PSOs																		
COs/F	os	P01	PO2	PO3	PO4	PO5	PO6	6 PO7	PO8	PO9	PO10	PO11	P01	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 – Slig	ght, 2	– Mode	erate, 3 -	Substantia	al, BT- I	Bloom's	Taxor	nomy					1						
						ASSES	SMEN		RN - T	HEORY									
Test Ca	/ Blo tego	om's ry*	Rem (embering K1) %	Und	erstand (K2) %	ling	Applying (K3) %	j An	alyzing K4) %	Eval	uating (K	5) %	Creating (K6) %	Total %				
	CAT1			30		70									100				
	CAT2			15		35		50						100					
(САТ З	3		15		35		50							100				
	ESE			25		25		50							100				
* ±3%	* ±3% may be varied (CAT 1,2 & 3 – 50 marks & ESE – 100 marks)																		

	22MBO02 Economic Analysis for Decision	ion Making	9									
	(Offered by Department of Management	Studies)										
Programme Branch	& All BE/BTech Engineering and Technology Branches	Sem.	Category	L	т	Ρ	Credit					
Prerequisite	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	g out economi	c ana	alysis	for m	naking					
Unit – I	Economic Optimization						9 + 3					
Economic C Theory of firm incremental	Pptimization: n – Business versus Economic profit – Revenue relations – Cost relaconcept.	ations – Pro	ofit relations –	Mar	ginal	versu	IS					
Unit – II	Forecasting						9 + 3					
Forecasting: Forecasting applications – Techniques –Naire method – Moving average – Exponential smoothing - Trend analysis – Linear Trend – Growth Trend – Sales, cost and revenue forecasting.												
Unit – III	Production and Cost Analysis						9 + 3					
 Production: Production function – Returns to scale and returns to factor – Total, managerial and average product – Law of diminishing returns – Optimal input usage – Production function estimation. Cost Analysis: Economic and Accounting costs – Time in cost analysis – Short run cost – Long run cost – cost relations – cost volume – profit analysis. 												
Unit – IV	Competitive Market Analysis						9+3					
competitive r	narket Analysis: Characteristics of competitive markets – Profit market supply curve – Equilibrium in competitive markets - Monopoly	aximisation y – Monopo	i – Marginal a blistic competi	halys tion.	sis in	comp	etition –					
Unit – V	Game theory and Competitive Strategy						9 + 3					
Game Theor Dominance F	y Basics - Prisoner's Dilemma - Saddle Point - Two Person Zero Sur Rule - Mixed Strategies.	n Game - C	Games withou	t Sad	dle F	Points	; -					
			Lecture:	45, T	utor	ial: 1	5, Total:60					
TEXT BOOK	is a second s											
1. Marl	K Hirschey, "Managerial Economics", 12 th Edition, Cengage Learning	, New Delh	i, 2022.									
2. Gee 2019	tika, PiyaliGhosh, Purba Roy Choudhury, "Managerial Economics", 3 9.	Brd Edition,	McGraw Hill I	Educ	ation	, New	/ Delhi,					
REFERENC	ES			_	_	_						
1. Gup	ta. G, "Managerial Economics", 2nd Edition, McGraw Hill Education,	New Delhi	, 2019.									
2. Ahuj	a. H. L, "Principles of Microeconomics", 22nd Edition, S. Chand Pub	lishing, Nev	w Delhi, 2019									
3. Pan Delh	3. PanneerSelvam R, P. Sivasankaran, P. Senthilkumar., "Managerial Economics", 1st Edition, Cengage Learning, New Delhi, 2018.											
1												

COURSE OUTCOMES: On completion of the course, the students will be able to													BT Ma (Highes	BT Mapped (Highest Level)		
CO1	Und	erstand	l revenue	e, cost and	profit r	elations	and ap	oply techr	niques	to find b	est cours	e of actior	٦.	Applyi	ng (K3)	
CO2	Арр	ly appro	opriate fo	precasting	echniq	ues for e	estimat	ing sales	, cost	and reve	nue.			Applyi	ng (K3)	
CO3	Und – pr	erstand ofit ana	l the rela lysis	tion betwe	en inpu	its and o	output	of produc	tion s	/stem ar	d perforr	n cost – v	olume	Applyi	ng (K3)	
CO4 Apply market equilibrium concepts in monopoly and monopolistically competitive markets. Applying (K3)												ng (K3)				
CO5	CO5 Understand game theory and apply in different strategic decisions Applying (K3)															
	Mapping of COs with POs and PSOs															
COs/F	POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10 PO11 PO12 PSO1 PS					
CO	1					2					1	3				
CO	2					2					1	3				
CO	3					2					1	3				
CO	4					2					1	3				
CO	5					2					1	3				
1 – Slig	ght, 2	– Mode	erate, 3 -	Substanti	al, BT-	Bloom's	Taxon	iomy		·				· ·		
						ASSES	SMEN	Τ ΡΑΤΤΕ	RN - 1	THEORY	,					
Test Ca	/ Blo atego	om's ry*	Rem (embering K1) %	Und	erstanc (K2) %	ling	Applying (K3) %	g A	nalyzing (K4) %	Eval	uating (K	5) %	Creating (K6) %	Total %	
	CAT1			35		35		30							100	
	CAT2	2		15		45		40							100	
	CAT 3	3		15		35		50							100	
	ESE			5		40		55							100	
* ±3%	* ±3% may be varied (CAT 1,2 & 3 – 50 marks & ESE – 100 marks)															

		22MBO03 Marketing Analytics	6										
(Offered by Department of Management Studies)													
Progra Branch	amme& h	All BE/BTech Engineering and Technology Branches	Sem.	Category	L	т	Ρ	Credit					
Prereq	uisites	Basic understanding of differential calculus	7	OE	3	1	0	4					
Preaml	ble	Marketing analytics enables marketers to measure, manage an effectiveness and optimize return on investment (ROI). This con measure customer value and apply analytic tools to various ma Market & Marketing Analytics	id analyze i urse expos irketing dec	marketing per es the studen cisions.	forma ts wit	ance h the	to ma tools	aximize its to 9+3					
Introdu Market Market	uction - Ir t Insight - t Segmen	ntroduction to marketing analytics, Models & Metrics Market sizing. tation –Segmentation, Targeting & Positioning											
Unit –	11	Business & Competition						9 + 3					
Compe Busine Busine	etitive An ess Strate ess Opera	alysis - Competitor identification, analysis, and actions egy –Scenarios, Decision Model, Metrics ations - Forecasting											
Unit – III Product and Price													
Product and Service Analytics - Conjoint analysis and product/service metrics Price Analytics - Pricing techniques and assessment													
Unit –	IV	Distribution & Promotion						9 + 3					
Distrib Promo	oution Ana otion Anal	alytics –Characteristics, Channel evaluation and selection, Multion ytics - Promotion budget estimation and allocation, Metrics	channel dis	tribution and	metri	CS.							
Unit –	V	Sales						9 + 3					
Sales /	Analytics	- Metrics for sales, profitability, and support											
				Lecture:	45, T	utori	al: 15	5, Total:60					
TEXT E	BOOKS												
1.	Stephen	Sorger, "Marketing Analytics: Strategic Models and Metrics", 1st	t Edition, A	dmiral Press,	UK, 2	2016							
2.	Wayne L 2018.	Winston, "Marketing Analytics: Data-Driven Techniques with M	icrosoft Exe	cel", 1st Editio	on, W	'iley,	New	Delhi,					
REFER	RENCES												
1.	Tommy	Blanchard, "Data Science for Marketing Analytics", 1st Edition, P	ackt Publis	hing, UK, 201	9.								
2.	Mike Gri	gsby, "Marketing Analytics", 2nd Edition, Kogan Page, UK, 2018											
3.	David A.	Aaker, V. Kumar, Robert P. Leone, George S. Day., "Marketing	Research",	, 1st Edition, V	Viley	, Nev	v Delł	ni, 2019.					

COURSE OUTCOMES: On completion of the course, the students will be able to													BT Mapped (Highest Level)					
CO1	Und	erstand	the imp	ortance of	Analytic	cs in Ma	rketing	g, size and	d segm	ent the	market			Understand	ing (K2)			
CO2	Und	erstand	the Bus	iness, com	petitior	and its	relate	d decisior	IS.					Understand	ing (K2)			
CO3	CO3 Identify important features of a product and suitable pricing methods. Applying (K3)													(K3)				
CO4	CO4 Assess Channel performance and Promotion Metrics. Applying (K3)												(K3)					
CO5	Ass	ess sale	es perfor	mance.										Applying	(K3)			
COc/E	000	PO1	PO2	BO3	PO 4				POs an		BO10	PO11	PO1		BSO2			
CUS/F	1	PUI	FUZ	PU3	P04	P05	PUG	5 P07	PU0	PU9	2	2	PUL	2 9301	P302			
	ו ר										2	3	1					
	2										2	3	1					
00	3										2	3	1					
CO	4										2	3	1					
CO	5										2	3	1					
1 – Slię	ght, 2	– Mode	erate, 3 –	Substantia	al, BT- I	Bloom's	Taxor	nomy										
						ASSES	SMEN	IT PATTE	RN - T	HEORY	•							
Test Ca	/ Blo atego	om's ry*	Rem (I	embering K1) %	Und	erstand (K2) %	ling	Applying (K3) %	g An (alyzing K4) %	Eval	uating (K	5) %	Creating (K6) %	Total %			
	CAT1			35		65									100			
	CAT2	2		15		35		50						100				
(CAT 3	3		15		15		70							100			
	ESE			25		25		50							100			
* ±3%	* ±3% may be varied (CAT 1,2 & 3 – 50 marks & ESE – 100 marks)																	

KONGU ENGINEERING COLLEGE, PERUNDURAI, ERODE-638060

(AUTONOMOUS)

BOARD OF ELECTRICAL AND ELECTRONICS ENGINEERING

Programme: B.E & EEEHonours Degree: Electric Vehicles

The following courses are identified to earn additional 18 credits to get a Honours degree with specialization in Electrical and Electronics Engineering

S.No	Course Code	Course Name	Credits	Prerequisites	Semester
1.	22EEJ01	Fundamentals of Electric Vehicles	4	Nil	5
2.	22EEH01	Energy Storage System	3	Nil	5
3.	22EEJ02	Basics of Automotive Engineering	4	Nil	6
4.	22EEH02	Electric Vehicle Data Acquisition system and Maintenance	3	Nil	6
5.	22EEJ03	Drives and Control of EV	4	Electrical Machines	7
		TOTAL	18		

		22EEJ01-FUNDAMENTALS OF ELECTRIC	VEHICL	ES							
Progra Branci	mme & າ	BE- Electrical and Electronics Engineering	Sem.	Category	L	т	Ρ	Credit			
Prereq	uisites	Nil	5/6/7	HN	3	0	2	4			
Preaml	ble	The main objective of this course is to develop a basic under and performance of the electric vehicle. It provides knowle vehicles based on the requirement. It enables the developm study.	erstandin edge abo nent of a	g of the cond out the analy n electric veh	cepts vsis a hicle	s, prir and o mod	nciple desigi el in	s, operation n of electric software for			
Unit –		Electric Vehicles						9			
History Techno	, Componen ology, Advant	ts of Electric Vehicle, General Layout of EV, EV classification ages &Disadvantages of EV, Overview of Tesla car.	n Compa	arison with In	iterna	al co	mbus	tion Engine:			
Unit –		Hybrid Electric Vehicles						9			
History, Components of Hybrid Electric Vehicle, General Layout of Hybrid EV, Comparison with Electric Vehicles, Advantages & Disadvantages of Hybrid EV, Overview of Toyota prius											
Unit –		Vehicle Fundamentals						9			
Vehicle Accele Differe	e resistance, ration Force, ntial, clutch &	Types: Rolling Resistance, grading resistance, Aerodynam maximum speed, Finding The Total Tractive Effort, Torque agear box, Braking performance	iic drag Require	vehicle perf d On The D	orma rive	ance, Whe	Calo el, Ti	culating The ransmission:			
Unit –	IV	Electric Vehicle Modelling						9			
Tractive scooter	e Effort-Mod -Modelling th	elling Vehicle Acceleration-Acceleration performance parameter acceleration of a small car-Modelling Electric Vehicle Range	eters-Mo	delling the a	acce	eratio	on of	an electric			
Unit –	V	Design Considerations for Electric Vehicle						9			
Aerody Vehicle	namic Consi Chassis and	derations-Consideration of Rolling Resistance-Transmission E Body Design-General Issues in Design	fficiency	-Consideratio	on of	Vehi	cle N	lass-Electric			
1.	Performar	nce Simulation of the GM EV1									
2.	Importing	and Creating Driving Cycles.									
3.	Simulating	g One Cycle									
4.	Range Sir	nulation of the GM EV1 Electric Car.									
5.	Electric So	cooter Range Modelling									
				Lecture	:45,	Prac	tical:	30, Total:75			
TEXT I	BOOK:										
1.	James Larn	ninie, John Lowry, "Electric Vehicle Technology Explained", 2 nd	Edition,	Wiley, 2012							
REFER	ENCES:										
1.	MehrdadEh Fundament	sani, YimiGao, Sebastian E. Gay, Ali Emadi, "Modern Electric, als, Theory and Design", 3 rd Edition, CRC Press, 2018	Hybrid E	lectric and Fu	uel C	ell V	ehicle	es:			
2.	lqbal Hussa Florida, Uni	in., "Electric and Hybrid Vehicles: Design Fundamentals", 3rd E ted States, 2021	Edition, C	CRC press, Ta	aylor	& Fr	ancis	Group,			
3.	Laboratory	Manual									

COUR On co	SE OUTCOMES: mpletion of the course, the students will be able to	BT Mapped (Highest Level)								
CO1	explain the overview of Electric Vehicle and Examine the performance of an electric vehicle using a software tool	Applying (K3) Precision (S3)								
CO2	explain the overview of Hybrid Electric Vehicle and Demonstrate the driving cycles and analyze the performance of an electric car	Applying (K3) Precision (S3)								
CO3	illustrate the fundamental terminologies of Electric vehicle	Applying (K3) Precision (S3)								
CO4	demonstrate a basic electric vehicle model	Applying (K3) Precision (S3)								
CO5	design an electric vehicle based on the requirement and execute the range modeling of an electric scooter	Applying (K3) Precision (S3)								
	Mapping of COs with POs and PSOs									

						0								
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	P011	PO12	PSO1	PSO2
CO1	3	2	1	1									2	3
CO2	3	2	1	1									2	3
CO3	3	1											2	3
CO4	3	1											2	3
CO5	3	2	1	1									2	3
			• • •		<u> </u>	_								

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	80	10				100				
CAT2	10	80	10				100				
CAT3	10	75	15				100				
ESE	10	80	10				100				
* ±3% may be varied (CAT 1.2.3 – 50 marks & ESE – 100 marks)											

22EEH01 – ENERGY STORAGE SYSTEMS

Prog B	ramme& ranch	BE & Electrical and Electronics Engineering	Sem.	Category	L	т	Р	Credit			
Prer	equisites	Nil	5/6/7	HN	3	0	0	3			
				1							
Pre	eamble	This course aims in imparting the fundamental concepts and	l principles	s of various en	ergy	stora	age s	ystems.			
Unit –		Introduction to Energy Storage Systems:						9			
Introdu of a cel Double	ction – Need II – Theoretic Layer Capac	of energy storage systems - Basic Concepts: Components of al Cell Voltage, Capacity and Energy. Electrochemical Principl city and Ionic Adsorption – Parameters of Batteries – Comparis	Cells and les and Re son of vari	Batteries – Cl actions: Cell I ous Recharge	assif Polar eable	icatio izatio Batt	on – C on – E eries.	Dperation Electrical			
Unit –	II	Design and Selection of Battery:						9			
Design Factors	ing to Elimina Affecting Ba	ate Potential Safety Problems – Battery Safeguards when usin ttery Performance – Major Consideration in Selecting a Batter	ig Discrete ry – Applic	Batteries – B ations of Batte	atter ery.	y Co	nstru	ction –			
Unit –		Primary and Secondary Batteries:						9			
Genera Zinc Cł	al characterist nloride Lithiur	ics and Applications of Primary Batteries – Types and Charac n Battery – Nickel Cadmium – Lead Acid – Classifications of r	teristics of eserve bat	^f Primary and tteries.	Seco	ondai	y Bat	teries –			
Unit –	IV	Advanced Batteries for Emerging Applications:						9			
Advanc Batterie three-c	ced Recharge es: Portable F ell Zinc/Brom	eable Batteries – General Characteristics – Characteristics of li Primary Zinc/Air Battery – Zinc/Bromine Batteries: Advantages ine Battery – Lithium/Ion Sulfide Batteries: General characteries	ithium recl and Disad stics – Per	nargeable Bat dvantages – E rformance.	terie: lectr	s – Z oche	inc/Ai mical	r System of			
Unit –	V	Fuel Cells and Ultra Capacitors:						9			
Fuel Ce Electro	ells: General chemical cap	Characteristics – Operating Principles of Fuel Cells – Fuel Pro acitors: Chemistry and materials properties – Performance ch	ocessing a aracteristi	nd storage co cs of devices.	nfigu	ratio	ns.				
								Total:45			
TEXT E	BOOK:										
1.	David Linde	n, Thomas B.Reddy, "Handbook of Batteries", 4 th Edition. Mo	Graw-Hill	, New Delhi, 2	011.						
REFER	RENCES:										
1.	Mehrdad Er New Delhi,	nsani, YiminGao, Ali Emadi, "Modern Electric, Hybrid Electric a 2010.	and Fuel C	ell Vehicle", 2	nd Ec	dition	, CRC	CPress,			
2.	2. James Larminie, Andrew Dick, "Fuel Cell System Explained", 2nd Edition, J.Wiley, New Jersy, 2003.										

COURSE OUTCOMES: On completion of the course, the students will be able to										BT Mapped (Highest Level)					
CO1	CO1 Explain the various aspects and performance of battery technologies										Understand (K2)				
CO2	Understand the performance of batteries and their design aspects										Understand (K2)				
CO3	Conceptualize the principles of Primary and Secondary batteries										Understand (K2)				
CO4	Apply the requirement of advanced batteries for emerging applications										Applying (K3)				
CO5	Illustrate the concepts & principles of fuel cells and ultra-capacitors										Understand (K2)				
Mapping of COs with POs and PSOs															
COs/P	Os	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1 3		2	1										3	2	
CO2	2	3	2	2										3	2
COS	3	2	1	3										3	2
CO4	4	3	2	1										2	3
COS	5	2	1	3										3	2
1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy															
ASSESSMENT PATTERN - THEORY															
Test / Bloom's Category*		R	Remembering (K1) %		Understanding (K2) %		Apply (K3)	ying %	Analyzi (K4) 9	ing %	Evaluating (K5) %		Creating (K6) %	Total %	
CAT1			20		80									100	
CAT2			20		80									100	
CAT3		10			60		30							100	
ESE			10		70		20							100	
* ±3% I	may t	be varie	d (CAT	1 & 2 – 60) marks	& ESE -	– 100 m	arks)							

22EEJ02 - BASICS OF AUTOMOTIVE ENGINEERING											
Programn Branch	ne &	B.E & Electrical and Electronics Engineering	Sem.	Category	L	т	Р	Credit			
Prerequis	ites	Nil	5/6/7	HN	3	0	2	4			
Preamble	mble This course provides the knowledge on working principle of automotive components and various alternative fuel resources recommended for automotive engines.										
Unit – I	nit – I Engines and Exhaust systems S										
Engine components: Cylinder block – Cylinder head – Sump – Manifolds – Gaskets – Cylinder - Piston – Rings – Connecting rod – Piston pins –											
Crank shaft – Bearings – Valves – Mufflers. Simple Carburetor, Port and Valve Timing diagram, Engine cooling and Lubrication systems, MPFI											
and CKDI.Exhaust systems – SCR, EGR, Catalytic converter, Denox Trap, Emission standards in India. Unit – II Transmission Systems 9											
Clutch – Types and Construction – Clutch operation: Electromagnetic – Mechanical – Hydraulic – Vacuum. Gear Boxes: Manual and Automatic											
- Simple Floor Mounted Shift Mechanism, CVT, Dual Clutch transmission Over Drives - Transfer Box - Fluid flywheel - Torque converter -											
Propeller shaft – Slip Joint – Universal Joints – Differential and Rear Axle.											
Unit – III		Steering, Brakes and Suspension						9			
Wheels and	d Tyres – V	Vheel Alignment Parameters. Steering: Steering Geometry - Types of Steering - Fleetnesis Steering and	of steerin	g gear box – D	avis	and A	Ackerr	nann steering			
mechanism - Power Steering – Electronic Steering. Types of Front Axle. Suspension systems: Types of suspension springs - Shock absorbers.											
Unit – IV	items. Type	Chassis Frame, Battery and Lighting System	599000					9			
Chassis con	struction -	 Truck chassis, Four wheel drive chassis, Body on frame, semi integr 	al and in	tegral type, Lo	ads a	acting	on fra	ame. Types of			
batteries - Construction, Operation and Maintenance. Electrical systems: Lighting – Wiring circuit.											
Unit – V		Automotive accessories and Alternate Energy Sources						9			
Head lights – Switches – Indicating lights. Accessories: Direction indicators – Windscreen wiper – Horn – Speedometer – Heaters – Air											
conditioner, Use of Natural Gas, LPG, CNG, LPG, Bio diesel, Shale gas, Liquid nitrogen, Ethanol and Hydrogen in Automobiles - Fuel Cells.											
LIST OF E	EXPERIM	ENTS / EXERCISES:									
1. Di	ismantling	and Assembling of Two stroke Petrol Engine									
2. Di	Dismantling and Assembling of Four Stroke Petrol Engine										
3. Di	Dismantling and Assembling of Four Stroke Diesel Engine										
4. Di	Dismantling and Assembling of Constant Mesh Gear Box										
5. Di	Dismantling and Assembling of Synchromesh Gear Box										
6. Di	Dismantling and Assembling of Differential and Live Axles										
7. Di	Dismantling and Assembling of Hydraulic and Pneumatic Braking Systems										
8. Di	Dismantling and Assembling of Re-circulating Ball and Rack & Pinion Steering Systems										
9. Fa	Fault diagnosis in Automotive Electrical Wiring Circuit										
10. Di	Dismantling and Assembling of Horn, Wiper and Starter Motor										
Lecture:45, Practical:30, Total:75											
TEXT BOOK:											
1. Kirpal Singh, "Automobile Engineering", 13th Edition, Volume I & II, Standard Publishers, New Delhi, 2017.											
REFERENCES/ MANUAL / SOFTWARE:											
	anesan V	"Internal Combustion Engines" 4th Edition Tata McGraw-Hill	New D	elhi 2017							
1. 0		, internal compussion Engines, 4th Eulion, rata McGlaw-Hill	, NGW D	onn, 2017.							
I Engineering College, Perundurai, Erode – 638060, India

2.	Tom Denton, "Automobile Electrical and Electronics Systems", 4th Edition, Edward Arnold Publishers, 2013.														
3.	. Lab Manual														
COUR On co	SE OI mplet	UTCON	/IES: the co	urse, the	studer	nts will be	e able to)						BT Map (Highest	oped Level)
CO1	identify the IC engine components and exhaust system along with its function Understanding (H Manipulation (S														ling (K2) on (S2)
CO2	categorize the types of transmission system Applying (K3) Precision (S3)														
CO3	3 select appropriate suspension, brake and steering systems for automobile applications Applying (K3) Precision (S3)														
CO4	O4 illustrate the types of chassis and circuit for automotive electrical systems Applying (K3) Precision (S3)													յ (K3) า (S3)	
CO5	CO5 analyze the use of automotive accessories and alternate fuel sources recommended for Applying (K3) automobiles Precision (S3)													յ (K3) า (S3)	
COs/F	206	PO1	PO2	PO3	PO				POS			PO11	PO12	PSO1	PSO2
CO	1	3	2	1	104	2	1.00	107	100	100	1010	1011	1012	2	3
CO	2	3	3	2										2	3
CO	3	3	2	1		2								2	3
CO	4	3	2	1										2	3
CO	5	3	3	2		2								2	3
1 – Slig	ght, 2	– Mode	erate, 3	 Substa 	ntial, B	T- Bloom	's Taxor	nomy							
						ASSE	SSMEN		FERN -	THEOR	Y				
Tes C	t / Blo atego	oom's ory*	R	emember (K1) %	ing	Understa (K2)	anding %	Apply (K3)	ying) %	Analyz (K4) 9	ing %	Evaluating (K5) %	g Ci (reating K6) %	Total %
CAT1 40 60											100				
CAT2 40 60											100				
CAT3 20 60 20											100				
	ESE			20		60		20)						100
* ±3%	may b	e varie	d (CA	1,2,3 – 5	0 mark	s & ESE	– 100 m	arks)							

22EEH02 - ELECTRIC VEHICLE DATA ACQUISITION SYSTEM AND MAINTENANCE													
Progra Branch	וmme & ז	BE- Electrical and Electronics Engineering Sem. Category L T P											
Prereq	uisites	Nil 5/6/7 HN 3 0 0											
Pream	PambleThis course deals with fundamentals of electronic, electrical systems required for Electric Vehicle the details of automotive sensors controlled by On-board Diagnostic with the aid Controller Area N also covers the power control module interaction with sensors and on-board diagnostic tool.												
Unit –	Unit – I Automotive Sensors:												
Temperature Sensors-Engine Coolant Temperature (ECT)-Intake Air Temperature (IAT)-Throttle Position Sensors-Manifold Absolute Pressure (MAP) Sensors-Barometric (BARO) Sensors-Mass Air Flow (MAF) Sensors-Oxygen Sensors-Heated Oxygen Sensors-Rain Sensor-Electronic Control of Fuel Injection System-Air Fuel Sensors-Fuel Level Sensors-Troubleshooting of Sensors.													
Unit –	11	Controller Area Network Bus System:						9					
Introdu J1859 Commu	ction-Termin PWM (Class unication Dia	ating Resistor-Controller Area Network (CAN) Protocols-IS B)-J1859 VPW-Classes of Controller Area Network-Controller gnosis-Data Link Connector.	09131-2 r Area N	2-ISO13230-4 letwork Bus	I-ISC Digita	01576 al Sig	65-3-9 gnals∙	SAE J2480- No Network					
Unit –		Electrical System Diagnostics:						9					
Electronic Components & Circuits-Introduction-Multiplexing Diagnostics-Lighting Diagnostics- Auxiliary System Diagnostics-In Car Entertainment (ICE) Security and Communication Diagnostics-Body Electrical System Diagnostics- Instrumentation Diagnostics- Heating Ventilation and Air Conditioning (HVAC) Diagnostics- Cruise Control Diagnostics-Air Bag and Belt Tensioners Diagnostics													
Unit –	IV	On-board Diagnostics:						9					
Introdu Develo Numbe	ction to On pments in C ering System-	-board Diagnostics(OBD) -Gasoline On-board Diagnostic Me DBD-OBDI-OBDII- OBDII Monitors-Malfunction Indicator Lamp -Freeze Frame Data-Scan Tool.	onitors-I p (MIL)-	Misfire Detec Diagnostic T	tion- roub	Drivi le C	ng C odes	ycles-Future (DTC)-DTC					
Unit –	V	Power Control Module:						9					
Power Control Module (PCM) and Sensor Interactions-Body Control Module (BCM)& PCM difference-Antilocking Braking System (ABS) Module-PCM Architecture-Hexacodes for PCM Input-Memories of PCM-Reprogramming PCM-Types of Fuel Trim-PCM Interaction in Air/Fuel Ratio-PCM Controlled Evaporative Emission Controls (EVAP) System-Exhaust Gas Recirculation (EGR) System-Positive Positive Crankcase Ventilation (PCV) System.													
								Total:45					
TEXT E	BOOK:												
1.	Happyson (Digital Serv	Gavi, "Troubleshooting Automotive Computer Systems: Automo rices LLC, United States, 2018.	tive Con	nputers, Sens	ors a	& Ne	twork	", Amazon					
REFER	RENCES:												
1.	James Hal Edition, Pea	derman, "Diagnosis and Troubleshooting of Automotive Ele arson Prentice Hall, United States,2010.	ectrical,	Electronic ar	nd C	omp	uter	Systems",5 th					
2.	Tom Dento Taylor & Fra	n, "Advance Automotive Fault Diagnosis Automotive Vehicle M ancis Group, New York, 2017.	laintena	nce and Rep	air",	4th E	ditior	n, Routledge					
3.	A.K. Sawhney, Puneet Sawhney, "A Course in Electrical and Electronic Measurements and Instrumentation", Dhanpat R & Co,2016.												

COURSE OUTCOMES: BT Mapped																			
On cor	On completion of the course, the students will be able to														(Highest Level)				
CO1	O1 Understand the basic operation of sensors used in Electric Vehicle														Understanding (K2)				
CO2	2 Illustrate the Controller Area Network Bus System														Understanding (K2)				
CO3	O3 Explain the basics of electrical system diagnostics														Understanding (K2)				
CO4	CO4 Exemplify on board diagnostics														Understanding (K2)				
CO5	CO5 Interpret the different power control module components													Applying (K3)					
						Маррі	ng of C	Os with	n POs a	nd PSC	Ds								
COs/P	Os	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2				
CO1		3	2											2	2				
CO2	2	3	2											2	2				
CO3	03 3 2										2	2							
CO4 3 2											2	2							
CO5 3 2												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	80	10				100						
CAT2	10	80	10				100						
CAT3	10	80	10				100						
ESE	10	80	10				100						
* ±3% may be varied (CAT 1,2,3 – 50 ma	rks & ESE – 100 m	arks)										

22EEJ03-DRIVES AND CONTROL FOR EV														
Progra Branci	nmme &	Ne & BE- Electrical and Electronics Engineering Sem. Category L T P												
Prereq	uisites	Electrical Machines5/6/7HN302												
Pream	This course provides a comprehensive discussion on machines and drives for pure electric, hybric cell vehicles, including both electric propulsion and hybrid propulsion. The corresponding motor electric propulsion range from the existing types, namely the DC, induction, permanent m brushless, and switched reluctance motor drives, to the advanced types which are extensively of this course.													
Unit –	Jnit – I DC Motor drives													
System Design	System configurations - DC motor control: speed control and Regenerative braking. Design criteria for DC motor drives Design Example – Application examples of DC motor drives in EVs.													
Unit –	11	Induction Motor drives						9						
System induction	System configurations – Inverters for induction motors – Induction motor control: VVVF control, FOC and DTC. Design induction motor drives for EVs- Design Example – Application examples of induction motor drives in EVs.													
Unit –		Permanent Magnet Brushless Motor drives						9						
Permanent magnet materials - System configurations - Inverters for PMBL motors - PMBL motor control: PMSM control PMBLDC motor control. Design criteria for PMBL motor drives for EVs- Design Example – Application examples of PMB drives in EVs														
Unit –	IV	Switched Reluctance Motor drives						9						
System sensor	System configurations – SR converters - SR motor control: speed control, Torque ripple minimization control and position sensorless control. Design criteria for SR motor drives for EVs- Design Example – Application examples of SR motor drives for EVs-													
Unit –	v	Advanced motor drives						9						
Design drives	criteria and and integrate	design examples of Stator PM motor drives, Magnetic geared ned starter generator systems.	notor driv	ves, vernier p	erma	anent	mag	net motor						
LIST C	F EXPERIM	ENTS / EXERCISES:												
1.	Conversio	n of AC-DC for plugin hybrid vehicles												
2.	Closed loc	p DC motor control for EV												
3.	Control of	an induction motor for EV												
4.	Control of	special electrical drives for EV												
				Lecture	:45,	Prac	tical:	30, Total:75						
TEXT	BOOK:													
1.	Chau K.T.,	Electric vehicle Machines and drives- Design, analysis and app	olication,	Wiley, IEEE	Pres	s, 20	15							
REFE	RENCES/ MA	ANUAL / SOFTWARE:												
1.	Dubey G.K	., Fundamentals of Electrical Drives, Narosa Publishing House,	New De	elhi, 2013.										
2.	L.Ashok Kumar, and S.Albert Alexander, Power Converters for Electric Vehicles. CRC Press, 2020.													

COURSE OUTCOMES:														BT Mapped				
On co	On completion of the course, the students will be able to														(Highest Level)			
CO1	eva	luate th	e perfori	mance of	DC driv	es for E	V							Applying	g (K3)			
CO2	22 understand the operation and control of AC drives for EV and Convert AC-DC for plugin hybrid Applying (K3) Precision (S3)																	
	choose the control techniques employed for PM motor drives for EV and Implement closed loop Applying (K3)																	
CO3	O3 Choose the control techniques employed for Pivi motor drives for EV and implement closed loop Precision (S3)																	
CO4	Applying (K3)																	
	Precision (S3)																	
CO5	CO5 Apply the advanced drives and control for EV and control of an induction motor and special Applying (K3)														g (K3)			
	elec	trical d	rives for	EV										Precision	1 (53)			
	Mapping of COs with POs and PSOs																	
COs/P	S/POS PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11							PO12	PSO1	PSO2								
CO	1	3	3	3										2	3			
CO	2	3	3	3										2	3			
CO	3	3	3	3										2	3			
CO	4	3	3	3										2	3			
CO	5	3	3	3										2	3			
1 – Slię	ght, 2	– Mode	erate, 3 -	- Substar	ntial, BT	- Bloom	s Taxon	iomy										
						ASSE	SSMEN	T PAT	TERN -	THEOR	RY							
Tes	t / Ble	oom's	Re	memberi	ing l	Jndersta	anding	Appl	ying	Analyz	ing	Evaluating	g C	reating	Total %			
С	atego	ory*		(K1) %		(K2)	%	(K3)) %	(K4) 9	%	(K5) %	((K6) %				
	CAT	1		30		30		4(0						100			
	CAT2 30 30 40										100							
	CAT	3		30		30		40	C						100			
	ESE	Ξ		30		30		4(C						100			
* ±3%	* ±3% may be varied (CAT 1,2,3 – 50 marks & ESE – 100 marks)																	