KONGU ENGINEERING COLLEGE

(Autonomous Institution Affiliated to Anna University, Chennai)

PERUNDURAI ERODE – 638 060

TAMILNADU INDIA

REGULATIONS, CURRICULUM & SYLLABI - 2018

(CHOICE BASED CREDIT SYSTEM AND OUTCOME BASED EDUCATION)

(For the students admitted during 2018 - 2019 and onwards)

BACHELOR OF SCIENCE DEGREE
IN
COMPUTER SYSTEMS AND DESIGN

DEPARTMENT OF COMPUTER TECHNOLOGY- UG

KONGU
Assuring the Best

INDEX

KONGU ENGINEERING COLLEGE
PERUNDURAI ERODE – 638 060
(Autonomous)

INSTITUTE VISION

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

INSTITUTE MISSION

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

QUALITY POLICY

We are committed to

- Provide value based quality education for developing the student as a competent and responsible citizen.
- Contribute to the nation and beyond through the state-of-the-art technology.
- Continuously improve our services.

DEPARTMENT OF COMPUTER TECHNOLOGY -UG

VISION

To become a technologically competent centre in the domain of Computer Science to take care of the global industrial needs.

MISSION

Department of Computer Technology-UG is committed to:

MS1: Develop inventive, proficient, ethical and quality conscious Software professionals

MS2: Produce stake holders who can contribute to technological development and social upliftment

MS3: Provide students with the state-of-art technologies to excel in academics to meet the IT industrial needs

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

Graduate of Computer Systems and Design will:

PEO1: Be successfully employed as Software developer and/or accepted into higher education

PEO2: Engage in professional development with the ability to progress in the organization.

PEO3: Adapt to societal changes of industries, lifelong learning and entrepreneurial endeavors.

MAPPING OF MISSION STATEMENTS (MS) WITH PEOs

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

1 – Slight, 2 – Moderate, 3 – Substantial

PROGRAM OUTCOMES (POs)

Graduates of Computer Systems and Design 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, 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

PO10 **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large

PO11 **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work

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)

Graduates of Computer Systems and Design will**:**

PSO1 Analyze, develop and provide solutions to industrial problems in Computer domain using Programming, Data Processing and analytical skill

PSO2 Apply software application oriented skills to innovate solution to meet the ever changing demands of IT industry.

MAPPING OF PEOs WITH POs AND PSOs

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

1 – Slight, 2 – Moderate, 3 – Substantial

KONGU ENGINEERING COLLEGE, PERUNDURAI, ERODE – 638060
(Autonomous)

REGULATIONS 2018
(Revision : 3)

CHOICE BASED CREDIT SYSTEM AND OUTCOME BASED EDUCATION

BACHELOR OF SCIENCE (BSc) DEGREE PROGRAMMES

These regulations are applicable to all candidates admitted into BSc Degree programmes from the academic year 2018 – 2019 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 Science (BSc) Degree programme

iv. "Branch" means specialization or discipline of BSc Degree Programme, like Computer Systems and Design, Information Systems and Software Systems.

v. "Course" means a Theory / Theory cum Practical / Practical course that is normally studied in a semester like Mathematics, Computer Practice, 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.

xi. "Controller of Examinations" means authorized person who is responsible for all examination related activities of the College.

xii. "Head of the Department" means Head of the Department concerned of the College.

2. PROGRAMMES AND BRANCHES OF STUDY

The BSc programmes and branches of study approved by Anna University, Chennai are offered by the College.

Programme	Branch
BSc	Computer Systems and Design
	Information Systems
	Software Systems

3. ADMISSION REQUIREMENTS

Candidates for admission to the first semester of the BSc Programme shall be required to have passed the Higher Secondary Examination (academic / vocational) of the (10+2) curriculum prescribed by the appropriate authority of Govt. of Tamil Nadu or any examination of any other authority accepted by the Anna University, Chennai as equivalent thereto.

4. STRUCTURE OF PROGRAMMES

4.1 Categorisation of Courses

The B.Sc. programme shall have a curriculum with syllabi comprising of theory, theory cum practical, practical courses in each semester and project work/internship 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) 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 categorised as follows:

i. Humanities and Social Sciences (HS) including Management Courses

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 (EEC) include Project work, Seminar and Internship in Industry or elsewhere

viii Audit Courses (AC)

4.2 Credit Assignment

Each course is assigned certain number of credits as per the following:

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 B.Sc. programme is 117.

4.3 Value Added Courses / Online Courses / Self Study Courses

The candidates may optionally undergo Value Added Courses / Online Courses / Self Study Courses as elective courses.

4.3.1 **Value Added Courses:** Value Added courses each with One / Two credits shall be offered by the college with the prior approval from respective Board of Studies. A candidate can earn a maximum of three credits through value added courses during the entire duration of the programme.

4.3.2 **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.

4.3.3 **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.

4.3.4 Two elective courses in the final semester may be exempted if the candidate earns the required credits vide clause 4.3 by registering the required number of courses up to fifth semester of the programme.

4.3.5 A candidate can earn a maximum of 24 credits through all value added courses, online courses and self study courses.

4.4. Internships

The curriculum enables a candidate to go for full time internship during a part of fifth semester and/or entire sixth semester and can earn credits through it for his/her academics vide clause 7.6, 7.7 and 7.8.

A candidate is permitted to go for full time internship in fifth semester with the following condition: The candidate shall complete a part of the fifth semester courses with a total credit of about 50% of the total credits of fifth semester including Project Work I in the first two months from the commencement of the fifth semester under fast track mode. The balance credits required to complete the fifth semester shall be earned by the candidate through either approved Value Added Courses /Online courses / Self Study Courses or

Add/Drop courses as per clause 4.3 and clause 4.5 respectively.

A candidate is permitted to go for full time internship during sixth semester in place of Project Work I. Such candidate shall earn the minimum number of credits required to complete sixth semester other than project/internship through either approved Value Added Courses /Online courses / Self Study Courses or Add/Drop courses as per clause 4.4 and clause 4.5 respectively. The number of credits for the internship same as that of Project Work in the final semester.

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

4.5 Flexibility to Add or Drop Courses

4.5.1 A candidate has to earn the total number of credits specified in the curriculum of the respective programme of study in order to be eligible to obtain the degree. However, if the candidate wishes, then the candidate is permitted to earn more than the total number of credits prescribed in the curriculum of the candidate's programme.

4.5.2 From the fourth to sixth semesters the candidates have the option of registering for additional courses or dropping of already registered additional courses within two weeks from the start of the semester. Add / Drop is only an option given to the candidates. Total number of credits of such courses during the entire programme of study cannot exceed six.

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 B.Sc. Degree programme in 6 consecutive semesters (3 Years), but in any case not more than 10 semesters (5 Years).

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), earn continuous assessment marks. This will be considered as an attempt for the purpose of classification.

6.3 If a candidate is prevented from writing end semester examination of a course due to lack of attendance, the candidate has to attend the classes, when offered next, and fulfill the attendance requirements as per clause 8 and earn continuous assessment marks. If the course, in which the candidate has a lack of attendance, is an elective, the candidate may register for the same or any other elective course in the subsequent semesters and that will be considered as an attempt for the purpose of classification.

7. ASSESSMENT AND EXAMINATION PROCEDURE FOR AWARDING MARKS

7.1 The B.Sc. programmes consist of Theory Courses, Theory cum Practical courses, Practical courses, Project Work, and Internship. 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:

<table>
<tr><th>Sl. No.</th><th>Category of Course</th><th>Continuous Assessment Marks</th><th>End Semester Examination</th></tr>
<tr><td>1.</td><td>Theory</td><td>50</td><td>50</td></tr>
<tr><td>2.</td><td>Theory cum Practical</td><td colspan="2">The distribution of marks shall be decided based on the credit weightage assigned to theory and practical components respectively.</td></tr>
<tr><td>3.</td><td>Practical / Industrial / Practical Training / Internship / Summer Project</td><td>100</td><td>---</td></tr>
<tr><td>4.</td><td>Project Work I/Project Work II/ Mini Project</td><td>50</td><td>50</td></tr>
<tr><td>5.</td><td>Value Added Course</td><td rowspan="2">The distribution of marks shall be decided based on the credit</td><td rowspan="2"></td></tr>
<tr><td>6.</td><td>All other Courses</td></tr>
</table>

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 50 marks and the end semester examination shall be for 50 marks. However, the end semester examinations shall be conducted for 100 marks and the marks obtained shall be reduced to 50. The continuous assessment tests shall be conducted as per the schedule laid down in the academic schedule. Three tests shall be conducted for 50 marks each and reduced to 30 marks each. 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.	Type	Max. Marks	Remarks
1.	Test – I	30	Average o f best two
	Test – II	30	
	Test - III	30	
2.	Tutorial	15	Should be of Open Book/Objective Type. Average of best 4 (or more, depending on the nature of the course, as may be approved by Principal)
3.	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	50	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 duration of three hours.

7.4 Theory cum Practical Courses

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

7.5 Practical Courses

For all practical courses the continuous assessment shall be for 100 marks. Every exercise / experiment shall be evaluated based on the candidate's performance during the practical class and the candidate's records maintained.

7.5.1 The apportionment of continuous assessment marks for each course shall be decided by the course coordinator based on rubrics of that particular course.

Type	Max. Marks	Remarks
Assessment based on rubrics for each experiment	50	Absolute Mark System
Assessment Test	50	
Total	100	Rounded off to one decimal place

7.6 Project Work 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. Candidates can opt for full time internship (vide clause 7.8) in lieu of project work II. 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 and the Viva-Voce Examination shall be distributed as below.

Continuous Assessment (Max. 50 Marks)						End Semester Examination (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)		
Rv. Com	Guide	Review Committee (excluding guide)	Guide	Review Committee (excluding guide)	Guide	Ext. Exr.	Guide	Exr. 1	Exr. 2
0	0	10	10	15	15	20	10	10	10

7.6.4 The Project Report prepared according to approved guidelines and duly signed by the Guide and Project Co-ordinator 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 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 guide 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

The Project Work I shall be evaluated based on continuous assessment and end semester examinations. The evaluation method shall be same as that of the Project Work II.

7.8 Internships

Each candidate shall submit a brief report about the internship undergone and a certificate issued from the organization concerned at the time of Viva-voce examination to the review committee. The evaluation method shall be same as that of the Project Work II as per clause 7.6.

7.9 Value Added Course

Two assessments shall be conducted during the semester by the Department concerned.

7.10 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.

7.11 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.

7.12 Audit Course

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

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

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

credit can be considered as an audit course.

Candidates registering for an audit course shall meet all the assessment and examination requirements 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 SF (Satisfactory). 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.

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 and satisfy the attendance requirements.

9. REQUIREMENTS FOR APPEARING FOR END SEMESTER EXAMINATION

9.1 A candidate shall normally be permitted to appear for end semester examination of the current semester if he/she has satisfied the semester completion requirements as per clause 8, and has registered for examination in all courses of that semester. Registration is mandatory for current semester examinations as well as for arrear examinations failing which the candidate shall not be permitted to move on to the higher semester.

9.2 When a candidate is deputed for a National / International Sports event during End Semester examination period, supplementary examination shall be conducted for such a candidate on return after participating in the event within a reasonable period of time. Such appearance shall be considered as first appearance.

9.3 A candidate who has already appeared for a course in a semester and passed the examination is not entitled to reappear in the same course for improvement of letter grades / marks.

10. PROVISION FOR WITHDRAWAL FROM EXAMINATIONS

10.1 A candidate may, for valid reasons, be granted permission to withdraw from appearing for the examination in any regular course or all regular courses registered in a particular semester. Application for withdrawal is permitted only once during the entire duration of the degree programme.

10.2 The withdrawal application shall be valid only if the candidate is otherwise eligible to write the examination (vide clause 9) and has applied to the Principal for permission prior to the last examination of that semester after duly recommended by the Head of the Department.

10.3 The withdrawal shall not be considered as an appearance for deciding the eligibility of a candidate for First Class with Distinction/First Class.

10.4 If a candidate withdraws a course or courses from writing end semester examinations, he/she shall register the same in the subsequent semester and write the end semester examinations. A final semester candidate who has withdrawn shall be permitted to appear for supplementary examination to be conducted within reasonable time as per clause 14.

10.5 The final semester candidate who has withdrawn from appearing for project viva-voce for genuine reasons shall be permitted to appear for supplementary viva-voce examination within reasonable time with proper application to Controller of Examinations and on payment of prescribed fee.

11. PROVISION FOR BREAK OF STUDY

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

11.2 The candidates permitted to rejoin the programme after break of study / prevention due to lack of attendance shall be governed by the rules and regulations in force at the time of rejoining.

11.3 The candidates rejoining in new Regulations shall apply to the Principal in the prescribed format through Head of the Department at the beginning of the readmitted semester itself for prescribing additional/equivalent courses, if any, from any semester of the regulations in-force, so as to bridge the curriculum in-force and the old curriculum.

11.4 The total period of completion of the programme reckoned from the commencement of the semester to which the candidate was admitted shall not exceed the maximum period specified in clause 5 irrespective of the period of break of study in order to qualify for the award of the degree.

11.5 If any candidate is prevented for want of required attendance, the period of prevention shall not be considered as authorized break of study.

11.6 If a candidate has not reported to the college for a period of two consecutive semesters without any intimation, the name of the candidate shall be deleted permanently from the college enrollment. Such candidates are not entitled to seek readmission under any circumstances.

12. PASSING REQUIREMENTS

12.1 A candidate who secures not less than 50 % of total marks (continuous assessment and end semester examination put together) prescribed for the course with a minimum of 45 % of the marks prescribed for the end semester examination in all category of courses vide clause 7.1 except for the courses which are evaluated based on continuous assessment only shall be declared to have successfully passed the course in the examination.

12.2 A candidate who secures not less than 50 % in continuous assessment marks prescribed for the courses which are evaluated based on continuous assessment only shall be declared to have successfully passed the course. If a candidate secures less than 50% in the continuous assessment marks, he / she shall have to re-enroll for the same in the subsequent semester and satisfy the attendance requirements.

12.3 For a candidate who does not satisfy the clause 12.1, the continuous assessment marks secured by the candidate in the first attempt shall be retained and considered valid for subsequent attempts. However, from the fourth attempt onwards the marks scored in the end semester examinations alone shall be considered, in which case the candidate shall secure minimum 50 % marks in the end semester examinations to satisfy the passing requirements.

13. REVALUATION OF ANSWER SCRIPTS

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

14. SUPPLEMENTARY EXAMINATION

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

15. AWARD OF LETTER GRADES

Range of % of Total Marks	Letter Grade	Grade Point
91 to 100	O (Outstanding)	10
81 to 90	A+ (Excellent)	9
71 to 80	A (Very Good)	8
61 to 70	B+ (Good)	7
50 to 60	B (Average)	6
Less than 50	RA (Reappear)	0
Satisfactory	SF	0
Withdrawal	W	-
Absent	AB	-
Shortage of Attendance in a course	SA	-

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

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

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

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

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 B.Sc. Degree provided the candidate has

i. Successfully completed all the courses under the different categories, as specified in the regulations.

ii. Successfully gained the required number of total credits as specified in the curriculum corresponding to the candidate's programme within the stipulated time (vide clause 5).

iii. Successfully passed any additional courses prescribed by the respective Board of Studies whenever readmitted under regulations other than R-2018 (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 six semesters in the **First Appearance** within six consecutive semesters 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 regulation to another regulation 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 six semesters in the **First Appearance** within six consecutive semesters 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 six semesters within eight consecutive semesters 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 7.00

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.

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 Kongu Engineering College, reserves the right to modify/amend without notice, the Regulations, Curricula, Syllabi, Scheme of Examinations, procedures, requirements, and rules pertaining to its B.Sc. programme.

All amendments until the 12th Academic council meeting have been incorporated.

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CURRICULUM BREAKDOWN STRUCTURE								
Summary of Credit Distribution								
Category	**Semester**						**Total number of credits**	**Curriculum Content (% of total number of credits of the program)**
	I	**II**	**III**	**IV**	**V**	**VI**		
HS	**4**	**5**					**9**	**07.69**
BS	**4**	**4**					**8**	**06.84**
ES	**4**	**4**					**8**	**06.84**
PC	**8**	**7**	**16**	**16**	**12**		**59**	**50.43**
PE					**6**	**7**	**13**	**11.11**
OE			**3**	**3**			**6**	**05.13**
EC					**6**	**8**	**14**	**11.96**
Semesterwise Total	**20**	**20**	**19**	**19**	**24**	**15**	**117**	**100.00**

Category	Abbreviation
Lecture hours per week	**L**
Tutorial hours per week	**T**
Practical, Project work, Internship, Professional Skill Training, Industrial Training hours per week	**P**
Credits	**C**

CATEGORISATION OF COURSES							
HUMANITIES AND SOCIAL SCIENCES AND MANAGEMENT STUDIES(HSMS), BASIC SCIENCES (BS),ENGINEERING SCIENCES(ES)							
Sl. No.	**Course Code**	**Course Name**	**L**	**T**	**P**	**C**	**Sem**
1	18BCC11	Communicative English I	3	0	2	4	I
2	18BCC21	Communicative English II	3	0	2	4	II
3	18BCT11	Mathematics I	3	1	0	4	I
4	18BCT21	Mathematics II	3	1	0	4	II
5	18VEC11	Value Education	0	0	3	1	II
6	18BCC12	Digital Principles	3	0	2	4	I
7	18BCC22	Basics of Electrical and Electronics Engineering	3	0	2	4	II
Total Credits to be earned						**25**	

PROFESSIONAL CORE(PC)							
Sl. No.	**Course Code**	**Course Name**	**L**	**T**	**P**	**C**	**Sem**

1	18BCC13	Python Programming	3	0	2	4	I
2	18BCC14	Computer Fundamentals and Office Automation	3	0	2	4	I
3	18BCC23	Object Oriented Programming using Python	3	0	2	4	II
4	18BCT22	Introduction to Software Engineering	3	0	0	3	II
5	18BCT31	Java Programming	3	0	0	3	III
6	18BCT32	Operating Systems	3	0	0	3	III
7	18BCT33	Data Structures	3	0	0	3	III
8	18BCT34	Computer Architecture	3	1	0	4	III
9	18BCL31	Java Programming Laboratory	0	0	2	1	III
10	18BCL32	Operating Systems Laboratory	0	0	2	1	III
11	18BCL33	Data Structures Laboratory	0	0	2	1	III
12	18BCT41	Computer Networks	3	1	0	4	IV
13	18BCT42	Database Management Systems	3	0	0	3	IV
14	18BCT43	Web Technology	3	0	0	3	IV
15	18BCT44	Mobile Application Development	3	0	0	3	IV
16	18BCL41	Database Management Systems Laboratory	0	0	2	1	IV
17	18BCL42	Web Technology Laboratory	0	0	2	1	IV
18	18BCL43	Mobile Application Development Laboratory	0	0	2	1	IV
19	18BCT51	Internet of Things	3	1	0	4	V
20	18BCT52	User Interface Design	3	0	0	3	V
21	18BCT53	Distributed Computing	3	0	0	3	V
22	18BCL51	User Interface Design Laboratory	0	0	4	2	V
Total Credits to be earned						**73**	

EMPLOYABILITY ENHANCEMENT COURSES (EC)							
Sl. No.	**Course Code**	**Course Name**	**L**	**T**	**P**	**C**	**Sem**
1.	18BCP51	Project Work I	0	0	`12	6	V
2.	18BCP61	Project Work II/ Internship	0	0	`16	8	VI
Total Credits to be earned						**14**	

PROFESSIONAL ELECTIVE							
Sl. No.	**Course Code**	**Course Name**	**L**	**T**	**P**	**C**	**Sem**
		Elective III					
1	18BCE01	Unix and Shell Programming	3	0	0	3	V
2	18BCE02	Object Oriented Analysis and Design	3	0	0	3	V
3	18BCE03	Data Visualization Techniques	3	0	0	3	V

		Elective IV					
4	18BCE04	Cloud Security	3	0	0	3	V
5	18BCE05	E-Commerce	3	0	0	3	V
6	18BCE06	Security Threats and Control	3	0	0	3	V
		Elective V					
7	18BCE07	Business Intelligence	3	1	0	4	VI
8	18BCE08	Web Mining	3	1	0	4	VI
9	18BCE09	Agile Software Development	3	1	0	4	VI
		Elective VI					
10	18BCE10	Human Resource Management	3	0	0	3	VI
11	18BCE11	System Analysis and Design	3	0	0	3	VI
12	18BCE12	Extreme Programming	3	0	0	3	VI
Total Credits to be earned						**13**	

OPEN ELECTIVE							
Sl. No.	**Course Code**	**Course Name**	**L**	**T**	**P**	**C**	**Sem**
1	18BCO01	Data Mining	3	0	0	3	III
2	18BCO02	Multimedia and Virtual Reality Systems	3	0	0	3	III
3	18BCO03	Big Data Analytics	3	0	0	3	IV
4	18BCO04	Open Source Programming	3	0	0	3	IV
Total Credits to be earned						**6**	

SCHEDULING OF COURSES - B.Sc. COMPUTER SYSTEMS AND DESIGN (Total Credit : 117)

Sem.	Course 1	Course 2	Course 3	Course 4	Course 5	Course 6	Course 7	Course 8	Credit
I	18BCC11 Communicative English I (3-0-2-4)	18BCT11 Mathematics I (3-1-0-4)	18BCC12 Digital Principles (3-0-2-4)	18BCC13 Python Programming (3-0-2-4)	18BCC14 Computer Fundamentals and Office Automation (3-0-2-4)				20
II	18BCC21 Communicative English II (3-0-2-4)	18BCT21 Mathematics II (3-0-2-4)	18BCC22 Basics of Electrical and Electronics Engineering (3-0-2-4)	18BCC23 Object Oriented Programming using Python (3-0-2-4)	18BCT22 Introduction to Software Engineering (3-0-0-3)	18VEC11 Value Education (0-0-3-1)			20
III	18BCT31 Java Programming (3-0-0-3)	18BCT32 Operating Systems (3-0-0-3)	18BCT33 Data Structures (3-0-0-3)	18BCT34 Computer Architecture (3-0-1-4)	Open Elective - I (3-0-0-3)	18BCL31 Java Programming Laboratory (0-0-2-1)	18BCL32 Operating Systems Laboratory (0-0-2-1)	18BCL33 Data Structures Laboratory (0-0-2-1)	19
IV	18BCT41 Computer Networks (3-0-1-4)	18BCT42 Database Management Systems (3-0-0-3)	18BCT43 Web Technology (3-0-0-3)	18BCT44 Mobile Application Development (3-0-0-3)	Open Elective - II (3-0-0-3)	18BCL41 Database Management Systems Laboratory (0-0-2-1)	18BCL42 Web Technology Laboratory (0-0-2-1)	18BCL43 Mobile Application Development Laboratory (0-0-2-1)	19
V	18BCT51 Internet of Things (3-0-1-4)	18BCT52 User Interface Design (3-0-0-3)	18BCT53 Distributed Computing (3-0-0-3)	Elective - III (3-0-0-3)	Elective - IV (3-0-0-3)	18BCL51 User Interface Design Laboratory (0-0-4-2)	18BCP51 Project Work I (0-0-12-6)		24
VI	Elective - V (3-0-1-4)	Elective - VI (3-0-0-3)	18BCP61 Internship / Project Work II (0-0-16-8)						15

MAPPING OF COURSES WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

Sem.	Course Code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	18BCC11	Communicative English I	✓			✓	✓				✓	✓		✓	✓	✓
1	18BCT11	Mathematics I	✓	✓	✓	✓					✓	✓		✓	✓	✓
1	18BCC12	Digital Principles	✓	✓	✓	✓	✓					✓		✓	✓	✓
1	18BCC13	Python Programming	✓	✓	✓	✓	✓								✓	✓
1	18BCC14	Computer Fundamentals and Office Automation	✓	✓	✓	✓	✓						✓		✓	✓
2	18BCC21	Communicative English II	✓	✓	✓	✓	✓				✓	✓		✓	✓	✓
2	18BCT21	Mathematics II	✓	✓	✓	✓	✓							✓	✓	✓
2	18BCC22	Basics of Electrical and Electronics Engineering	✓	✓	✓	✓	✓								✓	✓
2	18BCC23	Object Oriented Programming using Python	✓	✓	✓	✓	✓								✓	✓
2	18BCT22	Introduction to Software Engineering	✓	✓	✓	✓									✓	✓
2	18VEC11	Value Education			✓					✓						
3	18BCT31	Java Programming	✓	✓	✓	✓									✓	✓
3	18BCT32	Operating Systems	✓	✓	✓	✓	✓								✓	✓
3	18BCT33	Data Structures	✓	✓	✓	✓									✓	✓
3	18BCT34	Computer Architecture	✓	✓	✓	✓									✓	✓
3	18BCL31	Java Programming Laboratory	✓	✓	✓	✓									✓	✓
3	18BCL32	Operating Systems Laboratory	✓	✓	✓	✓									✓	✓
3	18BCL33	Data Structures Laboratory	✓	✓	✓	✓									✓	✓
4	18BCT41	Computer Networks	✓	✓	✓	✓					✓	✓			✓	✓
4	18BCT42	Database Management Systems	✓	✓	✓	✓									✓	✓
4	18BCT43	Web Technology	✓	✓	✓	✓									✓	✓
4	18BCT44	Mobile Application Development	✓	✓	✓	✓									✓	✓
4	18BCL41	Database Management Systems Laboratory	✓	✓	✓	✓									✓	✓
4	18BCL42	Web Technology Laboratory	✓	✓	✓	✓									✓	✓

4	18BCL43	Mobile Application Development Laboratory	✓	✓	✓	✓									✓	✓
5	18BCT51	Internet of Things	✓	✓	✓	✓									✓	✓
5	18BCT52	User Interface Design	✓	✓	✓	✓									✓	✓
5	18BCT53	Distributed Computing	✓	✓	✓	✓	✓								✓	✓
5	18BCL51	User Interface Design Laboratory	✓	✓	✓	✓	✓								✓	✓
5	18BCP51	Project Work I	✓	✓	✓	✓	✓				✓	✓	✓	✓	✓	✓
6	18BCP61	Project Work II/ Internship	✓	✓	✓	✓	✓				✓	✓	✓	✓	✓	✓
		Professional Electives														
5	18BCE01	Unix and Shell Programming	✓	✓	✓	✓									✓	✓
5	18BCE02	Object Oriented Analysis and Design	✓	✓	✓	✓	✓								✓	✓
5	18BCE03	Data Visualization Techniques	✓	✓	✓	✓	✓								✓	✓
5	18BCE04	Cloud Security	✓	✓	✓	✓									✓	✓
5	18BCE05	E-Commerce	✓	✓	✓	✓	✓								✓	✓
5	18BCE06	Security Threats and Control	✓	✓	✓	✓									✓	✓
6	18BCE07	Business Intelligence	✓	✓	✓	✓									✓	✓
6	18BCE08	Web Mining	✓	✓	✓	✓									✓	✓
6	18BCE09	Agile Software Development	✓	✓	✓	✓									✓	✓
6	18BCE10	Human Resource Management	✓	✓	✓	✓	✓			✓			✓		✓	✓
6	18BCE11	System Analysis and Design	✓	✓	✓	✓									✓	✓
6	18BCE12	Extreme Programming	✓	✓	✓	✓									✓	✓
		Open Electives														
3	18BCO01	Data Mining	✓	✓	✓	✓	✓		✓						✓	✓
3	18BCO02	Multimedia and Virtual Reality systems	✓	✓	✓	✓	✓		✓					✓	✓	✓
4	18BCO03	Big Data Analytics	✓	✓	✓	✓									✓	✓
4	18BCO04	Open Source Programming	✓	✓	✓	✓									✓	✓

B.Sc COMPUTER SYSTEMS AND DESIGN CURRICULUM – R2018

SEMESTER I

Course Code	Course Title	Hours / Week			Credit	Maximum Marks		
		L	T	P		CA	ESE	Total
Theory/Theory with Practical								
18BCC11	Communicative English I	3	0	2	4	50	50	100
18BCT11	Mathematics I	3	1	0	4	50	50	100
18BCC12	Digital Principles	3	0	2	4	50	50	100
18BCC13	Python Programming	3	0	2	4	50	50	100
18BCC14	Computer Fundamentals and Office Automation	3	0	2	4	50	50	100
Total Credits to be earned					**20**			

SEMESTER II

Course Code	Course Title	Hours / Week			Credit	Maximum Marks		
		L	T	P		CA	ESE	Total
Theory/Theory with Practical								
18BCC21	Communicative English II	3	0	2	4	50	50	100
18BCT21	Mathematics II	3	1	0	4	50	50	100
18BCC22	Basics of Electrical and Electronics Engineering	3	0	2	4	50	50	100
18BCC23	Object Oriented Programming using Python	3	0	2	4	50	50	100
18BCT22	Introduction to Software Engineering	3	0	0	3	50	50	100
18VEC11	Value Education	0	0	3	1	100	0	100
Total Credits to be earned					**20**			

SEMESTER III								
Course Code	Course Title	Hours / Week			Credit	Maximum Marks		
		L	T	P		CA	ESE	Total
Theory								
18BCT31	Java Programming	3	0	0	3	50	50	100
18BCT32	Operating Systems	3	0	0	3	50	50	100
18BCT33	Data Structures	3	0	0	3	50	50	100
18BCT34	Computer Architecture	3	1	0	4	50	50	100
	Elective – I (Open)	3	0	0	3	50	50	100
Practical								
18BCL31	Java Programming Laboratory	0	0	2	1	100	0	100
18BCL32	Operating Systems Laboratory	0	0	2	1	100	0	100
18BCL33	Data Structures Laboratory	0	0	2	1	100	0	100
Total Credits to be earned					**19**			

SEMESTER IV								
Course Code	Course Title	Hours / Week			Credit	Maximum Marks		
		L	T	P		CA	ESE	Total
Theory								
18BCT41	Computer Networks	3	1	0	4	50	50	100
18BCT42	Database Management Systems	3	0	0	3	50	50	100
18BCT43	Web Technology	3	0	0	3	50	50	100
18BCT44	Mobile Application Development	3	0	0	3	50	50	100
	Elective – II (Open)	3	0	0	3	50	50	100
Practical								
18BCL41	Database Management Systems Laboratory	0	0	2	1	100	0	100
18BCL42	Web Technology Laboratory	0	0	2	1	100	0	100
18BCL43	Mobile Application Development Laboratory	0	0	2	1	100	0	100
Total Credits to be earned					**19**			

SEMESTER V								
Course Code	**Course Title**	**Hours / Week**			**Credit**	**Maximum Marks**		
		L	**T**	**P**		**CA**	**ESE**	**Total**
Theory								
18BCT51	Internet of Things	3	1	0	4	50	50	100
18BCT52	User Interface Design	3	0	0	3	50	50	100
18BCT53	Distributed Computing	3	0	0	3	50	50	100
	Elective III	3	0	0	3	50	50	100
	Elective IV	3	0	0	3	50	50	100
Practical								
18BCL51	User Interface Design Laboratory	0	0	4	2	100	0	100
18BCP51	Project Work I	0	0	`12	6	50	50	100
Total Credits to be earned					**24**			

SEMESTER VI								
Course Code	**Course Title**	**Hours / Week**			**Credit**	**Maximum Marks**		
		L	**T**	**P**		**CA**	**ESE**	**Total**
Theory								
	Elective V	3	1	0	4	50	50	100
	Elective VI	3	0	0	3	50	50	100
Project								
18BCP61	Project Work II / Internship	0	0	16	8	50	50	100
Total Credits to be earned					**15**			

Total Credits : 117

18BCC11 COMMUNICATIVE ENGLISH I

(Common to Computer Systems and Design, Information Systems & Software Systems)

Programme & Branch	B.Sc & Computer Systems and Design	Sem.	Category	L	T	P	Credit
Prerequisites	Nil	1	HS	3	0	2	4

Preamble	To employ techniques of active reading, effective speaking and integrate ideas through writing skills. Learners can gain confidence to communicate in formal forum effectively and write long passages independently.	
Unit - I	**Grammar & Vocabulary:**	**9**
Content words- Nouns, Verbs, Adjectives and Adverbs identification - Changing Parts of speech; **Reading Comprehension**: Prediction and Surveying; **Writing**: Filling an application form. **Activities**: **Listening:** Types of listening; **Speaking**: Talking about oneself, one's family, friends and favorite persons.		
Unit - II	**Grammar & Vocabulary:**	**9**
Prefixes and Suffixes- Nouns and Noun phrases; **Reading**: Skimming for gist and scanning for information; **Writing**: Describing persons, places and products. **Activities : Listening**: The process of listening; **Speaking:** Presentation		
Unit - III	**Grammar & Vocabulary:**	**9**
Verbs - Main verbs, Primary and Modal auxiliary verbs – Finite Verbs and non-finite verbs; **Reading**: Comprehension; **Writing**: Paragraph writing (narrative, descriptive and process description passages). **Activities: Listening:** Effective listening strategies; **Speaking:** DET talk.		
Unit - IV	**Grammar & Vocabulary:**	**9**
Adjectives – Attributive and Predicative functions – Classifiers – Verbs and tenses; **Reading**: Intensive reading and Note-making; **Writing**: Formal and Informal letters. **Activities**: **Listening:** Gap filling activity while listening; **Speaking:** 1. Narration of an event. 2. Description of a product		
Unit - V	**Grammar & Vocabulary:**	**9**
Adverbs and Adverbial Phrases –Sentence Patterns in English; **Reading**: Reading passages; **Writing**: E-mails. **Activities**: **Listening:** Listening to a lecture and taking notes; **Speaking:** Describing a picture.		

List of Exercises / Experiments :

	Listening/ DVD, podcasts and Authentic Videos	Speaking
1.	People saying 'hello' and giving personal information; BBC programme about people around the world	Self-introduction, giving personal information and talking about important people in one's life
2.	Listening to celebrity talk	Talking about role-models, leaders, thinkers, musicians, singers, actors and people in the news
3.	Listening to talks related to leisure, hobbies, travel and life in a country; travel shows	Talking about places one has visited and would like to go
4.	Listening to discussions of current topics and social issues; people living on the edge	Presentation on a topic of social relevance
5.	Listening to models of welcome address, introduction of the guests, proposing a vote of thanks in a function	Giving welcome address/ introduction/ vote of thanks for a given context
6.	Listening to real or imaginary stories; The Chilean Miners' rescue	Narrating an event or a story
7.	Listening to descriptions of technological gadgets; Days that shook the world	Describing a scientific invention or a piece of technology
8.	Stand-up comedy; Mr. Beans; Miranda	Anecdotes and examples of wit and humour
9.	Learning a new language; study habits	Talking about various aspects of language
10.	Goal-setting; motivation; positive thinking, time management	Understanding and explaining the meaning of famous quotes

Lecture:45, Practical:30, Total:75

TEXT BOOK:

1.	Raymond Murphy, " Essential English Grammar: Reference and Practice for South Asian Students Cambridge ", Cambridge University Press, 2010.

REFERENCES:

1.	GlennisPye, " Vocabulary in Practice, Parts 1 and 2 ", 1 Edition, Cambridge University Press, 2011.

COURSE OUTCOMES: On completion of the course, the students will be able to		**BT Mapped (Highest Level)**
CO1	identify and use content words which carry more meaning	Remembering (K1)
CO2	construct sentences in English	Creating (K6)
CO3	implement reading skills by reading short, simple messages and texts with complete understanding	Applying (K3)
CO4	construct words at sentence and paragraph level	Creating (K6)
CO5	demonstrate effectively in a vast range of personal, professional, academic, and cultural situations	Applying (K3)
CO6	understand the pronunciation of the native speakers (English) about their real time experience after listening the videos	Understanding(K2) Manipulation (S3)
CO7	reconstruct the information through writing after effectively listening	Evaluating (K5), Imitation (S1)
CO8	take part in various professional, academic, and cultural situations events	Analyzing (K4), Manipulation (S2)

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1			1	2				2	2		3		
CO2	1			1	2				2	3		3		
CO3	1			1	2				2	3		3		
CO4	1			1	2				2	3		3	1	1
CO5	1			1	2				2	3		3	1	
CO6	1			1	2				2	3		3		
CO7	1			1	2				2	3		3	1	
CO8	1			1	2				2	3		3	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	10	10	50	-	-	30	100
CAT2	10	10	50	-	-	30	100
CAT3	10	10	50	-	-	30	100
ESE	10	10	50	-	-	30	100

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

18BCT11 - MATHEMATICS I

(Common to Computer Systems and Design, Information Systems & Software Systems)

Programme & Branch	B.Sc & Computer Systems and Design	Sem.	Category	L	T	P	Credit
Prerequisites	Nil	1	BS	3	1	0	4

Preamble	To the course aims to formulate and solve problems using matrices and differential equations. Eventually the course provides a thorough understanding in solving real world problems using numerical methods.	
Unit - I	**Matrices:**	**9+3**
Characteristic Equation of a matrix - Eigen values and Eigen vectors of real matrix - Properties of Eigen values and Eigen vectors(statement and problems only) - Cayley Hamilton Theorem(statement only) - Orthogonal Matrices - Orthogonal transformation of symmetric matrix to diagonal form - Quadratic forms - Reduction of Quadratic form to Canonical form by Orthogonal reduction		
Unit - II	**Ordinary Differential Equations:**	**9+3**
Linear differential equations of second order with constant coefficients particular integral for the types e^{ax}, x^n (n>0), sinax, cosax, $e^{ax}x^n$, e^{ax}sinbx, e^{ax}cosbx - Differential equations with variable coefficients (Euler's type only).		
Unit - III	**Solution to Algebraic and Transcendental Equations:**	**9+3**
Iteration method: Method of false position - Newton-Raphson method - Solution of linear system of equations: Direct Methods: Gauss elimination and Gauss Jordan methods - Iterative methods: Gauss Jacobi and Gauss Seidel methods.		
Unit - IV	**Interpolation:**	**9+3**
Interpolation with equal intervals: Newton's forward and backward difference formulae –Gauss forward and backward interpolation formulae – Interpolation with unequal intervals: Newton's divided difference formula - Lagrange's interpolation formula.		
Unit - V	**Numerical Differentiation and Integration:**	**9+3**
Differentiation using Newton's forward and backward difference formulae (equal intervals) - Numerical Integration: Trapezoidal rule - Simpsons 1/3rd rule - Double integrals using Trapezoidal and Simpson's rules.		

Lecture:45, Tutorial:15, Total:60

TEXT BOOK:

1. Kandasamy P, Thilagavathy K, Gunavathy K, "Engineering Mathematics For First Year", S.Chand & Co, New Delhi, 2015.

REFERENCES:

1. Kandasamy P, Thilagavathy K, Gunavathy K, "Numerical Methods", 3rd Edition, S.Chand & Co, New Delhi, 2016
2. Veerarajan T, "Engineering Mathematics for first year", 3rd Edition, Tata McGraw-Hill, New Delhi, 2012.

COURSE OUTCOMES: On completion of the course, the students will be able to		**BT Mapped (Highest Level)**
CO1	Interpret the basics of matrix applications	Understanding (K2)
CO2	Solve the second order linear differential equations	Applying (K3)
CO3	Solve polynomial, transcendental equations numerically	Applying (K3)
CO4	Illustrate interpolation techniques for equal and unequal intervals	Analyzing (K4)
CO5	Apply the concepts of numerical differentiation and integration	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	2	1							1	1		1	2	3
CO2	3	2	1	1					1	1		1	2	3
CO3	3	2	1	1					1	1		1	2	3
CO4	3	3	2	2					1	1		1	3	3
CO5	3	2	1	1					1	1		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	30	40	30				100
CAT2	20	30	30	20			100
CAT3	20	30	30	20			100
ESE	20	30	30	20			100

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

18BCC12 - DIGITAL PRINCIPLES

(Common to Computer Systems and Design, Information Systems & Software Systems)

Programme & Branch	B.Sc & Computer Systems and Design	Sem.	Category	L	T	P	Credit
Prerequisites	Nil	1	ES	3	0	2	4

Preamble	To deal with the basic principles of number systems and Boolean algebra and to exemplify the fundamental concepts of combinational and synchronous sequential logic circuits.	
Unit - I	**Digital Systems and Logic Gates:**	**9**
Digital systems - Binary Numbers – Decimal Numbers - Octal Numbers - Hexa Decimal Numbers - Number Base Conversions - Complements (1's Complement and 2's Complement) - Binary codes - Digital logic gates.		
Unit - II	**Boolean Algebra:**	**9**
Basic theorems and properties of Boolean Algebra - Boolean Functions - Minimization: K-Map Method: 2-variable, 3-variable, 4-variable - Don't care conditions - NAND and NOR Implementation.		
Unit - III	**Combinational Logic:**	**9**
Combinational circuits - Design: Half Adder - Full Adder - Half Subtractor - Full Subtractor – Decoders – Encoders – Multiplexers - Demultiplexer.		
Unit - IV	**Synchronous Sequential Logic:**	**9**
Sequential circuits – Latches - SR, D latches - Flip-Flops: SR Flip-Flop, D Flip-Flop, JK Flip-Flop, T Flip-Flop, Characteristic table, Characteristic equation - Analysis of D Flip-Flops, Analysis of T Flip-Flops		
Unit - V	**Registers and Counters:**	**9**
Registers - Types of Shift Registers: SISO, SIPO, PISO, PIPO - Universal Shift Register - Binary Synchronous Counters using T and D Flip flops - Ring Counters - Johnson Counter		

List of Exercises / Experiments :

1.	Verification of logic gates
2.	Verification of code convertor
3.	Verification of parity generator
4.	Verification of half adder and full adder
5.	Verification of half subtractor and full subtractor
6.	Verification of decoder and encoder
7.	Verification of multiplexer and demultiplexer
8.	Verification of SR and JK Flipflops
9.	Verification of T and D Flipflops
10.	Verification of binary and BCD counter

Lecture:45, Practical:30, Total:75

TEXT BOOK:

1.	Mano M. Morris and Ciletti D. Michael, "Digital Design", 5 Edition, Pearson Prentice Hall, 2017.

REFERENCES:

1.	Ghoshal Subrata, "Digital Electronics", 2 Edition, Cengage Learning, Delhi, 2018.
2.	Alam Mansaf, Alam Bashir, "Digital Logic Design", PHI Learning Pvt. Ltd, Delhi, 2016.

COURSE OUTCOMES: On completion of the course, the students will be able to		**BT Mapped (Highest Level)**
CO1	solve problems related to number base conversions and binary codes	Understanding (K2)
CO2	apply the concept of boolean algebra and implement minimization techniques	Applying (K3)
CO3	design the basic combinational circuits	Applying (K3)
CO4	analyze the functions of basic flip-flops	Analyzing (K4)
CO5	apply the concepts of registers and counters	Applying (K3)
CO6	demonstrate various digital ICs and understand their operation	Understanding (K2), Imitation (S1)
CO7	design basic combinational circuits and verify their functionalities	Applying (K3), Imitation (S1)
CO8	apply the design procedures to design basic sequential circuits	Applying (K3), Precision (S3)

Mapping of COs with POs and PSOs														
COs/POs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	2	1								1		1	2	3
CO2	3	2	1	1									2	3
CO3	3	2	1	1									2	3
CO4	3	3	2	2	1								3	3
CO5	3	2	1	1									2	3
CO6	2	1											2	3
CO7	3	2	1	1									2	3
CO8	3	2	1	1									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	30	40	30				100
CAT2	30	30	30	10			100
CAT3	30	40	20	10			100
ESE	30	30	30	10			100

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

18BCC13 - PYTHON PROGRAMMING

(Common to Computer Systems and Design, Information Systems & Software Systems)

Programme & Branch	B.Sc & Computer Systems and Design	Sem.	Category	L	T	P	Credit
Prerequisites	Nil	1	PC	3	0	2	4

Preamble	This course introduces computer programming using Python language. It emphasizes procedural programming, algorithm design and language construction which is common to most of the high level languages.	
Unit - I	**Problem Solving Strategies and Python Basics:**	**9**
Problem Analysis - Algorithms - Flowcharts - Introduction to python: Introduction – Overview - comments - Identifiers - Reserved Keywords – Variables - Standard Data Types - Operators - Statement and Expression - String Operations - Boolean Expressions - Control Statements - Iteration - While statement - Input from keyboard.		
Unit - II	**Functions:**	**9**
Introduction - Built-in Functions - Composition of Functions - User Defined Functions - Parameters and Arguments - Function Calls - Return statement - Recursive Function - Anonymous Functions - Writing python scripts		
Unit - III	**Strings and Lists:**	**9**
Strings: Compound data type - len function - string slices - strings as immutable - String traversal - Escape characters - String Formatting operator - String Formatting functions - Lists: Values and accessing elements - lists are mutable - Traversing a list - deleting elements from list – Built-in list operators – Built-in list methods.		
Unit - IV	**Tuples and Dictionaries:**	**9**
Tuples: Creating tuples - Accessing values in tuples - Tuples are immutable - Tuple Assignment - Tuples as return Values - Variable-length Argument tuples - Basic tuple operations - Built in Tuple Functions - Dictionaries : Creating a dictionary - Accessing values in a dictionary - Updating Dictionary - Deleting elements in Dictionary - Properties of Dictionary keys - Operations in Dictionary - Built in Dictionary Methods.		
Unit - V	**Files:**	**9**
Text Files - Opening a file - Closing a file - File object attributes - Writing to a file - Reading from a file - Renaming a file - Deleting a file - Files related methods – Directories.		

List of Exercises / Experiments :

1.	Develop an algorithm and flowchart for solving simple problems
2.	Develop a python program to perform decision making operations
3.	Develop a python program to perform for and while operations
4.	Develop a python program to manipulate strings
5.	Develop a python program to implement functions
6.	Develop a python program for implementing lists
7.	Develop a python program for implementing tuples
8.	Develop a python program for implementing directories
9.	Develop a python program for manipulating text file

Lecture:45, Practical:30, Total:75

TEXT BOOK:

1.	Balagurusamy E, "Introduction to Computing and Problem Solving using Python", McGraw Hill Education India Pvt Ltd, India, 2017.

REFERENCES:

1.	Nageswara Rao R, "Core Python Programming", 2 Edition, Dreamtech Press, 2018.
2.	Timothy A. Budd, "Exploring Python", NA Edition, McGraw Hill Education, India, 2017.
3.	http://highered.mheducation.com/sites/9352602587/student_view0/index.html

COURSE OUTCOMES: On completion of the course, the students will be able to		**BT Mapped (Highest Level)**
CO1	examine the problem statement by applying problem solving techniques and represent the basic concepts of python	Analyzing (K4)
CO2	solve the simple problem by breaking it down into sub-problem using function	Applying (K3)
CO3	experiment with string and list data structures	Applying (K3)
CO4	utilize tuples and dictionaries for pairing of values	Applying (K3)
CO5	apply the file handling functions to process the data	Applying (K3)
CO6	develop the problem solving skills by applying algorithm and flowchart	Applying (K3), Manipulation (S2)
CO7	modularize the program using functions and to apply the condition and control statements.	Applying (K3), Manipulation (S2)
CO8	implement the apt data structures of python based on the application need	Applying (K3), Precision (S3)

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	2	1								3	3
CO2	3	2	1	1									2	3
CO3	3	2	1	1									2	3
CO4	3	2	1	1									2	3
CO5	3	2	1	1									2	3
CO6	3	2	1	1									2	3
CO7	3	2	1	1									2	3
CO8	3	2	1	1									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	20	20	60				100
CAT2	10	30	60				100
CAT3	15	25	60				100
ESE	20	20	60				100

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

18BCC14 - COMPUTER FUNDAMENTALS AND OFFICE AUTOMATION

(Common to Computer Systems and Design, Information Systems & Software Systems)

Programme & Branch	B.Sc & Computer Systems and Design	Sem.	Category	L	T	P	Credit
Prerequisites	Nil	1	ES	3	0	2	4

Preamble	To emphasize the basics of computers and focuses the functionality of memory units and I/O devices. It also deals with document preparation ,calculation and presentation tools with hands on practices.	
Unit - I	**Basics of Computer:**	**9**
Introduction - Digital and Analog Computers - Characteristics of Computer - History of Computer - Generations of Computer - Classification of Computer - The Computer System - Applications of Computer - Computer System Hardware: Introduction - Central Processing Unit - Memory Unit - Inside a Computer Cabinet.		
Unit - II	**Memory and I/O Devices:**	**9**
Computer Memory: Introduction - Memory Representation - Memory Hierarchy - CPU Registers - Cache Memory - Primary and Secondary Memory - Access types of Storage Devices - Magnetic Tape and Disk - Optical storage - Using the memory - Input and Output Devices: Introduction - Input-Output Unit - Input Devices - Human Data Entry Devices - Source Data Entry Devices - Output Devices.		
Unit - III	**MS Word:**	**9**
Introduction - Starting MS Word - MSWord Screen and its Components - The Office Button - The Ribbon: The Home Tab - The Insert Tab - Page Layout Tab - References Tab - Mailings Tab - Review Tab - View Tab - Help Tab - Solved Examples.		
Unit - IV	**MS Excel:**	**9**
Introduction - Starting MS Excel - Basics of Spreadsheet – MS Excel Screen and its Components - The Office Button - The Ribbon: The Home Tab - The Insert Tab - Page Layout Tab - Formulas Tab - Data Tab - Review Tab - View Tab - Help Tab - Solved Examples.		
Unit - V	**MS PowerPoint:**	**9**
Introduction - Basics of PowerPoint - Starting MS PowerPoint – MS PowerPoint Screen and its Components - The Office Button - The Ribbon: The Home Tab - The Insert Tab - Design Tab - Animations Tab - Slide Show Tab - Review Tab - View Tab - Help Tab-Example applications.		

List of Exercises / Experiments :

1.	To understand physical components of a computer
2.	To examine motherboard layout
3.	Working with Documents, Editing and Formatting
4.	To create an advertisement and apply mail merge
5.	Working with Excel functions and formulas
6.	To apply sorting, filtering and prepare charts
7.	To create power point slide on the given theme
8.	Applying Transition and animation effects to slides

Lecture:45, Practical:30, Total:75

TEXT BOOK:

1. Anita Goel, "Computer Fundamentals", Pearson Education , India, 2015.

REFERENCES:

1. Balagurusamy E, "Fundamentals of Computers", Tata McGraw-Hill Ltd, New Delhi, 2009.
2. Rajaraman, "Fundamentals of Computers", 6 Edition, PHI Learning, 2014.

COURSE OUTCOMES: On completion of the course, the students will be able to		**BT Mapped (Highest Level)**
CO1	determine the functionalities of various components of computer	Understanding (K2)
CO2	compare various memory components and I/O devices	Understanding (K2)
CO3	prepare word document and perform common editing and formatting options	Applying (K3)
CO4	create worksheet and manipulate data using formulas and functions	Analyzing (K4)
CO5	design and format power point presentations by applying transitions and animations	Applying (K3)
CO6	apply editing and processing of word documents and perform mailmerging and macro operations	Applying (K3), Manipulation (S2)
CO7	create workbooks and prepare charts using MS-Excel	Analyzing (K4), Precision (S3)
CO8	prepare slides using MS-Powerpoint	Applying (K3), Manipulation (S2)

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1											2	3
CO2	2	1											2	3
CO3	3	2	1	1							1		2	3
CO4	3	3	2	1	1						1		3	3
CO5	3	2	1	1							1		2	3
CO6	3	2	1	1									2	3
CO7	3	3	2	1	1								3	3
CO8	3	2	1	1									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	30	40	30				100
CAT3	30	30	30	10			100
ESE	25	25	40	10			100

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

18BCC21 - COMMUNICATIVE ENGLISH II

(Common to Computer Systems and Design, Information Systems & Software Systems)

Programme & Branch	B.Sc & Computer Systems and Design	Sem.	Category	L	T	P	Credit
Prerequisites	Nil	2	HS	3	0	2	4

Preamble	To construct sentences effectively and facilitate to improve interpersonal skills of the learners. It can also provide good exposure in the field of communication.	
Unit - I	**Grammar & Vocabulary:**	**9**
Synonyms and antonyms – Meaning-based classification of sentences - Imperative, positive, negative, interrogative and exclamative; Reading: Passages focusing on factual details, and features of text organization as well as gist, opinions and attitudes; Writing: Note-making. Activities: Listening: Social Conversations; Speaking: Presentation		
Unit - II	**Grammar & Vocabulary:**	**9**
Homonyms and homophones- Interrogative sentences- Reading: Gapped-text exercises; Writing: Graphic presentation and Transcoding. Activities: Listening: Telephone conversations. Speaking: Role-Play		
Unit - III	**Grammar & Vocabulary:**	**9**
Articles and determiners- Structure-based classification of sentences - Simple, compound and complex sentences- Reading: Multiple-matching- Writing: Essays. Activities: Listening: Group Discussions- Speaking: Group Discussion.		
Unit - IV	**Grammar & Vocabulary:**	**9**
Prepositions - Active and normal and impersonal passive voice; Reading: BEC (Business English Certificate) type exercises; Writing: Informal reports. Activities: Listening: Motivational Talks- Speaking: Soft skills		
Unit - V	**Grammar & Vocabulary:**	**9**
Conjunctions and discourse markers and text organization; Reading: IELTS (International English Language Testing System) type exercises- Writing: Reports. Activities: Listening: TED Talks; Speaking: Mock-Interviews		

List of Exercises / Experiments :

	Listening/ DVD, podcasts and Authentic Videos	Speaking
1	Professional Presentation: Preparation	Self-introduction in detail and One-minute self introduction
2	Professional Presentation: Delivery	Presentation on a topic
3	Telephone Etiquette	Role play
4	Telephone Conversations	Answering Interview Questions
5	Group Discussion I	Participating in a GD (with prior preparation)
6	Group Discussion II	Participating in a GD (without preparation)
7	Soft Skills I	Speaking on goal-setting, motivation, positive thinking etc.
8	Soft Skills II	Speaking on time and stress management, emotional intelligence, working in teams, conflict resolution, negotiation etc.
9	Job Interview I	Group Activity-I
10	Job Interview II	Group Activity-II

Lecture:45, Practical:30, Total:75

TEXT BOOK:

1.	Raymond Murphy, "Intermediate English Grammar: Reference and Practice for South Asian Students Cambridge", Cambridge University Press, 2011.

COURSE OUTCOMES: On completion of the course, the students will be able to		**BT Mapped (Highest Level)**
CO1	use structural words appropriately in spoken and written texts	Remembering (K1)
CO2	construct different types of sentences	Applying (K3)
CO3	read longer academic and business English texts with maximum understanding	Understanding (K2)
CO4	write beyond the sentence level	Applying (K3)
CO5	communicate effectively in a vast range of personal, professional, academic, and cultural situations	Applying (K3)
CO6	understand the videos through effective listening (Presentation, telephone etiquette, Group Discussion and Soft skills)	Understanding (K2), Precision (S3)
CO7	Reconstruct the information by their own after effectively listening	Evaluating (K5), Imitation (S1)
CO8	Take part in Group Discussion, Paper or project presentation, mock interview and acquire knowledge on soft skills	Analyzing (K4), Manipulation (S2)

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1								2	2		2	2	3
CO2	3	2	1	1					2	3		2	2	3
CO3	2	1							2	3		2	2	3
CO4	3	2	1	1					2	3		2	2	3
CO5	3	2	1	1					2	3		2	2	3
CO6	2	1							2	3		2	2	3
CO7	3	3	3	3	2				2	3		2	3	3
CO8	3	3	2	2	1				2	3		2	3	3

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

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	10	10	40	10		30	100
CAT2	10	10	50			30	100
CAT3	10	10	50			30	100
ESE	10	10	40	10		30	100

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

18BCT21 - MATHEMATICS II

(Common to Computer Systems and Design, Information Systems & Software Systems)

Programme & Branch	B.Sc & Computer Systems and Design	Sem.	Category	L	T	P	Credit
Prerequisites	Nil	2	BS	3	1	0	4

Preamble	To introductory course which inculcate the knowledge of Statistics and its application in the field of business and also it gives adequate exposure in the basic concepts of test of hypothesis and control charts	
Unit - I	**Statistical Measures:**	**9+3**
Measures of central tendency: mean, median, mode - Measures of dispersion: Range, quartile deviation, mean deviation, standard deviation.		
Unit - II	**Curve Fitting::**	**9+3**
Evaluation of constants by the method of group averages: Fitting a straight line– Equations involving three constants of the form $y = a+bx+cx^2$, $y= ax^b+c$, $y=ab^x +c$ and $y= ae^{bx} + c$ – Method of least squares : Fitting a straight line - Fitting a parabola – Fitting an exponential curve .		
Unit - III	**Correlation and Linear Regression:**	**9+3**
Karl Pearson's coefficient of correlation - Spearman's rank correlation - Regression coefficients - Regression lines.		
Unit - IV	**Test of Significance for Small Samples:**	**9+3**
Introduction to sampling distributions - Types of sampling - Standard Error - t-test of significance for single mean - t-test for difference of means of two small samples - F-test of significance - Chi-square distribution.		
Unit - V	**Statistical Quality Control:**	**9+3**
Control Charts - Types of Control Charts - Mean Chart- R- Chart, σ- Chart, C-Chart (Number of Defectives) - P-Chart (Fraction Defective) .		

Lecture:45, Tutorial:15, Total:60

TEXT BOOK:

1. Gupta S.P, "Statistical Methods", 41st Edition, Sultan Chand & Sons, New Delhi, 2011.

REFERENCES:

1. Kandasamy P, Thilagavathy K and Gunavathy K, "Probability Statistics and Queueing Theory", S.Chand, 2006.
2. Kandasamy P, Thilagavathy K and Gunavathy K, "Numerical Methods",3rdEdition, S.Chand and Co, New Delhi, 2014.

COURSE OUTCOMES: On completion of the course, the students will be able to		**BT Mapped (Highest Level)**
CO1	determine the mean, median and mode for ungrouped and grouped data	Understanding (K2)
CO2	estimate curve fitting	Applying (K3)
CO3	identify when correlation and regression analyses are appropriate	Applying (K3)
CO4	analyze the testing of hypothesis and formulate null and alternative hypothesis	Analyzing (K4)
CO5	evaluate a process variable over time using control charts	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	2	1										2	2	3
CO2	3	2	1	1								2	2	3
CO3	3	2	1	1								2	2	3
CO4	3	3	2	2	1							2	3	3
CO5	3	2	1	1	2							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	30	40	30				100
CAT2	20	30	30	20			100
CAT3	30	30	20	20			100
ESE	20	20	30	30			100

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

18BCC22 BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING

(Common to Computer Systems and Design, Information Systems & Software Systems)

Programme & Branch	B.Sc & Computer Systems and Design	Sem.	Category	L	T	P	Credit
Prerequisites	Nil	2	ES	3	0	2	4

Preamble	To emphasize the fundamental concepts and overview of Electrical and Electronics Engineering for beginners.	
Unit - I	**Power Generation:**	**9**
[Excluding problems]: Introduction-Conventional Energy: Generating Systems-Schematic arrangements of Steam (Thermal) Power Station - Nuclear power station - Gas turbine power station- Comparison of the power plants. Non-conventional energy: Solar energy – Wind energy.		
Unit - II	**Fundamentals of AC and DC Circuits:**	**9**
Basic concepts of Electric Field, Electric Current, Electric Potential, Potential Difference, Electric Work, Electric Power & Electric Energy. Ohm's law, Kirchhoff's law: Kirchhoff's Current Law, Kirchhoff's Voltage Law. Alternating Voltage and Current: Waveform, Cycle, Time period and Frequency, RMS and Average value, Form factor, Peak factor for Sine wave only. Wiring Diagram for Fluorescent Lamp and Staircase.		
Unit - III	**Fundamentals of Electronic Devices:**	**9**
Basics concept of Conductors, Insulators, Semiconductors. Construction, Characteristics and Applications: PN Junction diode, Zener diode, Bipolar Junction Transistor.		
Unit - IV	**Converters:**	**9**
[Excluding problems]: Working principles of Half wave rectifier, Full wave Bridge rectifier –Working Operation of Switched Mode Power Supply (SMPS), Uninterrupted Power Supply (UPS) (block diagram only).		
Unit - V	**Electrical Machines:**	**9**
[Excluding problems]: Faraday's law - Lenz's law - Fleming's left and right-hand rule. Principle, Construction and Applications of: DC Generator, DC Motor, Single Phase Transformer.		

List of Exercises / Experiments :

1.	Verification of Ohm's Law.
2.	Verification of Kirchhoff's Law.
3.	Power Measurement in DC Circuits
4.	VI characteristics of PN junction diode.
5.	VI characteristics of Zener diode.
6.	Voltage Regulator using Zener diode.
7.	Single phase Power Measurement Using Voltmeter and Ammeter
8.	Open circuit Test on D.C. Shunt Generator
9.	Load Test on Single Phase Transformer
10.	Load Test on Single Phase induction Motor

Lecture:45, Practical:30, Total:75

TEXT BOOK:

1.	Prasad P.V, Sivanagaraju S, Prasad R, " Basic Electrical and Electronics Engineering ", Cengage Learning India Pvt. Ltd, 2017.

REFERENCES:

1.	Salivahanan S, " Electronic Devices ", 2 Edition, McGraw Hill Education (India) Pvt. Ltd, New Delhi , 2016.
2.	Chakrabarti Abhijit, Debnath Sudipta, " Electrical Machines ", McGraw Hill Education (India) Pvt. Ltd, New Delhi , 2015.

REFERENCES/MANUAL/SOFTWARE:

1.	Laboratory Manual

COURSE OUTCOMES: On completion of the course, the students will be able to		**BT Mapped (Highest Level)**
CO1	explain the different sources of energy and types of power plants	Understanding (K2)
CO2	analyze the Direct and Alternating Circuits	Analyzing (K4)
CO3	demonstrate the principles of basic electronic devices	Understanding (K2)
CO4	apply the electronic devices principles in the design of converters	Applying (K3)
CO5	demonstrate the working of DC machines and AC transformer	Understanding (K2)
CO6	compute parameters in DC and AC circuits.	Understanding (K2), Imitation (S1)
CO7	conduct experiments to learn characteristics of PN junction diode and Zener diode	Understanding (K2), Manipulation (S2)
CO8	perform suitable test and analyze the performance of transformer and single-phase induction motor	Analyzing (K4), Manipulation (S2)

Mapping of COs with POs and PSOs														
COs/POs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	2	1											2	3
CO2	3	3	2	2	1								3	3
CO3	2	1											1	2
CO4	3	2	1	1									2	3
CO5	2	1											2	3
CO6	2	1											2	3
CO7	2	1											2	3
CO8	3	3	2	2	1								3	3
1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy														

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

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

18BCC23 - OBJECT ORIENTED PROGRAMMING USING PYTHON

(Common to Computer Systems and Design, Information Systems & Software Systems)

Programme & Branch	B.Sc & Computer Systems and Design	Sem.	Category	L	T	P	Credit
Prerequisites	18BCC13	1	PC	3	0	2	4

Preamble	To focus on problem solving aspects of object oriented environment using python by emphasizing the coding and debugging practices.	
Unit - I	**Introduction to OOP and Classes:**	**9**
Features of OOP - Classes and Objects: Creating Class - self variable- Constructor - Types of variable- Namespace - Types of methods - Objects - Passing members of one class to another class - Inner classes.		
Unit - II	**Inheritance and Polymorphism:**	**9**
Constructors in Inheritance- Overriding super class constructors and methods - Super() Method - Types of Inheritance –MRO-Polymorphism-Operator overloading - Method overloading – Method Overriding.		
Unit - III	**Abstraction, Interfaces and Regular Expression:**	**9**
Abstract Classes and Abstract Methods – Interfaces in Python– Abstract classes Vs Interfaces-Regular Expression: Sequence Characters- Quantifiers-Special Characters.		
Unit - IV	**Exception Handling:**	**9**
Errors and Exceptions – Exception handling- Types of Exceptions – Except Block – Assert Statement – User-defined Exceptions-Logging the Exceptions.		
Unit - V	**Exception Handling:**	**9**
Errors and Exceptions – Exception handling- Types of Exceptions – Except Block – Assert Statement – User-defined Exceptions-Logging the Exceptions.		

List of Exercises / Experiments :

1.	Develop a python program to find Area of a rectangle using classes and object
2.	Develop a python program for finding Area of different shapes using method overloading
3.	Develop a python program to check whether the given string is palindrome
4.	Develop a python program for Addition of different data types using operator overloading
5.	Develop a python program to implement Object manipulation using constructor and destructor
6.	Develop a python program to prepare Students mark sheet using inheritance
7.	Develop a python program for Employee salary calculation using interface
8.	Develop a python program for Arithmetic exception
9.	Develop a python program for Addition of three number using threads

Lecture:45, Practical:30, Total:75

TEXT BOOK:

1.	Nageswara Rao, "The Core Python Programming", 2 Edition, Dreamtech Press, New Delhi, 2018.

REFERENCES:

1.	Timothy A. Budd, "Exploring Python", NA Edition, McGraw Hill Education, India, 2017.
2.	Sheetal Taneja, Naveen Kumar, "Python Programming: A Modular Approach, Pearson, 2017.
3.	https://realpython.com/python3-object-oriented-programming/

COURSE OUTCOMES: On completion of the course, the students will be able to		**BT Mapped (Highest Level)**
CO1	give description about the basic concepts of Classes and Objects	Understanding (K2)
CO2	experiment with Inheritance and Polymorphism	Applying (K3)
CO3	interpret the level of abstractions and regular expressions	Understanding (K2)
CO4	examine the types of run-time error and the mechanism to handle it	Analyzing (K4)
CO5	construct programs to perform single and multiple tasking	Applying (K3)
CO6	develop programs using classes and objects for a given application	Applying (K3), Manipulation (S2)
CO7	implement different forms of polymorphism and inheritance	Applying (K3), Manipulation (S2)
CO8	implement the concept of exception and perform parallel processing using threads	Applying (K3), Manipulation (S2)

Mapping of COs with POs and PSOs														
COs/POs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	2	1											2	3
CO2	3	2	1	1									2	3
CO3	2	1											2	3
CO4	3	3	2	2	1								3	3
CO5	3	2	1	1									2	3
CO6	3	2	1	1									2	3
CO7	3	2	1	1									2	3
CO8	3	2	1	1									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	20	20	60				100
CAT2	10	30	50	10			100
CAT3	15	25	50	10			100
ESE	20	40	40				100

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

18BCT22 - INTRODUCTION TO SOFTWARE ENGINEERING

(Common to Computer Systems and Design, Information Systems & Software Systems)

Programme & Branch	B.Sc & Computer Systems and Design	Sem.	Category	L	T	P	Credit
Prerequisites	Nil	2	PC	3	0	0	3

Preamble	To introduce the basic software engineering concepts and software development process models. It also focuses on requirement analysis, cost estimation, design and coding principles and practices in software engineering.	
Unit - I	**Introduction and Software Process:**	**9**
The Problem Domain – Software Engineering Challenges - Software Engineering Approach - Software Processes: Software Process - Desired Characteristics of Software Process – Software Development Process Models-Case Study: Identification and analysis of process model.		
Unit - II	**Software Requirements Analysis and Specification:**	**9**
Software Requirements – Problem Analysis - Requirement Specification - Functional Specification with Use Cases – Validation – Metrics-Case Study: Requirement specification for a given project.		
Unit - III	**Planning a Software Project:**	**9**
Process Planning – Effort Estimation – Project Scheduling and Staffing – Software Configuration Management Plan – Quality Plan – Risk Management – Project Monitoring Plan-Case Study: Effort Estimation using COCOMO Model		
Unit - IV	**Function Oriented Design:**	**9**
Design Principles -Module Level Concepts - Design Notation and Specification - Structured Design Methodology - Verification – Metrics-Case Study: Data Flow Diagram for a given project.		
Unit - V	**Coding and Testing:**	**9**
Programming Principles and Guidelines – Common Coding Errors – Structured Programming - Information Hiding – Programming Practices – Coding Standards - Coding Process – Refactoring – Verification – Metrics-Testing Fundamentals.		

Total:45

TEXT BOOK:

1. Jalote Pankaj, "An Integrated Approach to Software Engineering", 3 Edition, Narosa Publishing House, New Delhi, 2014.

REFERENCES:

1. Pressman, Roger S, "Software Engineering: A Practitioner's Approach", 7 Edition, McGraw-Hill, New York, 2014.
2. Sommerville Ian, "Software Engineering", 10 Edition, Pearson, 2015.

COURSE OUTCOMES: On completion of the course, the students will be able to		**BT Mapped (Highest Level)**
CO1	determine the appropriate process model for a given software application	Understanding (K2)
CO2	practice to write software requirement specification	Understanding (K2)
CO3	calculate effort estimation using COCOMO model	Applying (K3)
CO4	design a conceptual model for a given project	Applying (K3)
CO5	apply the essential programming practices for software development	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	2	1											2	3
CO2	2	3											2	3
CO3	3	2	1	1									2	3
CO4	3	2	1	1									2	3
CO5	3	2	1	1									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	30	70					100
CAT2	30	50	20				100
CAT3	20	40	40				100
ESE	20	40	40				100

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

18BCT31 - JAVA PROGRAMMING

(Common to Computer Systems and Design, Information Systems & Software Systems)

Programme & Branch	B.Sc & Computer Systems and Design	Sem.	Category	L	T	P	Credit
Prerequisites	18BCC23	3	PC	3	0	0	3

Preamble	To introduce the core aspects of Java programming. It emphasizes on developing Java programs with object oriented features, packages, interfaces and applets.	
Unit - I	**Introduction:**	**9**
Java Evolution: Java History - Features - Java and WWW - Web Browsers. Overview of Java Language: Simple Java Program - Java Program Structure - Java Tokens - Java Statements - Installing and Configuring Java - Implementing a Java Program - Java Virtual Machine - Command Line Arguments - Constants, Variables and Data Types.		
Unit - II	**Expressions, Decision Making Statements, Classes and Objects:**	**9**
Operators and Expressions - Decision Making and Branching - Decision Making and Looping. Classes, Objects and Methods: Introduction to Class - Defining a Class - Fields Declaration - Methods Declaration - Creating Objects - Accessing Class Members - Constructors - Method Overloading - Static Members - Nesting of Methods - Inheritance - Overriding methods.		
Unit - III	**Arrays, Strings, Vectors and Interfaces:**	**9**
One Dimensional Array - Creating an Array - Two Dimensional Arrays – Strings – Vectors – Wrapper Classes. Interfaces: Defining Interfaces - Extending Interfaces - Implementing Interfaces - Accessing Interface Variables.		
Unit - IV	**Packages and Multithreaded Programming:**	**9**
Packages: Java API Packages - Using System Packages - Naming Conventions - Creating Packages - Accessing a Package - Using a Package - Adding a Class to a Package - Hiding Classes. Multithreaded Programming: Creating Threads - Extending the Thread Class - Stopping and Blocking a Thread - Life Cycle of a Thread - Using Thread Methods - Implementing the Runnable Interface.		
Unit - V	**Exceptions and Applet Programming:**	**9**
Managing Errors and Exceptions: Types of Errors - Exceptions - Syntax of Exception Handling Code - Multiple Catch Statements - Using Finally Statement. Applet Programming: Introduction - Applets Vs Applications - Writing Applets - Building Applet Code - Applet Life Cycle - Creating an Executable Applet - Designing a Web Page - Applet Tag - Adding Applet to HTML File - Running the Applet.		

Total:45

TEXT BOOK:

1. Balagurusamy E, "Programming with Java A Primer", 5 Edition, McGraw Hill Education, New Delhi, 2017.

REFERENCES:

1. Schildt Herbert, "Java: The Complete Reference", 11 Edition, McGraw Hill Education, India, 2018.
2. Cay S. Horstmann, "Core Java Volume I—Fundamentals", 11 Edition, Prentice Hall, 2018.

COURSE OUTCOMES: On completion of the course, the students will be able to		**BT Mapped (Highest Level)**
CO1	understand the basics of Java and object oriented programming	Understanding (K2)
CO2	solve the real time problems using classes and objects	Applying (K3)
CO3	apply arrays, strings, vectors and interfaces in program	Applying (K3)
CO4	apply multithreading concepts and to create own user defined packages	Applying (K3)
CO5	handle the run time errors and to develop simple applets and graphics	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	2	1											2	3
CO2	3	2	1	1									2	3
CO3	3	2	1	1									2	3
CO4	3	2	1	1									2	3
CO5	3	2	1	1									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	15	30	55				100
CAT2	10	30	60				100
CAT3	15	20	65				100
ESE	20	20	60				100

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

18BCT32 - OPERATING SYSTEMS

(Common to Computer Systems and Design, Information Systems & Software Systems)

Programme & Branch	B.Sc & Computer Systems and Design	Sem.	Category	L	T	P	Credit
Prerequisites	18BCC14	3	PC	3	0	0	3

Preamble	This course imparts the role of operating system in managing the process, memory and storage. It also demonstrates disk scheduling problems, deadlocks and synchronization issues.	
Unit - I	**Overview of Operating System and System Calls:**	**9**
Role of Operating System - Operating System Structure - Operating System Operations - Process Management - Memory Management - Storage Management - Computing Environments. System Structures: System Calls - Types of System Calls		
Unit - II	**Process Concept, Multithreading and Process Scheduling:**	**9**
Process Concept - IPC. Multithreaded Programming: Overview - Multithreading Models. Process Scheduling: Basic concepts - Scheduling criteria. Scheduling algorithms: FCFS - SJF - Round Robin - Priority. Case Study: Job Scheduling.		
Unit - III	**Synchronization and Deadlock:**	**9**
Background - Critical Section Problem - Peterson`s Solution - Semaphores. Classic Problems of Synchronization: Producer Consumer problem - Dining Philosopher`s problem. Deadlock: System Model - Characterization - Methods for handling Deadlock - Deadlock Prevention - Deadlock Avoidance - Deadlock Detection - Recovery from Deadlock.		
Unit - IV	**Memory Management and Virtual Memory:**	**9**
Memory Management Strategies: Background - Swapping - Contiguous Memory Allocation - Paging - Structure of Page Table - Segmentation. Virtual Memory Management: Demand Paging - Copy on Write. Page Replacement: FIFO - LRU - Optimal.		
Unit - V	**File System Implementation and Secondary Storage Structure:**	**9**
File System: File concept - Access Methods - Directory and Disk Structure. Implementing File systems: File System Implementation - Directory Implementation - Allocation Methods. Secondary Storage Structure: overview - Disk Scheduling - FCFS - SSTF - SCAN - CSCAN - LOOK.		

Total:45

TEXT BOOK:

1. Silberschatz Abraham, Galvin B Peter and Gagne Greg, “Operating System Concept", 9 Edition, Wiley IndiaPvt. Ltd, NewDelhi, 2016.

REFERENCES:

1. Andrew S. Tanenbaum, Albert S. Woodhull, "Operating Systems, Design and Implementation", 8 Edition, Pearson Prentice Hall, 2009.
2. Deitel H.M, "Operating Systems", 3 Edition, Pearson Education, 2009.

COURSE OUTCOMES: On completion of the course, the students will be able to		**BT Mapped (Highest Level)**
CO1	explain the role of operating system to manage the resources with system calls	Understanding (K2)
CO2	design multithreading models and solve the scheduling algorithms	Applying (K3)
CO3	analyze the critical section problem and inspect the safe state of the system to avoid deadlock	Analyzing (K4)
CO4	apply the memory management strategies and analyze the best page replacement algorithm	Applying (K3)
CO5	design solutions for problems related to secondary storage management with an understanding of file systems and disk scheduling	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	2	1											2	3
CO2	3	2	1	1									2	3
CO3	3	3	2	2	1								3	3
CO4	3	2	1	1									2	3
CO5	3	2	1	1									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	30	40	30				100
CAT2	20	30	30	20			100
CAT3	30	30	40				100
ESE	25	30	30	15			100

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

18BCT33 - DATA STRUCTURES

(Common to Computer Systems and Design, Information Systems & Software Systems)

Programme & Branch	B.Sc & Computer Systems and Design	Sem.	Category	L	T	P	Credit
Prerequisites	Nil	3	PC	3	0	0	3

Preamble	This course imparts the basic data structure operations and algorithms. This course also discusses the application of the data structures	
Unit - I	**Arrays and Stacks:**	**9**
Definition, Structure and properties of algorithm – Development of an algorithm – data structures and algorithms – Data Structure definition and classification – Arrays: Introduction – array operations – Number of elements in an array – Representation of arrays in memory – Applications of arrays: Sparse matrix- Stacks: Introduction- Stack Operations - Applications of stacks: Evaluations of postfix expressions.		
Unit - II	**Queues and Linked Lists:**	**9**
Queues: Introduction – Operations on queues – Circular Queues – Other types Queue –Application of Linear queues : Time sharing system– Linked Lists: Introduction – Singly linked lists - Circularly linked lists - Doubly Linked Lists – Application of Linked List: Polynomial addition		
Unit - III	**Trees:**	**9**
Introduction – Trees Definitions and basic terminologies – representation of tress - Binary Trees: Basic terminologies and types - Representation of Binary Trees – Binary tree traversals – Threaded of Binary Tree – Applications of Tress : Expression trees.		
Unit - IV	**Graphs:**	**9**
Introduction – Definitions and basic terminologies - Representation of graphs – Graph Traversals: Breadth first search – Depth first search – Application of Graphs: Single source shortest path problem.		
Unit - V	**Sorting and Searching:**	**9**
Sorting: Selection Sort – Bubble Sort – Quick Sort – Heap Sort – Radix Sort – Searching Techniques: Linear Search - Binary Search.		

Total:45

TEXT BOOK:

1. Vijayalakshmi Pai G.A, "Data Structures and algorithms – Concepts, Techniques and Applications", 1 Edition, McGraw Hill Education, 2017.

REFERENCES:

1. Tremblay J.P. and Sorensen P.G, "An Introduction to Data Structures with Applications", 2 Edition, Tata McGraw Hil, New Delhi, 2013.
2. Reema Thareja, "Data Structures Using C", 2 Edition, Oxford University Press, 2014.

COURSE OUTCOMES: On completion of the course, the students will be able to		**BT Mapped (Highest Level)**
CO1	develop an algorithm for a problem statement	Applying (K3)
CO2	apply the concept of queue and linked list	Applying (K3)
CO3	apply the concept of linked list for trees	Applying (K3)
CO4	demonstrate the functionalities of graph	Applying (K3)
CO5	illustrate sorting and searching techniques	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	2	1	1									2	3
CO2	3	2	1	1									2	3
CO3	3	2	1	1									2	3
CO4	3	2	1	1									2	3
CO5	2	1											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	35	40	25				100
CAT2	35	35	30				100
CAT3	35	40	25				100
ESE	35	40	25				100

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

18BCT34 - COMPUTER ARCHITECTURE

(Common to Computer Systems and Design, Information Systems & Software Systems)

Programme & Branch	B.Sc & Computer Systems and Design	Sem.	Category	L	T	P	Credit
Prerequisites	18BCC12	3	PC	3	1	0	4

Preamble	To cover the basics of organization and architecture of a digital computer. It also emphasis arithmetic operations, instruction processing and pipelining.	
Unit - I	**Basic Structure and Machine Instructions:**	**9+3**
Computer Types- Functional Units- Operational Concepts- Bus Structures- Software- Performance- Multiprocessors and Multicomputers. Machine Instructions: Numbers, Arithmetic Operations and Characters- Memory Locations and Addresses Memory Operations- Instructions and Instruction Sequencing- Addressing Modes.		
Unit - II	**Input/Output Organization:**	**9+3**
Accessing I/O Devices- Interrupts- Direct Memory Access- Buses-Interface Circuits- Standard I/O Interfaces.		
Unit - III	**Memory System:**	**9+3**
Basic Concepts - Semiconductor RAM Memories - Read-Only Memories - Speed, Size and Cost - Cache Memories: Mapping Functions - Replacement Algorithms - Example of Mapping Techniques - Examples of Caches in Commercial Processors - Virtual Memories.		
Unit - IV	**Arithmetic:**	**9+3**
Addition and Subtraction of Signed Numbers - Design of Fast Adders - Multiplication of Positive Numbers – Signed-Operand Multiplication - Fast Multiplication - Integer Division - Floating Point Numbers and Operations.		
Unit - V	**Processing Unit and Pipelining:**	**9+3**
Fundamental Concepts- Execution of a Complete Instruction-Multiple Bus Organization- Hardwired Control-Microprogrammed Control. Pipelining: Basic Concepts- Data Hazards- Instruction Hazards.		

Lecture:45, Tutorial:15, Total:60

TEXT BOOK:

1. Hamacher Carl, Vranesic Zvonko, Zaky Safwat, "Computer Organization", 5 Edition, McGraw Hill Education, 2016.

REFERENCES:

1. Stallings William, "Computer Organization and Architecture Designing for Performance", 10 Edition, Pearson Education, 2016.
2. Rajaraman V. and Radhakrishnan T, "Computer Organization and Architecture", 4 Edition, Prentice Hall of India, NA, 2011.

COURSE OUTCOMES: On completion of the course, the students will be able to		**BT Mapped (Highest Level)**
CO1	describe the basic instruction types and addressing modes	Understanding (K2)
CO2	outline the I/O organization of computer	Understanding (K2)
CO3	interpret the different memory types of a system	Applying (K3)
CO4	compute the various arithmetic operations	Applying (K3)
CO5	outline the processing units and pipelining concepts	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	2	1											2	3
CO2	2	1											2	3
CO3	3	2	1	1									2	3
CO4	3	2	1	1									2	3
CO5	3	2	1	1									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	16	56	28				100
CAT2	16	52	32				100
CAT3	16	56	28				100
ESE	10	52	38				100

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

18BCL31 - JAVA PROGRAMMING LABORATORY

(Common to Computer Systems and Design, Information Systems & Software Systems)

Programme & Branch	B.Sc & Computer Systems and Design	Sem.	Category	L	T	P	Credit
Prerequisites	18BCC14	3	PC	0	0	2	1

List of Exercises / Experiments :

1.	Implementation of classes and objects using Java.
2.	Implementation of command line arguments in Java.
3.	Implementation of various types of constructors in a class.
4.	Overloading a method within a class.
5.	Implementation of inheritance and method overriding.
6.	Implementation of multiple inheritances using interface
7.	Create and import a user defined package.
8.	Implementation of multithreading concept.
9.	Implementation of exception handling mechanisms.
10.	Create simple graphics using Applet programming

Total:30

REFERENCES/MANUAL/SOFTWARE:

1.	Laboratory Manual

COURSE OUTCOMES: On completion of the course, the students will be able to		**BT Mapped (Highest Level)**
CO1	demonstrate classes and objects with tokens	Applying (K3), Imitation (S1)
CO2	implement interface and packages for the given application	Applying (K3), Manipulation (S2)
CO3	demonstrate a simple applet with graphics and handle the exception	Applying (K3), Precision (S3)

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									2	3
CO2	3	2	1	1									2	3
CO3	3	2	1	1									2	3
1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy														

18BCL32 - OPERATING SYSTEMS LABORATORY

(Common to Computer Systems and Design, Information Systems & Software Systems)

Programme & Branch	B.Sc & Computer Systems and Design	Sem.	Category	L	T	P	Credit
Prerequisites	18BCC14	3	PC	0	0	2	1

List of Exercises / Experiments :

1.	Implementation of basic Unix commands.
2.	Implementation of the process control System calls.
3.	Implementation of Inter Process Communication using shared memory.
4.	Implementation of producer consumer problem.
5.	Implementation of Semaphores using IPC
6.	Implementation of FCFS scheduling.
7.	Implementation of SJF scheduling.
8.	Implementation of FIFO page replacement algorithm.
9.	Implementation of LRU page replacement algorithm.
10.	Implementation of file operations.

Total:30

REFERENCES/MANUAL/SOFTWARE:

1.	Laboratory Manual

COURSE OUTCOMES: On completion of the course, the students will be able to		**BT Mapped (Highest Level)**
CO1	demonstrate inter process communication with the system calls	Applying (K3), Imitation (S1)
CO2	perform scheduling with the given set of process	Applying (K3), Manipulation (S2)
CO3	demonstrate the page replacement problems	Applying (K3), Manipulation (S2)

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									2	3
CO2	3	2	1	1									2	3
CO3	3	2	1	1									2	3

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

18BCL33 - DATA STRUCTURES LABORATORY

(Common to Computer Systems and Design, Information Systems & Software Systems)

Programme & Branch	B.Sc & Computer Systems and Design	Sem.	Category	L	T	P	Credit
Prerequisites	Nil	3	PC	0	0	2	1

List of Exercises / Experiments :

1.	Implementation of Stack operations
2.	Conversion of Infix expression to Postfix expression using Stack
3.	Implementation of Queue Operations
4.	Demonstration of Circular Queue Operations
5.	Implementation of Linked List Operations
6.	Polynomial addition using Linked List
7.	Binary Tree Creation and Traversal
8.	Performing Selection Sort and Quick Sort
9.	Performing Linear and Binary Search
10.	Implementation of Graph Representation

Total:30

REFERENCES/MANUAL/SOFTWARE:

1.	Laboratory Manual

COURSE OUTCOMES: On completion of the course, the students will be able to		**BT Mapped (Highest Level)**
CO1	code the operations of stack and queue	Applying (K3), Imitation (S1)
CO2	perform sorting and searching on a given dataset	Applying (K3), Manipulation (S2)
CO3	solve the problem by applying programming skills	Applying (K3), Precision (S3)

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									2	3
CO2	3	2	1	1									2	3
CO3	3	2	1	1									2	3
1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy														

18BCT41 - COMPUTER NETWORKS

(Common to Computer Systems and Design, Information Systems & Software Systems)

Programme & Branch	B.Sc & Computer Systems and Design	Sem.	Category	L	T	P	Credit
Prerequisites	NIL	4	PC	3	1	0	4

Preamble	To provide an overview of computer network architecture, technologies available to build a computer network and protocols in use at different layers of networks	
Unit - I	**Introduction:**	**9+3**
Overview of the Internet: Networks- Switching- The Internet- Accessing the Internet- Hardware and Software – Protocol Layering: Scenarios-TCP/IP Protocol Suite-The OSI Model- Standards and Administration: Internet Standards- Internet Administration. Transmission Media: Guided Media-Unguided Media: Wireless		
Unit - II	**Application Layer:**	**9+3**
Introduction: Providing Services-Application Layer Paradigm-Client-Server Paradigm: Application Programming Interface-Using Services of the Transport Layer-Standard Client-Server Applications: World Wide Web and HTTP-FTP-Electronic Mail-TELNET-Secure Shell (SSH)-Domain Name System (DNS)-Socket Interface Programming		
Unit - III	**Transport Layer:**	**9+3**
Introduction: Transport Layer Services- Transport Layer Protocols: Simple Protocol-Stop and Wait Protocol-Go Back N Protocol-Selective Repeat Protocol- Bidirectional Protocols: Piggybacking- Internet Transport Layer Protocols-User Datagram Protocol (UDP): User Datagram-UDP Services-UDP Applications-Transmission Control Protocol (TCP):TCP Services-TCP Features- Segment-TCP Connection- State Transition Diagram-Windows in TCP-Flow Control-Error Control-TCP Congestion Control		
Unit - IV	**Network Layer:**	**9+3**
Introduction: Network Layer Services - Network Layer Congestion - Structure of a router - Network Layer Protocols: IPv4 Datagram format - IPv4 Addresses - Next Generation IP: IPv6 Addressing - Unicast Routing: Routing algorithms - Unicast Routing Protocols		
Unit - V	**Data Link Layer:**	**9+3**
Introduction - Data Link Control (DLC): Framing-Flow and Error Control - Error Detection and Correction - Two DLC Protocols - Multiple Access Protocols (MAC): Random Access -Controlled Access – Channelization - Link Layer Addressing - Wired LANs: Ethernet Protocol: IEEE Project 802 - Standard Ethernet - Virtual LANs		

Lecture:45, Tutorial:15, Total:60

TEXT BOOK:

1. Forouzan Behrouz A, Moshrraf Firouz, "Computer Networks A Top-Down Approach", 1 Edition, McGraw –Hill Education, India, 2018.

REFERENCES:

1. Kurose F. James, Ross W. Keith, "Computer Networking A Top-Down Approach", 7 Edition, Pearson Education, 2018.
2. Davie Bruce S., and Peterson Larry L, "Computer Networks a Systems Approach", 5 Edition, Morgan Kaufmann, 2012.

COURSE OUTCOMES: On completion of the course, the students will be able to		**BT Mapped (Highest Level)**
CO1	explain the overview of the Internet, layered architecture and the data transfer through the Internet	Understanding (K2)
CO2	interpret the functionalities of network applications like HTTP, FTP, DNS and Email	Applying (K3)
CO3	apply suitable transport layer protocol based on needs of application	Applying (K3)
CO4	interpret routing and forwarding solutions with the basic understanding of the underlying swishing techniques and router architectures	Applying (K3)
CO5	solve the flow control and error control issues in the data link layer by applying appropriate error and flow control techniques	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	2	1											2	3
CO2	3	2	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
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	35	40	25				100
CAT2	30	40	30				100
CAT3	30	40	30				100
ESE	30	40	30				100

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

18BCT42 - DATABASE MANAGEMENT SYSTEMS

(Common to Computer Systems and Design, Information Systems & Software Systems)

Programme & Branch	B.Sc & Computer Systems and Design	Sem.	Category	L	T	P	Credit
Prerequisites	NIL	4	PC	3	0	0	3

Preamble	To interpret the knowledge about various aspects of database design, database languages and database system implementation	
Unit - I	**Introduction and Database Design Model:**	**9**
Introduction: Database System Applications - View of Data - Database Architecture. Database Design and the E-R Model: Overview of the Design Process - The Entity-Relationship Model - Constraints - Removing Redundant Attributes in Entity Sets - Entity Relationship Diagrams - Extended E-R Features		
Unit - II	**Introduction to SQL:**	**9**
Overview of SQL Query Language - SQL Data Definition - Basic Structure of SQL Queries - Additional Basic Operations - Set Operations - Null Values - Aggregate Functions - Nested Sub Queries - Modification of the Database		
Unit - III	**Intermediate and Advanced SQL:**	**9**
Intermediate SQL: Join Expressions - Views - Materialized Views - Transactions - Commit - Rollback - Integrity Constraints - Assertions - SQL Data Types and Schemas - Authorization. Advanced SQL: Functions and Procedures – Triggers		
Unit - IV	**Relational Database Design:**	**9**
Features of Good Relational Designs - Functional Dependency - Atomic Domains and First Normal Form - Second Normal Form - Third Normal Form - Boyce-Codd Normal Form - Multivalued Dependency and Fourth Normal Form - Join Dependency and Fifth Normal Form		
Unit - V	**Transactions and Concurrency Control:**	**9**
Transactions: Transaction Concept - A Simple Transaction Model – Storage Structure - Transaction Atomicity and Durability - Transaction Isolation - Serializability. Concurrency Control: Lock Based Protocols - Timestamp Based Protocols - Validation Based Protocols		

Total:45

TEXT BOOK:

1. Silberschatz Abraham, Korth Henry F., and Sudarshan S, "Database System Concepts", 6 Edition, McGraw Hill Education, India, 2018.

REFERENCES:

1. Elmasri Ramez, Navathe Shamkant B, "Fundamentals of Database Systems", 7 Edition, Pearson Education, , 2016.
2. Ramakrishnan Raghu, Gehrke Johannes, "Database Management Systems", 3 Edition, McGraw Hill Education, , 2014.

COURSE OUTCOMES: On completion of the course, the students will be able to		**BT Mapped (Highest Level)**
CO1	develop E-R model for banking and university applications	Applying (K3)
CO2	design SQL expressions using SET operations and aggregate functions	Applying (K3)
CO3	execute SQL expressions using join operations	Applying (K3)
CO4	apply normal forms to design a relational database	Applying (K3)
CO5	interpret the transaction and concurrency control concepts	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	2	1	1									2	3
CO2	3	2	1	1									2	3
CO3	3	2	1	1									2	3
CO4	3	2	1	1									2	3
CO5	2	1											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	20	50	30				100
CAT2	20	50	30				100
CAT3	15	55	30				100
ESE	10	50	40				100

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

18BCT43 - WEB TECHNOLOGY

(Common to Computer Systems and Design, Information Systems & Software Systems)

Programme & Branch	B.Sc & Computer Systems and Design	Sem.	Category	L	T	P	Credit
Prerequisites	NIL	4	PC	3	0	0	3

Preamble	To impart the basic structure and design of webpage using HTML, CSS and scripting. It also emphasizes the client based web design	
Unit - I	**Introduction to Web and HTML:**	**9**
The Birth of The Web - Web Applications in Comparison to Desktop Applications - Static Websites versus Dynamic Websites - Web2.0 and Beyond - Uniform Resource Locators - Hypertext Transfer Protocol - Web Servers. HTML: HTML Syntax - Structure of HTML Documents - HTML Elements - HTML Tables - Styling Tables – Forms - Form Control Elements - Table and Form Accessibility		
Unit - II	**Style Sheet:**	**9**
Introduction To CSS - CSS Syntax - Location of Styles - Selectors - Interaction With Style Sheet - The Box Model - CSS Text Styling. CSS Layouts: Normal Flow - Positioning Elements - Floating Elements – Constructing Multicolumn Layouts - Approaches To CSS Layout - Responsive Design		
Unit - III	**Client side scripting and Dynamic HTML:**	**9**
JavaScript: Introduction to JavaScript - JavaScript Design Principles - Inline JavaScript - Embedded JavaScript - External JavaScript - JavaScript Syntax - JavaScript Objects - Document Object Model (DOM) - Nodes - Document Object - Element Node Object - Modifying DOM Element - Additional Properties - JavaScript Events - Forms		
Unit - IV	**Java Server Pages:**	**9**
Introduction - Elements of a JSP page - Implicit JSP objects - Session Management in JSP/Servlets – JSP Standard Template Library (JSTL) – JSP Examples – JSP and JDBC		
Unit - V	**XML:**	**9**
Introduction- XML versus HTML - Electronic Data Exchange - XML Terminology - Introduction to DTD - Document Type Declaration - Element Type Declaration - Attribute Declaration - Limitations of DTDs - Introduction to Schema - Complex Types - Extensible Style sheet Language Transformation		

Total:45

TEXT BOOK:

1.	Randy Connolly and Ricardo Hoar, "Fundamentals of Web Development", Pearson Education, 2015.	I,II,III
2.	Godbole Achyut and Kahate Atul, "Web Technologies: TCP/IP, Web/Java Programming and Cloud Computing", 3 Edition, McGraw Hill Education, New Delhi, 2014.	IV,V

REFERENCES:

1.	Robert W. Sebesta, "Programming the World Wide Web", 8 Edition, Pearson Education, , 2015.
2.	Paul Deitel, Harvey Deitel, Abbey Deitel, "Internet and World Wide Web-How to Program", 5 Edition, Pearson Education, , 2012.

COURSE OUTCOMES: On completion of the course, the students will be able to		**BT Mapped (Highest Level)**
CO1	illustrate web technology concepts and web page designing using HTML	Understanding (K2)
CO2	design a dynamic web page using CSS and JavaScript	Applying (K3)
CO3	develop an interactive web applications using DHTML	Applying (K3)
CO4	design a web page with database connectivity using JSP and JDBC	Applying (K3)
CO5	make use of Schema for validation and XSLT to transform XML documents into other formats	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	2	1											2	3
CO2	3	2	1	1									2	3
CO3	3	2	1	1									2	3
CO4	3	2	1	1									2	3
CO5	3	2	1	1									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	20	40	40				100
CAT2	20	45	35				100
CAT3	20	35	45				100
ESE	20	40	40				100

18BCT44 - MOBILE APPLICATION DEVELOPMENT

(Common to Computer Systems and Design, Information Systems & Software Systems)

Programme & Branch	B.Sc & Computer Systems and Design	Sem.	Category	L	T	P	Credit
Prerequisites	18BCT31	4	PC	3	0	0	3

Preamble	To emphasize the fundamental knowledge and programming concepts of Android.	
Unit - I	**Introduction to Android Programming and Android Studio:**	**9**
Android -Android Versions-Features of Android - Architecture of Android - Android Devices in Market- The Android Market - Obtaining the Required Tools - Launching First Android Application - Exploring the IDE - Using Code Completion - Debugging Application - Publishing Application		
Unit - II	**Activities, Fragments and Intents:**	**9**
Understanding Activities - Applying Styles and Themes to an Activity - Hiding the Activity Title - Displaying a Dialog Window - Displaying a Progress Dialog - Linking Activities using Intents - Returning Results from an Intent - Passing Data Using an Intent Object - Fragments - Displaying Notifications		
Unit - III	**Android User Interface:**	**9**
Understanding the Components of a Screen - Views and ViewGroups - FrameLayout - LinearLayout-TableLayout - RelativeLayout - FrameLayout - ScrollView - Adapting to Display Orientation - Anchoring Views - Designing User Interface with Views: Using Basic Views - Using Picker Views - Using List Views to Display Long Lists		
Unit - IV	**Specialized Fragments, Pictures and Menus:**	**9**
Using Specialized Fragments - ListFragment - DialogFragment -Preference Fragment - Using Image Views to Display Pictures -ImageView View - Image Switcher - GridView - Using Menus with Views - Creating the Helper Methods - Options Menu - Context Menu		
Unit - V	**Data Persistence and Content Providers:**	**9**
Saving and Loading User Preferences- Persisting Data to files - Creating and Using Databases - Content Providers: Sharing Data in Android -Using a Content Provider - Predefined Query String Constants - Projections - Filtering - Sorting - Creating Content Providers using Content Provider		

Total:45

TEXT BOOK:

1. DiMarzio J,"Beginning Android Programming with Android Studio", 4 Edition, John Wiley & Sons, Indiana, 2017.

REFERENCES:

1. Pradeep Kothari, "Android Application Development (with Kit Kat Support) Black Book", Dreamtech Press, 2018.
2. Dawn Griffiths, David Griffiths, "Head First Android Development A Brain - Friendly Guide", 1 Edition, O'Relly Media,2015.

COURSE OUTCOMES: On completion of the course, the students will be able to		**BT Mapped (Highest Level)**
CO1	install and understand the development environment of Android Studio.	Understanding (K2)
CO2	create activities, divide the activities into fragments and pass data between activities.	Applying (K3)
CO3	design and develop applications using different views and viewgoups	Applying (K3)
CO4	implement pictures and menus in android apps	Applying (K3)
CO5	apply the SQLite database and Content Providers in handling permanent data	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	2	1											2	3
CO2	3	2	1	1									2	3
CO3	3	2	1	1									2	3
CO4	3	2	1	1									2	3
CO5	3	2	1	1									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	15	25	60				100
CAT2	10	40	50				100
CAT3	20	20	60				100
ESE	20	20	58				98

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

18BCL41 - DATABASE MANAGEMENT SYSTEMS LABORATORY

(Common to Computer Systems and Design, Information Systems & Software Systems)

Programme & Branch	B.Sc & Computer Systems and Design	Sem.	Category	L	T	P	Credit
Prerequisites	NIL	4	PC	0	0	2	1

List of Exercises / Experiments :

1.	Study of simple DDL commands and DML commands
2.	Design relations to implement the integrity constraints(primary key, foreign key, unique and check)
3.	Apply aggregate functions to group the values of multiple rows
4.	Implementation of group by functions with having clause
5.	Retrieval of data from one or more relations with nested sub queries
6.	Apply join operations to retrieve data from multiple relations
7.	Construct views from a single table/ multiple tables and demonstrate the manipulation of views
8.	8. Development of PL/SQL functions with select and update statements
9.	Development of stored and unnamed PL/SQL procedures to retrieve data from a relation
10.	Demonstrate the execution of Triggers whenever the insertion or deletion event occurs in the database

Total:30

REFERENCES/MANUAL/SOFTWARE:

1.	Laboratory Manual

COURSE OUTCOMES: On completion of the course, the students will be able to		**BT Mapped (Highest Level)**
CO1	code the operations of stack and queue	Applying (K3), Imitation (S1)
CO2	perform sorting and searching on a given dataset	Applying (K3), Manipulation (S2)
CO3	solve the problem by applying programming skills	Applying (K3), Precision (S3)

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									2	3
CO2	3	2	1	1									2	3
CO3	3	2	1	1									2	3
1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy														

18BCL42 - WEB TECHNOLOGY LABORATORY

(Common to Computer Systems and Design, Information Systems & Software Systems)

Programme & Branch	B.Sc & Computer Systems and Design	Sem.	Category	L	T	P	Credit
Prerequisites	NIL	4	PC	0	0	2	1

List of Exercises / Experiments :

1.	Develop a static web page using HTML.
2.	Apply CSS properties to your college website.
3.	Construct a multicolumn layout web page using CSS with responsive design
4.	Write a JavaScript to validate the webpage
5.	Using DOM, add various elements and change the attributes of the webpage dynamically when keyboard or mouse event occurs.
6.	Develop a webpage using JSP elements.
7.	Develop a webpage using JSP implicit objects.
8.	Design a web page using JSP and establish database connectivity using JBDC to retrieve and store an employee data.
9.	Write XML schema to validate the XML document.
10.	Apply XSLT to transform the XML document

Total:30

REFERENCES/MANUAL/SOFTWARE:

1.	Laboratory Manual

COURSE OUTCOMES: On completion of the course, the students will be able to		**BT Mapped (Highest Level)**
CO1	design a webpage using HTML, CSS and JavaScript	Applying (K3), Imitation (S1)
CO2	develop dynamic webpage using server side scripting with Java server pages	Applying (K3), Manipulation (S2)
CO3	validate and transform XML documents	Applying (K3), Manipulation (S2)

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									2	3
CO2	3	2	1	1									2	3
CO3	3	2	1	1									2	3

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

18BCL43 - MOBILE APPLICATION DEVELOPMENT LABORATORY
(Common to Information Systems and Software Systems)

Programme & Branch	B.Sc & Computer Systems and Design	Sem.	Category	L	T	P	Credit
Prerequisites	NIL	4	PC	0	0	2	1

List of Exercises / Experiments :

1.	Design an activity to display "Hello World" message
2.	Create an activity to display the contact picked by the user.
3.	Implement an application that creates an alert message.
4.	Establish the communication between activities using Indent.
5.	Develop a simple calculator.
6.	Design an application with Views and ViewGoups to perform user interactions.
7.	Implement the various menus for an application
8.	Display number names using Toast message
9.	Design a SQLite database and perform insert, delete, update and read operations
10.	Design an application using SQLite database

Total:30

REFERENCES/MANUAL/SOFTWARE:

1.	Laboratory Manual

COURSE OUTCOMES: On completion of the course, the students will be able to		**BT Mapped (Highest Level)**
CO1	build simple activities and activities involving alert message and indent	Applying (K3), Imitation (S1)
CO2	develop application having views , view groups and menus	Applying (K3), Manipulation (S2)
CO3	develop database related applications	Applying (K3), Manipulation (S2)

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									2	3
CO2	3	2	1	1									2	3
CO3	3	2	1	1									2	3
1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy														

18BCT51 - INTERNET OF THINGS

(Common to Computer Systems and Design, Information Systems & Software Systems)

Programme & Branch	B.Sc & Computer Systems and Design	Sem.	Category	L	T	P	Credit
Prerequisites	18BCT41	5	PC	3	1	0	4

Preamble	To introduce the basics of Internet of Things and exemplifying the application areas where IoT is applied with appropriate tools	
Unit - I	**Internet of Things:**	**9+3**
Third ICT Wave – Rise of the Machines –IoT Kaleidoscope - Defining Internet of Things- IoT A Web 3.0 View- Ubiquitous IoT Applications: Panoramic View of IoT Applications – Important Vertical IoT Applications -Telematics and intelligent Transport systems – Smartgrid and electric vehicles-smarter planet and smart buildings		
Unit - II	**Four Pillars of IoT:**	**9+3**
Horizontal, Verticals and Four Pillars – M2M Internet of Devices – RFID Internet of Objects – WSN Internet of Transducers– SCADA Internet of Controllers		
Unit - III	**DNA and Middleware:**	**9+3**
DNA of IoT: DCM – Device – Connect Via Pervasive Networks –Wired Networks-Wireless Networks – Satellite IoT- Manage: To create New business Value – Middleware and IoT: Overview of Middleware– Communication Middleware for IoT MTC/M2M Middleware – SCADA Middleware – RFID Middleware – WSN Middleware – LBS and Surveillance Middleware		
Unit - IV	**Protocol Standardization for IoT:**	**9+3**
Web of Things versus Internet of Things Two Pillars of Web- IoT Protocol Standardization Efforts M2M and WSN Protocols – SCADA and RFID Protocols – Issues with IoT Standardization - Unified Data Standards		
Unit - V	**Architecture Standardization for WoT:**	**9+3**
Platform Middleware for WoT -Standards for M2M-Frameworks for WSN-Standards for SCADA – Extension of RID Standards – Unified Multitier WoT Architecture SOA/EAI versus SODA/MAI–OSGI – WoT Framework based on DATA Standards- WoT Portals and Business Intelligence – Challenges of IoT Information Security		

Lecture: 45, Tutorial:15, Total:60

TEXT BOOK:

1. Zhou Honbo, "The Internet of Things in the Cloud A Middleware Perspective", 1 Edition, CRC Press, 2013.

REFERENCES:

1. Cirani Simone, "Internet of Things: Architectures, Protocols and Standards", 1 Edition, John Wiely & Sons, 2018.
2. Waher Peter, "Mastering Internet of Things", 1 Edition, Packt Publishing, 2018.

COURSE OUTCOMES: On completion of the course, the students will be able to		**BT Mapped (Highest Level)**
CO1	identify architecture, infrastructure and constraints of Internet of Things	Understanding (K2)
CO2	explain the basic connection and connecting technologies	Understanding (K2)
CO3	apply the fundamental concepts of Internet of Things connection	Applying (K3)
CO4	summarize the protocol standardization for connections	Understanding (K2)
CO5	interpret the middleware technologies and security	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	2	1											2	3
CO2	2	1											2	3
CO3	3	2	1	1									2	3
CO4	2	1											2	3
CO5	3	2	1	1									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	30	40	30				100
CAT3	30	30	40				100
ESE	20	40	40				100

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

18BCT52 - USER INTERFACE DESIGN

Programme & Branch	B.Sc & Computer Systems and Design	Sem.	Category	L	T	P	Credit
Prerequisites	Nil	5	PC	3	0	0	3

Preamble	To impart the common principles of user interface design and focus on maximizing usability and the user experience.	
Unit - I	**Graphical and Web User Interfaces::**	**9**
Graphical User Interface – Web User Interface – Merging of Graphical Business Systems and The Web – Principles of User Interface Design. The User Interface Design Process: Obstacles and Pitfalls in Development Path – Usability – The Design Team.		
Unit - II	**System Menus and Navigation Schemes:**	**9**
Structures of Menus – Functions of Menus – Content of Menus – Formatting of Menus – Phrasing the Menu – Selecting Menu Choices – Navigating Menus – Kinds of Graphical Menus – Graphical Menu Examples.		
Unit - III	**Screen–Based Controls:**	**9**
Operable Controls – Text Entry/Read – Only Controls – Selection Controls – Combination Entry/Selection Controls – Other Operable Controls – Custom Controls – Presentation Controls – Selecting the Proper Controls – Examples.		
Unit - IV	**Windows:**	**9**
Window Characteristics – Components of Window – Window Presentation Styles – Types of Windows– Window Management – Organizing Window Functions – Window Operations – Web Systems		
Unit - V	**Feedback, Guidance, Assistance and Accessibility:**	**9**
Providing the Proper Feedback – Guidance and Assistance – International Considerations – Accessibility.		

Total:45

TEXT BOOK:

1. Galitz, O Wilbert, "The Essential Guide to User Interface Design", 2 Edition, Wiley, New Delhi, 2015.

REFERENCES:

1. Shneiderman Ben, Plaisant Catherine, Cohen Maxine and Jacobs Steven, "Designing the User Interface Strategies for Effective Human-Computer Interaction", 6 Edition, Pearson Education, New Delhi, 2016.
2. Cooper Alan, "The Essentials of User Interface Design", 4 Edition, Wiley Dream Tech Ltd, New Delhi, 2014.

COURSE OUTCOMES: On completion of the course, the students will be able to		**BT Mapped (Highest Level)**
CO1	explain the principles and importance of user interface design	Understanding (K2)
CO2	illustrate user interface with menus and navigation menu	Understanding (K2)
CO3	elaborate screen based and custom controls	Understanding (K2)
CO4	demonstrate window presentation styles and its types	Applying (K3)
CO5	Apply the principles of screen design and technological considerations in interface design	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	2	1											2	3
CO2	2	1											2	3
CO3	2	1											2	3
CO4	3	2	1	1									2	3
CO5	3	2	1	1									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	30	40	30				100
CAT3	20	50	30				100
ESE	30	40	30				100

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

18BCT53 - DISTRIBUTED COMPUTING

Programme & Branch	B.Sc & Computer Systems and Design	Sem.	Category	L	T	P	Credit
Prerequisites	18BCT32	5	PC	3	0	0	3

Preamble	To provide basic principles on which the internet and other distributed systems are based, their architecture, algorithms, design and how they meet the demands of modern distributed applications.	
Unit - I	**Characterization of Distributed Systems and Models:**	**9**
Introduction – Examples of Distributed Systems – Trends in distributed systems – Focus on Resource Sharing - Challenges – System Models: Introduction – Physical Models – Architectural Models - Fundamental Models – Interaction Model – Failure Model – Security Model.		
Unit - II	**Remote Invocation and Distributed File Systems:**	**9**
Introduction – Request-reply protocols - Remote procedure call - Remote method invocation – Distributed Objects and Components: Introduction – Distributed Objects - Distributed File Systems: Introduction – Characteristics of File systems - Distributed File system requirements - File Service Architecture.		
Unit - III	**Time and Process Coordination:**	**9**
Introduction - Clocks, Events and Process States – Synchronizing Physical Clocks – Logical Time and Clocks - Coordination and Agreement: Introduction - Failure assumptions and Failure detectors - Algorithms for Mutual exclusion - Distributed Mutual Exclusion – Elections.		
Unit - IV	**Distributed Transactions and Replication:**	**9**
Introduction – Flat and Nested Distributed Transactions – The Coordinator of a Distributed Transaction - Atomic Commit Protocols – Two phase Commit Protocol – Two Phase Commit Protocol for Nested Transactions - Replication: Introduction – System Model and the role of Group Communication – Fault Tolerant Services - Passive Replication - Active Replication.		
Unit - V	**Designing Distributed System:**	**9**
Google Case Study - Introduction - Overall architecture and Design Philosophy - Physical model - Overall system architecture - Underlying Communication Paradigms - Data Storage and Coordination Services - The Google File System (GFS) – Chubby – Bigtable - Summary of Key Design Choices - Distributed Computation Services.		

Total:45

TEXT BOOK:

1. George Coulouris, Jean Dollimore , Tim Kindberg and Gordon Blair, "Distributed Systems Concepts and Design", 5 Edition, Pearson Education, 2017.

REFERENCES:

1. Andrew S Tanenbaum, Maarten van Steen, "Distibuted Systems Principles and Pardigms", 2 Edition, Pearson Education, 2015.
2. Sunitha Mahajan, Seema Shah, "Distributed Computing", 2 Edition, Oxford University Press, 2018.

COURSE OUTCOMES: On completion of the course, the students will be able to		**BT Mapped (Highest Level)**
CO1	outline the distributed system models	Understanding (K2)
CO2	illustrate the methods for process communication and review distributed file architecture	Understanding (K2)
CO3	apply algorithms for clock synchronization, mutual exclusion and election	Applying (K3)
CO4	utilize transactions, implement atomic commit protocols and demonstrate replication model	Applying (K3)
CO5	survey the Google architecture and recognize its services	Analyzing (K4)

Mapping of COs with POs and PSOs

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

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

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	30	70					100
CAT2	30	30	40				100
CAT3	20	40	40				100
ESE	20	40	30	10			100

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

18BCL51 - USER INTERFACE DESIGN LABORATORY

Programme & Branch	B.Sc & Computer Systems and Design	Sem.	Category	L	T	P	Credit
Prerequisites	Nil	5	PC	0	0	4	2

List of Exercises / Experiments :

1.	Design a wireframe for your college website
2.	Design a wireframe for Shopping Cart
3.	Design a prototype for student registration form.
4.	Design a prototype for food ordering website
5.	Design a prototype for chat mobile application.
6.	Create a webpage to implement jQuery UI interactions.
7.	Create a webpage to implement jQuery UI Widgets.
8.	Create a webpage to implement jQuery UI Effects.
9.	Create a webpage to Displays collapsible content panels for presenting information in a limited amount of space.
10.	Design a webpage using menus with mouse and keyboard interactions for navigation

Total:30

REFERENCES/MANUAL/SOFTWARE:

1.	Laboratory Manual

COURSE OUTCOMES: On completion of the course, the students will be able to		**BT Mapped (Highest Level)**
CO1	design a webpage using wireframe tool	Applying (K3), Imitation (S1)
CO2	develop a prototype for website	Applying (K3), Manipulation (S2)
CO3	design a webpage with interactive and dynamic UI	Applying (K3), Manipulation (S2)

Mapping of COs with POs and PSOs

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

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

18BCP51 - PROJECT WORK I

Programme & Branch	B.Sc & Computer Systems and Design	Sem.	Category	L	T	P	Credit
Prerequisites	Nil	5		0	0	12	6

COURSE OUTCOMES: On completion of the course, the students will be able to		BT Mapped (Highest Level)
CO1	outline and plan the requirements for a team project	Understanding (K2)
CO2	apply basic steps in project management and construct planning models	Applying (K3)
CO3	understand the issues in project monitoring and control	Understanding (K2)
CO4	apply the technical knowledge and skills for developing a product with a given specification	Applying (K3)
CO5	build a project report as teamwork with different team roles	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	2	1							2	2	3	1	2	3
CO2	3	2	1	1	1				2	1	2	1	2	3
CO3	2	1							2	1	2	1	2	3
CO4	3	2	1	1					2	2	1	1	2	3
O5	3	2	1	1					2	2	1	1	2	3
1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy														

18BCP61 - PROJECT WORK II

Programme & Branch	B.Sc & Computer Systems and Design	Sem.	Category	L	T	P	Credit
Prerequisites	Nil	6		0	0	16	8

COURSE OUTCOMES: On completion of the course, the students will be able to		BT Mapped (Highest Level)
CO1	undertake problem identification, formulation and solution	Understanding (K2)
CO2	interpret various activities performed during the development of the project	Applying (K3)
CO3	analyze the techniques for project planning, scheduling and execution control	Analyzing (K4)
CO4	demonstrate a sound technical knowledge of their selected project area	Applying (K3)
CO5	build a project report as a team which contains the requirement specification, plan, schedule and design documents	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	2	1							3	2	2	1	2	3
CO2	3	2	1	1					3	2	2	1	2	3
CO3	3	3	2	2	1				3	2	3	1	3	3
CO4	3	2	1	1					3	2	2	1	2	3
CO5	3	2	1	1					3	2	2	1	2	3

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

18BCO01 - DATA MINING

Programme & Branch	B.Sc & Computer Systems and Design	Sem.	Category	L	T	P	Credit
Prerequisites	Nil	3	OE	3	0	0	3

Preamble	This course imparts the concepts of data mining and various classification and cluster analysis techniques.	
Unit - I	**Introduction to Data Mining:**	**9**
Data – Types of Data- Attributes and Measurements – Type of Data sets – Data Quality – Data Preprocessing – Measure of Similarity and Dissimilarity- Simple Attributes – Dissimilarity between data objects – Similarities between Data objects- Examples of Proximity measure – issues-Selecting the right proximity measure.		
Unit - II	**Exploring Data and Association Analysis:**	**9**
Summary statistics – Visualization – OLAP and Multi-dimensional data - Association Analysis. Basic Concepts and Algorithms: Frequent item set generation – Rule generation -Compact representation of frequent item set – Alternative methods – FP growth.		
Unit - III	**Classification:**	**9**
Preliminaries – General Approach to solving a classification problem – Decision Tree Induction – Model over fitting – Evaluating the performance of classifiers – Methods for comparing classifiers.		
Unit - IV	**Cluster Analysis:**	**9**
Overview- K-means- Basic K means Algorithm-K-Means additional issues – Bisecting K- means – K-means and different types of cluster – strength and weakness – optimization problem- Agglomerative Hierarchical clustering – Basic Algorithm – Specific techniques -Key issues – strength and weakness- Cluster Evaluation.		
Unit - V	**Classification Alternative Techniques:**	**9**
Bayesian Classifier – Bayes theorem- Naïve bayes classifier- Error rate – Bayesian belief Networks -Artificial Neural Network – Support Vector Machines - Optimization – Unconstrained Optimization – Constrained Optimization.		

Total:45

TEXT BOOK:

1. Vipin Kumar, Pang Ning Tan Michael Steinbach, "Introduction to Data Mining", Pearson Education, NA, 2016.

REFERENCES:

1. Daniel T. Larose, Chantal D. Larose, "Data Mining and Predictive Analytics", 2 Edition, Wiley, 2016.
2. Mehmed Kantardzic, "Data Mining: Concepts, Models, Methods and Algorithms", 2 Edition, Wiley, 2017.

COURSE OUTCOMES: On completion of the course, the students will be able to		**BT Mapped (Highest Level)**
CO1	classify the data, its types and preprocessing methods	Understanding (K2)
CO2	apply the data exploration and visualization methods	Applying (K3)
CO3	analyze classification algorithms and performance classifiers	Analyzing (K4)
CO4	illustrate the clustering concepts and its types	Understanding (K2)
CO5	compare various data mining techniques	Analyzing (K4)

Mapping of COs with POs and PSOs

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

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

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	30	40	30				100
CAT2	20	40	30	10			100
CAT3	25	35	30	10			100
ESE	20	40	20	20			100

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

18BCO02 - MULTIMEDIA AND VIRTUAL REALITY SYSTEMS

Programme & Branch	B.Sc & Computer Systems and Design	Sem.	Category	L	T	P	Credit
Prerequisites	Nil	3	OE	3	0	0	3

Preamble	To understand the characteristics of various multimedia concepts and virtual reality systems.	
Unit - I	**Multimedia and Text:**	**9**
Multimedia: Definitions -Use of Multimedia -Delivering Multimedia. Text: Power of Meaning-Fonts and Faces-Using Text in Multimedia-Computers and Text-Font Editing and Design Tools-Hypermedia and Hypertext.		
Unit - II	**Images and Sound:**	**9**
Images: Before Starting-Making Still Images-Color-Image File Formats. Sound: Power of Sound-Digital Audio-MIDI Audio - MIDI vs. Digital Audio-Multimedia System Sounds-Audio File Formats-Vaughan's Law-Adding Sound to Multimedia Project. Case study: Making website logo using GNU Image Manipulation Program (GIMP).		
Unit - III	**Animation and Video:**	**9**
Animation: Power of Motion-Principles of Animation-Animation by Computer-Making Animations that Work. Video: Using Video-Working of Video-Digital Video Containers-Obtaining Video Clips-Shooting and Editing Video. Case study: Creating Video Clips using Blender or Pencil Studio open source software.		
Unit - IV	**Internet and Multimedia on the Web:**	**9**
Internet and Multimedia: Internet History-Internetworking-Multimedia on the Web. Designing for the WWW: Developing-Text-Images-Sound-Animation-Video. Case study: Making 3 D models using Open shot tool.		
Unit - V	**Introduction to Virtual Reality:**	**9**
Virtual Reality – Beginning of VR – VR Paradigms – Collaboration –VR Systems Hardware - Software – Representation – User Interaction		

Total:45

TEXT BOOK:

1.	Vaughan Tay, "Multimedia: Making It Work", 8 Edition, Tata McGraw Hill Publishing Company, New Delhi, 2011.	I,II,III,IV
2.	Alan B. Craig, William R. Sherman, Jeffrey D. Will, "Developing Virtual Reality Applications: Foundations of Effective Design", 1 Edition, Morgan Kauffman, 2009.	V

REFERENCES:

1.	Jeffloate Judith, "Multimedia in Practice: Technology and Applications", Prentice Hall of India, New Delhi, 2004.

COURSE OUTCOMES: On completion of the course, the students will be able to		**BT Mapped (Highest Level)**
CO1	illustrate various multimedia elements	Understanding (K2)
CO2	summarize different medias to develop meaningful scenes	Applying (K3)
CO3	demonstrate the supporting file formats	Applying (K3)
CO4	identify multimedia hardware, software and authoring tools	Applying (K3)
CO5	outline hardware and software components for a virtual reality environment	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	2	1										1	2	3
CO2	3	2	1	1	2		2					1	2	3
CO3	3	2	1	1	2		2					1	2	3
CO4	3	2	1	1	2		2					1	2	3
CO5	2	1			2		2					1	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	30	40	30				100
CAT2	20	40	40				100
CAT3	25	35	40				100
ESE	30	40	30				100

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

18BCO03 - BIG DATA ANALYTICS

Programme & Branch	B.Sc & Computer Systems and Design	Sem.	Category	L	T	P	Credit
Prerequisites	NIL	4	OE	3	0	0	3

Preamble	To introduce the basic knowledge about Big Data and NoSQL	
Unit - I	**Digital Data and Big Data:**	**9**
Types of Digital Data: Classification of Digital Data. Introduction to Big Data: Characteristics of Data - Evolution - Definition - Challenges - Volume, Velocity and Variety - Other Characteristics of Big Data -Need for Big Data - Information Consumer or We Produce Information - Traditional BI vs Big Data - Typical Data Warehouse Environment - Hadoop Environment - New Today - Changing in Realms of Big Data		
Unit - II	**Big Data Analytics and Technology Landscape:**	**9**
Big Data Analytics: Introduction - Sudden Hype - Classifications of Analytics - Greatest Challenges - Top Challenges Facing Big Data - Importance of Big Data Analytics - Kind of Technologies - Data Science - Data Scientist - Terminologies Used in Big Data Environment- Base - Top Analytical Tools. Big Data Technology Landscape: No SQL - Hadoop		
Unit - III	**Hadoop and Map Reduce:**	**9**
Hadoop: Introduction - Need for Hadoop - Why not RDBMS - RDBMS vs Hadoop - Distributed Computing Challenges - History - Hadoop Overview Hadoop: Introduction - Need for Hadoop - Why not RDBMS - RDBMS vs Hadoop - Distributed Computing Challenges - History - Hadoop Overview -Use Case of Hadoop - Hadoop Distributors - Hadoop Distributed File System - Processing Data with Hadoop - Managing Resources and Applications with Hadoop Yarn - Interacting with Hadoop Eco System. Map Reduce Programming: Introduction - Mapper - Reducer - Combiner - Partitioner - Searching - Sorting - Compression		
Unit - IV	**Cassandra:**	**9**
Apache Cassandra - Features of Cassandra - CQL Data Types - CQLSH - Keyspaces - Crud - Collections - Using a Counter - Time to Live -Alter Commands - Import and Export - Querying System Tables - Practice Examples		
Unit - V	**Hive and Jasper Report:**	**9**
Hive: Introduction - Hive Architecture - Hive Data Types - Hive File Format - Hive Query Language - Rcfile Implementation - Serde - User Defined Function. Jasper Report using Jaspersoft: Introduction to Jasper Report - Connecting to Mongodb NOSQL Database - Connecting to Cassandra NOSQL Database.		

Total:45

TEXT BOOK:

1. Seema Acharya , Subhashini Chellapan, "Big Data And Analytics", 1 Edition, Wiley, 2015.

REFERENCES:

1. Bill Franks, "Taming the Big Data Tidal Wave", 1 Edition, Wiley Reprint, 2014.
2. DJ Editorial Services, "Big Data Black Book", 1 Edition, Dreamtech Press, 2016.

COURSE OUTCOMES: On completion of the course, the students will be able to		**BT Mapped (Highest Level)**
CO1	outline the concepts of digital data and big data	Understanding (K2)
CO2	interpret the Big Data Analytics and Technology Landscape	Understanding (K2)
CO3	illustrate Hadoop and Map Reduce framework	Understanding (K2)
CO4	design Cassandra query expressions	Applying (K3)
CO5	demonstrate Hive architecture and apply Hive query language	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	2	1											2	3
CO2	2	1											2	3
CO3	2	1											2	3
CO4	3	2	1	1									2	3
CO5	3	2	1	1									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	30	70					100
CAT3	20	40	40				100
ESE	30	40	30				100

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

18BCO04 - OPEN SOURCE PROGRAMMING

Programme & Branch	B.Sc & Computer Systems and Design	Sem.	Category	L	T	P	Credit
Prerequisites	NIL	4	OE	3	0	0	3

Preamble	To focus on server side programming with open source tool. It also provides knowledge on dynamic web application development using databases	
Unit - I	**Introduction to PHP programming:**	**9**
Basic Syntax-Sending Data to The Web Browser - Writing Comments - Variables - Strings - Concatenating Strings - Numbers - Constants - Single Vs Double Quotation Marks - Basic Debugging Steps. Programming With PHP: Creating and Handling an HTML Form - Conditionals and Operators - Validating Form Data - Arrays - For and While Loops.		
Unit - II	**Creating Dynamic Websites and MySQL:**	**9**
Including Multiple Files - Handling HTML Forms - Making Sticky Forms - Creating Functions. Introduction to MYSQL: Naming Database Elements - Column Types and Properties - Accessing MYSQL. Database Design: Different Table Types - Languages and MYSQL - Foreign Key Constraints		
Unit - III	**PHP With MYSQL:**	**9**
Connecting to MYSQL - Executing Simple Queries - Retrieving Query Results - Ensuring Secure SQL - Counting Returned Records - Updating Records with PHP		
Unit - IV	**Common Programming Techniques and Error Handling:**	**9**
Sending Values to a Script - Using Hidden Form Inputs - Editing Existing Records. Error Handling and Debugging: Error Types and Basic Debugging - Displaying PHP Errors - Adjusting Error Reporting in PHP - PHP Debugging Techniques - SQL and MYSQL Debugging Techniques		
Unit - V	**Web Application Development:**	**9**
Sending Email-Handling File Uploads - Understanding HTTP Headers - Date and Time Functions. Cookies and Sessions: Making a Login Page and Login Functions - Using Cookies and Sessions - Improving Session Security		

Total:45

TEXT BOOK:

1. Larry Ullaman, "PHP and MySQL for Dynamic Web Sites", 5 Edition, Pearson Education, 2017.

REFERENCES:

1. David Powers, "PHP Solutions: Dynamic Web Design Made Easy", 3 Edition, Apress, 2014.
2. Luke Welling and Laura Thomson, "PHP and MySQL Web Development", 5 Edition, Addison Wesley, 2016.

COURSE OUTCOMES: On completion of the course, the students will be able to		**BT Mapped (Highest Level)**
CO1	manipulate and execute HTML forms using PHP	Applying (K3)
CO2	develop dynamic webpage and database using MYSQL	Applying (K3)
CO3	implement webpage with database connectivity	Applying (K3)
CO4	illustrate error handling techniques in PHP	Understanding (K2)
CO5	design a webpage with options for uploading files, session handling and sending mail	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									2	3
CO2	3	2	1	1									2	3
CO3	3	2	1	1									2	3
CO4	2	1											2	3
CO5	3	2	1	1									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	30	40	30				100
CAT2	20	40	40				100
CAT3	20	30	50				100
ESE	20	30	50				100

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

18BCE01 - UNIX AND SHELL PROGRAMMING

Programme & Branch	B.Sc & Computer Systems and Design	Sem.	Category	L	T	P	Credit
Prerequisites	18BCT32	5	PE	3	0	0	3

Preamble	To introduce the basic concepts of Unix Operating System and gives sufficient knowledge in writing shell scripts in UNIX	
Unit - I	**Introduction to Unix:**	**9**
Brief History – Salient Features - Components – Kernel - Shell - File System - Using Unix - Shell Prompt - Commands in Unix - Types of Unix Commands - Basic Commands – Getting Help – The manual and the man Command - The info Utility - Command Substitution – Giving Multiple Commands – Aliases		
Unit - II	**File Organization, Attributes and Permissions:**	**9**
File organization - Unix files – Categories of files – Hidden files – File system – Path Names – Home Directory Commands – Dot (.) and (..) File names – File commands – Dispalying and Printing Files – Comparing Files. File Attributes and Permissions: File Ownership – Attributes – ls, file, chmod, chown, chgrp,umask Commands		
Unit - III	**Standard I/O, Redirection Pipes, Filters and vi Editor:**	**9**
Standard I/O – Redirection – Pipes and Pipeline – Mixing input – Filter – tee command – Terminal and Trash Files – Database File – Handling Columns and Fields - sort,uniq,tr Commands. The vi Editor: Editing – Moving Cursor - Copying and Moving Text – Pattern Searching – Repeating the Last Editor Command – Undoing Commands – Joining and Writing Lines – Using shell from vi – Configuring vi Environment		
Unit - IV	**Regular Expressions and Process:**	**9**
Regular Expressions – grep, egrep, fgrep Commands – Stream Editor. The Process: Meaning – Parent and Child Processes – Types – Foreground and Background – Internal and External Commands – ps Command – Process Creation – nohub, nice, time, signals, trap,stty, kill, wait Commands – Job Control – Command History – Scheduling Job Execution		
Unit - V	**Shell Programming:**	**9**
Shell Variables – export Command - .profile File – read Command – Positioning Parameters - $ Variables – set,exit Commands – Branching and Control – Loop Control – continue and break Statements – expr Command – Real Arithmetic – here Document – sleep Command – Debugging Scripts – script, eval, exec Commands		

Total:45

TEXT BOOK:

1.	Venkateshmurthy.M.G, "Introduction to UNIX & SHELL programming", 1 Edition, Pearson Education, 2015.

REFERENCES:

1.	Patrick H. Wood and Stephen G. Kochan , "Shell Programming in Unix, Linux and OS X", 4 Edition, Pearson Education, USA, 2016.
2.	Sumitabha Das, "Unix Concepts and Applications", 4 Edition, McGraw Hill Higher Education, India, 2017.

COURSE OUTCOMES: On completion of the course, the students will be able to		**BT Mapped (Highest Level)**
CO1	outline unix system structure and introduce basic commands	Understanding (K2)
CO2	examine unix file organization, attributes and permissions	Analyzing (K4)
CO3	inspect standard i/o, redirection pipes, filters and vi editor	Analyzing (K4)
CO4	review regular expressions and illustrate process types	Understanding (K2)
CO5	writing and executing shell programs	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	2	1											2	3
CO2	2	3	2	2									3	2
CO3	2	3	2	2									3	2
CO4	2	1											2	3
CO5	3	2	1	1									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	20	50		30			100
CAT2	10	30		60			100
CAT3	10	30	60				100
ESE	10	35	20	35			100

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

18BCE02 - OBJECT ORIENTED ANALYSIS AND DESIGN

Programme & Branch	B.Sc & Computer Systems and Design	Sem.	Category	L	T	P	Credit
Prerequisites	18BCC23	5	PE	3	0	0	3

Preamble	To focus on analysis and design of objects and classes based on object oriented techniques and methodologies using UML.	
Unit - I	**Object Basics:**	**9**
Introduction - An Object-Oriented Philosophy – Objects - Objects are grouped in classes – Attributes - Object Behavior and Methods - Objects Respond to Messages – Encapsulation and Information Hiding - Class Hierarchy – Polymorphism - Object Relationships and Associations - Aggregations and Object Containment - Object Oriented Systems Development Life Cycle.		
Unit - II	**Object-Oriented Methodologies:**	**9**
Rumbaugh Object Modeling Technique - The Booch Methodology - The Jacobson Methodologies – Patterns – Frameworks - The Unified Approach.		
Unit - III	**Object-Oriented Analysis:**	**9**
Business Object Analysis - Use-Case Driven Object Oriented Analysis - Business Process Modeling - Use-Case Model- Object Analysis: Noun Phrase Approach – Common Class Patterns Approach - Use-Case Driven Approach - Classes Responsibilities and Collaborators.		
Unit - IV	**Object-Oriented Design:**	**9**
Object Oriented Design Process- Object Oriented Design Axioms- Corollaries- Design Patterns- Designing Classes.		
Unit - V	**Unified Modeling Language:**	**9**
Introduction- Static and Dynamic Models- Introduction to the Unified Modeling Language- UML Diagrams- UML Class Diagram- Use Case Diagram- UML Dynamic Modeling-Case Study.		

Total:45

TEXT BOOK:

1.	Bahrami Ali, "Object Oriented Systems Development", 1 Edition, Tata McGraw Hill Publishing Company, New Delhi, 2017.

REFERENCES:

1.	Michael R. Blaha, James R. Rumbaugh, "Object Oriented Modeling and Design with UML", 2 Edition, Pearson Education, 2011.
2.	Brahma Dathan, Sarnath Ramnath, "Object-Oriented Analysis, Design and Implementation", 1 Edition, Orient Blackswan, 2014.

COURSE OUTCOMES: On completion of the course, the students will be able to		**BT Mapped (Highest Level)**
CO1	understand the need for object oriented programming	Understanding (K2)
CO2	gain knowledge on object oriented methodologies	Understanding (K2)
CO3	analyze and design applications using UML diagrams	Analyzing (K4)
CO4	apply knowledge of design process and patterns while designing applications	Applying (K3)
CO5	model and analyze UML structures for the proposed application	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	2	1											2	3
CO2	2	1											2	3
CO3	3	3	2	2	1								3	3
CO4	3	2	1	1									2	3
CO5	3	2	1	1									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	40	20				100
CAT2	30	40	10	20			100
CAT3	20	40	20	20			100
ESE	30	40	20	10			100

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

18BCE03 - DATA VISUALIZATION TECHNIQUES

Programme & Branch	B.Sc & Computer Systems and Design	Sem.	Category	L	T	P	Credit
Prerequisites	18BCT42	5	PE	3	0	0	3

Preamble	To learn different data visualization techniques and manipulating the data using R tool	
Unit - I	**Data Visualization:**	**9**
Introduction: Visualization - Visualization process- scatter Plot-Data Foundations: Types of data-Structure within and between records -Data preprocessing.		
Unit - II	**Visualization Techniques for Spatial Data and Geo spatial Data:**	**9**
Spatial Data: One Dimensional-Two Dimensional-Three dimensional-Dynamic Data-Combining Techniques-Geospatial Data :spatial data- Point data-Line Data-Area Data- Other Issues in Geospatial Data Visualization.		
Unit - III	**Visualization of Time Oriented Data, multivariate data, Trees and Graph:**	**9**
Introduction- Characterizing Time-Oriented Data visualizing time oriented data- Multivariate data :Point based-Line based-Region based- Trees and Graph :Displaying Hierarchical structures-Displaying graphs- Other Issues.		
Unit - IV	**Visualizing Data in R:**	**9**
Data Frames- -Importing and exporting data –control and condition statements in R-functions-Basic and interactive plots: scatter plot-Generating an interactive scatter plot-bar plot-line plot-Generating an interactive Gantt/Time line Chart-merging Histograms.		
Unit - V	**Dendrograms ,Heat Maps and Maps:**	**9**
Dendrograms:Introduction-Dendrogram construction-Dendrogram with colors and Labels-Heat Maps: Creating Heat Map-Heat Map with customized color-Integrated Dendrogram and heat map-Creating Stereo Map.		

Total:45

TEXT BOOK:

1. Matthew O. Ward, Georges Grinstein, Daniel Keim, "Interactive Data Visualization: Foundations, Techniques, and Applications", CRC Press , 2015.

REFERENCES:

1. Atmajitsinh Gohil , "R Data Visualization Cookbook ", Packet Publishing Ltd, 2015.
2. Thomas Rahlf, "Data Visualisation with R 100 Examples", Springer International Publishing, 2017.

COURSE OUTCOMES: On completion of the course, the students will be able to		**BT Mapped (Highest Level)**
CO1	explain the basics of data and Information visualization	Understanding (K2)
CO2	visualize the spatial data, and geo spatial data	Applying (K3)
CO3	display the hierarchical structure and graph	Applying (K3)
CO4	create different types of chart using R tool	Applying (K3)
CO5	construct dendrograms and maps in R tool	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	2	1											2	3
CO2	3	2	1	1									2	3
CO3	3	2	1	1									2	3
CO4	3	2	1	1	2								2	3
CO5	3	2	1	1	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	30	40	30				100
CAT2	20	50	30				100
CAT3	20	50	30				100
ESE	20	50	30				100

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

18BCE04 - CLOUD SECURITY

(Common to Computer Systems and Design, Information Systems & Software Systems)

Programme & Branch	B.Sc & Computer Systems and Design	Sem.	Category	L	T	P	Credit
Prerequisites	18BCT41	5	PE	3	0	0	3

Preamble	To comprehend the security issues and challenges prevailing in Cloud and securing the Cloud architecture.	
Unit - I	**Cloud Computing Architecture:**	**9**
Cloud Delivery Models: The SPI Framework-Cloud Software as a Service(SaaS)-Cloud Platform as a Service(PaaS)-Cloud Infrastructure as a Service(IaaS)-Cloud Deployment Models: Public Clouds-Community Clouds-Private Clouds-Hybrid Clouds-Expected Benefits.		
Unit - II	**Cloud Computing Software Security Fundamentals:**	**9**
Cloud Information Security Objectives-Cloud Security Services-Relevant Cloud Security Design Principles-Secure Cloud Software Requirements: Secure Development Practices- Cloud Computing and Business Continuity Planning/Disaster Recovery		
Unit - III	**Cloud Computing Risk Issues:**	**9**
The CIA Triad-Privacy and Compliance Risks: Payment Card Industry Data Security Standard (PCI DSS)-Information Privacy and Privacy Laws- Threats to Infrastructure, Data and Access Control- Cloud Service Provider Risks.		
Unit - IV	**Cloud Computing Security Challenges:**	**9**
Security Policy Implementation: Policy Types-Computer Security Incident Response Team (CSIRT)-Virtualization Security Management: Virtual Threats-VM Security Recommendations- VM-Specific Security Techniques		
Unit - V	**Cloud Computing Security Architecture:**	**9**
Architectural Considerations: General Issues-Trusted Cloud Computing-Secure Execution Environments and Communications-Identity Management and Access Control-Autonomic Security.		

Total:45

TEXT BOOK:

1. Ronald L. Krutz, Russell Dean Vines, "Cloud Security: A Comprehensive Guide to Secure Cloud Computing", 1 Edition, Wiley Publishing Inc, 2018.

REFERENCES:

1. John R.Vacca, "Cloud Computing Security: Foundations and Challenges", 1 Edition, CRC Press, 2017.
2. Nate Jenner, "Cloud Security: Introduction to Cloud Security and Data Protection", 1 Edition, CreateSpace Independent Publishing Platform, 2018.

COURSE OUTCOMES: On completion of the course, the students will be able to		**BT Mapped (Highest Level)**
CO1	outline the types and benefits of various cloud delivery and deployment models	Understanding (K2)
CO2	design secure cloud with disaster recovery	Applying (K3)
CO3	interpret the risks and threats associated with cloud information	Understanding (K2)
CO4	inspect and respond to computer security incident	Applying (K3)
CO5	recognize the importance of identity management and access control in the cloud	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	2	1											2	3
CO2	3	2	1	1									2	3
CO3	2	1											1	2
CO4	3	2	1	1									2	3
CO5	2	1											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	40	20				100
CAT2	30	40	30				100
CAT3	20	40	40				100
ESE	30	30	40				100

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

18BCE05 - E COMMERCE

(Common to Computer Systems and Design, Information Systems & Software Systems)

Programme & Branch	B.Sc & Computer Systems and Design	Sem.	Category	L	T	P	Credit
Prerequisites	NIL	5	PE	3	0	0	3

Preamble	To inculcate knowledge and give adequate exposure to electronic commerce and its technologies.	
Unit - I	**Business Models for E-commerce:**	**9**
Business Model - E-Business Models Based on the Relationship of Transaction Parties - Transaction Types: Aggregator Model - Info-Mediary Model - Community Model - Advertising Model - Subscription Model		
Unit - II	**E-Marketing:**	**9**
Traditional Marketing - Identifying Web Presence Goals - Browsing Behaviour Model - Online Marketing - E-Branding - Marketing Strategies		
Unit - III	**E-Payment Systems:**	**9**
Digital Payment Requirements - Digital Token-based E-Payment Systems - Classification of New Payment Systems - Electronic Cash - Risk and E-Payment Systems - Designing E-Payment Systems-Case Study		
Unit - IV	**E-Supply Chain and Value Chain Management:**	**9**
E-Supply Chain Management: Supply Chain - Virtual Value Chain - Seven Dimensions of E-Commerce Strategy - Value Chain and E-Strategy- Planning the E - Commerce Project		
Unit - V	**E-Security, Legal and Ethical Issues:**	**9**
E-Security: Information System Security - Security on the Internet - E-Business Risk Management Issues - Legal and Ethical Issues		

Total:45

TEXT BOOK:

1. Joseph P.T, S.J, "E-Commerce an Indian Perspective", 5 Edition, PHI Learning Private Limited, New Delhi, 2015.

REFERENCES:

1. Kalakota Ravi, Whinston Andrew B, "Frontiers of Electronic Commerce", 1 Edition, Pearson Education, 2017.
2. Bharat Bhasker, "Electronic Commerce: Framework, Technologies and Applications", 4 Edition, McGraw Hill Higher Education, 2017.

COURSE OUTCOMES: On completion of the course, the students will be able to		**BT Mapped (Highest Level)**
CO1	understand the business models for electronic commerce	Understanding (K2)
CO2	analyze browsing behavior model of a website	Analyzing (K4)
CO3	classify and decide type of e-payment systems suitable for the site	Understanding (K2)
CO4	plan for electronic commerce projects	Applying (K3)
CO5	apply knowledge in providing security for electronic commerce world	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	2	1											2	3
CO2	3	3	2	2	1								3	3
CO3	2	1											2	3
CO4	3	2	1	1									2	3
CO5	3	2	1	1									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	30	40	30				100
CAT2	20	40	20	20			100
CAT3	20	30	30	20			100
ESE	20	40	20	20			100

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

18BCE06 - SECURITY THREATS AND CONTROL

(Common to Computer Systems and Design, Information Systems & Software Systems)

Programme & Branch	B.Sc & Computer Systems and Design	Sem.	Category	L	T	P	Credit
Prerequisites	18BCT41	5	PE	3	0	0	3

Preamble	To alert the students to the magnitude of computer network vulnerabilities, weaknesses, loopholes and to bring effective security practices and solutions.	
Unit - I	**Security Threats to Computer Networks and Vulnerabilities:**	**9**
Security Threats to Computer Networks: Introduction - Sources of Security Threats - Security Threat Motives - Security Threat Management - Security Threat Correlation - Security Threat Awareness - Computer Network Vulnerabilities: Definition - Sources of Vulnerabilities - Vulnerability Assessment.		
Unit - II	**Security Assessment, Analysis, Assurance and Disaster Management:**	**9**
Introduction - System Security Policy - Building a Security Policy - Security Requirements Specification - Threat Identification - Threat Analysis - Vulnerability Identification and Assessment - Security Certification - Security Monitoring and Auditing - Products and Services – Disaster Management : Introduction – Disaster prevention – Disaster Response – Disaster Recovery – Make your Business Disaster Ready – Resources for Disaster Planning and Recovery.		
Unit - III	**Access Control, Authorization and Authentication:**	**9**
Definitions - Access Rights - Access Control Systems – Authorization - Types - Principles - Granularity - Web Access and Authorization - Authentication: Definition - Multiple Factors and Effectiveness of Authentication - Elements - Types - Methods - Developing an Authentication Policy.		
Unit - IV	**Cryptography, Firewall, System Intrusion Detection and Prevention:**	**9**
Definition - Symmetric Encryption - Public Key Encryption - Enhancing Security - Key Management - Public Key Infrastructure - Hash Function - Digital Signatures – Firewalls: Definition - Types - Configuration and Implementation - Demilitarized Zone (DMZ) - Improving Security - Forensics - Services and Limitations - System Intrusion Detection and Prevention.		
Unit - V	**Security in Wireless Networks and Efforts to Security:**	**9**
Introduction - Cellular Wireless Communication Network Infrastructure - WLAN or Wi-Fi - Standards - Security - Other Efforts to Secure Information and Computer Networks: Introduction - Legislation - Regulation -Self-Regulation - Education - Reporting Centers - Market Forces – Activism.		

Total:45

TEXT BOOK:

1. Joseph Migga kizza, "A Guide to Computer Network Security", 1 Edition, Springer India, 2010.

REFERENCES:

1. William Stallings, "Cryptography and Network Security : Principles and Practice", 7 Edition, Pearson Education, 2017.
2. Chris McNab, "Network Security Assessment: Know Your Network", 3 Edition, Shroff Publishers & Distributors, 2017.

COURSE OUTCOMES: On completion of the course, the students will be able to		**BT Mapped (Highest Level)**
CO1	explain the different types of security threats and vulnerabilities	Understanding (K2)
CO2	outline the security assessments and disaster methodologies	Understanding (K2)
CO3	apply appropriate authorization and access control techniques	Applying (K3)
CO4	make use of firewall system for intrusion detection	Applying (K3)
CO5	interpret the security aspects of wireless networks and efforts required to secure information	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	2	1											2	3
CO2	2	1											2	3
CO3	3	2	1	1									2	3
CO4	3	2	1	1									2	3
CO5	2	1											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	20	40	40				100
CAT3	20	40	40				100
ESE	30	40	30				100

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

18BCE07 - BUSINESS INTELLIGENCE

(Common to Computer Systems and Design, Information Systems & Software Systems)

Programme & Branch	B.Sc & Computer Systems and Design	Sem.	Category	L	T	P	Credit
Prerequisites	18BCT42	6	PE	3	1	0	4

Preamble	To impart knowledge on decision making by applying analytics on business data	
Unit - I	**Types of Digital Data, OLTP and OLAP:**	**9+3**
Introduction - Getting into "GOODLIFE" Database- Structured Data - Unstructured Data - Semi-Structured Data - Difference between semi-structured and structured data - Introduction to OLTP and OLAP: OLTP-OLAP -Different OLAP architecture - OLTP and OLAP - Data models for OLTP and OLAP - Role of OLAP Tools in BI Architecture - OLAP Operations on Multidimensional data- Leveraging ERP data using Analytics		
Unit - II	**Business Intelligence:**	**9+3**
Definition - Evolution of BI and Role of DSS, EIS, MIS and Digital Dashboards- Need for BI - BI Value chain - Introduction to Business Analytics - BI Definitions and Concepts: BI Component Frameworks - Who is BI for? - BI Users - BI Applications - BI Roles and Responsibilities		
Unit - III	**Multidimensional Data Modeling:**	**9+3**
Introduction - Data Modeling Basics - Types of Data Model - Data Modeling Techniques - Fact Table - Dimension Table - Typical Dimension Models - Dimensional Modeling Life Cycle		
Unit - IV	**Performance Management and Enterprise Reporting:**	**9+3**
Understanding Measures and Performance - Measurement System Terminology - Navigating a Business Enterprise, Role of Metrics, and Metrics Supply Chain - KPIS and its usage - Reporting Perspectives - Standardization - Enterprise Reporting Characteristics - Balance Scoreboard - Dashboards - Creating Dashboards - Scorecards Vs. Dashboards - Analysis		
Unit - V	**BI Evolution and Applications:**	**9+3**
BI and Mobility - BI and Cloud Computing - BI for ERP systems Social CRM and BI - Case Studies: Good Life Healthcaregroup - GoodFood Restaurants Inc. - TenToTen Retail Stores		

Lecture:45, Tutorial:15, Total:60

TEXT BOOK:

1. Prasad R N, Seema Acharya, "Business Analytics", Wiley India Pvt, Ltd, India, 2014.

REFERENCES:

1. Rick Sherman, "Business Intelligence Guidebook from Data Integration to Analytics", Elsevier Inc, 2015.
2. Anil K.Maheshwari, "Business Intelligence and Data Mining", NA Edition, Business Expert Press, 2015.

COURSE OUTCOMES: On completion of the course, the students will be able to		**BT Mapped (Highest Level)**
CO1	categorize the types of data, differentiate the OLTP and OLAP operations and to perform the OLAP operations on operational databases	Applying (K3)
CO2	understand BI, its architecture and its role in decision making	Understanding (K2)
CO3	design a data model at the conceptual and logical levels using different types of model	Understanding (K2)
CO4	interpret the key terminology associated with measurement and to apply the scoreboards and dash boards	Understanding (K2)
CO5	identify the need of BI in mobility, cloud computing, ERP and Social CRM	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	2	1	1									2	3
CO2	2	1											2	3
CO3	2	1											2	3
CO4	2	1											2	3
CO5	3	2	1	1									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	30	40	30				100
CAT2	30	70					100
CAT3	30	40	30				100
ESE	20	30	50				100

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

18BCE08 - WEB MINING

Programme & Branch	B.Sc & Computer Systems and Design	Sem.	Category	L	T	P	Credit
Prerequisites	18BCT42	6	PE	3	1	0	4

Preamble	To articulate web based social mining techniques and its usage.	
Unit - I	**Introduction:**	**9+3**
Social Media Mining - Challenges for Mining. Graph Essentials: Graph Basics – Graph Representation – Types of Graphs – Connectivity in Graphs – Special Graphs – Graph Algorithms.		
Unit - II	**Network Measures and Models:**	**9+3**
Centrality – Transitivity and Reciprocity – Balance and Status – Similarity. Network Models: Properties of Real World Networks - Random Graphs – Small World Model – Preferential Attachment Model.		
Unit - III	**Data Mining Essentials and Community Analysis:**	**9+3**
Data – Data Preprocessing – Data Mining Algorithms – Supervised Learning – Unsupervised Learning. Community Analysis: Community Detection – Community Evolution – Community Evaluation.		
Unit - IV	**Interactions in Social Media:**	**9+3**
Herd Behavior – Information Cascades – Diffusion of Innovations – Epidemics. Applications: Measuring Assortativity – Influence – Homophily.		
Unit - V	**Recommendation in Social Media:**	**9+3**
Challenges – Classical Recommendation Algorithms – Using Social Context – Evaluating Recommendations – Evaluating Ranking of recommendations. Behavior Analytics: Individual behaviour – Collective behaviour.		

Lecture:45, Tutorial:15, Total:60

TEXT BOOK:

1.	Reza Zafarani, Mohammad Ali Abbasi and Huan Liu, "Social Media Mining- An Introduction", 1 Edition, Cambridge University Press, 2014.

REFERENCES:

1.	V S Kumbhar, K S Oza and R K Kamat, "Web Mining", 1 Edition, River Publishers, 2016.
2.	Gage Ignatow and Rada F. Mihalcea, "Text Mining: A Guidebook for the Social Sciences", 1 Edition, Sage Publications, 2017.

COURSE OUTCOMES: On completion of the course, the students will be able to		**BT Mapped (Highest Level)**
CO1	explain the basic concepts of social media mining and various graph algorithms	Understanding (K2)
CO2	summarize the various network measures and network models used for mining	Understanding (K2)
CO3	apply the data mining algorithms for analyzing social media mining	Applying (K3)
CO4	explain the various interactions in social media with its applications	Understanding (K2)
CO5	interpret the various recommendations in social media`	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	2	1											2	3
CO2	2	1											2	3
CO3	3	2	1	1									2	3
CO4	2	1											2	3
CO5	3	2	1	1									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	10	50	40				100
CAT2	20	50	30				100
CAT3	10	50	40				100
ESE	10	50	40				100

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

18BCE09 - AGILE SOFTWARE DEVELOPMENT

(Common to Computer Systems and Design, Information Systems & Software Systems)

Programme & Branch	B.Sc & Computer Systems and Design	Sem.	Category	L	T	P	Credit
Prerequisites	18BCT22	6	PE	3	1	0	4

Preamble	To implement agility anywhere that enables to cope with changes in our life, in our team and in our organizations. Agility focuses on change, trust, quality measures, globalization and leadership in software development	
Unit - I	**Introduction to Agile Software Development and Teamwork:**	**9+3**
Perspectives on Software Engineering - Agile Manifesto – Applications of Agile Software Development - Data about Agile Software Development - Teamwork: Role Scheme in Agile Teams - Dilemmas in Teamwork - Teamwork in Learning Environments		
Unit - II	**Customers, Users and Time:**	**9+3**
The Customers - The Users - Time: Time Related Problems in Software Projects -Tightness of Software Development Methods - Sustainable Pace - Time Management of Agile Projects		
Unit - III	**Measures, Quality and Abstraction:**	**9+3**
Measures - Quality: The Agile Approach to Quality Assurance - Test Driven Development - Measured TDD - Abstraction: Abstraction Levels in ASD		
Unit - IV	**Trust, Globalization and Reflection:**	**9+3**
Software Intangibility and Process Transparency - Game Theory Perspective in Software Development - Ethics in Agile Teams - Diversity - Globalization: The Agile Approach in Global Software Development - Application of Agile Principles in Non-Software Projects - Reflection: Reflective Practitioner Perspective - Retrospective		
Unit - V	**Change, Leadership, Delivery and Cyclicality:**	**9+3**
Conceptual Framework for Change Introduction - Transition to an Agile Software Development Environment - Leadership: Leaders - Coaches - Delivery - Cyclicality.		

Lecture:45, Tutorial:15, Total:60

TEXT BOOK:

1. Hazzan Orit, Dubinsky Yael, "Agile Software Engineering", 1 Edition, Springer International Edition, 2014.

REFERENCES:

1. Stober Thomas, Hansmann Uwe, "Agile Software Development: Best Practices for Large Software Development Projects", Springer, 2014.
2. James A. Crowder, Shelli Friess, "Agile Project Management: Managing for Success", 1 Edition, Springer, 2016.

COURSE OUTCOMES: On completion of the course, the students will be able to		**BT Mapped (Highest Level)**
CO1	outline the perspectives of software engineering, applications and teamwork of agile software development	Understanding (K2)
CO2	explain about users of software, time related issues and time management in the agile projects	Understanding (K2)
CO3	compute the quality measures and abstraction levels of agile software development	Applying (K3)
CO4	elucidate the perspective, ethics, diversity and globalization of agile software development	Understanding (K2)
CO5	apply conceptual framework , development environment and leadership of Agile software engineering	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	2	1											2	3
CO2	2	1											2	3
CO3	3	2	1	1									2	3
CO4	2	1											2	3
CO5	3	2	1	1									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	50	30	20				100
CAT2	30	50	20				100
CAT3	30	40	30				100
ESE	30	40	30				100

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

18BCE10 - HUMAN RESOURCE MANAGEMENT

Programme & Branch	B.Sc & Computer Systems and Design	Sem.	Category	L	T	P	Credit
Prerequisites	NIL	6	PE	3	0	0	3

Preamble	To impart the knowledge on the role and importance of human function in an organization. It also highlight the various activities of HR that can be effectively managed to the efficient utilization of available workforce.	
Unit - I	**Introduction:**	**9**
Understanding the Nature and Scope of HRM: Nature of HRM – Functions and Objectives – Organisation of HR Department – HRM models – Human Capital Management –Jobs and Careers. Human Resource Planning: Planning Process – Requisites for Successful HRP – Barriers to HRP		
Unit - II	**Analysing Work and Designing Jobs:**	**9**
Nature – Job Analysis and Competitive Advantage – Process– Methods of Collecting Job Data – Job Design – Factors affecting Job Design – Issues. Recruiting Human Resources: Nature – Recruitment Process – Evaluation and Control – Alternatives to Recruitment		
Unit - III	**Selection and Training Process:**	**9**
Nature – Selection as a Source of Competitive Advantage – Organisation for Selection – Selection Process – Barriers for Effective Selection. Training, Development Career and Talent Management: Nature- Training Process		
Unit - IV	**Appraisal and Incentive Payments:**	**9**
Nature – Appraisal Process. Incentive Payments: Nature – Scope – Types – Group Incentive Plans – Incentives for Indirect Workers- Incentive Schemes in Indian Industries		
Unit - V	**Safety and Industrial Relations:**	**9**
Safety – Types of Accidents – Need for Safety – Safety Programme – Health. Industrial Relations, Disputes and Trade Unions: Nature – Importance – Approaches – Parties to IR – IR Strategy – Trade Unions		

Total:45

TEXT BOOK:

1.	Aswathappa K, "Human Resource Management: Text and Cases", 8 Edition, McGraw Hill, 2017.

REFERENCES:

1.	Gary Dessler and Biju Varkkey, "Human Resource Management", 15 Edition, Pearson Education, 2017.
2.	R. Wayne Dean Mondy and Joseph J. Martocchio, "Human Resource Management", 14 Edition, Pearson Education, 2016.
3.	John M. Ivancevich, "Human Resource Management", 11 Edition, Tata McGraw Hill, 2016.

COURSE OUTCOMES: On completion of the course, the students will be able to		**BT Mapped (Highest Level)**
CO1	outline the concept of different HRM models and planning process	Understanding (K2)
CO2	utilize the job design and recruitment process for staffing	Applying (K3)
CO3	design a training program using a useful framework for evaluating training needs	Applying (K3)
CO4	compare the training results and implement performance based payment system	Understanding (K2)
CO5	focus on the safety needs of employees and industrial relations	Analyzing (K4)

Mapping of COs with POs and PSOs														
COs/POs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	2	1											2	3
CO2	3	2	1	1									2	3
CO3	3	2	1	1									2	3
CO4	2	1						1			1		2	3
CO5	3	3	2	2	1			1					3	3
1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy														

ASSESSMENT PATTERN - THEORY							
Test / Bloom's Category*	**Remembering (K1) %**	**Understanding (K2) %**	**Applying (K3) %**	**Analyzing (K4) %**	**Evaluating (K5) %**	**Creating (K6) %**	**Total %**
CAT1	20	50	30				100
CAT2	15	35	50				100
CAT3	15	30	40	15			100
ESE	15	40	30	15			100

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

18BCE11 - SYSTEM ANALYSIS AND DESIGN

Programme & Branch	B.Sc & Computer Systems and Design	Sem.	Category	L	T	P	Credit
Prerequisites	18BCT22	6	PE	3	0	0	3

Preamble	To provide the technical, analytical and design skills on systems which also impart knowledge on the input, output and database designs.	
Unit - I	**System Analysis and Design Methods:**	**9**
The Context of Systems Analysis and Design Methods: A Framework for Systems Analysis and Design - System Stakeholders - Systems Owners, Systems Users, Designers, Builder, Analysts, External Service Providers- The Project Manager - Business Drivers for Today's Information Systems - Technology Drivers for Today's Information Systems - A Simple System Development Process.		
Unit - II	**Systems Analysis:**	**9**
Introduction - System Analysis - Systems Analysis Approaches – Model-Driven Analysis Approaches, Accelerated Systems Analysis Approaches, Requirements Discovery Methods, Business Process Redesign Methods, FAST Systems Analysis Strategies - The Scope Definition Phase - The Problem Analysis Phase - The Requirements Analysis Phase - The Logical Design Phase- The Decision Analysis Phase.		
Unit - III	**Requirement Discovery and Feasibility Analysis:**	**9**
Fact Finding Techniques For Requirements Discovery: Introduction – The Process of Requirements Discovery – Fact Finding Techniques -A Fact Finding Strategy. Feasibility Analysis and the System Proposal: Introduction - Feasibility Analysis and the System Proposal - Six Tests for Feasibility – Operational, Cultural, Technical, Schedule, Economic, Legal Feasibility - Cost Benefit Analysis Techniques - Feasibility Analysis of Candidate Systems- The System Proposal.		
Unit - IV	**Systems and Database Design:**	**9**
Introduction - Systems Design – Design Approaches – Model-Driven, Rapid Application Development, FAST Systems Design Strategies – System Design for In House Development - System Design for Integrating Commercial Software. Database Design: Introduction - Conventional Files versus the Database-Database Concepts for the Systems Analyst - Prerequisite for Database Design - Conventional File Design - Modern Database Design- Goals and Prerequisites, Database Schema, Data and Referential Integrity, Roles, Database Distribution and Replication, Prototypes, Capacity Planning, Structure Generation.		
Unit - V	**Input and Output Design:**	**9**
Input Design and Prototyping: Input Design Concepts and Guidelines – Data Capture, Data Entry, Data Processing, Input Methods and Implementation, User Issues, Internal Controls -GUI Controls for Input Design – Common GUI Controls for Inputs, Advanced Input Controls - Design and Prototype Inputs -Output Design and Prototyping: Introduction- Output Design Concepts and Guidelines – Distribution and Audience of Outputs, Implementation Methods.		

Total:45

TEXT BOOK:

1. Jeffrey L. Whitten and Bentley D. Lonnie, " Systems Analysis and Design Methods ", 7 Edition, Tata McGraw Hill Publishing Company, New Delhi, 2017.

REFERENCES:

1. Kendall Kenneth and Kendall Julie, " System Analysis and Design ", 9 Edition, Prentice Hall of India, 2017.
2. John W. Satzinger, Robert B. Jackson and Stephen D. Burd, " System Analysis and Design in a changing world ", 7 Edition, 2015.

COURSE OUTCOMES: On completion of the course, the students will be able to		**BT Mapped (Highest Level)**
CO1	explain the development and working of systems	Understanding(K2)
CO2	identify and explain the different phases in systems analysis	Applying(K3)
CO3	analyze the techniques for requirement discovery and feasibility analysis	Analyzing(K4)
CO4	apply different design concepts for In-House Development	Applying(K3)
CO5	experiment with various input and output design concepts	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	2	1											2	3
CO2	3	2	1	1									1	3
CO3	3	3	2	2									3	3
CO4	3	2	1	1									2	3
CO5	3	2	1	1									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	30	50	20				100
CAT2	30	40	30				100
CAT3	30	50	20				100
ESE	20	40	40				100

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

18BCE12 - EXTREME PROGRAMMING

Programme & Branch	B.Sc & Computer Systems and Design	Sem.	Category	L	T	P	Credit
Prerequisites	18BCC23	6	PE	3	0	0	3

Preamble	To introduce the fundamental concepts and programming aspects of C#	
Unit - I	**Fundamentals of C#:**	**9**
Understanding .NET: The C# Environment – Overview of C# - Literals, Variables and Data types of C#.		
Unit - II	**Basic Programming in C#:**	**9**
Operators and Expressions – Decision Making and Branching – Looping Statements – Methods in C#: Main () – Nesting of methods – Pass by Value and Reference – Output Parameters – Method Overloading.		
Unit - III	**Working with Data types:**	**9**
Handling Arrays: One, Two dimensional Arrays, Variable size Arrays, Array List Class– Strings: Creating and Manipulating Strings – Array of Strings – Structures and Enumerations.		
Unit - IV	**Object Oriented Programming:**	**9**
Introduction to OOP – Creating class and Objects – Access modifiers -Accessing Class members – Constructors – Types of constructors – Destructor – Nesting of classes – The This keyword.		
Unit - V	**OOP Concepts:**	**9**
Indexer and Properties – Operator Overloading - Inheritance: Types of Inheritance – Abstract Classes and Methods - Interface: Extending and Implementing Interface.		

Total:45

TEXT BOOK:

1.	Balagurusamy E, "Programming in C# A Primer", 4 Edition, Tata McGraw Hill Publication, New Delhi, 2017.

REFERENCES:

1.	Herbert Schildt, "C# 4.0: The Complete Reference", NA Edition, McGraw-Hill Education, New Delhi, 2017.
2.	Gaurav Kumar Arora, "Learn C# in 7 days", NA Edition, Packet Publishing, 2017.

COURSE OUTCOMES: On completion of the course, the students will be able to		**BT Mapped (Highest Level)**
CO1	compare the importance of C# with C++, Java and relates it with .NET Environment	Understanding (K2)
CO2	demonstrate the use of programming statements in C# and its methods	Understanding (K2)
CO3	develop C# applications with Arrays, Structures and Enumerations	Applying (K3)
CO4	apply Object Oriented Programming concepts in C# programs	Applying (K3)
CO5	develop C# applications by implementing Inheritance and Interfaces	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	2	1											2	3
CO2	2	1											2	3
CO3	3	2	1	1									2	3
CO4	3	2	1	1									2	3
CO5	3	2	1	1									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	30	40	30				100
CAT2	20	40	40				100
CAT3	20	30	50				100
ESE	30	30	40				100

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