KONGU ENGINEERING COLLEGE

(Autonomous Institution Affiliated to Anna University, Chennai)

PERUNDURAI ERODE – 638 060

TAMILNADU INDIA

Estd : 1984

REGULATIONS, CURRICULUM & SYLLABI - 2018

(CHOICE BASED CREDIT SYSTEM AND OUTCOME BASED EDUCATION)

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

BACHELOR OF TECHNOLOGY DEGREE
IN
INFORMATION TECHNOLOGY

DEPARTMENT OF INFORMATION TECHNOLOGY

KONGU
Assuring the Best

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KONGU ENGINEERING COLLEGE
PERUNDURAI ERODE – 638 060
(Autonomous)

INSTITUTE VISION

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

INSTITUTE MISSION

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

QUALITY POLICY

We are committed to

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

DEPARTMENT OF INFORMATION TECHNOLOGY

VISION

To be a centre of excellence for development and dissemination of knowledge in Information Technology for the nation and beyond.

MISSION

Department of Information Technology is committed to:

MS1: To transform the students into innovative, competent and high quality IT professionals to meet the growing global challenges
MS2: To impart value-based IT education to the students and enrich their knowledge.
MS3: To endeavour for continuous up gradation of technical expertise of students to cater to the needs of the society.
MS4: To achieve an effective interaction with industry for mutual benefits

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

Graduate of Information Technology Engineering programme will:

PEO1: Excel in industry and higher education by applying fundamental knowledge in engineering principles.
PEO2: Analyze, design and implement Information Technology based solutions to meet the real world problems.
PEO3: Exhibit Soft skills, Professional and Ethical values and thrust for continuous learning for a successful professional career

MAPPING OF MISSION STATEMENTS (MS) WITH PEOs

MS\PEO	PEO1	PEO2	PEO3
MS1	3	3	2
MS2	2	3	2
MS3	3	3	3
MS4	3	2	3

1 – Slight, 2 – Moderate, 3 – Substantial

PROGRAM OUTCOMES (POs)

Graduates of Information Technology Engineering will**:**

PO1 **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2 **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3 **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4 **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5 **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6 **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7 **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8 **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9 **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10 **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11 **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12 **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES (PSOs)

Graduates of Information Technology Engineering will**:**	
PSO1	**Foundations of IT:** Comprehend mathematical and computational methodologies to address the problems of various domains
PSO2	**Providing IT solutions:** Analyze, design and implement IT enabled solutions to meet industrial needs using appropriate tools and techniques

MAPPING OF PEOs WITH POs AND PSOs

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

1 – Slight, 2 – Moderate, 3 – Substantial

KONGU ENGINEERING COLLEGE, PERUNDURAI, ERODE – 638060

(Autonomous)

REGULATIONS 2018
(Revision: 4)

CHOICE BASED CREDIT SYSTEM AND OUTCOME BASED EDUCATION

BACHELOR OF ENGINEERING (BE) / BACHELOR OF TECHNOLOGY (BTech)

DEGREE PROGRAMMES

These regulations are applicable to all candidates admitted into BE/BTech Degree programmes from the academic year 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 Engineering (BE) / Bachelor of Technology (BTech) Degree programme

iv. "Branch" means specialization or discipline of BE/BTech Degree programme, like Civil Engineering, Information Technology, etc.

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

vi. "Credit" means a numerical value allocated to each course to describe the candidate's workload required per week.

vii. "Grade" means the letter grade assigned to each course based on the marks range specified.

viii. "Grade point" means a numerical value (0 to 10) allocated based on the grade assigned to each course.

ix. "Principal" means Chairman, Academic Council of the College.

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

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

2. PROGRAMMES AND BRANCHES OF STUDY

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

Programme	Branch
BE	Civil Engineering
	Mechanical Engineering
	Electronics and Communication Engineering
	Computer Science and Engineering
	Electrical and Electronics Engineering
	Electronics and Instrumentation Engineering
	Mechatronics Engineering
	Automobile Engineering
BTech	Chemical Engineering
	Information Technology
	Food Technology

3. ADMISSION REQUIREMENTS

3.1 First Semester Admission

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

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

(OR)

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

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

3.2 Lateral Entry Admission

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

(OR)

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

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

4. STRUCTURE OF PROGRAMMES

4.1 Categorisation of Courses

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

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

ii. Basic Science (BS) Courses

iii. Engineering Science (ES) Courses

iv. Professional Core (PC) Courses

v. Professional Elective (PE) Courses

vi. Open Elective (OE) Courses

vii. Employability Enhancement Courses (EC) like Project work, Professional Skills/Industrial Training, Comprehensive Test & Viva, Entrepreneurships/Start ups and Internship in Industry or elsewhere

viii. Audit Courses (AC)

ix. Mandatory Courses (MC)

4.2 Credit Assignment

4.2.1. Credit Assignment

Each course is assigned certain number of credits as follows:

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

The minimum number of credits to complete the programme shall vary from 168 to 173 as per the chosen programme of study.

4.3 Employability Enhancement Courses

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

4.3.1 Professional Skills Training/Industrial Training/ Entrepreneurships/Start Ups

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

(OR)

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

(OR)

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

4.3.2 Comprehensive Test and Viva

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

4.3.3 Internships

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

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

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

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

4.4 Value Added Courses / Online Courses / Self Study Courses

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

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

4.4.2 Online Courses: Candidates may be permitted to earn credits for online courses, offered by NPTEL / SWAYAM / a University / Other Agencies, approved by respective Board of Studies.

4.4.3 Self Study Courses: The Department may offer an elective course as a self study course. The syllabus of the course shall be approved by the respective Board of Studies. However, mode of assessment for a self study course will be the same as that used for other courses. The candidates shall study such courses on their own under the guidance of member of the faculty following due approval procedure. Self study course is limited to one per semester.

4.4.4 The elective courses in the final year may be exempted if a candidate earns the required credits vide clause 4.4.1, 4.4.2 and 4.4.3 by registering the required number of courses in advance.

4.4.5 A candidate can earn a maximum of 30 credits through all value added courses, online courses and self study courses.

4.5 Flexibility to Add or Drop Courses

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

4.5.2 From the first to eighth semesters the candidates have the option of registering for additional elective courses or dropping of already registered additional elective 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 eight.

4.6 Maximum number of credits the candidate can enroll in a particular semester cannot exceed 30 credits.

4.7 The blend of different courses shall be so designed that the candidate at the end of the programme would have been trained not only in his / her relevant professional field but also would have developed to become a socially conscious human being.

4.8 The medium of instruction, examinations and project report shall be English.

5. DURATION OF THE PROGRAMME

5.1 A candidate is normally expected to complete the BE / BTech Degree programme in 8 consecutive semesters/4 Years (6 semesters/3 Years for lateral entry candidate), but in any case not more than 14 semesters/7 Years (12 semesters/6 Years for lateral entry candidate).

5.2 Each semester shall consist of a minimum of 90 working days including continuous assessment test period. The Head of the Department shall ensure that every teacher imparts instruction as per the number of periods specified in the syllabus for the course being taught.

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

6. COURSE REGISTRATION FOR THE EXAMINATION

6.1 Registration for the end semester examination is mandatory for courses in the current semester as well as for the arrear courses failing which the candidate will not be permitted to move on to the higher semester. This will not be applicable for the courses which do not have an end semester examination.

6.2 The candidates who need to reappear for the courses which have only continuous assessment shall enroll for the same in the subsequent semester, when offered next, and repeat the course. In this case, the candidate shall attend the classes, satisfy the attendance requirements (vide clause 8) and earn continuous assessment marks. This will be considered as an attempt for the purpose of classification.

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

7. ASSESSMENT AND EXAMINATION PROCEDURE FOR AWARDING MARKS

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

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

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 of 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 a duration of three hours and shall be conducted between November and January during odd semesters and between April and June during even semesters every year.

7.4 Theory Cum Practical Courses

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

7.5 Practical Courses

For all practical courses 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 candidates' 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 / Project Work I Phase II

7.6.1 Project work shall be assigned to a single candidate or to a group of candidates not exceeding 4 candidates in a group. The project work is mandatory for all the candidates.

7.6.2 The Head of the Department shall constitute review committee for project work. There shall be two assessments by the review committee during the semester. The candidate shall make presentation on the progress made by him/her before the committee.

7.6.3 The continuous assessment and end semester examination marks for Project Work II/ Project Work I Phase II 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	Super visor	Review Committee (excluding Super visor)	Super visor	Review Committee (excluding Super visor)	Super visor	Ext. Exr.	Super visor	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 Supervisor shall be submitted to Head of the Department. The candidate(s) must submit the project report within the specified date as per the academic schedule of the semester. If the project report is not submitted within the specified date then the candidate is deemed to have failed in the Project Work and redo it in the subsequent semester.

7.6.5 If a candidate fails to secure 50% of the continuous assessment marks in the project work, he / she shall not be permitted to submit the report for that particular semester and shall have to redo it in the subsequent semester and satisfy attendance requirements.

7.6.6 The end semester examination of the project work shall be evaluated based on the project report submitted by the candidate in the respective semester and viva-voce examination by a committee consisting of two examiners and supervisor of the project work.

7.6.7 If a candidate fails to secure 50 % of the end semester examination marks in the project work, he / she shall be required to resubmit the project report within 30 days from the date of declaration of the results and a fresh viva-voce examination shall be conducted as per clause 7.6.6.

7.6.8 A copy of the approved project report after the successful completion of viva-voce examination shall be kept in the department library.

7.7 Project Work I Phase I/Industrial Training

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

Continuous Assessment (Max. 100 Marks)								
Zeroth Review		Review I (Max.. 20 Marks)		Review II (Max.. 30 Marks)		Review III (Max. 50 Marks)		
						Report Evaluation (Max. 20 Marks)	Viva - Voce (Max. 30 Marks)	
Review Committee	Supervisor	Review Committee (excluding supervisor)	Supervisor	Review Committee (excluding supervisor)	Supervisor	Review Committee	Supervisor	Review Committee

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

7.8 Professional Skills Training

Phase I training shall be conducted for minimum of 80 hours in 4th semester vacation and during 5th semester. Phase II training shall be conducted for minimum of 80 hours in 5th semester vacation and during 6th semester. The evaluation procedure shall be approved by the Principal.

7.9 Comprehensive Test and Viva

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

7.10 Entrepreneurships/ Start ups

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

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

7.11 Projects through Internships

Each candidate shall submit 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.

7.12 Value Added Course

Minimum of two assessments shall be conducted during the value added course duration by the offering department concerned.

7.13 Online Course

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

7.14 Self Study Course

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

7.15 Audit Course

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

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

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

Candidates registering for an audit course shall meet all the assessment and examination requirements 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.

7.16 Universal Human Values

The course imparting the human values shall be taught for all candidates who have joined in various branches of all BE/BTech programmes. This course shall carry a maximum of 100 marks and shall be evaluated through continuous assessment tests only vide clause 7.1. The candidate(s) can earn 2 credits by successfully completing this course. Two continuous assessment tests will be conducted and the average marks will be taken for the 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 BE / BTech Degree provided the candidate has

i. Successfully completed all the courses under the different categories, as specified in the regulations.
ii. Successfully gained the required number of total credits as specified in the curriculum corresponding to the candidate's programme within the stipulated time (vide clause 5).
iii. Successfully passed any additional courses prescribed by the respective Board of Studies whenever readmitted under regulations other than R-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 eight semesters (six semesters for lateral entry candidates) in the **First Appearance** within eight consecutive semesters (six consecutive semesters for lateral entry candidates) excluding the authorized break of study (vide clause 11) after the commencement of his / her study.
- Withdrawal from examination (vide clause 10) shall not be considered as an appearance.
- Should have secured a CGPA of not less than 8.50

(OR)

17.1.2 A candidate who joins from other institutions on transfer or a candidate who gets readmitted and has to move from one regulations to another regulations and who qualifies for the award of the degree (vide clause 16) and satisfies the following conditions shall be declared to have passed the examination in First class with Distinction:

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

- Submission of equivalent course list approved by the respective Board of studies.

- Withdrawal from examination (vide clause 10) shall not be considered as an appearance.

- Should have secured a CGPA of not less than 9.00

17.2 First Class:

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

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

- Withdrawal from the examination (vide clause 10) shall not be considered as an appearance.

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 BE / BTech programme.

All amendments until the 16th 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**	**VII**	**VIII**		
HS	4	3	1		2		3		13	**7.69**
BS	11	11	4	4					30	**17.75**
ES	6	4	7	4					21	**12.43**
PC		3	11	16	16	12			58	**34.32**
PE						3	9	3	15	**8.88**
OE					4	4	3	3	14	**8.28**
EC					2	4	6	6	18	**10.65**
Semester wise Total	21	21	23	24	24	23	21	12	169	**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 SCIENCE INCLUDING MANAGEMENT (HS)							
S. No.	**Course Code**	**Course Name**	**L**	**T**	**P**	**C**	**Sem**
1. .	18EGT11	English for Communication I	3	0	0	3	I
2.	18VEC11	Value Education	2	0	1	1	I
3.	18EGT21	English for Communication II	3	0	0	3	II
4.	18EGL31	English for workplace communication	0	0	2	1	IV
5.	18GET51	Universal Human Values	2	0	0	2	V
6. .	18MBT71	Engineering Economics and Management	3	0	0	3	VII
Total Credits to be earned						**13**	
BASIC SCIENCE (BS)							
S. No.	**Course Code**	**Course Name**	**L**	**T**	**P**	**C**	**Sem**
1.	18MAC11	Mathematics I	3	1*	2*	4	I

2.	18PHC11	Applied Physics	3	0	2*	3.5	I
3.	18CYC11	Applied Chemistry	3	0	2*	3.5	I
4.	18MAC21	Mathematics II	3	1*	2*	4	II
5.	18PHC24	Solid State Physics	3	0	2*	3.5	II
6.	18CYC25	Environmental Science and Organic Electronic Materials	3	0	2*	3.5	II
7.	18MAT31	Discrete Mathematics	3	1	0	4	III
8.	18MAC42	Probability and Statistics	3	1*	2*	4	IV
Total Credits to be earned						**30**	

ENGINEERING SCIENCE (ES)

S. No.	Course Code	Course Name	L	T	P	C	Sem
1.	18GET11	Introduction to Engineering	3	0	0	3	I
2.	18CSC11	Problem Solving and Programming	2	0	2	3	I
3.	18MEC11	Engineering Drawing	2	0	2	3	II
4.	18MEL11	Engineering Practices Laboratory	0	0	2	1	II
5.	18ITC31	Digital Principles and Design	3	0	2	4	III
6.	18ITT31	Principles of Communication	3	0	0	3	III
7.	18ECT44	Microprocessor and Embedded Systems	3	0	0	3	IV
8.	18ECL43	Microprocessor and Embedded Systems Laboratory	0	0	2	1	IV
Total Credits to be earned						**21**	

PROFESSIONAL CORE (PC)

S. No.	Course Code	Course Name	L	T	P	C	Sem	Domain/ Stream
1.	18CSC21	Programming and Linear Data Structures	2	0	2	3	II	SD
2.	18CST31	Data Structures	3	0	0	3	III	SD
3.	18CST32	Computer Organization	3	0	0	3	III	AP
4.	18CST33	Object Oriented Programming	3	0	0	3	III	SD
5.	18CSL31	Data Structures Laboratory	0	0	2	1	III	SD
6.	18CSL32	Object Oriented Programming Laboratory	0	0	2	1	III	SD
7.	18CST41	Database Management Systems	3	1	0	4	IV	SD
8.	18CST42	Design and Analysis of Algorithms	3	1	0	4	IV	SD
9.	18CST43	Operating Systems	3	0	0	3	IV	AP

10.	18ITT41	Python Programming and Frameworks	3	0	0	3	IV	SD
11.	18CSL41	Database Management Systems Laboratory	0	0	2	1	IV	SD
12.	18ITL41	Python Programming Laboratory	0	0	2	1	IV	SD
13.	18ITT51	Computer Networks	3	0	0	3	V	NW
14.	18ITT52	Web Technology	3	0	0	3	V	SD
15.	18ITC51	Building Enterprise application using Java	3	0	2	4	V	SD
16.	18ITT53	Software Engineering	3	0	0	3	V	SD
17.	18ITL51	Web Technology Laboratory	0	0	2	1	V	SD
18.	18ITL52	Network Laboratory	0	0	2	1	V	NW
19.	18CSL53	Case Tools Laboratory	0	0	2	1	V	SD
20.	18ITT61	Machine Learning	3	0	0	3	VI	CI
21.	18ITT62	Internet of Things	3	0	0	3	VI	NW
22.	18ITT63	Cryptography and Network Security	3	0	0	3	VI	NW
23.	18ITL61	Machine Learning Laboratory	0	0	2	1	VI	CI
24.	18ITL62	Internet of Things Laboratory	0	0	2	1	VI	NW
25.	18ITL63	Network Security Laboratory	0	0	2	1	VI	NW
Total Credits to be earned						**58**		

PROFESSIONAL ELECTIVE COURSES (PE)								
S. No.	**Course Code**	**Course Name**	**L**	**T**	**P**	**C**	**Sem**	**Domain/ Stream**
		Elective 1						
1.	18ITE02	Compiler Design	3	1	0	4	VI	AP
2.	18ITE03	Advanced Database	3	0	0	3	VI	AP
3.	18ITE04	Cross platform Applications Development	3	0	0	3	VI	SD
4.	18ITE05	Platform Technologies	3	0	0	3	VI	SD
5.	18ITE06	Network Communication Protocols	3	0	0	3	VI	NW
6.	18ITE07	Data Warehousing and Data Mining	3	0	0	3	VI	CI
		Elective 2						
7.	18ITE08	Computer Graphics	3	0	0	3	VII	AP
8.	18ITE09	Software Quality and Testing	3	0	0	3	VII	SD
9.	18ITE10	Block Chain Technologies	3	0	0	3	VII	NW
10	18ITE11	Deep Learning	3	0	0	3	VII	CI

11	18ITE12	Information Coding Techniques	3	0	0	3	VII	GN
		Elective 3						
12.	18ITE13	Distributed Systems	3	0	0	3	VII	AP
13.	18ITE14	3D Modeling and Mixed Reality Applications	3	0	0	3	VII	SD
4.	18ITE15	Agile methodologies	3	0	0	3	VII	SD
15.	18ITE16	Mobile Computing	3	0	0	3	VII	NW
16.	18ITE17	Big Data Analytics	3	0	0	3	VII	CI
17.	18ITE18	Information Retrieval Techniques	3	0	0	3	VII	GN
		Elective 4						
18.	18ITE19	Service Oriented Architecture	3	0	0	3	VII	AP
19.	18ITE20	Building Enterprise Applications	3	0	0	3	VII	SD
20.	18ITE21	Software Defined Networks	3	0	0	3	VII	NW
21.	18ITE22	Cyber Forensics	3	0	0	3	VII	NW
22.	18ITE23	Data Visualization Techniques	3	0	0	3	VII	CI
23.	18ITE24	Disaster Management on Information Technology	3	0	0	3	VII	GN
24.	18GEE01	Fundamentals of Research	3	0	0	3	VII	GN
		Elective 5						
25.	18MBE49	Entrepreneurship Development	3	0	0	3	VIII	GN
26.	18ITE25	Parallel Computing Architecture and Programming	3	0	0	3	VIII	AP
27.	18ITE26	Information Storage and Cloud Computing	3	0	0	3	VIII	AP
28.	18ITE27	Software Project Management	3	0	0	3	VIII	SD
29.	18ITE28	Wireless Sensor Networks	3	0	0	3	VIII	NW
30.	18ITE29	Ethical Hacking	3	0	0	3	VIII	NW
31.	18ITE30	Social Network Analysis	3	0	0	3	VIII	CI
32.	18ITE31	Business Intelligence and its Applications	3	0	0	3	VIII	CI
33.	18ITE32	Green Computing	3	0	0	3	VIII	GN
Total Credits to be earned						**15**		

EMPLOYABILITY ENHANCEMENT COURSES (EC)							
S. No.	**Course Code**	**Course Name**	**L**	**T**	**P**	**C**	**Sem**
1.	18GEL51/ 18GEI51	Professional Skills Training I / Industrial Training I	0	0	0	2	V
2.	18GEL61/ 18GEI61	Professional Skills Training II / Industrial Training II	0	0	0	2	VI

3.	18ITP61	Project Work I Phase I	0	0	4	2	VI
4.	18GEP71	Comprehensive Test and Viva	0	0	0	2	VII
5.	18ITP71	Project Work I Phase II	0	0	8	4	VII
6.	18ITP81	Project Work II	0	0	12	6	VIII
Total Credits to be earned						**18**	

***** Domain/Stream Abbreviations: GE – General Engineering, AP -Architecture &Programming ,SD- Software Development, NW-Networking, CI- Computational Intelligence, GN- General

OPEN ELECTIVE COURSES OFFERED TO OTHER DEPARTMENTS (OE)							
S. No.	**Course Code**	**Course Name**	**L**	**T**	**P**	**C**	**Sem**
1.	18ITO01	Python Programming	3	1	0	4	V
2.	18ITO02	Advanced Java Programming	3	1	0	4	V
3.	18ITO03	Java Programming	3	1	0	4	VI
4.	18ITO04	Next Generation Databases	3	1	0	4	VI
5.	18ITO05	Business Continuity Planning	3	0	0	3	VII
6.	18ITO06	Mobile Application Development	3	0	0	3	VII
7.	18ITO07	Essentials of Information Technology	3	0	0	3	VIII
8.	18ITO08	Virtual and Reality Frameworks	3	0	0	3	VIII

OPEN ELECTIVE COURSES OFFERED BY OTHER DEPARTMENTS (OE)

S. No.	**Course Code**	**Course Name**	**L**	**T**	**P**	**C**	**OFFERED BY**
		SEMESTER V					
9.	18MAO01	Mathematical Foundations of Machine Learning	3	1	0	4	MATHS
10.	18PHO01	Thin film Technology	3	1	0	4	PHYSICS
11.	18CYO01	Corrosion Science and Engineering	3	1	0	4	CHEMISTRY
12.	18CEO01	Remote Sensing and its Applications	3	0	2	4	CIVIL
13.	18MEO01	Renewable Energy Sources	3	0	2	4	MECH
14.	18MTO01	Design of Mechatronics Systems	3	1	0	4	MTS
15.	18AUO01	Automotive Engineering	3	0	2	4	AUTO
16.	18ECO01	PCB Design and Fabrication	3	0	2	4	ECE
17.	18ECO02	Neural Networks and Fuzzy Logic for Engineering Applications	3	0	2	4	ECE
18.	18EEO01	Electrical Wiring and Lighting	3	1	0	4	EEE
19.	18EEO02	Solar and Wind Energy Systems	3	1	0	4	EEE

20.	18EIO01	Neural Networks and Deep Learning	3	1	0	4	EIE
21.	18CSO01	Data Structures and its Applications	3	0	2	4	CSE
22.	18CSO02	Formal Languages and Automata Theory	3	1	0	4	CSE
23.	18CSO03	Computational Science for Engineers	3	1	0	4	CSE
24.	18CHO01	Polymer Technology	3	1	0	4	CHEM
25.	18CHO02	Introduction to Drugs and Pharmaceuticals Technology	3	1	0	4	CHEM
26.	18FTO01	Food Processing Technology	3	1	0	4	FT
27.	18FTO02	Baking Technology	3	0	2	4	FT
		SEMESTER VI					
28.	18MAO02	Graph Theory and its Applications	3	1	0	4	MATHS
29.	18MAO03	Number Theory and Cryptography	3	1	0	4	MATHS
30.	18CYO02	Instrumental Methods of Analysis	3	1	0	4	CHEMISTRY
31.	18CEO02	Disaster Management	3	1	0	4	CIVIL
32.	18MEO02	Design of Experiments	3	0	2	4	MECH
33.	18MTO02	Factory Automation	3	0	2	4	MTS
34.	18MTO03	Data Acquisition and Virtual Instrumentation	3	0	2	4	MTS
35.	18AUO02	Autonomous Vehicles	3	1	0	4	AUTO
36.	18ECO03	Principles of Quantum Computing	3	0	2	4	ECE
37.	18EEO03	Energy Conservation and Management	3	1	0	4	EEE
38.	18EIO02	Digital Image Processing and Its Applications	3	1	0	4	EIE
39.	18EIO03	Industrial Automation	3	1	0	4	EIE
40.	18CSO04	Web Engineering	3	0	2	4	CSE
41.	18CSO05	Foundations of Data Analytics	3	1	0	4	CSE
42.	18CSO06	Nature Inspired Optimization Techniques	3	1	0	4	CSE
43.	18CSO07	Introducing Data Science	3	1	0	4	CSE
44.	18CHO03	Bio Energy Resources	3	1	0	4	CHEM
45.	18CHO04	Fundamentals of Nanoscience and Nanotechnology	3	1	0	4	CHEM
46.	18FTO03	Processing of Milk and Milk Products	3	0	2	4	FT
47.	18FTO04	Processing of Fruits and Vegetables	3	0	2	4	FT
		SEMESTER VII					
48.	18MAO04	Advanced Linear Algebra	3	0	0	3	MATHS

49.	18MAO05	Optimization Techniques	3	0	0	3	MATHS
50.	18PHO02	Structural and Optical Characterization of Materials	3	0	0	3	PHYSICS
51.	18CYO03	Waste and Hazardous Waste Management	3	0	0	3	CHEMISTRY
52.	18CEO03	Introduction to Smart Cities	3	0	0	3	CIVIL
53.	18CEO04	Environmental Health and Safety	3	0	0	3	CIVIL
54.	18MEO03	Fundamentals of Ergonomics	3	0	0	3	MECH
55.	18MEO04	Principles of Management and Industrial Psychology	3	0	0	3	MECH
56.	18MTO04	3D Printing and Design	3	0	0	3	MTS
57.	18MTO05	Drone System Technology	3	0	0	3	MTS
58.	18AUO03	Alternate Fuels for Automobile	3	0	0	3	AUTO
59.	18ECO04	Electronic Hardware and Troubleshooting	2	0	2	3	ECE
60.	18ECO05	Principles of Communication Techniques	3	0	0	3	ECE
61.	18EEO04	Micro Grid and Smart Grid	3	0	0	3	EEE
62.	18EEO05	Electrical Safety	3	0	0	3	EEE
63.	18EIO04	Biomedical Instrumentation and Applications	3	0	0	3	EIE
64.	18EIO05	PLC Programming and Its Applications	3	0	0	3	EIE
65.	18CSO08	Artificial intelligence and its Applications	3	0	0	3	CSE
66.	18CHO05	Enzyme Engineering	3	0	0	3	CHEM
67.	18CHO06	Nuclear Engineering	3	0	0	3	CHEM
68.	18FTO05	Principles of Food Safety	3	0	0	3	FT
69.	18FTO06	Food and Nutrition	3	0	0	3	FT
		SEMESTER VIII					
70.	18CEO05	Infrastructure Planning and Management	3	0	0	3	CIVIL
71.	18CEO06	Environmental Laws and Policy	3	0	0	3	CIVIL
72.	18MEO05	Safety Measures for Engineers	3	0	0	3	MECH
73.	18MEO06	Energy Conservation in Thermal Equipments	3	0	0	3	MECH
74.	18MTO06	Robotics	3	0	0	3	MTS
75.	18MTO07	Virtual and Augment Reality in Industry 4.0	3	0	0	3	MTS
76.	18AUO04	Automotive Electronics	3	0	0	3	AUTO
77.	18AUO05	Vehicle Maintenance	3	0	0	3	AUTO
78.	18ECO06	Bioinspired Computing Technologies	2	0	2	3	ECE

79.	18EEO06	Electric Vehicle	3	0	0	3	EEE
80.	18EIO06	Measurements and Instrumentation	3	0	0	3	EIE
81.	18EIO07	Graphical Programming using Virtual Instrumentation	3	0	0	3	EIE
82.	18CSO09	Applied Machine Learning	3	0	0	3	CSE
83.	18CSO10	Fundamentals of Blockchain	3	0	0	3	CSE
84.	18CSO11	Fundamentals of Internet of Things	3	0	0	3	CSE
85.	18CHO07	Fertilizer Technology	3	0	0	3	CHEM
86.	18FTO07	Food Ingredients	3	0	0	3	FT
87.	18FTO08	Fundamentals of Food Packaging and Storage	3	0	0	3	FT

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

S. No.	Course Code	Course Title	L	T	P	C	Offering Department	Semester
88.	18GEO01	German Language Level 1	4	0	0	4	ECE	V/ VI/ VII/ VIII
89.	18GEO02	Japanese Language Level 1	4	0	0	4	ECE	V/ VI/ VII/ VIII
90.	18GEO03	Design Thinking for Engineers	3	0	0	3	CSE	VI
91.	18GEO04	Innovation and Business Model Development	3	0	0	3	MTS	VIII
92.	18GEO05	German Language Level 2	4	0	0	4	ECE	V/ VI/ VII/ VIII
93.	18GEO06	German Language Level 3	3	0	0	3	ECE	V/ VI/ VII/ VIII
94.	18GEO07	German Language Level 4	3	0	0	3	ECE	V/ VI/ VII/ VIII
95.	18GEO08	Japanese Language Level 2	4	0	0	4	ECE	V/ VI/ VII / VIII
96.	18GEO09	Japanese Language Level 3	3	0	0	3	ECE	V/ VI/ VII / VIII
97.	18GEO10	Japanese Language Level 4	3	0	0	3	ECE	V/ VI/ VII / VIII
98.	18GEO11	NCC Studies (Army Wing) – I	3	0	2	4	EEE	V/ VI
99.	18GEO12	NCC Studies (Air Wing) – I	3	0	2	4	IT	V / VI

KEC R2018: SCHEDULING OF COURSES – B.Tech Information Technology Total Credits :169

Sem.	Course1	Course2	Course3	Course4	Course5	Course6	Course7	Course8	Course9	Course10	Credits
I	18EGT11 English for Communication I (3-0-0-3)	18MAC11 Mathematics I (3-1*-2*-4)	18PHC11 Applied Physics (3-0-2*-3.5)	18CYC11 Applied Chemistry (3-0-2*-3.5)	18GET11 Introduction to Engineering (3-0-0-3)	18MEC11 Problem Solving and Programming (2-0-2-3)	18MEL11 Value Education (0-0-2-1)				**21**
II	18EGT21 English for Communication II (3-0-0-3)	18MAC21 Mathematics II (3-1*-2*-4)	18PHC24 Solid State Physics (3-0-2*-3.5)	18CYC25 Environmental Science and Organic Electronic Materials (3-0-2*-3.5)	18MEC11 Engineering Drawing (2-0-2-3)	18CSC21 Programming and LinearData Structures (2-0-2-3)	18MEL11 Engineering Practices Laboratory (0-0-2-1))				**21**
III	18MAT31 Discrete Mathematics (3-1*-2*-4)	18CST31 Data Structures (3-0-0-3)	18CST32 Computer Organizatio n (3-0-0-3)	18CST33 Object Oriented Programming (3-1-0-4)	18ITC31 Digital Principles and Design (3-1-0-4)	18ITT31 Principles of Communi cation (3-0-0-3)	18CSL31 Data Structures Laboratory (0-0-2-1)	18CSL32 Object Oriented Programming Laboratory (0-0-2-1)	18EGL31 English for Work Place Communi cation (0-0-2-1)		**23**
IV	18MAC42 Probability and Statistics (3-1-2*-4)	18ECT44 Microprocess or and Embedded Systems (3-0-0-3)	18CST42 Design and Analysis of Algorithms (3-1-0-4)	18CST41 Database Management Systems (3-1-0-4)	18ITT41 Python Programming and Frameworks (3-0-0-3)	18CST43 Operating Systems (3-0-0-3)	18ECL43 Microprocesso r and Embedded Systems Laboratory (0-0-2-1)	18ITL41 Python Programming and Frameworks Laboratory (0-0-2-1)	18CSL41 Database Management Systems Laboratory (0-0-2-1)		**24**
V	18ITT51 Computer Networks (3-0-0-3)	18ITT52 Web Technology (3-0-0-3)	18ITT53 Enterprise Application Developme nt using Java (3-0-2-4)	18CSC51 Software Engineering (3-0–0-3)	Open Elective I (3-1/0-0/2-4)	18ITL51 Network Laboratory (0-0-2-1)	18ITL52 Web Technology Laboratory (0-0-2-1)	18CSL Case Tools Laboratory (0-0-2-1)	18GEL51/ 18GEI51 Professional Skills Training I / Industrial Training I (0-0-0-2)	18GET51 Universal Human Values (2-0-0-2)	**24**
VI	18ITT61 Machine Learning (3-0-0-3)	18ITT62 Internet of Things (3-0-0-3)	18ITT63 Cryptograp hy and Network Security (3-0–0-3)	Professional Elective – 01 (3-0-0-3)	Open Elective II (3-1/0-0/2-4)	18ITL61 Machine Learning Laboratory (0-0-2-1)	18ITL62 Internet of Things Laboratory (0-0-2-1)	18ITL63 Network Security Laboratory (0-0-2-1)	18GEL61 / 18GEI61 Professional Skills Training II / Industrial Training II (0-0-0-2)	18ITP61 Project Work I Phase I (0-0-4-2)	**23**
VII	18MBT71 Engineering Economics and Management (3-0-0-3)	Open Elective III (3-0-0-3)	Professional Elective II (3-0-0-3)	Professional Elective III (3-0-0-3)	Professional Elective IV (3-0-0-3)	18GEP71 Comprehen-sive Test & Viva (0-0-0-2)	18ITP71 Project Work I Phase II (0-0-8-4)				**21**
VIII	Open Elective IV (3-0-0-3)	Professional Elective V (3-0-0-3)	18ITP81 Project Work II (0-0-12-6)								**12**

MAPPING OF COURSES WITH PROGRAM OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

Sem.	Course Code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	18EGT11	English for Communication I						✓			✓	✓	✓	✓		
1	18MAC11	Mathematics I	✓	✓	✓	✓	✓									
1	18PHC11	Applied Physics	✓	✓	✓	✓										
1	18CYC11	Applied Chemistry	✓	✓	✓	✓										
1	18GET11	Introduction to Engineering	✓	✓	✓	✓		✓	✓					✓		
1	18CSC11	Problem Solving and Programming	✓	✓	✓	✓	✓					✓			✓	✓
1	18VEC11	Value Education						✓		✓				✓		
2	18EGT21	English for Communication II						✓			✓	✓	✓	✓		
2	18MAC21	Mathematics II	✓	✓	✓		✓									
2	18PHC24	Solid state physics	✓	✓	✓	✓										
2	18CYC25	Environmental Science and Organic Electronic Materials	✓	✓	✓	✓			✓							
2	18MEC11	Engineering Drawing	✓	✓	✓	✓						✓	✓	✓		
2	18CSC21	Programming and Linear and Data Structures	✓	✓	✓	✓	✓								✓	✓
2	18MEL11	Engineering Practices Laboratory	✓	✓	✓	✓	✓				✓	✓	✓	✓		
3	18MAT31	Discrete Mathematics	✓	✓	✓	✓									✓	
3	18CST31	Data Structures	✓	✓	✓	✓									✓	✓
3	18CST32	Computer Organization	✓	✓	✓										✓	✓
3	18CST33	Object Oriented Programming	✓	✓	✓	✓									✓	✓
3	18ITC31	Digital Principles and Design	✓	✓	✓										✓	✓
3	18ITT31	Principles of Communication	✓	✓	✓	✓									✓	✓
3	18CSL31	Data Structures Laboratory	✓	✓	✓	✓	✓								✓	✓
3	18CSL32	Object Oriented Programming Laboratory	✓		✓	✓	✓	✓						✓	✓	✓
3	18EGL31	English for Workplace Communication									✓	✓		✓		
4	18MAC42	Probability and Statistics	✓	✓	✓	✓	✓								✓	

Sem.	Course Code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
4	18CST41	Database Management Systems	✓	✓	✓						✓				✓	✓
4	18CST42	Design and Analysis of Algorithms	✓	✓	✓	✓	✓								✓	✓
4	18CST43	Operating Systems	✓	✓	✓	✓									✓	✓
4	18ITT41	Python Programming and Frameworks	✓	✓	✓		✓							✓		✓
4	18ECT44	Microprocessor and Embedded Systems	✓	✓	✓	✓										✓
4	18CSL41	Database Management Systems Laboratory	✓	✓	✓	✓	✓					✓	✓		✓	✓
4	18ITL41	Python Programming Laboratory	✓	✓	✓		✓				✓			✓		✓
4	18ECL43	Microprocessor and Embedded Systems Laboratory	✓	✓	✓	✓										✓
5	18ITT51	Computer Networks	✓	✓	✓	✓									✓	✓
5	18ITT52	Web Technology	✓	✓	✓	✓									✓	✓
5	18ITT53	Software Engineering	✓	✓	✓	✓									✓	✓
5	18ITC51	Enterprise Application Development using Java	✓	✓	✓	✓									✓	✓
5	18ITL51	Network Laboratory	✓	✓	✓	✓									✓	✓
5	18ITL52	Web Technology Laboratory	✓	✓	✓	✓									✓	✓
5	18ITL53	Case Tools Laboratory	✓	✓	✓	✓									✓	✓
5	18GEL51/ 18GEI51	Professional Skills Training I / Industrial Training I	✓	✓				✓	✓		✓	✓	✓	✓		
5	18GET51	Universal Human Values						✓		✓						
6	18ITT61	Machine Learning	✓	✓	✓	✓									✓	✓
6	18ITT62	Internet of Things	✓	✓	✓	✓									✓	✓
6	18ITT63	Cryptography and Network Security	✓	✓	✓	✓									✓	✓
6	18ITL61	Machine Learning Laboratory	✓	✓	✓	✓								✓	✓	✓
6	18ITL62	Internet of Things Laboratory	✓	✓	✓										✓	✓
6	18ITL63	Network security Laboratory	✓	✓	✓	✓	✓								✓	✓
6	18GEL61/ 18GEI61	Professional Skills Training II/ Industrial Training II	✓	✓				✓	✓		✓	✓	✓	✓		
6	18ITP61	Project Work I Phase I	✓	✓	✓	✓	✓				✓	✓	✓		✓	✓
7	18MBT71	Engineering Economics and Management	✓	✓	✓			✓	✓	✓	✓	✓	✓	✓	✓	✓

Sem.	Course Code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
7	18GEP71	Comprehensive Test and Viva	✓	✓	✓	✓					✓	✓	✓	✓	✓	✓
7	18ITP71	Project Work I Phase II	✓	✓	✓	✓	✓				✓	✓	✓		✓	✓
8	18ITP81	Project Work II	✓	✓	✓	✓	✓				✓	✓	✓		✓	✓
		Professional Elective Courses														
6	18ITE02	Compiler Design	✓	✓	✓	✓	✓								✓	✓
6	18ITE03	Advanced Database	✓	✓	✓	✓									✓	✓
6	18ITE04	Cross platform Applications Development	✓	✓	✓	✓									✓	✓
6	18ITE05	Platform Technologies	✓	✓	✓	✓									✓	✓
6	18ITE06	Network Communication Protocols	✓	✓	✓	✓									✓	✓
6	18ITE07	Data Warehousing and Data Mining	✓	✓	✓	✓									✓	✓
7	18ITE08	Computer Graphics	✓	✓	✓	✓									✓	✓
7	18ITE09	Software Quality and Testing	✓	✓	✓	✓									✓	✓
7	18ITE10	Block Chain Technologies	✓	✓	✓	✓									✓	✓
7	18ITE11	Deep Learning	✓	✓	✓	✓									✓	✓
7	18ITE12	Information Coding Techniques	✓	✓	✓	✓									✓	✓
7	18ITE13	Distributed Systems	✓	✓	✓	✓									✓	✓
7	18ITE14	3D Modeling and Mixed Reality Applications	✓	✓	✓	✓									✓	✓
7	18ITE15	Agile Methodologies	✓	✓	✓	✓									✓	✓
7	18ITE16	Mobile Computing	✓	✓	✓	✓									✓	✓
7	18ITE17	Big Data Analytics	✓	✓	✓	✓									✓	✓
7	18ITE18	Information Retrieval Techniques	✓	✓	✓	✓									✓	✓
7	18ITE19	Service Oriented Architecture	✓	✓	✓	✓									✓	✓
7	18ITE20	Building Enterprise Applications	✓	✓	✓	✓									✓	✓
7	18ITE21	Software Defined Networks	✓	✓	✓	✓									✓	✓
7	18ITE22	Cyber Forensics	✓	✓	✓	✓									✓	✓
7	18ITE23	Data Visualization Techniques	✓	✓	✓	✓									✓	✓
7	18ITE24	Disaster Management on Information Technology	✓	✓	✓	✓									✓	✓
7	18GEE01	Fundamentals of Research	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Sem.	Course Code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
8	18MBE49	Entrepreneurship Development	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓
8	18ITE25	Parallel Computing Architecture and Programming	✓	✓	✓	✓									✓	✓
8	18ITE26	Information Storage and Cloud Computing	✓	✓	✓	✓									✓	✓
8	18ITE27	Software Project Management	✓	✓	✓	✓									✓	✓
8	18ITE28	Wireless Sensor Networks	✓	✓	✓	✓									✓	✓
8	18ITE29	Ethical Hacking	✓	✓	✓	✓									✓	✓
8	18ITE30	Social Network Analysis	✓	✓	✓	✓									✓	✓
8	18ITE31	Business Intelligence and its Applications	✓	✓	✓										✓	✓
8	18ITE32	Green Computing	✓	✓	✓	✓									✓	✓

		Open Elective Courses														
5	18MAO01	Mathematical Foundations of Machine Learning	✓	✓	✓	✓	✓									
5	18PHO01	Thin film Technology	✓	✓	✓											
5	18CYO01	Corrosion Science and Engineering	✓	✓	✓	✓										
5	18CEO01	Remote Sensing and its Applications	✓	✓	✓	✓	✓									
5	18MEO01	Renewable Energy Sources	✓	✓	✓	✓			✓			✓		✓		
5	18MTO01	Design of Mechatronics Systems	✓	✓	✓	✓	✓							✓		
5	18AUO01	Automotive Engineering	✓	✓	✓		✓									
5	18ECO01	PCB Design and Fabrication	✓	✓	✓	✓	✓				✓					
5	18ECO02	Neural Networks and Fuzzy Logic for Engineering Applications	✓	✓	✓	✓	✓				✓					
5	18EEO01	Electrical Wiring and Lighting	✓	✓	✓	✓	✓	✓								
5	18EEO02	Solar and Wind Energy Systems	✓	✓	✓	✓										
5	18EIO01	Neural Networks and Deep Learning	✓	✓	✓	✓	✓									
5	18CSO01	Data Structures and its Applications	✓	✓	✓	✓	✓									
5	18CSO02	Formal Languages and Automata Theory	✓	✓	✓	✓										
5	18CSO03	Computational Science for Engineers	✓	✓	✓	✓	✓									
5	18CHO01	Polymer Technology	✓	✓												

Sem.	Course Code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
5	18CHO02	Introduction to Drugs and Pharmaceuticals Technology	✓	✓	✓	✓	✓									
5	18FTO01	Food Processing Technology	✓	✓	✓	✓										
5	18FTO02	Baking Technology	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓		
6	18MAO02	Graph Theory and its Applications	✓	✓	✓											
6	18MAO03	Number Theory and Cryptography	✓	✓	✓		✓									
6	18CYO02	Instrumental Methods of Analysis	✓	✓	✓	✓										
6	18CEO02	Disaster Management	✓	✓	✓			✓	✓					✓		
6	18MEO02	Design of Experiments	✓	✓	✓	✓	✓						✓	✓		
6	18MTO02	Factory Automation	✓	✓	✓	✓	✓	✓			✓	✓		✓		
6	18MTO03	Data Acquisition and Virtual Instrumentation	✓	✓	✓	✓	✓				✓	✓		✓		
6	18AUO02	Autonomous Vehicles	✓	✓	✓											
6	18ECO03	Principles of Quantum Computing	✓	✓	✓	✓	✓									
6	18EEO03	Energy Conservation and Management	✓	✓	✓		✓									
6	18EIO02	Digital Image Processing and Its Applications	✓	✓	✓	✓	✓									
6	18EIO03	Industrial Automation	✓	✓	✓	✓	✓									
6	18CSO04	Web Engineering	✓	✓	✓	✓										
6	18CSO05	Foundations of Data Analytics	✓	✓	✓											
6	18CSO06	Nature Inspired Optimization Techniques	✓	✓	✓	✓										
6	18CSO07	Introducing Data Science	✓	✓	✓											
6	18CHO03	Bio Energy Resources	✓	✓	✓	✓	✓									
6	18CHO04	Fundamentals of Nanoscience and Nanotechnology	✓	✓	✓	✓	✓									
6	18FTO03	Processing of Milk and Milk Products	✓	✓	✓		✓	✓		✓	✓	✓		✓		
6	18FTO04	Processing of Fruits and Vegetables	✓	✓	✓		✓	✓		✓	✓	✓		✓		
7	18MAO04	Advanced Linear Algebra	✓	✓	✓											
7	18MAO05	Optimization Techniques	✓	✓	✓											
7	18PHO02	Structural and Optical Characterization of Materials	✓	✓	✓											

Sem.	Course Code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
7	18CYO03	Waste and Hazardous Waste Management	✓	✓	✓	✓			✓							
7	18CEO03	Introduction to Smart Cities	✓	✓	✓				✓							
7	18CEO04	Environmental Health and Safety	✓	✓	✓	✓										
7	18MEO03	Fundamentals of Ergonomics	✓	✓	✓	✓		✓	✓			✓		✓		
7	18MEO04	Principles of Management and Industrial Psychology			✓			✓	✓	✓	✓	✓				
7	18MTO04	3D Printing and Design	✓	✓	✓	✓	✓						✓	✓		
7	18MTO05	Drone System Technology	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓		
7	18AUO03	Alternate Fuels for Automobile	✓	✓												
7	18ECO04	Electronic Hardware and Troubleshooting	✓	✓	✓	✓	✓	✓								
7	18ECO05	Principles of Communication Techniques	✓	✓	✓	✓	✓									
7	18EEO04	Micro Grid and Smart Grid	✓	✓	✓	✓	✓									
7	18EEO05	Electrical Safety	✓	✓	✓											
7	18EIO04	Biomedical Instrumentation and Applications	✓	✓	✓	✓	✓									
7	18EIO05	PLC Programming and Its Applications	✓	✓	✓	✓	✓									
7	18CSO08	Artificial intelligence and its applications	✓	✓	✓											
7	18CHO05	Enzyme Engineering	✓	✓	✓	✓	✓									
7	18CHO06	Nuclear Engineering	✓	✓												
7	18FTO05	Principles of Food safety	✓	✓	✓		✓	✓	✓	✓				✓		
7	18FTO06	Food and Nutrition	✓	✓	✓	✓								✓		
7	18CEO05	Infrastructure Planning and Management	✓	✓	✓											
8	18CEO06	Environmental Laws and Policy	✓	✓	✓	✓										
8	18MEO05	Safety Measures for Engineers		✓		✓	✓	✓	✓	✓	✓			✓		
8	18MEO06	Energy Conservation in Thermal Equipments	✓	✓	✓			✓	✓			✓	✓	✓		
8	18MTO06	Robotics	✓	✓	✓	✓	✓							✓		
8	18MTO07	Virtual and Augment Reality in Industry 4.0	✓	✓	✓	✓	✓	✓						✓		
8	18AUO04	Automotive Electronics	✓	✓	✓											

Sem.	Course Code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
8	18AUO05	Vehicle Maintenance	✓		✓			✓								
8	18ECO06	Bioinspired Computing Technologies	✓	✓	✓	✓										
8	18EEO06	Electric Vehicle	✓	✓	✓	✓	✓									
8	18EIO06	Measurements and Instrumentation	✓	✓	✓	✓	✓									
8	18EIO07	Graphical Programming using Virtual Instrumentation	✓	✓	✓	✓	✓									
8	18CSO09	Applied Machine Learning	✓	✓	✓											
8	18CSO10	Fundamentals of Blockchain	✓	✓	✓	✓										
8	18CSO11	Fundamentals of Internet of Things	✓	✓	✓	✓	✓									
8	18CHO07	Fertilizer Technology	✓	✓												
8	18FTO07	Food Ingredients	✓	✓	✓			✓						✓		
8	18FTO08	Fundamentals of Food Packaging and Storage	✓	✓	✓		✓	✓		✓				✓		
		General Open Elective														
5,6,7,8	18GEO01	German Language Level 1								✓	✓	✓		✓		
5,6,7,8	18GEO02	Japanese Language Level 1								✓	✓	✓		✓		
7	18GEO03	Design Thinking for Engineers	✓	✓	✓	✓										
8	18GEO04	Innovation and Business Model Development	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
5,6,7,8	18GEO05	German Language Level 2								✓	✓	✓		✓		
5,6,7,8	18GEO06	German Language Level 3								✓	✓	✓		✓		
5,6,7,8	18GEO07	German Language Level 4								✓	✓	✓		✓		
5,6,7,8	18GEO08	Japanese Language Level 2								✓	✓	✓		✓		
5,6,7,8	18GEO09	Japanese Language Level 3								✓	✓	✓		✓		
5,6,7,8	18GEO10	Japanese Language Level 4								✓	✓	✓		✓		
5,6	18GEO11	NCC Studies (Army Wing) – I	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓				
5,6	18GEO12	NCC Studies (Air Wing) – I	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓				

B.TECH. INFORMATION TECHNOLOGY CURRICULUM – R2018

SEMESTER – I									
Course Code	Course Title	Hours / Week			Credit	Maximum Marks			Category
		L	T	P		CA	ESE	Total	
Theory/Theory with Practical									
18EGT11	English for Communication I	3	0	0	3	50	50	100	HS
18MAC11	Mathematics I	3	1*	2*	4	50	50	100	BS
18PHC11	Applied Physics	3	0	2*	3.5	50	50	100	BS
18CYC11	Applied Chemistry	3	0	2*	3.5	50	50	100	BS
18GET11	Introduction to Engineering	3	0	0	3	50	50	100	ES
18CSC11	Problem Solving and Programming	2	0	2	3	50	50	100	ES
Practical / Employability Enhancement									
18VEC11	Value Education	2	0	1	1	50	50	100	HS
Total Credits to be earned					**21**				

***Alternate Weeks**

SEMESTER – II									
Course Code	Course Title	Hours / Week			Credit	Maximum Marks			Category
		L	T	P		CA	ESE	Total	
Theory/Theory with Practical									
18EGT21	English for Communication II	3	0	0	3	50	50	100	HS
18MAC21	Mathematics II	3	1*	2*	4	50	50	100	BS
18PHC24	Solid State Physics	3	0	2*	3.5	50	50	100	BS
18CYC25	Environmental Science and Organic Electronic Materials	3	0	2*	3.5	50	50	100	BS
18MEC11	Engineering Drawing	2	0	2	3	50	50	100	ES
18CSC21	Programming and Linear Data Structures	3	0	0	3	50	50	100	PC
Practical / Employability Enhancement									
18MEL11	Engineering Practices Laboratory	0	0	2	1	100	0	100	ES
Total Credits to be earned					**21**				

***Alternate Weeks**

B.TECH. INFORMATION TECHNOLOGY CURRICULUM – R2018

SEMESTER – III									
Course Code	Course Title	Hours / Week			Credit	Maximum Marks			Category
		L	T	P		CA	ESE	Total	
Theory/Theory with Practical									
18MAT31	Discrete Mathematics	3	1	0	4	50	50	100	BS
18CST31	Data Structures	3	0	0	3	50	50	100	PC
18CST33	Object Oriented Programming	3	0	0	3	50	50	100	PC
18CST32	Computer Organization	3	0	0	3	50	50	100	PC
18ITC31	Digital Principles and Design	3	0	2	4	50	50	100	ES
18ITT31	Principles of Communication	3	0	0	3	50	50	100	ES
Practical / Employability Enhancement									
18CSL31	Data Structures Laboratory	0	0	2	1	100	0	100	PC
18CSL32	Object Oriented Programming Laboratory	0	0	2	1	100	0	100	PC
18EGL31	English for Workplace Communication	0	0	2	1	100	0	100	HS
Total Credits to be earned					**23**				

SEMESTER – IV									
Course Code	Course Title	Hours / Week			Credit	Maximum Marks			Category
		L	T	P		CA	ESE	Total	
Theory/Theory with Practical									
18MAC42	Probability and Statistics	3	1*	2*	4	50	50	100	BS
18ECT44	Microprocessor and Embedded Systems	3	0	0	3	50	50	100	ES
18ITT41	Python Programming and Frameworks	3	0	0	3	50	50	100	PC
18CST41	Database Management Systems	3	1	0	4	50	50	100	PC
18CST42	Design and Analysis of Algorithms	3	1	0	4	50	50	100	PC
18CST43	Operating Systems	3	0	0	3	50	50	100	PC
Practical / Employability Enhancement									
18ECL43	Microprocessor and Embedded Systems Laboratory	0	0	2	1	100	0	100	PC
18ITL41	Python Programming and Frameworks Laboratory	0	0	2	1	100	0	100	PC
18CSL41	Database Management Systems Laboratory	0	0	2	1	100	0	100	PC
Total Credits to be earned					**24**				

***Alternate Weeks**

B.TECH. INFORMATION TECHNOLOGY CURRICULUM – R2018

SEMESTER – V

Course Code	Course Title	Hours / Week			Credit	Maximum Marks			Category
		L	T	P		CA	ESE	Total	
Theory/Theory with Practical									
18ITT51	Computer Networks	3	0	0	3	50	50	100	PC
18ITT52	Web Technology	3	0	0	3	50	50	100	PC
18ITT53	Software Engineering	3	0	0	3	50	50	100	PC
18ITC51	Enterprise Application Development using Java	3	0	2	4	50	50	100	PC
	Open Elective I	3	1/0	0/2	4	50	50	100	OE
Practical / Employability Enhancement									
18ITL51	Network Laboratory	0	0	2	1	100	0	100	PC
18ITL52	Web Technology Laboratory	0	0	2	1	100	0	100	PC
18ITL53	Case Tools Laboratory	0	0	2	1	100	0	100	PC
18GEL51/ 18GEI51	Professional Skills Training I / Industrial Training I *	--	--	--	2	100	0	100	EC
18GET51	Universal Human Values	2	0	0	2	100	0	100	HS
Total Credits to be earned					**24**				

***80 Hours of Training**

SEMESTER – VI

Course Code	Course Title	Hours / Week			Credit	Maximum Marks			Category
		L	T	P		CA	ESE	Total	
Theory/Theory with Practical									
18ITT61	Machine Learning	3	0	0	3	50	50	100	PC
18ITT62	Internet of Things	3	0	0	3	50	50	100	PC
18ITT63	Cryptography and Network Security	3	0	0	3	50	50	100	PC
	Professional Elective I	3	0	0	3	50	50	100	PE
	Open Elective II	3	1/0	0/2	4	50	50	100	OE
Practical / Employability Enhancement									
18ITL61	Machine Learning Laboratory	0	0	2	1	100	0	100	PC
18ITL62	Internet of Things Laboratory	0	0	2	1	100	0	100	PC
18ITL63	Network Security Laboratory	0	0	2	1	100	0	100	PC
18GEL61/ 18GEI61	Professional Skills Training II / Industrial Training II *	---	---	---	2	100	0	100	EC
18ITP61	Project Work I Phase I	0	0	4	2	100	0	100	EC
Total Credits to be earned					**23**				

***80 Hours of Training**

B.TECH. INFORMATION TECHNOLOGY CURRICULUM – R2018

SEMESTER – VII									
Course Code	Course Title	Hours / Week			Credit	Maximum Marks			Category
		L	T	P		CA	ESE	Total	
Theory/Theory with Practical									
18MBT71	Engineering Economics and Management	3	0	0	3	50	50	100	PC
	Professional Elective II	3	0	0	3	50	50	100	PE
	Professional Elective III	3	0	0	3	50	50	100	PE
	Professional Elective IV	3	0	0	3	50	50	100	PE
	Open Elective III	3	0	0	3	50	50	100	OE
Practical / Employability Enhancement									
18GEP71	Comprehensive Test and Viva	---	---	---	2	100	0	100	EC
18ITP71	Project Work I Phase II	0	0	8	4	50	50	100	EC
Total Credits to be earned					**21**				

SEMESTER – VIII									
Course Code	Course Title	Hours / Week			Credit	Maximum Marks			Category
		L	T	P		CA	ESE	Total	
Theory/Theory with Practical									
	Professional Elective V	3	0	0	3	50	50	100	PE
	Open Elective IV	3	0	0	3	50	50	100	OE
Practical / Employability Enhancement									
18ITP81	Project Work II	--	--	12	6	50	50	100	EC
Total Credits to be earned					**12**				

Total Credits : 169

LIST OF PROFESSIONAL ELECTIVE COURSES (PE)								
S. No.	**Course Code**	**Course Name**	**L**	**T**	**P**	**C**	**Sem**	**Domain/ Stream**
		Elective I						
1.	18ITE02	Compiler Design	3	1	0	4	VI	AP
2.	18ITE03	Advanced Database	3	0	0	3	VI	AP
3.	18ITE04	Cross platform Applications Development	3	0	0	3	VI	SD
4.	18ITE05	Platform Technologies	3	0	0	3	VI	SD
5.	18ITE06	Network Communication Protocols	3	0	0	3	VI	NW
6.	18ITE07	Data Warehousing and Data Mining	3	0	0	3	VI	CI
		Elective II						
7.	18ITE08	Computer Graphics	3	0	0	3	VII	AP
8.	18ITE09	Software Quality and Testing	3	0	0	3	VII	SD
9.	18ITE10	Block Chain Technologies	3	0	0	3	VII	NW
10	18ITE11	Deep Learning	3	0	0	3	VII	CI
11	18ITE12	Information Coding Techniques	3	0	0	3	VII	GN
		Elective III						
12.	18ITE13	Distributed Systems	3	0	0	3	VII	AP
13.	18ITE14	3D Modeling and Mixed Reality Applications	3	0	0	3	VII	SD
4.	18ITE15	Agile methodologies	3	0	0	3	VII	SD
15.	18ITE16	Mobile Computing	3	0	0	3	VII	NW
16.	18ITE17	Big Data Analytics	3	0	0	3	VII	CI
17.	18ITE18	Information Retrieval Techniques	3	0	0	3	VII	GN
		Elective IV						
18.	18ITE19	Service Oriented Architecture	3	0	0	3	VII	AP
19.	18ITE20	Building Enterprise Applications	3	0	0	3	VII	SD
20.	18ITE21	Software Defined Networks	3	0	0	3	VII	NW
21.	18ITE22	Cyber Forensics	3	0	0	3	VII	NW
22.	18ITE23	Data Visualization techniques	3	0	0	3	VII	CI
23.	18ITE24	Disaster Management on Information Technology	3	0	0	3	VII	GN
24.	18GEE01	Fundamentals of Research	3	0	0	3	VII	GE

		Elective V						
25.	18MBE49	Entrepreneurship Development	3	0	0	3	VIII	GE
26.	18ITE25	Parallel Computing Architecture and Programming	3	0	0	3	VIII	AP
27.	18ITE26	Information Storage and Cloud Computing	3	0	0	3	VIII	AP
28.	18ITE27	Software Project Management	3	0	0	3	VIII	SD
29.	18ITE28	Wireless Sensor Networks	3	0	0	3	VIII	NW
30.	18ITE29	Ethical Hacking	3	0	0	3	VIII	NW
31.	18ITE30	Social Network Analysis	3	0	0	3	VIII	CI
32.	18ITE31	Business Intelligence and its Applications	3	0	0	3	VIII	CI
33.	18ITE32	Green Computing	3	0	0	3	VIII	GN

LIST OF OPEN ELECTIVE COURSES (OE) OFFERED TO OTHER DEPARTMENTS							
S. No.	**Course Code**	**Course Name**	**L**	**T**	**P**	**C**	**Sem**
1.	18ITO01	Python Programming	3	0	2	4	V
2.	18ITO02	Advanced Java Programming	3	0	2	4	V
3.	18GEO12	NCC Studies (Air Wing) – I	3	0	2	4	V / VI
3.	18ITO03	Java Programming	3	0	2	4	VI
4.	18ITO04	Next Generation Databases	3	1	0	4	VI
5.	18ITO05	Business Continuity Planning	3	0	0	3	VII
6.	18ITO06	Mobile Application Development	3	0	0	3	VII
7.	18ITO07	Essentials of Information Technology	3	0	0	3	VIII
8.	18ITO08	Virtual and Reality Frameworks	3	0	0	3	VIII

18EGT11 - ENGLISH FOR COMMUNICATION I

(Common to all Engineering and Technology Branches)

Programme & Branch	B.Tech. & Information Technology	Sem.	Category	L	T	P	Credit
Prerequisites	NIL	1	HS	3	0	0	3

Preamble	This course is designed to impart required levels of fluency in using the English Language at B1 level in the Common European Framework (CEFR).	
Unit - I	**Listening, Speaking, Reading and Writing. Activity Based Learning – Phase – I:**	**9**
Listening - People talking about their past experiences - listening to descriptions - Speaking - Exchanging personal information - Talking about cities and transportation - Reading - Life and achievements of a famous personality - Global transport systems - Writing - Childhood experiences - Process Description.		
Unit - II	**Listening, Speaking, Reading and Writing. Activity Based Learning – Phase – II:**	**9**
Listening - Information about hotels and accommodation - Recipes and food items - Speaking - Life style changes and making comparisons - Talking about food - Reading - Habit formation and changing habits - International cuisine - Writing - Personal email - emails about food and recipes.		
Unit - III	**Listening, Speaking, Reading and Writing. Activity Based Learning – Phase – III:**	**9**
Listening - Information about travel - descriptions / conversations about family life - Speaking - Vacations and Holidays - Requests, complaints and offering explanations - Reading - Tourist places and travel experiences - Group behaviour and politeness - Writing - Personal letter about travelling - Writing guidelines and checklists.		
Unit - IV	**Listening, Speaking, Reading and Writing. Activity Based Learning – Phase – IV:**	**9**
Listening - Descriptions about festivals - Presentations on technology - Speaking - About technology - festivals, special events and traditions - Reading - Sports, hobbies and past time - About different cultures - Writing - Product Description - Writing web content.		
Unit - V	**Listening, Speaking, Reading and Writing. Activity Based Learning – Phase – V:**	**9**
Listening - Talking about changes - Job preferences - Speaking - Comparing different periods or phases in life – changes that happen - skills and abilities, Personality Development - Employability Skills – Reading - Reading about life experiences - emotions and feelings – Job preferences – Jobs and Personality – Writing - Writing about one's past, present and future – Researching job options – choosing the right job.		

Total: 45

TEXT BOOK:

1. Jack C. Richards, "Interchange, Student's Book 2", 4th Edition, Cambridge University Press, New York, 2017.

REFERENCES:

1. Jack C. Richards & Theodore Rodgers, "Approaches and Methods in Language Teaching", 3rd Edition, Cambridge University Press, New York, 2014.
2. Penny Ur, "A Course in English Language Teaching", 2nd Edition, Cambridge University Press, New York, 2012.

COURSE OUTCOMES: On completion of the course, the students will be able to		**BT Mapped (Highest Level)**
CO1	use language effectively and accurately acquiring vocabulary from real-life context	Applying (K3)
CO2	listen/view and comprehend different spoken discourses / excerpts in different accents	Applying (K3)
CO3	read different genres of texts adopting various reading strategies	Analyzing (K4)
CO4	write cohesively, coherently and flawlessly avoiding grammatical errors, using a wide range of vocabulary, organizing their ideas logically on a topic	Creating (K6)
CO5	speak clearly, confidently, comprehensibly and communicate with others using appropriate communicative strategies	Creating (K6)

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

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

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1		3	47	17		33	100
CAT2			37	23		40	100
CAT3		3	47	33		17	100
ESE		2	42	27		29	100

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

18MAC11 - MATHEMATICS I

(Common to All Engineering and Technology Branches)

Programme & Branch	B.Tech. & Information Technology	Sem.	Category	L	T	P	Credit
Prerequisites	Nil	1	BS	3	1*	2*	4

Preamble	To provide the skills to the students for solving different real time problems by applying matrices, multivariable functions and differential equations.	
Unit - I	**Matrices:**	**9**
Introduction to Matrices in Engineering – Characteristic equation – Eigen values and Eigen vectors of a real matrix – Properties of Eigen values and Eigen vectors (without proof) – Cayley – Hamilton theorem (Statement and applications only) - Orthogonal matrices – Orthogonal transformation of a symmetric matrix to diagonal form – Quadratic form – Nature of Quadratic forms - Reduction of quadratic form to canonical form by orthogonal transformation – Applications of Eigen values and Eigen vectors: Electric circuit – Mass string problems.		
Unit - II	**Multivariable Calculus:**	**9**
Functions of two variables – Partial derivatives – Total differential – Taylor's series for functions of two variables – Maxima and minima – Constrained maxima and minima – Lagrange's multiplier method.		
Unit - III	**First Order Ordinary Differential Equations:**	**9**
Solutions of differential equations in variables separable form – Exact differential equations – Linear first order differential equations – Bernoulli's equation – Clairaut's equation.		
Unit - IV	**Ordinary Differential Equations of Higher Order:**	**9**
Linear differential equations of second and higher order with constant coefficients - Particular Integrals for the types: e^{ax} – cosax, sinax – x^n – e^{ax} x^n , e^{ax} sinbx and e^{ax} cosbx – x^n sinax and x^n cosax – Differential Equations with variable coefficients: Euler-Cauchy's equation – Legendre' s equation.		
Unit - V	**Applications of Ordinary Differential Equations:**	**9**
Method of variation of parameters – Simultaneous first order linear equations with constant coefficients – Applications of differential equations: Simple harmonic motion – Electric circuits (Differential equations and associated conditions need to be given).		

List of Exercises / Experiments:

1.	Introduction to MATLAB
2.	Matrix operations : Addition, Multiplication, Transpose and Inverse
3.	Computation of eigen values and eigen vectors
4.	Finding ordinary and partial derivatives
5.	Computing extremes of a single variable function
6.	Plotting and visualizing single variable functions
7.	Solving first and second order ordinary differential equations
8.	Solution of Simultaneous first order ODEs

***Alternate Weeks**

Lecture:45, Theory and Practical:15, Total:60

TEXT BOOK:

1. Grewal B. S., "Higher Engineering Mathematics", 42nd Edition, Khanna Publications, New Delhi, 2011.

REFERENCES:

1. Duraisamy C., Vengataasalam S., Arun Prakash K. and Suresh M., "Engineering Mathematics - I", 2nd Edition, Pearson India Education, New Delhi, 2018.
2. Won Y. Yang, Young K. Choi, Jaekwon Kim, Man Cheol Kim, Jin Kim H. and Taeho Im, "Engineering Mathematics with MATLAB", 1st Edition, CRC Press, London, 2018.

COURSE OUTCOMES: On completion of the course, the students will be able to		**BT Mapped (Highest Level)**
CO1	solve engineering problems which needs matrix computations	Applying (K3)
CO2	compute extremal values which arise in function of several	Understanding (K2)
CO3	identify the appropriate method for solving first order ordinary differential equations	Applying (K3)
CO4	solve higher order linear differential equations with constant and variable coefficients	Applying (K3)
CO5	apply the concept of ordinary differential equations for modeling and finding solutions to engineering problems	Applying (K3)
CO6	determine eigen values and eigen vectors of a given matrix using MATLAB	Applying (K3), Manipulation (S2)
CO7	compute maxima and minima of a single variable function, plot and visualize single variable function using MATLAB	Applying (K3), Manipulation (S2)
CO8	solve first and second order ordinary differential equations and simultaneous first order ordinary differential equations using MATLAB	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	2	1										
CO2	3	2												
CO3	3	3	1	1										
CO4	3	3	1	1										
CO5	3	3	1											
CO6					3									
CO7					3									
CO8					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	10	70				100
CAT2	20	10	70				100
CAT3	20	10	70				100
ESE	20	10	70				100

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

18PHC11 - APPLIED PHYSICS

(Common to All Engineering and Technology Branches)

Programme & Branch	B.Tech. & Information Technology	Sem.	Category	L	T	P	Credit
Prerequisites	NIL	1	BS	3	0	2*	3.5

Preamble	This course aims to impart the essential concepts of properties of matter, acoustics, ultrasonics, quantum physics, laser and fibre optics, crystal structure and crystal defects. It also describes the physical phenomena related to the aforementioned concepts and their applications in engineering and provides motivation towards innovations.	
Unit - I	**Properties of Matter:**	**9**
Elasticity: Stress – Strain – Hooke's law – Stress-strain diagram – Poisson's ratio - Modulus of elasticity - Beams – Bending of beams – Expression for bending moment - Cantilever – Depression of the loaded end of a cantilever - Young's modulus by uniform and non-uniform bending methods - I-shaped girders. Viscosity: Viscous force – Viscosity – Co-efficient of viscosity – Importance of viscosity of liquids (qualitative).		
Unit - II	**Acoustics and Ultrasonics:**	**9**
Acoustics: Sound - Reverberation and reverberation time – Growth and decay of sound and Sabine's formula (qualitative) - Absorption coefficient - Factors affecting acoustics of buildings and their remedies. Ultrasonics: Properties of ultrasonic waves - Production of ultrasonic waves - Magnetostrictive generator - Piezoelectric generator - Applications of ultrasonic waves in non destructive testing.		
Unit - III	**Thermal and Quantum Physics:**	**9**
Thermal Physics: Modes of heat transfer - Thermal conductivity - Radial and cylindrical heat flow - Conduction through compound media (series and parallel). Quantum Physics: Matter waves - Schrodinger's time independent and time dependent wave equations – Physical significance of wave function - Particle in a one dimensional box.		
Unit - IV	**Laser, Fibre Optics and Applications:**	**9**
Laser and Applications: Spontaneous emission and stimulated emission - Population inversion - Pumping methods - Einstein's coefficients - Nd:YAG laser - Holography. Fiber Optics and Applications: Principle of propagation of light through optical fibers - Numerical aperture and acceptance angle - Classification of optical fibers based on refractive index, modes and materials - Fiber optical communication links (block diagram).		
Unit - V	**Crystal Physics:**	**9**
Crystal systems - Bravais lattice - Lattice planes - Miller indices - Interplanar spacing in cubic lattice - Atomic radius, Coordination number and Packing factor for SC, BCC and FCC crystal structures - Crystal imperfections: line and surface imperfections.		

List of Exercises / Experiments:

1.	Determination of the Young's modulus of the material of a given beam using uniform bending method.
2.	Determination of the viscosity of a given liquid using Poiseuilles' method.
3.	Determination of the velocity of ultrasonic waves in a liquid and the compressibility of a liquid using ultrasonic interferometer.
4.	Determination of the wavelength and the angle of divergence of a semiconductor laser.
5.	Determination of the acceptance angle and the numerical aperture of a given optical fiber.

Lecture:45, Practical:15, Total:60

TEXT BOOK:

1. Tamilarasan K. and Prabu K., "Engineering Physics - I", 3rd Edition, McGraw Hill Education Pvt. Ltd., New Delhi, 2014.

REFERENCES:

1. Gaur R.K. and Gupta S.L., "Engineering Physics", 8th Edition, Dhanpat Rai and Sons, New Delhi, 2009.
2. Mehta and Neeraj, "Applied Physics for Engineers", 1st Edition, Prentice-Hall of India Pvt. Ltd., New Delhi, 2011.
3. Tamilarasan K. and Prabu K., "Physics Laboratory Manual", 3rd Edition, SCM Publishers, Erode, 2018.

COURSE OUTCOMES: On completion of the course, the students will be able to		**BT Mapped (Highest Level)**
CO1	make use of the concepts of elasticity and bending moment of a beam to a simple structure under simple loading to compute the Young\'s modulus of a material, and to explain the concepts of viscosity of liquids.	Applying (K3)
CO2	apply the concepts of growth and decay of sound energy in a hall to recognize the requirements of acoustically good buildings, and to describe the production of ultrasonic waves and non-destructive testing using ultrasonic waves.	Applying (K3)
CO3	use the concepts of heat flow to explain heat conduction through materials, and to describe the behavior of electrons in a metal by means of quantum physics.	Applying (K3)
CO4	apply the concepts of laser to explain the working and the applications of laser in engineering and technology, and to apply the principle of propagation of light through optical fiber to compute acceptance angle and numerical aperture to comprehend the fiber optic communication link.	Applying (K3)
CO5	explain seven crystal systems, atomic packing factor of the select crystal systems and the types of crystal defects.	Understanding (K2)
CO6	determine the Young\'s modulus of a material using the concepts of elasticity and bending moment of a beam, and to determine the viscosity of a liquid using the concepts of viscosity.	Applying (K3), Precision (S3)
CO7	compute the velocity of ultrasonic waves in a liquid and the compressibility of a liquid using the concepts of propagation of sound through a medium.	Applying (K3), Precision (S3)
CO8	determine the wavelength and the angle of divergence of a semiconductor laser beam using the concepts of propagation of light through a medium, and to compute the acceptance angle and the numerical aperture of an optical fiber using the concept of total internal reflection.	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											
CO2	3	2	1											
CO3	3	2	1											
CO4	3	2	1											
CO5	3	2												
CO6				3										
CO7				3										
CO8				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	50	30				100
ESE	20	40	40				100

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

18CYC11 - APPLIED CHEMISTRY

(Common to All Engineering and Technology Branches)

Programme & Branch	All BE/BTech branches	Sem.	Category	L	T	P	Credit
Prerequisites	NIL	1	BS	3	0	2*	3.5

Preamble	Applied Chemistry course imparts the basic principles and concepts of chemistry in the field of Engineering and Technology. It also imparts knowledge on Water Technology, Electrochemistry, Corrosion and its control, Fuels & Combustion and Polymers.	
Unit - I	**Water Technology:**	**9**
Introduction - Sources of water - Impurities in water - Types of water – Water Quality Standards - Hardness of water - Expression of hardness - Units of hardness - Estimation of hardness of water by EDTA method - Determination of alkalinity - Disadvantages of using hard water - Boiler troubles - Scale and sludge - Softening of water - External treatment method - Demineralization process - Internal treatment process - Carbonate and Calgon conditioning - Desalination by reverse osmosis method.		
Unit - II	**Electrochemistry:**	**9**
Introduction - Cells - Representation of a galvanic cell - Reversible and irreversible cells - Electrode potential - Nernst equation - Reference electrode - Standard hydrogen electrode - Glass electrode - Electrochemical series and its applications - Conductometric titrations - Mixture of weak and strong acid vs strong base.		
Unit - III	**Corrosion and its Control:**	**9**
Introduction - Chemical corrosion - Electrochemical corrosion - Galvanic corrosion - Concentration cell corrosion - Galvanic series - Factors influencing rate of corrosion - Corrosion control methods - Sacrificial anodic method - Protective coatings - Pretreatment of metal surface - Metallic coating - Electroplating - Nonmetallic coating - Phosphate coating - Organic coating - Paints - Constituents and their functions - Special paints - water repellant and luminescent paints.		
Unit - IV	**Fuels and Combustion:**	**9**
Introduction - Classification of fuels - Requirements of a good fuel - Combustion - Principle of combustion - Calorific value - Gross and net calorific values - Explosive range - Spontaneous ignition temperature - Calorific intensity - Solid fuels - Coal and its varieties - Proximate analysis - Significance - Metallurgical coke - Otto-Hoffman byproduct method - Liquid fuel - Refining of petroleum - Manufacture of synthetic petrol - Hydrogenation of coal - Bergius method - Knocking - Octane number - Cetane number - Gaseous fuel - LPG.		
Unit - V	**Polymers:**	**9**
Introduction - Classification of polymers - Functionality - Polymerization - Plastics - Types - Thermo and thermosetting plastics - Individual polymers - Polypropylene, PVC, PET and epoxy resin - Preparation, properties and uses - Compounding of plastics - Fabrication of plastics - Compression, injection, extrusion and blow moulding methods - Foamed plastics.		

List of Exercises / Experiments:

1.	Estimation of total, temporary and permanent hardness of water by EDTA method.
2.	Estimation of Ca2+ and Mg2+ hardness separately by EDTA method.
3.	Estimation of alkalinity of the given water sample.
4.	Conductometric titration - Mixture of acids.
5.	Estimation of hydrochloric acid using pH meter.

***Alternate Weeks**

Lecture:45, Practical:15, Total:60

TEXT BOOK:

1. Palanisamy P.N., Manikandan P., Geetha A. & Manjula Rani K., "Applied Chemistry", 5th Edition, Tata McGraw Hill Education Pvt. Ltd, New Delhi, 2018.

REFERENCES:

1. Jain & Jain, "Engineering Chemistry", 16th Edition, Dhanpat Rai Publishing Company, New Delhi, 2016.
2. Sharma B.K., "Industrial Chemistry", Krishna Prakasan Media Pvt. Ltd, Meerut, 2014.
3. Palanisamy P.N., Manikandan P., Geetha A & Manjula Rani K., "Chemistry Laboratory Manual", Rajaganapathy Publishers, Erode, 2018.

COURSE OUTCOMES: On completion of the course, the students will be able to		BT Mapped (Highest Level)
CO1	apply the suitable water softening methods to avoid boiler troubles	Applying (K3)
CO2	apply the principle of electrochemistry to construct cells and measure the electrode potential	Applying (K3)
CO3	adopt the suitable corrosion control methods for the given practical problems	Applying (K3)
CO4	illustrate the quality of fuels from its characteristics	Understanding (K2)
CO5	explain the types of polymers, plastics and fabrication methods	Understanding (K2)
CO6	estimate the amount of hardness for the given water sample by EDTA method	Applying (K3), Precision (S3)
CO7	estimate the amount of alkalinity for the given water sample	Applying (K3), Precision (S3)
CO8	demonstrate the conductivity meter and pH meter to estimate the amount of the given solution	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										
CO2	3	2	1	1										
CO3	3	2	1	1										
CO4	3	2												
CO5	3	2												
CO6	3	2	1	3										
CO7	3	2	1	3										
CO8	3	2	1	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	25	35	40				100
CAT2	25	35	40				100
CAT3	25	35	40				100
ESE	25	35	40				100

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

18GET11 - INTRODUCTION TO ENGINEERING

(Common to All Engineering and Technology Branches)

Programme & Branch	B.Tech. & Information Technology	Sem.	Category	L	T	P	Credit
Prerequisites	NIL	1	ES	3	0	0	3

Preamble	The objective of this course is to realize the importance of engineering, measurements and the fundamental concepts of common engineering disciplines like Civil, Mechanical, Electrical and Electronics Engineering.	
Unit - I	**Engineering and Measurements**	**9**
Engineering and Measurements: Engineering - Engineer and Engineering Graduate - Graduate attributes - Role of engineer - Professional bodies and their role. Physical Quantities - Dimensions - SI Units, Symbols and Conversions - Mechanical Measuring Instruments - Electrical Measuring Instruments - Accuracy and Precision - Data Acquisition System.		
Unit - II	**Mechanical Engineering**	**9**
Mechanical Engineering: IC Engines - Power Plants - Boilers and Furnaces - Pumps - Refrigeration and Air Conditioner - CAD/CAM - Additive Manufacturing. Hybrid Electric Vehicles, Industry 4.0.		
Unit - III	**Civil Engineering**	**9**
Civil Engineering: Selection of the site for Building - Building approval process - Contract and tenders - Building Materials - Components of Building - Sequence of works for building construction - Prefabricated Structures - Water Management - Rainwater harvesting - Infrastructure - Bridges, Dams and Roads.		
Unit - IV	**Electrical Engineering**	**9**
Electrical Engineering: Terminologies - Current, voltage, potential difference, power, energy - Supply: DC, AC - single phase and three phase - Energy conversion - Utility structure - Single line diagram of power system - Apparatus - Tariff - House wiring. Alternator - Induction motor - Solar and wind energy.		
Unit - V	**Electronics Engineering**	**9**
Electronics Engineering: Resistor, Inductor, capacitor - Diode - LEDs - Rectifier - Power Supply - Transistor - Transistor as an amplifier - MOSFET - Logic Gates - Microprocessor - Micro controller - Radio communication - Internet of Things.		

Total:45

TEXT BOOK:

1. Faculty of Mechanical Engineering, "Introduction to Engineering", McGraw Hill Education India Pvt. Ltd., Chennai.

REFERENCES:

1. Arvid R. Eide, Roland D. Jenison, Steven K. Mickelson and Larry L. Northup. , "Engineering Fundamentals and Problem Solving", 7th Edition, McGraw Hill Education, New York, 2018.
2. Navaneethakrishnan P., Selvakumar P., Rajeshkumar G. and Sangeetha R.K., "Basic Civil and Mechanical Engineering", McGraw Hill Education, New Delhi, 2016.
3. Senthilnathan N., Logeswaran T. and Suresh M., "Basic Electrical and Electronics Engineering", McGraw Hill, New Delhi, 2016.

COURSE OUTCOMES: On completion of the course, the students will be able to		BT Mapped (Highest Level)
CO1	recognize the roles of engineer, measurement quantities and systems in Engineering	Understanding (K2)
CO2	infer the components and principles of mechanical engineering applications	Understanding (K2)
CO3	summarize the process involved in building construction, infrastructure and water conservation	Understanding (K2)
CO4	recognize the fundamental terms involved in electrical engineering	Understanding (K2)
CO5	explain the working of basic electronic components and its applications	Understanding (K2)

Mapping of COs with POs and PSOs

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

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

18CSC11 - PROBLEM SOLVING AND PROGRAMMING
(Common to All Engineering and Technology Branches)

Programme & Branch	B.Tech. & Information Technology	Sem.	Category	L	T	P	Credit
Prerequisites	Nil	1	ES	2	0	2	3

Preamble	This course mainly focuses on the basic concepts of computing, the methodology of problem solving and developing skills in programming using C language.	
Unit - I	**Introduction to Computer and Problem Solving::**	**6**
Overview of computers - Applications of computers - Characteristics of computer - Basic computer Organization - Number System - Problem solving: Planning the computer program – Algorithms - Flowcharts – Pseudocodes - Structuring the logic.		
Unit - II	**Case Study on Problem Solving::**	**6**
Algorithm, Flowchart and Pseudo code for the problems: Exchanging the values of two variables - Finding the biggest number - Counting - Summation of numbers - Factorial computation - Generation of Fibonacci Sequence - Summation of series - Base Conversion - Reversing the digits of an Integer.		
Unit - III	**Introduction to C and Control Statements::**	**6**
Overview of C - Basic structure of a C Program - Executing a C Program - C Character set - Tokens - Keywords and Identifiers - Constants - Variables - Data types - Storage classes - Managing Input and Output operations - Operators and Expressions - Decision making and Branching - Looping - Break and continue statements.		
Unit - IV	**Arrays, Strings and Structures::**	**6**
Arrays - One dimensional and Two dimensional arrays - Handling of character strings: Declaring and initializing string variables - Performing simple string operations - Introduction to structures: Structure definition - Structure declaration - Accessing a structure member - Structure initialization - Unions.		
Unit - V	**Functions::**	**6**
User defined functions: Elements of user defined functions - String handling functions - Library functions (strings and characters manipulation) - Passing arguments to functions – Recursion. Introduction to Pointers: Understanding pointers - Accessing address of a variable - Declaring pointer variables - Initialization of pointer variables - Accessing a variable through its pointer - Parameter passing mechanisms.		

List of Exercises / Experiments :

1.	Writing algorithms and drawing flowcharts using Raptor Tool for problems involving sequential, selective and repetitive structures
2.	Programs for demonstration of working of different types of operators like arithmetic, logical, relational and ternary operators involving sequential structures
3.	Demonstration of programs using decision making statements namely ‘if’, ‘else if’, ‘switch’, conditional and unconditional ‘goto’ (selective structures)
4.	Programs for demonstrating repetitive control statements like ‘for’, ‘while’ and ‘do-while’ (iterative structures)
5.	Demonstration of programs for declaration, initialization and performing operations on one-dimensional and two-dimensional numeric arrays
6.	Demonstration of programs for implementing various string operations like ‘copy’, ‘finding length’, ‘compare’, ‘concatenate’ with and without built-in library functions.
7.	Demonstration of programs for making use of user-defined data types namely structures and unions
8.	Demonstration of modular programming concepts using functions – developing programs using built-in and user-defined functions and parameter passing mechanisms

Lecture:30, Practical:30, Total:60

TEXT BOOK:

1.	"Problem Solving and Programming", compiled by Department of CSE, Kongu Engineering College, Internal circulation, 2017.

REFERENCES:

1.	Dromey R.G., "How to Solve it by Computer", Pearson Education, 2009.
2.	Balagurusamy E., "Fundamentals of Computing and Programming", Tata McGrawHill Education Pvt. Ltd., 2017.

COURSE OUTCOMES: On completion of the course, the students will be able to		**BT Mapped (Highest Level)**
CO1	outline the characteristics, organisation, working principles and applications of computers	Understanding (K2)
CO2	express the solution for the given real world problems in terms of algorithm, flowchart and pseudocode	Applying (K3)
CO3	identify the appropriate looping and control statements in C for providing the solution to the given problems	Understanding (K2)
CO4	demonstrate the usage of arrays, strings and structures to solve the given problems	Understanding (K2)
CO5	apply fundamental modular programming knowledge to solve the given problems and recall the basic concepts of pointers	Understanding (K2)
CO6	demonstrate the execution of flowchart for the given problem using Raptor	Applying (K3), Precision (S3)
CO7	demonstrate the application of control statements using simple C programs	Applying (K3), Precision (S3)
CO8	implement solutions to the given problem using user defined functions and data types	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													
CO2	2	2	2		2									
CO3		2	1											
CO4		2	1											
CO5		2	1											
CO6	3	2	1	1	1					1				
CO7	3	2	1	1	1					1				
CO8	3	2	1	1	1					1				

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

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	10	15	25				50
CAT2	5	15	30				50
CAT3	5	15	30				50
ESE	20	30	50				100

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

18VEC11 - VALUE EDUCATION

(Common to All Engineering and Technology Branches)

Programme & Branch	B.Tech. & Information Technology	Sem.	Category	L	T	P	Credit
Prerequisites	NIL	1	HS	2	0	1	1

Preamble	The aim of the course is to make the students to understand the purpose and value of life and to exhibit positive human values.	
Unit - I	**Philosophy of Life Science:**	**4**
Life - Purpose of life (four stages of life) - Philosophy of life (who am I') – Law of nature (cause of the life and body) - Content of the Life (five sheaths) - Goal of life. Five duties in life. Methodology: Life and messages of spiritual and national leaders - The forgotten hero, etc. Project report: Complementing with happiness - Every soul is potentially divine.		
Unit - II	**Human Values - Moral Foundation:**	**4**
Truth, forgiveness, compassion, endurance, humility, non violence,moderate diet, non stealing, self purification, self discipline, self study, content, cleanliness, honesty, and totality in faith - Good habits - Attitude forming for Individual peace. Practical Methods: Personal experience with above characters, Puranic Stories - Self resolve diary maintenance.		
Unit - III	**Social Values:**	**4**
Family - Family System - Greatness of women - World brotherhood (vasudeiva kudumbagam) - Glorious Bharath - Bharathian systems - Past-Present-Future - Team spirit - Goal setting - Economics - Education - Politics - Responsibilities of people - Preserving natural resources. Methodology: Preparing an album on glorious Bharath Past, Present and Future Plans. Goal setting - Management Games.Team Spirit - Yogic Games.		
Unit - IV	**Development of Mental Prosperity:**	**4**
Prosperity of mind - Functions of mind - Obstacles of mind - Practical method to perfect mind is yoga - Types - Uses - Precaution - Contradiction - Kriyas - Asanas - Pranayamas - Meditative techniques. Methodology: Asana - Pranayama - Cyclic meditation - Nada anu sandhana - Meditation - Yogic games for memory. Album on asanas, pranayama and mantra.		
Unit - V	**Maintenance of Physical Health:**	**4**
Human body - Structure - Ten Systems of the body as per modern science.Five elements - Harmonious relationship - Life force - Conserving vitality and health through natural life -Pranic food and its importance - Uses of herbs - Right way of cooking to preserve nutrients - Cause of the disease - Acute and chronic - Disease - Life and death. Methodology: Natural food making, traditional millet dishes. Asanas, pranayamas, cleansing procedures, Quiz on healthy living, Uses of herbs or kitchen garden.		

List of Exercises / Experiments:

1.	List of Loosening Exercises: Neck Movements, Shoulder Joint Movements, Elbow Joint Movement, Wrist Joint Movements, Finger Joint Movements, Rip Joint Movement, Hip Joint Movements, Spinal Cord Movement, Knee Joint Movements, Ankle Joint Movements, Toe Joint Movements.
2.	List of Asanas: Surya Namaskara, Shavasana, Makarasanas, Uttanpadasana, Pawanamuktasana, Sedubandasana, Naukasana, Vipareetakarani, Bhujangasana, Sarpasana, Shalabasana, Dhanurasana, Padmasana,Parvatasana, Vakrasana, Janu Sirashasana, Ustrasana, Yoga Mudra, Meru Tandasana, Tadasana, Katichakrasana, Paadahastasana, Parivarta Trikonasana, Ardha Chakrasana, Viruksasana.
3.	List of Pranayamas: Naadi Sodhana Pranayama, Bhastrika Pranayama, Bhramari Pranayama, Sheetali Pranayama.

Lecture:20, Practical:10, Total:30

TEXT BOOK:

1. Value Education, "Compiled by Vethathiri Maharishi Institute for Spiritual and Intuitional Education", Aliyar, Pollachi, 2018.

REFERENCES:

1. Value Education - Yoga Practical Guide, "Compiled by Padmasoorya Naturopathy and Yoga Foundation", Coimbatore, 2018.

COURSE OUTCOMES: On completion of the course, the students will be able to		**BT Mapped (Highest Level)**
CO1	understand the purpose and value of life.	Understanding (K2)
CO2	exhibit positive human values.	Understanding (K2)
CO3	understand social values.	Understanding (K2)
CO4	take steps to develop mental and physical health	Applying (K3), Imitation (S1)

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		
CO2						3		3				3		
CO3						3		3				3		
CO4														
CO5														
CO6						3		3				3		
CO7														
CO8														

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							0
CAT2							0
CAT3							0
ESE	25	75					100

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

18EGT21 - ENGLISH FOR COMMUNICATION II

(Common to All Engineering and Technology Branches)

Programme & Branch	All BE/BTech branches	Sem.	Category	L	T	P	Credit
Prerequisites	NIL	2	HS	3	0	0	3

Preamble	This course is designed to impart required levels of fluency in using the English Language at B1 level in the CEFR.	
Unit - I	**Listening, Speaking, Reading, Writing and Grammar & Vocabulary. Activity Based Learning – Phase – VI:**	**9**
Listening – Job and career related descriptions and conversations – requests of different kinds and the responses – Speaking - Career choices and professional skills – making requests and responding to requests – Reading – Using texts about jobs and careers – about different societies and cultural differences – Writing – Resumes, CVs and job oriented advertisements – business and career related emails – Grammar & Vocabulary – Gerunds and elements of comparison – requests and indirect requests.		
Unit - II	**Listening, Speaking, Reading, Writing and Grammar & Vocabulary. Activity Based Learning – Phase – VII:**	**9**
Listening – Expository and narrative descriptions – information about different cultures, nations and societies - Speaking – Narrating and describing – talking about other countries and other cultures – Reading – Using texts about media and information technology – living abroad and experiencing different cultures – Writing – Blog writing – brochures and tourist pamphlets – Grammar & Vocabulary – The past tense forms - noun phrases and relative clauses.		
Unit - III	**Listening, Speaking, Reading, Writing and Grammar & Vocabulary. Activity Based Learning – Phase – VIII:**	**9**
Listening – Consumerism – product description – complaints and redressal – environmental issues – ecology – saving the planet – Speaking – Talking about problems, issues, complaints – solutions and redressal – talking about environmental issues – Reading – Using texts on segregating wastes – recycling and reusing – texts on environmental issues – Writing – Online reviews, articles and writing web content – Grammar & Vocabulary – Phrases and sentences used for describing problems – passives – prepositions and infinitives.		
Unit - IV	**Listening, Speaking, Reading, Writing and Grammar & Vocabulary. Activity Based Learning – Phase – IX:**	**9**
Listening – Education, learning and the choice of courses – various services needed in daily life – self-improvement for success in life – Speaking - Discussions about educational and career oriented issues – talking about everyday services – giving advice and self improvement – Reading – Reading about learning strategies and learning styles – using texts about personality development – Writing – Writing about hobbies – pastime and individual skills – writing short articles on everyday life and personality development – Grammar & Vocabulary – Using of "would" and certain gerund forms – use of modals, verbs, gerunds, negative questions and infinitives.		
Unit - V	**Listening, Speaking, Reading, Writing and Grammar & Vocabulary. Activity Based Learning – Phase – X:**	**9**
Listening – Historical narratives – biographies and learning about the future – important life events, milestones and happenings of the past – Speaking – Talking about the past, present and the future – talking about important events in life – Reading – Texts about new technologies and future science – using texts about social organization, culture and social practices – Writing – Biographical sketches – historical events – famous personalities, stages of life and getting along with people – Grammar & Vocabulary – Future tense forms – time clauses and certain "if clauses".		

Total:45

TEXT BOOK:

1. Jack C. Richards, "Interchange, Student's Book 3", 4th Edition, Cambridge University Press, New York, 2017.

REFERENCES:

1. Jane Willis, "A Framework for Task Based Learning", Longman, Harlow, 1996.
2. Rod Ellis, "Task Based Language Learning and Teaching", Oxford University Press, London, 2003.

COURSE OUTCOMES: On completion of the course, the students will be able to		**BT Mapped (Highest Level)**
CO1	use functional grammar for improving communication skills	Applying (K3)
CO2	listen and comprehend different spoken excerpts critically and infer unspoken and implied meanings.	Applying (K3)
CO3	read different genres of texts, infer implied meanings and critically analyze and evaluate them for ideas as well as for method of presentation.	Analyzing (K4)
CO4	write effectively and persuasively and produce different types of writing such as narration, description, exposition and argument as well as creative, critical, analytical and evaluative writing.	Creating (K6)
CO5	speak effectively, to express opinions clearly, initiate and sustain a discussion and also negotiate using appropriate communicative strategies.	Creating (K6)

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

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

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	3	3	30	40		24	100
CAT2	3	3	33	43		18	100
CAT3	3	3	33	43		18	100
ESE	3	3	31	45		18	100

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

18MAC21 - MATHEMATICS II

(Common to All Engineering and Technology Branches)

Programme & Branch	B.Tech. & Information Technology	Sem.	Category	L	T	P	Credit
Prerequisites	Nil	2	BS	3	1*	2*	4

Preamble	To impart the knowledge of evaluation of real and complex integrals, vector calculus and analytic functions to the students for solving the problems related to various engineering disciplines	
Unit - I	**Multiple Integrals:**	**9**
Double integration in cartesian coordinates – Change of order of integration – Application: Area between two curves – Triple integration in cartesian coordinates – Volume as triple integrals.		
Unit - II	**Vector Calculus:**	**9**
Directional derivative – Gradient of a scalar point function – Divergence of a vector point function – Curl of a vector – Solenoidal and Irrotational vectors – Green's and Gauss divergence theorems (without proof) – Verification of the above theorems and evaluation of integrals using them.		
Unit - III	**Beta and Gamma Functions:**	**9**
Definition of beta and gamma Functions – Properties – Relation between beta and gamma functions – Transformations of gamma function – Applications of beta and gamma functions: Evaluation of definite integrals in terms of beta and gamma functions.		
Unit - IV	**Analytic Functions:**	**9**
Functions of a complex variable – Analytic functions – Necessary and sufficient conditions (excluding proof) – Cauchy–Riemann equations (Statement only) – Properties of analytic function (Statement only) – Harmonic function – Construction of analytic function – Conformal mapping: w = z + a, az, 1/z – Bilinear transformation.		
Unit - V	**Complex Integration:**	**9**
Introduction – Cauchy's theorem (without proof) – Cauchy's integral formula – Singularities – Classification – Cauchy's residue theorem (without proof) – Applications: Evaluation of definite integrals involving sine and cosine functions over the circular contour.		

List of Exercises / Experiments :

1.	Evaluating indefinite and definite integrals
2.	Evaluating double and triple integrals
3.	Finding the area between two curves
4.	Computing gradient, divergence and curl
5.	Computation of beta and gamma functions
6.	Applying Milne-Thomson method for constructing analytic function
7.	Determination of Mobius transformation for the given set of points
8.	Finding poles and residues of an analytic function

Lecture: 45, Tutorial and Practical:15, Total:60

TEXT BOOK:

1. Grewal B.S., "Higher Engineering Mathematics", 43rd Edition, Khanna Publications, New Delhi, 2014.

REFERENCES:

1. Duraisamy C., Vengataasalam S., Arun Prakash K. and Suresh M., "Engineering Mathematics - II", 2nd Edition, Pearson India Education, New Delhi, 2018.
2. Won Y. Yang, Young K. Choi, Jaekwon Kim, Man Cheol Kim, Jin Kim H. and Taeho Im, "Engineering Mathematics with MATLAB", 1st Edition, CRC Press, London, 2018.

COURSE OUTCOMES: On completion of the course, the students will be able to		**BT Mapped (Highest Level)**
CO1	solve problems involving double and triple integrals	Understanding (K2)
CO2	apply the concept of vectors in engineering problems	Applying (K3)
CO3	use Beta and Gamma functions to improper evaluate integrals	Applying (K3)
CO4	identify, construct and apply analytic functions in electrostatics and fluid flow problems	Applying (K3)
CO5	evaluate complex integrals which is extensively applied in engineering	Applying (K3)
CO6	evaluate line, double and triple integrals and determine area between two curves using MATLAB	Applying (K3), Manipulation (S2)
CO7	compute gradient, curl and divergence of a vector function using MATLAB	Applying (K3), Manipulation (S2)
CO8	construct analytic function, find bilinear transformation and compute poles and residues using MATLAB	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	2											
CO2	3	2												
CO3	3	2	1											
CO4	3	1												
CO5	3	2	2											
CO6					3									
CO7					2									
CO8					2									

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

ASSESSMENT PATTERN - THEORY

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

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

18PHC24 - SOLID STATE PHYSICS
(Common to ECE, CSE & IT branches)

Programme & Branch	B.Tech. & Information Technology	Sem.	Category	L	T	P	Credit
Prerequisites	Applied Physics	2	BS	3	0	2*	3.5

Preamble: This course aims to impart the knowledge on the physics of conductors, superconductors, semiconductors, magnetic materials, dielectrics, optoelectronic materials, and nano materials. It also describes the working of the select semiconducting and optoelectronic devices and the applications of aforementioned materials in communication engineering and computer science and engineering and information technology and provides motivation towards innovations.

UNIT – I **9**

Conducting and Superconducting Materials: Conducting Materials: Introduction - Classical free electron theory - Electrical conductivity - Quantum free electron theory of metals - Fermi distribution function - Effect of temperature on Fermi function - Energy band theory of solids (qualitative). Superconducting Materials: Properties - Type I and Type II superconductors - Applications: Magnetic levitation.

UNIT – II **9**

Semiconducting Materials and Devices: Intrinsic semiconductor: Carrier concentration, electrical conductivity and band gap (qualitative) - Extrinsic semiconductor - p-n junction diode: Construction and V-I characteristics - Zener diode: Construction and characteristics - Uni-junction Transistor (UJT): Construction and characteristics - Hall effect: Determination of Hall coefficient and Applications.

UNIT –III **9**

Magnetic and Dielectric Materials: Magnetic materials: Origin of magnetism - Types of magnetic materials – Domain theory of ferromagnetism – Hysteresis - Soft and hard magnetic materials – Transformer core. Dielectric Materials: Introduction - Dielectric constant - Types of polarization (qualitative) - Frequency and temperature dependence of polarization – Concepts of dielectric loss and dielectric breakdown – Uses of dielectric materials in capacitor.

UNIT – IV **9**

Optoelectronic Materials and Devices: LED: Materials, principle, construction and working – LDR: Materials, principle, construction and working - Solar cell: principle, construction and working - Birefringence crystals: Opto-electric effect - Electro-optic amplitude modulator: Franz –Keldysh and Stark effect modulators.

UNIT – V **9**

Nano Materials: Low dimensional structures: Quantum dot, quantum wire and quantum well – Properties of nano materials – Synthesis: Top down and bottom up approaches – Lithographic methods – Physical vapor deposition method – Carbon nanotubes: Structures, properties, synthesis by laser ablation method - Applications of nanomaterials.

List of Experiments:

1. Determination of the specific resistance of a material using Carey–Foster's bridge.
2. Determination of the band gap of a semiconductor using post office box.
3. Determination of hysteresis loss in a ferromagnetic material.
4. Observation of the V-I characteristics of a p-n junction diode.
5. Determination of the thickness of a nano-structured material using air-wedge arrangement.

Lecture:45, Practical: 15, Total: 60

TEXT BOOK:

1. Tamilarasan K. and Prabu K., "Engineering Physics-II", Tata McGraw Hill Education Pvt. Ltd., New Delhi, 2014.

REFERENCES / MANUAL:

1. Raghavan V., "Materials Science and Engineering: A first course", 5th Edition, Prentice-Hall of India, New Delhi, 2009.
2. Albert Malvino and David J. Bates, "Electronic Principles", 8th Edition, McGraw-Hill Publications, 2016.
3. Tamilarasan K. and Prabu K., "Physics Laboratory Manual", SCM Publishers, Erode, 2018.

* Alternate week

COURSE OUTCOMES: On completion of the course, the students will be able to		**BT Mapped (Highest Level)**
CO1:	apply the concepts of classical and quantum free electron theory of metals to compute the electrical conductivity of metals and to explain band theory of solids, and to summarize the types, properties and applications of superconductor, and the working of magnetic levitation	Applying (K3)
CO2:	use the concept of density of states to describe the carrier concentration, electrical conductivity and band gap of intrinsic semiconductors, extrinsic semiconductors, the working of p-n junction, Zener diodes and UJT, Hall Effect and its applications	Applying (K3)
CO3:	explain the select types, properties and applications of magnetic and dielectric materials, and the hysteresis loss of ferromagnetic material	Understanding (K2)
CO4:	apply the theory of p-n junction to describe the materials, construction, working and applications of the select optoelectronic devices (LED, LDR and Solar cells) and the application of opto-electric effect in modulator	Applying (K3)
CO5:	explain the properties, types and applications, and the select preparation methods of nanomaterials and carbon nanotubes	Understanding (K2)
CO6:	determine the specific resistance of conducting materials and the band gap of semiconducting materials using the concept of electrical conductivity	Applying (K3), Precision (S3)
CO7:	determine the hysteresis loss in a ferromagnetic materials using the concept of domain theory of ferromagnetism, and to obtain the V-I characteristics of a p-n junction diode using the theory of p-n junction	Applying (K3), Precision (S3)
CO8:	determine the thickness of nano-crystalline thin films using the concept of interference of light	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											
CO2	3	2	1											
CO3	2	1												
CO4	3	2	1											
CO5	2	1												
CO6				3										
CO7				3										
CO8				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	25	40	35				100
ESE	20	40	40				100

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

18CYC25 - ENVIRONMENTAL SCIENCE AND ORGANIC ELECTRONIC MATERIALS
(Common to CSE, EEE & IT branches)

Programme & Branch	BTech – Information Technology	Sem.	Category	L	T	P	Credit
Prerequisites	Applied Chemistry	2	BS	3	0	2*	3.5

Preamble: Environmental Science aims to realize the interdisciplinary and holistic nature of the environment for engineering students and stimulate them to know about environment, ecosystem, biodiversity, organic electronic materials, e-waste management and environmental impact assessment for sustainable development.

UNIT - I **9**

Environmental Pollution: Environment - planet earth - components of environment- atmosphere-hydrosphere-lithosphere-biosphere-interrelationship between components and sub components - environmental pollution - environmental pollutants-sources, effects and control methods of air, water, soil and noise pollution - role of an individual in prevention of pollution - case studies.

UNIT - II **9**

Ecosystems and Biodiversity: Ecosystems - definition - concept of an ecosystem – components of an ecosystem - structural and functional features – energy flow in the ecosystem- functional attributes (food chain and food web only) – introduction, types, characteristic features, structure and functions of the (a) forest ecosystem (b) aquatic ecosystems (ponds, rivers and oceans) - Biodiversity - introduction – classification –values of biodiversity - India as a mega diversity nation - biodiversity at global, national and local level- hotspots of biodiversity – threats to biodiversity – endangered and endemic species of India – in-situ and ex-situ conservation of biodiversity.

UNIT – III **9**

Chemistry of Organic Electronic Materials: Organic semiconducting materials – principle, applications and advantages over inorganic semiconducting materials - P-type and N-type organic semiconducting materials (definition and examples) - organic dielectric materials - principle and examples – organic light emitting polymer (definition, examples and applications) – conducting polymers and its applications.

UNIT – IV **9**

E-Waste and its Management: E- Waste – definition - sources of e-waste– hazardous substances in e-waste – effects of e-waste on environment and human health- need for e-waste management– e-waste handling rules - waste minimization techniques for managing e-waste – recycling of e-waste - disposal treatment methods of e-waste - case studies.

UNIT – V **9**

Environmental Impact Assessment and Auditing: Sustainability -three pillars of sustainability- factors affecting environmental sustainability-approaches for sustainable development - Introduction to EIA - objectives of EIA - steps in EIA - participants of EIA - general approach of environmental auditing - audit programmes in India - ISO 14001 certification - environment protection act – air (prevention and control of pollution) act – water (prevention and control of pollution) act.

List of Experiments:

1. Estimation of chloride ion in the given water sample using Argentometric method.
2. Estimation of chromium (Cr^{6+}) in wastewater sample.
3. Determination of dissolved oxygen in the given wastewater sample.
4. Estimation of iron using permanganometry.
5. Estimation of copper in the given solution by Iodometric method.

Lecture:45, Practical:15, Total: 60

TEXT BOOK:

1. Palanisamy P.N., Manikandan P., Geetha A., Manjula Rani K., Kowshalya V.N., “Environmental Science”, Pearson Education, New Delhi, Revised Edition 2019.

REFERENCES / MANUALS:

1. Rakesh Johri, “E-waste: implications, regulations, and management in India and current global best practices”, The Energy and Resources Institute (TERI), 2013.
2. Hagen Klauk, “Organic Electronics: Materials, Manufacturing and Applications”, Wiley-VCH, 2006.
3. Palanisamy P.N., Manikandan P., Geetha A. and Manjula Rani K., “Chemistry Laboratory Manual”, Rajaganapathy Publishers, Erode, 2018.

* Alternate week

COURSE OUTCOMES: On completion of the course, the students will be able to		**BT Mapped (Highest Level)**
CO1:	manipulate the sources, effects and control methods of various environmental pollution	Applying (K3)
CO2:	elaborate the features of ecosystems and biodiversity to find the need for conservation	Understanding (K2)
CO3:	outline the organic electronic materials and its applications in various field	Understanding (K2)
CO4:	utilize the knowledge to handle the e-waste and reduce its impacts on environment	Applying (K3)
CO5:	make use of the knowledge of EIA, EA and environmental legislation laws towards sustainability	Applying (K3)
CO6:	determine the amount of iron in the given solution using permanganometry	Applying (K3), Precision (S3)
CO7:	determine the amount of chloride and copper in the given solution	Applying (K3), Precision (S3)
CO8:	estimate the amount of chromium and DO in the given wastewater	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			3							
CO2	3	2					3							
CO3	3	2												
CO4	3	2	1	1			3							
CO5	3	2	1	1			3							
CO6	3	2	1	3										
CO7	3	2	1	3										
CO8	3	2	1	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	25	35	40				100
CAT2	25	35	40				100
CAT3	25	35	40				100
ESE	25	35	40				100

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

18MEC11 - ENGINEERING DRAWING
(Common to all Engineering and Technology Branches)

Programme & Branch	B.Tech. & Information Technology	Sem.	Category	L	T	P	Credit
Prerequisites	NIL	2	ES	2	0	2	3

Preamble	To impart knowledge on orthographic, isometric projections, sectional views and development of surfaces by solving different application-oriented problems.	
Unit - I	**General Principles of Orthographic Projection**	**9**
General Principles of Orthographic Projection: Importance of graphics in engineering applications - Use of drafting instruments - BIS conventions and specifications - Size, layout and folding of drawing sheets - Lettering and dimensioning - Projections of Points, Lines and Planes - General principles of orthographic projection - First angle projection - Layout of views - Projection of points located in all quadrant and straight lines located in the first quadrant - Determination of true lengths and true inclinations and location of traces - Projection of polygonal surface and circular lamina inclined to both reference planes.		
Unit - II	**Projections of Solid**	**9**
Projections of Solid: Projections of simple solids like prisms, pyramids, cylinder and cone when the axis is inclined to one reference plane by change of position method.		
Unit - III	**Sectioning of Solids**	**9**
Sectioning of Solids: Sectioning of solids - prisms, pyramids, cylinder and cone in simple vertical position by cutting planes inclined to one reference plane and perpendicular to the other - Obtaining true shape of section.		
Unit - IV	**Development of Surfaces**	**9**
Development of Surfaces: Development of lateral surfaces of simple solids like prisms, pyramids, cylinders and cones – development of simple truncated solids involving prisms, pyramids, cylinders and cones.		
Unit - V	**Isometric Projection and Introduction to AutoCAD**	**9**
Isometric Projection and Introduction to AutoCAD: Principles of isometric projection - Isometric scale - Isometric projections of simple and truncated solids like prisms, pyramids, cylinders and cones - Conversion of isometric projection into orthographic projection - Introduction to AutoCAD.		

Total:45

TEXT BOOK:

1. Venugopal K. and Prabhu Raja V. “Engineering Graphics”, 15th Edition, New Age International Pvt. Ltd., New Delhi, 2018.

REFERENCES:

1. Basant Agrawal, Agrawal C.M. “Engineering Drawing”, 2nd Edition, McGraw Hill Education, 2019.
2. Gopalakrishnana K.R. “Engineering Drawing”, Volume. I & II, Subhas Publications, Bengaluru, 2014.
3. Parthasarathy N.S., Vela Murali. “Engineering Drawing”, 1st Edition, Oxford University Press, 2015.

COURSE OUTCOMES: On completion of the course, the students will be able to		**BT Mapped (Highest Level)**
CO1	interpret international standards of drawings and sketch the projections of points, lines and planes.	Understanding(K2)
CO2	draw the projections of 3D primitive objects like prisms, pyramids, cylinders and cones.	Applying (K3)
CO3	construct the various sectional views of solids like prisms, pyramids, cylinders and cones.	Applying (K3)
CO4	develop the lateral surfaces of simple and truncated solids.	Applying (K3)
CO5	sketch the isometric projections of simple and truncated solids and convert isometric drawing in to orthographic projection.	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								3	2	2	2	3
CO2	3	2	1	1						3	2	3	2	3
CO3	3	2	1	1						3	2	3	2	3
CO4	3	2	1	1						3	2	3	2	3
CO5	3	2	1	1						3	2	3	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	40	40				100
CAT3	20	40	40				100
ESE	20	40	40				100

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

18CSC21 - PROGRAMMING AND LINEAR DATA STRUCTURES
(Common to CSE & IT branches)

Programme & Branch	B.Tech. & Information Technology	Sem.	Category	L	T	P	Credit
Prerequisites	Problem Solving and Programming	2	PC	2	0	2	3

Preamble: This course provides an introduction to the advanced features of C language, basic concepts and applications of Linear data Structures like linked list, stack and queue.

UNIT – I		6

Pointers and Arrays, Pointers and Strings: Pointers- pointer basics – pointer operators – pointer arithmetic – NULL pointers – generic pointers – pointers and arrays: Pointers and 1D,2D arrays – passing an array to a function – returning an array from function – array of pointers – pointers and strings – two dimensional character array – array of pointers to strings – dynamic memory allocation

UNIT – II		6

Pointers and Functions, Pointers and Structures: Function pointers – calling a function using a function pointer – array of function pointers – Structures – typedef and its use in structure declaration – nesting of structures - array of structures - Arrays within structure - structures and functions – passing structures to functions - structure pointers - self referential structures.

UNIT – III		6

File Handling and Preprocessor Directives: Introduction - Operations on Files - opening and closing - Input and Output operations - Sequential and random access - Detecting the end-of-file - Renaming and Removing a file - Preprocessor directives – Macros - File Inclusion - Conditional Compilation – Command line Arguments.

UNIT – IV		6

Data Structures and Linked List: Introduction to Data Structures – Classification – Introduction to linked lists - Linked lists Vs arrays – Memory allocation and deallocation for a linked list – different types of linked list – singly linked list – traversing – searching – inserting and deleting a node in a linked list

UNIT – V		6

Stack and Queue: Introduction – Stack – Implementation of stack using array and linked list – Application of stack – Queue – Implementation of Queue using array and linked list– Other variations of Queue – Applications of Queue.

List of Exercises / Experiments:

1. Program to access an array(1D and 2D) using pointers
2. Program to manipulate strings using pointers
3. Program to demonstrate dynamic memory allocation for 1D and 2D array
4. Program to pass an array as an argument to function and access the array using pointers
5. Programs using pointers and structures
6. Program to perform operations on files
7. Program using conditional preprocessor directives
8. Program to implement singly linked list
9. Program to implement stack using array and linked list
10. Program to implement Queue using array and linked list

Lecture:30, Practical:30, Total: 60

TEXT BOOK:

1. Sumitabha Das, “Computer Fundamentals and Programming”, 1st Edition, McGraw Hill Education (India) Pvt. Ltd., 2018.

REFERENCES / MANUAL / SOFTWARE:

1. Yashavant Kanetkar, “Pointers in C”, 4th Edition, BPB Publications, 2017.
2. Pradip Dey, Manas Ghosh, “Programming in C”, 2nd Edition, Oxford University Press, 2011.

COURSE OUTCOMES: On completion of the course, the students will be able to		**BT Mapped (Highest Level)**
CO1:	write C programs that use pointers to access arrays and strings	Understanding (K2)
CO2:	develop C programs using pointers to access functions and structures	Applying (K3)
CO3:	implement file operations and apply preprocessor directives to solve the given problems	Understanding (K2)
CO4:	explain memory allocation during runtime and implement linked list using pointers	Understanding (K2)
CO5:	outline the operations on stacks and queues and their usage	Understanding (K2)
CO6:	use pointers to perform operations on arrays and structures	Applying (K3), Precision(S3)
CO7:	write programs to demonstrate the application of dynamic memory allocation and macros	Applying (K3), Precision(S3)
CO8:	compare and use appropriate data structure for a given application	Analyzing (K4), 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											2	1
CO2	3	2	1	1									2	2
CO3	3	2											2	1
CO4	3	2											2	1
CO5	3	2											2	1
CO6	3	2	1	1									2	2
CO7	3	2	1	1									2	2
CO8	3	3	2	1	1								2	2

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

ASSESSMENT PATTERN - THEORY

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

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

18MEL11 - ENGINEERING PRACTICES LABORATORY
(Common to all Engineering and Technology Branches)

Programme & Branch	B.Tech. & Information Technology	Sem.	Category	L	T	P	Credit
Prerequisites	NIL	I	ES	0	0	2	1
Preamble	This course is designed to provide a hands-on experience in the field of mechanical engineering and electrical engineering such as fitting, plumbing, wood working, sheet metal work, welding, safety aspects, assembly and testing of electrical and electronic circuits.						

List of Exercises / Experiments:

	PART A – MECHANICAL ENGINEERING
1.	To prepare square or rectangular shaped MS plates using power tools for cutting, polishing and shaping to the required dimensions.
2.	To carryout drilling, tapping and assembly on the given MS plates.
3.	To carryout thread forming on a GI/PVC pipes and prepare water leak proof water line from overhead tank.
4.	To prepare a wood or plywood box/tray/any innovative models using modern power tools like cutting machine, router, jigsaw, power screw driver etc.
5.	To prepare a leak proof sheet metal tray/box/funnel using modern power tools.
6.	Welding practice using welding simulator.
7.	Project: Preparing innovative articles using wood/sheet metal.
	PART B – ELECTRICAL AND ELECTRONICS ENGINEERING
8.	Safety Aspects of Electrical Engineering, Electrical Symbols, Components Identification, Fuse selection and installation, Circuit Breakers selection
9.	Wiring circuit for fluorescent lamp and stair case wiring
10.	Measurement of earth resistance
11.	Soldering of simple circuits and trouble shooting
12.	Implementation of half wave and full wave rectifier using diodes

Total:30

REFERENCES/MANUAL/SOFTWARE:

1.	Engineering Practices Laboratory Manual.

COURSE OUTCOMES: On completion of the course, the students will be able to		**BT Mapped (Highest Level)**
CO1	plan the sequence of operations for effective completion of the planned models/innovative articles	Creating (K6), Precision (S3)
CO2	identify and use appropriate modern power tools and complete the exercises/models accurately	Applying (K3), Precision (S3)
CO3	select fuses and Circuit breakers	Understanding (K2), Manipulation (S2)
CO4	perform house wiring and realize the importance of earthing	Applying (K3), Manipulation (S2)
CO5	trouble shoot the electrical and electronic circuits	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	2	3		
CO2	3	2	1	1					3	2	2	3		
CO3	2	1							3	2	2	3		
CO4	3	2	1	1					3	3	2	3		
CO5	3	2	1	1					3	2	2	3		

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

18MAT31 DISCRETE MATHEMATICS

(Common to Computer Science and Engineering & Information Technology branches)

Programme & Branch	B.Tech. & Information Technology	Sem.	Category	L	T	P	Credit
Prerequisites	Nil	3	BS	3	1	0	4

Preamble: To impart knowledge in mathematical logic, partial ordering and lattices, investigate various category of functions and develop skills to apply group structures in coding theory.

UNIT – I **9+3**

Propositional Calculus: Propositions – Logical connectives – Compound propositions – Conditional and biconditional propositions – Truth tables – Tautologies and contradictions – Contrapositive – Logical equivalences and implications – DeMorgan's Laws – Normal forms – Principal conjunctive normal form and Principal disjunctive normal form – Rules of inference – Arguments – Validity of arguments.

UNIT – II **9+3**

Predicate Calculus: Predicates – Statement function – Variables – Free and bound variables – Quantifiers – Universe of discourse – Logical equivalences and implications for quantified statements – Theory of inference – Rules of universal specification and generalization – Validity of arguments.

UNIT – III **9+3**

Set Theory: Cartesian product of sets – Relations on sets – Types of relations and their properties – Matrix representation of a relation - Graph of a relation – Equivalence relations – Partial ordering – Poset – Hasse diagram – Lattices – Properties of lattices.

UNIT – IV **9+3**

Functions: Definition – Classification of functions – Composition of functions – Inverse functions – Characteristic function of a set – Recurrence relations – Solution of recurrence relations – Generating Functions – Solving recurrence relation by generating functions.

UNIT – V **9+3**

Group Theory: Groups and Subgroups (Definitions only) – Homomorphism – Cosets – Lagrange's theorem – Normal subgroups – Coding Theory – Group codes – Basic notions of error correction – Error recovery in group codes (Excluding theorems in coding theory)

Lecture: 45, Tutorial:15, Total: 60

TEXT BOOK:

1. Veerarajan T., "Discrete Mathematics with Graph Theory and Combinatorics", Reprint Edition, Tata McGraw Hill Publishing Company, New Delhi, 2013.

REFERENCES:

1. Kenneth H. Rosen, "Discrete Mathematics and its Applications", 7th Edition, Tata McGraw Hill Publishing Company, 2012.
2. Susanna S. Epp, "Discrete Mathematics with Applications", 4th Edition, Cengage Learning, USA, 2011.

COURSE OUTCOMES: On completion of the course, the students will be able to		**BT Mapped (Highest Level)**
CO1:	use mathematical proof techniques to solve computing problems	Applying (K3)
CO2:	construct algorithms to derive complexities	Applying (K3)
CO3:	possess knowledge of sets that are required for developing computational model	Understanding (K2)
CO4:	perform computational operations associated with functions	Applying (K3)
CO5:	implement the concepts of group structures in coding theory	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										
CO2	3	2	1	1										
CO3	3	2	1											
CO4	3	2	1	1										
CO5	3	2	2	2										

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

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	10	20	70				100
CAT2	20	20	60				100
CAT3	20	20	60				100
ESE	10	20	70				100

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

18CST31 - DATA STRUCTURES

(Common to Computer Science and Engineering & Information Technology branches)

Programme & Branch	B.Tech. & Information Technology	Sem.	Category	L	T	P	Credit
Prerequisites	Basic Programming Knowledge	3	PC	3	0	0	3
Preamble	This course provides an introduction to the basic concepts and techniques of nonlinear data structures and applications of Linear data structures.						

UNIT – I		**9**
List and its Applications: Abstract Data Types (ADT) – Linked List – Doubly Linked List – Circular Linked List – Applications of List: Polynomial Addition - Representing sparse matrices - Reversing a linked List - Cloning a Linked List - Sorting of linked list		
UNIT – II		**9**
Stack, Queue and its Applications: Stack Implementation – Applications of stack: Towers of Hanoi – Balancing Parenthesis - Evaluating Expressions – Expression Conversion – String Reversal - Queue Implementation – Priority Queue - Deque – Applications of Queue:Reversing the Stack using Queue		
UNIT – III		**9**
Trees: General trees - Terminology - Representation of trees - Tree traversal - Binary tree - Representation - Expression tree – Binary tree traversal - Binary Search Tree: Construction - Searching - Insertion – Deletion - Find Min - Find Max - AVL trees: Rotation – Insertion - Deletion		
UNIT – IV		**9**
Graphs: Definition – Representation of Graph – Types of graph – Breadth-first traversal – Depth-first traversal – Topological Sort – Applications of DFS: Bi-connectivity - Euler circuits - Finding Strong Components – Applications of BFS: Bipartite- Graph coloring		
UNIT – V		**9**
Advanced Trees and Hashing: B-Trees-insertion-deletion, Splay trees, Red-Black Trees-Rotation-Insertion- Deletion - Hashing: Hash Functions –Separate Chaining – Open Addressing: Linear Probing – Quadratic Probing-Double Hashing - Rehashing – Extendible Hashing.		
		Total: 45

TEXT BOOK:

1. Weiss M. A., “Data Structures and Algorithm Analysis in C”, 2nd Edition, Pearson Education Asia, New Delhi, 1997.

REFERENCES:

1. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein, “Introduction to Algorithms”, 3rd Edition, MIT Press, USA, 2009.
2. Langsam Y.M., Augenstein J. and Tenenbaum A. M., “Data Structures using C and C++”, 2nd Edition, Pearson Education, 1996.

COURSE OUTCOMES: On completion of the course, the students will be able to		**BT Mapped (Highest Level)**
CO1:	employ the linked list for solving the given problem	Applying (K3)
CO2:	solve the computational problems using stack and queue	Applying (K3)
CO3:	demonstrate the structure and operations on trees	Applying (K3)
CO4:	apply appropriate graph algorithms for solving computing problems	Applying (K3)
CO5:	implement the operations of special treesand hashing 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	3	2	1	1									3	1
CO2	3	2	1	1									3	1
CO3	3	2	1	1									3	1
CO4	3	2	1	1									3	1
CO5	3	2	1	1									3	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	80				100
CAT2	10	20	70				100
CAT3	10	20	70				100
ESE	10	20	70				100

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

18CST33 - OBJECT ORIENTED PROGRAMMING
(Common to CSE and IT branches)

Programme & Branch	B.Tech. & Information Technology	Sem.	Category	L	T	P	Credit
Prerequisites	Problem Solving and Programming	3	PC	3	0	0	3

Preamble	**To provide a concise introduction to the fundamental concepts of object oriented programming**	
UNIT – I		**9**
Introduction to OOP, Java, Classes and Objects: Software Development and object oriented programming paradigms - History and Evolution of Java –Overview –Data Types -Variables -Arrays –Operators -Control Statements –Classes – Fundamentals –Declaring Objects -Assigning Object Reference Variables -Methods –Constructors -this keyword -Garbage collection -finalize method -Stack Class.		
UNIT – II		**9**
Reusability, Packages and Interfaces: Overloading Methods -Objects as Parameters -Argument Passing -Returning Objects – Recursion -Access Control –Static –Nested and Inner Classes -Command-Line Arguments –Variable Length Arguments. Inheritance –Basics –Super keyword -Multilevel Hierarchy -Method Overriding -Dynamic Method Dispatch -Abstract Classes -final with Inheritance. Packages -Access Protection -Importing Packages- Interfaces.		
UNIT – III		**9**
Exception Handling, Multithreading, I/O and Applet: Exception Handling basics – Multiple catch Clauses- Nested try Statements - Java's Built-in Exceptions –User defined Exception – Chained exceptions. Java Thread Model - Creating a Thread - Priorities – Synchronization – Inter thread Communication – Suspending - Resuming, and Stopping Threads – Multithreading. Enumerations - Wrappers – Auto boxing – Annotations. I/O Basics - Reading and Writing Console I/O - PrintWriter Class - Reading and Writing Files - Applet – Architecture – Skeleton – Display methods - Repainting – Applet tag – Passing parameters - transient and volatile modifiers.		
UNIT – IV		**9**
String Handling, Generics and Event Handling: String Class – methods – String Buffer Class – Methods – String Builder.Generics – Example – Parameters - General Form- Bounded Types - Wildcard Arguments - Generic Method and Interfaces – Raw Types and Legacy Code - Generic Class Hierarchies. Event Handling – Mechanisms -Delegation Event Model - Event Classes - Sources of Events - Event Listener Interfaces – Mouse and Keyboard events - Adapter Classes - Inner Classes		
UNIT – V		**9**
AWT: AWT Classes - Window Fundamentals - Frame Windows - Frame Window in an Applet – Graphics –Color – Fonts – Font Metrics. AWT Controls - Layout Managers - Menu Bars and Menus -Dialog Boxes - FileDialog - Handling Events by Extending AWT Components.		
		Total: 45

TEXT BOOK:

1. Schildt Herbert, "Java: The Complete Reference", 9th Edition,Tata McGraw Hill Publishing Company, New Delhi, 2014.

REFERENCES:

1. Buyya Rajkumar, Thamarai Selvi S. and Xingchen Chu, "Object Oriented Programming with Java Essentials and Applications", Tata McGraw Hill, 2009.
2. Deitel Paul and Deitel Harvey, "Java How to Program", 8th Edition, Eastern Economy Edition, 2010.

COURSE OUTCOMES: On completion of the course, the students will be able to		BT Mapped (Highest Level)
CO1:	apply the concepts of classes and objects to solve simple problems	Applying (K3)
CO2:	develop applications using inheritance, packages and interfaces	Applying (K3)
CO3:	experiment with exception handling mechanisms, multithreaded model, I/O packages and Applet classes	Applying (K3)
CO4:	make use of string classes, generics and event handling concepts to solve real world problems	Applying (K3)
CO5:	integrate the concepts of AWT for developing GUI based applications	Applying (K3)

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	1									3	1
CO2	3	2	1	1									3	1
CO3	3	2	1	1									3	1
CO4	3	2	1	1									3	1
CO5	3	2	1	1									3	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	15	25	60				100
CAT2	15	20	65				100
CAT3	15	20	65				100
ESE	10	20	70				100

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

18CST32 COMPUTER ORGANIZATION
(Common to CSE & IT branches)

Programme & Branch	B.Tech. & Information Technology	Sem.	Category	L	T	P	Credit
Prerequisites	Knowledge of digital computers and number systems	3	PC	3	0	0	3

Preamble	Provides knowledge on basics of computer organization, introduces various arithmetic operations. Analyzes performance issues in processor, memory and I/O design of a digital computer	
UNIT – I		**9**
Basic Structure of Computers and Machine Instructions: Functional Units–Basic Operational Concepts–Number Representation and Arithmetic Operations – Performance – Memory Locations and Addresses – Memory Operations – Instruction and Instruction Sequencing – Addressing Modes – CISC Instruction Sets – RISC and CISC Styles		
UNIT – II		**9**
Arithmetic Unit: Addition and Subtraction of Signed Numbers–Design of Fast Adders–Multiplication of Unsigned Numbers – Multiplication of Signed Numbers – Fast Multiplication – Integer Division – Floating Point Numbers and Operations		
UNIT – III		**9**
Basic Processing Unit: Fundamental Concepts–Instruction Execution –Hardware Components–Instruction Fetch and Execution Steps – Control Signals - Hardwired control – CISC Style Processors. **Pipelining:** Pipelining – Basic concepts – Pipeline Organization – Pipelining Issues - Data Dependencies – Memory Delay – Branch Delay – Performance Evaluation		
UNIT – IV		**9**
Memory System: Basic Concepts–Semiconductor RAM Memories – Read-Only Memories – Direct Memory Access – Memory Hierarchy - Cache Memories: Mapping Functions – Performance Consideration – Virtual Memory – Secondary Storage: Magnetic Hard Disks.		
UNIT – V		**9**
I/O Organization: Accessing I/O Devices–Interrupts - Enabling and Disabling Interrupts – Handling Multiple Devices – Bus Structure – Bus Operation – Arbitration – Interface Circuits – Interconnection Standards: USB.		
		Total: 45

TEXT BOOK:

1. Carl Hamacher, ZvonkoVranesic, SafwatZaky and NaraigManjikian, “Computer Organization and Embedded Systems”, 6th Edition, McGraw Hill International Edition, 2012.

REFERENCES:

1. Patterson David A. and Hennessy John L., “Computer Organization and Design: The Hardware / Software Interface”, 5th Edition, Harcourt Asia, Morgan Kaufmann, Singapore, 2014.
2. Stallings William, “Computer Organization and Architecture: Designing for Performance”, 9th Edition, Pearson Education, New Delhi, 2012.

COURSE OUTCOMES: On completion of the course, the students will be able to		**BT Mapped (Highest Level)**
CO1:	describe the basic structure and operation of a digital computer and determine the addressing modes for the set of instructions	Applying (K3)
CO2:	describe and apply algorithms for performing different arithmetic operations	Applying (K3)
CO3:	make use of the various bus organizations to determine the control sequence for an instruction and apply the concepts of pipelining identify and handle the data hazards and instructional hazards	Applying (K3)
CO4:	distinguish between different types of memory organization and apply the mapping functions between main memory and cache	Applying (K3)
CO5:	compare the different ways of communication between memory and I/O devices and standard I/O interfaces	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										3	1
CO2	3	2	1										3	1
CO3	3	2	1										3	1
CO4	3	2	1										3	1
CO5	2	1											2	

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

ASSESSMENT PATTERN - THEORY

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

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

18ITC31 - DIGITAL PRINCIPLES AND DESIGN

(Common to Information Technology & Computer Science and Engineering branches)

Programme & Branch	B.Tech. & Information Technology	Sem.	Category	L	T	P	Credit
Prerequisites	NIL	3	ES	3	0	2	4

Preamble	This course enables the students to understand the basic principles of number system, Binary Codes, Boolean algebra, digital logic gates, combinational and sequential circuits. And it also provides discussion on registers, counters and programmable logic devices.	
UNIT – I		**9**
Number Systems and Boolean Algebra: Number Systems and their conversions- Complements – Signed Binary Numbers – Binary Codes – Binary Logic - Boolean Algebra: Definitions – Basic and Axiomatic –Theorems of Boolean Algebra – Boolean functions: Realization of functions using Logic gates		
UNIT – II		**9**
Gate Level Minimization: Canonical and Standard Forms of Boolean functions – Minimization of functions using Karnaugh Map – Don't–Care Conditions – NAND and NOR Implementation– Exclusive-OR function - Minimization of functions using Quine-McCluskey method		
UNIT – III		**9**
Combinational Logic: Analysis procedure – Design procedure – Half Adder – Full Adder - Half Subtractor – Full Subtractor – Binary Adder-Subtractor – BCD Adder – Code Converters - Magnitude Comparator – Decoders – Encoders – Multiplexers – Demultiplexers – Boolean Functions implementation using Multiplexers and Decoders.		
UNIT – IV		**9**
Sequential Logic: Introduction – Latches and Flip-flops – Triggering – Analysis of clocked sequential circuits: State Equations – State Table – State Diagram– State Reduction and Assignment– Mealy and Moore machines and their circuit design procedure		
UNIT – V		**9**
Register, Counter and Programmable Logic: Shift Registers: SISO– SIPO– PISO–PIPO–Bidirectional Shift register–Universal Shift register– Synchronous Counters: Binary Counter – up-down Binary Counter – BCD Counter – modulo-N Counter – Ring Counter – Johnson Counter – Programmable Logic devices: PROM – PLA – PAL**.**		
List of Exercises:		
1. Simplify and Implement of Boolean functions using logic gates		
2. Implement the following combinational logic circuits using logic gates i. Half Adder and Full Adder ii. Half Subtractor and Full Subtractor		
3. Design and Implement 4- Bit Adder /Subtractor		
4. Design and Implement BCD Adder /Subtractor		
5. Design a 4-bit binary to gray and gray to binary code converter		
6. Implement Multiplexer and Demultiplexer circuits using logic gates		
7. Design and implement decoders and encoders		
8. Implement various Flip-flops using Logic gates		
9. Design various Shift Registers.		
10. Design various Synchronous counters.		
		Lecture: 45, Practical: 30, Total: 75

TEXT BOOK:

1. Morris Mano M., Micheal D. Ciletti, "Digital Design: With an Introduction to the Verilog HDL,VHDL, and System Verilog", 6th Edition, Pearson Education, 2019.

REFERENCES/MANUAL:

1. Charles H. Roth, "Fundamentals of Logic Design", 6th Edition, Thomson Learning, 2013.
2. Thomas L. Floyd, "Digital Fundamentals", 10th Edition, Pearson Education Inc., 2011.

COURSE OUTCOMES: On completion of the course, the students will be able to		**BT Mapped (Highest Level)**
CO1:	summarize the different number systems and their conversion and boolean algebra	Understanding (K2)
CO2:	interpret boolean expression using map and tabulation technique and realize it using logic gates	Applying (K3)
CO3:	design combinational logic circuits	Applying (K3)
CO4:	design sequential logic circuits	Applying (K3)
CO5:	implement digital systems using registers, counters and programmable logic devices	Applying (K3)
CO6:	experiment the combinational logic circuits for the given application using logic gates	Applying (K3), Manipulation (S2)
CO7:	design and implement combinational logic circuits	Applying (K3), Manipulation (S2)
CO8:	implement sequential logic circuits using flip-flops	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											3	1
CO2	3	2	2										3	2
CO3	3	2	2										3	2
CO4	3	2	2										3	2
CO5	3	2	2										3	2
CO6	3	2	2										3	2
CO7	3	2	2										3	2
CO8	3	2	2										3	2

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

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	**10**	**50**	**40**				**100**
CAT2	**10**	**15**	**75**				**100**
CAT3	**10**	**15**	**75**				**100**
ESE	**10**	**20**	**70**				**100**

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

18ITT31 - PRINCIPLES OF COMMUNICATION

Programme & Branch	B.Tech. & Information Technology	Sem.	Category	L	T	P	Credit
Prerequisites	NIL	3	ES	3	0	0	3

Preamble	Aims at designing Analog and Digital communication systems that are used for the transmission of information from source to destination. A detailed quantitative framework for analog and digital transmission techniques is addressed.	
UNIT – I		**9**
Amplitude Modulation: Principles of amplitude modulation – AM envelope - Frequency spectrum and bandwidth - Modulation index and percentage modulation - AM power distribution - AM modulator circuits – Low level AM modulator - AM transmitters – Low level transmitter - AM receivers – Superheterodyne receivers		
UNIT – II		**9**
Angle Modulation: Angle Modulation – FM and PM waveforms - Phase deviation and modulation index - Frequency deviation - Direct FM and PM demodulators - Frequency spectrum of angle modulated waves - Bandwidth requirement - Narrowband FM and Broadband FM - Average power - FM and PM modulators, Direct FM transmitter - Angle modulation vs. amplitude modulation – Indirect FM transmitter.		
UNIT – III		**9**
Digital Modulation: Sampling - Time Division Multiplexing - Digital T-carrier System – Pulse code modulation – Amplitude shift keying - Frequency and phase shift keying – Modulator and demodulator - bit error rate calculation.		
UNIT – IV		**9**
Data Communication: Data communication codes: ASCII - BAR codes - Error Control - Error Detection - Redundancy checking - Error Correction - Hamming – Line coding : AMI – NRZ - RZ - Serial interfaces : RS232 - RS485 - Data communication circuits - Data communication modems - Public Switched Telephone Network(PSTN) – ISDN		
UNIT – V		**9**
Spread Spectrum: PN sequence code and its properties- Direct sequence spread spectrum system - Processing gain- Frequency hopping spread spectrum.		
		Total: 45

TEXT BOOK:

1. Wayne Tomasi, “Electronic Communications Systems: Fundamentals Through Advanced”, 5th Edition, Pearson Education, 2008.

REFERENCES:

1. Michael Moher and Simon Haykin, “Communication System”, 5th Edition, Wiley India Pvt. Ltd., 2011.
2. Frenzel and Louis E., “Principles of Electronic Communication Systems”, 3rd Edition, Tata McGraw Hill Publishing Company, New Delhi, 2008.

COURSE OUTCOMES: On completion of the course, the students will be able to		BT Mapped (Highest Level)
CO1:	explain amplitude modulation techniques	Understanding (K2)
CO2:	characterize the different analog modulation schemes	Understanding (K2)
CO3:	apply the concepts of digital modulation techniques	Applying (K3)
CO4:	detect and correct the errors occurred in the channel using error control coding schemes and summarize the concepts of data communication	Applying (K3)
CO5:	adapt the spread spectrum techniques for modern communication	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									3	2
CO2	3	2	1	1									3	2
CO3	3	2	1	1									3	2
CO4	3	2	1	1									3	2
CO5	3	2	1	1									3	2

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

ASSESSMENT PATTERN - THEORY

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

18CSL31 - DATA STRUCTURES LABORATORY
(Common to CSE & IT branches)

Programme & Branch	B.Tech. & Information Technology	Sem.	Category	L	T	P	Credit
Prerequisites	Programming and Linear Data Structures	3	PC	0	0	2	1
Preamble	This course provides an introduction to the concepts and techniques of linear and non-linear data structures, implements applications using these data structures and analyze the various algorithm.						

List of Experiments:

1.a. A music player needs to store Illayaraja's hit songs. Develop a C program to implement the following operations:

i) Read the hit songs of Illayaraja and store it in the beginning of the music player
ii) Get a song 'x' and search 'x' in music player. If 'x' is present then play the song otherwise add to the list of the songs
iii) Display the songs in the music player and count the number of songs in the music player
iv) Select a song 'x' from music player and play the previous and next song
v) Print the play list in reverse order

2. Perform the following polynomial operations:

i) Add $10x^5+2x^3-1$ to $8x^4-x^3+16x^2$
ii) Subtract $100x^4-19x^2-7x$ from $150x^3+8x-14$

3.When multiple applications are running on a PC, it is common for the operating system to put the running applications on a list and then to cycle through them, giving each of them a slice of time to execute and then making them wait while the CPU is given to another application. When the operating system reaches the end of the list it can cycle around to the front of the list. Assist the operating system to perform the above operations using the appropriate data structure.

4. a. Perform infix into postfix expression conversion.
b. Consider that you are given the following C program:

```
void main()
{
    printf("KONGU";
    if((a>b)&&(b>c)
}
```

When the program is executed, the compiler reports an error "Missing parenthesis". Show how the compiler detects the error.

5. Write a program to show how the evaluation of an expression takes place in a computer.
For example:
printf("%d",(2* 5 +(7+9))); will produce the output 26.
printf("%d",(2*(5 +(7+9)))); will produce the output 42.

6. Assume 'n' number of air planes are waiting for the instruction to land. The services are provided from the ground station on first come first serve basis.

i) Display the order in which the air planes are serviced
ii) Display the air planes in the order of waiting time in air (Lowest to highest)

7. Implement the following service using priority queue.

Vehicle Type	Priority (Assume lowest value has highest priority)
Medium Passenger Vehicle (Bus)	2
Light motor vehicle(cars)	4
Ambulance	1
Medium goods vehicle	3

8. Suppose the customer is getting online orders placed and he wants to maintain the live data in sorted order of prices. For example, he wishes to know the number of items purchased at cost below a given cost at any moment. Or he wishes to know number of items purchased at higher cost than given cost. Help the customer to implement the above scenario.

9. Google maps uses graphs for building transportation systems, where intersection of two(or more) roads are considered to be a vertex and the road connecting two vertices is considered to be an edge, Visit the roads using BFS and DFS.

10. Consider that the height of the student has to be maintained in a tree. The tree height must be balanced at all the time. Implement it with a suitable data structure.
11. A person wants to travel from a home city to all other cities. Find the order in which the person has to visit the cities (No need to return back).
12. Implement the operations of Red Black tree: i) Store a number on to the tree ii) Delete a number from the tree iii) Display all the numbers in the tree
Total: 30
REFERENCES/MANUAL/SOFTWARE:
1. Operating System : Windows/Linux
2. Software : C
3. Laboratory Manual

COURSE OUTCOMES: On completion of the course, the students will be able to		**BT Mapped (Highest Level)**
CO1:	identify the appropriate data structure for solving the given problem	Applying (K3), Precision (S3)
CO2:	use a data structure to implement another data structure	Applying (K3), Precision (S3)
CO3:	synthesize operations like searching, insertion, deletion and traversing on various data structures	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	1								3	1
CO2	3	2	1	1	1								3	1
CO3	3	2	1	1	1								3	1

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

18CSL32 - OBJECT ORIENTED PROGRAMMING LABORATORY
(Common to CSE & IT branches)

Programme & Branch	B.Tech. & Information Technology	Sem.	Category	L	T	P	Credit
Prerequisites	Problem Solving and Programming	3	PC	0	0	2	1
Preamble	In this course, programs will be implemented in java where virtually a complete application in any domain can be implemented.						

List of Experiments:	
1	Use Eclipse IDE or Netbeans IDE platform and acquaint with the various menus. Create a test project, add a test class and methods using class wizard, and run it. See how you can use auto suggestions, auto fill.Try code formatter, code search/replace and code refactoring likerenaming variables, methods, and classes. Try debug step by step with a small program of about 10 to 15 lines whichcontains at least one if else condition and a for loop.
2	Simple java programs using operators, arrays and control statements • Finding the prime numbers between 1 to n • Counting the alphabets, digits, special characters in a given string • Multiplication of two Matrices
3	Develop a stack and queue data structures using classes and objects.
4	Program to demonstrate inheritance & polymorphism • Create one base class for student personal details and inherit those details into the sub class of student Educational details to display complete student information. • Create an abstract class named shape that contains two integers and an empty method named printArea(). Provide two classes named Rectangle and Triangle such that each one of the classes extends the class shape. Each one of the class contains only the method printArea() that print the area of the given shape.
5	Develop an application using interfaces and by accessing super class constructors and methods.
6	Develop the Employee payroll application using packages.
7	Program to illustrate exception handling in java and creation of user defined exception.
8	Program to demonstrate thread concepts • A multi-threaded program which has three threads. First thread generates a random integer every 1 second and if the value is even, second thread computes the square of the number and prints. If the value is odd the third thread will print the cubeof the number. • Program to implement the producer –consumer problem using the concept of inter-thread communication.
9	Program to copy the contents of one file into another file, count the number of characters and print the file size in bytes.
10	Develop and configure a simple banner applet
11	Program to demonstrate the features of generics classes and interfaces. • Implement sorting algorithm for integer, character, float and double data types • Implement stack data structure for integer and string data types
12	Program to capture the various keyboard and mouse events.
13	Develop any ONE of the applications using AWT components. • Scientific calculator • Text editor with basic file and edit functionalities
	Total: 30

REFERENCES/MANUAL/SOFTWARE:

1. Operating System : Windows/Linux
2. Software : Eclipse/Netbeans IDE, Java SE 12.0
3. Laboratory Manual

COURSE OUTCOMES: On completion of the course, the students will be able to		**BT Mapped (Highest Level)**
CO1:	design and develop java program using object oriented programming concepts	Applying (K3), Precision (S3)
CO2:	develop application using package, multithreading concepts and generics	Applying (K3), Precision (S3)
CO3:	create applets, GUIs and event driven programming applications	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	1		3	2									2	2
CO2	1		3	2									2	3
CO3			3	3	1	1						3		3

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

18EGL31 - ENGLISH FOR WORKPLACE COMMUNICATION
(Common to all Engineering & Technology Branches)

Programme & Branch	All BE/BTech branches	Sem.	Category	L	T	P	Credit
Prerequisites	Nil	4	HS	0	0	2	1

Preamble	This course is designed to impart required levels of fluency in using the English Language at B2 level in the CEFR through activities, hands-on training and application.	
Unit - I	**Listening:**	**6**
Techniques for effective listening - Listening and note taking - Listening activities using listening texts - Listening to discourse samples of native English speakers – Focussed listening for improving pronunciaition - understanding different accents.		
Unit - II	**Reading:**	**6**
Developing reading skills - Reading aloud - Group reading activities - Reading with correct word stress and intonation.		
Unit - III	**Soft Skills:**	**6**
Attitude - Goal setting - Time Management - Team Work - Telephonic conversation skills.		
Unit - IV	**Writing:**	**6**
Making preparatory notes, drafts and PPT"s for laboratory activities - Word editing features - editing and proof reading..		
Unit - V	**Speaking:**	**6**
Verbal and non-verbal communication - Introducing oneself - Introducing others – Mock Interviews - Making presentations on chosen topics - Group Discussion.		

Total:30

REFERENCES/ MANUALS:

1. Kumar, Sanjay and Pushp Lata, "Communication Skills", 2nd Edition, Oxford University Press, New Delhi, 2017.
2. Laboratory Manual.

COURSE OUTCOMES: On completion of the course, the students will be able to		**BT Mapped (Highest Level)**
CO1	acquire effective listening and reading skills	Understanding (K2), Imitation (S1)
CO2	acquire and demonstrate appropriate professional skills for the workplace	Applying (K3), Naturalization (S5)
CO3	speak fluently and write meaningfully in English in the given context	Applying (K3), Articulation (S4)

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	3		3		
CO2									2	2		2		
CO3									2	2		2		

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

18MAC42 - PROBABILITY AND STATISTICS
(Common to CSE & IT branches)

Programme & Branch	B.Tech. & Information Technology	Sem.	Category	L	T	P	Credit
Prerequisites	NIL	4	BS	3	1*	2*	4

Preamble	To provide an in-depth knowledge about random variables, correlation, sampling theory and promote the ability to use probability distributions and analysis of variance to experimental data.	
UNIT – I		**9**
Random Variables: Discrete and Continuous random variables – Probability Mass and Probability density functions – Mathematical expectation and Variance – Moments – Moment generating functions.		
UNIT – II		**9**
Standard Probability Distributions: Discrete Distributions: Binomial distribution – Poisson distribution – Geometric distribution – Continuous Distributions: Uniform distribution – Exponential distribution – Normal distribution.		
UNIT – III		**9**
Two Dimensional Random Variables: Joint probability distributions – Marginal and conditional distributions – Covariance – Correlation and regression.		
UNIT – IV		**9**
Testing of Hypothesis: Introduction – Critical region and level of significance – Types of Errors – Large sample tests: Z-test for single mean and difference of means – Small sample tests: Student's t-test for significance of means – F-test for comparison of variances – Chi-square test for goodness of fit and independence of attributes.		
UNIT – V		**9**
Design of Experiments: Analysis of variance – One way classification: Completely Randomized Design – Two way classification: Randomized Block Design – Three way classification: Latin Square Design.		
		Lecture: 45, Tutorial and Practical:15, Total: 60

***Alternate Weeks**

List of Exercises:

1. Introduction to R studio
2. Identifying Mean and Variance for discrete and continuous random variables
3. Computation of probability using Binomial, Poisson and Normal distributions
4. Estimating the correlation coefficient
5. Finding the Marginal and conditional distributions of two-dimensional random variable
6. Testing significance of means by student's t - test
7. Testing the independence of attributes by Chi-square test
8. Analyze whether the difference in means is statistically significant by completely randomized design

TEXT BOOK:

1. Douglas C. Montgomery, George C. Runger, "Applied Statistics and Probability for Engineers", 6th Edition, John Wiley and Sons, USA, 2016.

REFERENCES:

1. Veerarajan T., "Probability, Statistics and Random Process", 4th Edition, Tata McGraw-Hill, New Delhi, 2018.
2. William Mendenhall, Robert J. Beaver and Barbara M. Beaver, "Introduction to Probability and Statistics", 14th Edition, Cengage Learning, USA, 2013.
3. Laboratory Manual.

COURSE OUTCOMES: On completion of the course, the students will be able to		BT Mapped (Highest Level)
CO1:	classify random variables and apply suitably in practical problems	Applying (K3)
CO2:	use different types of distributions in engineering problems	Applying (K3)
CO3:	apply effectively the concepts of two dimensional random variables	Applying (K3)
CO4:	identify large and small samples and apply suitable tests for getting required results	Applying (K3)
CO5:	apply the concepts of analysis of variance to experimental data	Applying (K3)
CO6:	understand the basics of R studio and calculate the probability using various distributions in R studio	Applying (K3), Manipulation (S2)
CO7:	estimate the correlation coefficient, find marginal and conditional probability of two-dimensional random variables using R studio	Applying (K3), Manipulation (S2)
CO8:	analyze large samples, independence of attributes and difference in means by completely randomized design using R studio	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	1	1										1	
CO2	3	2	1										2	
CO3	3	2	1										1	
CO4	3	2	1	3									2	
CO5	3	2	1	3									2	
CO6					3									
CO7					3									
CO8					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	80				100
CAT2	10	10	80				100
CAT3	10	10	80				100
ESE	10	10	80				100

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

18ECT44 - MICROPROCESSOR AND EMBEDDED SYSTEMS

(Common to CSE & IT branches)

Programme & Branch	B.Tech. & Information Technology	Sem.	Category	L	T	P	Credit
Prerequisites	Digital Principles and Design	4	PC	3	0	0	3

Preamble	This course focuses on the architectures and programming of microprocessors and microcontrollers for an embedded system design.	
UNIT – I		**9**
8086 Microprocessor: Architecture of 8086 –The execution unit –Bus interface unit-Addressing modes –Instruction set of 8086: Data transfer instructions –Branch Instructions -Logical instructions -Arithmetic instructions –Shift and rotate instructions		
UNIT – II		**9**
8086 Microprocessor Programming and Stack: Simple Assembly Language Programming - Introduction to stack - Interrupt and interrupt service routines-Time delays using counter.		
UNIT – III		**9**
89c51 Microcontroller: 89c51 Microcontroller hardware block diagram - Data and program memory mapping - Register organization - Instruction sets - Addressing modes- simple programming		
UNIT – IV		**9**
89C51 Interfacing with I/O and Memory: I/O port programming - Timer and counter programming –Serial Data Communication – Interrupt programming - Interfacing to external memory		
UNIT – V		**9**
Principles of Embedded Systems: Introduction -Embedded systems description, definition, design considerations and requirements - Overview of Embedded system Architecture (CISC and RISC) -Categories of Embedded Systems -Embedded processor selection and tradeoffs.		
		Total: 45

TEXT BOOK:

1. Muhammad Ali Mazidi, Janice Gillispie Mazidi, Rolin McKinlay and Lyla B. Das, “Microprocessors and Microcontrollers”, 1st Edition, Pearson Education, 2013.

REFERENCES:

1. Ray K. and Bhurchandi K.M., “Advanced Microprocessors and Peripherals: Architecture, Programming and Interface”, 3rd Edition, McGraw Hill Publishing, New Delhi, 2012.
2. Lyla B. Das, “Embedded Systems: An Integrated Approach”, Pearson, 2013.

COURSE OUTCOMES: On completion of the course, the students will be able to		**BT Mapped (Highest Level)**
CO1:	describe the internal blocks and register organisation of 8086 microprocessor architecture	Understanding (K2)
CO2:	use assembly language programming skill for simple addition/Subtraction/Multiplication/Division and sorting program using 8086 processor	Applying (K3)
CO3:	describe the internal blocks of 8051 microcontroller Architecture and interfacing external memory	Understanding (K2)
CO4:	use assembly language programming skill for Timer/Counter programming for generation of various delays	Applying (K3)
CO5:	apply programming skills to program internal peripherals devices and Interrupts	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
CO2	3	2	1	1										3
CO3	2	1												2
CO4	3	2	1	1										3
CO5	3	2	1											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	20	50	30				100
ESE	20	50	30				100

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

18ITT41 - PYTHON PROGRAMMING AND FRAMEWORKS
(Common to CSE & IT branches)

Programme & Branch	B.Tech. & Information Technology	Sem.	Category	L	T	P	Credit
Prerequisites	Object Oriented Programming	4	PC	3	0	0	3

Preamble	To acquire knowledge on Python programming and develop solutions for different real world problems using Python concepts and its frameworks	
UNIT – I		**9**
Basic Concepts: Introduction - Variable, Expressions and Statements – Functions – Case Study: Interface Design – Conditional and recursion – Fruitful Functions: return values, parameters, local and global scope, function composition – Iteration Statements		
UNIT – II		**9**
Data Structures: Mutable vs immutable data types - Strings – String slices – Searching – looping and Counting – String methods – Case Study : word play – Lists – List operations, slices and methods- Dictionaries – Tuples – Case Study : Data Structure Selection – Files – Exception handling		
UNIT – III		**9**
Object Oriented Programming: Classes and Objects–Classes and Functions – Classes and methods: Object-oriented features – __init__() method - __str__() method – Operator Overloading – Type-based dispatch– Polymorphism – Inheritance – Aggregation and Association		
UNIT – IV		**9**
Python Database Integration: Need for database programming – Connect SQL Database – CRUD operations – Cursor Attributes. **Python Environment and Frameworks:** Anaconda – Jupyter notebook **- NumPy:** NumPy Arrays – Computation on NumPy Arrays – Aggregation – Sorting Arrays – Structured Arrays		
UNIT – V		**9**
Data Visualization with Pandas: Pandas Objects – Data Indexing and Selection – Operating on data – Handling missing data - Hierarchical Indexing – Concat and Append – Merge and Join –Aggregation and Grouping - **Matplotlib:** Line plots – Scatter Plots – Visualizing Errors – Density and Contour plots –Three Dimensional Plotting		
		Total: 45

TEXT BOOK:

1. Allen B.Downey, “Think Python: How to Think Like a Computer Scientist”, 2nd Edition, O’Reilly Publishers, 2016 for Unit I, II and III.
2. Jake Vander Plas, “Python Data Science Handbook Essential Tools for Working with Data”, 1st Edition, O’Reilly Publishers, 2016 for Unit IV and V.

REFERENCES:

1. Bill Lubanovic, “Introducing Python Modern Computing in Simple Packages”, 1st Edition, O’Reilly Media, 2014.

COURSE OUTCOMES: On completion of the course, the students will be able to		**BT Mapped (Highest Level)**
CO1:	understand the basic concepts of Python programming	Understanding (K2)
CO2:	write programs using functions and different data structures	Applying (K3)
CO3:	implement object oriented programming concepts	Applying (K3)
CO4:	perform CRUD operations using cursor attributes	Applying (K3)
CO5:	make use of python frameworks to provide data visualization	Applying (K3)

Mapping of COs with POs and PSOs

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

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

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	10	70	20				100
CAT2	5	15	80				100
CAT3		20	80				100
ESE	10	30	60				100

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

18CST41 - DATABASE MANAGEMENT SYSTEMS
(Common to CSE & IT branches)

Programme & Branch	B.Tech. & Information Technology	Sem.	Category	L	T	P	Credit
Prerequisites	NIL	4	PC	3	1	0	4

Preamble	To learn the fundamentals of data models, conceptualize and depict a database system using different techniques and methods.	
UNIT – I		**9**
Data Models and Relational Model: Introduction – Database System Applications – Purpose of database systems – View of data – Database Languages – Relational Databases **–** Database Architecture – Database Users and administrators – Relational Model – Structure of Relational Databases – Database Schema – Keys – Schema Diagrams – Relational Query Languages - Relational Algebra – Fundamental Relational Operations – Additional relational operations.		
UNIT – II		**9**
SQL and Database Design: Database Design – E-R model – Constraints – ER diagrams – Reduction to Relational Schema – ER design issues. SQL: Basic structure – Operations – Aggregate Functions –Sub queries – Nested Sub queries – modification of the database – Intermediate SQL: Joins – views– Index – Integrity Constraints – SQL data types and schemas – Authorization.		
UNIT – III		**9**
Relational Database Design: Features of good relational designs – Functional dependency – Decomposition using functional dependencies – Normal Forms: 1NF, 2NF, 3NF, BCNF, 4NF, 5NF – Data Storage: RAID – Tertiary storage – File Organization – Organization of Records in Files – Data dictionary storage.		
UNIT – IV		**9**
Indexing, Hashing and Transactions: Ordered indices – B tree index files – B+ Tree index files – Multiple key access – Static and Dynamic Hashing – Bitmap indices – Transaction concept – Transaction model –Storage structure – Transaction atomicity and durability – Isolation – Serializability .		
UNIT – V		**9**
Concurrency Control and Recovery System: Lock-based Protocols – Deadlock Handling – Multiple Granularity – Timestamp and Validation Based Protocols – Failure classification – Storage – Recovery and atomicity – Algorithm – Buffer management – Failure with loss of nonvolatile storage – early lock release and logical undo operations – Overview of query processing and query optimization.		
		Lecture: 45, Tutorial:15, Total: 60

TEXT BOOK:

1. Silberschatz Abraham, Korth Henry F. and Sudarshan S., "Database System Concepts", 7th Edition, McGraw Hill, New York, 2019.

REFERENCES:

1. Elmasri Ramez and Navathe Shamkant B., "Fundamental Database Systems", 6th Edition, Pearson Education, New Delhi, 2010.
2. Date C.J., Kannan A. and Swamynathan S., "An Introduction to Database Systems", 8th Edition, Pearson Education, New Delhi, 2006.

COURSE OUTCOMES: On completion of the course, the students will be able to		**BT Mapped (Highest Level)**
CO1:	outline the features, architecture, applications of database system and relational algebra operations	Applying (K3)
CO2:	design an ER model and use relational database with SQL statements	Applying (K3)
CO3:	design relational database using normalization methods	Applying (K3)
CO4:	apply indexing and hashing techniques in the design of relational database and perform transaction processing	Applying (K3)
CO5:	apply the concepts of concurrency control and recovery in a relational database	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	1
CO2	3	2	1						2				3	1
CO3	3	2	1						2				3	1
CO4	3	2	1										3	1
CO5	2	1	1										3	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	30	60				100
CAT2	10	30	60				100
CAT3	10	30	60				100
ESE	10	30	60				100

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

18CST42 DESIGN AND ANALYSIS OF ALGORITHMS
(Common to CSE & IT branches)

Programme & Branch	B.Tech. & Information Technology	Sem.	Category	L	T	P	Credit
Prerequisites	Data Structures	4	PC	3	1	0	4

Preamble	This course offers first formal introduction to various common algorithm design techniques, methods for analyzing the performance of corresponding algorithms and improving their efficiency. The theoretical aspects of this course are supplemented by tutorial sessions.	
UNIT – I		**9+3**
Introduction: Notion of an Algorithm – Fundamentals of Algorithmic Problem Solving – Important Problem Types – Fundamentals of the Analysis of Algorithm Efficiency – Analysis Framework – Asymptotic Notations and its properties – Mathematical analysis for Recursive and Non-recursive algorithms – Empirical analysis of algorithm – Algorithm visualization.		
UNIT – II		**9+3**
Brute Force: Selection and Bubble Sort, Sequential search and String Matching - closest pair and convex hull problem- Divide and Conquer methodology: Merge sort – Quick sort – Binary search – Binary tree traversals and related properties - Multiplication of large integers and Strassen's Matrix Multiplication - closest pair and convex hull problem.		
UNIT – III		**9+3**
Decrease and Conquer: Insertion sort –Topological Sorting- Fake coin problem- Computing a Median and the Selection Problem - Transform and conquer: Presorting – Balanced search trees –AVL trees -2-3Trees- Heaps and Heap sort.		
UNIT – IV		**9+3**
Dynamic Programming: Warshall's and Floyd's algorithm - Optimal Binary Search Trees - Knapsack Problem and Memory functions - Greedy Technique: Prim's algorithm – Kruskal's Algorithm - Dijkstra's Algorithm – Huffman Trees.		
UNIT – V		**9+3**
Backtracking: n-Queens problem –Hamiltonian Circuit Problem –Subset Sum Problem **-** Branch and Bound: Assignment problem – Knapsack Problem – Traveling Salesman Problem - Overview of P, NP and NP-Complete Problems.		
		Lecture:45, Tutorial:15, Total: 60

TEXT BOOK:

1. Anany Levitin, "Introduction to the Design and Analysis of Algorithms", 3rd Edition, Pearson Education, 2012.

REFERENCES:

1. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein, "Introduction to Algorithms", 3rd Edition, Prentice Hall of India, 2009.
2. Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, "Data Structures and Algorithms", Pearson Education, Reprint 2006.

COURSE OUTCOMES: On completion of the course, the students will be able to		BT Mapped (Highest Level)
CO1:	examine various frameworks for algorithmic design	Analyzing (K4)
CO2:	apply brute force and divide-and-conquer techniques to various problems and analyze their efficiency	Analyzing (K4)
CO3:	utilize decrease & conquer and transform & conquer strategies for solving problems	Applying (K3)
CO4:	make use of dynamic programming and greedy techniques to solve problems	Applying (K3)
CO5:	solve difficult combinatorial problems with backtracking and branch & bound 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	3	3	2	2	1								3	2
CO2	3	3	2	2	1								3	2
CO3	3	2	1	1									2	1
CO4	3	2	1	1									2	1
CO5	3	2	1	1									2	1

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

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	10	30	40	20			100
CAT2	10	30	50	10			100
CAT3	10	30	50	10			100
ESE	10	20	50	20			100

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

18CST43 - OPERATING SYSTEMS
(Common to CSE & IT branches)

Programme & Branch	B.Tech. & Information Technology	Sem.	Category	L	T	P	Credit
Prerequisites	Nil	4	PC	3	0	0	3

Preamble	To provide basic operating system abstractions, mechanisms and their implementations.	
UNIT – I		**9**
Operating Systems Overview: Introduction – Computer System Organization – Computer System Architecture – Operations – Resource Management – Security and Protection – Virtualization – Computing Environments. **Operating Systems Structures:** Services – User and OS Interface – System Calls – Linkers and Loaders – Operating system Structure – Building and Booting OS.		
UNIT – II		**9**
Process Management: Process Concept, Process Scheduling, Operations on Processes, Interprocess Communication – IPC in Shared Memory and Message Passing Systems. **CPU Scheduling:** Scheduling Criteria – Scheduling Algorithms. **Multithreaded Programming:** Threads Overview, Multicore Programming, Multithreading Models.		
UNIT – III		**9**
Process Synchronization: Critical Section Problem – Mutex Locks – Semaphores – Monitors. **Deadlocks:** Deadlock Characterization – Methods for handling deadlocks – Deadlock Prevention and Avoidance – Deadlock Detection – Recovery from Deadlock.		
UNIT – IV		**9**
Memory Management: Main Memory – Background – Contiguous Memory Allocation – Paging – Segmentation – Structure of the page table – Swapping**.** Virtual Memory: Background – Demand Paging – Page Replacement – thrashing.		
UNIT – V		**9**
Storage Management: Mass Storage Structure – Overview – HDD Scheduling – File System: File Concept – Access Methods – Directory Structure – Protection – File System Implementation – File System Structure-File System Operations – Directory Implementation – Allocation Methods – Free Space Management – **Case study:** Linux System.		
		Total: 45

TEXT BOOK:

1. Silberschatz, Peter Baer Galvin and Greg Gagne, “Operating System Concepts”, 10th Edition, John Wiley & Sons Inc., 2018.

REFERENCES:

1. William Stallings, “Operating Systems Internals and Design Principles”, 9th Edition, Prentice Hall, 2018.
2. Andrew S. Tanenbaum, “Modern Operating Systems”, 4th Edition, Pearson Education, 2016.

COURSE OUTCOMES: On completion of the course, the students will be able to		**BT Mapped (Highest Level)**
CO1:	outline operating system structure, services and system calls	Understanding (K2)
CO2:	demonstrate various process scheduling algorithms and describe multithreading models	Applying (K3)
CO3:	apply different methods for process synchronization and for handling deadlocks	Applying (K3)
CO4:	illustrate memory management strategies and demonstrate various page replacement algorithms	Applying (K3)
CO5:	summarize the features of file systems and apply various disk scheduling algorithms	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	1
CO2	3	3	2	2									3	1
CO3	3	2	1	1									2	1
CO4	3	3	2	2									2	1
CO5	2	1	1	1									2	1

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

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	25	25	50				100
CAT2	20	20	60				100
CAT3	20	20	60				100
ESE	15	25	60				100

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

18ECL43 - MICROPROCESSOR AND EMBEDDED SYSTEMS LABORATORY

(Common to Computer Science and Engineering & Information Technology branches)

Programme& Branch	B.Tech. & Information Technology	Sem.	Category	L	T	P	Credit
Prerequisites	NIL	4	PC	0	0	2	1
Preamble	This course focuses on programming of microprocessors and microcontrollers for an embedded system design.						

List of Experiments:	
1.	Arithmetic operations using 8086
2.	Sorting, searching and string manipulation using 8086.
3.	Hex./ASCII/BCD code conversion using 8086 microprocessor
4.	Matrix Multiplication using 8086 microprocessor
5.	Data transfer and String manipulation using 8086 microprocessor
6.	8 bit and Multibyte arithmetic operations using 8051 microcontroller
7.	Interfacing of LED and switch
8.	Interfacing of seven segment display
9.	Interfacing of LCD
10.	Interfacing of DC/stepper motor
	Total: 30

REFERENCES / MANUALS / SOFTWARES:	
1.	Laboratory Manual

COURSE OUTCOMES: On completion of the course, the students will be able to		BTMapped (Highest Level)
CO1:	predict the usage of instruction sets and addressing modes for a given simple addition/Subtraction/Multiplication/Division and sorting program in 8086 processor	Applying (K3), Manipulating (S2)
CO2:	build LED , LCD and Switch Interface with 8051 Microcontroller	Applying (K3), Precision (S3)
CO3:	demonstrate speed control of DC Motors and Stepper Motor using 8051 Microcontroller	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										3
CO2	3	2	1	1										3
CO3	3	2	1	1										3

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

18ITL41 - PYTHON PROGRAMMING AND FRAMEWORKS LABORATORY

(Common to Computer Science and Engineering & Information Technology branches)

Programme & Branch	B.Tech. & Information Technology	Sem.	Category	L	T	P	Credit
Prerequisites	Object Oriented Programming Laboratory	4	PC	0	0	2	1
Preamble	Provides hands-on experience in implementing Python concepts and frameworks to develop real time applications of different domains.						

List of Experiments:
1. Implement linear search and binary search
2. Implement Quick Sort and Merge Sort
3. Find the most frequent words from a given text file and copy the same into another file
4. Explore string manipulation functions (word play)
5. Program using user-defined functions with different types of argument passing methods
6. Demonstrate tuple, list, set and dictionary operations
7. Program to illustrate the concept of constructors
8. Program to implement different types of inheritance, Aggregation and Association
9. Develop an application to illustrate CRUD operations using python and MySQL
10. Program to demonstrate the usage of exception handling
11. Demonstrate the use of Anaconda and Jupyter Notebook
12. Perform data manipulation using NumPy
13. Demonstrate Data Visualization using Pandas and Matplotlib
Total: 30

REFERENCES / MANUALS / SOFTWARE:	
1.	Python 3 interpreter for Windows/Linux

COURSE OUTCOMES: On completion of the course, the students will be able to		BTMapped (Highest Level)
CO1:	write, test and debug simple Python programs using control structures and functions	Applying (K3), Precision (S3)
CO2:	develop real time applications using Object Oriented Programming concepts and database programming	Applying (K3), Precision (S3)
CO3:	demonstrate data manipulation and data visualization using Numpy, Pandas and Matplotlib	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	3		3				3			2		2
CO2	3	3	3		3				3			2		2
CO3	3	3	3		3				3			2		3

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

18CSL41 - DATABASE MANAGEMENT SYSTEMS LABORATORY

(Common to Computer Science and Engineering & Information Technology branches)

Programme & Branch	B.Tech. & Information Technology	Sem.	Category	L	T	P	Credit
Prerequisites	Nil	4	PC	0	0	2	1
Preamble	The course explores the features of database management systems and to interface with front end tools.						

List of Exercises:

1. Write the queries using Data definition language and integrity constraints.
2. Write the queries using Data manipulation language, Data control language commands and TCL commands.
3. Write nested and sub queries.
4. Write queries which illustrates Join operations in SQL.
5. Create Views and index and perform SQL operations in it.
6. Write PL/SQL statements to illustrate the concepts of looping.
7. Implement Cursors and its operations.
8. Implement Triggers and its operations.
9. Write Procedures and Functions to perform operations in SQL.
10. Mini project: (Application Development using Oracle/ SQL SERVER / MYSQL)
    Sample Applications:
    - Inventory Control System
    - Hospital Management System
    - Railway Reservation System
    - Web Based User Identification System
    - Hotel Management System
    - Student Information System
    - Library Information System and etc.,

Total: 30

REFERENCES / MANUALS / SOFTWARES:

1. Front End: Microsoft Visual Studio 6.0, Microsoft .NET Framework SDK v2.0, Java etc.,
2. Back End : ORACLE / SQL SERVER / MYSQL
3. Manuals: https://docs.oracle.com/cd/E11882_01/server.112/e41085.pdf

Mapping of COs with POs and PSOs

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

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

18ITT51 - COMPUTER NETWORKS

Programme & Branch	B.Tech. & Information Technology	Sem.	Category	L	T	P	Credit
Prerequisites	NIL	5	PC	3	0	0	3

Preamble	This course provides a bottom up approach of computer networks. It also deals with various protocols and functionalities of each layer.	
Unit - I	**Network Models and Physical Layer:**	**9**
Data Communications – Networks – Network categories. Network Models: The OSI Model - TCP/IP Protocol model. Digital-to-digital conversion: Line coding – Line Coding Schemes – Transmission Modes – Transmission media: Guided – Unguided media.		
Unit - II	**Data Link Layer:**	**9**
Introduction – Link Layer Addressing – Error Detection and Correction: Introduction – Block Coding – CRC – Checksum– Framing – HDLC - Point-to-point protocol. Media Access Control Protocols: Random Access Protocols – Channelization. Wired LAN: Standard Ethernet – Connecting Devices – Virtual LANs.		
Unit - III	**Network Layer**	**9**
Network Layer Services- Network layer performance - IPV4 addresses – Internet Protocol (IP) - ICMPv4. Unicast Routing Algorithms: Distance Vector and Link-state routing. Routing Protocols: RIP and OSPF - IPV6 addressing- IPV6 protocol.		
Unit - IV	**Transport Layer**	**9**
Introduction – Transport layer protocols: Simple – Stop-and-wait - Go-back-N – Selective Repeat - Piggybacking – UDP – TCP. Quality of Service: Data Flow Characteristics -Techniques to improve QoS.		
Unit - V	**Application Layer**	**9**
WWW - HTTP- FTP - Electronic mail –Telnet - SSH, DNS. Network Management: Introduction - SNMP.		

Total:45

TEXT BOOK:

1. Behrouz A. Forouzan, "Data Communications and Networking", 5th Edition, McGraw-Hill Education, India, 2015.

REFERENCES:

1. Kurose James F. and Ross Keith W., "Computer Networking: A Top-Down Approach", 6th Edition, Pearson Education, New Delhi, 2017.
2. Tanenbaum, Andrew S. and David Wetherall, "Computer Networks", 5th Edition, Prentice Hall of India, New Delhi, 2012.
3. Stallings, "Data and Computer Communications", 10th Edition, Prentice Hall of India, New Delhi, 2015.

COURSE OUTCOMES: On completion of the course, the students will be able to		BT Mapped (Highest Level)
CO1	explain the basic fundamentals of networks for data communication and apply the different line coding schemes for digital-to-digital conversion	Applying (K3)
CO2	demonstrate the knowledge of error detection and correction methods and protocols at data link layer	Applying (K3)
CO3	interpret the different addressing schemes and apply various routing protocols at network layer	Applying (K3)
CO4	illustrate the different transport layer protocols and the beneficial effects of adopting suitable flow control and QoS techniques	Understanding (K2)
CO5	explore the various protocols and its working principles at application layer	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									3	2
CO2	3	2	1	1									3	2
CO3	3	2	1	1									3	2
CO4	2	1											3	1
CO5	2	1											3	1

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

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	30	50	20				100
CAT2	20	50	30				100
CAT3	30	70					100
ESE	20	50	30				100

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

18ITT52 - WEB TECHNOLOGY

Programme & Branch	B.Tech. & Information Technology	Sem.	Category	L	T	P	Credit
Prerequisites	Object Oriented Programming	5	PC	3	0	0	3

Preamble	The course provides an introduction to HTML, CSS, Bootstrap- Client-side JS and Server Side JS Framework.	
Unit - I	**UI Design**	**9**
HTML5: Introduction – Basic tags – HTML Forms Element – Page Structured Elements – Media Tags. Cascading Style Sheet: Types of CSS – Positioning Elements – Backgrounds – Box Model – Dropdown Menus. Responsive Web Design: Introduction – Bootstrap – Grid basics – Nav – Nav Bar – List – Drop down – Tables – Button –Images – Forms-Input – Input Groups.		
Unit - II	**JavaScript**	**9**
Introduction – Operators – Control Structures: Selection: if – if-else – switch. Repetition: while – do-while – for – break and continue. Functions: Function Definition – Scope Rules – Recursion. Array: Declaration – Initialization – Growing Arrays – Passing Arrays to Function. Event Handling.		
Unit - III	**Server-side JS Framework**	**9**
Node JS: Introduction – Architecture – Features – Creating Web Servers with HTTP Request – Response – Event Handling – GET and POST Methods – Modules – Connect to NoSQL Database using Node JS – Implementation of CRUD operations.		
Unit - IV	**TypeScript and Angular 6.0**	**9**
TypeScript : Introduction – Features – Variables – Data types – Enum – Array – Tuples – Functions – OOP concepts – Interfaces – Classes – Modules – Decorators.Angular 6.0 : Introduction – Needs – Features – Evolution – Setup and Configuration – Components and Modules – Templates – Change Detection – Directives – Nested Components – Data Binding – Pipes		
Unit - V	**Client-side JS Framework**	**9**
Services – HTTP – Routing – Forms in Angular – Template Driven Forms – Model Driven Forms \ Reactive Forms – Custom Validators – Dependency Injection		

Total:45

TEXT BOOK:

1. Paul Deitel, Harvey M.Deitel and Abbey Deitel, “Internet and World Wide Web - How To Program”, 5th Edition, Prentice Hall, 2011 for Units I, II.
2. Infosys campus connect material shared by infy for Units I, III, IV, V.

REFERENCES:

1. https://www.javatpoint.com

COURSE OUTCOMES: On completion of the course, the students will be able to		**BT Mapped (Highest Level)**
CO1	design static web pages using HTML, CSS and Bootstrap.	Applying (K3)
CO2	demonstrate interactive and dynamic web pages using JavaScript	Applying (K3)
CO3	develop a web application using node JS with database connectivity	Applying (K3)
CO4	apply the features of Typescript and Angular to develop web applications.	Applying (K3)
CO5	utilize client side JS framework to develop web applications	Applying (K3)

Mapping of COs with POs and PSOs

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

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

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	20	20	60				100
CAT2	20	20	60				100
CAT3	10	20	70				100
ESE	15	25	60				100

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

18ITT53 - SOFTWARE ENGINEERING

Programme & Branch	B.Tech. & Information Technology	Sem.	Category	L	T	P	Credit
Prerequisites	NIL	5	PC	3	0	0	3

Preamble	This course is to promote the practice of software engineering concepts at a higher level of abstraction which is to be acquired by software engineers and developers. It also covers software engineering principles that are applicable to the analysis, design, development and testing of software systems.	
Unit - I	**Process Models**	**9**
Software process structure – Process models - Waterfall model, Incremental process models, Evolutionary process models, Specialized process models – Unified Process - Agile development: Agile process - Extreme programming – Scrum.		
Unit – II	**Requirement Gathering and Analysis**	**9**
Requirements engineering – Eliciting requirements, Developing use cases – Building the analysis model – Negotiating requirements – Requirements monitoring – Validating requirements – Requirements analysis.		
Unit - III	**UML Modeling**	**9**
Introduction – Unified Modeling Language – Static model – Dynamic model – UML diagrams– UML class diagram– Use case diagram – UML dynamic modeling – UML interaction diagrams –UML state chart diagram – UML activity diagram – Implementation Diagrams – Component diagram –Deployment diagram.		
Unit - IV	**Software Design**	**9**
Design concepts and model – Architectural design: Software architecture, Architectural styles – Architectural design – Component level design: Designing class-based components, Conducting component level design – User interface design: User interface analysis and design – Interface analysis –Interface design steps – Design patterns.		
Unit – V	**Software Testing Fundamentals**	**9**
Software testing strategies: Strategic approach – Issues – Test strategies for conventional and Object Oriented software –Validation and System testing – Debugging – Testing conventional applications: White box testing – Basis path testing – Control structure testing – Black box testing – Software configuration management – SCM repository – SCM process.		

Total:45

TEXT BOOK:

1. Roger S. Pressman, Bruce R. Maxim, "Software Engineering: A Practitioner's Approach", 8th Edition, McGraw-Hill Education, India, 2019.

REFERENCES:

1. Ali Bahrami, "Object Oriented Systems Development", 1st Edition, Tata McGraw-Hill, New Delhi, 2008.
2. Jalote Pankaj, "An Integrated Approach to Software Engineering", 3rd Edition, Narosa Publishing House, New Delhi, 2012.

COURSE OUTCOMES: On completion of the course, the students will be able to		**BT Mapped (Highest Level)**
CO1	identify various software development models	Applying (K3)
CO2	apply the requirement engineering tasks to identify the requirements for a given scenario	Applying (K3)
CO3	use different methods for modeling and design of a software system	Applying (K3)
CO4	apply the different design principles for a software system	Applying (K3)
CO5	make use of various software testing techniques to test the software systems	Applying (K3)

Mapping of COs with POs and PSOs

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

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

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	20	30	50				100
CAT2	30	30	40				100
CAT3	20	30	50				100
ESE	10	40	50				100

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

18ITC51 - ENTERPRISE APPLICATION DEVELOPMENT USING JAVA

Programme & Branch	B.Tech. & Information Technology	Sem.	Category	L	T	P	Credit
Prerequisites	Object Oriented Programming	5	PC	3	0	2	4

Preamble	This course offers skill to develop enterprise applications using java technologies and deploy with application server.	
Unit - I	**Java Swing**	**9**
Introduction – Features – MVC Connection – Components and Containers – Swing Package – Simple Application – Event Handling – Swing Applet – Painting in Swing. Exploring swing: JLabel and ImageIcon – JTextField – Swing Buttons – JTabbedPane – JScrollPane – JList – JComboBox.		
Unit - II	**Advanced Swing Components and JDBC**	**9**
Swing Components – Trees – JTable – Tooltips – Swing Menus: Menu basic – JMenuBar, JMenu, JMenuItem – Main Menu – Mnemonics and Accelerators to menu items – Images and Tooltips to MenuItems – JRadioButtonMenuItem – JCheckBoxMenuItem – Popup Menus – ToolBar – Actions – Java Database Programming: java.sql Package – Database connectivity – Relational databases – JDBC API.		
Unit - III	**Servlets and JSP**	**9**
Introduction – HTTP Servlet Basics: Servlet API – Page Generation – Web Applications. Servlet Life Cycle: Servlet Alternatives – Reloading – init and destroy – Single Thread Model – Background Processing – Load on Startup – Client-Side Caching – Server-Side Caching – Retrieving information – Sending HTML information - Java Server Pages : Basics – Expression and Declaration – Directives – Includes and Forwards – Custom Tag libraries – Simple JSP program.		
Unit - IV	**Network Programming and RMI**	**9**
Network Programming – Basics – Classes and Interfaces – InetAddress – Factory methods – Instance Methods – Inet4Address and Inet6Address – TCP/IP Client Sockets – URL – URLConnection – HttpURLConnection – URI Class – Cookies – TCP/IP Server sockets – Datagrams – RMI architecture – Developing Simple RMI applications.		
Unit - V	**J2EE, Spring Boot and Application Server**	**9**
J2EE architecture – EJB – Session, Entity and Message driven beans – Model View Control (MVC) architecture - Spring Boot: Introduction to Spring vs. Spring Boot vs. Spring MVC – Architecture - Initializr Modules – Interface – Database – Case study : Application server - Apache Tomcat –Introduction - Installation – services – Hosting Java Apps with server		

List of Exercises / Experiments :

1.	Develop swing applications using basic and advanced swing components.
2.	Create Payroll system using Swing Components and JDBC.
3.	Develop servlet based Login application for session tracking.
4.	Develop basic JSP programs
5.	Create Resume registration web application using Servlets, JDBC and JSP
6.	Develop chat application using TCP and UDP
7.	Develop an RMI application
8.	Develop an EJB application that demonstrates Entity and Session Bean
9.	Develop a simple database application using Spring Boot.
10.	Develop an application and hosting with tomcat server.

Lecture:45, Practical:30, Total:75

TEXT BOOK:

1.	Schildt Herbert, "Java: The Complete Reference", 9th Edition, Tata McGraw-Hill, New Delhi, 2014.

REFERENCES:

1.	Asbury Stephen and Weiner Scott R., "Developing Java Enterprise Applications", 2nd Edition, Wiley Publications, 2001.
2.	https://www.javatpoint.com

COURSE OUTCOMES: On completion of the course, the students will be able to		**BT Mapped (Highest Level)**
CO1	develop Java Swing Applications	Applying (K3)
CO2	create desktop applications with Database connectivity and Swing	Applying (K3)
CO3	design server side programs with JSP and Servlets	Applying (K3)
CO4	develop network applications with socket programming	Applying (K3)
CO5	demonstrate the RMI architecture and its applications	Applying (K3)
CO6	design and develop desktop applications with Java swing and JDBC	Applying (K3), Precision (S3)
CO7	create applications using EJB and Spring Boot	Applying (K3), Precision (S3)
CO8	develop applications and deploy with tomcat server.	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									3	2
CO2	3	2	1	1									3	2
CO3	3	2	1	1									3	2
CO4	3	2	1	1									3	2
CO5	3	2	1	1									3	2
CO6	3	2	1	1									3	2
CO7	3	2	1	1									3	2
CO8	3	2	1	1									3	2

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

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	15	30	55				100
CAT2	15	30	55				100
CAT3	15	30	55				100
ESE	15	30	55				100

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

18ITL51 - NETWORK LABORATORY

Programme & Branch	B.Tech. & Information Technology	Sem.	Category	L	T	P	Credit
Prerequisites	Problem Solving and Programming	5	PC	0	0	2	1
Preamble	This course provides practical knowledge to configure the router, end devices and server packet tracer using GNS3 and packet tracer						

List of Exercises / Experiments :

1.	Simulate the network topologies (Bus, Ring, Star and Mesh) using Cisco Packet Tracer
2.	Simulate and identify the difference in working operation of Hub and Switch using Cisco Packet Tracer
3.	Configure a Web server, DHCP server and a DNS server all together in a single simulation through which IP have to be allocated for the host through DHCP server, Conversion of Canonical Name to IP address to be done by DNS server and Access to the webpage has to given by web server using Cisco Packet Tracer.
4.	Simulate a network that performs Network Address Translation to share a single public IP to the entire hosts connected in the network.
5.	Write a program to implement bit stuffing and byte stuffing.
6.	Demonstrate the functionality of FTP server using Cisco packet tracer.
7.	Simulate the TCP and UDP communications using Cisco packet tracer.
8.	Study of Packet Analyzer using wireshark Tool.
9.	Demonstrate the operation of Address Resolution Protocol using GNS3 Emulator and capture the packets using wireshark tool.
10.	Configure RIP and OSPF Protocols using Cisco packet Tracer

Total:30

REFERENCES/MANUAL/SOFTWARE:

1.	Linux / GCC Compiler

COURSE OUTCOMES: On completion of the course, the students will be able to		**BT Mapped (Highest Level)**
CO1	demonstrate and Configure Networking Protocols using Cisco Packet Tracer	Applying (K3), Precision (S3)
CO2	implement the working mechanism of supporting protocols of each layer through Packet Tracer	Applying (K3), Precision (S3)
CO3	model the performance of network layer and transport layer protocols using simulation	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									3	2
CO2	3	2	1	1									3	2
CO3	3	2	1	1									3	2

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

18ITL52 - WEB TECHNOLOGY LABORATORY

Programme & Branch	B.Tech. & Information Technology	Sem.	Category	L	T	P	Credit
Prerequisites	Object Oriented Programming	5	PC	0	0	2	1
Preamble	This course provides knowledge on creation of static and dynamic websites using HTML, CSS, Java script, Bootstrap and Angular.						

List of Exercises / Experiments :

1.	Design a web page using HTML tags and host it in github repository.
2.	Design an attractive webpage using style sheets.
3.	Design a responsive website using Bootstrap.
4.	Design a webpage to create simple interactive CGPA calculator using Event Handling.
5.	Design a web application using HTTP Request and HTTP Response
6.	Develop simple login page by performing event handling using GET and POST method.
7.	Design a simple calculator using “Modules” in Node.js.
8.	Design a webpage to maintain personal information using CRUD operations in MongoDB.
9.	Design a Payroll Management System using typescript.
10.	Design a web application using components, modules and router in Angular.
11.	Design a reactive form to maintain personal information and perform validation using Angular.
12.	Develop and deploy eCart management system using Angular.

Total:30

REFERENCES/MANUAL/SOFTWARE:

1.	Visual Studio code/ GEdit, Node JS+NPM, MongoDB
2.	Angular, Github

COURSE OUTCOMES: On completion of the course, the students will be able to		**BT Mapped (Highest Level)**
CO1	develop interactive web pages using HTML, CSS, JavaScript and Bootstrap	Applying (K3), Precision (S3)
CO2	develop a web application to maintain information in a database using server-side scripting	Applying (K3), Precision (S3)
CO3	apply the concepts of Angular to design full-fledged web applications	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									3	2
CO2	3	2	1	1									3	2
CO3	3	2	1	1									3	2

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

18ITL53 - CASE TOOLS LABORATORY

Programme & Branch	B.Tech. & Information Technology	Sem.	Category	L	T	P	Credit
Prerequisites	NIL	5	PC	0	0	2	1
Preamble	This course focuses on providing hands-on experience in modeling, designing and developing different software systems.						

List of Exercises / Experiments :

1.	Define problem statement, develop business and domain models with UML diagrams, implement the interfaces and do testing for the Passport Automation system
2.	Define problem statement, develop business and domain models with UML diagrams, implement the interface and do testing for the Library Management system
3.	Define problem statement, develop business and domain models with UML diagrams, implement the interface and do testing for the Exam Registration System
4.	Define problem statement, develop business and domain models with UML diagrams, implement the interface and do testing for the Stock Maintenance system
5.	Define problem statement, develop business and domain models with UML diagrams, implement the interface and do testing for the Online Course Registration system
6.	Define problem statement, develop business and domain models with UML diagrams, implement the interface and do testing for the E-ticketing system
7.	Define problem statement, develop business and domain models with UML diagrams, implement the interface and do testing for the Insurance management system
8.	Define problem statement, develop business and domain models with UML diagrams, implement the interface and do testing for the Credit card processing system
9.	Define problem statement, develop business and domain models with UML diagrams, implement the interface and do testing for the Employee Recruitment system
10.	Define problem statement, develop business and domain models with UML diagrams, implement the interface and do testing for the Bank Management system

Total: 30

REFERENCES/MANUAL/SOFTWARE:

1.	IBM Rational Suite
2.	Java / Eclipse IDE/.Net Framework/Visual Studio Package

COURSE OUTCOMES: On completion of the course, the students will be able to		**BT Mapped (Highest Level)**
CO1	design and implement projects using OO concepts	Applying (K3), Precision (S3)
CO2	use UML analysis and design diagrams in various applications	Applying (K3), Precision (S3)
CO3	apply appropriate design patterns for the given scenarios	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									3	2
CO2	3	2	1	1									3	2
CO3	3	2	1	1									3	2

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

18GEL51 - PROFESSIONAL SKILLS TRAINING I
(Common to all BE/ BTech / MSc /MCA /BSc Branches)

Programme & Branch	B.Tech. & Information Technology	Sem.	Category	L	T	P	Credit
Prerequisites	NIL	5	EC	0	0	80	2

Preamble	This subject is to enhance the employability skills and to develop career competency	
Unit - I	**Soft Skills – I**	**20**
Soft skills and its importance: Pleasure and pains of transition from an academic environment to work environment-Need for change-Fear, stress and competition in the professional world-Importance of positive attitude- Self motivation and continuous knowledge upgradation-Self-confidence. Professional grooming and practices: Basics of corporate culture-Key pillars of business etiquette- Basics of etiquette-Introductions and greetings-Rules of the handshake, earning respect, business manners-Telephone etiquette- Body Language.		
Unit - II	**Quantitative Aptitude & Logical Reasoning - I**	**30**
Problem solving level I: Number System-LCM &HCF-Divisibility test-Surds and indices-Logarithms- Ratio-proportions and variation-Partnership-Time speed and distance-Data interpretation-data representation. Logical reasoning: Family tree-Deductions-Logical connectives-Binary logic Linear arrangements- Circular and complex arrangement		
Unit - III	**Written Communication & Verbal Aptitude**	**30**
Writing Skills: Writing strategies and formats – Importance of Résumés – Writing a Cover letter – Writing a fresher's CV / Résumés – Responding to Job Advertisements – Professional e-mail Writing – Responding to e-mails and business letters – Technical Report writing – Interpretation of Technical Data (Transcoding) – Writing One-page Essays. Verbal Aptitude – Synonyms – Antonyms – Homonyms – One word substitution – Idioms and Phrases – Paired words – Analogies – Spelling test – Cloze test – using suitable verb forms – using appropriate articles and prepositions; Spotting Errors – Sentence Correction and Formation – Grammar Based questions (Transformation : Active-Passive & Direct-Indirect); Rearranging Jumbled Sentences & Jumbled paragraphs, Identifying Facts, Inferences and Judgements statements.		

Total: 80

TEXT BOOK:

1	Thorpe, Showick and Edgar Thorpe, "Objective English For Competitive Examination", 6th Edition, Pearson India Education Services Pvt Ltd, 2017.

REFERENCES:

1	Bailey Stephen, "Academic Writing: A practical guide for students", Routledge, New York, 2011.
2	Raman, Meenakshi and Sharma, Sangeeta**,** "Technical Communication - Principles and Practice", 3rd Edition, Oxford University Press, New Delhi, 2015.

COURSE OUTCOMES: On completion of the course, the students will be able to		**BT Mapped (Highest Level)**
CO1	develop the soft skills of learners to support them work efficiently in an organization as an individual and as a team	Applying (K3), Precision (S3)
CO2	solve real time problems using numerical ability and logical reasoning	Applying (K3), Precision (S3)
CO3	apply communication skills effectively to understand and deliver information in various written discourses grammatically with accuracy	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				3	3		3		3	2		
CO2	3	2				3	3		3		3	2		
CO3		2				3	3		3	3	3	2		

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

ASSESSMENT PATTERN - THEORY

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

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

18GET51 - UNIVERSAL HUMAN VALUES
(Common to all BE/BTech branches)

Programme & Branch	B.Tech. & Information Technology	Sem.	Category	L	T	P	Credit
Prerequisites	NIL	5	MC	2	0	0	2

Preamble	To make the student to know what they 'really want to be' in their life and profession, understand the meaning of happiness and prosperity for a human being. Also to facilitate the students to understanding of harmony at all the levels of human living, and live accordingly	
Unit - I	**Introduction:**	**9**
Need and Basic Guidelines of Value Education – Content and Process of Value Education – Self Exploration – purpose of self-Exploration – Content and Process of Self exploration – Natural Acceptance – Realization and Understanding – Basic Human Aspirations – Continuous Happiness and Prosperity – Exploring Happiness and Prosperity – Basic Requirement for Fulfillment of Human Aspirations – Relationships – Physical Facilities – Right Understanding.		
Unit - II	**Harmony in the Self and Body:**	**9**
Human Begin and Body – Understanding Myself as Co–existence of Self ('I') and Body, Needs of the Self and Body, Activities in the Self and Body, Self ('I') as the Conscious Entity, the Body as the Material Entity – Exercise – Body as an Instrument– Harmony in the Self ('I) – Understanding Myself – Harmony with Body.		
Unit - III	**Harmony in the Family and Society:**	**9**
Harmony in the Family – Justice – Feelings (Values) in Human Relationships – Relationship from Family to Society – Identification of Human Goal – Five dimensions of Human Endeavour.		
Unit - IV	**Harmony in Nature and Existence:**	**9**
Order of Nature – Interconnectedness – Understanding the Four order – Innateness – Natural Characteristic – Basic Activity – Conformance – Introduction to Space – Co–existence of units of Space – Limited and unlimited – Active and No–activity – Existence is Co–existence.		
Unit - V	**Implications of the above Holistic Understanding of Harmony on Professional Ethics:**	**9**
Values in different dimensions of Human Living – Definitiveness of Ethical Human Conduct –Implications of Value based Living – Identification of Comprehensive Human Goal – Humanistic Education – Universal Human Order – Competence and Issues in Professional Ethics.		

Total: 45

TEXT BOOK:

1. Gaur R.R., Sangal R., Bagaria G.P., "A Foundation Course in Human Values and Professional Ethics", 1st Edition, Excell Books Pvt. Ltd., New Delhi, 2016.

REFERENCES:

1. Ivan Illich, "Energy & Equity", The Trinity Press, USA, 1974.
2. Schumacher E.F., "Small is Beautiful: a study of economics as if people mattered", Britain, 1973.

COURSE OUTCOMES: On completion of the course, the students will be able to		**BT Mapped (Highest Level)**
CO1	understand the significance of value inputs in a classroom, distinguish between values and skills, understand the need, basic guidelines, content and process of value education, explore the meaning of happiness and prosperity and do a correct appraisal of the current scenario in the society.	Understanding (K2)
CO2	distinguish between the Self and the Body, understand the meaning of Harmony in the Self the Co–existence of Self and Body.	Understanding (K2)
CO3	understand the value of harmonious relationship based on trust, respect and other naturally acceptable feelings in human–human relationships and explore their role in ensuring a harmonious society.	Understanding (K2)
CO4	understand the harmony in nature and existence, and work out their mutually fulfilling participation in the nature.	Understanding (K2)
CO5	distinguish between ethical and unethical practices, and start working out the strategy to actualize a harmonious environment wherever they work.	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						1		3						
CO2								2						
CO3						1		3						
CO4								2						
CO5								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	25	75					100
CAT2	25	75					100
CAT3	NA						
ESE	NA						

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

18ITT61 - MACHINE LEARNING

Programme & Branch	B.Tech. & Information Technology	Sem.	Category	L	T	P	Credit
Prerequisites	Data Structures, Design and Analysis of Algorithms	6	PC	3	0	0	3

Preamble	This is an introductory course on machine learning for undergraduate students. It deals with different types of machine learning algorithms and their utility in various real-world problems	
Unit - I	**Introduction, supervised learning and Bayesian decision theory:**	**9**
Definition – Examples of Machine learning applications. **Supervised learning**: Learning a class from examples-Vapnik-Chervonenkis (VC) Dimension – Noise-Learning multiple classes –Regression - Model Selection and Generalization. **Bayesian Decision Theory:** Introduction – Classification – Losses and Risks – Discriminant functions – Utility theory.		
Unit - II	**Parametric methods, Multivariate methods and Dimensionality Reduction:**	**9**
Parametric methods: Maximum Likelihood Estimation-Evaluating an estimator-Bayes estimator – Parametric classification – Regression.**Multivariate methods:** Multivariate data – Parameter Estimation-Estimation of Missing Values–Multivariate Normal Distribution–Multivariate Classification and Regression. **Dimensionality Reduction:** Subset Selection– Principal Components Analysis–Factor Analysis.		
Unit - III	**Clustering and Nonparametric methods:**	**9**
Clustering: Mixture densities- k–Means Clustering– EM Algorithm - Hierarchical Clustering – Choosing the number of clusters. **Nonparametric Methods:** Nonparametric Density Estimation and Classification-Generalization to Multivariate Data - Smoothing Models.		
Unit - IV	**Decision trees, Multilayer Perceptrons and Kernel machines:**	**9**
Decision Trees: Univariate Trees–Pruning–Rule Extraction–Learning Rules–Multivariate Trees. Multilayer Perceptrons: Introduction – Perceptron-Training a perceptron- Multilayer Perceptron-Backpropagation Algorithm- Training Procedures.Kernel Machines: Optimal Separating Hyperplane - The Nonseparable Case: Soft Margin Hyperplane - v-SVM - Kernel Trick - Vectorial Kernels - Defining Kernels - Multiple Kernel Learning- Multiclass Kernel Machines		
Unit - V	**Reinforcement Learning and Design and Analysis of Machine Learning Experiments:**	**9**
Reinforcement Learning: Elements – Model based learning –Temporal difference learning – Generalization.Design and Analysis of Machine Learning experiments:Factors, Response and Strategy of Experimentation- Guidelines for Machine Learning Experiments-Cross Validation and Resampling methods- Measuring classifier performance-Assessing classifier algorithm's performance.		

Total:45

TEXT BOOK:

1. EthemAlpaydin, "Introduction to Machine Learning", 3 Edition, Prentice Hall , India, 2015.

REFERENCES:

1. Tom M. Mitchell , "Machine Learning", Indian edition Edition, Tata McGraw-Hill Education Pvt. Ltd, New Delhi, 2013.
2. Sebastian Raschka, "Python Machine Learning", 2 Edition, Packt Publishing, 2015.

COURSE OUTCOMES: On completion of the course, the students will be able to		**BT Mapped (Highest Level)**
CO1	interpret the basic concepts of machine learning techniques, supervised learning methods and apply Bayesian Theory to simple problems	Applying (K3)
CO2	utilize parametric methods, multivariate methods and dimensionality reduction methodsfor real world problems	Applying (K3)
CO3	apply clustering methodsfor applications and usenon-parametric methods	Applying (K3)
CO4	design solutions for the given problem using decision trees, multilayer perceptronand SVM	Applying (K3)
CO5	solve real world problems using reinforcement learning,design and analyse machine learning experiments	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									3	2
CO2	3	2	1	1									3	2
CO3	3	2	1	1									3	2
CO4	3	2	1	1									3	2
CO5	3	1	1	1									3	2

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

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	20	55	25				100
CAT2	20	50	30				100
CAT3	20	50	30				100
ESE	20	40	40				100

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

18ITT62 - INTERNET OF THINGS

Programme & Branch	B.Tech. & Information Technology	Sem.	Category	L	T	P	Credit
Prerequisites	Microprocessors and Embedded Systems	6	PC	3	0	0	3

Preamble	This course provides an introduction to Internet of Things and also technologies to develop simple real world applications using Internet of Things	
Unit - I	**Introduction to Internet of Things:**	**9**
Introduction to Internet of Things: Definition and Characteristics of IoT, Physical Design of IoT – IoT Protocols, IoT Communication Models - IoT Communication APIs – IoT enabled Technologies – Wireless Sensor Networks - Cloud Computing – Big data analytics – Communication Protocols- Embedded Systems – IoT Levels and Templates.		
Unit - II	**IoT Design Methodology:**	**9**
IoT Design Methodology: M2M – Difference between M2M &IoT – Software defined networks – Network function Virtualization – IoT Platform design Methodologies – Domain Specific IoT – Home Automation – Smart Agriculture.		
Unit - III	**Python Packages and IoT Physical Devices:**	**9**
Python packages: HTTPLib- URLLib-SMTPLib. IoT Physical Devices and Endpoints: Introduction to Raspberry PI – Interfaces: serial-SPI- 12C- Programming – Python program with Raspberry PI with focus of interfacing external gadgets – controlling output – reading input from pins		
Unit - IV	**IoT Cloud Storage &DataA Analytics for IoT**	**9**
Introduction to cloud storage models - Amazon Web Services for IoT- MQTT- Storing data in database-Data Analytics for IoT –Apache Hadoop – Using HadoopMapReduce for Batch Data Analysis		
Unit - V	**IoT USE CASES**	**9**
IoT USE CASES: Asset Management – The Smart Grid – Commercial Building Automation – Smart Cities.		

Total:45

TEXT BOOK:

1. ArshdeepBahga and Vijay Madisetti, "Internet of Things – A Hands-on Approach", 1st Edition, Universities Press , 2015 for Units I,II,III,IV.
2. Jan Holler, VlasiosTsiatsis, Catherine Mulligan, StatmatisKarnouskos, Stefan Avesand and David Boyle, "From Machine-to-Machine to the Internet of Things – Introduction to a New Age of Intelligence", 1st Edition, Academic Press, 2014 for Unit V.

REFERENCES:

1. https://aws.amazon.com/
2. Honbo Zhou, "The Internet of Things in the Cloud: A Middleware Perspective", 1st Edition, CRC Press, 2012.

COURSE OUTCOMES: On completion of the course, the students will be able to		**BT Mapped (Highest Level)**
CO1	apply architecture, infrastructure and constraints of Internet of Things	Applying (K3)
CO2	utilize design methodologies for IoT applications	Applying (K3)
CO3	experiment with simple applications using python and Raspberry Pi	Applying (K3)
CO4	develop IoT product with the use of cloud storage and data analytics	Applying (K3)
CO5	identify the challenges and the opportunities in different domains for Internet of Things	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									3	2
CO2	3	2	1	1									3	2
CO3	3	2	1	1									3	2
CO4	3	2	1	1									3	2
CO5	3	2	1	1									3	2

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

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	40	50	10				100
CAT2	30	50	20				100
CAT3	30	30	40				100
ESE	25	35	40				100

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

18ITT63 - CRYPTOGRAPHY AND NETWORK SECURITY

Programme & Branch	B.Tech. & Information Technology	Sem.	Category	L	T	P	Credit
Prerequisites	Computer Networks	6	PC	3	0	0	3

Preamble	This course describes the explosive growth in computer systems and their interconnections via networks, has increased the dependence of both organizations and individuals on the information stored and communicated using these systems.	
Unit - I	**Symmetric Ciphers**	**9**
Computer Security Concepts – The OSI Security Architecture – Security Attacks – services and mechanisms – Model for Network Security – Classical encryption techniques – Block ciphers and Data Encryption Standard – Advanced Encryption Standard – Block cipher operation.		
Unit - II	**Asymmetric Ciphers**	**9**
Public key cryptography and RSA – Other Public key cryptosystems – Diffie-Hellman Key Exchange – Elgamal Cryptographic System – Elliptic Curve Arithmetic – Elliptic Curve Cryptography.		
Unit - III	**Cryptographic Data Integrity Algorithms**	**9**
Cryptographic hash functions – Message authentication codes: Message Authentication Requirements – Message Authentication Functions – Requirements for Message Authentication Codes – Security of MACs – MACs Based on Hash Functions: HMAC – Digital signatures: Elgamal Digital Signature Scheme – Schnorr Digital Signature Scheme – NIST Digital Signature Algorithm – Elliptic Curve Digital Signature Algorithm.		
Unit - IV	**Mutual Trust and User authentication**	**9**
Key management and distribution: symmetric key distribution using symmetric and asymmetric encryption – Distribution of public keys – X.509 Certificates – Public key infrastructure – Remote user authentication principles – Remote user authentication using symmetric and asymmetric encryption – Kerberos – Federated identity management – Personal identity verification.		
Unit - V	**Network and Internet Security**	**9**
Network access control and cloud security – Transport level security – Wireless network security – Electronic mail security – IP security		

Total:45

TEXT BOOK:

1. William Stallings, "Cryptography and Network Security", 7 Edition, Pearson Education, New Delhi, 2017.

REFERENCES:

1. Behrouz A. Ferouzan, Debdeep Mukhopadhyay, "Cryptography and Network Security", 3 Edition, Tata McGraw-Hill Education , India, 2015.
2. Charles P Fleeger, "Security in Computing", 5 Edition, Prentice Hall of India, 2015.

COURSE OUTCOMES: On completion of the course, the students will be able to		**BT Mapped (Highest Level)**
CO1	apply various Cryptographic Techniques and symmetric key cryptography techniques to solve real world problems	Applying (K3)
CO2	apply various public key cryptography techniques to real case scenarios	Applying (K3)
CO3	demonstrate Hashing and Digital Signature techniques to solve the problems	Applying (K3)
CO4	explain the various mutual trust and User authentication mechanisms	Applying (K3)
CO5	discuss the different Security Protocols and standards for various layers of wired and wireless networks	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									3	2
CO2	3	2	1	1									3	2
CO3	3	2	1	1									3	2
CO4	3	2	1	1									3	2
CO5	3	2	1	1									3	2

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

ASSESSMENT PATTERN - THEORY

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

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

18ITL61 - MACHINE LEARNING LABORATORY

Programme & Branch	B.Tech. & Information Technology	Sem.	Category	L	T	P	Credit
Prerequisites	Data Structures, Design and Analysis of Algorithms	6	PC	0	0	2	1

List of Exercises / Experiments :

1.	Impute missing values in data inputs
2.	Demonstrate Naïve Bayes Classification
3.	Perform multivariate classification and regression
4.	Use Principal component analysis to perform dimensionality reduction
5.	Implement K-means clustering
6.	Perform Classification using decision tree
7.	Develop a program to implement multilayer perceptron
8.	Perform classification using Support Vector Machines
9.	Develop a simple application to demonstrate reinforcement learning
10.	Assess machine learning experiments using cross validation methods

Total:30

REFERENCES/MANUAL/SOFTWARE:

1.	Python/ R/ Java
2.	Jupyter Notebook/Eclipse

COURSE OUTCOMES: On completion of the course, the students will be able to		**BT Mapped (Highest Level)**
CO1	Identify solution for searching and constraint satisfaction problems	Applying (K3), Precision (S3)
CO2	Preprocess the datasets and perform classification using supervised learning methods	Applying (K3), Precision (S3)
CO3	Demonstrate unsupervised learning and reinforcement learning methods	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	1
CO2	3	2	1	1								2	3	2
CO3	3	2	1									2	3	2

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

18ITL62 - INTERNET OF THINGS LABORATORY

Programme & Branch	B.Tech. & Information Technology	Sem.	Category	L	T	P	Credit
Prerequisites	Microprocessors and Embedded System Laboratory	6	PC	0	0	2	1

List of Exercises / Experiments :

1.	Simple LED bargraph using Arduino
2.	Find the obstacle distance using Arduino
3.	Create simple security alarm system using Arduino
4.	Interface and control an LED with NODEMCU in online
5.	Control and monitor the temperature of the elements using temperature sensor with NODEMCU
6.	Create your own smart light using Raspberry pi
7.	Use SMTP for monitoring pollution levels using Raspberry pi and Python
8.	Control any electrical appliance via webpage using Raspberry pi/Arduino
9.	Push IoT sensor data for cloud storage and apply simple data analytics.
10.	Mini Project

Total:30

REFERENCES/MANUAL/SOFTWARE:

1.	Raspberry pi , Arduino, NODEMCU, GSM Module and Sensors
2.	Linux ,Python and C

COURSE OUTCOMES: On completion of the course, the students will be able to		**BT Mapped (Highest Level)**
CO1	make smart objects	Applying (K3), Precision (S3)
CO2	control and monitor smart objects via web application	Applying (K3), Precision (S3)
CO3	build solutions for the societal problems	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										3	3
CO2	3	2	1										3	3
CO3	3	2	1										3	3

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

18ITL63 - NETWORK SECURITY LABORATORY

Programme & Branch	B.Tech. & Information Technology	Sem.	Category	L	T	P	Credit
Prerequisites	NIL	6	PC	0	0	2	1

List of Exercises / Experiments :

1.	Write a program to perform encryption and decryption using the following algorithms: a. Caesar cipher b. Vigenere Cipher c. Playfair Cipher
2.	Perform Brute force attack on any of the algorithms implemented in the above exercise .
3.	Implementation and Cryptanalysis of Hill Cipher to secure client-server communications.
4.	Write a program to demonstrate symmetric key encryption process using DES algorithm.
5.	Write a program to demonstrate symmetric key encryption process using AES algorithm
6.	Implement the RSA asymmetric cryptography algorithm.
7.	Implement ElGamal asymmetric cryptography algorithm.
8.	Implementation of Diffie-Hellman Key exchange algorithm with Man in the Middle Attack
9.	Write a program to generate message digest for the given message using the SHA/MD5 algorithm and verify the integrity of message.
10.	Write a program to sign and verify a document using DSA algorithm
11.	Security Analysis of Cryptographic algorithms using OPEN SSL packages
12.	Analysis of Secure Socket Layer and IPSec protocol using Network packet analyzer (Wireshark or equivalent tools)

Total:30

REFERENCES/MANUAL/SOFTWARE:

1.	C / C++ / Java GnuPG, Wireshark,

COURSE OUTCOMES: On completion of the course, the students will be able to		**BT Mapped (Highest Level)**
CO1	demonstrate various symmetric, asymmetric key cryptography algorithms and number theory concepts.	Applying (K3), Manipulation (S2)
CO2	practice hashing and digital signatures to provide authentication for the given scenario.	Applying (K3), Manipulation (S2)
CO3	inspect the strength of the cryptographic algorithms by cryptanalysis and OPENSSL	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	2
CO2	3	3	2	2	1								3	3
CO3	3	2	1	1									3	2

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

18GEL61 PROFESSIONAL SKILLS TRAINING II
(Common to all BE/ BTech / MSc /MCA /BSc Branches)

Programme & Branch	B.E. & Computer Science and Engineering	Sem.	Category	L	T	P	Credit
Prerequisites	NIL	6	EC	0	0	80	2

Preamble	This subject is to enhance the employability skills and to develop career competency	
Unit - I	**Soft Skills – I**I	**20**
Group discussions: Advantages of group discussions-Structured GD- Team work: Value of team work in organizations- Definition of a team, why team-Elements of leadership, disadvantages of a team, stages of team formation- Group development activities. Facing an interview: Foundation in core subject- industry orientation / knowledge about the company- professional personality-Communication skills-Activities before Interview, upon entering interview room, during the interview and at the end Mock interviews.		
Unit - II	**Quantitative Aptitude & Logical Reasoning - II**	**30**
Problem solving level II: Money related problems-Mixtures-Symbol base problem-Clocks and calendars-Simple-linear-quadratic and polynomial equations-Special, equations-Inequalities-Sequence and series-Set theory-Permutations and combinations-Probability-Statistics-Data sufficiency- Geometry-Trigonometry-Heights and distances-Co-ordinate geometry-Mensuration. Logical reasoning: Conditionality and grouping-Sequencing and scheduling- Selections-Networks:-Codes; Cubes-Venn diagram in logical reasoning-Quant based reasoning-Flaw detection- Puzzles-Cryptarithms.		
Unit - III	**Reading & Speaking Skills**	**30**
Reading: Reading comprehension– Effective Reading strategies – Descriptive, Inferential, & Argumentative reading passages – Identifying and locating factual information within a text – global reading/skimming for general understanding – selective comprehension / scanning for specific information – detailed comprehension / intensive reading – understanding the development of an argument – identifying the writer's attitude and opinions – Reading news articles in business magazines, newspapers – Reading notices and book reviews –Interpreting graphic data & Advertisements. Speaking: Mock Interviews –Self-Introduction – Sharing of Real Time Experience; Conversational Practices –Role Play – Short Talks / TED Talks –Extempore; Giving a Presentation on Various Topics – Technical / Non-Technical Topics – Project Review Presentation – Oratory and Effective Public Speaking; Pair Discussion – Group Discussion – The process of Group Discussion – Strategies to be adopted – Skills Assessed – Telephonic Conversations & Skills – Negotiating Skills.		

Total: 80

TEXT BOOK:

1	Thorpe, Showick and Edgar Thorpe, "Objective English For Competitive Examination", 6th Edition, Pearson India Education Services Pvt Ltd, 2017.

REFERENCES:

1	Aruna Koneru, "Professional Speaking Skills," Oxford University Press India, 2015.
2	Thorpe, Showick and Edgar Thorpe, "Winning at Interviews," 5th edition, Pearson Education, India, 2013.
3	Rizvi, Ashraf M, "Effective Technical Communication," 2nd Edition, McGraw Hill Education India, 2017.

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

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	0	0	0	3	3	0	3	0	3	2		
CO2	3	2	0	0	0	3	3	0	3	0	3	2		
CO3	0	2	0	0	0	3	3	0	3	3	3	2		

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

ASSESSMENT PATTERN - THEORY

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

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

18ITP61 - PROJECT WORK I PHASE I

Programme & Branch	B.Tech. & Information Technology	Sem.	Category	L	T	P	Credit
Prerequisites	--	6	EC	0	0	4	2

Total : 60

COURSE OUTCOMES: On completion of the course, the students will be able to		BT Mapped (Highest Level)
CO1	identify and formulate an IT related solutions for an engineering problem	Applying (K3)
CO2	analysis and review research literature related to the problem	Applying (K3)
CO3	apply mathematical knowledge for design a solution for the problem	Applying (K3)
CO4	implement IT enabled solutions	Applying (K3)
CO5	communicate, demonstrate and document the work as a member and leader in a tam	Applying (K3)

Mapping of COs with POs and PSOs

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

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

18MBT71 - ENGINEERING ECONOMICS AND MANAGEMENT

(Common to All Engineering And Technology Branches except Chemical Engineering)

Programme & Branch	B.Tech. & Information Technology	Sem.	Category	L	T	P	Credit
Prerequisites	NIL	7	HS	3	0	0	3

Preamble	The aim of the course is to create fundamental knowledge on management by introducing concepts like economics, national income, marketing, operations management, accounting principles etc.	
Unit - I	**Micro Economics:**	**9**
Economics – Basics Concepts and Principles – Demand and Supply – Law of demand and Supply – Determinants – Market Equilibrium – Circular Flow of Economic activities and Income.		
Unit - II	**Macro Economics, Business Ownership and Management concepts:**	**9**
National Income and its measurement techniques. Inflation - Causes of Inflation – Controlling Inflation – Business Cycle. Forms of business – Ownership types. Management concepts: Taylor and Fayol's Principles – Functions of Management - Managerial Skills - Levels of Management - Roles of manager.		
Unit - III	**Marketing Management:**	**9**
Marketing - Core Concepts of Marketing - Four P's of Marketing - New product development – Intellectual Property rights (IPR), Product Life Cycle - Pricing Strategies and Decisions.		
Unit - IV	**Operations Management:**	**9**
Operations Management - Resources - Types of Production system - Site selection, Plant Layout, Steps in Production Planning and Control - Inventory - EOQ Determination.		
Unit - V	**Financial Management:**	**9**
Accounting Principles – Financial Statements and its uses – Depreciation: Straight Line and Diminishing Balance Method – Break Even Analysis – Capital Budgeting: Significance –Traditional and discounted cash flow methods.		

Total:45

TEXT BOOK:

1. Compiled by Department of Management Studies, Kongu Engineering College, "Economics and Management for Engineers", 1st Edition, McGraw Hill Education, Noida, 2013.

REFERENCES:

1. Geetika, Piyali Ghosh and Purba Roy Choudhury, "Managerial Economics", 3rd Edition, McGraw-Hill, New Delhi, 2018.
2. William J. Stevenson, "Operations Management", 14th Edition, McGraw-Hill Education, 2021.
3. William G. Nickels, James M. McHugh, Susan M. McHugh, "Understanding Business", 12th Edition, McGraw-Hill Education, New York, 2019.

COURSE OUTCOMES: On completion of the course, the students will be able to		**BT Mapped (Highest Level)**
CO1	identify market equilibrium and interpret national income calculations and inflation issues	Applying (K3)
CO2	choose a suitable business ownership for their enterprise and illustrate managerial functions	Applying (K3)
CO3	infer marketing management decisions	Understanding (K2)
CO4	apply appropriate operation management concept in business situations	Applying (K3)
CO5	interpret financial and accounting statements and evaluate new proposals	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	1	1	2			3		2	2	2	3	2	1	2
CO2		1	2			2	2	2	2	2	3	2	1	2
CO3	1	2	1			2		2	2	2	3	2	2	2
CO4	1	2	1			2		2	2	2	3	2	1	2
CO5	2	2				2		2	2	2	3	2	2	2

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

ASSESSMENT PATTERN - THEORY

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

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

18GEP71 – COMPREHENSIVE TEST AND VIVA
(Common to all BE/BTech branches)

Programme & Branch	All BE/BTech branches	Sem.	Category	L	T	P	Credit
Prerequisites	Nil	7	EC	0	0	0	2

COURSE OUTCOMES: On completion of the course, the students will be able to		BT Mapped (Highest Level)
CO1	demonstrate knowledge in their respective programme domain.	Applying (K3)
CO2	defend any type of interviews, viva-voce, and aptitude tests conducted for career progression	Applying (K3)
CO3	exhibit professional etiquette and solve related engineering problems	Applying (K3)

Mapping of COs with POs and PSOs

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

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

18ITP71 - PROJECT WORK I PHASE II

Programme & Branch	B.Tech. & Information Technology	Sem.	Category	L	T	P	Credit
Prerequisites	---	7	EC	0	0	8	4

Total : 120

COURSE OUTCOMES: On completion of the course, the students will be able to		BT Mapped (Highest Level)
CO1	identify and formulate a new problem from the existing work	Applying (K3)
CO2	analyse and review research literature related to the new problem identified	Applying (K3)
CO3	choose appropriate design methodology for finding solution to the problem	Applying (K3)
CO4	implement IT enabled solutions	Applying (K3)
CO5	communicate, demonstrate and document the work as a member and leader in a tam	Applying (K3)

Mapping of COs with POs and PSOs

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

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

18ITP81 - PROJECT WORK II

Programme & Branch	B.Tech. & Information Technology	Sem.	Category	L	T	P	Credit
Prerequisites	--	8	EC	0	0	12	6

Total: 180

COURSE OUTCOMES: On completion of the course, the students will be able to		BT Mapped (Highest Level)
CO1	identify and formulate an IT related solutions for an engineering problem	Applying (K3)
CO2	analyze and review existing system	Applying (K3)
CO3	choose appropriate design methodology for the problem	Applying (K3)
CO4	implement IT enabled solutions	Applying (K3)
CO5	communicate, demonstrate and document the work as a member and leader in a tam	Applying (K3)

Mapping of COs with POs and PSOs

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

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

18ITE02 - COMPILER DESIGN

Programme & Branch	B.Tech. & Information Technology	Sem.	Category	L	T	P	Credit
Prerequisites	Formal Languages and Automata	6	PE	3	1	0	4

Preamble	This course provides insight into the process of compiler construction as well as the design techniques for the given programming language.	
Unit - I	**Introduction and Lexical Analysis:**	**9**
Compilers - Analysis of Source Program – The phases of a compiler – Grouping of phases- Lexical Analysis – The Role of the Lexical Analyzer – Input Buffering – Specification of Tokens –Recognition of Tokens– The language for specifying Lexical Analyzer – Lex – Finite Automata –From Regular Expressions to NFA.		
Unit - II	**Syntax Analysis:**	**9**
Role of the Parser – Context-Free Grammars – Writing a Grammar – Top-Down Parsing – Bottom-Up parsing – Operator Precedence Parser – Introduction to LR Parsing: Simple LR – LALR – Parser Generators.		
Unit - III	**Syntax - Directed Translation and Intermediate Code Generation**	**9**
Syntax-Directed Translation – Construction of syntax trees – Intermediate Code Generation : Intermediate languages – Three Address Code – Declarations – Translation of Expressions – Control Flow – Backpatching –Switch Statements– Procedure calls.		
Unit - IV	**Machine Independent Optimizations**	**9**
Basic Blocks and Flow Graphs –Optimization of Basic Blocks– Peephole Optimization–The Principal Sources of Optimization – Introduction to Data-Flow Analysis– loops and flow graphs.		
Unit - V	**Code Generation and Storage Management**	**9**
Issues in the design of a code generation – The target Language – Addresses in the Target code – A simple code Generator –Run-Time Environments: Storage organization – Stack allocation of space – Heap Management – Introduction to garbage collection.		

Lecture:45, Tutorial:15, Total:60

TEXT BOOK:

1. Aho Alfred, Monica S. Lam, Sethi Ravi and Ullman Jeffrey D., "Compilers: Principles, Techniques and Tools", 2 Edition, Pearson India Education , New Delhi, 2014.

REFERENCES:

1. Srikant Y.N. and Priti Shankar, "The Compiler Design Handbook: Optimizations and Machine Code Generation", 2 Edition, CRC Press, 2007.
2. Keith Cooper and Linda Torczon, "Engineering a Compiler", 2 Edition, Morgan Kauffman Publishers, 2004.

COURSE OUTCOMES: On completion of the course, the students will be able to		**BT Mapped (Highest Level)**
CO1	make use of regular expression to perform lexical analysis for the given source program	Applying (K3)
CO2	design a syntax-analysis tool for the given grammar	Applying (K3)
CO3	develop intermediate code for the given source program	Applying (K3)
CO4	employ optimization techniques for the given intermediate code	Applying (K3)
CO5	identify the suitable storage allocation technique to generate the target code	Applying (K3)

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

ASSESSMENT PATTERN - THEORY							
Test / Bloom's Category*	**Remembering (K1) %**	**Understanding (K2) %**	**Applying (K3) %**	**Analyzing (K4) %**	**Evaluating (K5) %**	**Creating (K6) %**	**Total %**
CAT1	12	26	62				100
CAT2	4	23	73				100
CAT3	42	35	23				100
ESE	20	30	50				100

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

18ITE03 - ADVANCED DATABASES

Programme & Branch	B.Tech. & Information Technology	Sem.	Category	L	T	P	Credit
Prerequisites	Database Management Systems	6	PE	3	0	0	3

Preamble	This course deals with concepts of advanced databases like NoSQL Database, HDFS Database, parallel database, distributed database, active database, and temporal database which are necessary to effectively store the data for real time applications.	
Unit - I	**Parallel Database**	**9**
Database System Architectures – Centralized and Client/Server Architectures – Server System Architectures – Parallel Systems – Distributed Systems – Parallel Databases: I/O Parallelism – Inter and Intra Query Parallelism – Inter and Intra operation Parallelism – Design of Parallel Systems.		
Unit - II	**Distributed Database**	**9**
Distributed Database Concepts – Distributed Data Storage – Distributed Transactions – Commit Protocols – Concurrency Control – Distributed Query Processing		
Unit - III	**Specialty Databases**	**9**
Complex data types – Structured types and inheritance in SQL – Table inheritance – Array and Multiset Types in SQL – Object Identity and Reference Types in SQL – Spatial and Temporal Data: – Time in databases –Spatial and Geographic Data – Multimedia databases – Mobility and Personal databases		
Unit - IV	**NoSQL Databases**	**9**
NoSQL (Not Only SQL)) - Introduction to MongoDB – Term Used in RDBMS and MongoDB – Data Types in MongoDB – MongoDB Query Language – Introduction to Apache Cassandra – CQL Data Types – CQLSH – CRUD operations –Collections – Using a counter – Time to Live – Alter Commands – Import and Export – Querying System Tables.		
Unit - V	**Big Data Storage Systems**	**9**
Introduction to Hive – Hive Architecture– Hive Data Types – Hive File Format – Hive Query Language – DDL – DML – Starting Hive Shell– Database – Tables – Partitions –Bucketing – Views – Subquery – Joins –Aggregation –Group by and Having – RCFile Implementation – User Defined Function.		

Total:45

TEXT BOOK:

1. Henry F Korth, Abraham Silberschatz, S. Sudharshan, “Database System Concepts”, Sixth Edition, McGraw Hill, 2011 for Units I,II,III.
2. Seema Acharya and Subhashini Chellappan, "Big Data and Analytics", 1 Edition, Wiley India, 2015 for Units IV,V.

REFERENCES:

1. ElmasriR., NavatheS.B, "Fundamentals of Database Systems", 5 Edition, Pearson Education, 2010.

COURSE OUTCOMES: On completion of the course, the students will be able to		**BT Mapped (Highest Level)**
CO1	identify the concepts in parallel database	Applying (K3)
CO2	apply the distributed databases and XML to real world problems	Applying (K3)
CO3	make use of methods and techniques for specialty database	Applying (K2)
CO4	identify the significant features of NOSQL Databases	Applying (K3)
CO5	apply the bigdata storage concepts using Hive	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									3	2
CO2	3	2	1	1									3	2
CO3	3	2	1	1									3	2
CO4	3	2	1	1									3	2
CO5	3	2	1	1									3	2

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

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	30	60	10				100
CAT2	5	40	55				100
CAT3	10	50	40				100
ESE	10	60	30				100

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

18ITE04 - CROSS PLATFORM APPLICATIONS DEVELOPMENT

Programme & Branch	B.Tech. & Information Technology	Sem.	Category	L	T	P	Credit
Prerequisites	Problem Solving and Programming	6	PE	3	0	0	3

Preamble	This course focuses on creating frameworks for development cross platform mobile applications using PhoneGap	
Unit - I	**Introduction to PhoneGap**	**9**
History - Designing for the Container - Applications- Limitations – Plug-Ins – Resourses - Hybrid Application Frameworks - PhoneGap Development, Testing, and Debugging : Hello, World app – Initialization – APIs- Enhancing the User Interface - Testing and Debugging - Running a PhoneGap Application on a Physical Device and Simulator - Debugging Capabilities - Debugging Tools - Dealing with Cross-Platform Development Issues.		
Unit - II	**PhoneGap Developer Tools**	**9**
PhoneGap Developer Tools : Configuring an Android Development Environment for PhoneGap - Installing the Android SDK – Creating and Testing an Android PhoneGap Project - BlackBerry - Installing the WebWorks SDK – creating and Testing BlackBerry PhoneGap Applications - iOS - Registering as an Apple Developer - Xcode Creating and Testing an iOS PhoneGap Project Applications - Symbian - Nokia Web Tools - Creating and Testing a Symbian PhoneGap Project - Using PhoneGap Build		
Unit - III	**PhoneGap APIs**	**9**
PhoneGap APIs : Notification – Events - Contacts - Geolocation – Device		
Unit - IV	**PhoneGap APIs**	**9**
PhoneGap APIs : Media –- Camera – Network Connection - Accelerometer		
Unit - V	**Storage**	**9**
Storage: Local Storage – SQL Storage - Connect PHP & MySQL - Parse JSON - Upload Images - Login System.		

Total:45

TEXT BOOK:

1. John M. Wargo, "PhoneGap Essentials: Building Cross-Platform Mobile Apps", 1 Edition, Addison-Wesley Professional, United States, 2014.

REFERENCES:

1. http://docs.phonegap.com/tutorials
2. Purusothaman Ramanujam, Giorgio Natili - PhoneGap: Beginner's Guide - Third Edition July 2015

COURSE OUTCOMES: On completion of the course, the students will be able to		**BT Mapped (Highest Level)**
CO1	Summarize the concepts of PhoneGap platform tools	Understanding (K2)
CO2	Design and validate a simple cross platform native applications using android, BlackBerry, iOS and Symbian OS	Applying (K3)
CO3	Elaborate the mechanisms for PhoneGap APIs	Applying (K3)
CO4	Develop a simple Applications using different types PhoneGAP APIs	Applying (K3)
CO5	Create a simple storage based 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	3	2	1	1									3	2
CO2	3	2	1	1									3	2
CO3	3	2	1	1									3	2
CO4	3	2	1	1									3	2
CO5	3	2	1	1									3	2

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

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	20	40	40				100
CAT2	15	45	40				100
CAT3	15	35	50				100
ESE	15	45	40				100

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

18ITE05 - PLATFORM TECHNOLOGIES

Programme & Branch	B.Tech. & Information Technology	Sem.	Category	L	T	P	Credit
Prerequisites	Object Oriented Programming	6	PE	3	0	0	3

Preamble	Arm you with broad knowledge of the .NET-centric building blocks, C# programming constructs with OOP concepts. Also leverages your newfound knowledge bybuilding window application and ASP.NET application with ADO.NET support and deploying using Azure App service.	
Unit - I	**.NET Platform**	**9**
NET platform - Benefits - Building blocks of .NET platform – .NET Aware Programming Language- .NET Assemblies - Common Type System- CLS – CLR - .NET Name Spaces –Exploring an Assembly Using ildasm.exe- Building C# Applications Using csc.exe		
Unit - II	**Core C# Programming**	**9**
The Anatomy of a Simple C# Program - Data Types – Keywords – String data – Narrowing and Widening Data Type Conversions – Implicitly Typed Local variables – Iteration Constructs – Arrays - Enum, Structure, Value and Reference types.		
Unit - III	**Object-Oriented Programming with C#**	**9**
Encapsulation -C# Class Type – Constructors - this Keyword - static Keyword - Pillars of OOP - Access Modifiers - Encapsulation Services - Automatic Properties- Constant Field Data - Inheritance and Polymorphism – Exception Handling –.NET Delegate Type - Events – Operator overloading.		
Unit - IV	**ADO.NET and Windows Application**	**9**
ADO.NET – Connected Layer: Data providers – Data readers – Data access library–Windows application development – Case study : Develop a windows application to analysis daily outlays - ASP.NET: Building a ASP.NET Web Page - ASP.NET Web Sites vs ASP.NET Web Applications.		
Unit - V	**ASP.NET Web Controls & Azure App**	**9**
Web controls- WebControl Base Classes - Validation Controls – ASP.NET State Management Techniques - Azure App Service - Key features of App Service -Deploy ASP.NET web app to Azure App Service - Deploy ASP.NET Core web app to Azure App Service.		

Total:45

TEXT BOOK:

1. Andrew Troelsen, "Pro C# 5.0 and the .NET 4.5 Framework", 6 Edition, Apress , 2012.

REFERENCES:

1. Christian Nagel, Jay Glynn and Morgan Skinner, "Professional C# 5.0 and .NET 4.5", 1 Edition, John Wiley and Sons, 2014.
2. Kogent Learning Solutions Inc., "C# 2010 Programming: Covers .NET 4.0 Black Book ", Kindle Edition, Dreamtech Press, 2010.

COURSE OUTCOMES: On completion of the course, the students will be able to		**BT Mapped (Highest Level)**
CO1	Utilize .NET assemblies to build C# applications	Applying (K3)
CO2	Develop simple applications using C# core programming constructs	Applying (K3)
CO3	Develop C# console application using OOP, Exception and delegate concepts	Applying (K3)
CO4	Build windows based applications using C#, ADO.NET with SQL Server	Applying (K3)
CO5	Utilize validation controls and statement management techniques to build stable ASP.NET application and deploy it using Azure app service	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									3	2
CO2	3	2	1	1									3	2
CO3	3	2	1	1									3	2
CO4	3	2	1	1									3	2
CO5	3	2	1	1									3	2

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

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	20	50	30				100
CAT2	20	40	40				100
CAT3	20	50	30				100
ESE	20	35	45				100

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

18ITE06 - NETWORK COMMUNICATION PROTOCOLS

Programme & Branch	B.Tech. & Information Technology	Sem.	Category	L	T	P	Credit
Prerequisites	Computer Networks	6	PE	3	0	0	3

Preamble	This course covers protocols involved in computer networks which help in establishing communication between two end systems.	
Unit - I	**Introduction and Link layer Protocols**	**9**
Introduction – The Architecture and Protocols of the TCP/IP Suite - Standardization Process – Link Layer – Introduction - Ethernet and the IEEE 802 LAN/MAN Standards - Bridges and Switches: Spanning Tree Protocol - Multiple registration protocol – Point to point protocol – Address Resolution Protocol		
Unit - II	Internet Protocol and DHCP	**9**
Internet Protocol – Introduction - IPv4 and IPv6 Headers - IPv6 Extension Headers - IP Forwarding – Dynamic Host Configuration Protocol - Stateless Address Autoconfiguration - DHCP and DNS Interaction		
Unit - III	NAT and ICMP	**9**
Firewalls and Network Address Translation – Introduction – Firewalls - Network Address Translation (NAT) - NAT Traversal - Configuring Packet-Filtering Firewalls and NATs - ICMPv4 and ICMPv6: Internet Control Message Protocol – Introduction - ICMP Messages - ICMP Error Messages - ICMP Query/Informational Messages - Neighbor Discovery in IPv6 - Translating ICMPv4 and ICMPv6		
Unit - IV	IGMP and UDP	**9**
Broadcasting and Local Multicasting – Introduction – Broadcasting – Multicasting - The Internet Group Management Protocol (IGMP) and Multicast Listener Discovery Protocol (MLD) - User Datagram Protocol (UDP) and IP Fragmentation – Introduction – Header – Check sum - Path MTU Discovery with UDP - Maximum UDP Datagram Size - UDP Server Design - Translating UDP/IPv4 and UDP/IPv6 Datagrams - UDP in the Internet		
Unit - V	DNS and TCP	**9**
Name Resolution and the Domain Name System – Introduction – Domain Name Space – DNS Protocol - Open DNS Servers and DynDNS - Translating DNS from IPv4 to IPv6 - TCP: The Transmission Control Protocol – Introduction – Connection Management – Establishment and Termination – TCP Options – TCP Server Operation - TCP Timeout and Retransmission - TCP Data Flow and Window Management		

Total:45

TEXT BOOK:

1. Kevin R. Fall, W. Richard Stevens, "TCP/IP Illustrated volume1", 2 Edition, Pearson Education, 2012.

REFERENCES:

1. Behrouz A. Forouzan, "TCP/IP Protocol Suite", 4 Edition, McGraw-Hill Education , 2011.
2. "Network Protocols Handbook", 2 Edition, Javvin Technologies Inc, 2005.

COURSE OUTCOMES: On completion of the course, the students will be able to		**BT Mapped (Highest Level)**
CO1	Identify the link layer protocols in a TCP/IP communication	Understanding (K2)
CO2	Summarize Internet Protocol and use DHCP in address autoconfiguration	Applying (K3)
CO3	Choose appropriate protocol to be used for network translation and inform error using ICMP	Applying (K3)
CO4	Utilize the role of IGMP and unacknowledged transport layer protocols in taking the data from one device to another device	Understanding (K2)
CO5	Identify the role of DNS, and re-transmission and flow control techniques of TCP	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									3	2
CO2	3	2	1	1									3	2
CO3	3	2	1	1									3	2
CO4	3	2	1	1									3	2
CO5	3	2	1	1									3	2

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

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	20	50	30				100
CAT2	25	50	25				100
CAT3	20	40	40				100
ESE	30	40	30				100

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

18ITE07 - DATA WAREHOUSING AND DATA MINING

Programme & Branch	B.Tech. & Information Technology	Sem.	Category	L	T	P	Credit
Prerequisites	Database management systems	6	PE	3	0	0	3

Preamble	This course provides knowledge on design, build and evaluate a data mining solutions for real world problems. Also, it describes the process of data mining and its importance in various fields.	
Unit - I	**Data Warehouse**	**9**
Data warehouse -basic concepts- Modeling – Design and usage- Implementation –Data generalization by Attribute-oriented induction approach.		
Unit - II	**Introduction to Data Mining and Data preprocessing**	**9**
Introduction- Kinds of Data and Patterns–Major issues in data mining- Data Objects and attribute types –Statistical description of data - Measuring data similarity and dissimilarity Data preprocessing : Overview-Data cleaning- Data integration –Data reduction-Data transformation and discretization.		
Unit - III	**Association Rule Mining:**	**9**
Basic concepts- Frequent itemset mining methods : Apriori algorithm - A pattern growth approach for mining frequent itemsets—Pattern evaluation methods- Mining multilevel , multi dimensional space.		
Unit - IV	**Classification**	**9**
Basic concepts- Decision Tree Induction - Bayes Classification Methods – Rule Based Classification-Model evaluation and selection – Support Vector Machines- Classification using frequent patterns-k-NN		
Unit - V	**Clustering**	**9**
Cluster analysis- Partitioning methods- Hierarchical methods- Density based methods – Grid based methods – Evaluation of Clustering Methods– Introduction to Outlier Analysis - Data Mining Applications.		

Total:45

TEXT BOOK:

1. Jiawei Han and Micheline Kamber, "Data Mining Concepts and Techniques", 3 Edition, Elsevier, 2012.

REFERENCES:

1. G.K.Gupta , "Introduction to Data Mining with Case Studies", Eastern Economy Edition, Prentice Hall of India, 2006.
2. Charu C. Aggarwal, "Data Mining: The Textbook", Kindle Edition, Springer, 2015.

COURSE OUTCOMES: On completion of the course, the students will be able to		**BT Mapped (Highest Level)**
CO1	Identify the architecture of data warehousing and data mining process	Applying (K3)
CO2	apply suitable data pre-processing methods for the given Dataset	Applying (K3)
CO3	develop association rules using algorithms like Apriori,Frequent Pattern tree for the given problem.	Applying (K3)
CO4	model different classification algorithms	Applying (K3)
CO5	Make use of clustering techniques for grouping 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	3	2	1	1									3	2
CO2	3	2	1	1									3	2
CO3	3	2	1	1									3	2
CO4	3	2	1	1									3	2
CO5	3	2	1	1									3	2
1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy														

ASSESSMENT PATTERN - THEORY							
Test / Bloom's Category*	**Remembering (K1) %**	**Understanding (K2) %**	**Applying (K3) %**	**Analyzing (K4) %**	**Evaluating (K5) %**	**Creating (K6) %**	**Total %**
CAT1	15	35	50				100
CAT2	15	25	60				100
CAT3	15	25	60				100
ESE	15	30	55				100

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

18ITE08 - COMPUTER GRAPHICS

Programme & Branch	B.Tech. & Information Technology	Sem.	Category	L	T	P	Credit
Prerequisites	**Mathematics I**	**7**	**PE**	**3**	**0**	**0**	**3**

Preamble	This course describes about the basic algorithms of 2D and 3D objects representation and applications of computer graphics.	
Unit - I	**Introduction**	**9**
Introduction - Graphics applications -Graphics systems – Output Primitives: Line, Circle and Ellipse drawing algorithms – Attributes of Output Primitives		
Unit - II	**Two Dimensional**	**9**
Two Dimensional Geometric Transformations – Basic Transformation – Matrix Representation and Homogeneous Coordinate – Composite Transformation – Other Transformation - Two Dimensional Clipping and Viewing		
Unit - III	**Three Dimensional**	**9**
Concepts - Three dimensional object representations: Polygon Surfaces - Curved Lines and Surfaces - Quadratic Surfaces - Spline Representations - Visualization of Datasets		
Unit - IV	**Three Dimensional Modeling**	**9**
Three Dimensional Geometric and Modeling Transformations – Three Dimensional Viewing – Viewing Pipeline – Viewing Coordinates – Projection – Parallel Projection – Perspective Projection		
Unit - V	**View**	**9**
View Volumes and General projection transformation - Visible Surface Detection Methods - Color Models and Color Applications - Computer Animation		

Total:45

TEXT BOOK:

1. Hearn, Donald and Baker, M. Pauline, "Computer Graphics - C Version", 2 Edition, Pearson Education, India, 2008.

REFERENCES:

1. John F. Hughes, Andries Van Dam, Morgan Mcguire, David F. Sklar, James D. Foley , Steven K. Feiner, and Kurt Akeley, "Computer Graphics: Principles & Practice", 3 Edition, Pearson Education, India, 2013.

COURSE OUTCOMES: On completion of the course, the students will be able to		**BT Mapped (Highest Level)**
CO1	Interpret the fundamental concepts of computer graphics and the components that constitute 2D and 3D graphics	Applying (K3)
CO2	perform 2D objects transformation, clipping, and viewing operations	Applying (K3)
CO3	build 3D object representations	Applying (K3)
CO4	Perform 3D objects transformations, viewing and projection operations	Applying (K3)
CO5	choose color models and computer animations	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									3	2
CO2	3	2	1	1									3	2
CO3	3	2	1	1									3	2
CO4	3	2	1	1									3	2
CO5	3	2	1	1									3	2

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

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	20	30	50				100
CAT2	20	40	40				100
CAT3	20	40	40				100
ESE	20	35	45				100

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

18ITE09 - SOFTWARE QUALITY AND TESTING

Programme & Branch	B.Tech. & Information Technology	Sem.	Category	L	T	P	Credit
Prerequisites	Software Engineering	7	PE	3	0	0	3

Preamble	This course describes the concepts and skills needed for software quality assurance and testing. Also to ensure the implementation of appropriate functionality that satisfies the requirements/needs of its targeted client/users for the intended software system, product, or service correctly and efficiently.	
Unit - I	**Software Quality Assurance and Review Techniques:**	**9**
Defining Quality –Need for Quality –Quality Control Vs Quality assurance –Quality assurance at each phase of SDLC - Need for SQA group in an Organization. Structured walkthroughs –Inspections –Various roles and responsibilities involved in Reviews / Inspections – Some psychological aspects of reviews.		
Unit - II	**Software Measurement and Metrics:**	**9**
Product quality –Models for software product Quality –Process Quality. Measurement and Metrics: Introduction –Measurement during software life cycle context –Defect metrics –Metrics for software maintenance –Classification of software metrics –Requirements related metrics –Measurements and process improvement –Measurement principles		
Unit - III	**Basics of Testing:**	**9**
Introduction - Definition- Need for Testing- Testing Approaches-Essentials, features and principles of software Testing. Testing Environment: Assessing Capabilities, Staff Competency, and User Satisfaction-Creating an environment supportive of software testing - Building the software testing process – Testing Guidelines.		
Unit - IV	**Software Testing process:**	**9**
Overview - The Seven Step Software Testing Process - Organizing for testing- Workbench- Procedure, Developing the test plan- Workbench- Procedure, Verification testing- Workbench- Procedure -Validation testing-Workbench- Procedure - Analyzing and reporting test results-Workbench-Procedure.		
Unit - V	**Specialized Software Testing methodologies:**	**9**
Testing client/server systems- Rapid Application Development Testing - Testing software system security- Testing web-based systems - Using Agile Methods to Improve Software Testing.		

Total:45

TEXT BOOK:

1. Nina S. Godbole, "Software Quality Assurance Principles and Practice", 2 Edition, Narosa Publishing House, 2017 for Units I,II.
2. Perry William, "Effective Methods for Software Testing", 3 Edition, Wiley India, 2013 forr Units III,IV,V.

REFERENCES:

1. Mordechai Ben-Menachem, Garry S. Marliss, "Software Quality", 2 Edition, Vikas Publishing House Pvt. Ltd, India, 2014.
2. Limaye M.G, "Software Testing - Principles, Techniques and Tools", 1 Edition, Tata McGraw-Hill, 2009.
3. Rajani Renu and Oak Pradeep, "Software Testing Effective Methods: Tools and Techniques", 2 Edition, Tata McGraw-Hill Education Pvt. Ltd, India, 2017.

COURSE OUTCOMES: On completion of the course, the students will be able to		BT Mapped (Highest Level)
CO1	Identify the components of software quality assurance systems	Applying (K3)
CO2	Apply the concepts, metrics, and models in software quality assurance	Applying (K3)
CO3	Use the step by step activities and set up environment for software testing.	Applying (K3)
CO4	Prepare procedures and workbenches for various testing process.	Applying (K3)
CO5	Apply testing for client server, RAD, web based and software security systems and identify the agile methods for improving the testing process.	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									3	2
CO2	3	2	1	1									3	2
CO3	3	2	1	1									3	2
CO4	3	2	1	1									3	2
CO5	3	2	1	1									3	2

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

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	30	50	20				100
CAT2	20	50	30				100
CAT3	20	50	30				100
ESE	25	30	45				100

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

18ITE10 - BLOCK CHAIN TECHNOLOGIES

Programme & Branch	B.Tech. & Information Technology	Sem.	Category	L	T	P	Credit
Prerequisites	Cryptography and Network Security	7	PE	3	0	0	3

Preamble	This course provides comprehensive introduction to the theoretical and practical aspects of block chain technologies and its applications.	
Unit - I	**Blockchain 101**	**9**
Distributed systems - The history of blockchain - Introduction to blockchain – definitions - elements - Features - Applications of blockchain technology - Tiers - Types of blockchain - Consensus in blockchain - CAP theorem - Benefits and limitations of blockchain		
Unit - II	**Decentralization and Cryptography and Technical Foundations**	**9**
Decentralization using blockchain – Methods – Routes - Blockchain and full ecosystem decentralization -.Smart contract - Decentralized applications - Platforms for decentralization. Cryptography and Technical Foundations – Introduction - Cryptography - Confidentiality - Integrity – Authentication - Cryptographic primitives - Asymmetric cryptography - Public and private keys – RSA - Discrete logarithm problem - Hash functions - Elliptic Curve Digital signature algorithm		
Unit - III	**Bitcoin**	**9**
Bitcoin – Transactions – Blockchain - Bitcoin payments - Alternative Coins - Theoretical foundations - Bitcoin limitations – Namecoin - Litecoin – Primecoin – Zcash - Smart Contracts		
Unit - IV	**Ethereum 101**	**9**
Introduction - Ethereum blockchain - Elements of the Ethereum blockchain - Precompiled contracts – Accounts – Block – Block header – Messages – Mining - Clients and wallets - The Ethereum network - Ethereum Development		
Unit - V	**Hyperledger**	**9**
Projects – protocol - Hyperledger Fabric - Sawtooth lake – Corda - Blockchain-Outside of Currencies: Internet of Things – Government – Health - Finance		

Total:45

TEXT BOOK:

1. Imran Bashir, "Mastering Blockchain Distributed ledgers, decentralization and smart contracts Explained", 2 Edition, Packt Publishing, 2018.

REFERENCES:

1. Brenn Hill, Samanyu Chopra, Paul Valencourt, "Blockchain Quick Reference: A guide to exploring decentralized blockchain application development", 1 Edition, Packt publishing, 2018.
2. Andreas Antonopoulos, "Mastering Bitcoin: Programming the open blockchain", 2 Edition, O'Reilly Media, 2017.

COURSE OUTCOMES: On completion of the course, the students will be able to		**BT Mapped (Highest Level)**
CO1	Outline the history and different applications of blockchain, and choose appropriate consensus in blockchain	Applying (K3)
CO2	Make use of practical aspect of cryptography in decentralization of blockchain	Applying (K3)
CO3	Discuss Bitcoins and identify alternative coins and smart contracts for your application	Applying (K3)
CO4	Develop a distributed application using Ethereum	Applying (K3)
CO5	Deploy an application using Hyperledger	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									3	2
CO2	3	2	1	1									3	2
CO3	3	2	1	1									3	2
CO4	3	2	1	1									3	2
CO5	3	2	1	1									3	2

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

ASSESSMENT PATTERN - THEORY

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

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

18ITE11 - DEEP LEARNING

Programme & Branch	B.Tech. & Information Technology	Sem.	Category	L	T	P	Credit
Prerequisites	Machine Learning	7	PE	3	0	0	3

Preamble	This course provides an introduction to the basics of machine learning, neural networks, and Deep learning techniques. This course also helps to understand and solve few real world problems.	
Unit - I	**Overview of Machine Learning**	**9**
Learning Algorithms – Capacity, Overfitting and Underfitting – Hyperparameters and Validation Sets – Estimators, Bias and Variance – Bayeian Estimates – Maximum Likelihood Estimation – Supervised Learning Algorithms – Unsupervised Learning Algorithms – Stochastic Gradient Descent – Building a Machine Learning Algorithm – Challenges Motivating Deep Learning.		
Unit - II	**Deep Feed forward Networks**	**9**
Deep Feed forward Networks -Example: Learning XOR – Gradient-Based Learning – Hidden Units – Architecture Design – Back-Propagation and Other Differentiation Algorithms.		
Unit - III	**Regularization for Deep Learning**	**9**
Parameter Norm Penalties – Dataset Augmentation – Noise Robustness – Semi-Supervised Learning – Multi-Task Learning – Early Stopping – Parameter Tying and Parameter Sharing – Bagging and Other Ensemble Methods – Dropout – Adversarial Training.		
Unit - IV	**Convolutional Networks**	**9**
The Convolution Operation – Motivation – Pooling – Variants of the Basic Convolution Function – Structured Outputs - Efficient Convolution Algorithms - Random or Unsupervised Features. Application: Computer Vision.		
Unit - V	**Sequence Modeling - Recurrent and Recursive Nets**	**9**
Recurrent Neural Networks – Bidirectional RNNs – Encoder-Decoder Sequence-to-Sequence Architectures – Deep Recurrent Networks – Recursive Neural Networks – The Long Short-Term Memory and Other Gated RNNs. Applications: Natural Language Processing.		

Total:45

TEXT BOOK:

1. Ian Goodfellow, YoshuaBengio, and Aaron Courvill, "Deep Learning", 1 Edition, MIT Press, USA, 2016.

REFERENCES:

1. JJosh Patterson and Adam Gibsonosh Patterson and Adam Gibson, "Deep Learning – A Practitioner's Approach", 1 Edition, O'Reilly Media, 2017.
2. Indra den Bakker, "Python Deep Learning Cookbook", 1 Edition, Packt Publishing, 2017.

COURSE OUTCOMES: On completion of the course, the students will be able to		**BT Mapped (Highest Level)**
CO1	Utilize the concepts of machine learning algorithms	Applying (K3)
CO2	explain the fundamentals of deep neural networks and solve simple problems	Applying (K3)
CO3	Make use of different regularization methods for Deep learning	Applying (K3)
CO4	exemplify the concepts of CNN models and apply it for solving computer vision related problems	Applying (K3)
CO5	explicate the concepts of RNN models and apply it for solving Natural Language problems	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									3	1
CO2	3	2	1	1									3	1
CO3	3	2	1	1									3	1
CO4	3	2	1	1									3	1
CO5	3	2	1	1									3	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	20	50	30				100
CAT2	20	50	30				100
CAT3	20	50	30				100
ESE	20	50	30				100

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

18ITE12 - INFORMATION CODING TECHNIQUES

Programme & Branch	B.Tech. & Information Technology	Sem.	Category	L	T	P	Credit
Prerequisites	NIL	7	PE	3	0	0	3

Preamble	The course aims at introducing information theory and the practical aspects of data compression and error-control coding. The theoretical course is complemented by a series of computer laboratories, in which the students can use various software tools for data compression and error control coding.	
Unit - I	**Information Entropy Fundamentals**	**9**
Uncertainty, Information and Entropy – Source coding Theorem – Data Compaction – Discrete Memoryless channels – Mutual Information - Channel Capacity – Channel Coding Theorem.		
Unit - II	**Error Control Coding**	**9**
Discrete-Memory less Channels**-** Linear Block codes- Syndrome - Minimum Distance Considerations – Syndrome Decoding - Cyclic codes – Generator Polynomial – Parity Check Polynomial – Generator and Parity-Check Matrices -Encoder for Cyclic codes – Calculation of the Syndrome – Convolutional Codes: Code Tree, Trellis and State Diagram.		
Unit - III	**Text and Image Compression**	**9**
Compression Principles – Text compression: Static Huffman Coding - Dynamic Huffman coding – Arithmetic coding – LZW coding - Image Compression: Graphics Interchange format – Tagged Image File Format – Digitized documents – Digitized Pictures - JPEG Standards.		
Unit - IV	**Audio Compression**	**9**
Audio Compression: Differential Pulse code Modulation – Adaptive Differential Pulse Code Modulation – Adaptive predictive coding – Linear Predictive coding – Code-excited LPC – Perceptual coding- MPEG audio coders – Dolby audio coders.		
Unit - V	**Video Compression**	**9**
Principles: Frame types-Motion estimation and compensation-Implementation issues – H.261- H.263- MPEG :MPEG-1 - MPEG-2 - MPEG-3 - MPEG-4 video standard**s.**		

Total:45

TEXT BOOK:

1. Simon Haykins, "Communication Systems", 4 Edition, John Wiley and Sons, 2012 for Units I,II.
2. Fred Halsall, "Multimedia Communications, Applications, Networks, Protocols and Standards", 4 Edition, Pearson Education, 2009 for Units III,IV,V.

REFERENCES:

1. Ranjan Bose, "Information Theory, Coding and Cryptography", 2 Edition, Tata McGraw-Hill, India, 2008.
2. Mark S. Drew, Ze-Nian Li, "Fundamentals of Multimedia", 1 Edition, Pearson Education, 2003.
3. Mark Nelson, "Data Compression Book", 2 Edition, BPB Publication, 2004.

COURSE OUTCOMES: On completion of the course, the students will be able to		**BT Mapped (Highest Level)**
CO1	summarize the fundamentals of information coding theorems.	Understanding (K2)
CO2	study various error control coding and apply to given problem.	Applying (K3)
CO3	make use of different compression standards for image and text compression.	Applying (K3)
CO4	review the standard concepts in audio compression.	Understanding (K2)
CO5	express familiarity in video compression.	Understanding (K2)

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1											3	1
CO2	3	2	1	1									3	2
CO3	3	2	1	1									3	2
CO4	2	1											3	1
CO5	2	1											3	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	40	50	10				100
CAT2	30	30	40				100
CAT3	30	60	10				100
ESE	20	55	25				100

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

18ITE13 - DISTRIBUTED SYSTEMS

Programme & Branch	B.Tech. & Information Technology	Sem.	Category	L	T	P	Credit
Prerequisites	Operating Systems, Computer Networks	7	PE	3	0	0	3

Preamble	This course deals with the principles of internet and other distributed system. Their architecture and design challenges are also covered.	
Unit - I	**Characteristics and System Models**	**9**
Introduction – Examples – Trends – focus on resource sharing – challenges in distributed systems – case study – The World Wide Web – System models – physical – architectural and fundamental models.		
Unit - II	**Inter process communications**	**9**
Introduction – API for the Internet protocol – External data representation and Marshalling – Multicast Communication – Network Virtualization – case study: MPI. Remote Invocation: request-reply protocol – Remote Method Invocations – case study: Java RMI. Indirect Communication – Group communication – Publish-Subscribe systems – message queues and shared memory approaches.		
Unit - III	**Peer-to-peer Systems**	**9**
Introduction – Napster and its legacy – Peer-to-peer – Middleware – Routing overlays case study: Pastry. Distributed File System – file service architecture – Case Study: Andrew File System. Name Services – Name Services and DNS – directory services – case study: Global Name Service.		
Unit - IV	**Time Synchronization**	**9**
Introduction – clocks – events and process states – synchronizing physical clocks – logical time and logical clocks. Transaction and Concurrency Control – transactions – nested transactions – locks – optimistic concurrency control and timestamp ordering. Distributed transactions – flat and nested – atomic commit protocols and concurrency control.		
Unit - V	**Replication and Designing Distributed Systems**	**9**
System model and group communications – fault tolerant services – Case Study: The Gossip architecture. Distributed Multimedia Systems – Characteristics of multimedia data – Quality of service management – Resource Management – Stream Adaptation – Case Study: BitTorrent. Designing Distributed Systems: GOOGLE Case Study – architecture and design philosophy – communication paradigms – data Storage and coordination services – Distributed Computation services.		

Total:45

TEXT BOOK:

1. Coulouris. George, Dollimore, Jean and Kindberg Tim., "Distributed Systems Concepts and Design", 5 Edition, Pearson Education,2013.

REFERENCES:

1. Tanenbaum A.S., Van Steen M, "Distributed Systems: Principles and Paradigms", 2 Edition, Pearson Education, 2013.
2. Liu M.L, "Distributed Computing, Principles and Applications", Edition, Pearson Education, 2004.

COURSE OUTCOMES: On completion of the course, the students will be able to		**BT Mapped (Highest Level)**
CO1	discuss the characteristics and models of distributed system	Understanding (K2)
CO2	apply different communication models in distributed application development	Applying (K3)
CO3	Summarize and experiment with case studies of Routing overlays, File system and Name services	Applying (K3)
CO4	implement synchronization and concurrency in transactions	Applying (K3)
CO5	design fault-tolerant and multimedia distributed systems	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	1
CO2	3	2	1	1									3	2
CO3	3	2	1	1									3	2
CO4	3	2	1	1									3	2
CO5	3	2	1	1									3	2

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

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	15	60	25				100
CAT2	15	55	30				100
CAT3	15	50	35				100
ESE	15	55	30				100

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

18ITE14 - 3D MODELING AND MIXED REALITY APPLICATIONS

Programme & Branch	B.Tech. & Information Technology	Sem.	Category	L	T	P	Credit
Prerequisites	Mathematics I	7	PE	3	0	0	3

Preamble	This course imparts the basic concepts in Virtual Reality and Augmented Reality which include content creation and applications. It also provides foundations in 2D and 3D object modeling.	
Unit - I	**2D Modeling**	**9**
Two Dimensional Geometric Transformations – Basic Transformation – Matrix Representation and Homogeneous Coordinates – Composite Transformation – Other Transformations - Two Dimensional Clipping and Viewing		
Unit - II	**3D Modeling**	**9**
Three Dimensional Geometric and Modeling Transformations – Three Dimensional Viewing – Viewing Pipeline – Viewing Coordinates – Projections – Parallel Projection – Perspective Projection		
Unit - III	**Getting started with VR and AR**	**9**
Defining virtual and augmented reality – Introduction – Types of VR and AR – Exploring the current state of virtual reality - Exploring the current state of augmented reality.		
Unit - IV	**Consuming content in VR and AR**	**9**
Consuming content in VR: Exploring Consumer-Grade VR - Identifying Near-Future Hardware - Comparing Current and Future Options - Consuming Content in AR: Exploring Consumer-Grade AR - Identifying Near-Future Hardware - Comparing Current and Future Options.		
Unit - V	**Creating content in VR and AR**	**9**
Evaluating Your Project: Assessing Your Project's Technology Needs - Choosing VR - Choosing AR - Planning Your Virtual Reality Project- Planning Your Augmented Reality Project - Creating Content for Virtual and Augmented Reality: Assessing Design Software - Capturing Real Life.		

Total:45

TEXT BOOK:

1. Hearn, Donald and Baker, Pauline.M, "Computer Graphics C Version", 2 Edition, Pearson Education, 2008 for Units I,II.
2. Allen Paul Mealy, "Virtual & Augmented Reality For Dummies", 1 Edition, John Wiley & Sons, 2018 for Units III,IV,V.

REFERENCES:

1. John F. Hughes, Andries Van Dam, Morgan Mcguire, David F. Sklar, James D. Foley , Steven K. Feiner, and Kurt Akeley, "Computer Graphics: Principles & Practice", 3 Edition, Pearson Education, 2013.
2. Steve Aukstakalnis, "Practical Augmented Reality: A Guide to the Technologies, Applications, and Human Factors for AR and VR", 1 Edition, Addison Wesley, 2016.

COURSE OUTCOMES: On completion of the course, the students will be able to		**BT Mapped (Highest Level)**
CO1	manipulate 2D objects using transformation, clipping, and viewing operations	Applying (K3)
CO2	perform 3D transformations, viewing, projection and view volume	Applying (K3)
CO3	outline the current states of virtual and augmented reality	Understanding (K2)
CO4	identify different applications for consuming VR and AR contents and indicate near future hardware for VR and AR experience.	Applying (K3)
CO5	plan and develop contents for VR and AR projects	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									3	2
CO2	3	2	1	1									3	2
CO3	2	1											2	1
CO4	3	2	1	1									3	2
CO5	3	2	1	1									3	2

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

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	20	30	50				100
CAT2	20	35	45				100
CAT3	20	40	40				100
ESE	20	35	45				100

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

18ITE15 - AGILE METHODOLOGIES

Programme & Branch	B.Tech. & Information Technology	Sem.	Category	L	T	P	Credit
Prerequisites	Software Engineering	7	PE	3	0	0	3

Preamble	This course helps in learning many kinds of agile methodologies first by grounding in agile's underlying principles, then by describing four specific and well used agile methods: Scrum, Extreme Programming (XP), Lean, and Kanban	
Unit - I	**Agile Principles:**	**9**
Agile Principles: What is Agile? – Understanding the Agile Values – Silver Bullet Methodology – Agile to the Rescue – A fractured perspective - Agile Manifesto and Purpose behind each practice – Agile Elephant – Where to start with a new Methodology – 12 principles of Agile Software – The Customer is always Right – Delivering the project – Communicating and Working Together – Project Execution – Constantly improving the project and t he team – Agile Project.		
Unit - II	**Scrum and Self-Organizing Teams:**	**9**
Scrum and Self-Organizing Teams : Basic pattern for a Scrum Project – Rules of Scrum –Command-and-Control Team – Self-Organizing Teams - Scrum Values – Daily Scrum – Sprints, Planning and Retrospectives.		
Unit - III	**Scrum Planning and Collective Commitment:**	**9**
Scrum Planning and Collective Commitment: User stories – Conditions of Satisfaction – Story Points and Velocity – Burndown Charts – Planning and Running a Sprint – GASP – Scrum Values Revisited – Practices Do Work Without the Values – Company Culture Compatible with Scrum Values.		
Unit - IV	**XP and Incremental Design:**	**9**
XP and Incremental Design: Primary Practices of XP – The XP values help the team change their mindset – An effective mindset starts with the XP values – Understanding the XP principles – Feedback Loops – Code and Design – Make Code and Design Decisions at the Last Responsible Moments – Incremental Design and the Holistic XP.		
Unit - V	**Lean, Kanban and Agile Coach:**	**9**
Lean, Kanban and Agile Coach: Lean Thinking – Commitment, Options Thinking and Set Based Development – Create Heroes and Magical Thinking – Eliminate Waste – Value Stream Map – Deliver As Fast As Possible – WIP Area Chart – Pull Systems – The Principles of Kanban – Improving Your Process with Kanban – Measure and Manage Flow – Little's Law – Emergent Behavior with Kanban – The Agile Coach – Shuhari - The Principles of Coaching.		

Total:45

TEXT BOOK:

1. Andrew Stellman and Jennifer Greene, "Learning Agile: Understanding Scrum, XP, Lean and Kanban", 1 Edition, O'Reilly Media, 2015.

REFERENCES:

1. Robert C. Martin, "Agile Software Development: Principles, Patterns, and Practices", 1 Edition, Pearson Prentice Hall, 2011.
2. Eric Brechner, "Agile Project Management with Kanban", 1 Edition, Microsoft Press, 2015.

	COURSE OUTCOMES: On completion of the course, the students will be able to	**BT Mapped (Highest Level)**
CO1	apply agile's core values and principles	Applying (K3)
CO2	utilize the scrum's emphasis on project management and self-organization	Applying (K3)
CO3	experiment with practices like user stories, story points, project velocity and visualization tools	Applying (K3)
CO4	model software design and architecture with XP practices like pair programming	Applying (K3)
CO5	make use of Lean thinking to empower a team, eliminate waste, and deliver software fast and Learn how Kanban's practices help deliver great software by managing flow	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									3	2
CO2	3	2	1	1									3	2
CO3	3	2	1	1									3	2
CO4	3	2	1	1									3	2
CO5	3	2	1	1									3	2

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

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	30	46	24				100
CAT2	10	47	43				100
CAT3	27	43	30				100
ESE	20	40	40				100

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

18ITE16 - MOBILE COMPUTING

Programme & Branch	B.Tech. & Information Technology	Sem.	Category	L	T	P	Credit
Prerequisites	Computer Networks	7	PE	3	0	0	3

Preamble	This course focuses on devices and technologies that communicate voice, data and other information. It also covers 4G and 5G spectrum, communication networks and satellite communications.	
Unit - I	**Wireless communication:**	**9**
Wireless communication: Wireless transmission –Frequencies for radio transmission –Signals –Antennas –Signal Propagation –Multiplexing –Spread spectrum –cellular systems-MAC-Motivation –SDMA –FDMA –TDMA –CDMA		
Unit - II	**Telecommunications systems:**	**9**
Telecommunications systems : GSM - Mobile services -System architecture -Radio interface -Protocols -Localization and calling –Handover -Security -New data services–Satellite Systems: Basics –Routing -Localization-Handover		
Unit - III	**Wireless Networks:**	**9**
Wireless Networks: Wireless LAN - Infrared Vs Radio Transmission – Infrastructure Networks and Adhoc Networks - IEEE 802.11 –HIPERLAN: HIPERLAN1 – Bluetooth-User scenarios-Architecture		
Unit - IV	**Mobile Network and Transport Layer:**	**9**
Mobile Network and Transport Layer: Mobile IP –Dynamic Host Configuration Protocol-Mobile ad-hoc Networks – Improvement on TCP for mobile and wireless network - TCP over 2.5/3G/4G/5G wireless networks		
Unit - V	**Mobile Platforms and Application Layer:**	**9**
Mobile Platforms and Application Layer: WAP-Architecture-Wireless application environment–Mobile Device Operating Systems: Special constraints and Requirements-Commercial mobile Operating System: Windows Mobile, Palm OS, iOS,Android, BlackBerry		

Total:45

TEXT BOOK:

1. Schiller J, "Mobile Communication", 2 Edition, Pearson Education, India,2014.

REFERENCES:

1. Asoke K Talukder, HasanAhmed, Roopa R Yavagal, "Mobile Computing Technology, applications and Service Creation", 2 Edition, McGraw-Hill Education , 2018.
2. Raj Kamal, "Mobile Computing", 3 Edition, oxford university press Inc., 2019.

COURSE OUTCOMES: On completion of the course, the students will be able to		**BT Mapped (Highest Level)**
CO1	identify the fundamental concepts in wireless transmission and implementation of CDMA technique	Applying (K3)
CO2	identify the working principles of telecommunication and satellite systems	Applying (K3)
CO3	Make use of Wireless LAN and Bluetooth environments	Applying (K3))
CO4	identify the concepts and issues in the DHCP , mobile TCP/IP techniques , 4G and 5G services	Applying (K3)
CO5	Make use of architecture of WAP and commercial mobile operating systems and their features	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									3	2
CO2	3	2	1	1									3	2
CO3	3	2	1	1									3	2
CO4	3	2	1	1									3	2
CO5	3	2	1	1									3	2
1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy														

ASSESSMENT PATTERN - THEORY							
Test / Bloom's Category*	**Remembering (K1) %**	**Understanding (K2) %**	**Applying (K3) %**	**Analyzing (K4) %**	**Evaluating (K5) %**	**Creating (K6) %**	**Total %**
CAT1	20	60	20				100
CAT2	20	70	10				100
CAT3	20	70	10				100
ESE	20	70	10				100

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

18ITE17 - BIG DATA ANALYTICS

Programme & Branch	B.Tech. & Information Technology	Sem.	Category	L	T	P	Credit
Prerequisites	Database Management Systems	7	PE	3	0	0	3

Preamble	This course provides basic knowledge about Big data, its framework, storage in databases and Stream processing with SPARK and KAFKA	
Unit - I	**Big data**	9
Introduction - Types of Digital Data – characteristics – evolution – definition – challenges – Big Data – Big Data Analytics – importance – data science – terminologies used in Big Data environments– Analytics Tools		
Unit - II	**Hadoop**	9
Hadoop Introduction – RDBMS Vs Hadoop – Distributed computing challenges – Hadoop Overview – HDFS – Processing data with Hadoop – Interacting with Hadoop Ecosystem. Introduction to MapReduce Programming- Mapper– Reducer– Combiner – Partitioner– Searching - Sorting - Compression.		
Unit - III	**MongoDB and Cassandra**	9
Introduction to MongoDB – Terms used in MongoDB– Data types in MongoDB – MongoDB Query Language. Introduction to Cassandra – Features of Cassandra – CQL Data types – CQLSH– CRUD operations – Collections – Alter commands – Import and Export – Querying System tables		
Unit - IV	**HIVE and PIG**	9
Introduction to Hive – Architecture – Data types – File format – Hive Query Language – RCFile implementation. Introduction to Pig – Pig on Hadoop – Data types – Running Pig – Execution modes of Pig – HDFS commands – Relational Operators –Eval function – Complex Data types.		
Unit - V	**Apache SPARK and KAFKA**	9
Stream processing with SPARK: Introduction – SPARK architecture- SPARK Eco system – SPARK for Big Data Processing – SPARK applications – Apache KAFKA – KAFKA Architecture – Use cases.		

Total:45

TEXT BOOK:

1. Seema Acharya and SubhashiniChellappan, "Big Data and Analytics", 2 Edition, Wiley, 2019 for Units I,II,III,IV.
2. Dr.Anil Maheshwari, “Big Data”, 1st Edition, McGraw Hill Education, 2017 for Unit V.

REFERENCES:

1. EMC Education Services, "Data science and Big data Analytics: Discovering, Analyzing, Visualizing and Presenting Data", Edition, John Wiley and Sons, 2015.

COURSE OUTCOMES: On completion of the course, the students will be able to		**BT Mapped (Highest Level)**
CO1	apply the concepts and characteristics of big data	Applying (K3)
CO2	make use of MapReduce programs in Hadoop framework	Applying (K3)
CO3	utilize MongoDB and Cassandra to solve real world problems	Applying (K3)
CO4	develop solutions for big data problems using Hive and Pig	Applying (K3)
CO5	identify the need for stream processing and discuss Spark and Kafka architecture.	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									3	2
CO2	3	2	1	1									3	2
CO3	3	2	1	1									3	2
CO4	3	2	1	1									3	2
CO5	3	2	1	1									3	2

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

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	25	50	25				100
CAT2	20	20	60				100
CAT3	25	50	25				100
ESE	25	30	45				100

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

18ITE18 - INFORMATION RETRIEVAL TECHNIQUES

Programme & Branch	B.Tech. & Information Technology	Sem.	Category	L	T	P	Credit
Prerequisites	Database Management Systems	7	PE	3	0	0	3

Preamble	This course provides basic knowledge about information retrieval system and various modelling techniques for different kinds of data.	
Unit - I	**Introduction and Modeling:**	**9**
Introduction and Modeling: Information Retrieval –The IR Problem –The IR System –Modeling: Classic Information Retrieval –Set Theoretic, Algebraic and Probabilistic Models –Retrieval Evaluation.		
Unit - II	**Relevance Feedback and Documents:**	**9**
Relevance Feedback and Documents: A Framework for feedback methods-Explicit feedback-Implicit feedback through local analysis-Global analysis-Documents: Metadata-Document Formats-Text Properties-Document Preprocessing-Organizing documents-Text Compression.		
Unit - III	**Queries, Indexing and Searching**	**9**
Queries, Indexing and Searching: Query Languages-Query Properties-Indexing and Searching: Introduction-Inverted Indexes –Signature Files –Suffix Trees and Suffix Arrays-Sequential Searching –Multidimensional Indexing		
Unit - IV	**Web Retrieval and Web Crawling**	**9**
Web Retrieval and Web Crawling: Introduction-The Web-Search Engine Architectures-Ranking-User Interaction-Browsing-Web Crawling.		
Unit - V	**Structure Text and Multimedia Information Retrieval**	**9**
Structure Text and Multimedia Information Retrieval: Structured Text Retrieval-Multimedia Information Retrieval-Enterprise Search-Tasks-Architecture-Evaluation.		

Total:45

TEXT BOOK:

1. Ricardo Baeza-Yate, Berthier Ribeiro-Neto, "Modern Information Retrieval", 2 Edition, Pearson Education, 2011.

REFERENCES:

1. Chowdhury G.G, "Introduction to Modern Information Retrieval", 2 Edition, Neal-Schuman Publishers, 2003.
2. Daniel Jurafsky and James H. Martin, "Speech and Language Processing", 2 Edition, Prentice Hall, 2008.

COURSE OUTCOMES: On completion of the course, the students will be able to		**BT Mapped (Highest Level)**
CO1	apply the basic concepts of information retrieval	Applying (K3)
CO2	identify the principles of relevance feed back	Applying (K3)
CO3	solve the different indexing and searching mechanisms	Applying (K3)
CO4	utilize information from complex data types	Applying (K3)
CO5	build steps to develop search engines and evaluate them	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									3	2
CO2	3	2	1	1									3	2
CO3	3	2	1	1									3	2
CO4	3	2	1	1									3	2
CO5	3	2	1	1									3	2

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

ASSESSMENT PATTERN - THEORY

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

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

18ITE19 - SERVICE ORIENTED ARCHITECTURE

Programme & Branch	B.Tech. & Information Technology	Sem.	Category	L	T	P	Credit
Prerequisites	Web Technology	7	PE	3	0	0	3

Preamble	This course provides XML based applications using service oriented technologies. Also it deals with a more productive, standards based approach for delivering cost effective business functions.	
Unit - I	**Fundamentals**	**9**
Fundamentals: Software architecture –Types of IT architecture –SOA –Evolution –Key components –Perspective of SOA –Enterprise wide SOA –Strawman Architecture –Enterprise applications –Solution architecture for enterprise application –Software platforms for enterprise applications –Service Oriented Enterprise Applications - Patterns for SOA –SOA programming models.		
Unit - II	**Service Oriented Analysis and Design**	**9**
Service Oriented Analysis and Design: Service -oriented analysis and design –Design of activity, data, client and business process services.		
Unit - III	**SOA Technologies**	**9**
SOA Technologies: SOA –SOAP –WSDL –JAXWS –XML WS for .NET –Service integration with ESB –Scenario –Business case for SOA -Stakeholder objectives –benefits of SOA –Cost savings		
Unit - IV	**SOA Implementation and Cloud Computing**	**9**
SOA Implementation and Cloud Computing: SOA implementation and governance –Strategy – SOA development –SOA governance – Trends in SOA –Event-driven architecture –Software as a service – Cloud Computing Concepts-SOA with Cloud Services-SOA Best Practices		
Unit - V	**XML and Security**	**9**
XML and Security: Meta data management – Web services security –XML signature –XML encryption –SAML –XACML –XKMS –WS-Security –Security in web service framework -Advanced messaging -Transaction Processing –Paradigm –Protocols and coordination – Transaction specifications –SOA in mobile –Research issues.		

Total:45

TEXT BOOK:

1. Shankar Kambhampaty, "Service – Oriented Architecture for Enterprise and Cloud Applications", 2 Edition, Wiley , 2014 for Units I,II,III,IV.
2. Eric Newcomer and Greg Lomow, "Understanding SOA with Web Services", 1 Edition, Pearson Education, 2005 for Unit V.

REFERENCES:

1. Thomas Erl , "Service Oriented Architecture : Concepts, Technology, and Design", 1 Edition, Prentice Hall, 2005.
2. Michael P. Papazoglou, "Web Services and SOA: Principles and Technology", 2 Edition, Pearson Education, 2011.

COURSE OUTCOMES: On completion of the course, the students will be able to		**BT Mapped (Highest Level)**
CO1	apply the fundamental concepts of SOA	Applying (K3)
CO2	interpret the service oriented analysis and design	Applying (K3)
CO3	demonstrate different SOA Technologies	Applying (K3)
CO4	make use of the principles of SOA implementation and governance	Applying (K3)
CO5	employ the XML support and security features for SOA	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									3	2
CO2	3	2	1	1									3	2
CO3	3	2	1	1									3	2
CO4	3	2	1	1									3	2
CO5	3	2	1	1									3	2

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

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	25	50	25				100
CAT2	25	50	25				100
CAT3	20	55	25				100
ESE	20	50	30				100

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

18ITE20 - BUILDING ENTERPRISE APPLICATIONS

Programme & Branch	B.Tech. & Information Technology	Sem.	Category	L	T	P	Credit
Prerequisites	Object Oriented Programming	7	PE	3	0	0	3

Preamble	This course provides knowledge on design and develops high quality enterprise applications.	
Unit - I	**Analysis and Modeling**	**9**
Introduction to enterprise applications and their types - Software engineering methodologies - Life cycle of raising an enterprise application - Introduction to skills required to build an enterprise application - Key determinants of successful enterprise applications - Measuring the success of enterprise applications. Inception of enterprise applications: Enterprise analysis- business modeling- requirements elicitation and analysis-requirements validation- planning and estimation.		
Unit - II	**Architecture and Designing**	**9**
Architecture,view and view points-Enterprise application architecture perspective - Logical architecture - Technical architecture and Design- - Data architecture and design		
Unit - III	**Architectural Design**	**9**
Infrastructure architecture and design-Documentation: system architecture documentation - design documentation		
Unit - IV	**Construction**	**9**
Construction readiness of enterprise applications: defining a construction plan- defining a package structure- setting up a configuration management plan- setting up a development environment-introduction to the concept of Software Construction Maps-constructing the solution layers- code review-static code analysis-build and testing-Dynamic code analysis.		
Unit - V	**Testing and Rolling out Enterprise Applications:**	**9**
Testing enterprise applications – enterprise application environments-integration testing-system testing-user acceptance testing-rolling out enterprise application		

Total:45

TEXT BOOK:

1. AnubhavPradhan, Satheesha B. Nanjappa, Senthil K. Nallasamy, VeerakumarEsakimuthu, "Raising Enterprise Applications", 1 Edition, Wiley India Pvt. Ltd, 2010.

REFERENCES:

1. Brian Berenbach, Daniel J. Paulish, Juergen Kazmeier, Arnold Rudorfer, "Software Systems Requirements and Engineering: In Practice", 1 Edition, McGraw-Hill Education, 2009.
2. Srinivasan Desikan, Gopalaswamy Ramesh, "Software Testing Principles and Practices ", 1 Edition, Pearson Education, 2006.

COURSE OUTCOMES: On completion of the course, the students will be able to		BT Mapped (Highest Level)
CO1	identify challenges in building an enterprise application and build a business model	Applying(K3)
CO2	build a logical ,technical and data architecture of an application	Applying(K3)
CO3	design infrastructure architecture of an application and document key elements of architecure	Applying(K3)
CO4	construct application framework components and perform code review and analysis	Applying(K3)
CO5	apply various testing methods and rolling out an enterprise 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	3	2	1	1									3	2
CO2	3	2	1	1									3	2
CO3	3	2	1	1									3	2
CO4	3	2	1	1									3	2
CO5	3	2	1	1									3	2

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

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	20	40	40				100
CAT2	20	40	40				100
CAT3	20	50	30				100
ESE	20	45	35				100

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

18ITE21 - SOFTWARE DEFINED NETWORKS

Programme & Branch	B.Tech. & Information Technology	Sem.	Category	L	T	P	Credit
Prerequisites	Computer Networks	7	PE	3	0	0	3

Preamble	To learn about Software Defined Networking and its use cases in various environment.	
Unit - I	**Introduction to SDN:**	**9**
Introduction to SDN: Basic packet switching terminology – The modern data center – Traditional switch architecture – Autonomous and dynamic forwarding table. Why SDN?: Evolution of switches and control planes – Cost-Data center innovation – Data center needs. The Genesis of SDN: The evolution of networking technology – Forerunners of SDN – Getting started with mininet and experimenting with mininet.		
Unit - II	**SDN and OpenFlow:**	**9**
SDN and OpenFlow: How SDN works: Fundamental characteristics of SDN – SDN operation – SDN devices – SDN controllers – Alternate SDN methods. The OpenFlow specification: OpenFlow overview – OpenFlow 1.0 and OpenFlow basics – OpenFlow 1.1 Additions – OpenFlow 1.2 Additions – OpenFlow 1.3 Additions – OpenFlow Limitations- NetApp Development: Simple forwarding in OpenDayLight controller.		
Unit - III	**SDN Interfaces:**	**9**
SDN Interfaces: Alternative definitions of SDN: Potential drawbacks of open SDN – SDN via APIs – SDN via hypervisor based overlays – SDN via opening up the device – Network Functions virtualization – Alternatives overlap and ranking. SDN open source: Open source licensing issues – OpenFlow source code – Switch implementation – Controller implementations – Orchestration and Network virtualization – Simulation, Testing and Tools – OpenStack – Applying SDN open source.		
Unit - IV	**SDN in data center:**	**9**
SDN in data center: Data center definition – Data center demands – Tunneling technologies for the data center- Path technologies in the data center – SDN and shortest path complexity – Ethernet fabrics in the data center – SDN use cases in the data center – Open SDN versus Overlays in the data center – Real-world data center implementation.		
Unit - V	**SDN environments and applications:**	**9**
SDN environments and applications: SDN in other environment: Wide area networks – Service provider and carrier networks – Campus networks – Hospitality networks – Mobile networks – In-Line network functions – Optical networks. SDN Applications: Reactive versus Proactive applications – A simple reactive Java application – Creating network virtualization tunnels – offloading flows in the data center – Access control for the campus – Traffic engineering for the service providers- NetApp Development: A simple Firewall.		

Total:45

TEXT BOOK:

1. Paul Goransson and Chuck Black, "Software Defined Networks: A Comprehensive Approach", 1 Edition, Morgan Kaufmann, 2014.

REFERENCES:

1. Siamak Azodolmolky, "Software Defined Networking with OpenFlow", 1 Edition, Packet Publishing, 2013.
2. Thomas D. Nadeau, Ken Gray, "SDN: Software Defined Networks", 1 Edition, O'Reilly Media, 2013.

COURSE OUTCOMES: On completion of the course, the students will be able to		**BT Mapped (Highest Level)**
CO1	identify the difference between traditional networks and software defined networks	Applying (K3)
CO2	model a networking task using OpenFlow	Applying (K3)
CO3	make use of SDN APIs and open source tools	Applying (K3)
CO4	identify the need of SDN in the data center	Applying (K3)
CO5	develop various applications of SDN	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									3	2
CO2	3	2	1	1									3	2
CO3	3	2	1	1									3	2
CO4	3	2	1	1									3	2
CO5	3	2	1	1									3	2

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

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	20	35	45				100
CAT2	20	40	40				100
CAT3	10	30	60				100
ESE	20	30	50				100

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

18ITE22 - CYBER FORENSICS

Programme & Branch	B.Tech. & Information Technology	Sem.	Category	L	T	P	Credit
Prerequisites	Cryptography and Network Security	7	PE	3	0	0	3

Preamble	This course imparts knowledge on fundamental principles and techniques for digital forensics investigation and security management.	
Unit - I	**Computer Investigations:**	**9**
Computer Investigations: Preparing a Computer investigation – Taking a systematic approach –Assessing the case – Planning Investigation – Securing evidence– Procedures for Corporate High – Tech investigations – Conducting an Investigation – Completing the case.		
Unit - II	**Data Acquisition:**	**9**
Data Acquisition: Understanding storage formats for digital evidence – Determining the best acquisition method - Contingency planning for image acquisitions – Using Acquisition tools: Windows XP Write-protection with USB Devices – Validating Data Acquisitions: Windows Validation Methods – Performing RAID Data Acquisitions – Using Remote Network Acquisition tools – Using other Forensics Acquisition tools.		
Unit - III	**Processing Crime and Incident Scenes:**	**9**
Processing Crime and Incident Scenes: Identifying Digital Evidence – Collecting Evidence in Private Sector Incident Scenes – Processing Law Enforcement Crime Scenes – Preparing for a Search –Securing a Computer Incident or Crime Scene –Seizing Digital Evidence at the Scene –Storing Digital Evidence –Obtaining a Digital Hash –Reviewing a Case.		
Unit - IV	**Computer Forensic Tools, Analysis and Validation:**	**9**
Computer Forensic Tools, Analysis and Validation: Evaluating Computer Forensics Tool Needs -Computer Forensics Software Tools – Computer Forensics Hardware Tools –Validating and Testing Forensic Software - Computer Forensics Analysis and Validation: Determining Data Collection and Analysis –Validating Forensic Data –Addressing Data-Hiding Techniques –Performing Remote Acquisitions.		
Unit - V	**Recovering Graph Files, Email Investigations:**	**9**
Recovering Graph Files, Email Investigations: Recognizing Graph File- Understanding Data Compression- Locating And Recovering Graphic Files- Identifying Un known File Formats- Understanding Copyright Issues- Investigating Email Crimes And Violations- Understanding Email Servers- Using Specialized Email Forensic Tools.		

Total:45

TEXT BOOK:

1. Nelson Bill, Phillips Amelia and Steuart Christopher, "Guide to Computer Forensics and Investigations", 4 Edition, Cengage Learning, 2017.

REFERENCES:

1. Marie-Helen Mara, "Computer Forensics", 2 Edition, Jones and Bartlett Learning, 2015.
2. Albert Marcella Jr, "Cyber Forensics", 2 Edition, Auerbach Publications , 2007.

COURSE OUTCOMES: On completion of the course, the students will be able to		**BT Mapped (Highest Level)**
CO1	apply digital forensic investigation with a systematic approach	Applying (K3)
CO2	make use of various tools for data acquisition	Applying (K3)
CO3	Identify the digital evidence in a crime scene	Applying (K3)
CO4	apply forensic tools in forensic examination	Applying (K3)
CO5	build the recovery of graph files and investigating E-mail crimes	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									3	2
CO2	3	2	1	1									3	2
CO3	3	2	1	1									3	2
CO4	3	2	1	1									3	2
CO5	3	2	1	1									3	2

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

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	25	50	25				100
CAT2	25	50	25				100
CAT3	25	50	25				100
ESE	20	50	30				100

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

18ITE23 - DATA VISUALIZATION TECHNIQUES

Programme & Branch	B.Tech. & Information Technology	Sem.	Category	L	T	P	Credit
Prerequisites	Database Management Systems	7	PE	3	0	0	3

Preamble	This course provides the opportunity to learn skills and content to practice and engage in scalable pattern discovery methods and display methods on massive transactional data.	
Unit - I	**Introduction:**	**9**
Introduction: Visualization – visualization process – role of cognition – Pseudocode conventions – Scatter plot - Data foundation : Types of data - Structure within and between records - Data preprocessing – Human perceptions and information processing – Visualization foundations.		
Unit - II	**Spatial and Geospatial, Time oriented data and Multivariate data:**	**9**
Spatial and Geospatial, Time oriented data and Multivariate data: one, two, three dimensional data – Dynamic data – Combining techniques- Visualization of spatial data - Visualization of point data - Visualization of line data - Visualization of area data - Issues in Geospatial data Visualization –Characterizing and visualizing Time oriented data- Point, Line ad region based techniques for multivariate data.		
Unit - III	**Tree, Graph, Networks, Text and Document:**	**9**
Tree, Graph, Networks, Text and Document: Displaying hierarchical structure – Displaying Arbitrary Graphs/Networks – Other issues. Visualization techniques for Tree- Graph and Networks - Levels of text representation – Vector space model – Single Document Visualization – Document collection visualization- Extended text visualization.		
Unit - IV	**Designing Effective Visualization:**	**9**
Designing Effective Visualization: Steps in Designing Visualization – problems in Designing Effective Visualization – Comparing and evaluating visualization techniques – Visualization Systems.		
Unit - V	**Information Dashboard Design:**	**9**
Information Dashboard Design: Characteristics of dashboards – Key goals in visual design process – Dashboard display media – Designing dashboards for usability – Meaningful organization – Maintaining consistency – Aesthetics of dashboards – Testing for usability – Case Studies: Sales dashboard, Marketing analysis dashboard.		

Total:45

TEXT BOOK:

1. Matthew O. Ward. , Georges Grinstein and Daniel Keim, "Interactive Data Visualization: Foundations, Techniques, and Applications", 2 Edition, CRC Press, 2015 for Units I,II,III,IV.
2. Stephen Few, "Information Dashboard Design: The Effective Visual Communication of Data", 1 Edition, O'Reilly Media, 2006 for Unit V.

REFERENCES:

1. Stephen Few, "Now you see it: Simple Visualization Techniques for Quantitative Analysis", 7 Edition, Analytics Press, 2009.
2. Ben Fry, "Visualizing data: Exploring and explaining data with the processing environment", 1 Edition, O'Reilly Media, 2008.

COURSE OUTCOMES: On completion of the course, the students will be able to		**BT Mapped (Highest Level)**
CO1	interpret principles of visual perception	Applying (K3)
CO2	apply visualization techniques for various data analysis tasks – numerical data	Applying (K3)
CO3	apply visualization techniques for the applications using unstructured data	Applying (K3)
CO4	demonstrate effective visualization techniques for different problems	Applying (K3)
CO5	employ information dashboard for Sales and marketing analysis	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									3	2
CO2	3	2	1	1									3	2
CO3	3	2	1	1									3	2
CO4	3	2	1	1									3	2
CO5	3	2	1	1									3	2

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

ASSESSMENT PATTERN - THEORY

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

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

18ITE24 - DISASTER MANAGEMENT ON INFORMATION TECHNOLOGY

Programme & Branch	B.Tech. & Information Technology	Sem.	Category	L	T	P	Credit
Prerequisites	NIL	7	PE	3	0	0	3

Preamble	This course introduces the concept of Business Continuity Process and Recovery from a natural or manmade disaster. It also discusses various aspects like risk evaluation, strategies, awareness and training programmes on business continuity	
Unit - I	**Introduction:**	**9**
Introduction: Vulnerability of today's business organizations-Disaster - Classification of Disasters-Direct impact: unavailability and loss of information-Alternative Business operations –Loss of information-Indirect impact-rippling effects of business operations-Long Term Impact –Image-Market Position-Growth or decline -Risk management – Building Continuity- Rebuilding the Infrastructure-Resumption of Business activities-Business Continuity planning Strategy		
Unit - II	**Multilateral Continuity Planning:**	**9**
Multilateral Continuity Planning: Multilateral continuity planning-MCP approach-Project success factors-Benefits of multilateral continuity planning-Marketing protection: a justification for funding of total asset protection programme-Total asset protection-Brand value-Operational risk management-Senior management arrangements, systems and controls-Understanding the organization's business-Business strategy and business continuity planning-BCP within a business strategic context		
Unit - III	**Business Continuity Planning:**	**9**
Business Continuity Planning: The business continuity planning methodology - The business continuity management lifecycle-BCM programme management-Understanding the organization - A practical approach-Risk evaluation and control:practical guidelines for risk assessment-Risk evaluation and control-Business impact analysis-A walk through a comprehensive BIA-Developing business continuity strategies for the business or work areas-Business/work area recovery-Types of contingencies-Vital records and paper documentation issues-Salvage considerations		
Unit - IV	**Developing Business Continuity Strategies:**	**9**
Developing Business Continuity Strategies Business continuity for telecommunications-Business continuity strategies-General strategies-Hardware strategies-Software strategies- Network service strategies-offsite storages and facility strategies-Call centre Strategies-Strategies for communications products and services -Understanding the business information flow-Vulnerability assessment-Business challenges-Marketplace trends-Planning to recover your data – Availability-Tape backup – Disk-to-disk-High availability-WAN availability-Virtualization		
Unit - V	**Awareness and training:**	**9**
Awareness and training-Establish BC policy-Acquiring or developing training aids-Awareness through maintenance, review, audit and testing-BC plan testing – Overview – Testing – Maintenance-BC audit-Audit objective-Determining the maturity level of the organization-Defining the audit programme-Audit planning – Fieldwork-Analysis		

Total:45

TEXT BOOK:

1. Andrew Hiles, "The Definitive Handbook of Business Continuity Management", 2 Edition, John Wiley& Sons, 2007.

REFERENCES:

1. Snedaker, Susan, "Business continuity & disaster recovery planning for IT professionals", 2 Edition, Syngress , 2013.

COURSE OUTCOMES: On completion of the course, the students will be able to		**BT Mapped (Highest Level)**
CO1	recognize the significance of Business Continuity Planning in the event of a disaster	Understanding (K2)
CO2	explain multilateral continuity planning and describe organization's business process and Strategy	Understanding (K2)
CO3	illustrate risk evaluation and control guidelines for risk assessment	Applying (K3)
CO4	choose appropriate Business continuity strategies for telecommunications and IT	Applying (K3)
CO5	discuss the importance of training, testing and auditing in Business continuity planning	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	1
CO2	2	1											2	1
CO3	3	2	1	1									3	2
CO4	3	2	1	1									3	2
CO5	2	1											2	1

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

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	15	85					100
CAT2	10	30	60				100
CAT3	20	40	40				100
ESE	15	50	35				100

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

18GEE01 - FUNDAMENTALS OF RESEARCH

Programme & Branch	All BE/BTech branches	Sem.	Category	L	T	P	Credit
Prerequisites	NIL	7	PE	3	0	0	3

Preamble	This course familiarize the fundamental concepts/techniques adopted in research, problem formulation and also disseminate the process involved in collection, consolidation of published literature and rewriting them in a presentable form using latest tools.	
Unit - I	**Introduction to Research**	**9**
Introduction to Research: Types and Process of Research - Outcome of Research - Sources of Research Problem - Characteristics of a Good Research Problem - Errors in Selecting a Research Problem - Importance of Keywords.		
Unit - II	**Literature Review**	**9**
Literature Review: Literature Collection - Methods - Analysis - Citation Study - Gap Analysis - Problem Formulation Techniques.		
Unit - III	**Research Methodology**	**9**
Research Methodology: Appropriate Choice of Algorithms/Methodologies/Methods - Measurement and Result Analysis - Investigation of Solutions for Research Problem - Interpretation - Research Limitations.		
Unit - IV	**Journals and Papers:**	**9**
Journals and Papers: Journals in Science/Engineering - Indexing and Impact factor of Journals. Plagiarism and Research Ethics. Types of Research Papers - Original Article/Review Paper/Short Communication/Case Study.		
Unit - V	**Reports and Presentations**	**9**
Reports and Presentations: How to Write a Report - Language and Style - Format of Project Report - Title Page - Abstract - Table of Contents - Headings and Sub-Headings - Footnotes - Tables and Figures - Appendix - Bibliography etc - Different Reference Formats. Presentation using PPTs. Research Tools.		

Total: 45

TEXT BOOK:

1. Walliman, Nicholas. “Research Methods: The basics”. Routledge, 2017.

REFERENCES:

1. Melville S, Goddard W. “Research Methodology: An Introduction For Science and Engineering Students”. Kenwyn: Juta & Co Ltd., 1996.
2. Kumar, Ranjit. “Research Methodology: A step-by-step guide for beginners”. SAGE Publications Limited, 2019.

COURSE OUTCOMES: On completion of the course, the students will be able to		**BT Mapped (Highest Level)**
CO1	list the various stages in research and categorize the quality of journals.	Analyzing (K4)
CO2	formulate a research problem from published literature/journal papers	Evaluating (K5)
CO3	write, present a journal paper/ project report in proper format	Creating (K6)
CO4	select suitable journal and submit a research paper.	Applying (K3)
CO5	compile a research report and the presentation	Applying (K3)

Mapping of COs with POs and PSOs

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

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

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1		40	35	25			100
CAT2		30	40	30			100
CAT3				50	50		100
ESE		25	25	25	25		100

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

18MBE49 - ENTREPRENEURSHIP DEVELOPMENT

(Common to All BE/BTech Engineering and Technology Branches)

Programme & Branch	All BE/BTech branches	Sem.	Category	L	T	P	Credit
Prerequisites	Engineering Economics and Management	8	EC	3	0	0	3

Preamble	The purpose of this course to create entrepreneurial awareness among engineering students.	
Unit - I	**Entrepreneurship Concepts:**	**9**
Entrepreneurship & Entrepreneur- Role in Economic Development - Factors affecting Entrepreneurship- Creativity and Innovation - Entrepreneurship vs Intrapreneurship- Entrepreneurial Motivation factors – Types of Entrepreneurship &Entrepreneurs - Characteristics of Entrepreneurs -Entrepreneurship Development in India		
Unit - II	**Entrepreneurial Ventures and Opportunity Assessment:**	**9**
New venture creation – Bootstrapping,Minipreneurship, Start-ups, Acquiring, Franchising & Social venturing - Venture development stages - Models of market opportunity- Opportunity assessment: Critical Factors In Opportunity Assessment, Idea vs Opportunity, Evaluation process, Global opportunities for entrepreneurs.		
Unit - III	**Business Plan:**	**9**
Designing Business Model- Business Model Canvas- Objectives of a Business Plan - Business Planning Process – Structure of a Business Plan – Technical, Marketing, Financial Feasibility assessment - Competitive analysis - Common errors in Business Plan formulation - Presentation of the Business Plan: The 'Pitch'- case studies		
Unit - IV	**Financing and Accounting:**	**9**
Forms of entrepreneurial capital – Sources of Financial capital: debt financing- Commercial banks and other sources, equity financing: Initial Public offering (IPO), Private placement - Venture capitalists - Angel investors-New forms of financing: Impact investors, Micro-financing, Peer-to-Peer Lending, Crowd funding - Natural capital. Preparing Financial Budget, Break even analysis, Taxation-Direct and indirect taxes, Insolvency and Bankruptcy.		
Unit - V	**Small Business Management:**	**9**
Definition of Small Scale Industries: Strengths and Weaknesses, Sickness in Small Enterprises: Symptoms -Causes and remedies-Indian Startup Ecosystem – Institutions supporting small business enterprises, Business Incubators – Government Policy for Small Scale Enterprises - Growth Strategies in small industry – Expansion, Diversification, Joint Venture, Merger, FDI and Sub-Contracting		

Total:45

TEXT BOOK:

1. Donald F. Kuratko, "Entrepreneurship: Theory, Process, Practice", 11th Edition, Cengage Learning, Boston, 2020.

REFERENCES:

1. Robert D. Hisrich, Michael P. Peters & Dean A. Shepherd, Sabyasachi Sinha, "Entrepreneurship", 11th Edition, McGraw Hill, Noida, 2020.
2. Charantimath Poornima M., "Entrepreneurship Development and Small Business Enterprises", 3rd Edition, Pearson Education, Noida, 2018.
3. Gordon E. & Natarajan K., "Entrepreneurship Development", 6th Edition, Himalaya Publishing House, Mumbai, 2017.

COURSE OUTCOMES: On completion of the course, the students will be able to		**BT Mapped (Highest Level)**
CO1	understand the importance of entrepreneurship and demonstrate the traits of an entrepreneur	Applying (K3)
CO2	identify suitable entrepreneurial ventures and business opportunity	Applying (K3)
CO3	assess the components of business plan	Analyzing (K4)
CO4	appraise the sources of finance and interpret accounting statements	Applying (K3)
CO5	interpret the causes of sickness of small scale enterprises and its remedies	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	2	1	1		3	2		1
CO2	1	2	2	2		2	2	1	1		3	2		2
CO3	2	2	2	2	2	2	2	2	2	2	3	2		1
CO4	1	1	2	1		2	1	1	1	2	3	2		1
CO5	1	1	2	1		2	1	1	1	2	3	2		1

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

ASSESSMENT PATTERN - THEORY

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

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

18ITE25 - PARALLEL COMPUTING ARCHITECTURE AND PROGRAMMING

Programme & Branch	B.Tech. & Information Technology	Sem.	Category	L	T	P	Credit
Prerequisites	Computer Organisation	8	PE	3	0	0	3

Preamble	This course deals with parallel computer architectures and methods for parallel algorithm development. Several standard algorithmic strategies are considered for parallelization and analyzed for efficiency. OpenMP and MPI techniques are discussed for the implementation of parallel algorithms	
Unit - I	**Parallel Architectures:**	**9**
Parallel Architectures: Modern scientific method – Evolution of supercomputing – Modern parallel computers – Seeking concurrency – Data clustering – Programming Parallel computers. Parallel Architectures: Introduction – Interconnection networks – Processor Arrays – Multiprocessors – Multicomputer – Flynn's Taxonomy.		
Unit - II	**Parallel Algorithm Design and Message-Passing Programming:**	**9**
Parallel Algorithm Design: Introduction – Task/Channel model – Foster's Design methodology – Boundary value problem – finding the maximum – The n-Body problem – Adding data input. Message-Passing Programming: Message-passing model – Message-passing interface – Circuit satisfiability – Introducing collective communication – Benchmarking parallel performance.		
Unit - III	**The Sieve of Eratosthenes and Floyd's Algorithm:**	**9**
The Sieve of Eratosthenes: Sequential algorithm, Sources of parallelism – Data Decomposition options – Developing the parallel algorithm – Analysis of parallel Sieve algorithm – documenting the parallel program. Floyd's Algorithm: The All-Pairs shortest path problem – Creating arrays at run time – Designing the parallel algorithm – Point-to-point communication – Documenting the Parallel program.		
Unit - IV	**Performance Analysis and Sorting:**	**9**
Performance Analysis: Speedup and efficiency – Amdhal's Law – Gustafsan-Barsis's Law – The Karp-Flatt Metric – The Isoefficiency Metric. Sorting: Quick sort – A parallel quick sort – Hyper quick sort – parallel sorting by regular sampling		
Unit - V	**Shared-Memory Programming and Combining MPI and OPenMP:**	**9**
Shared-Memory Programming: The Shared-memory model – Parallel for loops – Declaring private variables – Critical sections – Reductions – Performance Improvement – More general data parallelism – Functional parallelism. Combining MPI and OPenMP: Conjugate – Jacobi method.		

Total:45

TEXT BOOK:

1. Michael J. Quinn, "Parallel Programming in C with MPI and OpenMP", 1 Edition, McGraw Hill Education, 2013.

REFERENCES:

1. David E. Culler, Jaswinder Pal Singh, "Parallel Computing Architecture: A Hardware/ Software Approach", 1 Edition, Morgan Kaufmann, 2013.
2. Munshi Aaftab,Gaster R. Benedict, "OpenCL Programming Guide", 1 Edition, Addision-Wesley, 2011.

COURSE OUTCOMES: On completion of the course, the students will be able to		**BT Mapped (Highest Level)**
CO1	outline the fundamental concepts in modern parallel computers and thier architectures	Understanding (K2)
CO2	design parallel algorithms and message passing interface methods	Applying (K3)
CO3	develop parallel algorithms for Sieve and Floyd's algorithms	Applying (K3)
CO4	demonstrate the efficacy of parallel algorithms on several sorting algorithms	Applying (K3)
CO5	utilize OpenMP and MPI for developing shared memory programming 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	1
CO2	3	2	1	1									3	2
CO3	3	2	1	1									3	2
CO4	3	2	1	1									3	2
CO5	3	2	1	1									3	2

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

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	25	50	25				100
CAT2	15	50	35				100
CAT3	15	50	35				100
ESE	20	50	30				100

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

18ITE26 - INFORMATION STORAGE AND CLOUD COMPUTING

Programme & Branch	B.Tech. & Information Technology	Sem.	Category	L	T	P	Credit
Prerequisites	Database Management Systems	8	PE	3	0	0	3

Preamble	To learn about Cloud technology and Storage Management Techniques	
Unit - I	**Cloud Platform Architecture over Virtualized Data Centers**	**9**
Cloud Computing and Service Models - Data-Center Design and Interconnection Networks - Architectural Design of Compute and Storage Clouds - Public Cloud Platforms: GAE, AWS, and Azure - Inter-cloud Resource Management - Cloud Security and Trust Management		
Unit - II	**Virtual Machines and Virtualization of Cluster and data centers:**	**9**
Implementation Levels of Virtualization - Virtualization Structures/Tools and Mechanisms - Virtualization of CPU, Memory, and I/O Devices - Virtual Clusters and Resource Management - Virtualization for Data-Center Automation. Case study: VM creation on AWS.		
Unit - III	**Introduction to Storage and Management:**	**9**
Introduction: Introduction to information storage: Information Storage – Evolution of storage architecture – Data center infrastructure – Data center Environment: Host - Connectivity – Storage – Disk drive components – Intelligent Storage systems: Components of an intelligent storage system – storage provisioning – types of intelligent storage systems		
Unit - IV	**Storage Networking Technologies:**	**9**
Fibre channel Storage Area Networks: Overview – components of FC SAN – FC Connectivity – Fibre Channel Architecture: Fibre channel protocol stack – Fibre channel addressing – Zoning – FC SAN topologies – Virtualization in SAN - IP SAN and FCoE: iSCSI – iSCSI topologies - FCIP - FCoE – components of FCoE Network - Network Attached Storage (NAS): Benefits of NAS – Components of NAS – NAS I/O operations		
Unit - V	**Securing and Managing Storage Infrastructure:**	**9**
Securing the Storage Infrastructure: Information security Framework – Risk Triad – Security Implementations in Storage Networking: FC SAN – NAS – IP SAN - Managing the storage Infrastructure: Monitoring storage infrastructure – Storage Infrastructure Management Activities - Information lifecycle management - Storage tiering		

Total:45

TEXT BOOK:

1. Kai Hwang, Geoffrey .C Fox, Jack .J Dongarra , "Distributed and Cloud Computing From Parallel processing to Internet of Things", 1 Edition, Morgan Kaufman , 2012 for Units I,II.
2. EMC Education Services, "Information Storage and Management : Storing Managing, and Protecting Digital Information in Classic, Virtualized, and Cloud Environments", 2 Edition, Wiley, 2015 for Units III,IV,V.

REFERENCES:

1. Anthony T Velte, "Cloud Computing: A practical Approach", 1 Edition, Tata McGraw-Hill, 2009.
2. Mark Lippitt and Erik Smith, "NetworkedStorage Concepts and Protocols Techbook", V2.3 Edition, EMC Tech books, 2014.

COURSE OUTCOMES: On completion of the course, the students will be able to		**BT Mapped (Highest Level)**
CO1	outline the cloud architecture and Practice on public clouds	Applying (K3)
CO2	summarize different implementation of Virtualization techniques and implement a VM instance	Understanding (K2)
CO3	interrupt the concept of storage management and implement storage provisioning	Understanding (K2)
CO4	illustrate various storage networking Technologies and demonstrate the effectiveness of NAS	Applying (K3)
CO5	demonstrate security in storage networking	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									3	2
CO2	3	2	1	1									3	2
CO3	3	2	1	1									3	2
CO4	3	2	1	1									3	2
CO5	3	2	1	1									3	2

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

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	40	50	10				100
CAT2	30	50	20				100
CAT3	30	30	40				100
ESE	25	35	40				100

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

18ITE27 - SOFTWARE PROJECT MANAGEMENT

Programme & Branch	B.Tech. & Information Technology	Sem.	Category	L	T	P	Credit
Prerequisites	Software Engineering	8	PE	3	0	0	3

Preamble	This course provides knowledge about project management activities including project evaluation, planning, estimation, monitoring and control activities especially for software projects.	
Unit - I	**Introduction to Software Project Management:**	**9**
Introduction to Software Project Management: Introduction - Importance – Types of project – Activities – Plans, methods and methodologies – Ways of Categorizing software projects – Stakeholders – Setting objectives – Business case – Project success and failure - Management and management control – Traditional vs. Modern project management practices. Project Evaluation: Introduction – A business case – Project Portfolio Management – Evaluation of Individual Projects – Cost Benefit Evaluation Techniques – Risk Evaluation – Programme management – Managing the allocation of resources within programme – Strategic programme management – Creating a programme – Aids to programme management – Reservations about programme management – Benefits.		
Unit - II	**Project Planning:**	**9**
Project Planning: Introduction – Select project - Identify project scope and objectives, project infrastructure – Analyse project characteristics – Identify project products and activities – Estimate effort for activity – Identify activity risks - Allocate Resources – Review plan – Execute plan. Software Effort Estimation : Introduction – Estimates – Problems with over and under estimates – Basis – Techniques – Bottom-up Estimating – Top down approach and parametric models – Expert Judgement – Estimating by analogy – Albrecht Function Point analysis – Function Points Mark II - COSMIC FFP – COCOMO II.		
Unit - III	**Activity Planning:**	**9**
Activity Planning: Objectives – Project Schedule – Projects and Activities - Sequencing and Scheduling Activities –Network Planning Models – Formulation - Time dimension - Forward Pass – Backward Pass – Identifying the critical path - Activity Float – Shortening the Project Duration – Identifying critical activities - Activity on Arrow Networks. Risk Management: Risk – Categories of Risk – Framework for dealing with risk – Risk Identification – Risk Assessment – Risk Planning – Risk management – Evaluating risks to the schedule – Applying the PERT Technique – Monte Carlo Simulation – Critical chain concepts.		
Unit - IV	**Monitoring and Control:**	**9**
Monitoring and Control: Creating Framework – Collecting the Data – Review - Visualizing Progress – Cost Monitoring – Earned Value Analysis – Prioritizing Monitoring – Getting Project Back To Target – Change Control. Managing Contracts: Introduction – Types of Contract – Stages In Contract Placement – Typical Terms of a Contract – Contract Management – Acceptance.		
Unit - V	**Managing People:**	**9**
Managing People: Introduction – Understanding Behaviour – Organizational Behaviour: A Background – Selecting the Right Person For The Job – Instruction in the best methods – Motivation – The Oldham–Hackman Job Characteristics Model – Stress –Health and Safety. Working in Teams: Introduction - Becoming a Team –Decision Making– Organizational & Team Structures – Coordination Dependencies – Dispersed and virtual teams – Communication Generes – Communication Plans – Leadership.		

Total:45

TEXT BOOK:

1. Bob Hughes, Mike Cotterell and Rajib Mall, "Software Project Management", 5 Edition, Tata McGraw Hill, New Delhi, 2011.

REFERENCES:

1. Pankaj Jalote, "Software Project Management in Practice", 8 Edition, Pearson Education, 2002.
2. Watts S. Humphrey, "PSP: A self-improvement process for software engineers", 1 Edition, Addison-Wesley, 2005.

COURSE OUTCOMES: On completion of the course, the students will be able to		**BT Mapped (Highest Level)**
CO1	take part in the process of software project management and analyse the projects.	Applying (K3)
CO2	prepare the project plan and calculate the efforts required.	Applying (K3)
CO3	plan, schedule and sequence the activities and determine the risks.	Applying (K3)
CO4	develop visualization charts to monitor the progress of projects and to control the risks involved.	Applying (K3)
CO5	outline the methods of managing people and organising teams.	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									3	2
CO2	3	2	1	1									3	2
CO3	3	2	1	1									3	2
CO4	3	2	1	1									3	2
CO5	2	1											3	2

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

ASSESSMENT PATTERN - THEORY

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

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

18ITE28 - WIRELESS SENSOR NETWORKS

Programme & Branch	B.Tech. & Information Technology	Sem.	Category	L	T	P	Credit
Prerequisites	Computer Networks	8	PE	3	0	0	3

Preamble	The course aims to understand the fundamental concepts of wireless sensor networks and functionalities of different layers. It also helps to devise appropriate node and network management strategies and provides knowledge on sensor networks security.	
Unit - I	**Introduction**	**9**
Introduction-Motivation and Wireless Sensor Nodes: Definitions and Background, Challenges and Constraints - Applications: Structural Health Monitoring, Traffic Control, Health Care, Pipeline Monitoring, Precision Agriculture, Active Volcano, Underground Mining - Node Architecture: The Sensing Subsystem, The Processor Subsystem, Communication Interfaces, Prototypes - Operating Systems: Functional Aspects, Nonfunctional Aspects, Prototypes, Evaluation.		
Unit - II	**Basic Architectural Framework and Medium Access Control**	**9**
Basic Components, Source Encoding, Channel Encoding, Modulation, Signal Propagation. Medium Access Control: Overview, Wireless MAC Protocols, Characteristics of MAC Protocols in Sensor Networks, Contention-Free MAC Protocols, Contention-Based MAC Protocols, Hybrid MAC Protocols.		
Unit - III	**Routing Protocols and Power Management**	**9**
Network Layer: Overview, Routing Metrics, Flooding and Gossiping, Proactive Routing, On-Demand Routing, Hierarchical Routing, Location-Based Routing, QoS-Based Routing Protocols. Power Management: Local Power Management Aspects, Dynamic Power Management, Conceptual Architecture.		
Unit - IV	**Node and Network Management and Localization**	**9**
Node and Network Management: Time Synchronization: Clocks and the Synchronization Problem, Time Synchronization in Wireless Sensor Networks, Basics of Time Synchronization, Time Synchronization Protocols. Localization: Overview, Ranging Techniques, Range-Based Localization, Range-Free Localization, Event-Driven Localization.		
Unit - V	**Security and Sensor Network Programming**	**9**
Security: Fundamentals of Network Security, Challenges of Security in Wireless Sensor Networks, Security Attacks in Sensor Networks, Protocols and Mechanisms for Security, IEEE 802.15.4 and ZigBee Security. Sensor Network Programming: Challenges in Sensor Network Programming, Macro programming, Dynamic Reprogramming, Sensor Network Simulators.		

Total:45

TEXT BOOK:

1. Waltenegus Dargie, Christian Poellabauer, "Fundamentals of Wireless Sensor Networks: Theory and Practice", 1 Edition, John Wiley & Sons , 2011.

REFERENCES:

1. Mohammad S. Obaidat, Sudip Misra, "Principles of Wireless Sensor Networks", 1 Edition, Cambridge University Press, 2014.
2. Feng Zhao, Leonidas Guibas, "Wireless Sensor Networks", 1 Edition, Elsevier, 2004.

COURSE OUTCOMES: On completion of the course, the students will be able to		**BT Mapped (Highest Level)**
CO1	apply the basic concepts of wireless sensor networks	Applying (K3)
CO2	identify the basic architectural framework using physical and MAC layer protocols	Applying (K3)
CO3	develop various network layer protocols for inter and intra communication pattern	Applying (K3)
CO4	examine different synchronization and localization algorithms for managing node and network level functions	Applying (K3)
CO5	develop the design of software and hardware components required for an sensor network 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	3	2	1	1									3	2
CO2	3	2	1	1									3	2
CO3	3	2	1	1									3	2
CO4	3	2	1	1									3	2
CO5	3	2	1	1									3	2

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

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	40	50	10				100
CAT2	30	50	20				100
CAT3	30	30	40				100
ESE	25	35	40				100

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

18ITE29 - ETHICAL HACKING

Programme & Branch	B.Tech. & Information Technology	Sem.	Category	L	T	P	Credit
Prerequisites	Computer Networks	8	PE	3	0	0	3

Preamble	This course provides the fundamental knowledge about security and permissions in computer and internet. Also it deals with the information about various vulnerabilities and countermeasures	
Unit - I	**Penetration Testing**	**9**
Terminologies - Categories of Penetration Test - Writing Reports - Structure of a Penetration Testing Report - Vulnerability Assessment Summary - Risk Assessment – Methodology - Linux Basics: Major Linux Operating Systems - File Structure - Linux Scheduler -Users inside of Linux - Common Applications – BackTrack.		
Unit - II	**Information Gathering, Target Enumeration and Port Scanning Techniques:**	**9**
Active , Passive and Sources of information gathering - Copying Websites Locally –Traceroute - NeoTrace - Cheops-ng - Intercepting a Response –WhatWeb –Netcraft - Basic Parameters -Xcode Exploit Scanner - Interacting with DNS Servers –Nslookup – DIG - Fierce, Zone Transfer with Host Command and Automation - DNS Cache Snooping-Attack Scenario - Automating Attacks - SNMP –Problem - Sniffing Passwords - SolarWinds Toolset -Sweep, Brute Force and Dictionary – Tools - Attack – Enumeration - Intelligence Gathering Using Shodan - Target enumeration and Port Scanning Techniques.		
Unit - III	**Vulnerability Assessment and Network Sniffing**	**9**
Introduction to Vulnerability Assessment - Pros and Cons –Nmap -Updation of database - Testing SCADA Environments with Nmap – Nessus. Sniffing: Types - Hubs versus Switches -Promiscuous versus Nonpromiscuous Mode - MITM Attacks - ARP Protocol Basics – working – Attacks -DoS Attacks –Dsnifftool - Using ARP Spoof to Perform MITM Attacks - Sniffing the Traffic with Dsniff - Sniffing Pictures with Drifnet - Urlsnarf and Webspy - Sniffing with Wireshark –Ettercap-ARP Poisoning - Hijacking Session with MITM Attack - ARP Poisoning with Cain and Abel - Sniffing Session Cookies with Wireshark - Hijacking the Session.		
Unit - IV	**Remote Exploitation**	**9**
Understanding Network Protocols – Server Protocols - Attacking Network Remote Services - Common Target Protocols -Tools for cracking network remote services - Attacking SMTP - Attacking SQL Servers - Client Side Exploitation Methods: E-Mails Leading to Malicious Attachments & Malicious Links - Compromising Client Side Update - Malware Loaded on USB Sticks – Post exploitation: Acquiring Situation Awareness - Privilege Escalation - Maintaining Access - Data Mining - Identifying and Exploiting Further Targets.		
Unit - V	**Wireless and Web Hacking**	**9**
Wireless Hacking - Requirements -Aircracking- Hidden SSIDs - Monitor Mode - Monitoring Tool- Beacon Frames on Wireshark,Airodump-ng- Wireless Adapter in Monitor Mode - Determining the Target - Cracking a WPA/WPA2 Wireless Network Using Aircrack-ng- Capturing Packets and Four-Way Handshake. Web Hacking:Attacking the Authentication - Brute Force and Dictionary Attacks - Types of Authentication - Crawling Restricted Links - Testing for the Vulnerability - Authentication Bypass with Insecure Cookie Handling - SQL injection - XSS –DOM based XSS,BeEF – CSRF - Bypassing CSRF and BeEF with XSS.		

Total:45

TEXT BOOK:

1. RafayBaloch, "Ethical Hacking and Penetration Testing Guide ", 1 Edition, CRC Press, 2015.

REFERENCES:

1. Sean-Philip Oriyano, "CEH v9: Certified Ethical Hacker Version 9", 3 Edition, Wiley, 2016.
2. Stuart McClure, Joel Scambray and Goerge Kurtz, "Hacking Exposed 7 : Network Security" Secrets & Solutions", 7 Edition, Tata McGraw-Hill, 2012.

COURSE OUTCOMES: On completion of the course, the students will be able to		**BT Mapped (Highest Level)**
CO1	experiment with penetration testing, vulnerabilities and risks available in linux operating systems	Applying (K3)
CO2	identify how to gather information and execute enumeration and scanning to identify various types of vulnerabilities and attacks.	Applying (K3)
CO3	apply various vulnerabilities and employ suitable tools to carry out sniffing in networks	Applying (K3)
CO4	make use of the exploitation available in network protocols, servers, clients, services and USBs.	Applying (K3)
CO5	Identify appropriate tools for executing wireless and web hacking.	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									3	2
CO2	3	2	1	1									3	2
CO3	3	2	1	1									3	2
CO4	3	2	1	1									3	2
CO5	3	2	1	1									3	2

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

ASSESSMENT PATTERN - THEORY

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

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

18ITE30 - SOCIAL NETWORK ANALYSIS

Programme & Branch	B.Tech. & Information Technology	Sem.	Category	L	T	P	Credit
Prerequisites	Machine Learning	8	PE	3	0	0	3

Preamble	The course introduces various methods, models and concepts behind social network analysis. This course also describes about how to manipulate, analyze and visually display social network data.	
Unit - I	**Introduction and Random Walks in Social Networks:**	**9**
Statistical Properties of Social Networks – Preliminaries – Static Properties – Dynamic Properties – Random Walks on Graphs: Background – Random Walk based Proximity Measures – Other Graph-based Proximity Measures – Graph-theoretic Measures for Semi-supervised Learning – Clustering with random walk based measures – Algorithms – Applications – Evaluation and datasets		
Unit - II	**Community Discovery and Node Classification in Social Networks:**	**9**
Communities in Context – Core Methods – Quality Functions – The Kernighan-Lin(KL) algorithm – Agglomerative/Divisive Algorithms – Spectral Algorithms – Multi-level Graph Partitioning – Markov Clustering – Node Classification in Social Networks: Problem Formulation – Methods using Local Classifiers – Random Walk based Methods – Applying Node Classification to Large Social Networks.		
Unit - III	**Social Influence Analysis and Expert Location in Social Networks:**	**9**
Influence Related Statistics – Social Similarity and Influence – Influence Maximization in Viral Marketing – Expert Location in Social Networks: Expert Location without Graph Constraints – Expert Location with Score Propagation – Expert Team Formation – Other related approaches.		
Unit - IV	**Link Prediction and Privacy In Social Networks:**	**9**
Feature based Link Prediction – Feature Set Construction – Classification Models – Bayesian Probabilistic Models – Link Prediction by Local Probabilistic Models – Network Evolution based Probabilistic Model – Hierarchical Probabilistic Model – Probabilistic Relational Models: Relational Bayesian Network – Relational Markov Network – Privacy in Social Networks: Privacy breaches in social networks – Privacy definitions for publishing data – Privacy preserving mechanisms.		
Unit - V	**Visualization and Text Mining in Social Networks:**	**9**
Structural Visualization – Semantic and Temporal Visualization – Statistical Visualization – Text Mining in Social Networks: Keyword Search: Query Semantics and Answer Ranking – Keyword search over XML and relational data – Keyword search over graph data – Classification Algorithms – Clustering Algorithms.		

Total:45

TEXT BOOK:

1. Charu C. Aggarwal, "Social Network Data Analytics", Springer (e book), 2011.

REFERENCES:

1. Peter Mika, "Social Networks and the Semantic Web", 1 Edition, Springer, 2007.
2. Borko Furht, "Handbook of Social Network Technologies and Applications", 1 Edition, Springer, 2010.

COURSE OUTCOMES: On completion of the course, the students will be able to		BT Mapped (Highest Level)
CO1	summarize statistical properties of Social Networks and apply random walk approaches for social network analysis	Applying (K3)
CO2	make use of statistical methods for classification and community discovery in Social Networks	Applying (K3)
CO3	carry out social influence and expert location in Social Networks	Applying (K3)
CO4	apply statistical methods for link prediction and describe privacy preservation methods in Social Networks	Applying (K3)
CO5	summarize visualization and apply text mining techniques in Social Networks	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										3	2
CO2	3	2	1										3	2
CO3	3	2	1										3	2
CO4	3	2	1										3	2
CO5	3	2	1	1									3	2

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

ASSESSMENT PATTERN - THEORY

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

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

18ITE31 - BUSINESS INTELLIGENCE AND ITS APPLICATIONS

Programme & Branch	B.Tech. & Information Technology	Sem.	Category	L	T	P	Credit
Prerequisites	Database Management Systems	8	PE	3	0	0	3

Preamble	The course helps the learners to apply the BI concepts and techniques to various applications for making better decisions.	
Unit - I	**Introduction and Business View of Information Technology Applications**	**9**
Introduction: Business View of Information Technology Applications: Core Business Processes – Baldrige Business Excellence Framework – Purpose of using IT in Business – Characteristics of Internet-ready IT Applications – Enterprise Applications – Information users and their requirements. Case Study: GoodLife HealthCare Group, Good Food Restaurants Inc, TenToTen Retail Stores. Types of Digital Data: Introduction – Structured Data – Unstructured Data – Semi-Structured Data – Difference between semi-structured and structured data.		
Unit - II	**Business Intelligence and Data Integration**	**9**
Business Intelligence and Data Integration: Business Intelligence: Definition – Evolution – Need for BI – BI Value Chain – Business Analytics – BI Framework – BI Users – BI Applications – BI Roles and Responsibilities – Data Integration : Need for Data Warehouse – Definition of Data Warehouse – Data mart – Ralph Kimball's Approach vs. W.H.Inmon's Approach – Goals of Data Warehouse – ETL Process – Data Integration Technologies – Data Quality – Data Profiling.		
Unit - III	**OLTP, OLAP and Multidimensional Data Modeling**	**9**
OLTP, OLAP and Multidimensional Data Modeling: OLTP – OLAP – OLAP Architectures – Data Models – Role of OLAP Tools in BI – OLAP Operations – Basics of Data Modeling – Types of Data Model – Data Modeling Techniques – Fact Table – Dimension Table – Dimensional Models – Dimensional Modeling Life Cycle – Designing the Dimensional Model.		
Unit - IV	**Performance Management and Enterprise Reporting**	**9**
Performance Management and Enterprise Reporting: Measures, Metrics, KPIs and Performance Management: Understanding Measures and Performance – Measurement System – Role of metrics – KPIs – Enterprise Reporting: Reporting Perspectives – Report Standardization and Presentation Practices – Enterprise Reporting Characteristics – Balanced Scorecard – Dashboards – Creating Dashboards – Scorecards vs. Dashboards – Analysis.		
Unit - V	**Role of Statistics in Analytics and BI Applications**	**9**
Role of Statistics in Analytics and BI Applications: Role of Statistics in Analytics – Data Description and Summarization – Statistical Test – Application of Analysis in Industries. BI Applications: Understanding Business Intelligence and Mobility – Business Intelligence and Cloud Computing – Business Intelligence for ERP systems – Social CRM and Business Intelligence.		

Total:45

TEXT BOOK:

1. Prasad R.N. and Seema Acharya, "Fundamentals of Business Analytics", 2 Edition, Wiley, 2016.

REFERENCES:

1. Ramesh Sharda, Dursun Delen, Efraim Turban, "Business Intelligence, Analytics, and Data Science: A Managerial Perspective", 4 Edition, Pearson Education, 2017.
2. David Loshin, "Business Intelligence: The Savvy Manager's Guide", 2 Edition, Morgan Kaufmann , 2012.

COURSE OUTCOMES: On completion of the course, the students will be able to		**BT Mapped (Highest Level)**
CO1	demonstrate the enterprise view of IT applications and identify the different types of digital data	Applying (K3)
CO2	make use of BI concepts and techniques to experiment ETL process	Applying (K3)
CO3	compare OLTP with OLAP systems and design dimensional model	Applying (K3)
CO4	design model dashboard, balanced score card for performance management	Applying (K3)
CO5	apply BI to mobile, cloud, ERP and social CRM systems	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										3	2
CO2	3	2	1										3	2
CO3	3	2	1										3	2
CO4	3	2	1										3	2
CO5	3	2	1										3	2

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

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	13	47	40				100
CAT2	13	40	47				100
CAT3	13	40	47				100
ESE	10	42	48				100

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

18ITE32 - GREEN COMPUTING

Programme & Branch	B.Tech. & Information Technology	Sem.	Category	L	T	P	Credit
Prerequisites	Problem Solving and Programming	8	PE	3	0	0	3

Preamble	This course provides knowledge about basic energy management option in individual components such as CPUs, network interfaces, hard drives, memory and operating systems	
Unit – I	**Fundamentals**	**9**
Green IT Fundamentals: Business, IT, and the Environment:–Green IT Strategies: Drivers, Dimensions, and Goals		
Unit – II	**Responsible Business**	**9**
Environmentally Responsible Business: Policies, Practices, and Metrics: Introduction – Policies – Environmental Areas Covered – Practice –Metrics and Measurements		
Unit – III	**Green Assets**	**9**
Buildings, Data Centers, Networks, and Devices -Green Business Process Management: Modeling, Optimization, and Collaboration		
Unit – IV	**Green Modeling**	**9**
Green Enterprise Architecture –Environmental Intelligence Green Supply Chains –Green Information Systems: Design and Development Models.		
Unit – V	**Case Studies**	**9**
Applying Green IT Strategies and Applications to a Hospital-Applying Green IT Strategies to the Packaging Industry-Applying Green IT Strategies and Applications to the Telecom Sector.		

Total:45

TEXT BOOK:

1.	Bhuvan Unhelkar, "Green IT Strategies andApplications Using Environmental Intelligence", 1 Edition, CRC Press, 2011.

REFERENCES:

1.	Carl Speshocky, "Empowering Green Initiatives with IT", 1 Edition, John Wiley & Sons, , 2010.
2.	Wu Chun Feng, "Green computing: Large Scale energy efficiency", 1 Edition, CRC Press, 2012.

COURSE OUTCOMES: On completion of the course, the students will be able to		**BT Mapped (Highest Level)**
CO1	build green (power-efficient) technologies for components of one single computer, such as CPU, memory and disk, and appreciate cutting edge designs for these components.	Applying (K3)
CO2	make use of policy, practice and metrics in green computing.	Applying (K3)
CO3	apply technologies to build a green system.	Applying (K3)
CO4	develop a Green computing in enterprise environment.	Applying (K3)
CO5	apply the range of tools to help monitor and design green systems.	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									3	2
CO2	3	2	1	1									3	2
CO3	3	2	1	1									3	2
CO4	3	2	1	1									3	2
CO5	3	2	1	1									3	2

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

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	15	60	25				100
CAT2	15	55	30				100
CAT3	15	50	35				100
ESE	15	55	30				100

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

18ITO01 - PYTHON PROGRAMMING

(Offered by Department of Information Technology)

Programme & Branch	All BE/BTech branches except Information Technology branch	Sem.	Category	L	T	P	Credit
Prerequisites	NIL	5	OE	3	0	2	4

Preamble	This course introduces the corepython programming. It emphasizes on developing python programs with all data types, functions, classes, objects and numpy	
Unit - I	**Introduction:**	**9**
Introduction: Problem solving strategies – program design tools – Types of errors – Testing and Debugging- Basics: Literals – variables and identifiers – data types - input operation – comments – reserved words – indentation – Operators and Expressions – Decision Control Statements:Introduction – conditional statement – iterative statements – Nested Loops – break,continue and pass statements – else in loops.		
Unit - II	**Lists,Tuples and Dictionary:**	**9**
Lists,Tuples and Dictionary:Lists:Access, update, nested, cloning, operations, methods , comprehensions, looping - Tuple:Create, utility, access, update, delete, operations, assignments, returning multiple values, nested tuples, index and count method - Dictionary: Create, access, add and modify, delete, sort, looping, nested, built-in methods – list vs tuple vs dictionary.		
Unit - III	**Strings and Regular Expressions:**	**9**
Strings and Regular Expressions:Strings:Concatenation , append, multiply on strings – Immutable – formatting operator – Built-in string methods and functions – slice operation – functions – operators – comparing – iterating – string module – Regular Expressions – match, search, sub, findall and finditer functions – flag options.		
Unit - IV	**Functions and Modules:**	**9**
Functions and Modules: Functions:Introduction - definition – call – variable scope and lifetime – return statement – function arguments – lambda function – documentation strings – programming practices recursive function- Modules:Modules – packages – standard library methods – function redefinition.		
Unit - V	**Object Orientation,NumPy, AND Matplotlib:**	**9**
Object Orientation: Class and Objects:Class and objects – class methods and self – constructor – class and object variables – destructor – public and private data member.NumPy :NumPy Arrays – Computation on NumPy Arrays. Matplotlib : Line plots – Scatter Plots		

List of Exercises / Experiments :

1.	Programs using conditional and looping statements
2.	Implementation of list and tuple operations
3.	Implementation of dictionary operations
4.	Perform various string operations
5.	Use regular expressions for validating inputs
6.	Demonstration of different types of functions and parameter passing
7.	Develop programs using classes and objects
8.	Perform computation on Numpy arrays
9.	Draw different types of plots using Matplotlib

Lecture:45, Practical:15, Total:60

TEXT BOOK:

1. ReemaThareja, "Python Programming using problem solving approach", 3rd Edition, Oxford University Press, 2017.

REFERENCES:

1. Nageswara Rao, "Core Python Programming", 2nd Edition, DreamTech Press, New Delhi, 2018.
2. Jake Vander Plas , "Python Data Science Handbook Essential Tools for Working with Data", 1st Edition, O'Reilly Media, 2016.

COURSE OUTCOMES: On completion of the course, the students will be able to		**BT Mapped (Highest Level)**
CO1	understand the basics of python programming using nested and control statements.	Understanding (K2)
CO2	apply list, tuple and dictionary to handle variety of data.	Applying (K3)
CO3	apply strings and regular expression for searching in a string.	Applying (K3)
CO4	solve the problems using functions and modules.	Applying (K3)
CO5	understand the class and object and apply inheritance in programming.	Applying (K3)
CO6	implement the basic data types and control statements.	Applying (K3), Manipulation (S2)
CO7	demonstrate functions, regular expressions and object oriented concepts.	Applying (K3), Manipulation (S2)
CO8	perform numpy operations and analyse results using matplotlib	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									
CO2			3		3									
CO3			3		3							3		
CO4			3		3							3		
CO5			3		3							3		
CO6			3		3							3		
CO7			3		3							3		
CO8			3		3							3		

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

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	25	25	50				100
CAT2	20	20	60				100
CAT3	20	20	60				100
ESE	25	25	50				100

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

18ITO02 - ADVANCED JAVA PROGRAMMING

(Offered by Department of Information Technology)

Programme & Branch	All BE/BTech branches except Information Technology branch	Sem.	Category	L	T	P	Credit
Prerequisites	**Object Oriented Programming**	**5**	**OE**	**3**	**0**	**2**	**4**

Preamble	Advanced Java Programming offers good knowledge on how to develop client side and server side programs using java and java based technologies. Also it offers an insight into network and remote programming.	
Unit - I	**Java Swing:**	**9**
Java Swing: Introduction – Features – MVC Connection – Components and Containers – Swing Package – Simple Application – Event Handling – Swing Applet – Painting in Swing. Exploring swing: JLabel and ImageIcon – JTextField – Swing Buttons – JTabbedPane – JScrollPane – JList – JComboBox.		
Unit - II	**Advanced Swing Components and JDBC:**	**9**
Advanced Swing Components and JDBC: Swing Components – Trees – JTable – Tooltips – Swing Menus: Menu basic – JMenuBar, JMenu, JMenuItem – Main Menu – Mnemonics and Accelerators to menu items – Images and Tooltips to MenuItems – JRadioButtonMenuItem – JCheckBoxMenuItem – Popup Menus – ToolBar – Actions – Java Database Programming: java.sql Package – Database connectivity – Relational databases – JDBC API.		
Unit - III	**Servlets:**	**9**
Servlets: Introduction – HTTP Servlet Basics: Servlet API – Page Generation – Web Applications. Servlet Life Cycle: Servlet Alternatives – Reloading – init and destroy – Single Thread Model – Background Processing – Load on Startup – Client-Side Caching – Server-Side Caching – Retrieving information – Sending HTML information.		
Unit - IV	**Servlets and JSP:**	**9**
Servlets and JSP: Servlets – Session Tracking: User Authentication – Hidden Form Fields– URL Rewriting – Persistent Cookies– Session Tracking API. Java Server Pages : Basics – Expression and Declaration – Directives – JSP and Java Beans – Includes and Forwards – Custom Tag libraries– Simple JSP program.		
Unit - V	**Network Programming and RMI:**	**9**
Network Programming and RMI: Network Programming – Basics – Classes and Interfaces – InetAddress– Factory methods – Instance Methods –Inet4Address and Inet6Address –TCP/IP Client Sockets – URL – URLConnection – HttpURLConnection– URI Class – Cookies – TCP/IP Server sockets – Datagrams – RMI architecture – Developing Simple RMI applications.		

List of Exercises / Experiments :

1.	Develop scientific calculator using swing.
2.	Develop swing applications using basic and advanced swing components.
3.	Create Payroll system using Swing Components and JDBC.
4.	Develop basic servlet programs.
5.	Develop servlet based Login application for session tracking.
6.	Develop basic JSP programs.
7.	Create Resume registration web application using Servlets, JDBC and JSP.
8.	Develop chat application using TCP.
9.	Develop echo application using UDP.
10.	Develop an RMI application

Lecture:45, Practical:15, Total:60

TEXT BOOK:

1. Schildt, Herbert, "Java: The Complete Reference", 9th Edition, Tata McGraw-Hill, 2014.

REFERENCES:

1. Jason Hunter and William Crawford, "Java Servlet Programming", 2nd Edition, O'Reilly Media, 2010.
2. Elliotte Rusty Harold, "Java Network Programming", 4th Edition, O'Reilly Media, 2013.
3. Marc Loy, Robert Eckstein, Dave Wood, James Elliott and Brian Cole, "Java Swing", 2nd Edition, O'Reilly Media, 2002.

	COURSE OUTCOMES: On completion of the course, the students will be able to	**BT Mapped (Highest Level)**
CO1	develop Java Swing Applications	Applying (K3)
CO2	create desktop applications with Database connectivity and Swing	Applying (K3)
CO3	design server side programs with JSP and Servlets	Applying (K3)
CO4	develop network applications with socket programming	Applying (K3)
CO5	demonstrate the RMI architecture and its applications	Applying (K3)
CO6	design and develop desktop applications with Java swing and JDBC	Applying (K3), Precision (S3)
CO7	create web applications using servlets and JSP	Applying (K3), Precision (S3)
CO8	design applications using socket programming and RMI	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	1	3
CO2			3		3							2	1	3
CO3			3		3							2	1	3
CO4			3		3							2	1	3
CO5			3		3							2	1	3
CO6			3		3							2	1	3
CO7			3		3							2	1	3
CO8			3		3							2	1	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	40	40	20				100
CAT3	20	30	50				100
ESE	20	50	30				100

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

18ITO03 - JAVA PROGRAMMING

(Offered by Department of Information Technology)

Programme & Branch	All BE/BTech branches except Information Technology branch	Sem.	Category	L	T	P	Credit
Prerequisites	**Problem solving and Programming**	**6**	**OE**	**3**	**0**	**2**	**4**

Preamble	This course provides a concise introduction to the fundamental concepts of Java programming. Java is a multipurpose, easy to learn, powerful platform where virtually a complete application in any domain can be implemented.	
Unit - I	**Introduction to OOP, Java, Classes and Objects:**	**9**
Introduction to OOP, Java, Classes and Objects: History and Evolution of Java –An Overview of Java–Data Types, Variables and Arrays–Operators –Control Statements–Classes: Class Fundamentals-objects– Assigning Object Reference Variables –Introducing Methods –Constructors –this keyword –Garbage Collection–Stack Class.		
Unit - II	**Inheritance, Packages and Interfaces:**	**9**
Inheritance, Packages and Interfaces: Overloading Methods –Objects as Parameters –Argument Passing –Returning Objects –Recursion–Access Control–Static –Nested and Inner Classes–Command–Line Arguments –Variable Length Arguments. Inheritance–Basics–Super keyword -Multilevel Hierarchy -Method Overriding–Dynamic Method Dispatch–Abstract Classes –final with Inheritance. Packages and Interfaces: Packages –Packages and Member Access Importing Packages– Interfaces.		
Unit - III	**Exception Handling and Multithreading:**	**9**
Exception Handling and Multithreading: Exception Handling basics – Multiple catch Clauses – Nested try Statements – Java's Built-in Exceptions –User defined Exception. Multithreaded Programming: Java Thread Model - Creating a Thread and Multiple Threads –Priorities–Synchronization– Inter Thread Communication- Suspending –Resuming, and Stopping Threads –Multithreading.		
Unit - IV	**I/O and Generics:**	**9**
I/O and Generics: Enumerations –Wrappers – Auto boxing –Annotation Basics. I/O Basics –Reading and Writing Console I/O –Reading and Writing Files. Generics: Introduction– Example–Parameters –General Form –Generic Methods, Constructors and Interfaces.		
Unit - V	**String Handling and Collections:**	**9**
String Handling and Collections: String Handling: String constructors¬¬¬ ¬–operations– Character Extraction– String Comparison–Searching Strings¬– Modifying Strings– String Buffer. Collection Framework: Overview–Collection Interfaces–Collection Classes.		

List of Exercises / Experiments :

1.	Use Eclipse IDE or Netbeans IDE platform and acquaint with the various menus. Create a test project, add a test class and methods using class wizard, and run it. See how you can use auto suggestions, auto fill. Try code formatter, code search/replace and code refactoring like renaming variables, methods, and classes. Try debug step by step with a small program of about 10 to 15 lines which contains at least one if else condition and a for loop.
2.	Simple java programs using operators, arrays and control statements • Finding the prime numbers between 1 to n • Counting the alphabets, digits, special characters in a given string • Multiplication of two Matrices
3.	Develop a stack and queue data structures using classes and objects.
4.	Program to demonstrate inheritance & polymorphism • Create one base class for student personal details and inherit those details into the sub class of student Educational details to display complete student information. • Create an abstract class named shape that contains two integers and an empty method named printArea(). Provide two classes named Rectangle and Triangle such that each one of the classes extends the class shape. Each one of the class contains only the method printArea() that print the area of the given shape.
5.	Develop an application using interfaces by accessing super class constructors and methods.
6.	Develop the Employee payroll application using packages.
7.	Program to illustrate exception handling in java and creation of user defined exception.
8.	Program to demonstrate thread concepts A multi-threaded program which has three threads. First thread generates a random integer every 1 second and if the value is even, second thread computes the square of the number and prints. If the value is odd the third thread will print the cube of the number. Program to implement the producer –consumer problem using the concept of inter-thread communication.
9.	Program to copy the contents of one file into another file, count the number of characters and print the file size in bytes.
10.	Program to perform various string operations string comparison, searching of string and string modification.

Lecture:45, Practical:30, Total:75

TEXT BOOK:

1. Herbert Schildt, "Java: The Complete Reference", 11th Edition, McGraw Hill Education, 2019.

REFERENCES:

1.	Buyya Rajkumar., Thamarai Selvi S., and Xingchen Chu, "Object Oriented Programming with Java Essentials and Applications", 1st Edition, Tata McGraw-Hill, 2009.
2.	Cay S.Horstmann, "Core Java Fundamentals", 11th Edition, Prentice Hall, 2018.

COURSE OUTCOMES: On completion of the course, the students will be able to		**BT Mapped (Highest Level)**
CO1	apply the concepts of classes and objects to solve simple problems	Applying (K3)
CO2	develop programs using inheritance, packages and interfaces	Applying (K3)
CO3	make use of exception handling mechanisms and multithreaded model to solve real world problems	Applying (K3)
CO4	build Java applications with I/O packages ,string classes, and generics concepts	Applying (K3)
CO5	integrate the concepts of AWT and event handling for developing GUI based applications	Applying (K3)
CO6	design and develop java program using object oriented programming concepts	Applying (K3), Precision (S3)
CO7	develop application using package, multithreading concepts and generics	Applying (K3), Precision (S3)
CO8	demonstrate the various file operations, string manipulations and applications of collections classes	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									3	1
CO2	3	2	1	1									3	1
CO3	3	2	1	1									3	1
CO4	3	2	1	1									3	1
CO5	3	2	1	1									3	1
CO6	3		3	2									2	2
CO7	1		3	2									2	2
CO8	1		3	3	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	10	20	70				100
CAT3	10	20	70				100
ESE	10	20	70				100

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

18ITO04 - NEXT GENERATION DATABASES

(Offered by Department of Information Technology)

Programme & Branch	All BE/BTech branches except Information Technology branch	Sem.	Category	L	T	P	Credit
Prerequisites	Database Management Systems	6	OE	3	1	0	4

Preamble	This course provides knowledge on advanced databases like NoSQL Database, HDFS Database, parallel database, distributed database, active database, and temporal database to effectively store the data for real time applications.	
Unit - I	**Parallel Databases**	**9**
Database System Architectures – Centralized and Client/Server Architectures – Server System Architectures – Parallel Systems– Distributed Systems – Parallel Databases: I/O Parallelism – Inter and Intra Query Parallelism – Inter and Intra operation Parallelism – Design of Parallel Systems.		
Unit - II	**Distributed and XML Databases**	**9**
Distributed Database Concepts –Distributed Data Storage – Distributed Transactions – Commit Protocols – Concurrency Control – Distributed Query Processing - XML Databases: XML Data Model – DTD – XML Schema – XML Querying.		
Unit - III	**Specialty Databases**	**9**
Complex data types – Structured types and inheritance in SQL – Table inheritance – Array and Multiset Types in SQL – Object Identity and Reference Types in SQL – Spatial and Temporal Data: – Time in databases –Spatial and Geographic Data – Multimedia databases – Mobility and Personal databases		
Unit - IV	**NoSQL Databases**	**9**
Introduction to MongoDB – Term Used in RDBMS and MongoDB – Data Types in MongoDB – MongoDB Query Language – Introduction to Apache Cassandra – CRUD operations –Collections – Using a counter – Time to Live – Alter Commands – Import and Export – Querying System Tables.		
Unit - V	**Big Data Storage Systems**	**9**
Introduction to Hive– Hive Architecture– Hive Data Types – Hive File Format –Hive Query Language – DDL –DML –Starting Hive Shell– Database – Tables – Partitions –Bucketing – Views – Subquery – Joins –Aggregation –Group by and Having –RCFile Implementation – User Defined Function.		

Total:45

TEXT BOOK:

1. Henry F Korth, Abraham Silberschatz, S. Sudharshan, “Database System Concepts”, 6th Edition, McGraw Hill, 2011 for Units I,II,III.
2. Seema Acharya and Subhashini Chellappan, "Big Data and Analytics", 1st Edition, Wiley India Pvt. Ltd, 2015 for Units IV,V.

REFERENCES:

1. ElmasriR., NavatheS.B, "Fundamentals of Database Systems", 5th Edition, Pearson Education, 2010.

COURSE OUTCOMES: On completion of the course, the students will be able to		**BT Mapped (Highest Level)**
CO1	identify the concepts in parallel database	Applying (K3)
CO2	apply the distributed databases and XML to real world problems	Applying (K3)
CO3	make use of methods and techniques for specialty database	Applying (K2)
CO4	identify the significant features of NOSQL Databases	Applying (K3)
CO5	apply the bigdata storage concepts using Hive	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									3	2
CO2	3	2	1	1									3	2
CO3	3	2	1	1									3	2
CO4	3	2	1	1									3	2
CO5	3	2	1	1									3	2

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

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	30	70					100
CAT2	5	40	55				100
CAT3	10	50	40				100
ESE	10	65	25				100

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

18ITO05 - BUSINESS CONTINUITY PLANNING

(Offered by Department of Information Technology)

Programme & Branch	All BE/BTech branches except Information Technology branch	Sem.	Category	L	T	P	Credit
Prerequisites	NIL	7	OE	3	0	0	3

Preamble	This course introduces the concept of Business Continuity Process and Recovery from a natural or manmade disaster. It also discusses various aspects like risk evaluation, strategies, awareness and training programmes on business continuity	
Unit - I	**Introduction:**	**9**
Introduction - Vulnerability of today's business organizations-Disaster can strike, within your organization- The direct impact: unavailability and loss of information-Business continuity survival mean -business continuity planning (BCP) strategy -BCP strategies for managing risk-Document management and control- A crisis management perspective-Developing the CM team		
Unit - II	**Multilateral continuity planning:**	**9**
Multilateral continuity planning-MCP approach-Project success factors-Benefits of multilateral continuity planning-Marketing protection: a justification for funding of total asset protection programme-Total asset protection-Brand value-Operational risk management-Senior management arrangements, systems and controls-Understanding the organization's business-Business strategy and business continuity planning-BCP within a business strategic context		
Unit - III	**Business continuity planning methodology and Risk evaluation and control:**	**9**
The business continuity planning methodology - The business continuity management lifecycle-BCM programme management-Understanding the organization - A practical approach-Risk evaluation and control:practical guidelines for risk assessment-Risk evaluation and control-Business impact analysis-A walk through a comprehensive BIA-Developing business continuity strategies for the business or work areas-Business/work area recovery-Types of contingencies-Vital records and paper documentation issues-Salvage considerations		
Unit - IV	**Business continuity strategies:**	**9**
Business continuity for telecommunications-Business continuity strategies-General strategies-Network service strategies-Additional strategies-Strategies for IT and communications-Understanding the business information flow-Vulnerability assessment-Business challenges-Marketplace trends-Planning to recover your data – Availability-Tape backup – Disk-to-disk-High availability-WAN availability-Virtualization		
Unit - V	**Awareness and training:**	**9**
Awareness and training-Establish BC policy-Acquiring or developing training aids-Awareness through maintenance, review, audit and testing-BC plan testing – Overview – Testing – Maintenance-BC audit-Audit objective-Determining the maturity level of the organization-Defining the audit programme-Audit planning – Fieldwork-Analysis		

Total:45

TEXT BOOK:

1. Andrew Hiles, "The Definitive Handbook of Business Continuity Management", 2nd Edition, John Wiley& Sons, 2007.

REFERENCES:

1. Snedaker, Susan, "Business continuity & disaster recovery planning for IT professionals", 1st Edition, Syngress , 2007.
2. Kenneth L. Fulmer, "Business Continuity Planning: A step-by-step guide with planning forms", 3rd Edition, Rothstein Associates Inc., USA, 2015.

COURSE OUTCOMES: On completion of the course, the students will be able to		**BT Mapped (Highest Level)**
CO1	Recognize the significance of Business Continuity Planning in the event of a disaster	Understanding (K2)
CO2	Explain multilateral continuity planning and describe organization's business process and Strategy	Understanding (K2)
CO3	Illustrate risk evaluation and control guidelines for risk assessment	Applying (K3)
CO4	Choose appropriate Business continuity strategies for telecommunications and IT	Applying (K3)
CO5	Discuss the importance of training, testing and auditing in Business continuity planning	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	1
CO2	2	1											2	1
CO3	3	2	1	1									3	1
CO4	3	2	1	1									3	1
CO5	2	1											2	1

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

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	15	85					100
CAT2	10	30	60				100
CAT3	20	40	40				100
ESE	15	50	35				100

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

18ITO06 - MOBILE APPLICATION DEVELOPMENT

(Offered by Department of Information Technology)

Programme & Branch	All BE/BTech branches except Information Technology branch	Sem.	Category	L	T	P	Credit
Prerequisites	NIL	7	OE	3	0	0	3

Preamble	This course provides knowledge on developing mobile application using Android OS.	
Unit - I	**Introduction:**	**9**
Welcome to Androidville – The Android platform dissected - development environment - complete folder structure - Android Emulator – code editors – Build the App - The activity life cycle -- Building Interactive Apps: Design editor – String recourses - Text View - Edit Text – Button - spinner - button call a method.		
Unit - II	**Multiple activities and intents:**	**9**
app structure - Android manifest file –intent - putExtra() - intent filter- Sending SMS - The activity lifecycle : lifecycle - View and View groups : layouts – event handling - Toggle – checkbox – radiobutton – Spinner –ImageView –ScrollView – Toast - constraint layouts		
Unit - III	**List views and adapters:**	**9**
list views - listeners – array adapter - Support libraries and app bars: Overview of navigation - types –new features - style **–** Gallery **–** Color resource file**.** Fragments: Introduction - lifecycle - Design support libraries: Images, Color - ActionBar vs. Toolbar - String Array - Animations		
Unit - IV	**Navigation drawers:**	**9**
Email app – simple navigation app - SQLite databases: persist data - SQLite classes - SQLite database - Structured Query Language - Creating, Updating, and Deleting Database Records.		
Unit - V	**Started services:**	**9**
Introduction - Types **–** IntentService class **–** lifecycle **–** Log messages - Notifications builder - Bounded services and permissions : Binder - ServiceConnection class - The states of a bound service – lifecycle.		

Total:45

TEXT BOOK:

1. David Griffiths, Dawn Griffiths, "Head First Android Development", 2 Edition, O'Reilly Media, 2017.

REFERENCES:

1. Joseph Annuzzi Jr., Lauren Darcey and Shane Conder, "Android Wireless Application Development: Android Essentials", 5th Edition, Pearson Education, 2015.
2. http://developer.android.com

COURSE OUTCOMES: On completion of the course, the students will be able to		**BT Mapped (Highest Level)**
CO1	make use of android for an application creation and discuss its Activity life cycle	Applying (K3)
CO2	develop the Android application using Layouts, UI components with event handling	Applying (K3)
CO3	identify the resources for Android applications	Applying (K3)
CO4	develop Android applications with database and network support	Applying (K3)
CO5	build the services in 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	3	2	1	1									3	2
CO2	3	2	1	1									3	2
CO3	3	2	1	1									3	2
CO4	3	2	1	1									3	2
CO5	3	2	1	1									3	2

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

ASSESSMENT PATTERN - THEORY

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

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

18ITO07 - ESSENTIALS OF INFORMATION TECHNOLOGY

(Offered by Department of Information Technology)

Programme & Branch	All BE/BTech branches except Information Technology branch	Sem.	Category	L	T	P	Credit
Prerequisites	NIL	8	OE	3	0	0	3

Preamble	The course is specially designed for real understanding of the students about information technology. It gives easy insight into key concepts of information technology with practical illustrations and examples.	
Unit - I	**Python:**	**9**
Python: Introduction-Python data variables and operators - Control structures - Data structures - standard library – Functions - Regular expression - Modules and package- File operations - Exceptions and Error handling.		
Unit - II	**UML and OOP with Python:**	**9**
UML and OOP with Python: SDLC overview and Need for object oriented approach – UML. OOP in Python: Basic OO concepts- Class-Objects - Static, Class, Instance methods - init method – Relationships: Inheritance – Aggregation – Association.		
Unit - III	**Database Management System:**	**9**
Database Management System: Introduction - Database basics – RDBMS – Database design: Database life cycle, ER modeling, functional dependencies, normalization.		
Unit - IV	**SQL**	**9**
SQL: Need for SQL - Types of SQL –Data types of SQL –Select statement with operators –Join operations- Single row and Multi row functions – Group By and Having Clauses.		
Unit - V	**IUWT:**	**9**
IUWT: Internet basics – Web fundamentals – HTML and CSS -Java script. Software Engineering: Basics of software Engineering – Models and Approaches - Requirement Development activities – Software design and construction- Software testing - Project categories and project management phases – Software quality.		

Total:45

TEXT BOOK:

1.	Electronic Resources at http://campusconnect.infosys.com/

REFERENCES:

1.	www.learnpython.org
2.	www.diveintopython3.net
3.	http://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-830-database-systems-fall-2010/lecture-notes/
4.	http://www.htmlgoodies.com/primers/database/article.php/34780515
5.	http://nptel.ac.in/courses.php6.http://campusconnect.infosys.com/

COURSE OUTCOMES: On completion of the course, the students will be able to		**BT Mapped (Highest Level)**
CO1	develop simple programs using basic constructs, files and exception handling in Python	Applying (K3)
CO2	solve the problems using UML and OOP concepts in python.	Applying (K3)
CO3	apply the basic concepts, ER modeling, functional dependencies and normalization in databases.	Applying (K3)
CO4	write SQL queries to perform database manipulations	Applying (K3)
CO5	apply UI concepts, software engineering models and testing methods to develop real time projects.	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									3	2
CO2	3	2	1	1									3	2
CO3	3	2	1	1									3	2
CO4	3	2	1	1									3	2
CO5	3	2	1	1									3	2

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

ASSESSMENT PATTERN - THEORY

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

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

18ITO08 - VIRTUAL AND AUGMENTED REALITY FRAMEWORKS

(Offered by Department of Information Technology)

Programme & Branch	All BE/BTech branches except Information Technology branch	Sem.	Category	L	T	P	Credit
Prerequisites	NIL	8	OE	3	0	0	3

Preamble	To obtain broad knowledge of the VR and AR basics, their histories, and where they appear to be heading in the future. Also enables the learner with a broad knowledge base, so they can confidently move forward into the fields of VR and AR as best fits their goals.	
Unit - I	**Getting started with VR and AR:**	**9**
Getting started with VR and AR: Defining virtual and augmented reality – Introduction – Types of VR and AR – Exploring the current state of virtual reality - Exploring the current state of augmented reality.		
Unit - II	**Consuming content in VR and AR:**	**9**
Consuming content in VR and AR: Consuming content in VR - Exploring Consumer-Grade VR - Identifying Near-Future Hardware - Comparing Current and Future Options - Consuming Content in AR - Exploring Consumer-Grade AR - Identifying Near-Future Hardware - Comparing Current and Future Options.		
Unit - III	**Creating content in VR and AR:**	**9**
Creating content in VR and AR: Evaluating Your Project -Assessing Your Project's Technology Needs - Choosing VR - Choosing AR - Planning Your Virtual Reality Project- Planning Your Augmented Reality Project - Creating Content for Virtual and Augmented Reality - Assessing Design Software - Capturing Real Life.		
Unit - IV	**VR and AR in the wild:**	**9**
VR and AR in the wild: Exploring VR Use Cases - Art - Education - Entertainment - Healthcare - Gaming - Exploring AR Use Cases - Art - Education - Industry and Commerce - Entertainment - Utilities		
Unit - V	**The future of VR and AR:**	**9**
The future of VR and AR: Assessing the Future of VR - Anticipating the Near-Future Changes - Considering Virtual Reality's "Killer App" - Predicting the Impact - Assessing the Future of AR - Analyzing Near Future Changes - Considering AR's "Killer App" - Predicting the Impact.		

Total:45

TEXT BOOK:

1. Paul Mealy, "Virtual & Augmented Reality For Dummies", 1 Edition, John Wiley & Sons, 2018.

REFERENCES:

1. Dieter Schmalstieg, Tobias Hollerer, "Augmented Reality Principles and Practice", 1 Edition, Pearson Education, 2016.
2. Steve Aukstakalnis, "Practical Augmented Reality: A Guide to the Technologies, Applications, and Human Factors for AR and VR", 1 Edition, Addison Wesley, 2016.
3. Jonathan Linowes, "Unity Virtual Reality Projects", 2 Edition, Packt Publishing, 2018.

COURSE OUTCOMES: On completion of the course, the students will be able to		**BT Mapped (Highest Level)**
CO1	review the current state of virtual and augmented reality	Understanding (K2)
CO2	identify different applications for consuming VR and AR contents and indicate near future hardware for VR and AR experience.	Understanding (K2)
CO3	plan and develop contents for VR and AR projects	Applying (K3)
CO4	summarize the use-cases of both AR and VR technologies in different domains.	Understanding (K2)
CO5	predict the impact of AR and VR applications in thefuture applications.	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											3	1
CO2	2	1											3	1
CO3	3	2	1	1									3	2
CO4	2	1											3	1
CO5	2	1											3	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	20	80					100
CAT2	20	60	20				100
CAT3	20	80					100
ESE	20	60	20				100

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

18MAO01 - MATHEMATICAL FOUNDATIONS OF MACHINE LEARNING

(Offered by Department of Mathematics)

Programme & Branch	All BE/BTech Branches	Sem.	Category	L	T	P	Credit
Prerequisites	Nil	5	OE	3	1	0	4

Preamble	To impart the basic knowledge in linear algebra, decomposition of matrices, continuous optimization, linear regression and support vector machines which provide the foundations for machine learning and deep learning.	
Unit - I	**Vector Spaces:**	**9+3**
Definition – Subspaces – Linear dependence and independence – Basis and dimension – Row space, Column space and Null Space – Rank and nullity		
Unit - II	**Linear Transformations:**	**9+3**
Introduction – Kernel and range – Matrices of linear transformations – Change of basis – Rank and nullity.		
Unit - III	**Inner Product Spaces:**	**9+3**
Norms – Inner products – Length and Distance – Angle and Orthogonality – Orthonormal Basis – Gram-Schmidt Process – QR-Decomposition – Orthogonal Projection – Rotations.		
Unit - IV	**Matrix Decomposition And Continuous Optimization:**	**9+3**
Cholesky decomposition – Singular Value Decomposition, Continuous Optimization: Introduction – Unconstrained Optimization – Gradient Descent method – Constrained Optimization – Lagrange Multipliers method – Convex Optimization		
Unit - V	**Linear Regression And Support Vector Machines:**	**9+3**
Parameter Estimation – Maximum Likelihood estimation – Bayesian linear regression – Bayesian parameter estimation of Gaussian distribution, Support Vector Machines: Introduction – Margin and support vectors – Kernels – Primal support vector machine – Dual support vector machine.		

Lecture:45, Tutorial:15, Total:60

TEXT BOOK:

1. Howard Anton and Chris Rorres, "Elementary Linear Algebra", 9th Edition, John Wiley and Sons, New Delhi, 2011 for Units I, II, III.
2. Deisenroth M.P., Faisal A.A. and Ong C.S., "Mathematics for Machine Learning", 1st Edition, Cambridge University Press, 2019 for Units IV, V.

REFERENCES:

1. David C. Lay, Steven R. Lay and Judith McDonald, "Linear Algebra and its Applications", 5th Edition, Pearson Education, New Delhi, 2016.
2. Ethem Alpaydin, "Introduction to Machine Learning(Adaptive Computation and Machine Learning series)", 4th Edition, MIT Press, USA, 2020.
3. Duda R.O., Hart E. and Stork D.G., "Pattern Classification", 2nd Edition, John Wiley and Sons, New Delhi, 2012.

COURSE OUTCOMES: On completion of the course, the students will be able to		**BT Mapped (Highest Level)**
CO1	understand the concepts of vector spaces.	Understanding (K2)
CO2	apply the concepts of linear mappings in machine learning.	Applying (K3)
CO3	use the concept of inner product space and decompose the given matrix by means of orthonormal vectors.	Applying (K3)
CO4	apply the knowledge of factorisation of matrices and optimization techniques in clustering and classification of data.	Applying (K3)
CO5	describe the concepts of parameter estimation and support vector machine.	Applying (K3)

Mapping of COs with POs and PSOs

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

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

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	10	50	40				100
CAT2	10	20	70				100
CAT3	10	20	70				100
ESE	5	25	70				100

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

18MAO02 - GRAPH THEORY AND ITS APPLICATIONS

(Offered by Department of Mathematics)

Programme & Branch	All Engineering and Technology Branches	Sem.	Category	L	T	P	Credit
Prerequisites	NIL	6	OE	3	1	0	4

Preamble	To develop rigorous logical thinking and analytical skills by graph theoretic concepts which helps for solving real time engineering problems in networks, computer architecture, compiling techniques, model checking, artificial intelligence, software engineering, expert systems, software/hardware correctness problem.	
Unit - I	**Graphs:**	**9+3**
Introduction – Definition – Types of graphs – Degree of vertex – Walk, path and cycle – Isomorphism – Connected graph – Hamiltonian graph – Euler graph – Digraph – Representations of graphs: Adjacency matrix – Incidence matrix.		
Unit - II	**Trees:**	**9+3**
Introduction – Properties of trees – Pendant vertices in a tree – Distances and centers in a tree – Rooted and binary trees – Spanning tree – Construction of spanning tree: BFS algorithm – DFS algorithm – Tree traversal.		
Unit - III	**Graph Coloring:**	**9+3**
Vertex coloring – Chromatic number – Chromatic partitioning – Independent sets – Chromatic polynomial – Matching – Covering – Four color problem (statement only) – Simple applications.		
Unit - IV	**Basic Algorithms:**	**9+3**
Shortest paths – Shortest path algorithms: Dijkstra's algorithm – Warshall's algorithm – Minimum Spanning tree – Minimal spanning tree algorithms: Prim's algorithm – Krushkal's algorithm – Optimal assignment – Kuhn and Munkres algorithm – Travelling salesman problem: Two optimal algorithm – Closest Insertion Algorithm.		
Unit - V	**Network Flows and Applications:**	**9+3**
Flows and cuts in networks - Max-flow Min-cut Theorem – Algorithms: Flow Augmenting Path – Ford-Fulkerson Algorithm for Maximum Flow – Edmonds and Karp algorithm.		

Lecture:45, Tutorial:15, Total:60

TEXT BOOK:

1. Narsingh Deo, "Graph Theory with Applications to Engineering and Computer Science", Prentice Hall, New Delhi, 2010.

REFERENCES:

1. Douglas B.West, "Graph Theory", 2nd Edition, Prentice Hall, New Delhi, 2017.
2. Jonathan L. Gross & Jay Yellen, "Graph Theory and its Applications", 2nd Edition, CRC Press, New York, 2006.

COURSE OUTCOMES: On completion of the course, the students will be able to		**BT Mapped (Highest Level)**
CO1	explain the types of graphs and illustrate isomorphism on graphs.	Understanding (K2)
CO2	use the concepts and properties of different types of trees in data structures.	Applying (K3)
CO3	estimate the chromatic partition, chromatic polynomial and matching of a given graph.	Applying (K3)
CO4	apply various graph theoretic algorithms to communication and network problems.	Applying (K3)
CO5	identify the maximal flow in network by means of algorithms.	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											
CO2	3	1												
CO3	3	1												
CO4	3	2	1											
CO5	3	2	1											

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

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	10	50	40				100
CAT2	10	30	60				100
CAT3	10	30	60				100
ESE	10	30	60				100

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

18MAO03 - NUMBER THEORY AND CRYPTOGRAPHY

(Offered by Department of Mathematics)

Programme & Branch	All Engineering and Technology Branches	Sem.	Category	L	T	P	Credit
Prerequisites	NIL	6	OE	3	1	0	4

Preamble	To provide the skills for applying various number theoretic algorithms, congruences, primality tests in cryptography and network security and impart knowledge of basic cryptographic techniques.	
Unit - I	**Divisibility Theory and Canonical Decompositions:**	**9+3**
Division algorithm- Base-b representations – number patterns – Prime and composite numbers – Fibonacci and Lucas numbers – Fermat numbers – GCD – Euclidean Algorithm – Fundamental theorem of Arithmetic – LCM.		
Unit - II	**Theory of Congruences:**	**9+3**
Basic concepts – Properties of congruences – Linear congruences – Solution of congruences – Fermat's Little theorem – Euler's theorem – Chinese remainder theorem.		
Unit - III	**Number Theoretic Functions:**	**9+3**
Introduction – Functions τ and σ– Mobius function – Greatest integer function – Euler's Phi function – Euler's theorem – Properties of Euler's function – Applications to Cryptography.		
Unit - IV	**Primality Testing and Factorization:**	**9+3**
Primality testing: Fermat's pseudo primality test – Solvay-Strassen test – Miller-Rabin test – Fibonacci test – Lucas test – Integer factorization: Trial division – Pollard's Rho method – Quadratic sieve method.		
Unit - V	**Classical Cryptographic Techniques:**	**9+3**
Introduction – Substitution techniques – Transposition techniques – Encryption and decryption – Symmetric and asymmetric key cryptography – Steganography.		

Lecture:45, Tutorial:15, Total:60

TEXT BOOK:

1. Thomas Koshy, "Elementary Number Theory with Applications", 2nd Edition, Academic Press, Elsevier, USA, 2007 for Units I, II, III.
2. William Stallings, "Cryptography and Network Security: Principles and Practice", 7th Edition, Pearson Education, New Delhi, 2019 for Units IV, V.

REFERENCES:

1. Ivan Niven, Herbert S. Zukerman & Hugh L. Montgomery, "An Introduction to the Theory of Numbers", Reprint Edition, John Wiley & Sons, New Delhi, 2008.
2. Bernard Menezes, "Cryptography and Network Security", 1st Edition, Cengage Learning India, New Delhi, 2010.

COURSE OUTCOMES: On completion of the course, the students will be able to		BT Mapped (Highest Level)
CO1	understand various the concepts of divisibility and canonical decompositions.	Understanding (K2)
CO2	obtain knowledge in theory of congruences and solution of linear congruences.	Applying (K3)
CO3	use different number theoretic function suitably in cryptography.	Applying (K3)
CO4	apply various Primality test and factorisation algorithms to network security problems.	Applying (K3)
CO5	identify the suitable cryptographic techniques to handle real time security issues.	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												
CO2	3	1												
CO3	3	1												
CO4	3	2	1		2									
CO5	3	2	1		2									

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

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	10	30	60				100
CAT2	10	20	70				100
CAT3	10	20	70				100
ESE	10	20	70				100

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

18MAO04 - ADVANCED LINEAR ALGEBRA

(Offered by Department of Mathematics)

Programme & Branch	All Engineering and Technology Branches	Sem.	Category	L	T	P	Credit
Prerequisites	NIL	7	OE	3	0	0	3

Preamble	To provide the skills for applying linear equations, decomposition of matrices and linear transformations in real time engineering problems and impart knowledge of vector spaces.	
Unit - I	**Linear Equations:**	**9**
System of linear equations – Row reduction and echelon forms – Vector equations – Matrix equations – Solution sets of linear systems – Applications of Linear systems: Matrix operations – inverse of a matrix, Matrix factorization – Applications to computer graphics.		
Unit - II	**Vector Spaces:**	**9**
Definition – Subspaces – Linear dependence and independence – Basis and dimension – Row space, Column space and Null Space – Rank and nullity.		
Unit - III	**Inner Product Space:**	**9**
Inner products – Angle and Orthogonality in inner product spaces – Orthonormal Bases – Gram-Schmidt Process – QR-Decomposition – Orthogonal Projection – Least square technique.		
Unit - IV	**Linear Transformations:**	**9**
General linear transformation – Kernel and range – Matrices of linear transformations – Change of basis – Rank and nullity.		
Unit - V	**Eigenvalues and Eigenvectors:**	**9**
Definition – Orthogonal Diagonalization – Quadratic forms – Quadratic surfaces – Singular value decomposition – Applications.		

Total: 45

TEXT BOOK:

1. Howard Anton & Chris Rorres, "Elementary Linear Algebra", 11th Edition, John Wiley & Sons, USA, 2014.

REFERENCES:

1. David C. Lay, Steven R. Lay & Judith McDonald, "Linear Algebra and its Applications", 5th Edition, Pearson Education, New Delhi, 2016.
2. Gareth Williams, "Linear Algebra with Applications", 8th Edition, Jones & Barlett Learning, USA, 2014.

COURSE OUTCOMES: On completion of the course, the students will be able to		**BT Mapped (Highest Level)**
CO1	use the concepts of matrices and vectors in the solution of a system of linear equations.	Applying (K3)
CO2	understand the concepts of vector spaces.	Understanding (K2)
CO3	understand the concept of inner product space and decompose the given matrix by means of orthonormal vectors.	Understanding (K2)
CO4	transform the system from one dimension to another and represent the pertinent linear transformation in matrix form.	Applying (K3)
CO5	apply the knowledge of quadratic forms and techniques of singular value decomposition for problems arising in power/control system analysis, signals and systems.	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											
CO2	3	1												
CO3	3	1	1											
CO4	3	2	1											
CO5	3	2	2											

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

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	10	20	70				100
CAT2	10	30	60				100
CAT3	10	20	70				100
ESE	10	20	70				100

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

18MAO05 - OPTIMIZATION TECHNIQUES

(Offered by Department of Mathematics)

Programme & Branch	All Engineering and Technology Branches	Sem.	Category	L	T	P	Credit
Prerequisites	NIL	7	OE	3	0	0	3

Preamble	To provide the skills for solving the real time engineering problems involving linear, non-linear, transportation and assignment problems and also impart knowledge in project management and game theoretic concepts.	
Unit - I	**Linear Programming:**	**9**
Introduction – Formulation of Linear Programming Problem – Advantages of Linear Programming methods – Limitations of Linear Programming models – Standard form of LPP – Graphical Method – Simplex Method – Artificial variable techniques – Big M Method.		
Unit - II	**Transportation Problem:**	**9**
Mathematical Formulation of Transportation Problem – Initial basic feasible solution – North West Corner Method – Least Cost Method – Vogel's approximation method – Optimal solution – MODI Method – Degeneracy – Unbalanced transportation problem – Maximization transportation problem.		
Unit - III	**Assignment Problem and Theory of Games:**	**9**
Assignment Problem: Mathematical model of Assignment problem – Hungarian Method – Unbalanced assignment problem. Theory of Games: Two-person zero-sum game – Pure strategies - Game with mixed strategies – Rules of Dominance – Solution methods: Algebraic method – Matrix method – Graphical method.		
Unit - IV	**Project Management:**	**9**
Basic Concept of network Scheduling – Construction of network diagram – Critical path method – Programme evaluation and review technique – Project crashing – Time-cost trade-off procedure.		
Unit - V	**Non-Linear Programming:**	**9**
Formulation of non–linear programming problem – Constrained optimization with equality constraints – Kuhn-Tucker conditions – Constrained optimization with inequality constraints.		

Total: 45

TEXT BOOK:

1. Kanti Swarup, Gupta P.K. & Man Mohan, "Operation Research", 14th Edition, Sultan Chand & Sons, New Delhi, 2014.

REFERENCES:

1. Sharma J.K., "Operations Research – Theory and Applications", 4th Edition, Macmillan Publishers India Ltd., New Delhi, 2009.
2. Gupta P.K. & Hira D.S., "Operations Research: An Introduction", 6th Edition, S.Chand and Co. Ltd, New Delhi, 2008.

COURSE OUTCOMES: On completion of the course, the students will be able to		**BT Mapped (Highest Level)**
CO1	formulate and solve linear programming problems.	Applying (K3)
CO2	apply transportation algorithms in engineering problems.	Applying (K3)
CO3	use assignment and game theory concepts in practical situations.	Applying (K3)
CO4	handle the problems of Project Management using CPM and PERT.	Applying (K3)
CO5	solve various types of Non-linear Programming problems.	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											
CO2	3	1	1											
CO3	3	1												
CO4	3	2	1											
CO5	3	2	1											

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

ASSESSMENT PATTERN - THEORY

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

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

18PHO01 - THIN FILM TECHNOLOGY
(Offered by Department of Physics)

Programme & Branch	All BE/BTech Branches	Sem.	Category	L	T	P	Credit
Prerequisites	Nil	5	OE	3	1	0	4

Preamble	This course aims to impart the essential knowledge on deposition, characterization and application of thin films in various engineering fields, and also provides motivation towards innovations.	
Unit - I	**Theories and models of thin film growth:**	**9+3**
Introduction - Theories of thin film nucleation: Impingement, Adsorption and Thermal accommodation - The capillarity model - The atomistic models - Structural consequences of thin film nucleation - The four stages of film Growth - The incorporation of defects during growth.		
Unit - II	**Vacuum technology:**	**9+3**
Principle and working of vacuum pumps: Roots pump, Rotary pump, Diffusion pump, Turbo molecular pump, Cryogenic-pump, Ion pump, Ti-sublimation pump - Measurement of Pressure: Bayet-Albert gauge, Pirani and Penning gauge - Cold cathode and hot cathode ionization gauges - Pressure controlling system (qualitative).		
Unit - III	**Deposition of thin films - Physical methods:**	**9+3**
Thermal evaporation – Electron beam evaporation – Pulsed laser deposition – Ion plating – DC sputtering – RF sputtering – Magnetron sputtering – Reactive sputtering - Molecular beam epitaxy - Demonstration of deposition of thin films by RF sputtering.		
Unit - IV	**Deposition of thin films – Chemical methods:**	**9+3**
Chemical vapor deposition – Sol-gel method - Chemical bath deposition - Hydro thermal methods – Electroplating deposition - Electroless deposition - Spray Pyrolysis - Spin coating.		
Unit - V	**Characterization and Applications of thin films:**	**9+3**
Characterization: X-ray diffraction, Energy dispersive X-ray analysis, Atomic probe microscopy, UV-vis spectroscopy, Four probe resistivity – Applications (qualitative): Thin film resistors, Thin film capacitors, Thin film diodes, Thin film transistors, Thin film solar cells, Thin film gas sensors, Thin films for information storage and Optical coatings.		

Lecture:45, Tutorial:15,Total:60

TEXT BOOK:

1. Maissel L.I. and Glang R., "Hand book of Thin Film Technology", McGraw Hill Inc., 1970 for Units I,II,III, IV.
2. Zhang S., Li L. and Kumar A., "Materials Characterization Techniques", CRC Press, 2009 for Unit V.

REFERENCES:

1. Ohring M., "Material Science of Thin Films", Academic Press, 1992.
2. Goswami A., "Thin Film Fundamentals", New Age International Pvt. Ltd., 2003.
3. Chopra K.L., "Thin Film Phenomena", McGraw Hill Inc., 1969.

COURSE OUTCOMES: On completion of the course, the students will be able to		**BT Mapped (Highest Level)**
CO1	utilize the appropriate theory and models to comprehend the thin film growth process.	Applying (K3)
CO2	apply the principle of vacuum pump to explain select methods to create vacuum and to make use of the principle of vacuum gauge to explain the measurement of vacuum by select methods.	Applying (K3)
CO3	describe the deposition of thin films by select physical methods using the principle of working of respective methods.	Applying (K3)
CO4	explain the deposition of thin films by select chemical methods using the principle of working of respective methods.	Applying (K3)
CO5	make use of select characterization techniques to comprehend the properties of thin films and also to illustrate the various device applications of thin films.	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											
CO2	3	2	1											
CO3	3	2	1											
CO4	3	2	1											
CO5	3	2	1											

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

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	25	35	40				100
CAT2	20	40	40				100
CAT3	20	35	45				100
ESE	20	40	40				100

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

18PHO02 - STRUCTURAL AND OPTICAL CHARACTERIZATION OF MATERIALS

(Offered by Department of Physics)

Programme & Branch	All BE/BTech Branches	Sem.	Category	L	T	P	Credit
Prerequisites	NIL	7	OE	3	0	0	3

Preamble	This course aims to impart the essential knowledge on the characterization of materials using X-ray diffraction, Raman spectroscopy, UV-visible spectroscopy, Electron microscopy and Scanning tunneling microscopy and their application in various engineering fields, and also provides motivation towards innovations.	
Unit - I	**Introduction to Characterization Techniques and X-Ray Diffraction:**	**9**
Importance of materials characterization - Classification of characterization techniques - Destructive and non-destructive techniques - Crystalline materials - Reciprocal lattice - Theory of X-ray diffraction - Powder and Single crystal X-ray diffraction: Instrumentation, XRD pattern, Systematic procedure for structure determination, Particle size determination, Strain calculation - Applications of X ray diffraction measurements.		
Unit - II	**Raman Spectroscopy:**	**9**
Introduction – Pure rotational Raman spectra – Vibrational Raman spectra – Polarization of light and Raman effect – Structure determination – Instrumentation – Near-Infra-Red FT Raman Spectroscopy.		
Unit - III	**Electron Microscopy:**	**9**
Need of Electron Microscopy - Electron Specimen interaction: Emission of secondary electrons, Backscattered electrons, Characteristic X-rays, Transmitted electrons, Specimen interaction volume - Resolution - Scanning electron microscope and Transmission electron microscope: Schematic diagram, Short details of each component and working - Field Emission Gun - Field Emission Scanning electron microscope - Merits of Transmission electron microscope.		
Unit - IV	**Scanning Tunneling Microscopy:**	**9**
Introduction to quantum mechanical tunneling - Basic principles of scanning tunneling microscopy - Two modes of scanning - Interpreting scanning tunneling microscopic images -Applications of scanning tunneling microscopy.		
Unit - V	**Ultra Violet and Visible Spectroscopy:**	**9**
Regions of UV-Visible radiation - Colour and light absorption - The chromophore concept - Beer's and Lambert's laws – Theory of electronic transition - Frank Condon principle – Instrumentation and Working of UV vis spectrometer - Applications of UV visible spectroscopy.		

Total:45

TEXT BOOK:

1. Cullity B.D. and Stock S.R., "Elements of X-ray diffraction ", 3rd Edition, Pearson Education, India, 2003 for Units I,II,III,IV.
2. Banwell C.N., "Fundamentals of Molecular Spectroscopy", Tata McGraw-Hill Publications, New Delhi, 2007 for Unit V.

REFERENCES:

1. Holt D.B. and Joy D.C., "SEM micro characterization of semiconductors", Academic Press, New Delhi, 1989.
2. Willard H.H., Merritt L.L., John A. Dean and Settle F.A., "Instrumental Methods of Analysis", 7th Edition, CBS Publishers and Distributors, New Delhi.
3. Elton N. Kaufman, "Characterization of Materials (Volume1&2)", Wiley-Interscience, 2003.

COURSE OUTCOMES: On completion of the course, the students will be able to		**BT Mapped (Highest Level)**
CO1	apply the concept of X-ray diffraction to determine the crystal structure and related structural parameters of materials.	Applying (K3)
CO2	make use of the concept of Raman effect and Raman spectroscopy to determine the crystal structure and related structural parameters of materials.	Applying (K3)
CO3	determine the micro-structural parameters of materials and to perform surface analysis of materials using the concept of matter waves and electron microscopy.	Applying (K3)
CO4	utilize the concept and phenomenon of quantum mechanical tunneling to interpret the surface image at the atomic level recorded using scanning tunneling microscopy.	Applying (K3)
CO5	apply the theory of UV-Vis spectroscopy to comprehend the working of UV-Vis spectrophotometer.	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											
CO2	3	2	1											
CO3	3	2	1											
CO4	3	2	1											
CO5	3	2	1											

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

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	20	40	40				100
CAT2	20	40	40				100
CAT3	20	35	45				100
ESE	20	40	40				100

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

18CYO01 - CORROSION SCIENCE AND ENGINEERING

(Offered by Department of Chemistry)

Programme & Branch	All BE/BTech Branches	Sem.	Category	L	T	P	Credit
Prerequisites	Nil	5	OE	3	1	0	4

Preamble	Corrosion science and engineering aims to equip the students to have wide range knowledge of corrosion and prevention methods in order to meet the industrial needs.	
Unit - I	**Corrosion and its units:**	**9+3**
Importance of corrosion prevention in various industries: direct and indirect effects of corrosion –free energy and oxidation potential criterion of uniform corrosion –Pilling Bedworth ratio and it consequences –units corrosion rate – mdd (milligrams per square decimeter per day) and mpy (Mils per year) –importance of pitting factor – Pourbaix diagrams of Mg, Al and Fe – and their limitations.		
Unit - II	**Mechanism of Corrosion:**	**9+3**
Localized corrosion: electro chemical mechanism Vs. chemical mechanism – Galvanic corrosion – Area effect in anodic and cathodic metal coatings, Organic coatings of bimetallic systems – prediction using emf Series and Galvanic series – Crevice corrosion – Mechanism of differential oxygenation corrosion – Auto catalytic mechanism of pitting due to crevice or differential oxygenation corrosion – Principles and procedures of cathodic protection: Sacrificial anodes and external cathodic current impression – stray current corrosion.		
Unit - III	**Types of Corrosion:**	**9+3**
Inter-granular corrosion: Stainless steels – cause and mechanism (Cr- Depletion theory) – Weld decay and knife line attack – Stress corrosion and fatigue corrosion – Theory of critical corrosion rate in corrosion fatigue. Cavitation damage – Fretting damage – Atmospheric corrosion – Bacterial corrosion – Marine corrosion –High temperature oxidation of metals – Ionic diffusion through protective oxides.		
Unit - IV	**Kinetics of Corrosion:**	**9+3**
Kinetic aspects of corrosion: Over potential activation and concentration over potentials – Exchange current density – Mixed potential theory – corrosion rates of Fe and Zn in air – free acid – effect of oxidizing agents – Phenomenon of passivation – Theories – effect of oxidizing agents and velocity of flow on passivating metals – effect of galvanic coupling of Fe and Ti respectively with Platinum – Noble metal alloying – anodic protection.		
Unit - V	**Prevention of Corrosion:**	**9+3**
Corrosion in inhibition: Inhibitors of corrosion – passivators, adsorbing inhibitors, V.P. inhibitors. Prevention of galvanic crevice, inter granular, Stress and fatigue corrosion at the design stage and in service conditions – control of catastrophic oxidation and Hydrogen disease -control of Bacterial corrosion – Langelier saturation Index and its uses. Corrosion prevention by Coatings – Surface pre-treatment – Hot dip, diffusion and cladded coatings – Phosphating and its uses.		

Lecture:45, Tutorial:15, Total:60

TEXT BOOK:

1. Winston R. & Uhlig H.H., "Corrosion and Corrosion Control: An Introduction to Corrosion Science and Engineering", 4th Edition, A John Wiley & Sons Inc. Publication, New Jersey, 2008.

REFERENCES:

1. McCafferty E., "Introduction to Corrosion Science", Springer, New York, 2010.
2. Fontanna, "Corrosion Engineering (Materials Science and Metallurgy Series)", McGraw Hill International Education, Singapore, 2005.
3. Pietro Pedeferri, "Corrosion Science and Engineering", Springer Nature Switzerland AG, Switzerland, 2018.

COURSE OUTCOMES: On completion of the course, the students will be able to		**BT Mapped (Highest Level)**
CO1	illustrate the importance of direct and indirect corrosion to familiarize for industrial needs.	Understanding (K2)
CO2	demonstrate the mechanism of different types of corrosion with respect to the environment.	Applying (K3)
CO3	organize the various types and theory of corrosion to understand the corrosion problems.	Applying (K3)
CO4	utilize the theories and kinetics of corrosion to interpret with the real time applications.	Applying (K3)
CO5	summarize the corrosion prevention methods to avoid corrosion related issues.	Understanding (K2)

Mapping of COs with POs and PSOs

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

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

ASSESSMENT PATTERN - THEORY

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

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

18CYO02 - INSTRUMENTAL METHODS OF ANALYSIS

(Offered by Department of Chemistry)

Programme & Branch	All BE/BTech Branches	Sem.	Category	L	T	P	Credit
Prerequisites	Nil	6	BS	3	1	0	4

Preamble	Instrumental methods of analysis aim to prepare the students to have all-encompassing knowledge of spectral methods in order to identify the molecules and reaction mechanism for the process to enhance application towards the industries.	
Unit - I	**Absorption and Emission Spectroscopy:**	**9+3**
Basic concepts of Absorption and emission spectroscopy – representation of spectra – basic elements of practical spectroscopy – signal to noise ratio - techniques for signal to noise enhancement – resolving power – Fourier transform spectroscopy – evaluation of results – basic principles, instrumentation and applications of atomic absorption, atomic fluorescence and atomic emission spectroscopy.		
Unit - II	**IR, Raman and NMR Spectroscopy:**	**9+3**
Infrared spectroscopy – correlation of IR Spectra with molecular structure, instrumentation, samplings technique and quantitative analysis. Raman Spectroscopy – Classical and Quantum theory instrumentation, Structural analysis and quantitative analysis. Nuclear magnetic resonance spectroscopy – basic principles – pulsed Fourier transform NMR spectrometer – elucidation of NMR spectra and quantitative analysis.		
Unit - III	**Surface Studies:**	**9+3**
Surface study – x-ray emission spectroscopy (XES), electron spectroscopy for chemical analysis (ESCA) - UV photo electron spectroscopy (UPS)- X- ray photo electron spectroscopy (XPS) - Auger emission Spectroscopy (AES) - Transmission Electron microscopy (TEM) - Scanning Electron microscopy (SEM) - Surface tunneling microscopy (STEM) - Atomic force microscopy (AFM).		
Unit - IV	**Mass Spectroscopy:**	**9+3**
Mass spectroscopy – Ionization methods in mass spectroscopy – mass analyzer – ion collection systems - correlation of molecular spectra with molecular structure. Instrumentation design and application of Fourier transform mass spectroscopy (FT-MS)- Inductively coupled plasma mass spectroscopy (ICP-MS) - Secondary Ion Mass Spectroscopy (SIMS) and Ion microprobe mass analyzer (IMMA).		
Unit - V	**Thermal Analysis:**	**9+3**
Thermal analysis: principles and instrumentations and applications of thermogravimetry (TGA), Differential Thermal Analysis (DTA), Differential Scanning Calorimetry (DSC), evolved gas detection, thermo mechanical analysis and Thermometric titrimetry.		

Lecture:45, Tutorial:15, Total:60

TEXT BOOK:

1. Willard H.H., Merritt L.L., Dean J.A & Settle F.A., "Instrumental Methods of Analysis", 7th Edition, CBS Publishers & Distributors, New Delhi, 2012.

REFERENCES:

1. Chatwal G.R. & Anand Sham K., "Instrumental Methods of Chemical Analysis", 5th Edition, Himalaya Publishing House, Girgaon, Mumbai, 2019.
2. Srivastava A.K. & Jain P.C., "Instrumental Approach to Chemical Analysis", 4th Edition, S Chand and Company Ltd, New Delhi, 2012.
3. Sharma B.K., "Instrumental Method of Chemical Analysis", Krishna Prakashan Media Pvt. Ltd., Meerut, 2014.

	COURSE OUTCOMES: On completion of the course, the students will be able to	**BT Mapped (Highest Level)**
CO1	illustrate the basics of spectroscopy to understand the instrumentation of various spectral techniques.	Understanding (K2)
CO2	apply the IR, Raman and NMR for quantitative analysis of the sample.	Applying (K3)
CO3	apply the various techniques for the better understanding of surface morphology.	Applying (K3)
CO4	explain the principle, instrumentation of mass spectroscopy for the analysis of organic sample.	Understanding (K2)
CO5	illustrate the thermal analysis for the identification of thermal stability of the compounds.	Understanding (K2)

Mapping of COs with POs and PSOs

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

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

ASSESSMENT PATTERN - THEORY

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

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

18CYO03 - WASTE AND HAZARDOUS WASTE MANAGEMENT

(Offered by Department of Chemistry)

Programme & Branch	All BE/BTech Branches	Sem.	Category	L	T	P	Credit
Prerequisites	Nil	7	BS	3	0	0	3

Preamble	Waste and Hazardous waste management aims to equip the students to have a wide-range knowledge on waste management	
Unit – I	**Solid Waste Management:**	**9**
Solid wastes: Definition, types, sources, classification and composition of solid waste- Solid waste management system – Factors affecting solid waste management system – Solid waste processing technologies – incineration, combustion, stabilization, solidification, chemical fixation, encapsulation, composting, vermicomposting – Energy from waste –Biogasification –Anaerobic digestion, pyrolysis, refuse derived fuels; Landfill leachate and gas management, Landfill bioreactors – Recycling of household and commercial waste, recycling of paper, recycling of tire, recycling of plastics – Health and Environmental effects of Solid Waste – SWM: Indian scenario – Characteristics and quantity of various wastes.		
Unit – II	**Hazardous Waste Management:**	**9**
Hazardous waste Management: Identification and sources – characteristics and categorization – collection, segregation, packaging, labelling, transportation, processing (3R) – risk assessment and waste management treatment and disposal – storage and leak detection – site selection criteria, manifest system and records – Indian scenario – Responsibilities of various authorities. Radioactive Waste Management: Definition, sources, classification, collection, segregation, treatment and disposal.		
Unit – III	**E-Waste and Biomedical Waste Management:**	**9**
E-Waste Management: Definition, sources, classification, collection, segregation, treatment and disposal. Biomedical Waste Management : Types of wastes, major and minor sources of biomedical waste – categories and classification of biomedical waste – hazard of biomedical waste – need for disposal of biomedical waste – waste minimization – waste segregation and labelling – waste handling and collection- Treatment – autoclaving, Incineration, Chemical Disinfection – Disposal – Infection control Practices- status in India.		
Unit – IV	**Pollution from Major Industries and Management:**	**9**
Introduction- sources and characteristics – waste treatment flow sheets for selected industries such as Textiles, Tanneries, Pharmaceuticals, Electroplating industries, Dairy, Sugar, Paper, distilleries, Steel plants, Refineries, fertilizer, thermal power plants – Wastewater reclamation concepts.		
Unit – V	**Solid Waste Management Legislation:**	**9**
Solid waste management plan – Solid Waste (Management and Handling) Rules, 2000, 2016 and amendments if any – Biomedical Waste (Management and Handling) Rules, 2016; Notification of Ash utilization 1999, 2003, 2009, 2015 and amendments if any – Plastic Waste Management Rules, 2016 – E-Waste Management Rules, 2016 – Bio-Medical Waste Management Rules, 2016 – Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016 – Construction and Demolition Waste Management Rules, 2016.		

Total:45

TEXT BOOK:

1. John Pichtel, “Waste Management Practices: Municipal, Hazardous, and Industrial”, 2nd Edition, CRC Press, Boca Raton, Florida, 2014 for Unit II, III.
2. Sharma U.C. & Neetu Singh, “Environmental Science and Engineering, Volume 5: Solid Waste Management”, 2nd Edition, Studium Press, United State of America, 2017 for Unit I,IV,V.

REFERENCES:

1. VanGuilder & Cliff, "Hazardous Waste Management: An Introduction", Har Cdr Edition, Mercury Learning & Information, Herndon, VA, 2011.
2. Karen Hardt, "Solid Waste Management", 1st Edition, Callisto Reference, Germany, 2018.
3. Majeti Narasimha Vara Prasad, Meththika Vithanage & Anwesha Borthakur, "Handbook of Electronic Waste Management: International Best Practices and Case Studies", 1st Edition, Butterworth-Heinemann, United Kingdom, 2019.

COURSE OUTCOMES: On completion of the course, the students will be able to		**BT Mapped (Highest Level)**
CO1	apply the technical points that are required to set up a solid waste management system.	Applying (K3)
CO2	select the various disposal methods of hazardous wastes like radioactive wastes.	Understanding (K2)
CO3	organize the appropriate method for managing e-waste and biomedical wastes.	Applying (K3)
CO4	identify to plan minimization of industrial wastes.	Applying (K3)
CO5	relate the legal legislation to solid waste management.	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			3							
CO2	2	1					3							
CO3	3	2	1	1			3							
CO4	3	2	1	1			3							
CO5	2	1					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	25	35	40				100
CAT2	25	35	40				100
CAT3	25	35	40				100
ESE	25	35	40				100

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

18GEO01 – GERMAN LANGUAGE LEVEL 1

(Offered by Department of Electronics and Communication Engineering)

Programme& Branch	All BE/BTech Engineering and Technology Branches	Sem.	Category	L	T	P	Credit
Prerequisites	Basics of Language	5,6,7,8	HS	4	0	0	4

Preamble	To acquire the vocabulary as per the Common European framework of German language A1 level competence. This course will help to assimilate the basic grammar structures and gain vocabulary to understand and reciprocate in daily life situations on a broader sense. A thorough learner will be able to gain a comprehensive understanding of the German grammar and confidently articulate in day today situations.	
Unit - I	**Contacts (Kontakte):**	**12**
Understanding Letters, simple instructions, speaking about language learning, finding specific information in text, Acknowledging the theme and understanding conversations, Making appointments. Grammar – Preposition with Dative, Articles in Dative and Accusative possessive articles.		
Unit - II	**Accommodation (Die Wohnung):**	**12**
Understanding Accommodation advertisements, describing accommodation and directions, responding to an invitation, Expressing feelings, Colours. Grammar – Adjective with to be verb, Adjective with *sehr/zu*, Adjective with Accusative, prepositions with Dative		
Unit - III	**Working Environment Communication (ArbeitenSie):**	**12**
Daily Schedule, speaking about past, understanding Job openings advertisements, Opinions, Telephonic conversations, Speaking about Jobs. Grammar – Perfect tense, Participle II – regular and irregular verbs, Conjunctions – *und, oder, aber*.		
Unit - IV	**Clothes and Style (Kleidung und mode) :**	**12**
Clothes, Chats on shopping clothes, reporting on past, Orienting oneself in Supermarkets, Information and research about Berlin. Grammar – Interrogative articles and Demonstrative articles, Partizip II – separable and non-separable verbs, Personal pronouns in Dative, Verbs with Dative.		
Unit - V	**Health and Vacation (Gesundheit und Urlaub):**	**12**
Personal information, Human Body parts, Sports, Understanding instructions and prompts, health tips. Grammar – Imperative with *du/Ihr*, Modal verbs – sollen, müssen, nichtdürfen, dürfen. Suggestions for travel, Path, Postcards, weather, Travel reports, Problems in hotel, Tourist destinations. Grammar – Pronoun: *man*, Question words – *Wer, Wen, Was, Wem*, Adverbs – *Zuerst, dann, Später, ZumSchl*		

Total:60

TEXT BOOK:

1. "Stefanie Dengler, Paul Rusch, Helen Schmitz, TanjaSieber, "Netzwerk Deutsch alsFremdsprache A1–ursbuch, Arbeitsbuch und Glossar with 2 CDs", Goyal Publishers, Delhi, 2015.

REFERENCES:

1. https://ocw.mit.edu – Massachusetts Institute of Technology Open Courseware
   Refer: German 1 for undergraduate students
2. https://www.dw.com/en/learn-german - Deutsche Welle , Geramany's International Broadcaster

COURSE OUTCOMES: On completion of the course, the students will be able to		**BT Mapped (Highest Level)**
CO1	understanding letters and simple texts	Remembering (K1)
CO2	assimilating vocabulary on accommodation and invitation	Understanding (K2)
CO3	comprehend concept of time, telephonic conversation and job-related information	Understanding (K2)
CO4	understanding how to do shopping in a German store	Understanding (K2)
CO5	understanding body parts and how to plan personal travel	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								1	1	3		3		
CO2								1	1	3		3		
CO3								1	1	3		3		
CO4								1	1	3		3		
CO5								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	25	75					100
CAT2	25	75					100
CAT3	25	75					100
ESE	25	75					100

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

18GEO02 – JAPANESE LANGUAGE LEVEL 1

(Offered by Department of Electronics and Communication Engineering)

Programme& Branch	All BE/BTech Engineering & Technology Branches	Sem.	Category	L	T	P	Credit
Prerequisites	Basics of Language	5,6,7,8	HS	4	0	0	4

Preamble	To understand the basics of Japanese language which provides understanding of Hiragana, Katakana and 110 Kanjis and provides the ability to understand basic conversations and also enables one to request other person and also understand Casual form	
Unit - I	**Introduction to groups of verbs:**	**12**
tai form-Verb groups-te form-Give and ask permission to do an action-Present continuous form-Restrict other person from doing an action-nouns-Basic Questions		
Unit - II	**Introduction to Casual Form:**	**12**
nai form-Dictionary form-ta form-Polite style and Casual style differences-Conversation in plain style-Place of usage of Polite style and Casual style		
Unit - III	**Express opinions and thoughts:**	**12**
Introduction to new particle-Express someone one's thought-Convey the message of one person to another-Ask someone if something is right -Noun modifications		
Unit - IV	**Introduction to If clause and Kanjis:**	**12**
If clause tara form-Express gratitude for an action done by other person-Hypothetical situation-Particles to use in case of Motion verbs-110 Kanjis		
Unit - V	**Introduction to Counters:**	**12**
How to use numbers-How to use quantifiers-Past form of adjectives and Nouns-Way to say preference-Way of expression degrees of an action-Other necessary particles-How to use numbers-How to use quantifiers-Past form of adjectives		

Total:60

TEXT BOOK:

1. "MINNA NO NIHONGO–Japanese for Everyone", 2nd Edition, Goyal Publishers & Distributors Pvt. Ltd., New Delhi, 2017.

REFERENCES:

1. MargheritaPezzopane, "Try N5", 2nd Edition, Tankobon Softcover, Japan, 2017.
2. Sayaka Kurashina, "Japanese Word Speedmaster", 2nd Edition, Tankobon Softcover, Japan, 2018.

COURSE OUTCOMES: On completion of the course, the students will be able to		BT Mapped (Highest Level)
CO1	read and understand typical expression in Hiragana and Katakana	Remembering (K1)
CO2	understand Polite form and Casual form of Japanese	Understanding (K2)
CO3	comprehend personal communication and express greetings	Understanding (K2)
CO4	understand the Kanjis in Japanese Script	Understanding (K2)
CO5	comprehend concept of time, counters and job-related 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								1	1	3		3		
CO2								1	1	3		3		
CO3								1	1	3		3		
CO4								1	1	3		3		
CO5								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	25	75					100
CAT2	25	75					100
CAT3	25	75					100
ESE	25	75					100

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

18GEO03 - DESIGN THINKING FOR ENGINEERS

(Offered by Department of Computer Science and Engineering)

Programme & Branch	All BE/BTech Branches	Sem.	Category	L	T	P	Credit
Prerequisites	Problem Solving and Programming	7	OE	3	0	0	3

Preamble	In this course, systematic process of thinking which empowers even the most traditional thinker to develop new, innovative solutions to the problem at handare studied with an emphasis on bringing ideas to life based on how real users think, feel and behave.	
Unit - I	**Introduction::**	**9**
Introduction – Need for design thinking – Design and Business – The Design Process – Design Brief –Visualization – Four Questions, Ten Tools – Explore – STEEP Analysis – Strategic Priorities – Activity System – Stakeholder Mapping – Opportunity Framing.		
Unit - II	**Visualization:**	**9**
Introduction – Visualization – Journey Mapping – Value Chain Analysis – Mind Mapping – Empathize –Observations – Need Finding – User Personas.		
Unit - III	**Brainstorming:**	**9**
Introduction – Brainstorming – Concept Development – Experiment – Ideation – Prototyping – Idea Refinement.		
Unit - IV	**Assumption Testing:**	**9**
Introduction – Assumption Testing – Rapid Prototyping – Engage – Storyboarding.		
Unit - V	**Customer Co-Creation Learning Launch:**	**9**
Introduction – Customer Co-Creation Learning Launch – Leading Growth and Innovation – Evolve– Concept Synthesis – Strategic Requirements – Evolved Activity Systems – Quick Wins.		

Total:45

TEXT BOOK:

1. Jeanne Liedtka and Tim Ogilvie, "Designing for Growth: A Design Thinking Tool Kit for Managers", Columbia University Press, 2011.

REFERENCES:

1. Lee Chong Hwa, "Design Thinking The Guidebook", Design Thinking Master Trainers of Bhutan, 2017.
2. Jeanne Liedtka, Tim Ogilvie, and Rachel Brozenske, "The Designing for Growth FieldBook: A Step-by-Step Project Guide", Columbia University Press, 2014.

COURSE OUTCOMES: On completion of the course, the students will be able to		**BT Mapped (Highest Level)**
CO1	outline the basic concepts of design thinking	Understanding (K2)
CO2	make use of the mind mapping process for designing any system	Applying (K3)
CO3	develop many creative ideas through structured brainstorming sessions.	Applying (K3)
CO4	develop rapid prototypes to bring the ideas into reality	Applying (K3)
CO5	plan the implementation of the any system considering the real time feedback	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										
CO2	3	2	1	1										
CO3	3	2	1	1										
CO4	3	2	1	1										
CO5	3	2	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	70	20				100
CAT2	10	30	60				100
CAT3	10	20	70				100
ESE	10	20	70				100

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

18GEO04 - INNOVATION AND BUSINESS MODEL DEVELOPMENT

(Offered by Department of Mechatronics Engineering)

Programme & Branch	All BE/BTech Engineering and Technology Branches	Sem.	Category	L	T	P	Credit
Prerequisites	NIL	8	OE	3	0	0	3

Preamble	This course will inspire the students to think innovation concepts and ideas for business model developments.	
Unit - I	**Innovation and Design Thinking:**	**9**
Innovation and Creativity– Types of innovation – challenges in innovation- steps in innovation management- 7 concerns of design. Design Thinking and Entrepreneurship – Design Thinking Stages: Empathize – Define – Ideate – Prototype – Test. Design thinking tools: Analogies – Brainstorming – Mind mapping		
Unit - II	**User Study and Contextual Enquiry:**	**9**
Explanatory research – primary and secondary data – classification of secondary data – sources of secondary data – qualitative research – focus groups – depth interviews – analysis of qualitative data – survey methods – observations- Process of identifying customer needs –organize needs into a hierarchy –establish relative importance of the needs- Establish target specifications		
Unit - III	**Product Design:**	**9**
Techniques and tools for concept generation, concept evaluation – Product architecture –Minimum Viable Product (MVP)- Product prototyping – tools and techniques– overview of processes and materials – evaluation tools and techniques for user-product interaction		
Unit - IV	**Business Model Canvas (BMC):**	**9**
Lean Canvas and BMC - difference and building blocks- BMC: Patterns – Design – Strategy – Process–Business model failures: Reasons and remedies		
Unit - V	**IPR and Commercialization:**	**9**
Need for Intellectual Property- Basic concepts - Different Types of IPs: Copy Rights, Trademarks, Patents, Geographical Indications, Trade Secrets and Industrial Design– Patent Licensing - Technology Commercialization – Innovation Marketing		

Total:45

TEXT BOOK:

1. Rishikesha T.Krishnan, “8 Steps To Innovation: Going From Jugaad To Excellence”, Collins India, 2013.

REFERENCES:

1. Peter Drucker, “Innovation and Entrepreneurship”, Routledge CRC Press, London, 2014.
2. Eppinger, S.D. and Ulrich, K.T. “Product design and development”, 7th Edition, McGraw-Hill Higher Education, 2020.
3. Alexander Osterwalder, “Business model generation: A handbook for visionaries, game changers, and challengers”, 1st Edition, John Wiley and Sons; 2010.
4. Indian Innovators Association, “Patent IPR Licensing – Technology Commercialization – Innovation Marketing: Guide Book for Researchers, Innovators”, Notion Press, Chennai, 2017.

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

Mapping of COs with POs and PSOs

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

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

ASSESSMENT PATTERN - THEORY

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

18GEO05 - GERMAN LANGUAGE LEVEL 2

(Offered by Department of Electronics and Communication Engineering)

Programme & Branch	All BE/BTech Engineering and Technology Branches	Sem.	Category	L	T	P	Credit
Prerequisites	German Language Level 1	**5/6/7/8**	**HS**	**4**	**0**	**0**	**4**

Preamble	This course aims to help the learner to acquire the vocabulary as per the Common European framework of German language A1 level competence. This course will help to assimilate the basic grammar structures and gain vocabulary to understand and reciprocate in daily life situations on a broader sense. A thorough learner will be able to gain a comprehensive understanding of the German grammar and confidently articulate in day today situations.	
Unit - I	**Contacts(Kontakte):**	**12**
Understanding Letters, simple instructions, speaking about language learning, finding specific information in text, Acknowledging the theme and understanding conversations, Making appointments. Grammar – Preposition with Dative, Articles in Dative and Accusative possessive articles.		
Unit - II	**Accomodation(Die Wohnung):**	**12**
Understanding Accommodation advertisements, describing accommodation and directions, responding to an invitation, Expressing feelings, Colours. Grammar – Adjective with to be verb, Adjective with *sehr/zu*, Adjective with Accusative, prepositions with Dative		
Unit - III	**Are you Working?(Arbeiten Sie):**	**12**
Daily Schedule, speaking about past, understanding Job openings advertisements, Opinions, Telephonic conversations, Speaking abou Jobs. Grammar – Perfect tense, Participle II – regular and irregular verbs, Conjunctions – *und, oder, aber*.		
Unit - IV	**Clothes and Style(Kleidung und mode):**	**12**
Clothes, Chats on shopping clothes, reporting on past, Orienting oneself in Supermarkets, Information and research about Berlin. Grammar – Interrogative articles and Demonstrative articles, Partizip II – separable and non-separable verbs, Personal pronouns in Dative, Verbs with Dative		
Unit - V	**Health and Vacation(Gesundheit und Urlaub):**	**12**
Personal information, Human Body parts, Sports, Understanding instructions and prompts, health tips. Grammar – Imperative with *du/Ihr*, Modal verbs – sollen, müssen, nicht dürfen, dürfen. Suggestions for travel, Path, Postcards, weather, Travel reports, Problems in hotel, Tourist destinations. Grammar – Pronoun: *man*, Question words – *Wer, Wen, Was, Wem*, Adverbs – *Zuerst, dann, Später, Zum Schl*		

Total: 60

TEXT BOOK:

1	Stefanie Dengler, Paul Rusch, Helen Schmitz, Tanja Sieber, “Netzwerk Deutsch als Fremdsprache A1–ursbuch, Arbeitsbuch und Glossar with 2 CDs”, Goyal Publishers, Delhi, 2015.

REFERENCES:

1	https://ocw.mit.edu – Massachusetts Institute of Technology Open Courseware
2	https://www.dw.com/en/learn-german - Deutsche Welle , Geramany’s International Broadcaster

COURSE OUTCOMES: On completion of the course, the students will be able to		**BT Mapped (Highest Level)**
CO1	understand letters and simple texts	Remembering (K1)
CO2	assimilate vocabulary on Accommodation and invitation	Understanding (K2)
CO3	comprehend concept of time, telephonic conversation and job-related information	Understanding (K2)
CO4	understand how to do shopping in a German store	Understanding (K2)
CO5	understand body parts and how to plan personal travel	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								1	1	3		3		
CO2								1	1	3		3		
CO3								1	1	3		3		
CO4								1	1	3		3		
CO5								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	75	25					100
CAT2	25	75					100
CAT3	25	75					100
ESE	25	75					100

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

18GEO06 - GERMAN LANGUAGE LEVEL 3

(Offered by Department of Electronics and Communication Engineering)

Programme & Branch	All BE/BTech Engineering and Technology Branches	Sem.	Category	L	T	P	Credit
Prerequisites	German Language Level 2	**5/6/7/8**	**HS**	**3**	**0**	**0**	**3**

Preamble	This course provides enriching information about various everyday situations in personal and professional life and enhances the vocabulary and speaking ability to respond to and also seek information in those situations. It also equips one to express opinions and negotiate appointments. With diligent learning one can capture all basic grammatical structure to answer confidently in everyday situations.	
Unit - I	**All about food (Rund Ums Essen):**	**9**
Understand information about person, Speak about food, Introduce self and others, Understand and explain a picture base story, To justify something, To speak about feelings, To express opinions, To answer questions on a text, To describe a restaurant. Grammar: Possessive Articles in Dative, Yes/No questions, Reflexive verbs, Sentence with 'weil'		
Unit - II	**School days (Nach der Schulzeit):**	**9**
Understand School reports, Speak and write comments about schooldays, To speak about habits, Understand and provide City-Tipps, To Understand School types in Germany and speak about it. Grammar: Modal verbs in Past tense, Positional Verbs, Two-way prepositions in Dativ and Akkusativ.		
Unit - III	**Media in everyday life (Medien in Alltag):**	**9**
To speak about advantages and disadvantages of Media, formulate comparisons, Express your own opinion, Talk about Movies, Understand and Write Movie reviews. Grammar: Comparative degree, Comparative Sentences with 'Als' and 'Wie', Subordinate clause with 'dass', Superlative degree.		
Unit - IV	**Feelings and expressions (Gefühle):**	**9**
Express thanks and congratulations, Talk about feelings, To understand information about festivals and speak about it, To describe a city, Express joy and regrets, Understand and write Blog entries, Write appropriate heading. Grammar: Subordinate Clause with 'Wenn', Adjectives to be used along with definite articles.		
Unit - V	**Profession and Travel (Beruf und Reisen):**	**9**
To have a conversation at ticket counter, To talk about leisure activities, To gather information from Texts, Introduce people, Express career preferences, Ideate the dream job, To prepare and make telephone calls, To understand text about Workplace. Ask for information, Express uncertainty, Understand and give directions, Understand a newspaper article, Say your own opinion, Talk about the way to work, Describe a statistic, Understand information about a trip, Talk about travel. Grammar: Adjective to be used along with indefinite articles, Prepositions, verb – 'werden', Subordinate clause – indirect questions, All units will include elements for reading, writing, speaking and listening.		

Total: 45

TEXT BOOK:

1. Stefanie Dengler, Paul Rusch, Helen Schmitz, Tanja Sieber, "Netzwerk Deutsch als Fremdsprache A1–ursbuch, Arbeitsbuch und Glossar with 2 CDs", Goyal Publishers, Delhi, 2015.

REFERENCES:

1. Rosa-Maria Dallapiazza , Eduard von Jan, Till Schonherr, "Tangram 2 (German)" , Goyal Publishers, Delhi, 2011.
2. https://www.dw.com/en/learn-german - Deutsche Welle , Geramany's International Broadcaster

COURSE OUTCOMES: On completion of the course, the students will be able to		BT Mapped (Highest Level)
CO1	understand German food style, restaurant and be able express oneself.	Remembering (K1)
CO2	understand German school system and discuss about habits and provide City-Tipps.	Understanding (K2)
CO3	analyze and compare media in everyday life.	Understanding (K2)
CO4	express feelings, describe a city and write blog entries.	Understanding (K2)
CO5	seek and provide information in a professional setup, give directions to others and talk about travel.	Understanding (K2)

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1								1	1	3		3		
CO2								1	1	3		3		
CO3								1	1	3		3		
CO4								1	1	3		3		
CO5								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	75	25					100
CAT2	25	75					100
CAT3	25	75					100
ESE	25	75					100

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

18GEO07 - GERMAN LANGUAGE LEVEL 4

(Offered by Department of Electronics and Communication Engineering)

Programme & Branch	All BE/BTech Engineering and Technology Branches	Sem.	Category	L	T	P	Credit
Prerequisites	German Language Level 3	5/6/7/8	HS	3	0	0	3

Preamble	This course imparts knowledge about interacting with external world, understanding various cultural aspects, behaviour and addressing relationships in personal and professional front. It helps one to understand reports from various media and at work. Enhance learner's grammatical exposure and cover the core basic grammatical concepts which would lay the foundation to have a better hold of the language. With focused learning one should be able to read and respond to reports, write simple formal and informal letters and text messages and be able to engage in simple conversations in known situations.	
Unit - I	**Learning (Lernen):**	**9**
Understanding and describing learning problems, Understanding and giving advice, Giving reasons, Understanding reports about everyday work life, Talking about everyday working life, Understanding a radio report, Understanding and making a mini-presentation. Grammar: Conjunctions- denn,weil, Konjuntiv II: Sollte(suggestions), Genitive, Temporal prepositions – bis, über + Akkusativ,ab+dativ		
Unit - II	**Athletic (Sportlich):**	**9**
Expressing enthusiasm, hope, disappointment, Understanding and writing fan comments, Formulating follow-ups, Making suggestions and reacting, Making an appointment, Understanding a report about an excursion, Understanding difficult texts, Introducing a tourist attraction. Grammar: Conjunctions – deshalb, trotzdem, Verbs with Dativ and Akkusativ		
Unit - III	**Living Together (Zusammen Leben):**	**9**
To complain, apologize & give in, As for something, Understand experience reports, Report on the past, Talk about pets, Respond to information, Write and correct a story. Grammatik: Konjunctiv II- könnte, Subordinate clauses – als and Wenn.		
Unit – IV	**Good Entertainment (Gute Unterhaltung):**	**9**
Talk about music style, Buy concert tickets, Introduce a musician / band, Understand newspaper reports, Give more detailed information about a person, Understand information about painting, Understand description of a picture, Describe a picture. Grammatik: Interrogative Articles: Was fuer eine? , Pronouns – man/jemand/niemand and alles/etwas/nichts , Relative sentences in Nominativ.		
Unit - V	**Passage of time and Culture (Zeitablauf & Kultur):**	**9**
Talk about wishes, Express wishes, Give Suggestions, Understand a conversation, Plan something together, To ask others something, Understand a text, Exchange information, Talk about proverbs, write a story. Understand information about other cultures, Discuss about behavior, Express intentions, Use the appropriate salutation, Understand tips in a text, Talk about forms of addressing others, Give more information, Discuss about clichés and write about them. All units will include elements for reading, writing, speaking and listening. Grammatik: Konjunctiv II (Wishes, Suggestions), Verbs with prepositions, W- questions with prepositions, Relative sentences in Akkusativ, Subordinate clauses with damit and Um…Zu.		

Total: 45

TEXT BOOK:

1. Stefanie Dengler, Paul Rusch, Helen Schmitz, Tanja Sieber, "Netzwerk Deutsch als Fremdsprache A1–ursbuch, Arbeitsbuch", Goyal Publishers, Delhi, 2015.

REFERENCES:

1. Rosa-Maria Dallapiazza, Eduard von Jan, Till Schonherr, "Tangram 2 (German)", Goyal Publishers, Delhi, 2011.
2. https://www.dw.com/en/learn-german - Deutsche Welle, Geramany's International Broadcaster

COURSE OUTCOMES: On completion of the course, the students will be able to		**BT Mapped (Highest Level)**
CO1	leverage learning in Workplace, understanding reports and make presentation.	Remembering (K1)
CO2	reciprocate to different situations, make appointment and understand texts.	Understanding (K2)
CO3	handle relationships and respond appropriately to exchange information	Understanding (K2)
CO4	familiarize to various channels of entertainment	Understanding (K2)
CO5	know about various cultural aspects, usage of proverbs and cliches.	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								1	1	3		3		
CO2								1	1	3		3		
CO3								1	1	3		3		
CO4								1	1	3		3		
CO5								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	75	25					100
CAT2	25	75					100
CAT3	25	75					100
ESE	25	75					100

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

18GEO08 - JAPANESE LANGUAGE LEVEL 2

(Offered by Department of Electronics and Communication Engineering)

Programme & Branch	All BE/BTech Engineering and Technology Branches	Sem.	Category	L	T	P	Credit
Prerequisites	Japanese Language Level 1	5/6/7/8	HS	4	0	0	4

Preamble	The basic level of Japanese which provides understanding of Hiragana, Katakana and 110 Kanjis and provides the ability to understand basic conversations and also enables one to request other person and also understand Casual form	
Unit - I	**Introduction to groups of verbs:**	**12**
tai form-Verb groups-te form-Give and ask permission to do an action-Present continuous form-Restrict other person from doing an action-nouns-Basic Questions		
Unit - II	**Introduction to Casual Form:**	**12**
nai form-Dictionary form-ta form-Polite style and Casual style differences-Conversation in plain style-Place of usage of Polite style and Casual style		
Unit - III	**Express opinions and thoughts:**	**12**
Introduction to new particle-Express someone one's thought-Convey the message of one person to another-Ask someone if something is right -Noun modifications		
Unit - IV	**Introduction to If clause and remaining Kanjis:**	**12**
If clause tara form-Express gratitude for an action done by other person-Hypothetical situation-Particles to use in case of Motion verbs-50 Kanjis		
Unit - V	**Introduction to giving and receiving with te form and "when, even if" usages:**	**12**
Providing to and getting from differences - Understanding of situations and framing sentences using when and even if..etc.		

Total: 60

TEXT BOOK:

1. "MINNA NO NIHONGO–Japanese for Everyone", 2nd Edition, Goyal Publishers & Distributors Pvt. Ltd., New Delhi, 2017.

REFERENCES:

1. Margherita Pezzopane, "Try N5", 2nd Edition, Tankobon Softcover, Japan, 2017.
2. Sayaka Kurashina, "Japanese Word Speedmaster", 2nd Edition, Tankobon Softcover, Japan, 2018.

COURSE OUTCOMES: On completion of the course, the students will be able to		**BT Mapped (Highest Level)**
CO1	differentiate groups of verbs and its forms	Remembering (K1)
CO2	understand Polite form and Casual form of Japanese	Understanding (K2)
CO3	comprehend personal communication and express greetings	Understanding (K2)
CO4	understand the Kanjis in Japanese Script and If clause	Understanding (K2)
CO5	comprehend concept of “even if”, “when” and job-related 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								1	2	3		3		
CO2								1	2	3		3		
CO3								1	2	3		3		
CO4								1	2	3		3		
CO5								1	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	75	25					100
CAT2	25	75					100
CAT3	25	75					100
ESE	25	75					100

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

18GEO09 - JAPANESE LANGUAGE LEVEL 3

(Offered by Department of Electronics and Communication Engineering)

Programme & Branch	All BE/BTech Engineering and Technology Branches	Sem.	Category	L	T	P	Credit
Prerequisites	Japanese Language Level 2	5/6/7/8	HS	3	0	0	3

Preamble	The intermediate level of Japanese which provides understanding of all forms ofverbs, adverbs, conjunctions, etc. which includes 150 Kanji's and provides the ability to comprehend conversations encountered in daily life	
Unit - I	**Introduction to Potential verbs:**	**9**
Causes and Reasons-Favouring Expressions-Expressing a State-Potential Verb Sentences-Simultaneous actions-Verb Groups-te Form-Customary Actions-Nouns-Basic Questions and Kanji's.		
Unit - II	**Introduction to Transitive and Intransitive verbs:**	**9**
Consequence of verbs- Embarrassment about Facts- Consequence of Verbs with an Intentions-Affirmative Sentences- Conjunctions-Basic Questions and kanji's.		
Unit - III	**Introduction to Volitional forms:**	**9**
Expressions of Speakers Intention-Expressing Suggestion or Advice-Usage of Adverbs and Quantifiers-Basic Questions and kanji's.		
Unit - IV	**Introduction to Imperative and Prohibitive verbs:**	**9**
Commanding person- Interrogatives-Expressions of Third Person-Actions and its Occurrence - Possibilities of an Action-Changing of States Basic Questions and Kanji's.		
Unit - V	**Introduction to Conditional form and Passive verbs:**	**9**
Description of Requirement and Speaker's Judgement, HabitualActions, Directions and suggestions-Passive forms of Verbs-Basic Questions and Kanji's.		

Total: 45

TEXT BOOK:

1. "MINNA NO NIHONGO–Japanese for Everyone", 2nd Edition, Goyal Publishers & Distributors Pvt. Ltd., New Delhi, 2017.

REFERENCES:

1. Margherita Pezzopane, "Try N5", 2nd Edition, Tankobon Softcover, Japan, 2017.
2. Sayaka Kurashina, "Japanese Word Speedmaster", 2nd Edition, Tankobon Softcover, Japan, 2018.

COURSE OUTCOMES: On completion of the course, the students will be able to		**BT Mapped (Highest Level)**
CO1	read and understand BasicVocabularies.	Remembering (K1)
CO2	understand Conversations used in daily life.	Understanding (K2)
CO3	comprehend personal communication and express greetings.	Understanding (K2)
CO4	understand the Kanji's in Japanese Script.	Understanding (K2)
CO5	comprehend Coherent conversations in everyday situations.	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								1	2	3		3		
CO2								1	2	3		3		
CO3								1	2	3		3		
CO4								1	2	3		3		
CO5								1	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	75	25					100
CAT2	25	75					100
CAT3	25	75					100
ESE	25	75					100

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

18GEO10 - JAPANESE LANGUAGE LEVEL 4

(Offered by Department of Electronics and Communication Engineering)

Programme & Branch	All BE/BTech Engineering and Technology Branches	Sem.	Category	L	T	P	Credit
Prerequisites	Japanese Language Level 3	5/6/7/8	HS	3	0	0	3

Preamble	The intermediate level of Japanese provides understanding of expressions of verbs, its pattern, Relationships which also includes 150 Kanji's and also provides the ability to understand relationship among the people.	
Unit - I	**Introduction to Reasoning:**	**9**
Causes and Sequences-Causes and Effects-Interrogative Patterns-Adjective as a Noun -Basic Questions and Kanji's.		
Unit - II	**Introduction to Exchanging of things:**	**9**
Expressions for Giving and Receiving of Things-Polite Expression of Request-Indicating a Purpose of Actions-Basic Quantifiers-Basic Questions and kanji's.		
Unit - III	**Introduction to States of an Action:**	**9**
Sentence Pattern to Indicate Appearance-Degree of Action and State-Adjectives as Adverbs- Convey information -Basic Questions and kanji's.		
Unit - IV	**Introduction to Causative Verbs:**	**9**
Causative Forms of Verbs-Asking Opportunity to do something-Hypothetical Questions-Judgement and Course of an actions-Basic Questions and Kanji's.		
Unit - V	**Introduction to Relationship in Social Status:**	**9**
Honorific expressions- Respectful expressions- Humble expressions-Polite expressions-Basic Questions and Kanji's.		

Total: 45

TEXT BOOK:

1. "MINNA NO NIHONGO–Japanese for Everyone", 2nd Edition, Goyal Publishers & Distributors Pvt. Ltd., New Delhi, 2017.

REFERENCES:

1. Margherita Pezzopane, "Try N5", 2nd Edition, Tankobon Softcover, Japan, 2017.
2. Sayaka Kurashina, "Japanese Word Speedmaster", 2nd Edition, Tankobon Softcover, Japan, 2018.

COURSE OUTCOMES: On completion of the course, the students will be able to		**BT Mapped (Highest Level)**
CO1	read and Understand Relationship of a Person.	Remembering (K1)
CO2	understand Conversations Used in Everyday Activities.	Understanding (K2)
CO3	comprehend Contents at Near Natural Speed.	Understanding (K2)
CO4	understand the Kanji's in Japanese Script.	Understanding (K2)
CO5	comprehend Orally Presented Materials.	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								1	2	3		3		
CO2								1	2	3		3		
CO3								1	2	3		3		
CO4								1	2	3		3		
CO5								1	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	75	25					100
CAT2	25	75					100
CAT3	25	75					100
ESE	25	75					100

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

18GEO11 - NCC Studies(Army Wing) – I

(Offered by Department of Electrical and Electronics Engineering)

Programme & Branch	All BE/BTech Engineering and Technology Branches	Sem.	Category	L	T	P	Credit
Prerequisites	NIL	5 / 6	OE	3	0	2	4

Preamble	This course is designed especially for NCC Cadets. This course will help develop character, camaraderie, discipline, secular outlook, the spirit of adventure, sportsman spirit and ideals of selfless service amongst cadets by working in teams, learning military subjects including weapon training.	
Unit - I	**NCC Organisation and National Integration:**	**9**
NCC Organisation – History of NCC- NCC Organisation- NCC Training- NCC Uniform – Promotion of NCC cadets – Aim and advantages of NCC Training- NCC badges of Rank- Honours and Awards – Incentives for NCC cadets by central and state govt. National Integration- Unity in diversity- contribution of youth in nation building- national integration council- Images and Slogans on National Integration.		
Unit - II	**Basic physical Training and Drill:**	**9**
Basic physical Training – various exercises for fitness(with Demonstration)-Food – Hygiene and Cleanliness. Drill- Words of commands- position and commands- sizing and forming- saluting- marching- turning on the march and wheeling- saluting on the march- side pace, pace forward and to the rear- marking time- Drill with arms- ceremonial drill- guard mounting.(WITH DEMONSTRATION)		
Unit - III	**Weapon Training:**	**9**
Main Parts of a Rifle- Characteristics of 5.56mm INSAS rifle- Characteristics of .22 rifle- loading and unloading – position and holding- safety precautions – range procedure- MPI and Elevation- Group and Snap shooting- Long/Short range firing(WITH PRACTICE SESSION) - Characteristics of 7.62mm SLR- LMG- carbine machine gun.		
Unit - IV	**Social Awareness and Community Development:**	**9**
Aims of Social service-Various Means and ways of social services- family planning – HIV and AIDS- Cancer its causes and preventive measures- NGO and their activities- Drug trafficking- Rural development programmes - MGNREGA-SGSY-JGSY-NSAP-PMGSY-Terrorism and counter terrorism- Corruption – female foeticide -dowry –child abuse-RTI Act- RTE Act- Protection of children from sexual offences act- civic sense and responsibility		
Unit - V	**Specialized Subject (ARMY):**	**9**
Basic structure of Armed Forces- Military History – War heroes- battles of Indo-Pak war- Param Vir Chakra- Career in the Defence forces- Service tests and interviews-Fieldcraft and Battlecraft-Basics of Map reading including practical.		

Lecture :45, Practical:30, Total:75

TEXT BOOK:

1. "National Cadet Corps- A Concise handbook of NCC Cadets", Ramesh Publishing House, New Delhi, 2014.

REFERENCES:

1. "Cadets Handbook – Common Subjects SD/SW", published by DG NCC, New Delhi.
2. "Cadets Handbook- Specialized Subjects SD/SW", published by DG NCC, New Delhi.
3. "NCC OTA Precise", published by DG NCC, New Delhi.

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

Mapping of COs with POs and PSOs

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

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

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	-	-	-	-	-	-	-
CAT2	-	-	-	-	-	-	-
CAT3	-	-	-	-	-	-	-
ESE	The examination and award of marks will be done by the Ministry of Defence, Government of India which includes all K1 to K6 knowledge levels. The maximum marks for the End Semester Examination is 500 marks. It will be converted to 100 marks.						

18GEO12 - NCC STUDIES (AIR WING) – I

(Offered by Department of Information Technology)

Programme & Branch	All BE/BTech Engineering and Technology Branches	Sem.	Category	L	T	P	Credit
Prerequisites	Nil	5 / 6	OE	3	0	2	4

Preamble	This course is designed especially for NCC Cadets. This course will help develop character , camaraderie, discipline, secular outlook, the spirit of adventure, sportsman spirit and ideals of selfless service amongst cadets by working in teams, honing qualities such as self-discipline, self-confidence, self-reliance and dignity of labour in the cadets.	
Unit – I	**NCC Organization and National Integration:**	**9**
NCC Organization – History of NCC- NCC Organization- NCC Training- NCC Uniform – Promotion of NCC cadets – Aim and advantages of NCC Training- NCC badges of Rank- Honors' and Awards – Incentives for NCC cadets by central and state govt. History and Organization of IAF-Indo-Pak War-1971-Operation Safed Sagar. National Integration- Unity in diversity- contribution of youth in nation building- national integration council- Images and Slogans on National Integration.		
Unit – II	**Drill and Weapon Training:**	**9**
Drill- Words of commands- position and commands- sizing and forming- saluting- marching- turning on the march and wheeling- saluting on the march- side pace, pace forward and to the rear- marking time- Drill with arms- ceremonial drill- guard mounting.(WITH DEMONSTRATION). Main Parts of a Rifle- Characteristics of .22 rifle- loading and unloading – position and holding- safety precautions – range procedure- MPI and Elevation- Group and Snap shooting- Long/Short range firing (WITH PRACTICE SESSION).		
Unit – III	**Principles of Flight:**	**9**
Laws of motion-Forces acting on aircraft–Bernoulli's theorem-Stalling-Primary control surfaces – secondary control surfaces-Aircraft recognition.		
Unit - IV	**Aero Engines:**	**9**
Introduction of Aero engine-Types of engine-piston engine-jet engines-Turboprop engines-Basic Flight Instruments-Modern trends.		
Unit – V	**Aero Modeling:**	**9**
History of aero modeling-Materials used in Aero-modeling-Types of Aero-models – Static Models-Gliders-Control line models-Radio Control Models-Building and Flying of Aero-models.		

Lecture :45, Practical30, Total:75

TEXT BOOK:

1	"National Cadet Corps- A Concise handbook of NCC Cadets" by Ramesh Publishing House, New Delhi,2014.

REFERENCES:

1	"Cadets Handbook – Common Subjects SD/SW" by DG NCC, New Delhi.
2	"Cadets Handbook – Specialised Subjects SD/SW" by DG NCC, New Delhi.
3	"NCC OTA Precise" by DGNCC, New Delhi.

COURSE OUTCOMES: On completion of the course, the students will be able to		**BT Mapped (Highest Level)**
CO1	display sense of patriotism, secular values and shall be transformed into motivated youth who will carry out nation building through national unity and social cohesion.	Applying (K3)
CO2	demonstrate the sense of discipline with smartness and have basic knowledge of weapons and their use and handling	Applying (K3)
CO3	illustrate various forces and moments acting on aircraft	Applying (K3)
CO4	outline the concepts of aircraft engine and rocket propulsion	Applying (K3)
CO5	design, build and fly chuck gliders/model airplanes and display static models.	Applying (K3)

Mapping of COs with POs and PSOs

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

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

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	-	-	-	-	-	-	-
CAT2	-	-	-	-	-	-	-
CAT3	-	-	-	-	-	-	-
ESE	The examination and award of marks will be done by the Ministry of Defence, Government of India which includes all K1 to K6 knowledge levels. The maximum marks for the End Semester Examination is 500 marks. It will be converted to 100 marks.						