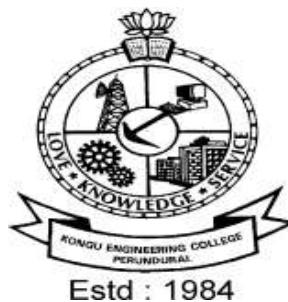


KONGU ENGINEERING COLLEGE

(Autonomous Institution Affiliated to Anna University, Chennai)

PERUNDURAI ERODE – 638 060

TAMILNADU INDIA



REGULATIONS, CURRICULUM & SYLLABI – 2022

**(CHOICE BASED CREDIT SYSTEM AND
OUTCOME BASED EDUCATION)**

(For the students admitted during 2022-2023 onwards)

BACHELOR OF TECHNOLOGY DEGREE IN INFORMATION TECHNOLOGY

DEPARTMENT OF INFORMATION TECHNOLOGY



KONGU ENGINEERING COLLEGE, PERUNDURAI, ERODE – 638060

(Autonomous)

REGULATIONS 2022

CHOICE BASED CREDIT SYSTEM AND OUTCOME BASED EDUCATION

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

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

1. DEFINITIONS AND NOMENCLATURE

In these Regulations, unless otherwise specified:

- i. “University” means ANNA UNIVERSITY, Chennai.
- ii. “College” means KONGU ENGINEERING COLLEGE.
- iii. “Programme” means Bachelor of Engineering (BE) / Bachelor of Technology (BTech) Degree programme
- iv. “Branch” means specialization or discipline of BE/BTech Degree programme, like Civil Engineering, Information Technology, etc.
- v. “Course” means a Theory / Theory cum Practical / Practical course that is normally studied in a semester like Mathematics, Physics etc.
- vi. “Credit” means a numerical value allocated to each course to describe the candidate’s workload required per week.
- vii. “Grade” means the letter grade assigned to each course based on the marks range specified.
- viii. “Grade point” means a numerical value (0 to 10) allocated based on the grade assigned to each course.
- ix. “Principal” means Chairman, Academic Council of the College.
- x. “Controller of Examinations (COE)” means authorized person who is responsible for all examination related activities of the College.
- xi. “Head of the Department (HOD)” means Head of the Department concerned.

2. PROGRAMMES AND BRANCHES OF STUDY

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

Programme	Branch
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
	Computer Science and Design
BTech	Chemical Engineering
	Information Technology
	Food Technology
	Artificial Intelligence and Data Science
	Artificial Intelligence and Machine Learning

3. ADMISSION REQUIREMENTS

3.1 First Semester Admission

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

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

(OR)

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

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

3.2 Lateral Entry Admission

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

(OR)

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

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

4. STRUCTURE OF PROGRAMMES

4.1 Categorisation of Courses

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

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

4.2 Credit Assignment and Honours Degree

4.2.1. Credit Assignment

Each course is assigned certain number of credits as follows:

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

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

4.2.2 Honours Degree

If a candidate earns 18 to 20 additional credits in an emerging area, then he/she can be awarded with Honours degree mentioning that emerging area as his/her specialization. The respective board of studies shall recommend the specializations for honours degree and appropriate additional courses to be studied by the candidate which shall get approval from Academic Council of the institution. A candidate shall have not less than 8 CGPA and no history of arrears to opt for the honours degree and has to maintain the same during the entire programme.

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

SNo	Specializations for Honours degree in emerging areas	To be offered as Honours, Only for the following branches mentioned against the specialization
1.	Construction Technology	BE – Civil Engineering
2.	Smart Cities	BE – Civil Engineering
3.	Smart Manufacturing *	BE – Mechanical Engineering
4.	Computational Product Design *	BE – Mechanical Engineering
5.	Intelligent Autonomous Systems *	BE – Mechatronics Engineering
6.	E-Mobility *	BE – Automobile Engineering
7.	Artificial Intelligence and Machine Learning	BE – Electronics and Communication Engineering
8.	System on Chip Design *	BE – Electronics and Communication Engineering
9.	Electric Vehicles	BE – Electrical and Electronics Engineering
10.	Microgrid Technologies	BE – Electrical and Electronics Engineering
11.	Intelligent Sensors Technology *	BE – Electronics and Instrumentation Engineering
12.	Smart Industrial Automation *	BE – Electronics and Instrumentation Engineering
13.	Data Science	BE – Computer Science and Engineering
14.	Cyber Security	BE – Computer Science and Engineering
15.	Data Science	BTech – Information Technology
16.	Cyber Security	BTech – Information Technology
17.	Petroleum and Petrochemical Engineering *	BTech – Chemical Engineering
18.	Waste Technology *	BTech – Chemical Engineering
19.	Food Processing and Management *	BTech – Food Technology
20.	Virtual and Augmented Reality	BE- Computer Science and Design
21.	Data Science	BE- Computer Science and Design
22.	Internet of Things (IoT)	BTech – Artificial Intelligence and Data Science
23.	Blockchain	BTech – Artificial Intelligence and Data Science
24.	Internet of Things (IoT)	BTech – Artificial Intelligence and Machine Learning
25.	Blockchain	BTech – Artificial Intelligence and Machine Learning

*Title by KEC

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

4.3 Employability Enhancement Courses

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

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

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

(OR)

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

(OR)

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

4.3.2 Comprehensive Test and Viva

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

4.3.3 Full Time Project through Internships

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

A candidate is permitted to go for full time projects through internship in seventh semester with the following condition: The candidate shall complete a part of the

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

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

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

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

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

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

- 4.4.1 One / Two Credit Courses:** One / Two credit courses shall be offered by the college with the prior approval from respective Board of Studies. A candidate can earn a maximum of six credits through one / two credit courses during the entire duration of the programme.
- 4.4.2 Online Courses:** Candidates may be permitted to earn credits for online courses, offered by NPTEL / SWAYAM / a University / Other Agencies, approved by respective Board of Studies.
- 4.4.3 Self Study Courses:** The Department may offer an elective course as a self study course. The syllabus of the course shall be approved by the respective Board of Studies. However, mode of assessment for a self study course will be the same as that used for other courses. The candidates shall study such courses on their own under the guidance of member of the faculty following due approval procedure. Self study course is limited to one per semester.
- 4.4.4** The elective courses in the final year may be exempted if a candidate earns the required credits vide clause 4.4.1, 4.4.2 and 4.4.3 by registering the required number of courses in advance.
- 4.4.5** A candidate can earn a maximum of 30 credits through all one / two credit courses, online courses and self study courses.

4.5 Flexibility to Add or Drop Courses

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

4.5.2 From the first to seventh semesters the candidates have the option of registering for additional elective/Honours courses or dropping of already registered additional elective/Honours courses within two weeks from the start of the semester. Add / Drop is only an option given to the candidates.

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

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

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

5. DURATION OF THE PROGRAMME

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

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

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

6. COURSE REGISTRATION FOR THE EXAMINATION

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

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

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

6.4 A candidate shall register for the chosen courses as well as arrear courses (if any vide clause 6.2 and 6.3) from the list of courses specified under Honours degree.

7. ASSESSMENT AND EXAMINATION PROCEDURE FOR AWARDING MARKS

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

Sl. No.	Category of Course	Continuous Assessment Marks	End Semester Examination Marks
1.	Theory	40	60
2.	Theory cum Practical (The distribution of marks shall be decided based on the credit weightage assigned to theory and practical components.)	50	50
3.	Practical	60	40
4.	Professional Skills Training / Comprehensive Test & Viva / Entrepreneurships / Start ups / Project Work I / Mandatory Course/Industrial Training/ Universal Human Values / Yoga and Values for Holistic Development	100	---
5.	Project Work II Phase I / Project Work II Phase II / Internships	50	50
6.	One / Two credit Course	The distribution of marks shall be decided based on the credit weightage assigned	---
7.	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 entrepreneurship/start ups shall be appointed by the Controller of Examinations after obtaining approval from the Principal.

7.3 Theory Courses

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

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

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

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

- 7.3.2** A reassessment test or tutorial covering the respective test or tutorial portions may be conducted for those candidates who were absent with valid reasons (Sports or any other reason approved by the Principal).

- 7.3.3** The end semester examination for theory courses shall be for a duration of three hours and shall be conducted between November and January during odd semesters and between April and June during even semesters of every year.

7.4 Theory cum Practical Courses

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

7.5 Practical Courses

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

7.5.1 The assessment pattern for awarding continuous assessment marks for each course shall be decided by the course coordinator based on rubrics of that particular course, and shall be based on rubrics for each experiment.

7.5.2 The end semester examination shall be conducted for a maximum of 100 marks for duration of 3 hours and reduced to 40 marks. The appointment of examiners and the schedule shall be decided by chairman of Board of Study of the relevant board.

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

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

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

7.6.3 The continuous assessment and end semester examination marks for Project Work II Phase I/Project Work II Phase II and the Viva-Voce Examination shall be distributed as below.

Continuous 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 supervisor)	Super visor	Review Committee (excluding supervisor)	Super visor	Ext. Exr.	Super visor	Exr.1	Exr.2
0	0	10	10	15	15	20	10	10	10

7.6.4 The Project Report prepared according to approved guidelines and duly signed by the Supervisor shall be submitted to Head of the Department. The candidate(s) must submit the project report within the specified date as per the academic schedule of the semester. If the project report is not submitted within the specified date then the candidate is deemed to have failed in the Project Work and redo it in the subsequent semester.

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

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

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

7.7 Project Work I / Industrial Training

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

Continuous Assessment (Max. 100 Marks)								
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
0	0	10	10	15	15	20	10	20

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

7.8 Professional Skills Training

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

7.9 Comprehensive Test and Viva

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

7.10 Entrepreneurships/ Start ups

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

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

7.11 In-Plant Training

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

7.12 One / Two Credit Courses

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

7.13 Online Course

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

7.14 Self Study Course

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

7.15 Audit Course

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

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

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

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

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

7.16 Mandatory Courses

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

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

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

8. REQUIREMENTS FOR COMPLETION OF A SEMESTER

8.1 A candidate who has fulfilled the following conditions shall be deemed to have satisfied the requirements for completion of a semester and permitted to appear for the examinations of that semester.

8.1.1 Ideally, every candidate is expected to attend all classes and secure 100 % attendance. However, a candidate shall secure not less than 80 % (after rounding off to the nearest integer) of the overall attendance taking into account the total number of working days in a semester.

8.1.2 A candidate who could not satisfy the attendance requirements as per clause 8.1.1 due to medical reasons (hospitalization / accident / specific illness) but has secured not less than 70 % in the current semester may be permitted to appear for the current semester examinations with the approval of the Principal on payment of a condonation fee as may be fixed by the authorities from time to time. The medical certificate needs to be submitted along with the leave application. A candidate can avail this provision only twice during the entire duration of the degree programme.

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

8.1.3 In addition to clause 8.1.1 or 8.1.2, a candidate shall secure not less than 60 % attendance in each course.

8.1.4 A candidate shall be deemed to have completed the requirements of study of any semester only if he/she has satisfied the attendance requirements (vide clause 8.1.1 to 8.1.3) and has registered for examination by paying the prescribed fee.

8.1.5 Candidate's progress is satisfactory.

8.1.6 Candidate's conduct is satisfactory and he/she was not involved in any indisciplined activities in the current semester.

8.2. The candidates who do not complete the semester as per clauses from 8.1.1 to 8.1.6 except 8.1.3 shall not be permitted to appear for the examinations at the end of the semester and not be permitted to go to the next semester. They have to repeat the incomplete semester in next academic year.

- 8.3** The candidates who satisfy the clause 8.1.1 or 8.1.2 but do not complete the course as per clause 8.1.3 shall not be permitted to appear for the end semester examination of that course alone. They have to repeat the incomplete course in the subsequent semester when it is offered next.

9. REQUIREMENTS FOR APPEARING FOR END SEMESTER EXAMINATION

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

10. PROVISION FOR WITHDRAWAL FROM EXAMINATIONS

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

11. PROVISION FOR BREAK OF STUDY

- 11.1** A candidate is normally permitted to avail the authorised break of study under valid reasons (such as accident or hospitalization due to prolonged ill health or any other valid reasons) and to rejoin the programme in a later semester. He/She shall apply in advance to the Principal, through the Head of the Department, stating the reasons therefore, in any case, not later than the last date for registering for that semester examination. A candidate is permitted to avail the authorised break of study only once during the entire period of study for a maximum period of one year. However, in extraordinary situation the candidate may apply for additional break of study not exceeding another one year by paying prescribed fee for the break of study.
- 11.2** The candidates permitted to rejoin the programme after break of study / prevention due to lack of attendance shall be governed by the rules and regulations in force at the time of rejoining.
- 11.3** The candidates rejoining in new Regulations shall apply to the Principal in the prescribed format through Head of the Department at the beginning of the readmitted semester itself for prescribing additional/equivalent courses, if any, from any semester of the regulations in-force, so as to bridge the curriculum in-force and the old curriculum.
- 11.4** The total period of completion of the programme reckoned from the commencement of the semester to which the candidate was admitted shall not exceed the maximum period specified in clause 5 irrespective of the period of break of study in order to qualify for the award of the degree.
- 11.5** If any candidate is prevented for want of required attendance, the period of prevention shall not be considered as authorized break of study.
- 11.6** If a candidate has not reported to the college for a period of two consecutive semesters without any intimation, the name of the candidate shall be deleted permanently from the college enrollment. Such candidates are not entitled to seek readmission under any circumstances.

12. PASSING REQUIREMENTS

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

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

13. REVALUATION OF ANSWER SCRIPTS

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

14. SUPPLEMENTARY EXAMINATION

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

15. AWARD OF LETTER GRADES:

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

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

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

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

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-2022 (vide clause 11.3)
- iv. No disciplinary action pending against him / her.

17. CLASSIFICATION OF THE DEGREE AWARDED

17.1 First Class with Distinction:

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

- Should have passed the examination in all the courses of all the eight semesters (six semesters for lateral entry candidates) in the **First Appearance** within eight consecutive semesters (six consecutive semesters for lateral entry candidates) excluding the authorized break of study (vide clause 11) after the commencement of his / her study.
- Withdrawal from examination (vide clause 10) shall not be considered as an appearance.
- Should have secured a CGPA of not less than 8.50

(OR)

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

- Should have passed the examination in all the courses of all the eight semesters (six semesters for lateral entry candidates) in the **First Appearance** within eight consecutive semesters (six consecutive semesters for lateral entry candidates) excluding the authorized break of study (vide clause 11) after the commencement of his / her study.
- Submission of equivalent course list approved by the respective Board of studies.
- Withdrawal from examination (vide clause 10) shall not be considered as an appearance.
- Should have secured a CGPA of not less than 9.00

17.2 First Class:

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

- Should have passed the examination in all the courses of all eight semesters (six semesters for lateral entry candidates) within ten consecutive semesters (eight consecutive semesters for lateral entry candidates) excluding authorized break of study (vide clause 11) after the commencement of his / her study.
- Withdrawal from the examination (vide clause 10) shall not be considered as an appearance.
- Should have secured a CGPA of not less than 6.50

17.3 Second Class:

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

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

17.5 Honors Degree:

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

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

18. MALPRACTICES IN TESTS AND EXAMINATIONS

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

19. AMENDMENTS

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

MAPPING OF COURSES WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

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

Sem.	Course Code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
8	22MTO05	Micro and Nano Electromechanical Systems	✓	✓	✓	✓								✓		
8	22AUO03	Public Transport Management	✓	✓				✓	✓	✓				✓		
8	22AUO04	Autonomous Vehicles	✓	✓	✓	✓	✓	✓	✓					✓		
8	22ECO02	Optical Engineering	✓	✓	✓	✓		✓	✓	✓	✓			✓		
8	22EEO17	Smart Grid Technologies	✓	✓	✓	✓	✓			✓				✓		
8	22EEO18	Biomass Energy Systems	✓	✓	✓			✓	✓				✓	✓		
8	22EIO12	Environmental Sensors	✓	✓	✓	✓	✓	✓	✓							
8	22EIO13	Pollution Control and Management	✓	✓	✓	✓	✓	✓	✓	✓						
8	22CSO04	Machine Translation	✓	✓	✓											
8	22CSO05	Fundamentals of Blockchain	✓	✓	✓											
8	22ITO07	Business Continuity Planning	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓		
8	22CDX02	Virtual Reality and Augmented Reality	✓	✓	✓	✓										
8	22ADO03	Business Analytics	✓	✓	✓	✓										
8	22ALO03	Machine Learning for Smart Cities	✓	✓	✓	✓										
8	22CHO09	Industrial Accident Prevention and Management	✓		✓	✓		✓	✓	✓	✓	✓	✓	✓		
8	22CHO10	Electrochemical Engineering	✓	✓	✓											
8	22CHO11	Smart and Functional Materials	✓	✓				✓	✓	✓				✓		
8	22FTO04	Food Ingredients	✓	✓	✓			✓		✓		✓		✓		
8	22FTO05	Food and Nutrition	✓	✓	✓			✓				✓		✓		
8	22CYO09	Chemistry of Nutrition for Women Health	✓	✓	✓											
		General Open Elective Courses														
ALL	22GEO01	German Language Level 1								✓	✓	✓		✓		
ALL	22GEO02	Japanese Language Level 1								✓	✓	✓		✓		
5	22GEO03	Design Thinking for Engineers	✓	✓	✓	✓										
6	22GEO04	Innovation and Business Model Development	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
ALL	22GEO05	German Language Level 2								✓	✓	✓		✓		

Sem.	Course Code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
ALL	22GEO06	German Language Level 3								✓	✓	✓			✓	
ALL	22GEO07	German Language Level 4								✓	✓	✓			✓	
ALL	22GEO08	Japanese Language Level 2								✓	✓	✓			✓	
ALL	22GEO09	Japanese Language Level 3								✓	✓	✓			✓	
ALL	22GEO10	Japanese Language Level 4								✓	✓	✓			✓	
ALL	22GEO11	French Language Level 1								✓	✓	✓			✓	
ALL	22GEO12	French Language Level 2								✓	✓	✓			✓	
ALL	22GEO13	French Language Level 3								✓	✓	✓			✓	
ALL	22GEO14	Spanish Language Level 1								✓	✓	✓			✓	
ALL	22GEO15	Spanish Language Level 2								✓	✓	✓			✓	
ALL	22GEO16	Spanish Language Level 3								✓	✓	✓			✓	
7	22GEO17	Entrepreneurship Development	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
5 / 6	22GEX01	NCC Studies (Army Wing) - I	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			
5 / 6	22GEX02	NCC Studies (Air Wing) - 1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			
5	22MBO01	Cost Accounting for Engineers										✓	✓	✓		
6	22MBO02	Economic Analysis for Decision Making					✓					✓	✓			
7	22MBO03	Marketing Analytics										✓	✓	✓		

B.Tech - INFORMATION TECHNOLOGY CURRICULUM – R2022
(For the students admitted in the academic year 2022-23)

SEMESTER – I									
Course Code	Course Title	Hours / Week			Credit	Maximum Marks			Category
		L	T	P		CA	ESE	Total	
Theory/Theory with Practical									
22EGT11	Communication Skills - I	3	0	0	3	40	60	100	HS
22MAC11	Matrices and Ordinary Differential Equations	3	1*	2*	4	50	50	100	BS
22PHT18	Physics for Information Technology	3	0	0	3	40	60	100	BS
22CSC12	Programming in C	3	0	2	4	100	0	100	PC
22ITC11	Scientific Computing	2	0	2	3	50	50	100	ES
22EET12	Basics of Electrical and Electronics Engineering	3	0	0	3	40	60	100	ES
Practical / Employability Enhancement									
22EEL11	Basics of Electrical and Electronics Engineering Laboratory	0	0	2	1	60	40	100	ES
22PHL18	Physics Laboratory for Information Technology	0	0	2	1	60	40	100	BS
22MNT11	Student Induction Program	---	---	---	0	100	0	100	MC
Total Credits to be earned						22			

SEMESTER – II									
Course Code	Course Title	Hours / Week			Credit	Maximum Marks			Category
		L	T	P		CA	ESE	Total	
Theory/Theory with Practical									
22EGT21	Communication Skills - II	3	0	0	3	40	60	100	HS
22MAC23	Probability and Statistics	3	1*	2*	4	50	50	100	BS
22CYT28	Chemistry for Information Technology	3	0	0	3	40	60	100	BS
22ITC21	Data Structures	3	0	2	4	50	50	100	PC
22ITC22	Object Oriented Programming	3	0	2	4	50	50	100	PC
22ITT21	Digital Logic Principles and Design	3	0	0	3	40	60	100	ES
22TAM01	Heritage of Tamils	1	0	0	1	100	0	100	HS
Practical / Employability Enhancement									
22MEL11	Engineering Practices Laboratory	0	0	2	1	60	40	100	ES
22CYL12	Chemistry Laboratory for Computer Systems	0	0	2	1	60	40	100	BS
22VEC11	Yoga and Values for Holistic Development	1	0	1	1	100	0	100	HS
Total Credits to be earned						25			

*Alternate weeks

B.Tech - INFORMATION TECHNOLOGY CURRICULUM – R2022
(For the students admitted in the academic year 2022-23)

SEMESTER – III									
Course Code	Course Title	Hours / Week			Credit	Maximum Marks			Category
		L	T	P		CA	ESE	Total	
Theory/Theory with Practical									
22ITT31	Design and Analysis of Algorithms	3	0	0	3	40	60	100	PC
22ITT32	Python Programming and Frameworks	3	0	0	3	100	0	100	PC
22ITT33	Computer Organization	3	1	0	4	40	60	100	PC
22ITT34	Information Theory and Coding	3	1	0	4	40	60	100	ES
22EIT35	Microprocessors and Embedded Systems	3	0	0	3	40	60	100	ES
22GET31	Universal Human Values	2	0	0	2	100	0	100	HS
22TAM02	Tamils and Technology	1	0	0	1	100	0	100	HS
Practical / Employability Enhancement									
22ITL31	Design and Analysis of Algorithms Laboratory	0	0	2	1	60	40	100	PC
22ITL32	Python Programming and Frameworks Laboratory	0	0	2	1	100	0	100	PC
22EIL33	Digital Logic and Microprocessors Laboratory	0	0	2	1	60	40	100	ES
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									
22MAT43	Discrete Mathematics	3	1	0	4	40	60	100	BS
22ITT41	Database Management Systems	3	0	0	3	40	60	100	PC
22ITT42	Web Technology	3	0	0	3	40	60	100	PC
22ITT43	Formal Languages and Automata Theory	3	0	0	3	40	60	100	PC
22ITT44	Operating Systems	3	1	0	4	40	60	100	PC
Practical / Employability Enhancement									
22ITL41	Database Management Systems Laboratory	0	0	2	1	60	40	100	PC
22ITL42	Web Technology Laboratory	0	0	2	1	60	40	100	PC
22GCL41 / 22GCI41	Professional Skills Training - I / Industrial Training I *	0	0	80	2	100	0	100	EC
22EGL31	Communication Skills Development Laboratory	0	0	2	1	60	40	100	HS
Total Credits to be earned					22				

*80 hours of Training

B.Tech - INFORMATION TECHNOLOGY CURRICULUM – R2022
(For the students admitted in the academic year 2022-23)

SEMESTER-V									
Course Code	Course Title	Hours/Week			Credit	Maximum Marks			
		L	T	P		CA	ESE	Total	
Theory/Theory with Practical									
22ITT51	Computer Networks	3	0	0	3	40	60	100	PC
22ITT52	Machine Learning	3	0	0	3	40	60	100	PC
22ITC51	Software Engineering	3	0	2	4	50	50	100	PC
22ITC52	User Interface Design	3	0	2	4	50	50	100	PC
	Professional Elective - I	3	0	0	3	40	60	100	PE
	Open Elective - I	3	1/0	0/2	4	40/50	60/50	100	OE
Practical/Employability Enhancement									
22ITL51	Networks Laboratory	0	0	2	1	60	40	100	PC
22ITL52	Machine Learning Laboratory	0	0	2	1	60	40	100	PC
22GCL51 / 22GCI51	Professional Skills Training II / Industrial Training II *	0	0	80	2	100	0	100	EC
Total Credits to be earned					25				

* 80 hours of Training

SEMESTER-VI									
Course Code	Course Title	Hours/Week			Credit	Maximum Marks			
		L	T	P		CA	ESE	Total	
Theory/Theory with Practical									
22ITT61	Cryptography and Network Security	3	0	0	3	40	60	100	PC
22ITT62	Mobile Communication	3	0	0	3	40	60	100	ES
	Professional Elective - II	3	0	0	3	40	60	100	PE
	Open Elective - II	3	1/0	0/2	4	40/50	60/50	100	OE
22MNT31	Environmental Science	2	0	0	0	100	0	100	MC
Practical / Employability Enhancement									
22ITL61	Cloud Computing Laboratory	0	0	2	1	60	40	100	PC
22ITL62	Internet of Things Laboratory	0	0	2	1	60	40	100	ES
22ITP61	Project Work I	0	0	8	4	50	50	100	EC
22GEP61	Comprehensive Test and Viva	---	---	---	2	100	0	100	EC
Total Credits to be earned					21				

B.Tech - INFORMATION TECHNOLOGY CURRICULUM – R2022
(For the students admitted in the academic year 2022-23)

SEMESTER–VII									
Course Code	Course Title	Hours/Week			Credit	Maximum Marks			
		L	T	P		CA	ESE	Total	
Theory / Theory with Practical									
22GCT71	Engineering Economics and Management	3	0	0	3	40	60	100	HS
	Professional Elective–III	3	0	0	3	40	60	100	PE
	Professional Elective–IV	3	0	0	3	40	60	100	PE
	Professional Elective–V	3	0	0	3	40	60	100	PE
	Open Elective-III	3	0	0	3	40	60	100	OE
Practical/Employability Enhancement									
22ITP71	Project Work II Phase I	0	0	10	5	50	50	100	EC
Total Credits to be earned					20				

SEMESTER– VIII									
Course Code	Course Title	Hours/Week			Credit	Maximum Marks			
		L	T	P		CA	ESE	Total	
Theory/Theory with Practical									
	Professional Elective-VI	3	0	0	3	40	60	100	PE
	Open Elective-IV	3	0	0	3	40	60	100	OE
Practical/Employability Enhancement									
22ITP81	Project Work II Phase II	0	0	8	4	50	50	100	EC
Total Credits to be earned					10				

Total Credits: 168

B.Tech - INFORMATION TECHNOLOGY CURRICULUM – R2022
(For the students admitted in the academic year 2022-23)

LIST OF PROFESSIONAL ELECTIVE COURSES

Course Code	Course Name	L	T	P	C	Domain/Stream
	Semester V					
	Elective I					
22ITE01	Computer Graphics	3	0	0	3	AP
22ITE02	Search Methods for Problem Solving	3	0	0	3	CI
22ITE03	Game Design and Development	3	0	0	3	NW
22ITE04	Big Data Analytics	3	0	0	3	CI
22ITE05	Information Security Principles	3	0	0	3	GE
22ITE06	Algorithmic Thinking in Bioinformatics	3	0	0	3	CI
22ITE07	Design Thinking	3	0	0	3	GE
22ITF01	Enterprise Application Development using Java	2	0	2	3	AP
	Semester VI					
	Elective II					
22ITE08	Coding and Security	3	0	0	3	AP
22ITE09	3D Modelling and Mixed Reality Applications	3	0	0	3	AP
22ITE10	Knowledge Representation	3	0	0	3	CI
22ITE11	5G Wireless Networks	3	0	0	3	NW
22ITF02	Devops	2	0	2	3	SD
22ITE12	Deep Learning	3	0	0	3	CI
	Semester VII					
	Elective III					
22ITE13	Video Analytics	3	0	0	3	CI
22ITE14	Contemporary Cryptography	3	0	0	3	NS
22ITE15	Digital Image Processing for Computer Vision	3	0	0	3	AP
22ITE16	Software Testing	3	0	0	3	SD
22ITE17	Native Mobile Application Development	3	0	0	3	SD
22ITE18	Software Defined Networks	3	0	0	3	NW
22GEE01	Fundamentals of Research	3	0	0	3	GE
	Elective IV					
22ITE19	Social Network Analysis	3	0	0	3	CI
22ITE20	Security in Mobile and Wireless Networks	3	0	0	3	NS
22ITE21	Ethical Hacking	3	0	0	3	NS
22ITE22	Natural Language Processing	3	0	0	3	CI

	Elective V					
22ITE23	Constraint Satisfaction Problem	3	0	0	3	CI
22ITE24	Audit and Assurance in Computer Security	3	0	0	3	NS
22ITE25	Cyber Forensics	3	0	0	3	NS
22ITE26	Multicore Architecture	3	0	0	3	AP
22ITE27	Business Intelligence and its Applications	3	0	0	3	CI
22GEE02	Total Quality Management	3	0	0	3	GE
	Semester VIII					
	Elective VI					
22ITE28	Information Storage and Management	3	0	0	3	AP
22ITE29	Software Project Management	3	0	0	3	SD
22ITE30	Building Enterprise Applications	3	0	0	3	SD
22ITE31	Web Application Security	3	0	0	3	NS
22ITE32	Wireless Sensor Networks	3	0	0	3	NW
22ITE33	Realtime Programming for Embedded Systems	3	0	0	3	AP

Domain/ Abbreviation: NW- Network, NS – Network Security, AP – Application, SD – Software Development, CI- Computer Interaction, GE – General Engineering

B.Tech - INFORMATION TECHNOLOGY CURRICULUM – R2022
(For the students admitted in the academic year 2023-24)

SEMESTER – I									
Course Code	Course Title	Hours / Week			Credit	Maximum Marks			
		L	T	P		CA	ES E	Total	
Theory/Theory with Practical									
22EGT11	Communication Skills - I	3	0	0	3	40	60	100	HS
22MAC11	Matrices and Ordinary Differential Equations	3	1*	2*	4	50	50	100	BS
22CYT28	Chemistry for Information Technology	3	0	0	3	40	60	100	BS
22CSC12	Programming in C	3	0	2	4	100	0	100	PC
22ITC11	Scientific Computing	2	0	2	3	50	50	100	ES
22TAM01	Heritage of Tamils	1	0	0	1	100	0	100	HS
Practical / Employability Enhancement									
22GCL11	Foundation Laboratory – Manufacturing, Design and Robotics	0	0	6	3	100	0	100	ES
22CYL12	Chemistry Laboratory for Computer Systems	0	0	2	1	60	40	100	BS
22MNT11	Student Induction Program	---	---	---	0	100	0	100	MC
Total Credits to be earned					22				

SEMESTER – II									
Course Code	Course Title	Hours / Week			Credit	Maximum Marks			
		L	T	P		CA	ES E	Total	
Theory/Theory with Practical									
22EGT21	Communication Skills - II	3	0	0	3	40	60	100	HS
22MAC23	Probability and Statistics	3	1*	2*	4	50	50	100	BS
22PHT18	Physics for Information Technology	3	0	0	3	40	60	100	BS
22ITT21	Digital Logic Principles and Design	3	0	0	3	40	60	100	ES
22ITC22	Object Oriented Programming	3	0	2	4	50	50	100	PC
22TAM02	Tamils and Technology	1	0	0	1	100	0	100	HS
Practical / Employability Enhancement									
22GCL12	Foundation Laboratory – Electrical, IoT and Web Technologies	0	0	6	3	100	0	100	ES
22PHL18	Physics Laboratory for Information Technology	0	0	2	1	60	40	100	BS
22VEC11	Yoga and Values for Holistic Development	1	0	1	1	100	0	100	HS
Total Credits to be earned					23				

*Alternate weeks

B.Tech - INFORMATION TECHNOLOGY CURRICULUM – R2022
(For the students admitted in the academic year 2023-24)

SEMESTER – III									
Course Code	Course Title	Hours / Week			Credit	Maximum Marks			Category
		L	T	P		CA	ESE	Total	
Theory/Theory with Practical									
22ITC33	Data Structures using Java	3	0	2	4	50	50	100	PC
22EIT35	Microprocessors and Embedded Systems	3	0	0	3	40	60	100	ES
22ITT32	Python Programming and Frameworks	3	0	0	3	100	0	100	PC
22ITT33	Computer Organization	3	1	0	4	40	60	100	PC
22ITT34	Information Theory and Coding	3	1	0	4	40	60	100	ES
22GET31	Universal Human Values	2	0	0	2	100	0	100	HS
Practical / Employability Enhancement									
22ITL32	Python Programming and Frameworks Laboratory	0	0	2	1	100	0	100	PC
22EIL33	Digital Logic and Microprocessors Laboratory	0	0	2	1	60	40	100	ES
Total Credits to be earned					22				

SEMESTER – IV									
Course Code	Course Title	Hours / Week			Credit	Maximum Marks			Category
		L	T	P		CA	ESE	Total	
Theory/Theory with Practical									
22MAT43	Discrete Mathematics	3	1	0	4	40	60	100	BS
22ITT41	Database Management Systems	3	0	0	3	40	60	100	PC
22ITT42	Web Technology	3	0	0	3	40	60	100	PC
22ITT31	Design and Analysis of Algorithms	3	0	0	3	40	60	100	PC
22ITT44	Operating Systems	3	1	0	4	40	60	100	PC
Practical / Employability Enhancement									
22ITL41	Database Management Systems Laboratory	0	0	2	1	60	40	100	PC
22ITL42	Web Technology Laboratory	0	0	2	1	60	40	100	PC
22GCL41 / 22GCI41	Professional Skills Training – I / Industrial Training I \$	0	0	80	2	100	0	100	EC
22EGL31	Communication Skills Development Laboratory	0	0	2	1	60	40	100	HS
Total Credits to be earned					22				

\$80 hours of training

B.Tech - INFORMATION TECHNOLOGY CURRICULUM – R2022
(For the students admitted in the academic year 2023-24)

SEMESTER-V									
Course Code	Course Title	Hours/Week			Credit	Maximum Marks			Category
		L	T	P		CA	ESE	Total	
Theory/Theory with Practical									
22ITT51	Computer Networks	3	0	0	3	40	60	100	PC
22ITT52	Machine Learning	3	0	0	3	40	60	100	PC
22ITC51	Software Engineering	3	0	2	4	50	50	100	PC
22ITC52	User Interface Design	3	0	2	4	50	50	100	PC
	Professional Elective I	3	0	0	3	40	60	100	PE
	Open Elective - I	3	1/0	0/2	4	40/ 50	60/ 50	100	OE
Practical/Employability Enhancement									
22ITL51	Networks Laboratory	0	0	2	1	60	40	100	PC
22ITL52	Machine Learning Laboratory	0	0	2	1	60	40	100	PC
22GCL51/ 22GCI51	Professional Skills Training II / Industrial Training I \$	0	0	80	2	100	0	100	EC
Total Credits to be earned					25				

\$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									
22ITT61	Cryptography and Network Security	3	0	0	3	40	60	100	PC
22ITT62	Mobile Communication	3	0	0	3	40	60	100	ES
	Professional Elective - II	3	0	0	3	40	60	100	PE
	Open Elective - II	3	1/0	0/2	4	40/ 50	60/ 50	100	OE
22MNT31	Environmental Science	2	0	0	0	100	0	100	MC
Practical / Employability Enhancement									
22ITL61	Cloud Computing Laboratory	0	0	2	1	60	40	100	PC
22ITL62	Internet of Things Laboratory	0	0	2	1	60	40	100	ES
22ITP62	Project Work I	0	0	10	5	100	0	100	EC
22GEP61	Comprehensive Test and Viva	---	---	---	2	100	0	100	EC
Total Credits to be earned					22				

B.Tech - INFORMATION TECHNOLOGY CURRICULUM – R2022
(For the students admitted in the academic year 2023-24)

SEMESTER–VII									
Course Code	Course Title	Hours/Week			Credit	Maximum Marks			
		L	T	P		CA	ESE	Total	
Theory / Theory with Practical									
22GET71	Engineering Economics and Management	3	0	0	3	40	60	100	HS
22ITT71	Blockchain Technology	3	1	0	4	40	60	100	PC
	Professional Elective–III	3	0	0	3	40	60	100	PE
	Professional Elective–IV	3	0	0	3	40	60	100	PE
	Open Elective-III	3	0	0	3	40	60	100	OE
Practical/Employability Enhancement									
22ITP72	Project Work II Phase I	0	0	12	6	50	50	100	EC
Total Credits to be earned					22				

SEMESTER– VIII									
Course Code	Course Title	Hours/Week			Credit	Maximum Marks			
		L	T	P		CA	ESE	Total	
Theory/Theory with Practical									
	Professional Elective-V	3	0	0	3	40	60	100	PE
	Open Elective-IV	3	0	0	3	40	60	100	OE
Practical/Employability Enhancement									
22ITP81	Project Work II Phase II	0	0	8	4	50	50	100	EC
Total Credits to be earned					10				

Total Credits: 168

B.Tech - INFORMATION TECHNOLOGY CURRICULUM – R2022
(For the students admitted in the academic year 2023-24)

LIST OF PROFESSIONAL ELECTIVE COURSES

Course Code	Course Name	L	T	P	C	Domain/Stream
	Semester V					
	Elective I					
22ITE01	Computer Graphics	3	0	0	3	AP
22ITE02	Search Methods for Problem Solving	3	0	0	3	CI
22ITE03	Game Design and Development	3	0	0	3	NW
22ITE04	Big Data Analytics	3	0	0	3	CI
22ITE05	Information Security Principles	3	0	0	3	GE
22ITE06	Algorithmic Thinking in Bioinformatics	3	0	0	3	CI
22ITE07	Design Thinking	3	0	0	3	GE
22ITF01	Enterprise Application Development using Java	2	0	2	3	AP
	Semester VI					
	Elective II					
22ITE08	Coding and Security	3	0	0	3	AP
22ITE09	3D Modelling and Mixed Reality Applications	3	0	0	3	AP
22ITE10	Knowledge Representation	3	0	0	3	CI
22ITE11	5G Wireless Networks	3	0	0	3	NW
22ITF02	Devops	2	0	2	3	SD
22ITE12	Deep Learning	3	0	0	3	CI
	Semester VII					
	Elective III					
22ITE13	Video Analytics	3	0	0	3	CI
22ITE14	Contemporary Cryptography	3	0	0	3	NS
22ITE15	Digital Image Processing for Computer Vision	3	0	0	3	AP
22ITE16	Software Testing	3	0	0	3	SD
22ITE17	Native Mobile Application Development	3	0	0	3	SD
22ITE18	Software Defined Networks	3	0	0	3	NW
22GEE01	Fundamentals of Research	3	0	0	3	GE
	Elective IV					
22ITE19	Social Network Analysis	3	0	0	3	CI
22ITE20	Security in Mobile and Wireless Networks	3	0	0	3	NS
22ITE21	Ethical Hacking	3	0	0	3	NS
22ITE22	Natural Language Processing	3	0	0	3	CI
22ITE23	Constraint Satisfaction Problem	3	0	0	3	CI
22ITE24	Audit and Assurance in Computer Security	3	0	0	3	NS

22ITE25	Cyber Forensics	3	0	0	3	NS
22ITE26	Multicore Architecture	3	0	0	3	AP
22ITE27	Business Intelligence and its Applications	3	0	0	3	CI
22GEE02	Total Quality Management	3	0	0	3	GE
Semester VIII						
Elective V						
22ITE28	Information Storage and Management	3	0	0	3	AP
22ITE29	Software Project Management	3	0	0	3	SD
22ITE30	Building Enterprise Applications	3	0	0	3	SD
22ITE31	Web Application Security	3	0	0	3	NS
22ITE32	Wireless Sensor Networks	3	0	0	3	NW
22ITE33	Realtime Programming for Embedded Systems	3	0	0	3	AP

Domain/ Abbreviation: NW- Network, NS – Network Security, AP – Application, SD – Software Development, CI- Computer Interaction, GE – General Engineering

B.Tech - INFORMATION TECHNOLOGY CURRICULUM – R2022

OPEN ELECTIVE COURSES OFFERED TO OTHER DEPARTMENTS (OE) (Offered by Department of Information Technology)							
S. No.	Course Code	Course Name	L	T	P	C	Sem
1.	22ITO01	Artificial Intelligence	3	1	0	4	V
2.	22ITX01	Next Generation Databases	3	0	2	4	V
3.	22GEX02	NCC Studies (Air Wing) - 1	3	1	0	4	V / VI
4.	22ITX02	Advanced Java Programming	3	0	2	4	V / VI
5.	22ITX03	Java Programming	3	0	2	4	V
6.	22ITO02	Internet of Things	3	1	0	4	VI
7.	22ITO03	Fundamentals of Software Development	3	1	0	4	VI
8.	22ITO04	Mobile Application Development	3	1	0	4	VI
9.	22ITO05	Fundamentals of Cloud Computing	3	0	0	3	VII
10.	22ITO06	Introduction to Ethical Hacking	3	0	0	3	VII
11.	22ITO07	Business Continuity Planning	3	0	0	3	VIII

OPEN ELECTIVE COURSES OFFERED BY OTHER DEPARTMENTS (OE)

S.No	Course Code	Course Title	L	T	P	C	Offering Dept.	Sem.
1.	22CEX01	Remote Sensing and its Applications	3	0	2	4	CIVIL	V
2.	22CEO01	Disaster Management	3	1	0	4	CIVIL	VI
3.	22CEO02	Introduction to Smart Cities	3	0	0	3	CIVIL	VII
4.	22CEO03	Environmental Health and Safety	3	0	0	3	CIVIL	VII
5.	22CEO04	Infrastructure Planning and Management	3	0	0	3	CIVIL	VIII
6.	22CEO05	Environmental Laws and Policy	3	0	0	3	CIVIL	VIII
7.	22MEX01	Renewable Energy Sources	3	0	2	4	MECH	V
8.	22MEX02	Design of Experiments	3	0	2	4	MECH	VI
9.	22MEO01	Fundamentals of Ergonomics	3	0	0	3	MECH	VII
10.	22MEO02	Principles of Management and Industrial Psychology	3	0	0	3	MECH	VII
11.	22MEO03	Waste Heat Recovery System and Storage	3	0	0	3	MECH	VII
12.	22MEO04	Safety Measures for Engineers	3	0	0	3	MECH	VIII
13.	22MEO05	Energy Conservation in Thermal Equipments	3	0	0	3	MECH	VIII
14.	22MEO06	Climate Change and New Energy Technology	3	0	0	3	MECH	VIII
15.	22MTO01	Design of Mechatronics Systems	3	1	0	4	MTS	V
16.	22MTX01	Data Acquisition and Virtual Instrumentation	3	0	2	4	MTS	V
17.	22MTX02	Factory Automation	3	0	2	4	MTS	V
18.	22MTO02	Robotics	3	1	0	4	MTS	VI
19.	22MTO03	3D Printing and Design	3	1	0	4	MTS	VI
20.	22MTO04	Drone System Technology	3	0	0	3	MTS	VII
21.	22MTO05	Micro and Nano Electromechanical Systems	3	0	0	3	MTS	VIII
22.	22AUX01	Automotive Engineering	3	0	2	4	AUTO	V
23.	22AUO01	Automotive Electronics	3	1	0	4	AUTO	VI
24.	22AUO02	Vehicle Maintenance	3	0	0	3	AUTO	VII
25.	22AUO03	Public Transport Management	3	0	0	3	AUTO	VII
26.	22AUO04	Autonomous Vehicles	3	0	0	3	AUTO	VIII
27.	22ECX01	Basics of Electronics in Automation Appliances	3	0	2	4	ECE	V
28.	22ECX02	Image Processing	3	0	2	4	ECE	V
29.	22ECX03	PCB Design and Fabrication	3	0	2	4	ECE	VI

S.No	Course Code	Course Title	L	T	P	C	Offering Dept.	Sem.
30.	22ECO01	Wearable Devices	3	0	0	3	ECE	VII
31.	22ECX04	Electronic Hardware and Troubleshooting	2	0	2	3	ECE	VII
32.	22ECO02	Optical Engineering	3	0	0	3	ECE	VIII
33.	22EEO01	Solar and Wind Energy Systems	3	1	0	4	EEE	V
34.	22EEO02	Electrical Wiring and Lighting	3	1	0	4	EEE	V
35.	22EEO03	Programmable Logic Controller and SCADA	3	1	0	4	EEE	V
36.	22EEO04	Analog and Digital Electronics	3	1	0	4	EEE	V
37.	22EEO05	Power Electronics and Drives	3	1	0	4	EEE	V
38.	22EEO06	Introduction to Sensors and Actuators	3	1	0	4	EEE	V
39.	22EEO07	Energy Conservation and Management	3	1	0	4	EEE	VI
40.	22EEO08	Microprocessors and Microcontrollers Interfacing	3	1	0	4	EEE	VI
41.	22EEO09	Electrical Safety	3	1	0	4	EEE	VI
42.	22EEO10	VLSI System Design	3	1	0	4	EEE	VI
43.	22EEO11	Automation for Industrial Applications	3	1	0	4	EEE	VI
44.	22EEO12	Electric Vehicle	3	0	0	3	EEE	VII
45.	22EEO13	E-Waste Management	3	0	0	3	EEE	VII
46.	22EEO14	Embedded Systems and IOT	3	0	0	3	EEE	VII
47.	22EEO15	Energy Storage Systems and Controllers	3	0	0	3	EEE	VII
48.	22EEO16	AI Techniques in Engineering Applications	3	0	0	3	EEE	VII
49.	22EEO17	Smart Grid Technologies	3	0	0	3	EEE	VIII
50.	22EEO18	Biomass Energy Systems	3	0	0	3	EEE	VIII
51.	22EIO01	Measurements and Instrumentation	3	1	0	4	EIE	V
52.	22EIO02	Biomedical Instrumentation and Applications	3	1	0	4	EIE	V
53.	22EIO03	Industrial Automation	3	1	0	4	EIE	V
54.	22EIO04	PLC Programming with High Level Languages	3	1	0	4	EIE	VI
55.	22EIO05	Virtual Instrumentation	3	1	0	4	EIE	VI
56.	22EIO06	Introduction to Distributed Control Systems	3	0	0	3	EIE	VII
57.	22EIO07	Instrumentation in Aircraft Navigation and Control	3	0	0	3	EIE	VII
58.	22EIO08	Industry 4.0 with Industrial IoT	3	0	0	3	EIE	VII
59.	22EIO09	Industrial Data Communication	3	0	0	3	EIE	VII
60.	22EIO10	Wireless Instrumentation	3	0	0	3	EIE	VII

S.No	Course Code	Course Title	L	T	P	C	Offering Dept.	Sem.
61.	22EIO11	Instrumentation Techniques in Agriculture	3	0	0	3	EIE	VII
62.	22EIO12	Environmental Sensors	3	0	0	3	EIE	VIII
63.	22EIO13	Pollution Control and Management	3	0	0	3	EIE	VIII
64.	22CSX01	Fundamentals of Database	3	0	2	4	CSE	V
65.	22CSX02	Data Science for Engineers	3	0	2	4	CSE	V
66.	22CSX03	Enterprise Application Development Using Java	3	0	2	4	CSE	V
67.	22CSO01	Computational Science for Engineers	3	1	0	4	CSE	V
68.	22CSO02	Formal Languages and Automata Theory	3	1	0	4	CSE	V
69.	22CSX04	Foundations of Machine Learning	3	0	2	4	CSE	VI
70.	22CSX05	Web Engineering	3	0	2	4	CSE	VI
71.	22CSO03	Nature Inspired Optimization Techniques	3	0	0	3	CSE	VII
72.	22CSO04	Machine Translation	3	0	0	3	CSE	VIII
73.	22CSO05	Fundamentals of Blockchain	3	0	0	3	CSE	VIII
74.	22CDO01	Fundamentals of User Experience Design	3	1	0	4	CSD	V
75.	22CDX01	Fundamentals of User Interactive Design	3	0	2	4	CSD	VI
76.	22CDO02	Introduction to Mobile Game Design	3	0	0	3	CSD	VII
77.	22CDO03	Introduction to Graphics Design	3	0	0	3	CSD	VII
78.	22CDO04	Virtual Reality and Augmented Reality	3	0	0	3	CSD	VIII
79.	22ADO01	Data Warehousing and Data Mining	3	1	0	4	AD	V
80.	22ADX01	Data Visualization	3	0	2	4	AD	VI
81.	22ADO02	Neural Networks and Deep Learning	3	0	0	3	AD	VII
82.	22ADO03	Business Analytics	3	0	0	3	AD	VIII
83.	22ALO01	Business Intelligence	3	1	0	4	AIML	V
84.	22ALX01	Data Exploration and Visualization Techniques	3	0	2	4	AIML	VI
85.	22ALO02	Industrial Machine Learning	3	0	0	3	AIML	VII
86.	22ALO03	Machine Learning for Smart Cities	3	0	0	3	AIML	VIII
87.	22CHO01	Industrial Enzymology	3	1	0	4	CHEM	V
88.	22CHO02	Waste to Energy Conversion	3	1	0	4	CHEM	V
89.	22CHO03	Applied Nanotechnology	3	1	0	4	CHEM	V
90.	22CHO04	Air Pollution Monitoring and Control	3	1	0	4	CHEM	VI
91.	22CHO05	Paints and Coatings	3	1	0	4	CHEM	VI

S.No	Course Code	Course Title	L	T	P	C	Offering Dept.	Sem.
92.	22CHO06	Powder Technology	3	1	0	4	CHEM	VI
93.	22CHO07	Hydrogen Energy	3	0	0	3	CHEM	VII
94.	22CHO08	Rubber Technology	3	0	0	3	CHEM	VII
95.	22CHO09	Industrial Accident Prevention and Management	3	0	0	3	CHEM	VIII
96.	22CHO10	Electrochemical Engineering	3	0	0	3	CHEM	VIII
97.	22CHO11	Smart and Functional Materials	3	0	0	3	CHEM	VIII
98.	22FTX01	Baking Technology	3	0	2	4	FT	V
99.	22FTO01	Food Processing Technology	3	1	0	4	FT	V
100.	22FTX02	Processing of milk and milk products	3	0	2	4	FT	VI
101.	22FTX03	Processing of Fruits and Vegetables	3	0	2	4	FT	VI
102.	22FTO02	Principles of Food safety	3	0	0	3	FT	VII
103.	22FTO03	Fundamentals of Food Packaging and Storage	3	0	0	3	FT	VII
104.	22FTO04	Food Ingredients	3	0	0	3	FT	VIII
105.	22FTO05	Food and Nutrition	3	0	0	3	FT	VIII
106.	22MAO01	Mathematical Foundations of Machine Learning	3	1	0	4	Maths	V
107.	22MAO02	Numerical Computing	3	1	0	4	Maths	V
108.	22MAO03	Stochastic Processes and Queuing Theory	3	1	0	4	Maths	V
109.	22MAO04	Statistics for Engineers and Data Scientists	3	1	0	4	Maths	V
110.	22MAO05	Graph Theory and its Applications	3	1	0	4	Maths	VI
111.	22MAX01	Data Analytics Using R Programming	3	0	2	4	Maths	VI
112.	22MAO06	Operations Research	3	1	0	4	Maths	VI
113.	22MAO07	Number Theory and Cryptography	3	1	0	4	Maths	VI
114.	22MAO08	Non-Linear Optimization	3	0	0	3	Maths	VII
115.	22MAO09	Optimization for Engineers	3	0	0	3	Maths	VII
116.	22PHO01	Thin Film Technology	3	1	0	4	Physics	V
117.	22PHO02	High Energy Storage Devices	3	1	0	4	Physics	V
118.	22PHO03	Structural and optical Characterization of Materials	3	1	0	4	Physics	V
119.	22PHO04	Synthesis, Characterization And Biological Applications Of Nanomaterial	3	1	0	4	Physics	VI
120.	22PHO05	Techniques of Crystal Growth	3	1	0	4	Physics	VI
121.	22CYO01	Instrumental Methods of Analysis	3	1	0	4	Chemistry	V
122.	22CYO02	Chemistry Concepts for Competitive Examinations	3	1	0	4	Chemistry	V

S.No	Course Code	Course Title	L	T	P	C	Offering Dept.	Sem.
123.	22CYO03	Organic Chemistry for Industry	3	1	0	4	Chemistry	V
124.	22CYO04	Corrosion Science and Engineering	3	1	0	4	Chemistry	VI
125.	22CYO05	Chemistry of Cosmetics in Daily Life	3	1	0	4	Chemistry	VI
126.	22CYO06	Nano composite Materials	3	1	0	4	Chemistry	VI
127.	22CYO07	Waste and Hazardous Waste Management	3	0	0	3	Chemistry	VII
128.	22CYO08	Chemistry in Everyday Life	3	0	0	3	Chemistry	VII
129.	22CYO09	Chemistry of Nutrition for Women Health	3	0	0	3	Chemistry	VIII

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

SNo	Course Code	Course Title	L	T	P	C	Offering Department	Semester
1.	22GEO01	German Language Level 1	4	0	0	4	ECE	ALL
2.	22GEO02	Japanese Language Level 1	4	0	0	4	ECE	ALL
3.	22GEO03	Design Thinking for Engineers	3	1	0	4	CSE	5
4.	22GEO04	Innovation and Business Model Development	3	1	0	4	MTS	6
5.	22GEO05	German Language Level 2	4	0	0	4	ECE	ALL
6.	22GEO06	German Language Level 3	3	0	0	3	ECE	ALL
7.	22GEO07	German Language Level 4	3	0	0	3	ECE	ALL
8.	22GEO08	Japanese Language Level 2	4	0	0	4	ECE	ALL
9.	22GEO09	Japanese Language Level 3	3	0	0	3	ECE	ALL
10.	22GEO10	Japanese Language Level 4	3	0	0	3	ECE	ALL
11.	22GEO11	French Language Level 1	4	0	0	4	ECE	ALL
12.	22GEO12	French Language Level 2	4	0	0	4	ECE	ALL
13.	22GEO13	French Language Level 3	3	0	0	3	ECE	ALL
14.	22GEO14	Spanish Language Level 1	4	0	0	4	ECE	ALL
15.	22GEO15	Spanish Language Level 2	4	0	0	4	ECE	ALL
16.	22GEO16	Spanish Language Level 3	3	0	0	3	ECE	ALL
17.	22GEO17	Entrepreneurship Development	3	0	0	3	MTS	7
18.	22GEO18	Fundamentals of Hindi Language	4	0	0	4	ENG	5
19.	22GEX01	NCC Studies (Army Wing) - I	3	0	2	4	EEE	5 / 6
20.	22GEX02	NCC Studies (Air Wing) - 1	3	0	2	4	IT	5 / 6
21.	22MBO01	Cost Accounting for Engineers	3	1	0	4	MBA	5
22.	22MBO02	Economic Analysis for Decision Making	3	1	0	4	MBA	6
23.	22MBO03	Marketing Analytics	3	1	0	4	MBA	7

22EGT11 - COMMUNICATION SKILLS I

(Common to All Engineering and Technology Branches)

Programme & Branch	All B.E./B.Tech. Branches	Sem.	Category	L	T	P	Credit
Prerequisites	Nil	I	HS	3	0	0	3
Preamble	This course is designed to impart required levels of Communication Skills and Proficiency in English language necessary for different professional contexts.						
Unit – I	Grammar, Vocabulary, Listening, Speaking, Reading & Writing						
Grammar: Parts of speech - Tenses - Types of sentences: Assertive, Imperative, Interrogative & Exclamatory – Affirmative & Negative - Gerunds & Infinitives - Vocabulary: Affixes - Synonyms & Antonyms - Listening: Types of listening - Barriers to listening - Listening to short talks - TV shows - Speaking: Verbal & Non-verbal communication - Pair conversation - Role play - Reading: Types of Reading – Intensive: scanning, word by word, survey - Writing: Dialogue writing, Informal Letters - Paragraph writing							9
Unit – II	Grammar, Vocabulary, Listening, Speaking, Reading & Writing						
Grammar: Voices - Impersonal passives - Vocabulary: Homonyms, Homophones & Homographs - Listening: Importance of listening - Listening to announcements & radio broadcasts - Speaking: Persuasive & Impromptu talks - Narrating a story - Reading: Reading comprehension - Articles from Newspapers/Magazines - Cloze exercises - Writing: Essay writing, Jumbled sentences							9
Unit – III	Grammar, Vocabulary, Listening, Speaking, Reading & Writing						
Grammar: Prepositions - Vocabulary: Compound Nouns - Listening: Listening to TED Talks, Commentaries - Speaking: Self Introduction - Reading: Extensive: speed, skimming - Identifying lexical & contextual meanings - Writing: Instructions & Warnings - Formal letters: Seeking permission for Industrial visits & Inviting guests							9
Unit – IV	Grammar, Vocabulary, Listening, Speaking, Reading & Writing						
Grammar: Articles & Determiners - Vocabulary: Technical Vocabulary - Analogy - Unscrambling words - Logical reasoning - Listening: Listening to conversations - Speaking: Tongue twisters - Skill Sharing - Note-taking - Reading: Note making - Paraphrasing & Summarizing - Writing: Recommendations & Suggestions - Business letters: Enquiry, Calling for quotations & placing orders							9
Unit – V	Grammar, Vocabulary, Listening, Speaking, Reading & Writing						
Grammar: Cause and effect expressions - Vocabulary: Abbreviations & acronyms, Definitions Listening: Listening to eminent personalities - Speaking: Commonly mispronounced words - Welcome address, Chief guest address & Vote of thanks - Reading: - IELTS type passages - Writing: Preparing transcript for a speech - Interpreting news articles & advertisements							9
Total:45							

TEXT BOOK:

1. Sanjay Kumar & Pushp Lata, "Communication Skills", 2nd Edition, Oxford University Press, New Delhi, 2018.

REFERENCES:

- | | |
|----|---|
| 1. | Ashraf Rizvi, "Effective Technical Communication", 2 nd Edition, McGraw-Hill India, 2017. |
| 2. | S. P. Dhanavel, "English and Communication Skills for Students of Science and Engineering", Orient BlackSwan Publishers, Hyderabad, 2009. |
| 3. | Jack C. Richards and Chuck Sandy, "Passages" Student's Book 1, 3 rd Edition, Cambridge University Press, New York, 2014. |

COURSE OUTCOMES: On completion of the course, the students will be able to											BT Mapped (Highest Level)
CO1	use language effectively by acquiring vocabulary and syntax in context										
CO2	listen and comprehend different spoken discourses from a variety of situations										
CO3	speak confidently in different professional contexts and with peers										
CO4	comprehend different genres of texts by adopting various reading strategies										
CO5	write legibly and flawlessly at varied professional contexts proficiently with appropriate choice of words and structures										

Mapping of COs with POs and PSOs

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

1 – 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		37	30			33	100
CAT2		30	30			40	100
CAT3		33	34			33	
ESE		17	63			20	100

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

22MAC11 - MATRICES AND ORDINARY DIFFERENTIAL EQUATIONS

(Common to all Engineering and Technology branches)

Programme & Branch	All BE/BTech Branches	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 and ordinary differential equations.						
Unit – I	Matrices:	9+3					
Introduction – 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: Stretching of an elastic membrane.							
Unit – II	Ordinary Differential Equations:	9					
Introduction – Solutions of First order differential equations: Exact differential equations – Leibnitz's Linear Equation – Bernoulli's equation –Clairaut's equation - Applications: Law of natural growth and decay.							
Unit – III	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} – $\cos ax / \sin ax$ – $x^n - e^{ax}x^n$, $e^{ax} \sin bx$ and $e^{ax} \cos bx$ – $x^n \sin ax$ and $x^n \cos ax$ – Differential Equations with variable coefficients: Euler-Cauchy's equation – Legendre's equation.							
Unit – IV	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).							
Unit – V	Laplace Transform:	9					
Laplace Transform: Conditions for existence – Transform of elementary functions – Basic properties – Derivatives and integrals of transforms –Transforms of derivatives and integrals – Transform of unit step function – Transform of periodic functions. Inverse Laplace transform: Inverse Laplace transform of elementary functions – Partial fraction method – Convolution theorem (Statement only) – Applications: Solution of linear ODE of second order with constant coefficients.							
LIST OF EXPERIMENTS / EXERCISES:							
1.	Introduction to MATLAB						
2.	Computation of eigen values and eigen vectors						
3.	Plotting and visualizing single variable functions						
4.	Solving first and second order ordinary differential equations						
5.	Solution of Simultaneous first order ODEs						
6.	Solving second order ODE by variation of parameters						
7.	Determining Laplace and inverse Laplace transform of basic functions						
8.	Solution of Second order ODE by employing Laplace transforms						
Lecture:45, Tutorials and Practical:15, Total:60							
TEXT BOOK:							
1.	Ramana B V, "Higher Engineering Mathematics", 1 st Edition, Tata McGraw-Hill Publishing Company Limited, New Delhi, 2018.						
REFERENCES/ MANUAL / SOFTWARE:							
1.	Kreyszig E, "Advanced Engineering Mathematics ", 10 th Edition, John Wiley, New Delhi, India, 2016.						
2.	Kandasamy P., Thilagavathy K. and Gunavathy K., "Engineering Mathematics For First Year B.E/B.Tech", Reprint Edition 2014, S.Chand and Co., New Delhi.						

3.	Duraisamy C., Vengataasalam S., Arun Prakash K. and Suresh M., "Engineering Mathematics - I", 2 nd Edition, Pearson India Education, New Delhi, 2018.
4.	Grewal B.S., "Higher Engineering Mathematics" 44th Edition, Khanna Publishers, New Delhi, 2018.
5.	Matrices and Ordinary Differential Equations Laboratory Manual.

COURSE OUTCOMES:

On completion of the course, the students will be able to

CO1	solve engineering problems which needs matrix computations.	Applying (K3), Manipulation (S2)
CO2	identify the appropriate method for solving first order ordinary differential equations.	Applying (K3), Manipulation (S2)
CO3	solve higher order linear differential equations with constant and variable coefficients.	Applying (K3), Manipulation (S2)
CO4	apply the concept of ordinary differential equations for modeling and finding solutions to engineering problems.	Applying (K3), Manipulation (S2)
CO5	apply Laplace Transform to find solutions of Linear Ordinary Differential Equations	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		3									
CO2	3	3	2		3									
CO3	3	3	2		3									
CO4	3	3	2		3									
CO5	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	20	70				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)

*Alternate week

22PHT18 – PHYSICS FOR INFORMATION TECHNOLOGY

Programme & Branch	B.Tech- Information Technology	Sem.	Category	L	T	P	Credit
Prerequisites	Nil	1 / 2	BS	3	0	0	3
Preamble	This course aims to impart the knowledge on oscillations & waves, lasers, fiber optics, conductors, semiconductors and smart materials. It also describes the applications of aforementioned topics in information technology.						
Unit – I	Oscillations and Waves:						
Periodic motion – Oscillations – Simple harmonic motion – Differential equation of simple harmonic motion – Forced oscillations – Damped oscillations – Application of simple harmonic motion in torsional pendulum, cantilever and LC circuit – Resonance – Waves – Equation of plane progressive wave – Types of progressive waves – Reflection and transmission of waves at a boundary (qualitative) – Energy transport of progressive waves.							
Unit – II	Conducting Materials:						
Conductors – Classical free electron theory of metals – Electrical conductivity – Thermal conductivity – Wiedemann-Franz law – Lorentz number – Draw backs of classical free electron theory – Quantum free electron theory (qualitative) – Fermi distribution function – Effect of temperature on Fermi function – Density of energy states – Carrier concentration in metals.							
Unit – III	Semiconductors:						
Intrinsic semiconductor – Carrier concentration – Fermi level – Variation of conductivity with temperature – Determination of band gap – Extrinsic semiconductors – Carrier concentration in n-type and p-type semiconductors – Hall effect – Determination of Hall coefficient – Applications – Solar Cell: Principle, construction and working.							
Unit – IV	Laser and Fiber Optics:						
Stimulated absorption – Spontaneous emission – Stimulated emission – Einstein's coefficients and their relations – Population inversion – Pumping – CO ₂ laser – Holography – Fiber optics – Numerical aperture and acceptance angle – Classification of optical fibers based on refractive index, modes and materials – Fiber optics communication system (qualitative) – Temperature and displacement sensors.							
Unit – V	Smart Materials:						
Metallic glasses: Properties, preparation and applications – Shape memory alloys: Characteristics and applications – Nanostructure – Surface-to-volume ratio – Quantum confinement – Nanomaterials synthesis: Top-down and bottom-up approaches – Electron beam lithography – Physical vapour deposition – Carbon nanotubes: Structures, properties, synthesis by laser ablation method – Applications.							
Total:45							
TEXT BOOK:							
1.	Hitendra K. Malik and A.K. Singh, "Engineering Physics", 2 nd Edition McGraw-Hill Education , New Delhi, 2018.						
REFERENCES:							
1.	Charles Kittel, "Introduction to Solid State Physics", 8 th Edition, John Wiley & Sons, New Jersey, 2004.						
2.	Pandey B.K. and Chaturvedi S., "Engineering Physics" 2 nd Edition, Cengage, New Delhi, 2022.						
3.	Tamilarasan K. and Prabu K., "Materials Science", 1 st Edition, McGraw Hill Education Pvt. Ltd., New Delhi, 2019.						

COURSE OUTCOMES: On completion of the course, the students will be able to												BT Mapped (Highest Level)	
CO1	make use of the concepts of oscillatory and wave motion to comprehend the phenomena related to the propagation of elastic waves.												Applying (K3)
CO2	apply the concepts of classical and quantum free electron theory of metals to compute their electrical and thermal conductivities and to comprehend the effect of temperature on Fermi function and to derive the expressions for carrier concentration in metals using density of states.												Applying (K3)
CO3	use the concept of density of states to compute the carrier concentration, electrical conductivity and band gap of intrinsic semiconductors and to compute the carrier concentration of extrinsic semiconductors, and also to explain the Hall Effect and the working of solar cell.												Applying (K3)
CO4	apply the concepts of stimulated emission of radiation to explain the working and the applications of laser in engineering and technology. To apply the principle of propagation of light through optical fiber to compute acceptance angle and numerical aperture and to comprehend the loss in optical fiber and also to explain fiber optic communication system and the working of fiber optic sensors.												Applying (K3)
CO5	utilize appropriate methods to prepare metallic glasses, shape memory alloys, nanomaterials and carbon nano tubes and also to comprehend their properties and 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	2						2	2			2	3	2
CO2	3	2	2						2	2			2	3	2
CO3	3	2	2						2	2			2	3	2
CO4	3	2	2						2	2			2	3	2
CO5	3	2	2						2	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	15	40	45				100
CAT2	15	40	45				100
CAT3	20	50	30				100
ESE	10	40	50				100

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

22CSC12 - PROGRAMMING IN C

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

Programme& Branch	BE - Computer Science and Engineering, BTech - Information Technology & BE - Computer Science and Design	Sem.	Category	L	T	P	Credit
Prerequisites	Nil	1	BS	3	0	2	4

Preamble	The course aims to provide exposure to problem-solving through programming. It introduces all the fundamental concepts of C Programming. This course provides adequate knowledge to solve problems in various domains.
-----------------	--

Unit - I	Introduction to C and Control Statements:	9
-----------------	--	----------

The life cycle of a C program – features of C - Data - Variables – Declaring, assigning, and printing variables – Data Classification: integer, float, and character types – constants – operators and expressions – Control Structures: decision making and looping statements – Input and output functions.

Unit - II	Arrays and Functions:	9
------------------	------------------------------	----------

Arrays: Declaring and initializing 1D array – Two-dimensional arrays – Multidimensional arrays

Functions: Basics, The anatomy of a function – Types of functions based on arguments and return types – Passing 1D and 2D arrays as arguments to functions – Calling function from another function – recursive functions -Variable scope and lifetime - Storage classes

Unit - III	Pointers and Strings:	9
-------------------	------------------------------	----------

Pointers: Memory access and pointers, pointer basics, declaring, initializing, and dereferencing a pointer, parameter passing mechanisms, operations on pointers

Strings: Basics, declaring and initializing strings – pointers for string manipulation – string handling functions: standard and user-defined functions – character oriented functions, Two-dimensional array of strings

Unit - IV	User-defined data types:	9
------------------	---------------------------------	----------

Structure basics –declaring and defining a structure - attributes of structures – nested structures – arrays as structure members – arrays of structure – Passing structures as arguments to functions - Unions – Bit Fields -Enumerated type

Unit - V	File handling :	9
-----------------	------------------------	----------

Basics – Opening and closing files -File pointers and buffer – File read/write functions: fgetc, fputc, fgets, fputs, fscanf, fprintf – File error handling functions - Text and Binary File – Reading and Writing binary files – Manipulating file position – other file handling functions : remove and rename.

Pre-processor directives: #define: macros with and without arguments, # include directive

LIST OF EXPERIMENTS / EXERCISES:

1.	Programs for demonstrating the use of different types of operators like arithmetic, logical, relational, and ternary operators (Sequential structures)
2.	Programs to Illustrate the different formatting options for input and output
3.	Programs using decision making statements like '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.	Programs for demonstrating one-dimensional arrays
6.	Programs for demonstrating two-dimensional arrays
7.	Programs to demonstrate modular programming concepts using functions (Using built-in and user-defined functions)
8.	Programs to implement various character and string operations with and without built-in library functions.
9.	Programs to demonstrate the use of pointers
10.	Programs to illustrate the use of user-defined data types
11.	Programs to implement various file operations
12.	Programs to demonstrate the use of pre-processor directives

Lecture:45, Practical:30, Total:75

TEXT BOOK:

1.	Sumitabha Das, Computer Fundamentals and C Programming, 1st Edition, McGraw Hill, 2018
----	--

REFERENCES/ MANUAL / SOFTWARE:		
1.	Yashavant Kanetkar, "Let us C", 16 th ,BPB publications,2018.	
2.	Reema Thareja., "Programming in C ", 2nd Edition, Oxford University Press, New Delhi, 2018	
3.	E.Balagurusamy, "Programming in ANSI C", seventh edition, Mc Graw Hill Education,2017.	
COURSE OUTCOMES: On completion of the course, the students will be able to		
CO1	Identify the appropriate looping and control statements in C and develop applications using these statements	Applying (K3), Precision(S3)
CO2	Develop simple C programs using the concepts of arrays and modular programming	Applying (K3), Precision(S3)
CO3	Recall the basic concepts of pointers and develop C programs using strings and pointers	Applying (K3), Precision(S3)
CO4	Make use of user-defined data types to solve given problems	Applying (K3), Precision(S3)
CO5	Explain various file operations and develop applications using files and pre-processor directives	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	2	2	1				1	1			1	3	1
CO2	3	2	2	2	1				1	1			1	3	1
CO3	3	2	2	2	1				1	1			1	3	1
CO4	3	2	2	2	1				1	1			1	3	1
CO5	3	2	2	2	1				1	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
ESE	10	30	60				100

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

22ITC11 - SCIENTIFIC COMPUTING

Programme & Branch	BTech – Information Technology	Sem.	Category	L	T	P	Credit
Prerequisites	Nil	1	ES	2	0	2	3
Preamble	This course provides the basic knowledge about the components of computer, software classifications, problem solving techniques, web design concepts and Git.						
Unit - I	Introduction to Computers and Organization						6
Introduction- Definition- Characteristics of computer- Block Diagram of a computer- Classification Of Computers- Applications of Computer- Capabilities- and limitations of computer. Input Units- Output Units- Storage devices- Primary storage- and secondary storage.							
Unit - II	Number Systems and Software						6
Number Systems and its conversions- Software and it's needs-Operating System- Utility Programs- Programming Language: Machine Language- Assembly Language- High-Level Language their advantages & disadvantages. Application S/W and its types: Word Processing- Spread Sheets and Presentation.							
Unit - III	Problem Solving Technique						6
Algorithms - Flowcharts – Pseudo codes – Structuring the logic: Sequential- selection and repetitive structure. Case Study on Problem Solving in sequential and selection and repetitive. Algorithm- Flowchart and Pseudo code for the problems related to sequential and selection and repetitive structures							
Unit - IV	Web Designing						6
Web Basics – Introduction to HTML 5 – Headings – Linking – Images – Special Characters and Horizontal rules – List – Tables – Forms – Internal Linking – meta elements. Introduction to Cascading Style Sheets (CSS) – Inline styles – Embedded style sheets – conflicting styles – linking external style sheets.							
Unit - V	Git						6
Introduction – installing Git – Installing Git on Windows – Installing the Cygwin Git package – Installing standalone Git – Git Command Line – Basic Git Concepts – Repositories – Object types – Index – Object Store Pictures – Git Concepts at Work. File management and the Index.							
LIST OF EXPERIMENTS / EXERCISES:							
1.	Study of various computer components						
2.	Installation of Operating system						
3.	Write an algorithm, pseudocode and flowchart for solving sequential and selection problems using raptor						
4.	Write an algorithm- pseudocode and flowchart for solving repetitive problems using raptor						
5.	Design a Web Page using basic HTML Tags						
6.	Design an Web Page to get and validate the data from the users						
7.	Develop an web page and apply different stye sheet on the web page						
8.	Create a repo and deploy the web page using gitup						
9.	Managing source code with multiple branches						
10.	Create a scenario for merge conflicts and resolve it using github						
Lecture:30, Practical:30, Total:60							
TEXT BOOK:							
1.	Anita Goel- Computer Fundamentals, First Edition, Pearson Education India,2010 (Unit I,II,III)						
2.	Paul Deitel, HarveyDeitel, Abby Deitel, "Internet & World Wide Web- How to Program", 5 th Edition, Pearson Education, 2019 (Unit IV)						
3.	Jon Loeliger and Matthew Mccullough- Version control with Git-Second Edition-Shroff Publishers& Distributors, 2012 (Unit V)						
REFERENCES/ MANUAL / SOFTWARE:							
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 Computer components, working principles and its applications	Understanding (K2)
CO2	explore Number System and its conversions, Software classifications	Understanding (K2)
CO3	express the solution for structuring logic in terms of algorithm- flowchart and pseudo code	Applying (K3)
CO4	design a simple webpage and validate the forms using HTML	Applying (K3)
CO5	create a repository and manage the repository file functions using Git	Applying (K3)
CO6	solve the real-world problems using raptor	Applying (K3), Precision (S3)
CO7	design a simple webpage using HTML	Applying (K3), Precision (S3)
CO8	perform file operations in Git	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											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
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	20	60	20				100
CAT2	10	30	60				100
CAT3	10	30	60				100
ESE	20	40	40				100

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

COURSE OUTCOMES:												BT Mapped (Highest Level)	
On completion of the course, the students will be able to													
CO1	interpret the basic concepts of electrical power systems and Identify the various electrical parameters in circuits												Understanding (K2)
CO2	analyze the DC and AC Circuits												Applying (K3)
CO3	interpret the construction and working of different types of DC machines												Applying (K3)
CO4	illustrate the working of different types of AC machines and transformers												Understanding (K2)
CO5	demonstrate the basic functions of semiconductor devices and analyze the characteristics of semiconductor devices												Applying (K3)

Mapping of COs with POs and PSOs

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

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

22EEL11 - BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING LABORATORY																										
(Common to Information Technology and Computer Science and Design branches)																										
Programme& Branch		BTech – Information Technology & BE - Computer Science and Design branches				Sem.	Category	L	T	P	Credit															
Prerequisites		Nil				1	ES	0	0	2	1															
Preamble	This course is designed to impart practical knowledge about AC and DC circuits, machines and electronic devices with its characteristics.																									
LIST OF EXPERIMENTS / EXERCISES:																										
1.	Resistor color coding and verification of Ohm's Law and Kirchhoff's Laws																									
2.	Computation of Current in a Loop using Mesh analysis																									
3.	Measurement of Power in RL, RC and RLC circuits																									
4.	Speed control of DC shunt motor																									
5.	Load test on DC shunt motor																									
6.	Load test on single phase induction motor																									
7.	Load test on single phase transformer																									
8.	Implementation of Half wave and Full wave Rectifier																									
9.	VI characteristics of PN junction diode																									
10.	Voltage Regulator using Zener diode																									
Total:30																										
REFERENCES/ MANUAL /SOFTWARE:																										
1.	Laboratory Manual																									
COURSE OUTCOMES:																										
On completion of the course, the students will be able to																										
CO1	select and apply various laws for the specific electric circuits										BT Mapped (Highest Level) Applying (K3), Manipulation (S2)															
CO2	perform suitable tests and analyze the performance of AC,DC Machines and transformers										Analyzing (K4), Manipulation (S2)															
CO3	sketch the characteristics of power electronic devices and Interpret various applications										Analyzing (K4), Manipulation (S2)															
Mapping of COs with POs and PSOs																										
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2												
CO1	3	2	2	1																						
CO2	3	3	2	1																						
CO3	3	2	2	1																						

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

22PHL18 - PHYSICS LABORATORY FOR INFORMATION TECHNOLOGY																						
Programme & Branch	B.Tech - Information Technology					Sem.	Category	L	T	P	Credit											
Prerequisites	Nil					1 / 2	BS	0	0	2	1											
Preamble	This course aims to impart hands on training in the determination of parameters such as rigidity modulus, AC frequency, wavelength of laser, particle size, acceptance angle and numerical aperture of an optical fiber, specific resistance, band gap, Hall coefficient, thickness of thin wire and knowledge on the working of LCR circuit, p-n junction diode and UJT, and also to impart skills on writing coding / developing project / product related to societal requirement.																					
LIST OF EXPERIMENTS / EXERCISES:																						
1.	Determination of the rigidity modulus of the given metallic wire using torsional pendulum / Studying the variation of current and voltage in a series LCR circuit.																					
2.	Determination of the frequency of alternating current using electrically vibrating tuning fork (Melde's apparatus).																					
3.	(i) Determination of the wavelength of semiconductor laser. (ii) Determination of the particle size of the given powder using laser.																					
4.	Determination of the acceptance angle and the numerical aperture of the given optical fiber.																					
5.	Determination of the specific resistance of the given metallic wire using Carey-Foster's bridge.																					
6.	Determination of the band gap of the given semiconducting material using post-office box.																					
7.	Observation of the I-V characteristics of a p-n junction diode / Determination of Hall coefficient using Hall effect arrangement.																					
8.	Observation of the I-V characteristics of a uni junction transistor.																					
9.	Determination of the thickness of a thin film using air-wedge arrangement.																					
10.	Writing coding for any one of the above experiments / developing a project / a product.																					
Total:30																						
REFERENCES/ MANUAL /SOFTWARE:																						
1.	Physics Laboratory Manual / Record, Department of Physics, 1 st Edition, 2020.																					
COURSE OUTCOMES:																						
On completion of the course, the students will be able to																						
CO1	determine the rigidity modulus of a wire or the variation of current and voltage in a series LCR circuit, the frequency of an alternating current, the wavelength of a semiconductor laser and the particle size of a powder material.										Applying (K3), Precision (S3)											
CO2	determine the acceptance angle and numerical aperture of an optical fiber and the specific resistivity of a metallic wire.										Applying (K3), Precision (S3)											
CO3	determine the band gap of a semiconductor, the I-V characteristics of a p-n diode or the Hall coefficient of a material, the I-V characteristics of a UJT, the thickness of a thin film and develop a coding / project / product.										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	2	3					2	2			2	3	2							
CO2	3	2	2	3					2	2			2	3	2							
CO3	3	2	2	3					2	2			2	3	2							
1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy																						

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 accents and infer implied meanings	Applying (K3)
CO3	speak clearly, initiate and sustain a discussion and negotiate using appropriate communicative strategies	Creating (K6)
CO4	read different genres of texts, infer implied meanings and critically analyze and evaluate them	Understanding (K2)
CO5	produce different types of narrative, descriptive expository texts and understand creative, critical, analytical and evaluative writing	Creating (K6)

Mapping of COs with POs and PSOs

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

1 – 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		37	30			33	100
CAT2		7	50			43	100
CAT3		17	50			33	100
ESE		15	45			40	100

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

4.	Douglas C. Montgomery & George C. Runger, "Applied Statistics and Probability for Engineers ", 7 th Edition, John Wiley and Sons, USA, 2018.
5.	Probability and Statistics Laboratory Manual.

COURSE OUTCOMES: On completion of the course, the students will be able to		BT Mapped (Highest Level)
CO1	interpret the concept of random variables.	Applying (K3), Manipulation (S2)
CO2	apply the standard probability distributions in engineering problems.	Applying (K3), Manipulation (S2)
CO3	understand the concepts of two dimensional random variables and regression.	Applying (K3), Manipulation (S2)
CO4	apply statistical tests for solving engineering problems involving small and large samples.	Applying (K3), Manipulation (S2)
CO5	apply the concepts of analysis of variance to experimental data.	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		3								1	
CO2	3	2	3		3								2	
CO3	3	2	1		3								1	
CO4	3	3	1	3	3								3	
CO5	3	3	2	3	3								3	

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

ASSESSMENT PATTERN - THEORY

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

*Alternate Week

22CYT28 – CHEMISTRY FOR INFORMATION TECHNOLOGY														
Programme & Branch	B.Tech & Information Technology	Sem.	Category	L	T	P	Credit							
Prerequisites	Nil	2 / 1**	BS	3	0	0	3							
Preamble	This course explores the basic concepts of electrochemistry, electrochemical storage devices, organic electronic materials, insulating materials and e-waste management. It also ensures to impart the applicability of these fields for IT students.													
Unit – I	ELECTROCHEMISTRY													
Introduction – cells – types – representation of galvanic cell – electrode potential – Nernst equation (derivation of cell EMF) – calculation of cell EMF from single electrode potential – reference electrodes: construction, working and applications of standard hydrogen electrode, standard calomel electrode, glass electrode – EMF series and its applications – potentiometric titrations (redox) – conductometric titrations – mixture of weak and strong acid vs strong base.														
Unit – II	ELECTROCHEMICAL STORAGE DEVICES													
Batteries: Introduction- types of batteries – discharging and charging of battery – characteristics of battery – battery rating – various tests on battery – primary battery: silver button cell – secondary battery: Ni-Cd battery –modern battery: lithium-ion battery – maintenance of batteries – choice of batteries for electric vehicle applications. Fuel Cells: Introduction-Importance and classification of fuel cells – description, principle, components and applications of fuel cells: H ₂ -O ₂ fuel cell , alkaline fuel cell, molten carbonate fuel cell and direct methanol fuel cell.														
Unit – III	ORGANIC ELECTRONIC MATERIALS													
Introduction – conducting polymers – p-type and n-type organic semiconducting materials – advantages over inorganic semiconducting materials – organic dielectric materials – processing and fabrication – spin coating, evaporation, sputtering, electrospinning, drop casting, templating – organic light emitting diodes – working, types and applications – comparison of LCD vs LED –organic field-effect transistors and organic solar cells- working, types and applications.														
Unit – IV	INSULATING MATERIALS													
Introduction – requirements – classification (solid, liquid & gas) – preparation, properties and applications of : solid inorganic insulators: glass, ceramic products – solid organic insulator: epoxy resin - liquid insulator: transformer oil – gas insulator: SF ₆ – electrical resistivity – factors influencing electrical resistivity of materials – composition, properties and applications of high resistivity materials: constantan, molybdenum disilicide and nichrome – polymers as electrical insulators – non-polar polymers – polar polymers – polarization of polymers.														
Unit – V	E-WASTE AND ITS MANAGEMENT													
Introduction-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- mechanism of extraction of precious metal from leaching solution – global scenario of E-waste – E-waste in India- case studies.														
Total:45														
TEXT BOOK:														
1.	Wiley Editorial Board, "Wiley Engineering Chemistry", 2 nd Edition, Wiley India Pvt. Ltd, New Delhi, Reprint 2019, for Unit-I, II, IV.													
2.	Palanisamy P.N., Manikandan P., Geetha A., Manjula Rani K., Kowshalya V.N., "Environmental Science", Pearson Education, New Delhi, Revised Edition 2019, for Unit- II, III ,V.													
REFERENCES:														
1.	S. S. Dara, "A Text book of Engineering Chemistry", S. Chand & Co Ltd., New Delhi, 20 th B.TECH. (BCL) Page 16 Edition, 2013.													
2.	Palanna O., "Engineering Chemistry", McGraw Hill Education, New Delhi, 2018.													

** for 2022 batch 2nd sem for IT, for 2023 batch 1st sem for IT

COURSE OUTCOMES: On completion of the course, the students will be able to												BT Mapped (Highest Level)	
CO1	apply the principle of electrochemistry for various applications.												Applying (K3)
CO2	use the concepts of batteries, fuel cells and their applications in various fields.												Applying (K3)
CO3	utilize the organic electronic materials for various applications												Applying (K3)
CO4	apply the knowledge of insulators to make different insulating materials for various applications												Applying (K3)
CO5	utilize the knowledge to handle the e-waste and reduce its impacts on environment.												Applying (K3)

Mapping of Cos with POs and PSOs

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

22ITC21 - DATA STRUCTURES

Programme& Branch	B.Tech. – Information Technology	Sem.	Category	L	T	P	Credit
Prerequisites	Programming in C	2	PC	3	0	2	4
Preamble	This course helps the students to learn the basic concepts of linear data structures, non-linear data structures and their applications						
Unit – I	Data structures and Linked List:						9
Introduction to Data Structures – Classification – Dynamic memory allocation- Self-referential structures- Introduction to Linked lists - Linked lists vs Arrays – Singly linked list-Doubly Linked list-Circular Linked list-Polynomial manipulations.							
Unit – II	Stack and Queue:						9
Introduction – Stack – Implementation of stack using array and linked list – Application of stack –Balanced Parentheses-Infix to Postfix expression conversion, Postfix expression evaluation. Queue – Implementation of Queue using array and linked list– Circular queue- Applications of queue-reversing the queue using stack.							
Unit – III	Sorting and Hashing:						9
Sorting: Internal sorting: Bubble sort – Shell sort – Bucket sort – External sorting: Multiway Merge – Polyphase Merge – Replacement Selection. Hashing: Hash Functions – Separate Chaining – Open Addressing: Linear Probing – Quadratic Probing – Double Hashing – Rehashing – Extendible Hashing.							
Unit – IV	Trees:						9
Preliminaries: Implementation of trees – Tree Traversals with an Application – Binary trees: Implementation – Expression trees – The Search Tree ADT– Binary Search Trees: Construction – Searching – Insertion – Deletion – Find Min – Find Max– AVL trees: Rotation – Insertion – Deletion.							
Unit – V	Graphs:						9
Definitions – Representation of Graphs – Types of Graph – Depth-first traversal – Breadth-first traversal – Topological Sort – Applications of DFS: Bi-connectivity – Euler circuits – Finding Strongly Connected Components – Applications of BFS: Bipartite graph – Graph Coloring.							
LIST OF EXPERIMENTS / EXERCISES:							
1.	Program to implement singly linked list						
2.	Program to implement Stack and Queue using array and linked list						
3.	Program to implement Infix to Postfix conversion using stack						
4.	Program to evaluate postfix evaluation using stack						
5.	Program to implement Reversing the queue using stack						
6.	Program to implement shell sort						
7.	Program to implement double hashing						
8.	Program to implement binary search tree and its operations						
9.	Program to implement BFS and DFS						
10.	Program to implement topological sort						
Lecture:45, Practical:30, Total:75							
TEXT BOOK:							
1.	Weiss M. A., "Data Structures and Algorithm Analysis in C", 2nd Edition, Pearson Education, London, 2016.						
REFERENCES/ MANUAL / SOFTWARE:							
1.	Cormen T. H., Leiserson C. E., Rivest R. L., & Stein C., "Introduction to Algorithms", 3rd Edition, MIT Press, USA, 2009.						
2.	Horowitz E., Sahni S., "Fundamentals of Data Structures in C", 2nd Edition, Galgotia Publications, New Delhi, 2008.						

COURSE OUTCOMES: On completion of the course, the students will be able to		BT Mapped (Highest Level)
CO1	describe the different operations on linked list	Applying (K3)
CO2	manipulate the operations on stacks and queue	Applying (K3)
CO3	demonstrate the concept of sorting and hashing techniques	Applying (K3)
CO4	build trees and perform its various operations	Applying (K3)
CO5	choose appropriate graph algorithm for solving problems	Applying (K3)
CO6	implement linear data structure for solving problems	Applying (K3), Precision (S3)
CO7	perform sorting and hashing operations	Applying (K3), Precision (S3)
CO8	implement various operations on non-linear 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									3	2
CO2	3	2	1	1									3	2
CO3	3	2	1	1									3	2
CO4	3	2	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	10	30	60				100
CAT2	10	30	60				100
CAT3	10	30	60				100
ESE	10	30	60				100

* ±3% may be varied, CAT1, 2, 3 – 50 marks, ESE – 100 marks

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 using C++												Applying (K3), Precision (S3)
CO2	develop simple applications using basic Java constructs												Applying (K3), Precision (S3)
CO3	build applications making use of packages, interfaces and exception handling in Java												Applying (K3), Precision (S3)
CO4	make use of multithreading and I/O streams												Applying (K3), Precision (S3)
CO5	develop simple event-based GUI applications in Java using AWT classes and controls												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

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	10	30	60				100
CAT3							
ESE	10	30	60				100

* ±3% may be varied, CAT1, 2, 3 – 50 marks, ESE – 100 marks

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												Applying (K3)
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)

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	50	40				100
CAT2	10	30	60				100
CAT3	10	40	50				100
ESE	10	40	50				100

* ±3% may be varied, CAT1, 2, 3 – 50 marks, ESE – 100 marks

COURSE OUTCOMES:											BT Mapped (Highest Level)	
படிப்பை முடித்தவுடன், மாணவர்கள்												
CO1	தமிழ் மொழி மற்றும் இலக்கியத்தில் மதிப்புமிக்க கருத்துக்களை விளக்க முடியும்.											Understanding (K2)
CO2	தமிழர்களின் சிற்பம் மற்றும் அவர்களின் ஓவியங்கள் பற்றி விளக்க முடியும்.											Understanding (K2)
CO3	தமிழர்களின் நாட்டுப்புற மற்றும் தற்காப்புக் கலைகளைப் பற்றி சுருக்கமாகக் கூற முடியும்.											Understanding (K2)
CO4	தமிழர்களின் திணைக் கோட்பாடுகளைப் பற்றி விளக்க முடியும்.											Understanding (K2)
CO5	இந்திய தேசிய இயக்கம் மற்றும் இந்திய பண்பாட்டிற்குத் தமிழர்களின் பங்களிப்பு பற்றி விளக்க முடியும்.											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		3	2	2			3	
CO2						3		3	2	2			3	
CO3						3		3	2	2			3	
CO4						3		3	2	2			3	
CO5						3		3	2	2			3	

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

ASSESSMENT PATTERN – THEORY

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

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

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

Mapping of COs with POs and PSOs

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

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

ASSESSMENT PATTERN – THEORY

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

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

22MEL11 - ENGINEERING PRACTICES LABORATORY														
(Common to All Engineering and Technology Branches)														
Programme & Branch	All BE/BTech Branches						Sem.	Category	L	T	P	Credit		
Prerequisites	Nil						1 / 2	ES	0	0	2	1		
Preamble	This course is designed to provide a hands-on experience in basic of mechanical and electrical engineering practices.													
LIST OF EXPERIMENTS / EXERCISES:														
	PART A – MECHANICAL ENGINEERING													
1.	Prepare a Square / Rectangular / V-Shape Projection with its Counterpart for Mating and Perform the Drilling, Tapping, and Assembling Tasks from the given Square / Rectangular MS Plates using Modern Power Tools.													
2.	Prepare T / L / Lap Joint from given Wooden Work Piece and Make a Box / Tray out of Plywood using Modern Power Tools.													
3.	Perform the Thread Formation on a GI/PVC Pipe and Prepare a Water Line from the Overhead Tank that is Leak-Proof.													
4.	Make a Butt / Lap / Tee Joint of MS Plate using Arc Welding Process and Welding Simulator.													
5.	Activity: Prepare an Innovative Model with the Knowledge from Fitting / Carpentry / Plumbing / Welding Involving Modern Power Tools.													
	PART B – ELECTRICAL AND ELECTRONICS ENGINEERING													
6.	Wiring circuit for fluorescent lamp and Stair case wiring													
7.	Wiring Circuit of Incandescent lamp using Impulse Relay													
8.	Measurement of Earth Resistance													
9.	Soldering of Simple Circuits and trouble shooting													
10.	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														
CO1	plan the sequence of operations for effective completion of the planned models / innovative articles										BT Mapped (Highest Level)			
CO2	identify and use appropriate modern power tools and complete the exercises/models accurately										Creating (K6) Manipulation (S2)			
CO3	perform house wiring and realize the importance of earthing										Applying (K3), Manipulation (S2)			
CO4	soldering with simple electronics circuits										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	1	3	1			3	3			3	
CO2	3		3	1	3				3	3			3	
CO3	3		3	2	1				2	2			3	2
CO4	3		2	1	1				2	3			3	2
CO5	3		3	2	1				2	2			3	2

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

22CYL12 – CHEMISTRY LABORATORY FOR COMPUTER SYSTEMS																										
(Common to CSE, CSD, IT, AIDS and AIML branches)																										
Programme & Branch		B.E & Computer Science and Engineering & Computer Science and Design, BTech – Information Technology, Artificial Intelligence and Data Science & Artificial Intelligence and Machine Learning branches				Sem.	Category	L	T	P	Credit															
Prerequisites		Nil				1 / 2**	BS	0	0	2	1															
Preamble	This course aims to impart the basic concepts of volumetric, conductometric, potentiometric, spectrophotometric and pH metry experiments for the estimation of given samples and thereby, to improve the analytical capability. It also aims to impart the knowledge on importance of water quality parameters (Ca, Mg & alkalinity) and the toxic substances (Cu, Cr) that we come across in day to day life.																									
LIST OF EXPERIMENTS / EXERCISES:																										
1.	Determination of strength of an unknown solution using pH meter.																									
2.	Analysis and comparison of the strength of acids in the given mixture using conductivity meter.																									
3.	Potentiometric approach using a Pt electrode for the estimation of iron in the given sample.																									
4.	Spectrophotometric method for the determination of nickel.																									
5.	Iodometric analysis of Cu content from discarded PCBs.																									
6.	Volumetric analysis of chromium prepared from electroplating sludge.																									
7.	Determination of Dissolved Oxygen in the given wastewater sample.																									
8.	Assessment of the given water sample for the suitability of drinking / industrial purpose by estimating the calcium, magnesium and total hardness by EDTA method.																									
9.	Estimation of alkalinity of river and borewell water collected from different places.																									
10.	Determination of molecular weight of a polymer / liquid by Ostwald viscometer.																									
11.	Construction and working of Zinc -Copper Electrochemical Cell (Demonstration).																									
12.	Electroplating process (Demonstration).																									
Total:30																										
REFERENCES/ MANUAL /SOFTWARE:																										
1.	Palanisamy P.N., Manikandan P., Geetha A. and Manjula Rani K., "Chemistry Laboratory Manual", 1 st Edition, Rajaganapathy Publishers, Erode, 2022.																									
COURSE OUTCOMES:																										
On completion of the course, the students will be able to																										
CO1	demonstrate the conductivity meter and pH meter to analyze the strength of the given solution.										BT Mapped (Highest Level) Applying (K3), Precision (S3)															
CO2	analyze the amount of Cu, Cr, DO, hardness and alkalinity present in the given sample.										Applying (K3), Precision (S3)															
CO3	demonstrate the potentiometric and spectrophotometric method for the estimation of Fe & Ni and Viscometer for the determination of molecular weight of a polymer.										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			2																			
1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy																										

** for 2022 batch 1st sem for CSE, CSD, AIML & AIDS & 2nd sem for IT,

for 2023 batch 1st sem for CSE, CSD, IT & 2nd sem for AIML & AIDS

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

Mapping of COs with POs and PSOs

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

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

ASSESSMENT PATTERN – THEORY

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

* ±3% may be varied (CAT3 – 100 marks)

COURSE OUTCOMES:											BT Mapped (Highest Level)	
படிப்பை முடித்தவுடன், மாணவர்கள்												
CO1	தமிழ் மொழி மற்றும் இலக்கியத்தில் மதிப்புமிக்க கருத்துக்களை விளக்க முடியும்.											Understanding (K2)
CO2	தமிழர்களின் சிற்பம் மற்றும் அவர்களின் ஓவியங்கள் பற்றி விளக்க முடியும்.											Understanding (K2)
CO3	தமிழர்களின் நாட்டுப்புற மற்றும் தற்காப்புக் கலைகளைப் பற்றி சுருக்கமாகக் கூற முடியும்.											Understanding (K2)
CO4	தமிழர்களின் திணைக் கோட்பாடுகளைப் பற்றி விளக்க முடியும்.											Understanding (K2)
CO5	இந்திய தேசிய இயக்கம் மற்றும் இந்திய பண்பாட்டிற்குத் தமிழர்களின் பங்களிப்பு பற்றி விளக்க முடியும்.											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		3	2	2			3	
CO2						3		3	2	2			3	
CO3						3		3	2	2			3	
CO4						3		3	2	2			3	
CO5						3		3	2	2			3	

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

ASSESSMENT PATTERN – THEORY

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

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

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

Mapping of COs with POs and PSOs

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

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

ASSESSMENT PATTERN – THEORY

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

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

22TAM02 - தமிழரும் தொழில்நுட்பமும்

(Common to All Engineering and Technology Branches)

Programme & Branch	All BE/BTech Branches	Sem.	Category	L	T	P	Credit						
Prerequisites	Nil	2 / 3	HS	1	0	0	1						
முன்னுரை	தமிழ் கலாச்சாரத்தோடு ஒன்றிய தொழில் நுட்பங்களைப் பற்றிப் எடுத்துரைத்தல்												
அலகு - I	நெசவு மற்றும் பானை தொழில்நுட்பம்												
சங்க காலத்தில் நெசவு தொழில் – பானைத் தொழில்நுட்பம் கருப்பு சிவப்பு பாண்டங்கள் – பாண்டகளில் கீறல் குறியீடுகள்													
அலகு - II	வடிவமைப்பு மற்றும் கட்டிடத் தொழில்நுட்பம்												
சங்க காலத்தில் வடிவமைப்பு மற்றும் கட்டுமானங்கள் & சங்க காலத்தில் வீட்டுப்பொருட்களில் வடிவமைப்பு – சங்க காலத்தில் கட்டுமான பொருட்களும் நடுகல்லும் – சிலப்பதிகாரத்தில் மேடை அமைப்பு பற்றிய விவரங்கள் – மாமல்லபுரச்சிற்பங்களும், கோவில்களும் – சோழர் காலத்து பெருங்கோயில்கள் மற்றும் பிற வழிபாட்டுத் தலங்கள் – நாயக்கர் காலக் கோயில்கள் – மாதிரிகட்டமைப்புகள் பற்றி அறிதல், மதுரை மீனாட்சி அம்மன் ஆலயம் மற்றும் திருமலை நாயக்கர் மஹால் – செட்டிநாட்டு வீடுகள் – பிரிட்டிஷ் காலத்தில் சென்னை இந்தோ-சாரோசெனிக் கட்டிடத்தை.													
அலகு - III	உற்பத்தித் தொழில்நுட்பம்												
கப்பல் கட்டும் கலை – உலோகவியல் – இரும்புத் தொழிற்சாலை – இரும்பை உருக்குதல், எஃகு – வெரலாற்றுச்சான்றுகளாக செம்பு மற்றும் தங்க நாணயங்கள் – நாணயங்கள் அச்சடித்தல் – மணி உருவாக்கும் தொழிற்சாலைகள் – கல்மணிகள் – கண்ணாடி மணிகள் – சுடுமண் மணிகள் – சங்கு மணிகள் – எலும்புத்துண்டுகள் – தொல்லியல் சான்றுகள் – சிலப்பதிகாரத்தில் மணிகளின் வகைகள்.							3						
அலகு - IV	வேளாண்மை மற்றும் நீர்ப்பாசனத் தொழில்நுட்பம்												
அணை, ஏரி, குளங்கள், மதகு – சோழர்கால குமிழித் தூம்பின் முக்கியத்துவம் – காலநடை பராமரிப்பு – காலநடைகளுக்காக வடிவமைக்கப்பட்ட கிணறுகள் – வேளாண்மை மற்றும் வேளாண்மை சார்ந்த செயல்பாடுகள் – கடல்சார் அறிவு – மீன்வளம் – முத்து மற்றும் முத்துக்குளித்தல் – பெருங்கடல் குறித்த பண்டைய அறிவு – அறிவுசார் சமூகம்.							3						
அலகு - V	அறிவியல் தமிழ் மற்றும் கணினித்தமிழ்												
அறிவியல் தமிழின் வளர்ச்சி – கணினித்தமிழ் வளர்ச்சி – தமிழ் நூல்களை மின்பதிப்பு செய்தல் – தமிழ் மென்பொருட்கள் உருவாக்கம் – தமிழ் இணையக் கல்விக்கழகம் – தமிழ் மின் நூலகம் – இணையத்தில் தமிழ் அகராதிகள் சொற்குவைத் திட்டம்.							3						
Total:15													
TEXT BOOK:													
1.	தமிழக வரலாறு – மக்களும் பண்பாடும் – கே கே பிள்ளை (வெளியீடு தமிழ்நாடு பாடநூல் மற்றும் கல்வியில் பணிகள் கழகம்), உலகத் தமிழாராய்ச்சி நிறுவனம், சென்னை, 2002												
2.	கணினித்தமிழ் முனைவர் இல. சுந்தரம், விகடன் பிரசுரம், 2016												
REFERENCES:													
1.	கீழடி-வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம்.(தொல்லியல் துறை வெளியீடு)												
2.	பொருநை-ஆற்றங்கரை நாகரிகம் (தொல்லியல் துறை வெளியீடு)												
3.	Social Life of Tamils (Dr.K.K.Pillay) A joint Publication of TNTB & ESC and RMRL – (in print)												
4.	Social Life of the Tamils – The Classical Period (Dr.S.Sigaravelu) (Published by: International Institute of Tamil Studies).												
5.	Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukarasu) (Published by : International Institute of Tamil Studies)												

6.	The Contribution of the Tamil to Indian Culture (Dr.M.Valarmathi) (Published by International Institute of Tamil Studies).
7.	Keeladi – 'Sangam City Civilization on the banks of river Vaigai; (Jointly Published by: Department of Archaeology & Tamilnadu Text Book and Educational Services Corporation, Tamilnadu)
8.	Studies in the History of India with Special Reference to Tamilnadu (Dr.K.K.Pillay) (Published by: The Author)
9.	Porunai Civilization (Jointly Published by: Department of Archaeology & Tamilnadu Textbook and Educational Services Corporation, Tamilnadu)
10.	Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

COURSE OUTCOMES:

படிப்பை முடித்தவுடன், மாணவர்கள்

BT Mapped
(Highest Level)

CO1	தமிழ் கலாச்சாரம் மற்றும் தமிழ் சமூகத்தினுடைய நெசவு மற்றும் பானை தொழில்நுட்பம் பற்றி விளக்க முடியும்.	Understanding (K2)
CO2	தமிழர்களின் வடிவமைப்பு மற்றும் கட்டிடத் தொழில்நுட்ப ஆற்றல் பற்றி விளக்க முடியும்.	Understanding (K2)
CO3	தமிழர்களின் உற்பத்தித் தொழில்நுட்பம் பற்றி சுருக்கமாகக் கூற முடியும்.	Understanding (K2)
CO4	தமிழர்களின் வேளாண்மை மற்றும் நீர்ப்பாசனத் தொழில்நுட்பம் பற்றி விளக்க முடியும்.	Understanding (K2)
CO5	தமிழர்களின் அறிவியல் தமிழ் மற்றும் கணினித்தமிழ் பற்றி விளக்க முடியும்.	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		3	2	2			3	
CO2						3		3	2	2			3	
CO3						3		3	2	2			3	
CO4						3		3	2	2			3	
CO5						3		3	2	2			3	

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

ASSESSMENT PATTERN – THEORY

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

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

22TAM02 - TAMILS AND TECHNOLOGY

(Common to All Engineering and Technology Branches)

Programme & Branch	All BE/BTech Branches	Sem.	Category	L	T	P	Credit
Prerequisites	Nil	2 / 3	HS	1	0	0	1
Preamble	This course aims to impart the essential knowledge on the tamil culture and related technology						
UNIT – I	WEAVING AND CERAMIC TECHNOLOGY						
Weaving Industry during Sangam Age – Ceramic technology – Black and Red Ware Potteries (BRW) – Graffiti on Potteries.							3
UNIT – II	DESIGN AND CONSTRUCTION TECHNOLOGY						
Designing and Structural construction House & Designs in household materials during Sangam Age – Building materials and Hero stones of Sangam age – Details of Stage Constructions in Silappathikaram – Sculptures and Temples of Mamallapuram – Great Temples of Cholas and other worship places – Temples of Nayaka Period – Type study (Madurai Meenakshi Temple) – Thirumalai Nayakar Mahal – Chetti Nadu Houses, Indo – Saracenic architecture at Madras during British Period.							
UNIT – III	MANUFACTURING TECHNOLOGY						
Art of Ship Building – Metallurgical studies – Iron industry – Iron smelting, steel – Copper and gold – Coins as source of history – Minting of Coins – Beads making – industries Stone beads – Glass beads –Terracotta beads –Shell beads/ bone beats – Archeological evidences – Gem stone types described in Silappathikaram.							3
UNIT – IV	AGRICULTURE AND IRRIGATION TECHNOLOGY						
Dam, Tank, ponds, Sluice, Significance of Kumizhi Thoompu of Chola Period, Animal Husbandry – Wells designed for cattle use – Agriculture and Agro Processing – Knowledge of Sea – Fisheries – Pearl – Conche diving – Ancient Knowledge of Ocean – Knowledge Specific Society.							3
UNIT – V	SCIENTIFIC TAMIL & TAMIL COMPUTING						
Development of Scientific Tamil – Tamil computing – Digitalization of Tamil Books – Development of Tamil Software – Tamil Virtual Academy – Tamil Digital Library – Online Tamil Dictionaries – Sorkuvai Project.							

Total:15

TEXT BOOK:

1. Social Life of Tamils (Dr.K.K.Pillay) A joint Publication of TNTB & ESC and RMRL – (in print)
2. Social Life of the Tamils – The Classical Period (Dr.S.Sigaravelu) (Published by: International Institute of Tamil Studies).

REFERENCES:

1. தமிழக வரலாறு - மக்களும் பண்பாடும் - கே கே பிள்ளை (வெளியீடு தமிழ்நாடு பாடத்துறை மற்றும் கல்வியில் பண்ணிகள் கழகம்), உலகத் தமிழ்மாராய்ச்சி நிறுவனம், சென்னை, 2002
2. கணினித்தமிழ் முனைவர் இல. சுந்தரம், விகடன் பிரசரம், 2016
3. கீழடி வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம்.(தொல்லியல் துறை வெளியீடு)
4. பொருநை ஆற்றங்கரை நாகரிகம் (தொல்லியல் துறை வெளியீடு)
5. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukarasu) (Published by : International Institute of Tamil Studies)
6. The Contribution of the Tamils to Indian Culture (Dr.M.Valarmathi)(Puplished by International Institute of Tamil Studies).
7. Keeladi – 'Sangam City Civilization on the banks of river Vaigai; (Jointly Published by: Department of Archaeology & Tamilnadu Text Book and Educational Services Corporation, Tamilnadu)
8. Studies in the History of India with Special Reference to Tamilnadu (dr.K.K.Pillay) (Published by : The Author)
9. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamilnadu Textbook and Educational Services Corporation, Tamilnadu)
10. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

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

Mapping of COs with POs and PSOs

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

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

ASSESSMENT PATTERN – THEORY

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

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

COURSE OUTCOMES: On completion of the course, the students will be able to												BT Mapped (Highest Level)		
CO1	develop the prototype model using mechanical operations like welding, forming and machining processes												Applying (K3), Precision (S3)	
CO2	sketch 3D model and enhance the prototype using modern machines like 3D printer, CNC milling machine, CNC Laser cutter and CNC Router												Applying (K3), Precision (S3)	
CO3	design and develop the autonomous robot for real-time 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	3	3		2				3	2		2		
CO2	3	3	3		3				3	2		2		
CO3	3	3	3		2				3	2		2		

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

22GCL12 – FOUNDATION ENGINEERING LABORATORY II

(Common to all BE/BTech branches)

Programme& Branch	All BE/BTech branches	Sem.	Category	L	T	P	Credit
Prerequisites	Nil	1 /2	ES	0	0	6	3
Preamble	This course is designed to provide a foundational knowledge on engineering with hands-on experience on the house wiring, Internet of Things and Web Technologies.						

LIST OF EXPERIMENTS / EXERCISES:

PART A – Electrical Installation (30 Hours)

1.	Develop wiring diagrams using software tools.
2.	Identify and select suitable components for Energy Measurement and Circuit Protection
3.	Design a wiring circuit integrating Energy Meter, MCB and RCCB
4.	Develop a wiring circuit for incandescent lamp and fluorescent lamp
5.	Develop and Investigate Simple and Staircase Wiring for Residential Applications
6.	Design the Wiring Circuits for Calling Bell System and Dimmable Light
7.	Create wiring circuits for power loads
8.	Measurement of Earth Resistance and its connections.

PART B – Internet of Things (30 Hours)

1.	Design a Single layer PCB layout designing
2.	Fabricate Single layer PCB printing
3.	Assembling, soldering and desoldering practice on single layer PCB
4.	GPIO programming in ESP8266
5.	Sensor and actuator interfacing with internet enabled microcontroller device
6.	Sensor and actuator calibration
7.	Integration of microcontroller based system with Cloud platform

PART C – Web Technologies (30 Hours)

1.	Design a website for an application using HTML and CSS.
2.	Convert the designed website into responsive website using Bootstrap.
3.	Add dynamism to the website by using JavaScript and embed the Social Media components to the website.
4.	Incorporate database interaction to the website.
5.	Deploy the developed website in the server.

Total:90

REFERENCES/ MANUAL /SOFTWARE:

1.	Laboratory Manual
2.	Eric T.Freeman,Elisabeth Robson, "Head First JavaScript Programming A Brain-Friendly Guide", 1st Edition, O'Reilly , 2014.
3.	Eric T.Freeman,Elisabeth Robson, "Head First HTML and CSS",2nd Edition, O'Reilly , 2012

3.	Program to implement Stack and Queue
4.	Program to evaluate postfix evaluation using stack
5.	Program to implement Reversing a word using stack
6.	Program to implement shell sort
7.	Program to implement double hashing
8.	Program to implement binary search tree and its operations
9.	Program to implement BFS and DFS
10.	Program to implement topological sort

Lecture:45, Practical:30, Total:75

TEXT BOOK:

1. Robert Lafore., "Data Structures and Algorithms in JAVA", 2nd Edition, Pearson Education, London, 2018.

REFERENCES/ MANUAL / SOFTWARE:

1. Cormen T. H., Leiserson C. E., Rivest R. L., & Stein C., "Introduction to Algorithms", 3rd Edition, MIT Press, USA, 2009.
 2. Horowitz E., Sahni S., "Fundamentals of Data Structures in C", 2nd Edition, Galgotia Publications, New Delhi, 2008.

COURSE OUTCOMES: On completion of the course, the students will be able to		BT Mapped (Highest Level)
CO1	describe the different operations on linked list	Applying (K3)
CO2	manipulate the operations on stacks and queue	Applying (K3)
CO3	demonstrate the concept of sorting and hashing techniques	Applying (K3)
CO4	build trees and perform its various operations	Applying (K3)
CO5	choose appropriate graph algorithm for solving 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	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		30	70				100
CAT3		30	70				100
ESE		40	60				100

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

COURSE OUTCOMES: On completion of the course, the students will be able to												BT Mapped (Highest Level)	
CO1	examine asymptotic notation and find time complexity of algorithms												Analyzing (K4)
CO2	apply brute force and divide-and-conquer techniques to various problems and identify their efficiencies												Applying (K3)
CO3	utilize decrease and 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		3	3	3	3	3	3	1	3	3
CO2	3	2	1	1		3	3	3	2	2	3		3	2
CO3	3	2	1	1		3	3	3	2	2	3		3	2
CO4	3	2	1	1		3	3	3	2	2	3		3	2
CO5	3	2	1	1		3	3	3	2	2	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		50	40	10			100
CAT2		30	70				100
CAT3		30	70				100
ESE		40	50	10			100

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

COURSE OUTCOMES: On completion of the course, the students will be able to												BT Mapped (Highest Level)	
CO1	develop simple applications using python - functions, string, data structures												Applying (K3)
CO2	build Python applications making use of List, Dictionaries, Tuples and Sets												Applying (K3)
CO3	apply Object Oriented Programming concepts and CRUD operations in Python applications												Applying (K3)
CO4	make use of NumPy Arrays in Python applications												Applying (K3)
CO5	utilize Pandas and Matplotlib for developing advance applications in Python												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	3	3	2	2	3		3	2
CO2	3	2	1	1		3	3	3	2	2	3		3	2
CO3	3	2	1	1		3	3	3	2	2	3		3	2
CO4	3	2	1	1		3	3	3	2	2	3		3	2
CO5	3	2	1	1		3	3	3	2	2	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		40	60				100
CAT2		30	70				100
CAT3		30	70				100
ESE		40	60				100

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

COURSE OUTCOMES: On completion of the course, the students will be able to												BT Mapped (Highest Level)	
CO1	describe the basic structure, arithmetic and memory operations of a digital computer and illustrate the addressing modes for set of instructions												Applying (K3)
CO2	describe and apply algorithms for performing different arithmetic operations.												Applying (K3)
CO3	make use of the data path in a processor to write the sequence of steps to fetch and execute a given instruction and apply the concepts of pipelining												Applying (K3)
CO4	distinguish between different types of memory and apply the mapping functions between different levels of memory												Applying (K3)
CO5	illustrate various types of interrupts in I/O transfer and the role of different types of bus in I/O operations.												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	3	3	2	2	3		3	2
CO2	3	2	1	1		3	3	3	2	2	3		3	2
CO3	3	2	1	1		3	3	3	2	2	3		3	2
CO4	3	2	1	1		3	3	3	2	2	3		3	2
CO5	3	2	1	1		3	3	3	2	2	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		40	60				100
CAT2		40	60				100
CAT3		60	40				100
ESE		40	60				100

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

COURSE OUTCOMES: On completion of the course, the students will be able to											BT Mapped (Highest Level)	
CO1	illustrate source coding theorem and entropy to quantify information											Applying (K3)
CO2	outline 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	apply various audio compression coding standards in different applications											Applying (K3)
CO5	use the different video compression standards in different 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	3	3	2	2	3		3	2
CO2	3	2	1	1		3	3	3	2	2	3		3	2
CO3	3	2	1	1		3	3	3	2	2	3		3	2
CO4	3	2	1	1		3	3	3	2	2	3		3	2
CO5	3	2	1	1		3	3	3	2	2	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		40	60				100
CAT2		40	60				100
CAT3		60	40				100
ESE		40	60				100

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

COURSE OUTCOMES: On completion of the course, the students will be able to												BT Mapped (Highest Level)		
CO1	describe the internal blocks and register organization of 8086 microprocessor architecture.											Applying (K3)		
CO2	describe the internal blocks of 8051 microcontroller Architecture											Applying (K3)		
CO3	write embedded c programs for 8051 features programming											Applying (K3)		
CO4	apply programming skills to interface peripheral devices.											Applying (K3)		
CO5	interpret the applications of microcontroller											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		3	3	3	2	2	3		3	2
CO2	3	3	2	2		3	3	3	2	2	3		3	2
CO3	3	2	2	2		3	3	3	2	2	3		3	2
CO4	3	2	2	2		3	3	3	2	2	3		3	2
CO5	3	2	2	2		3	3	3	2	2	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			60		40								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)

COURSE OUTCOMES:												BT Mapped (Highest Level)	
On completion of the course, the students will be able to													
CO1	restate the meaning of happiness and prosperity and do a correct appraisal of the current scenario in the society												Applying (K3)
CO2	distinguish between the Self and the Body, understand the meaning of Harmony in the Self, the Co-existence of Self and Body												Applying (K3)
CO3	infer the value of harmonious relationship based on trust, respect and other naturally acceptable feelings in human-human relationships and explore their role in ensuring a harmonious society												Applying (K3)
CO4	transform themselves to co-exist with nature by realising interconnectedness and four order of nature												Applying (K3)
CO5	distinguish between ethical and unethical practices, and extend ethical and moral practices for a better living												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	3	3	2	2	3		3	2
CO2	3	2	1	1		3	3	3	2	2	3		3	2
CO3	3	2	1	1		3	3	3	2	2	3		3	2
CO4	3	2	1	1		3	3	3	2	2	3		3	2
CO5	3	2	1	1		3	3	3	2	2	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		75	25				100
CAT2		75	25				100
CAT3		75	25				100
ESE	NA						100

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

22TAM02 - தமிழ்நூம் தொழில்நுட்பமும் (Common to All Engineering and Technology Branches)							
Programme & Branch	All BE/BTech Branches	Sem.	Category	L	T	P	Credit
Prerequisites	Nil	3 / 2	HS	1	0	0	1
முன்னுரை	தமிழ் கலாச்சாரத்தோடு ஒன்றிய தொழில் நுட்பங்களை பற்றிப் எடுத்துரைத்தல்						
அலகு - I	நெசவு மற்றும் பானை தொழில்நுட்பம்						
சங்க காலத்தில் நெசவு தொழில் – பானைத் தொழில்நுட்பம் கருப்பு சிவப்பு பாண்டங்கள் – பாண்டகளில் கீறல் குறியீடுகள்							
அலகு - II	வடிவமைப்பு மற்றும் கட்டிடத் தொழில்நுட்பம்						
சங்க காலத்தில் வடிவமைப்பு மற்றும் கட்டுமானங்கள் & சங்க காலத்தில் வீட்டுப்பொருட்களில் வடிவமைப்பு – சங்க காலத்தில் கட்டுமான பொருட்களும் நடுகல்லும் – சிலப்பதிகாரத்தில் மேடை அமைப்பு பற்றிய விவரங்கள் – மாமல்லபுரச்சிற்பங்களும், கோவில்களும் – சோழர் காலத்து பெருங்கோயில்கள் மற்றும் பிற வழிபாட்டுத் தலங்கள் – நாயக்கர் காலக் கோயில்கள் – மாதிரிகட்டமைப்புகள் பற்றி அறிதல், மதுரை மீனாட்சி அம்மன் ஆலயம் மற்றும் திருமலை நாயக்கர் மஹால் – செட்டிநாட்டு வீடுகள் – பிரிட்டிஷ் காலத்தில் சென்னை இந்தோ-சாரோசெனிக் கட்டிடக் கலை.							
அலகு - III	உற்பத்தித் தொழில்நுட்பம்						
கப்பல் கட்டும் கலை – உலோகவியல் – இரும்புத் தொழிற்சாலை – இரும்பை உருக்குதல், எஃகு – வரலாற்றுச்சான்றுகளாக செம்பு மற்றும் தங்க நாண்யங்கள் – நாண்யங்கள் அச்சடித்தல் – மணி உருவாக்கும் தொழிற்சாலைகள் – கல்மணிகள் – கண்ணாடி மணிகள் – சுடுமண் மணிகள் – சங்கு மணிகள் – எலும்புத்துண்டுகள் – தொல்லியல் சான்றுகள் – சிலப்பதிகாரத்தில் மணிகளின் வகைகள்.							3
அலகு - IV	வேளாண்மை மற்றும் நீர்ப்பாசனத் தொழில்நுட்பம்						
அனை, ஏரி, குளங்கள், மதுகு – சோழர்கால குமிழித் தூம்பின் முக்கியத்துவம் – காலநடை பராமரிப்பு – காலநடைகளுக்காக வடிவமைக்கப்பட்ட கிணறுகள் – வேளாண்மை மற்றும் வேளாண்மை சார்ந்த செயல்பாடுகள் – கடல்சார் அறிவு – மீன்வளம் – முத்து மற்றும் முத்துக்குளித்தல் – பெருங்கடல் குறித்த பண்டைய அறிவு – அறிவுசார் சமூகம்.							3
அலகு - V	அறிவியல் தமிழ் மற்றும் கணினித்தமிழ்						
அறிவியல் தமிழின் வளர்ச்சி – கணினித்தமிழ் வளர்ச்சி – தமிழ் நூல்களை மின்பதிப்பு செய்தல் – தமிழ் மென்பொருட்கள் உருவாக்கம் – தமிழ் இணையக் கல்விக்கழகம் – தமிழ் மின் நூலகம் – இணையத்தில் தமிழ் அகராதிகள் சொற்குவைத் திட்டம்.							Total:15
TEXT BOOK:							
1.	தமிழக வரலாறு - மக்களும் பண்பாடும் - கே கே பிள்ளை (வெளியீடு தமிழ்நாடு பாடநூல் மற்றும் கல்வியில் பணிகள் கழகம்), https://www.tamildigitallibrary.in/book-search.php?tag=%E0%AE%9A%E0%AF%86%E0%AE%A9%E0%AF%8D%E0%AE%A9%E0%AF%88 உலகத் தமிழாராய்ச்சி நிறுவனம், சென்னை, 2002						
2.	கணினித்தமிழ் முனைவர் இல. சுந்தரம், விகடன் பிரசரம், 2016						
REFERENCES:							
1.	கீழடி-வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம்.(தொல்லியல் துறை வெளியீடு)						
2.	பொருநை-ஆற்றங்கரை நாகரிகம் (தொல்லியல் துறை வெளியீடு)						
3.	Social Life of Tamils (Dr.K.K.Pillay) A joint Publication of TNTB & ESC and RMRL – (in print)						
4.	Social Life of the Tamils – The Classical Period (Dr.S.Sigaravelu) (Published by: International Institute of Tamil Studies).						
5.	Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukarasu) (Published by : International Institute of Tamil Studies)						
6.	The Contribution of the Tamil to Indian Culture (Dr.M.Valarmathi) (Published by International Institute of Tamil Studies).						
7.	Keeladi – 'Sangam City Civilization on the banks of river Vaigai; (Jointly Published by: Department of Archaeology & Tamilnadu Text Book and Educational Services Corporation, Tamilnadu)						
8.	Studies in the History of India with Special Reference to Tamilnadu (Dr.K.K.Pillay) (Published by: The Author)						
9.	Porunai Civilization (Jointly Published by: Department of Archaeology & Tamilnadu Textbook and Educational Services Corporation, Tamilnadu)						
10.	Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.						

COURSE OUTCOMES:											BT Mapped (Highest Level)	
படிப்பை முடித்தவுடன், மாணவர்கள்												
CO1	தமிழ் கலாச்சாரம் மற்றும் தமிழ் சமூகத்தினுடைய நெசவு மற்றும் பாணை தொழில்நுட்பம் பற்றி விளக்க முடியும்.										Understanding (K2)	
CO2	தமிழர்களின் வடிவமைப்பு மற்றும் கட்டிடத் தொழில்நுட்ப ஆற்றல் பற்றி விளக்க முடியும்.										Understanding (K2)	
CO3	தமிழர்களின் உற்பத்தித் தொழில்நுட்பம் பற்றி சுருக்கமாகக் கூற முடியும்.										Understanding (K2)	
CO4	தமிழர்களின் வேளாண்மை மற்றும் நீர்ப்பாசனத் தொழில்நுட்பம் பற்றி விளக்க முடியும்.										Understanding (K2)	
CO5	தமிழர்களின் அறிவியல் தமிழ் மற்றும் கணினித்தமிழ் பற்றி விளக்க முடியும்.										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		3	2	2		3		
CO2						3		3	2	2		3		
CO3						3		3	2	2		3		
CO4						3		3	2	2		3		
CO5						3		3	2	2		3		

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

ASSESSMENT PATTERN – THEORY

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

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

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

Mapping of COs with POs and PSOs

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

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

ASSESSMENT PATTERN – THEORY

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

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

22ITL31 - DESIGN AND ANALYSIS OF ALGORITHMS LABORATORY																																
Programme& Branch		B.Tech. & Information Technology				Sem.	Category	L	T	P	Credit																					
Prerequisites		Data Structures				3	PC	0	0	2	1																					
Preamble		This course investigates the various algorithm design techniques and methods for designing and analyzing algorithms.																														
LIST OF EXPERIMENTS / EXERCISES:																																
1.	Find the order of growth of the given problems. Identify the basic operation and count the number of times the basic operation is executed																															
2.	Implement the Quick sort algorithm and analyze with respect to space and time																															
3.	Implement the Merge sort algorithm and analyze with respect to space and time																															
4.	Implement binary search and analyze with respect to space and time																															
5.	Using Decrease and conquer technique, compute the kth smallest element in the list of 'n' numbers. Also, find the time complexity																															
6.	Write the heap sort algorithm to sort 'n' numbers using transform and conquer																															
7.	Compare top down and bottom-up approaches of solving the Knapsack problem using Dynamic Programming																															
8.	Construct the Huffman code for the given data. Also perform encoding and decoding (use Greedy technique).																															
9.	Apply backtracking to solve the given instance of subset sum problem																															
10.	Solve the travelling salesman problem of the given graph using branch and bound technique																															
Total:30																																
REFERENCES/ MANUAL /SOFTWARE:																																
1.	C/JAVA/Python																															
2.	Laboratory Manual																															
COURSE OUTCOMES:																																
On completion of the course, the students will be able to																																
CO1	analyze the Space and Time efficiency of various algorithms										Analyzing (K4) Precision (S3)																					
CO2	estimate the performance of various algorithm design techniques										Evaluating (K5) Precision (S3)																					
CO3	choose appropriate design strategies for solving a given problem										Applying (K3) Precision (S3)																					
Mapping of COs with POs and PSOs																																
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2																		
CO1	3	3	2	2	1	3	3	3	3	3	3	1	3	3																		
CO2	3	3	3	3	2	3	3	3	3	3	3	2	3	3																		
CO3	3	2	1	1		3	3	3	2	2	3		3	2																		

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

22EIL33 - DIGITAL LOGIC AND MICROPROCESSORS LABORATORY																																			
Programme& Branch		B.Tech. & Information Technology					Sem.	Category	L	T	P	Credit																							
Prerequisites		Nil					3	ES	0	0	2	1																							
Preamble		This course provides practical exposure in implementing various digital circuits. It also deals with assembly language programming and interfacing with 8086																																	
LIST OF EXPERIMENTS / EXERCISES:																																			
1. Simplify and Implement Simple Combinational Circuits																																			
2. Simplify and Implement Adder and Subtractor																																			
3. Simplify and Implement Decoder and Encoder																																			
4. Simplify and Implement Code converters																																			
5. Simplify and Implement Multiplexer and Demultiplexer																																			
6. Design counters and shift Registers																																			
7. Write simple programs using 8086 (Addition, subtraction, multiplication and division)																																			
8. Write simple programs using 8086 (Maximum and Minimum in a given list)																																			
9. Write simple programs using 8086 (Ascending/Descending ordering of a list)																																			
10. Perform the following Interfaces: i) Generate a square wave and rectangular wave by interfacing timer with 8051, ii) Generate rolling display by interfacing 8279 with 8051																																			
Total:30																																			
REFERENCES/ MANUAL /SOFTWARE:																																			
1.	Laboratory Manual																																		
COURSE OUTCOMES:																																			
On completion of the course, the students will be able to																																			
CO1	design and implement combinational logic circuits											BT Mapped (Highest Level)																							
CO2	examine sequential logic circuits using flip-flops											Analyzing (K4), Precision (S3)																							
CO3	develop assembly language programs for simple applications and interface peripherals with 16 bit microprocessor											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	3	3	2	2	3		3	2																					
CO2	3	3	2	2	1	3	3	3	3	3	3	1	3	3																					
CO3	3	2	1	1		3	3	3	2	2	3		3	2																					

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

COURSE OUTCOMES: On completion of the course, the students will be able to												BT Mapped (Highest Level)	
CO1	apply propositional logic to validate the arguments.												Applying (K3)
CO2	apply the rules of inference and methods of proof in predicate calculus to verify the validity of arguments.												Applying (K3)
CO3	use combinatorial concepts in analysis of algorithms.												Applying (K3)
CO4	understand various concepts of relations and different types of functions.												Understanding (K2)
CO5	apply 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	2										3	
CO2	3	2	1										1	
CO3	3	2	1											
CO4	3	3	3										1	
CO5	3	3	3										3	

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

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understand ing (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluati ng (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)

COURSE OUTCOMES:													BT Mapped (Highest Level)	
On completion of the course, the students will be able to														
CO1	outline the features, architecture and applications of database system													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 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	3	2	1	1		3	3	3	2	2	3		3	2
CO2	3	2	1	1		3	3	3	2	2	3		3	2
CO3	3	2	1	1		3	3	3	2	2	3		3	2
CO4	3	2	1	1		3	3	3	2	2	3		3	2
CO5	3	2	1	1		3	3	3	2	2	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		30	70				100
CAT2		30	70				100
CAT3		30	70				100
ESE		40	60				100

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

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	develop interactive and dynamic web pages using basics constructs of Javascript ES6												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	demonstrate full stack web development using Typescript, Angular and Node JS												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	3	3	2	2	3		3	2
CO2	3	2	1	1		3	3	3	2	2	3		3	2
CO3	3	2	1	1		3	3	3	2	2	3		3	2
CO4	3	2	1	1		3	3	3	2	2	3		3	2
CO5	3	2	1	1		3	3	3	2	2	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		40	60				100
CAT2		40	60				100
CAT3		40	60				100
ESE		40	60				100

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

COURSE OUTCOMES: On completion of the course, the students will be able to												BT Mapped (Highest Level)		
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	1		3	3	3	2	2	3		3	2
CO2	3	2	1	1		3	3	3	2	2	3		3	2
CO3	3	2	1	1		3	3	3	2	2	3		3	2
CO4	3	2	1	1		3	3	3	2	2	3		3	2
CO5	3	2	1	1		3	3	3	2	2	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		30	70				100
CAT2		30	70				100
CAT3		50	50				100
ESE		40	60				100

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

COURSE OUTCOMES: On completion of the course, the students will be able to												BT Mapped (Highest Level)	
CO1	identify operating system structure, services and system calls												Applying (K3)
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												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	3	2	1	1		3	3	3	2	2	3		3	2
CO2	3	2	1	1		3	3	3	2	2	3		3	2
CO3	3	2	1	1		3	3	3	2	2	3		3	2
CO4	3	2	1	1		3	3	3	2	2	3		3	2
CO5	3	2	1	1		3	3	3	2	2	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		60	40				100
CAT2		40	60				100
CAT3		40	60				100
ESE		40	60				100

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

22ITL41 - DATABASE MANAGEMENT SYSTEMS LABORATORY																																
Programme & Branch		B.Tech. & Information Technology						Sem.	Category	L	T	P	Credit																			
Prerequisites		Nil						4	PC	0	0	2	1																			
Preamble	This course provides hands-on experience in databases and its operations using SQL and other high level languages																															
LIST OF EXPERIMENTS / EXERCISES:																																
1.	Data definition language, commands, integrity constraints																															
2.	Data manipulation language, Data control language commands and TCL commands																															
3.	Nested queries																															
4.	Join operations																															
5.	Views and index																															
6.	PL/SQL statements																															
7.	Cursors																															
8.	Triggers																															
9.	Procedures and Functions																															
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/ MANUAL /SOFTWARE:																																
1.	Front End: Microsoft Visual Studio 6.0, Microsoft .NET Framework SDK v2.0, Java etc																															
2.	Back End : ORACLE / SQL SERVER / MYSQL																															
COURSE OUTCOMES: On completion of the course, the students will be able to										BT Mapped (Highest Level)																						
CO1	develop SQL and PL/SQL commands to create and manipulate databases										Applying (K3), Precision (S3)																					
CO2	execute and examine queries using concepts of embedded query languages										Analyzing (K4), Precision (S3)																					
CO3	apply database concepts to solve real world 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	1		3	3	3	2	2	3		3	2																		
CO2	3	2	1	1	1	3	3	3	3	3	3	1	3	3																		
CO3	3	2	1	1		3	3	3	2	2	3		3	2																		

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							100

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

22EGL31 - COMMUNICATION SKILLS DEVELOPMENT LABORATORY																						
(Common to All Engineering and Technology Branches)																						
Programme & Branch	All B.E./B.Tech Branches						Sem.	Category	L	T	P	Credit										
Prerequisites	Nil						4	HS	0	0	2	1										
Preamble	This course is designed to impart necessary skills to listen, speak, read and write in order to obtain better professional communication skills.																					
LIST OF EXPERIMENTS / EXERCISES:																						
1.	Self Introduction & Mock Interview																					
2.	Job Application letter with Resume																					
3.	Presentation: A Technical topic / Project report &a Case study																					
4.	Situational Dialogues / Telephonic Conversations																					
5.	Group Discussion																					
6.	Reading Aloud																					
7.	Listening Comprehension																					
8.	Writing Company Profiles																					
9.	Preparing reviews of a book/product/movie																					
10.	Pronunciation Test																					
Total:30																						
REFERENCES/ MANUAL /SOFTWARE:																						
1.	Lab Manual																					
2.	Orell Digital Language Lab Software																					
COURSE OUTCOMES:																						
On completion of the course, the students will be able to																						
CO1	enhance effective listening and reading skills																					
CO2	acquire professional skills required for workplace/higher education																					
CO3	use English language skills effectively in various situations																					
Mapping of Cos with POs and PSOs																						
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12										
CO1									2	3		3										
CO2									2	2		2										
CO3									2	2		2										

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

COURSE OUTCOMES: On completion of the course, the students will be able to												BT Mapped (Highest Level)	
CO1	explore the basics of network models and physical layer												Applying (K3)
CO2	identify error detection and correction methods and protocols at data link layer												Applying (K3)
CO3	outline the different addressing schemes and apply various routing protocols at network layer												Applying (K3)
CO4	illustrate the different transport layer protocols and employ suitable flow control and QoS techniques												Applying (K3)
CO5	know various protocols and their working principles at application layer												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	3	3	2	2	3		3	2
CO2	3	2	1	1		3	3	3	2	2	3		3	2
CO3	3	2	1	1		3	3	3	2	2	3		3	2
CO4	3	2	1	1		3	3	3	2	2	3		3	2
CO5	3	2	1	1		3	3	3	2	2	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		65	35				100
CAT2		65	35				100
CAT3		65	35				100
ESE		65	35				100

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

COURSE OUTCOMES: On completion of the course, the students will be able to													BT Mapped (Highest Level)	
CO1	utilize data preprocessing and explore structure of data													Applying (K3)
CO2	Select models and apply feature engineering methods to choose suitable models													Applying (K3)
CO3	employ supervised learning methods to solve real world problems													Applying (K3)
CO4	Solve problems using neural networks and unsupervised learning													Applying (K3)
CO5	apply the concepts of reinforcement learning and other types of machine learning 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	1		3	3	3	2	2	3		3	2
CO2	3	2	1	1		3	3	3	2	2	3		3	2
CO3	3	2	1	1		3	3	3	2	2	3		3	2
CO4	3	2	1	1		3	3	3	2	2	3		3	2
CO5	3	2	1	1		3	3	3	2	2	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		30	70				100
CAT2		30	70				100
CAT3		30	70				100
ESE		30	70				100

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

22ITC51 - SOFTWARE ENGINEERING

Programme & Branch	B. Tech & Information Technology	Sem.	Category	L	T	P	Credit	
Prerequisites	Nil	5	PC	3	0	2	4	
Preamble	This course promotes 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 agile 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								
Unit - II	Agile Principles and Scrum							9
Understanding the Agile Values–Agile Principles–Agile Project–Scrum and Self-Organizing Teams–Basic pattern for a Scrum Project–Rules of Scrum–Self-Organizing Teams–Scrum Values–Daily Scrum–Sprints, Planning and Retrospectives–Scrum Planning and Collective Commitment–User stories–Conditions of Satisfaction–Story Points and Velocity–Burn down Charts– Planning and Running a Sprint–Generally Accepted Scrum Practices								
Unit - III	XP and Incremental Design							9
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 - Make Code and Design Decisions at the Last Responsible Moment - Incremental Design and the Holistic XP Practices								
Unit - IV	Lean and Kanban							9
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								
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.								
LIST OF EXPERIMENTS / EXERCISES:								
1.	Create a product back log with stories							
2.	Determine Release plan to decide which stories can be accomplished in the release							
3.	Write Sprint plan to determine which features can be accomplished in the first iteration, or sprint							
4.	Manage your workload							
5.	Use several predefined and user created queries to Track project progress							
6.	Schedule the sprint review to allow team members to add their thought and review the discussion at the meeting							
7.	Create a plan to shut down the first sprint and get ready to start the next one							
8.	Identify use cases and develop business use case model (System use case diagram)							
9.	Identify the conceptual classes (boundary, controller and entity classes) and develop a domain model with UML Class diagram.							
10.	Develop user interface using Python and Database creation using MySQL and Perform unit and integration testing							
Lecture:45, Practical:30, Total:75								
TEXT BOOK:								
1.	Roger S. Pressman, Bruce R. Maxim, "Software Engineering: A Practitioner's Approach", 8 th Edition, McGraw-Hill Education, India, 2019. (Units 1 & 5)							
2.	Andrew Stellman and Jennifer Greene, "Learning Agile: Understanding Scrum, XP, Lean and Kanban", 1 st Edition, O'Reilly Media Inc, 2015 (Units 2,3 &4)							
REFERENCES/ MANUAL / SOFTWARE:								
1.	Ali Bahrami, "Object Oriented Systems Development", 1 st Edition, Tata McGraw-Hill, New Delhi, 2008.							
2.	Infosys spring board contents provided by Infosys at https://infyspringboard.onwingspan.com/web/en/page/home							

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), Precision (S3)
CO2	outline agile principles and apply Scrum for project development.												Applying (K3), Precision (S3)
CO3	use XP methods for modeling and design of a software system												Applying (K3), Precision (S3)
CO4	model applications using Lean and Kanban practices												Applying (K3), Precision (S3)
CO5	make use of various software testing techniques to test the software systems												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	3	3	2	2	3		3	2
CO2	3	2	1	1		3	3	3	2	2	3		3	2
CO3	3	2	1	1		3	3	3	2	2	3		3	2
CO4	3	2	1	1		3	3	3	2	2	3		3	2
CO5	3	2	1	1		3	3	3	2	2	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		60	40				100
CAT2		60	40				100
CAT3		60	40				100
ESE		60	40				100

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

COURSE OUTCOMES: On completion of the course, the students will be able to												BT Mapped (Highest Level)	
CO1	develop a react applications using basic elements and styles												Applying (K3), Precision (S3)
CO2	apply the fundamental concepts of component in react												Applying (K3), Precision (S3)
CO3	demonstrate properties and state in react												Applying (K3), Precision (S3)
CO4	implement simple applications using react events												Applying (K3), Precision (S3)
CO5	illustrate the functionalities of React hooks and routing												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	3	3	3	2	2	3		3	2
CO2	3	2	1	1	3	3	3	3	2	2	3		3	2
CO3	3	2	1	1	3	3	3	3	2	2	3		3	2
CO4	3	2	1	1	3	3	3	3	2	2	3		3	2
CO5	3	2	1	1	3	3	3	3	2	2	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		60	40				100
CAT2		60	40				100
CAT3		60	40				100
ESE		60	40				100

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

22ITL51 - NETWORKS LABORATORY																																			
Programme & Branch		B.Tech. & Information Technology					Sem.	Category	L	T	P	Credit																							
Prerequisites		Nil					5	PC	0	0	2	1																							
Preamble		This course provides an exposure to configure the routers, end devices and servers using packet Tracer. It also enables the students to configure routing protocols using tools like GNS3 and Packet Tracer.																																	
LIST OF EXPERIMENTS / EXERCISES:																																			
1.	Simulate the network topologies (Bus, Ring, Star and Mesh) using Cisco Packet Tracer																																		
2.	Implement bit stuffing and byte stuffing using C program.																																		
3.	Simulate and identify the difference in working operation of Hub and Switch using Cisco Packet Tracer																																		
4.	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 give by web server using Cisco Packet Tracer.																																		
5.	Simulate a network that performs Network address Translation to share a single public IP to the entire host connected in the network.																																		
6.	Develop as chat application using TCP socket																																		
7.	Create UDP based network application using socket programming																																		
8.	Implement Go-Back-N and Selective repeat flow control protocols																																		
9.	Transfer a file to a remote server, analyze the traces of the TCP segments sent and received and investigate the behaviours of TCP using Wireshark																																		
10.	Capture packet traces by retrieving an HTML file and investigate the operations of Ethernet protocol and the ARP protocol using Wireshark																																		
Total:30																																			
REFERENCES/ MANUAL /SOFTWARE:																																			
1.	Cisco Packet Tracer /C, Java /Wireshark Tool																																		
COURSE OUTCOMES:																																			
On completion of the course, the students will be able to																																			
CO1	demonstrate and configure networking protocols using Cisco Packet Tracer										BT Mapped (Highest Level)																								
CO2	implement the working mechanism using data link, network and transport layer protocols										Applying (K3), Precision (S3)																								
CO3	demonstrate the various layer protocols using simulator tool										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																							
CO1	3	2	1	1	3	3	3	3	2	2	3	2																							
CO2	3	2	1	1	3	3	3	3	2	2	3	2																							
CO3	3	2	1	1	3	3	3	3	2	2	3	2																							

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

22ITL52 - MACHINE LEARNING LABORATORY																						
Programme & Branch		B.Tech. & Information Technology				Sem.	Category	L	T	P	Credit											
Prerequisites	Design and Analysis of Algorithms, Object oriented programming				5	PC	0	0	2	1												
Preamble	This course provides implementation of various machine learning algorithms for designing solutions for real life problems																					
LIST OF EXPERIMENTS / EXERCISES:																						
1.	Impute missing values in data inputs																					
2.	Use feature selection/extraction method to perform dimensionality reduction																					
3.	Demonstrate Naïve Bayes Classification																					
4.	Classify the input dataset using decision tree																					
5.	Perform classification using Support Vector Machines																					
6.	Perform multivariate classification and regression																					
7.	Develop a program to implement feed-forward neural networks																					
8.	Implement K-means clustering																					
9.	Develop a simple application to demonstrate reinforcement learning																					
10.	Assess machine learning algorithms 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	apply various learning methods to preprocess the dataset by data cleaning and dimensionality reduction									Applying (K3), Precision (S3)												
CO2	use various supervised learning methods to perform classification									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	3	3	3	3	2	2	3	2	3	2								
CO2	3	2	1	1	3	3	3	3	2	2	3	2	3	2								
CO3	3	2	1	1	3	3	3	3	2	2	3	2	3	2								

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

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				3	3		3		3	2		
CO2	3	2				3	3		3		3	<u>2</u>		
CO3		2				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		60	40				100
CAT2		50	50				100
CAT3		50	50				100
ESE	NA						

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

COURSE OUTCOMES: On completion of the course, the students will be able to												BT Mapped (Highest Level)	
CO1	apply 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	illustrate various mutual trust and User authentication mechanisms												Applying (K3)
CO5	make use of 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	3	3	2	2	3		3	2
CO2	3	2	1	1		3	3	3	2	2	3		3	2
CO3	3	2	1	1		3	3	3	2	2	3		3	2
CO4	3	2	1	1		3	3	3	2	2	3		3	2
CO5	3	2	1	1		3	3	3	2	2	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		40	60				100
CAT2		40	60				100
CAT3		60	40				100
ESE		40	60				100

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

22ITT62 - MOBILE COMMUNICATION

Programme & Branch	B. Tech & Information Technology	Sem.	Category	L	T	P	Credit
Prerequisites	Computer Networks	6	ES	3	0	0	3
Preamble	Pre-requisites: Basic knowledge about data communication such as concepts of modulation, error correction code as well as networking concepts such as TCP/IP protocols.						
Unit - I	Introduction to Wireless Communication						9
Wireless transmission –Frequencies for radio transmission –Signals –Antennas –Signal Propagation –Multiplexing –Spread spectrum –cellular systems-MAC-Motivation –SDMA –FDMA –TDMA –CDMA							
Unit - II	Telecommunication and Satellite systems						9
Tele Communications –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 LAN						9
Wireless LAN -Infrared Vs Radio Transmission –Infrastructure Networks and Adhoc Networks -IEEE 802.11 –System architecture-Protocol architecture - HIPERLAN: HIPERLAN1 –Bluetooth-User scenarios-Architecture.							
Unit – IV	Mobile Network and Transport Layer						9
Mobile IP: Goals, assumptions and requirements – Entities and terminologies – IP packet delivery – Agent discovery – Registration – Tunneling and Encapsulation – Dynamic Host Configuration Protocol-Mobile ad-hoc Networks –Improvement on TCP for mobile and wireless network							
Unit – V	Application Layer & IoT						9
WAP-Architecture -Wireless application environment–Definition and Characteristics of IoT, Physical Design of IoT – IoT Protocols, IoT Communication Models - IoT Communication APIs – IoT enabling Technologies - Wireless Sensor Networks - Cloud Computing – Big data analytics – Communication Protocols - Embedded Systems – IoT Levels and Templates							
Total:45							
TEXT BOOK:							
1.	Schiller J., "Mobile Communication", 2 nd Edition,Pearson Education, New Delhi, 2014 (For Units I,II,III,IV)						
2.	Arshdeep Bahga and Vijay Madisetti, "Internet of Things – A Hands-on Approach", 1 st Edition, University Press, 2015. (For Units V)						
REFERENCES:							
1.	Raj Kamal, "Mobile Computing", 3 rd edition, Oxford University Press Inc. New Delhi, 2019						
2.	Asoke K Talukder, Hasan Ahmed, Roopa R Yavagal, "Mobile Computing Technology, applications and Service Creation", 2 nd Edition , McGraw Hill Education Private Ltd, 2018						
3.	Honbo Zhou, "The Internet of Things in the Cloud: A Middleware Perspective", 1 st Edition, CRC Press, 2012						
4.	Jonathan Rodriguez, "Fundamentals of 5G Mobile Networks", Wiley, 2015.						

COURSE OUTCOMES: On completion of the course, the students will be able to												BT Mapped (Highest Level)	
CO1	summarize the fundamentals of wireless communication and determine the suitable medium access control techniques												Applying (K3)
CO2	elaborate the concepts and protocol architectures of GSM and satellite systems												Applying (K3))
CO3	illustrate the concepts of Wireless LAN and associated technologies												Applying (K3)
CO4	explore the routing protocols and TCP congestion control mechanisms in wireless network												Applying (K3)
CO5	use the WAP and IoT architecture, infrastructure and explore the constraints of 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	3	3	2	2	3		3	2
CO2	3	2	1	1		3	3	3	2	2	3		3	2
CO3	3	2	1	1		3	3	3	2	2	3		3	2
CO4	3	2	1	1		3	3	3	2	2	3		3	2
CO5	3	2	1	1		3	3	3	2	2	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		70	30				100
CAT2		70	30				100
CAT3		70	30				100
ESE		70	30				100

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

22ITL61 - CLOUD COMPUTING LABORATORY																								
Programme & Branch	B.Tech. & Information Technology						Sem.	Category	L	T	P	Credit												
Prerequisites	Operating Systems, Computer Networks						6	PC	0	0	2	1												
Preamble	This course enables the students to design, develop, and deploy cloud-based web applications.																							
LIST OF EXPERIMENTS / EXERCISES:																								
1.	Install Virtualbox/VMware Workstation with different flavours of linux or windows OS on top of windows7 or 8.																							
2.	Install a C compiler in the virtual machine created using virtual box and execute Simple Programs																							
3.	Install Google App Engine. Create hello world app and other web applications using python/java																							
4.	Use GAE launcher to launch web applications																							
5.	Create EC2-AWS S3 bucket based static web pages																							
6.	Create EC2-AWS- instance and migration																							
7.	Create EC2-AWS web application using Beanstalk																							
8.	Perform AWS load balancing and auto scaling																							
9.	Implement PaaS-Mobile sensor based IoT application hosted via PaaS environment																							
10.	Install Hadoop single node cluster and run simple applications like wordcount.																							
Total:30																								
REFERENCES/ MANUAL /SOFTWARE:																								
1.	VMware, Google App Engine																							
2.	C/Python/Java																							
3.	Hadoop																							
COURSE OUTCOMES: On completion of the course, the students will be able to										BT Mapped (Highest Level)														
CO1	experiment with various virtualization tools such as Virtual Box and VMware workstation.										Applying (K3), Precision (S3)													
CO2	develop EC2-AWS buckets, instances and web applications										Applying (K3), Precision (S3)													
CO3	apply large data sets in a parallel environment.										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	3	3	3	2	2	3	2	3	2										
CO2	3	2	1	1	3	3	3	3	2	2	3	2	3	2										
CO3	3	2	1	1	3	3	3	3	2	2	3	2	3	2										

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

22ITL62 - INTERNET OF THINGS LABORATORY																								
Programme & Branch		B.Tech. & Information Technology					Sem.	Category	L	T	P	Credit												
Prerequisites		Computer Networks					6	ES	0	0	2	1												
Preamble		This course demonstrates the working of various communication technologies like GSM, ZigBee, and Arduino. Various environmental conditions like temperature, humidity etc. will be sensed and transmitted using these technologies and the values will be uploaded to cloud. This course also explores the development of simple real time applications using Raspberry Pi																						
LIST OF EXPERIMENTS / EXERCISES:																								
1.	Experiments on GSM / GPRS Basic AT Commands, Voice calls / Voice communication, Phone Book, SMS																							
2.	Experiments using ZigBee Data communication between co-ordinator and device module																							
3.	Create simple security alarm system using Raspberry Pi / Arduino																							
4.	Web page integration with Raspberry Pi / NODEMCU																							
5.	Create your own smart light using Raspberry Pi / Arduino / NODEMCU																							
6.	Control and monitor the temperature of the elements using temperature sensor with NODEMCU																							
7.	Sensing and sending the sensor value via SMS / Gmail																							
8.	Control any electrical appliance via webpage using Raspberry pi/ Arduino / NODEMCU																							
9.	Push IoT sensor data for cloud storage and apply simple data analytics.																							
10.	Develop a mini-project using Raspberry pi/Arduino																							
Total:30																								
REFERENCES/ MANUAL /SOFTWARE:																								
1.	Windows/Linux																							
2.	Win X Talk, Python IDE, Thingspeak																							
3.	Raspberry pi , Arduino, NODEMCU, GSM Module and Sensors																							
4.	Python and C																							
COURSE OUTCOMES: On completion of the course, the students will be able to										BT Mapped (Highest Level)														
CO1	demonstrate the basic working principles of different communication systems like GSM, WiFi, ZigBee									Applying (K3), Precision (S3)														
CO2	develop simple experiments to sense, monitor and control smart objects via web application									Applying (K3), Precision (S3)														
CO3	build IoT 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	1	3	3	3	3	2	2	3	2	3	2										
CO2	3	2	1	1	3	3	3	3	2	2	3	2	3	2										
CO3	3	2	1	1	3	3	3	3	2	2	3	2	3	2										

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

22ITP61 - PROJECT WORK I														
Programme & Branch		B.Tech. & Information Technology					Sem.	Category	L	T	P	Credit		
Prerequisites		Programming Languages, Software Engineering					6	EC	0	0	8	4		
Preamble		It provides practical exposure to the students and an opportunity to apply the IT mathematical concepts to solve the real world problems. It also gives opportunity to the students to work in a team.												
Total:120														
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 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 team											Applying (K3)		
Mapping of Cos with POs and PSOs														
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	1	1	2	2	3	3	3	3	3	3	2
CO2	3	2	1	1	1	2	2	3	3	3	3	3	3	2
CO3	3	2	1	1	1	2	2	3	3	3	3	3	3	2
CO4	3	2	1	1	1	2	2	3	3	3	3	3	3	2
CO5	3	2	1	1	1	2	2	3	3	3	3	3	3	2

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

22ITP62 - PROJECT WORK I														
Programme & Branch	B.Tech. & Information Technology							Sem.	Category	L	T	P	Credit	
Prerequisites	Programming Languages, Software Engineering							6	EC	0	0	10	5	
Preamble	It provides practical exposure to the students and an opportunity to apply the IT mathematical concepts to solve the real world problems. It also gives opportunity to the students to work in a team.													
	Total:150													
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 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 team										Applying (K3)			
Mapping of Cos with POs and PSOs														
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	1	1	2	2	3	3	3	3	3	3	2
CO2	3	2	1	1	1	2	2	3	3	3	3	3	3	2
CO3	3	2	1	1	1	2	2	3	3	3	3	3	3	2
CO4	3	2	1	1	1	2	2	3	3	3	3	3	3	2
CO5	3	2	1	1	1	2	2	3	3	3	3	3	3	2

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

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

Mapping of COs with POs and PSOs

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

1 – Slight, 2 – 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
ESE	NA						100

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

22GEP61 - COMPREHENSIVE TEST AND VIVA																			
(Common to All Engineering and Technology Branches)																			
Programme & Branch		B.Tech. & Information Technology						Sem.	Category	L	T	P	Credit						
Prerequisites	All core Subjects of IT						6	EC	0	0	0	0	2						
Total:60																			
COURSE OUTCOMES: On completion of the course, the students will be able to										BT Mapped (Highest Level)									
CO1	Identify the foundation courses in the field of Information Technology										Applying(K3)								
CO2	Examine each foundation course and relate it to other courses										Applying(K3)								
CO3	Summarize the concepts, methods and tools in the field of Information Technology to excel in placements and competitive examinations										Applying(K3)								
CO4	Organize the contents of the courses and discover a holistic approach to problem solving										Applying(K3)								
CO5	Make use of all the core courses to qualify as a fully competent graduate in IT field.										Applying(K3)								
Mapping of Cos with POs and PSOs																			
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2					
CO1	3	2	1	1	1	2	3	3	2	2	3	3	3	2					
CO2	3	2	1	1	1	2	3	3	2	2	3	3	3	2					
CO3	3	2	1	1	1	2	3	3	2	2	3	3	3	2					
CO4	3	2	1	1	1	2	3	3	2	2	3	3	3	2					
CO5	3	2	1	1	1	2	3	3	2	2	3	3	3	2					

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

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

22ITP71 - PROJECT WORK II PHASE I																
Programme & Branch		B. Tech & Information Technology							Sem.	Category	L	T	P	Credit		
Prerequisites		NIL							7	EC	0	0	10	5		
Preamble		It provides practical exposure to the students and an opportunity to apply the IT mathematical concepts to solve the real world problems. It also gives an opportunity to the students to work in a team.														
													Total:150			
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 team											Applying (K3)				
Mapping of Cos with POs and PSOs																
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2		
CO1	3	2	1	1	1	2	2	3	3	3	3	3	3	2		
CO2	3	2	1	1	1	2	2	3	3	3	3	3	3	2		
CO3	3	2	1	1	1	2	2	3	3	3	3	3	3	2		
CO4	3	2	1	1	1	2	2	3	3	3	3	3	3	2		
CO5	3	2	1	1	1	2	2	3	3	3	3	3	3	2		

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

22ITP72 - PROJECT WORK II PHASE I																
Programme & Branch		B. Tech & Information Technology							Sem.	Category	L	T	P	Credit		
Prerequisites		NIL							7	EC	0	0	12	6		
Preamble		It provides practical exposure to the students and an opportunity to apply the IT mathematical concepts to solve the real world problems. It also gives an opportunity to the students to work in a team.														
													Total:180			
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 team											Applying (K3)				
Mapping of Cos with POs and PSOs																
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2		
CO1	3	2	1	1	1	2	2	3	3	3	3	3	3	2		
CO2	3	2	1	1	1	2	2	3	3	3	3	3	3	2		
CO3	3	2	1	1	1	2	2	3	3	3	3	3	3	2		
CO4	3	2	1	1	1	2	2	3	3	3	3	3	3	2		
CO5	3	2	1	1	1	2	2	3	3	3	3	3	3	2		

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

22ITT71 - BLOCKCHAIN TECHNOLOGY

Programme & Branch	B. Tech & Information Technology	Sem.	Category	L	T	P	Credit	
Prerequisites	Cryptography and Network Security	7	PC	3	1	0	4	
Preamble	This course provides a comprehensive introduction to the theoretical and practical aspects of block chain technologies and its applications.							
Unit - I	Blockchain 101							9+3
Distributed systems - The history of block chain - Introduction to block chain – definitions - elements - Features - Applications of block chain technology - Tiers - Types of block chain - Consensus in block chain - CAP theorem - Benefits and limitations of block chain								
Unit - II	Decentralization, Cryptography and Technical Foundations							9+3
Decentralization using block chain – Methods – Routes - Block chain and full ecosystem decentralization -.Smart contract - Decentralized organization - 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+3
Bitcoin – Transactions – Blockchain - Bitcoin payments - Alternative Coins - Theoretical foundations - Bitcoin limitations – Namecoin - Litecoin – Primecoin – Zcash - Smart Contracts								
Unit - IV	Ethereum 101							9+3
Introduction - Ethereum block chain - Elements of the Ethereum block chain - Precompiled contracts – Accounts – Block – Block header – Messages – Mining - Clients and wallets - The Ethereum network - Ethereum Development Environment								
Unit - V	Hyperledger							9+3
Projects – protocol - Hyperledger Fabric - Sawtooth lake – Corda - Blockchain-Outside of Currencies: Internet of Things								
Lecture:45, Tutorial:15, Total:60								
TEXT BOOK:								
1.	Imran Bashir, "Mastering Blockchain: Distributed ledgers, decentralization and smart contracts Explained", 2 nd Edition, Packt Publishing, 2018.							
REFERENCES:								
1.	Brenn Hill, Samanyu Chopra, Paul Valencourt, "Blockchain Quick Reference: A guide to exploring decentralized blockchain application development", 1 st Edition, Packt publishing, 2018.							
2.	Andreas Antonopoulos, "Mastering Bitcoin: Programming the open blockchain", 2 nd 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 block chain, and choose appropriate consensus in block chain												Applying (K3)
CO2	make use of practical aspect of cryptography in decentralization of block chain												Applying (K3)
CO3	use bitcoins, identify alternative coins and smart contracts for your application												Applying (K3)
CO4	construct a distributed application using Ethereum												Applying (K3)
CO5	develop 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	3	3	2	2	3		3	2
CO2	3	2	1	1		3	3	3	2	2	3		3	2
CO3	3	2	1	1		3	3	3	2	2	3		3	2
CO4	3	2	1	1		3	3	3	2	2	3		3	2
CO5	3	2	1	1		3	3	3	2	2	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		50	50				100
CAT2		40	60				100
CAT3		50	50				100
ESE		50	50				100

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

22ITP81 - PROJECT WORK II PHASE II														
Programme & Branch		B. Tech & Information Technology				Sem.	Category	L	T	P	Credit			
Prerequisites		NIL				8	EC	0	0	8	4			
Preamble		It provides industry exposure to the students and an opportunity to analyze the problems, identify the appropriate design methodology for solving the problems. It also gives an opportunity to the students to work in a team.												
Total:120														
COURSE OUTCOMES: On completion of the course, the students will be able to											BT Mapped (Highest Level)			
CO1	Identify and formulate IT related solutions for an engineering problem													
CO2	Analyze and review existing system													
CO3	Choose appropriate design methodology for the problem													
CO4	Implement IT enabled solutions													
CO5	Communicate, demonstrate and document the work as a member and leader in a team													
Mapping of Cos with POs and PSOs														
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	1	1	2	2	3	3	3	3	3	3	2
CO2	3	2	1	1	1	2	2	3	3	3	3	3	3	2
CO3	3	2	1	1	1	2	2	3	3	3	3	3	3	2
CO4	3	2	1	1	1	2	2	3	3	3	3	3	3	2
CO5	3	2	1	1	1	2	2	3	3	3	3	3	3	2

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

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	brief 2D objects by applying transformation, clipping, and viewing operations												Applying (K3)
CO3	apply 3D concepts and 3D object representations												Applying (K3)
CO4	experiment with 3D transformations, viewing, projection and volume												Applying (K3)
CO5	make use of 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	3	3	2	2	3		3	2
CO2	3	2	1	1		3	3	3	2	2	3		3	2
CO3	3	2	1	1		3	3	3	2	2	3		3	2
CO4	3	2	1	1		3	3	3	2	2	3		3	2
CO5	3	2	1	1		3	3	3	2	2	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		60	40				100
CAT2		65	35				100
CAT3		65	35				100
ESE		45	55				100

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

COURSE OUTCOMES: On completion of the course, the students will be able to												BT Mapped (Highest Level)	
CO1	explain search strategies and solve problems by applying a suitable search method												Applying(K3)
CO2	apply heuristic search techniques												Applying(K3)
CO3	model search strategies as optimization problems												Applying(K3)
CO4	make use of game theory to solve adversarial problems												Applying(K3)
CO5	solve problems using constraint satisfaction formulation												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	3	3	2	2	3		3	2
CO2	3	2	1	1		3	3	3	2	2	3		3	2
CO3	3	2	1	1		3	3	3	2	2	3		3	2
CO4	3	2	1	1		3	3	3	2	2	3		3	2
CO5	3	2	1	1		3	3	3	2	2	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		70	30				100
CAT2		70	30				100
CAT3		60	40				100
ESE		55	45				100

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

COURSE OUTCOMES: On completion of the course, the students will be able to												BT Mapped (Highest Level)	
CO1	Summarize the concepts of unity platform tools												Applying (K3)
CO2	Apply the game programming concepts of C# in Unity												Applying (K3)
CO3	Design and develop a simple 2D Graphics with GIMP												Applying (K3)
CO4	Develop a 2D Graphics with sound and music effects												Applying (K3)
CO5	Create a simple animation game application using 2D unity tools												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	3	3	2	2	3		3	2
CO2	3	2	1	1		3	3	3	2	2	3		3	2
CO3	3	2	1	1		3	3	3	2	2	3		3	2
CO4	3	2	1	1		3	3	3	2	2	3		3	2
CO5	3	2	1	1		3	3	3	2	2	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		80	20				100
CAT2		60	40				100
CAT3		60	40				100
ESE		60	40				100

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

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 apply Spark and Kafka architectures.													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	3	3	2	2	3		3	2
CO2	3	2	1	1		3	3	3	2	2	3		3	2
CO3	3	2	1	1		3	3	3	2	2	3		3	2
CO4	3	2	1	1		3	3	3	2	2	3		3	2
CO5	3	2	1	1		3	3	3	2	2	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		60	40				100
CAT2		60	40				100
CAT3		60	40				100
ESE		60	40				100

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

COURSE OUTCOMES: On completion of the course, the students will be able to												BT Mapped (Highest Level)	
CO1	construct number theory concepts in various security applications												Applying (K3)
CO2	apply symmetric key cryptography techniques for real world problems												Applying (K3)
CO3	build various public key cryptography, hashing and digital signature techniques for real case scenarios												Applying (K3)
CO4	Illustrate the techniques to generate, test and factories prime numbers												Applying (K3)
CO5	make use of elliptic curve, properties for security services												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	3	3	2	2	3		3	2
CO2	3	2	1	1		3	3	3	2	2	3		3	2
CO3	3	2	1	1		3	3	3	2	2	3		3	2
CO4	3	2	1	1		3	3	3	2	2	3		3	2
CO5	3	2	1	1		3	3	3	2	2	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		50	50				100
CAT2		40	60				100
CAT3		40	60				100
ESE		40	60				100

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

COURSE OUTCOMES: On completion of the course, the students will be able to												BT Mapped (Highest Level)	
CO1	interpret the genome as a DNA string using computational methods.												Applying (K3)
CO2	solve motif identification using randomized algorithms												Applying (K3)
CO3	elucidate genome sequencing problems using graph algorithms												Applying (K3)
CO4	determine antibiotic sequencing using dynamic programming approaches												Applying (K3)
CO5	implement sequence alignment using algorithmic design 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	3	3	2	2	3		3	2
CO2	3	2	1	1		3	3	3	2	2	3		3	2
CO3	3	2	1	1		3	3	3	2	2	3		3	2
CO4	3	2	1	1		3	3	3	2	2	3		3	2
CO5	3	2	1	1		3	3	3	2	2	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		40	60				100
CAT2		40	60				100
CAT3		40	60				100
ESE		40	60				100

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

COURSE OUTCOMES: On completion of the course, the students will be able to													BT Mapped (Highest Level)	
CO1	construct design challenge and reframe the design challenge into design opportunity.													Applying (K3)
CO2	interview the user, and know the feelings of users to foster deep user understanding and be able to uncover the deep user insights and needs.													Applying (K3)
CO3	develop ideas and prototypes by brain storming using the ideation tools.													Applying (K3)
CO4	organize the user walkthrough experience using ideal user experience journey.													Applying (K3)
CO5	develop smart strategies & implementation plan that will deliver/achieve the idea/solution deduced from earlier phases.													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	3	3	2	2	3	3	3	3	3	3	2
CO2	3	2	3	3	3	2	2	3	3	3	3	3	3	2
CO3	3	2	3	3	3	2	2	3	3	3	3	3	3	2
CO4	3	2	3	3	3	2	2	3	3	3	3	3	3	2
CO5	3	2	3	3	3	2	2	3	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		30	70				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)

COURSE OUTCOMES: On completion of the course, the students will be able to													BT Mapped (Highest Level)	
CO1	construct network with socket programming concepts and RMI architecture													Applying (K3) Precision (S3)
CO2	interpret server side programming using JSP and Servlets													Applying (K3) Precision (S3)
CO3	make use of EJB, application server and microservice to implement enterprise application													Applying (K3) Precision (S3)
CO4	experiment with annotations, dev tools in Spring framework													Applying (K3) Precision (S3)
CO5	utilize JPA/Hibernate for Spring Boot database connectivity													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	3	2	2	3		3	2
CO2	3	2	3	3		3	3	3	2	2	3		3	2
CO3	3	2	3	3		3	3	3	2	2	3		3	2
CO4	3	2	3	3		3	3	3	2	2	3		3	2
CO5	3	2	3	3		3	3	3	2	2	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		40	60				100
CAT2		40	60				100
CAT3		40	60				100
ESE		40	60				100

* ±3% may be varied

COURSE OUTCOMES: On completion of the course, the students will be able to													BT Mapped (Highest Level)	
CO1	demonstrate the string manipulation errors, vulnerabilities and mitigation strategies													Applying (K3)
CO2	implement arbitrary memory write exploits, programming defects, vulnerabilities and mitigation strategies in dynamic memory management													Applying (K3)
CO3	interpret the integral security issues, correct and incorrect use of formatted output functions.													Applying (K3)
CO4	demonstrate various vulnerabilities associated with file I/O and specific development practices for improving the overall security in C code													Applying (K3)
CO5	adopt the proactive security development process and language independent 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	1	1		3	3	3	2	2	3		3	2
CO2	3	2	1	1		3	3	3	2	2	3		3	2
CO3	3	2	1	1		3	3	3	2	2	3		3	2
CO4	3	2	1	1		3	3	3	2	2	3		3	2
CO5	3	2	1	1		3	3	3	2	2	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		65	35				100
CAT2		65	35				100
CAT3		65	35				100
ESE		65	35				100

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

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												Applying (K3)
CO4	develop different applications for consuming VR and AR contents and indicate near future hardware for VR and AR experience.												Applying (K3)
CO5	design 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	3	3	2	2	3		3	2
CO2	3	2	1	1		3	3	3	2	2	3		3	2
CO3	3	2	1	1		3	3	3	2	2	3		3	2
CO4	3	2	1	1		3	3	3	2	2	3		3	2
CO5	3	2	1	1		3	3	3	2	2	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		40	60				100
CAT2		45	55				100
CAT3		50	50				100
ESE		45	55				100

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

COURSE OUTCOMES: On completion of the course, the students will be able to												BT Mapped (Highest Level)	
CO1	apply probabilistic reasoning under uncertain conditions												Applying (K3)
CO2	apply learning methodologies and modelling for agent design and development												Applying (K3)
CO3	develop ontologies using concepts and instances												Applying (K3)
CO4	make use of ontologies and rules for reasoning												Applying (K3)
CO5	Utilize machine learning to model rule learning and refinement												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	3	3	2	2	3		3	2
CO2	3	2	1	1		3	3	3	2	2	3		3	2
CO3	3	2	1	1		3	3	3	2	2	3		3	2
CO4	3	2	1	1		3	3	3	2	2	3		3	2
CO5	3	2	1	1		3	3	3	2	2	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		80	20				100
CAT2		80	20				100
CAT3		80	20				100
ESE		70	30				100

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

COURSE OUTCOMES: On completion of the course, the students will be able to												BT Mapped (Highest Level)	
CO1	explore the channel models and the use cases for 5G												Applying (K3)
CO2	interpret and explain 5G architecture, its components and functional criteria.												Applying (K3)
CO3	elaborate the device to device (D2D) communication , standardization and MIMO												Applying (K3)
CO4	illustrate the in-depth functioning of 5G radio access technologies												Applying (K3)
CO5	apply interference management, mobility management and spectrumtechniques in 5G.												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	3	3	2	2	3		3	2
CO2	3	2	1	1		3	3	3	2	2	3		3	2
CO3	3	2	1	1		3	3	3	2	2	3		3	2
CO4	3	2	1	1		3	3	3	2	2	3		3	2
CO5	3	2	1	1		3	3	3	2	2	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		70	30				100
CAT2		70	30				100
CAT3		70	30				100
ESE		70	30				100

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

22ITF02 - DEVOPS

Programme & Branch	B.Tech – Information Technology	Sem	Category	L	T	P	Credits
Prerequisites	Nil	6	PE	2	0	2	3
Preamble	This course covers the new paradigm of combined development and operations in SDLC. It covers concepts like virtualization, containerization, continuous integration and development and cluster / cloud integration.						
Unit – I	Introduction to DevOps, SDLC, Agile and Virtualization						6
Definition of DevOps –The need for DevOps – Key concepts and principles of DevOps – Overview of SDLC – Phases of SDLC (Planning,Analysis,Design,Development,Testing,Deployment,Maintenance) – Overview of Agile methodology – Agile principles and values– Agile practices (Scrum, Kanban, Lean) – Role of DevOps in SDLC – Continuous Integration and Continuous Deployment (CI/CD) –Virtualization vs containerization –Overview of virtualization technologies (VMware, VirtualBox).Setting up virtualization software (e.g., VirtualBox, VMware) and creating a virtual machine. Installing and configuring a Linux distribution on the virtual machine. Setting up a web application development environment with the LAMP stack (Linux, Apache, MySQL, PHP). Setting up version control with Git and creating a simple Git repository. Implementing Agile methodology with a team-based project using Scrum, Kanban or Lean methodologies							
Unit – II	Containerization and Docker						6
Overview of containerization - Introduction to Docker - Docker architecture and components - Docker images and containers - Docker CLI commands – Docker file for building custom images - Docker Compose for multi-container applications. Installing and setting up Docker on a Linux machine. Building a Docker image using a Docker file. Running a Docker container and accessing its shell. Creating and running a multi-container application with Docker Compose. Deploying a Docker container to a remote server							
Unit – III	CI/CD with Jenkins Pipeline						6
Introduction to Jenkins - Understanding Continuous Integration and Continuous Delivery/Deployment - Jenkins architecture and components - Setting up Jenkins and Creating jobs - Jenkins Pipeline as code - Jenkins Master-Slave setup - Jenkins security and User Management - Integrating Jenkins with other DevOps tools. Installing and setting up Jenkins on a Linux machine. Setting up a Jenkins pipeline job. Configuring the pipeline job to build and test a sample application from a Git Hub repository. Integrating the pipeline job with a Docker registry to store and deploy the Docker image. Adding notifications and alerts to the pipeline job using Slack or email							
Unit – IV	Kubernetes						6
Introduction to Kubernetes - Kubernetes architecture and components - Kubernetes cluster setup and configuration - Kubernetes objects (Pods, Services, Deployments, etc.) - Kubernetes CLI commands - Kubernetes Networking and Service Discovery - Scaling and self-healing with Kubernetes. Creating and managing applications with Kubernetes. Installing and setting up Kubernetes on a local machine or a cloud provider. Deploying a sample application to Kubernetes using Kubernetes CLI commands. Creating and managing Kubernetes objects (Pods, Services, Deployments, etc.). Scaling the application by creating replicas and load balancing with Kubernetes. Upgrading and rolling back the application with Kubernetes							
Unit – V	Terraform, Prometheus, and Grafana						6
Introduction to Infrastructure as Code (IaC) - Overview of Terraform - Terraform Configuration file - Terraform Providers and State Management - Terraform Modules and Variables - Provisioning Resources with Terraform - Overview of monitoring and alerting - Introduction to Prometheus and Grafana - Setting up Prometheus and Grafana - Creating and visualizing metrics with Prometheus and Grafana. Installing and setting up Terraform on a Linux machine. Creating and managing infrastructure using Terraform. Creating and configuring a Prometheus server to monitor a sample application. Setting up alert rules and notifications with Prometheus and Alert manager. Creating and visualizing metrics with Grafana							
LIST OF EXPERIMENTS / PROJECTS (using different case studies):							
1.	Dockerized Web Application Deployment Tools: Docker						
2.	Jenkins-Driven CI/CD Pipeline Tools: Jenkins, Docker						
3.	Docker Deployment with Integrated Monitoring Tools: Docker, Prometheus & Grafana						
4.	Kubernetes-Based E-Commerce Application Tools: Kubernetes Docker						
5.	Maven-Powered Java Application Deployment Tools: Maven, Jenkins, Kubernetes						

Lecture:30, Practical:30, Total:60

TEXT BOOK:														
1.	Gene Kim, Patrick Debois, John Willis, and Jez Humble , "The DevOps Handbook: How to Create World-Class Agility, Reliability, and Security in Technology Organizations", 2016													
REFERENCES:														
1.	Docker - https://www.docker.com/use-cases/devops													
2.	Kubernetes - https://kubernetes.io/docs/concepts/overview/what-is-kubernetes													
3.	Jenkins - https://www.jenkins.io/doc/book/													
4.	Prometheus - https://prometheus.io/docs/introduction/overview/													
COURSE OUTCOMES:														
On completion of the course, the students will be able to													BT Mapped (Highest Level)	
CO1	select and setup a virtualization software and create a virtual machine for web application development using WAMP/LAMP												Applying (K3) Precision(S3)	
CO2	experiment with containerization by installing and setting up Docker and Docker Compose												Applying (K3) Precision(S3)	
CO3	demonstrate Continuous Development (CD) / Continuous Integration (CI) using Jenkins integrated with other DevOps tools												Applying (K3) Precision(S3)	
CO4	make use of Kubernetes to build scalable applications on clusters to achieve load balancing												Applying (K3) Precision(S3)	
CO5	build and deploy cloud-based scalable solutions using Terraforms, Prometheus, and Grafana for effective monitoring and provisioning of resources												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	3	3	3	2	2	3	3	3	2
CO2	3	2	1	1	3	3	3	3	2	2	3	3	3	2
CO3	3	2	1	1	3	3	3	3	2	2	3	3	3	2
CO4	3	2	1	1	3	3	3	3	2	2	3	3	3	2
CO5	3	2	1	1	3	3	3	3	2	2	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	-	50	50				100							
CAT2	-	30	70				100							
CAT3	-	30	70				100							
ESE	-	0	100				100							

COURSE OUTCOMES: On completion of the course, the students will be able to												BT Mapped (Highest Level)	
CO1	identify features 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 processing												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	3	3	2	2	3		3	2
CO2	3	2	1	1		3	3	3	2	2	3		3	2
CO3	3	2	1	1		3	3	3	2	2	3		3	2
CO4	3	2	1	1		3	3	3	2	2	3		3	2
CO5	3	2	1	1		3	3	3	2	2	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		70	30				100
CAT2		70	30				100
CAT3		70	30				100
ESE		70	30				100

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

22ITE13 - VIDEO ANALYTICS

Programme & Branch	B. Tech & Information Technology	Sem.	Category	L	T	P	Credit
Prerequisites	Nil	7	PE	3	0	0	3
Preamble	This course aims to provide a broad view on processing and analyzing images and video.						
Unit - I	Introduction						9
Deep Neural Networks – Introduction to Tensor flow – Keras Deep Learning library – OpenCV Library - Hand Written Number Recognition with Keras and OpenCV							
Unit - II	Convolutional Neural Network for Computer Vision						9
Convolution Neural Network – CNN architectures and drawbacks of DNN- convolution and pooling operations in tensor flow – training and evaluating CNN – model performance optimization – ImageNet – LeNet – AlexNet – VGGNet – GoogleLENet - ResNet.							
Unit - III	Feature extraction, object detection and segmentation						9
Feature extraction approach – transfer learning example – multi-task learning – Auto encoders of CNN – difference between object detection and image classification - Traditional, nonCNN approaches to object detection - R-CNN – Regions with CNN features - Fast R-CNN – fast region-based CNN - Faster R-CNN – faster region proposal network-based CNN -Mask R-CNN – Instance segmentation with CNN							
Unit - IV	Generative Models						9
Pix2pix - Image-to-Image translation - GAN – code example – feature matching –applications of generative models – neural artistic style transfer – generative adversarial networks – visual dialogue model.							
Unit - V	Video Classification						9
Understanding and classifying videos – exploring video classification dataset – splitting videos in to frames – approaches for classifying videos – extending image based approaches to videos: Regressing the human pose- segmenting videos – generating videos.							
Total:45							
TEXT BOOK:							
1.	Mohit Sewak, Md. Rezaul Karim and Pradeep Pujari, "Practical Convolutional NeuralNetworks", Packt Publishing, 2018. (For Units I,II,III)						
2.	Rajalingappa Shanmugamani, "Deep Learning for Computer Vision", Packt Publishing, 2018. (For Units IV,V)						
REFERENCE BOOKS:							
1.	D. L. Baggio et al., "Mastering OpenCV with Practical Computer Vision Projects", Packt Publishing, 2012.						
2.	Jan Erik Solem, "Programming Computer Vision with Python: Tools and algorithms for analyzing images", O'Reilly Media, 2012.						

COURSE OUTCOMES: On completion of the course, the students will be able to												BT Mapped (Highest Level)	
CO1	make use of the basic concepts of image processing and its libraries												Applying (K3)
CO2	interpret the various CNN models used for image analytics												Applying (K3)
CO3	apply the various levels of segmentation and interpret the results for object detection and feature extraction.												Applying (K3)
CO4	make use of the GAN model to solve the real world problems.												Applying (K3)
CO5	identify various approaches for classifying and segmenting videos.												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	3	3	2	2	3		3	2
CO2	3	2	1	1		3	3	3	2	2	3		3	2
CO3	3	2	1	1		3	3	3	2	2	3		3	2
CO4	3	2	1	1		3	3	3	2	2	3		3	2
CO5	3	2	1	1		3	3	3	2	2	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		60	40				100
CAT2		60	40				100
CAT3		60	40				100
ESE		50	50				100

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

COURSE OUTCOMES: On completion of the course, the students will be able to												BT Mapped (Highest Level)	
CO1	interpret the basic principles of cryptographic protocols												Applying (K3)
CO2	determine the ways of generating one way functions												Applying (K3)
CO3	identify the use of provably secure encryption and digital signatures												Applying (K3)
CO4	articulate the cryptographic algorithms to compose, build and analyze transport layer security												Applying (K3)
CO5	express the use of quantum and post quantum 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	1		3	3	3	2	2	3		3	2
CO2	3	2	1	1		3	3	3	2	2	3		3	2
CO3	3	2	1	1		3	3	3	2	2	3		3	2
CO4	3	2	1	1		3	3	3	2	2	3		3	2
CO5	3	2	1	1		3	3	3	2	2	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		60	40				100
CAT2		60	40				100
CAT3		60	40				100
ESE		60	40				100

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

COURSE OUTCOMES: On completion of the course, the students will be able to												BT Mapped (Highest Level)	
CO1	use basic mathematical tools for image processing operations												Applying (K3)
CO2	apply intensity transformation and perform spatial filtering												Applying (K3)
CO3	illustrate filtering in the frequency domain using Fourier Transforms												Applying (K3)
CO4	manipulate color images and make use of Wavelet transforms												Applying (K3)
CO5	make use of image compression and digital image watermarking												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	3	3	2	2	3		3	2
CO2	3	2	1	1		3	3	3	2	2	3		3	2
CO3	3	2	1	1		3	3	3	2	2	3		3	2
CO4	3	2	1	1		3	3	3	2	2	3		3	2
CO5	3	2	1	1		3	3	3	2	2	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		60	40				100
CAT2		60	40				100
CAT3		60	40				100
ESE		70	30				100

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

COURSE OUTCOMES: On completion of the course, the students will be able to												BT Mapped (Highest Level)	
CO1	make use of the features, approaches and methodologies of software testing.												Applying (K3)
CO2	apply the step by step activities and set up environment for software testing.												Applying (K3)
CO3	develop procedures and workbenches for various testing processes.												Applying (K3)
CO4	identify the agile methods for improving the testing process and apply testing for client server, web based and software security systems.												Applying (K3)
CO5	use selenium tool to perform automated testing.												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	3	3	2	2	3		3	2
CO2	3	2	1	1		3	3	3	2	2	3		3	2
CO3	3	2	1	1		3	3	3	2	2	3		3	2
CO4	3	2	1	1		3	3	3	2	2	3		3	2
CO5	3	2	1	1		3	3	3	2	2	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		70	30				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)

COURSE OUTCOMES: On completion of the course, the students will be able to												BT Mapped (Highest Level)	
CO1	Illustrate the steps to create android application and discuss its activity life cycle												Applying (K3)
CO2	develop an Android application using Layouts, Fragments, UI components with event handling												Applying (K3)
CO3	design styles, themes, alerts and menu												Applying (K3)
CO4	perform CRUD operations on SQLite and firebase.												Applying (K3)
CO5	create applications using services and access data from sensors												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	3	3	2	2	3			3	2
CO2	3	2	1	1	3	3	3	2	2	3			3	2
CO3	3	2	1	1	3	3	3	3	2	2	3		3	2
CO4	3	2	1	1	3	3	3	3	2	2	3		3	2
CO5	3	2	1	1	3	3	3	3	2	2	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		40	60				100
CAT2		40	60				100
CAT3		40	60				100
ESE		40	60				100

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

22ITE18 - 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	This course deals with the concepts of Software Defined Networking and its use cases in various environments.							
Unit - I	Introduction to SDN							9
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								
Unit - II	SDN and OpenFlow							9
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, 1.2 &1.3 Additions – OpenFlow Limitations.								
Unit - III	SDN Definitions &open source							9
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
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 in other environment: Wide area networks – Service provider and carrier networks – Campus networks – Hospitality networks – Mobile networks – 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.								
Total:45								
TEXT BOOK:								
1.	Paul Goransson and Chuck Black, "Software Defined Networks: A Comprehensive Approach", 2 nd Edition, Morgan Kaufmann, USA, 2017.							
REFERENCES:								
1.	Bruce Davie, "Software-Defined Networks ", 1 st Edition, Systems Approach LLC, 2021							
2.	Thomas D. Nadeau, Ken Gray, "SDN: Software Defined Networks", 1 st 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 concepts of 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	utilize 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	3	3	2	2	3		3	2
CO2	3	2	1	1		3	3	3	2	2	3		3	2
CO3	3	2	1	1		3	3	3	2	2	3		3	2
CO4	3	2	1	1		3	3	3	2	2	3		3	2
CO5	3	2	1	1		3	3	3	2	2	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		60	40				100
CAT2		60	40				100
CAT3		60	40				100
ESE		60	40				100

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

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												Applying (K3)
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	2	1	1	3	3	1	1	3	3	3
CO2	3	3	3	3	2	1	1	3	3	3	3	3	3	3
CO3	3	3	3	3	3	1	1	3	3	3	1	3	3	3
CO4	3	2	1	1	2	1	1	3	2	1	1	3	3	3
CO5	3	3	2	2	3	1	1	3	3	3	1	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	50	10			100
CAT2		30	50	10	10		100
CAT3		20	30	30	10	10	100
ESE		40	40	10	10		100

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

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	identify 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 techniques 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	1		3	3	3	2	2	3		3	2
CO2	3	2	1	1		3	3	3	2	2	3		3	2
CO3	3	2	1	1		3	3	3	2	2	3		3	2
CO4	3	2	1	1		3	3	3	2	2	3		3	2
CO5	3	2	1	1		3	3	3	2	2	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		65	35				100
CAT2		65	35				100
CAT2		60	40				100
ESE		60	40				100

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

22ITE20 - SECURITY IN MOBILE AND WIRELESS NETWORKS

Programme & Branch	B.Tech & Information Technology	Sem.	Category	L	T	P	Credit
Prerequisites	Nil	7	PE	3	0	0	3
Preamble	This course aims to focus on the security issues in wireless networks						
UNIT – I	Introduction to Mobile and Wireless Networks						9
Cellular Networks, 1G through 3G, IEEE Network - WLAN IEEE 802.11, WPAN IEEE 802.15, WMAN IEEE 802.16, IEEE 802.20, MIH IEEE 802.21, WRAN IEEE 802.22, Mobile Internet Networks – Macro and Micro mobility – Personal mobility – SIP – Identity based mobility, NEMO and MANETs – Vulnerabilities of Wireless Networks – Review of security basics – symmetric and asymmetric cryptography, Hash functions – Electronic signatures – MAC – PKI and electronic certificate – IPSec – AAA protocol – Firewalls – Intrusion detection.							
UNIT – II	Wi-Fi Security Architectures						9
Hotspot architecture – WIDS – Rogue AP detection – IEEE 802.11 geolocation techniques – Honeypots – Passive and Active attacks – DOS attacks – Trojan attack – Dictionary Attack. Bluetooth Security – Protocol architecture – Radio physical layer – Device addressing – SCO and ACL logical transports – Security mode – Authentication and pairing – Attacks – BlueSmack.							
UNIT – III	Security in IEEE 802.11						9
WEP – WEP2 – IV collisions – RC4 weakness – 802.1x authentication -802.11i security architecture – policy negotiation – radio security policies – RADIUS – EAP – PKI – WiMAX security – TEK , KEK, IEEE 802.16e – PKMv2-RSA – Security Association – 3 way handshake – role of smart cards in WiMAX.							
UNIT – IV	Security in Ad Hoc Networks						9
Attacks to routing protocols – Security mechanisms – Auto-configuration – Key management – Self-managed PKI – Resurrecting Duckling – Group key management – Wireless Sensor Networks – Attacks – Preventive mechanisms – Intrusion tolerance – SNEP - µTELSA – TinySec – key management in WSNs.							
UNIT – V	Security in Mobile Telecommunication Networks						9
SS7 – GSM security – GRPS security – UMTS infrastructure and security – H.323 – SIP – Megaco – VoIP security flaws and countermeasures– IMS architecture – security flaws – 4G security – Protection of interception – Security issues in Mobile IP – HIP – NetLMM.							
Total:45							
TEXT BOOK:							
1.	Hakima Chaouchi and Maryline Laurent-Maknavicius, "Wireless and Mobile Network Security: Security basics, Security in On-the-shelf and Emerging Technologies", 2 nd Edition, John Wiley & Sons, 2009. (For Units I,II,III)						
2.	Pallapa Venkataram and Sathish Babu, Wireless and Mobile Network Security, 1st Edition, Tata McGrawHill, 2010. (For Units IV,V)						
REFERENCES:							
1.	Lei Chen, Jiahuang Ji, and Zihong Zhang, "Wireless Network Security: Theories and Applications", Springer Higher Education Press, 2013.						
2.	Amitabh Mishra, "Security and Quality of Service in Ad Hoc and Wireless Networks", 1 st Edition, Cambridge University Press, 2008.						
3.	S. Kami Makki, Peter Reiher, Kia Makki, Niki Pissinou, Shamila Makki, "Mobile and Wireless Security and Privacy", Springer Science, 2007.						

COURSE OUTCOMES: On completion of the course, the students will be able to												BT Mapped (Highest Level)	
CO1	make use of the mathematical models of security algorithms to wireless and mobile environment											Applying (K3)	
CO2	identify the specific vulnerabilities in wide range of WiFi systems											Applying (K3)	
CO3	develop robust systems against state-of-the-art security attacks											Applying (K3)	
CO4	plan for providing security in ad hoc networks											Applying (K3)	
CO5	identify the security issues in mobile telecommunication 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	3	3	2	2	3		3	2
CO2	3	2	1	1		3	3	3	2	2	3		3	2
CO3	3	2	1	1		3	3	3	2	2	3		3	2
CO4	3	2	1	1		3	3	3	2	2	3		3	2
CO5	3	2	1	1		3	3	3	2	2	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		60	40				100
CAT2		60	40				100
CAT3		60	40				100
ESE		60	40				100

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

22ITE21 - ETHICAL HACKING

Programme & Branch	B. Tech & Information Technology	Sem.	Category	L	T	P	Credit	
Prerequisites	Computer Networks	7	PE	3	0	0	3	
Preamble	This course provides the fundamental knowledge about risks in computer and network security. It also provides 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 & 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 Modes - MITM Attacks - ARP Protocol Basics – working – Attacks -DoS Attacks –Dsniff tool - 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	Basics of Exploitation							9
Introduction to Remote Exploitation -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 - Postexploitation:Acquiring Situation Awareness - Privilege Escalation - Maintaining Access - Data Mining - Identifying and Exploiting Further Targets.								
Unit - V	Wireless & Web Hacking							9
Wireless Hacking - Requirements -Aircracking- Hidden SSIDs - Monitor Mode - Monitoring Tool- Beacon Frames on Wireshark, Airodumping- Wireless Adapter in Monitor Mode - Determining the Target - Cracking a WPA/WPA2 Wireless Network using Aircracking- 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.	Rafay Baloch, "Ethical Hacking and Penetration Testing Guide", 1 st Edition, CRC Press, 2015.							
REFERENCES:								
1.	Sean-Philip Oriyano, "CEH v9: Certified Ethical Hacker Version 9", 3 rd Edition, Wiley publication, 2016.							
2.	Stuart McClure, Joel Scambray and Goerge Kurtz, "Hacking Exposed 7: Network Security Secrets & Solutions", Tata Mc Graw Hill Publishers, 7 th Edition, 2012.							
3.	EC- Council, "Ethical Hacking and Countermeasures: Attack Phases", Cengage Learning, 2009.							

COURSE OUTCOMES: On completion of the course, the students will be able to												BT Mapped (Highest Level)	
CO1	Illustrate about penetration testing, vulnerabilities and risks available in a system and explain about linux operating system												Applying (K3)
CO2	outline about gathering information and execution of enumeration and scanning to identify various types of vulnerabilities and attacks.												Applying (K3)
CO3	interpret various vulnerabilities and apply suitable tools to carry out sniffing in the networks												Applying (K3)
CO4	make use of the exploitation available in network protocols, servers, clients, services and USBs.												Applying (K3)
CO5	demonstrate how to execute wireless and web hacking using appropriate tools												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	3	3	3	2	2	3		3	2
CO2	3	2	1	1	3	3	3	3	2	2	3		3	2
CO3	3	2	1	1	3	3	3	3	2	2	3		3	2
CO4	3	2	1	1	3	3	3	3	2	2	3		3	2
CO5	3	2	1	1	3	3	3	3	2	2	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		60	40				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)

COURSE OUTCOMES: On completion of the course, the students will be able to												BT Mapped (Highest Level)	
CO1	summarize the concepts in speech and language processing and utilize regular expressions and other statistical methods to create Language Models.												Applying (K3)
CO2	make use of the Naïve Bayes classifier and Logistic regression on standard corpora and improve accuracy through regularization.												Applying (K3)
CO3	apply Vector Embedding to words and build Neural Language models.												Applying (K3)
CO4	solve sequence labeling problems (Named Entity Tagging and POS tagging) using RNN and LSTM.												Applying (K3)
CO5	apply the novel Transformers model to train large Language 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	2	1	1		3	3	3	2	2	3		3	2
CO2	3	2	1	1		3	3	3	2	2	3		3	2
CO3	3	2	1	1		3	3	3	2	2	3		3	2
CO4	3	2	1	1		3	3	3	2	2	3		3	2
CO5	3	2	1	1		3	3	3	2	2	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		70	30				100
CAT2		60	40				100
CAT3		60	40				100
ESE		60	40				100

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

COURSE OUTCOMES: On completion of the course, the students will be able to												BT Mapped (Highest Level)	
CO1	solve problems using constraint networks, constraint propagation and Arc consistency												Applying (K3)
CO2	make use of directional consistency in Constraint Satisfaction Problems												Applying (K3)
CO3	apply look-ahead strategies to solve problems in state space search.												Applying (K3)
CO4	model constraint satisfiability using lookback and backjumping strategies.												Applying (K3)
CO5	identify and solve typical problems in the domain of constraint satisfaction.												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	3	3	2	2	3		3	2
CO2	3	2	1	1		3	3	3	2	2	3		3	2
CO3	3	2	1	1		3	3	3	2	2	3		3	2
CO4	3	2	1	1		3	3	3	2	2	3		3	2
CO5	3	2	1	1		3	3	3	2	2	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		65	35				100
CAT2		65	35				100
CAT3		65	35				100
ESE		55	45				100

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

22ITE24 - AUDIT AND ASSURANCE IN COMPUTER SECURITY

Programme& Branch	B. Tech & Information Technology	Sem.	Category	L	T	P	Credit	
Prerequisites	NIL	7	PE	3	0	0	3	
Preamble	This course provides a comprehensive introduction to Information Security and discusses about legal issues, the audit process, ISO standards and certification, implementation of ISO 27001.							
UNIT – I	Introduction							9
History of Information Security – What is security? – CNSS Security Model – Components of Information Systems – balancing Information Security and Access – Information Security implementation. Systems development life cycle – The security systems development life cycle – Communities of Interest.								
UNIT – II	The Need for Information Security and its Legal, ethical, and professional issues							9
Business needs first – Threats – Attacks – Secure Software Development. Law and Ethics – US laws – international laws and legal bodies – Ethics and Information Technology – Code of Ethics and Professional Organizations.								
UNIT – III	Audit Planning, Preparation, and Techniques							9
Reasons – Audit Principles – Process of Audit Programme Management – Audit Competence and evaluation methods – Audit Responsibilities – Audit time and Process flow – Information Security and Management System (ISMS) Audit checklist. Auditor Quality and Selection – Audit script – Audit stages – Audit techniques – Collecting evidence through questions – Observation – Reporting to audit findings – Audit Team meetings – non-conformities and observations – Corrective and Preventive actions.								
UNIT – IV	ISO 27001							9
Overview of an ISMS – ISO standards that focus on an organization's ISMS – ISO/IEC standards – Scope of ISMS – Identifying applicable legislation – Risk Assessment – Information Assets and Protection – Identifying Risks – Assessing Risks – Objectives and Controls - Policies, Procedures and documented information on control risks – Resources and staff training – Monitoring and implementing ISMS – Preparing the certification for Audit.								
UNIT – V	Asset Management							9
Assets according to ISO 27001 – the importance of Assets – Asset inventory – Asset Owner – ISO 27001/ISO 27005 Risk Assessment – The six basic steps – ISO 27001 Controls – ISO2 27001 Statement of Applicability – ISO 27001 Asset Management – Responsibility for Assets – Information Classification – Media handling – BYOD.								
Total:45								
TEXT BOOK:								
1.	Michael E. Whitman and Herbert. J. Mattord, "Principles of Information Security", 4 th Edition, Cengage Learning, USA, 2012. (For Units I,II)							
2.	Rajkumar Banoth, Narasimha Gugulothu, Aruna Kranthi Godishala, "A Comprehensive Guide to Information Security Management and Audit", CRC Press Taylor and Francis Group, USA, 2023. (For Units III,IV,V)							
REFERENCES:								
1.	Joseph M.Kizza, "Computer Network Security", Springer, 2005							
2.	Matt Bishop, "Introduction to Computer Security", Addison-Wesley Professional, 2005.							

COURSE OUTCOMES: On completion of the course, the students will be able to												BT Mapped (Highest Level)	
CO1	Plan the organization's security needs with the CNSS security model.												Applying (K3)
CO2	apply legal aspects and code of ethics in Information Security.												Applying (K3)
CO3	Organize an audit and use the best practices of ISMS.												Applying (K3)
CO4	apply ISO 27001 and conduct a risk assessment.												Applying (K3)
CO5	illustrate Asset management in compliance with ISO 27001.												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	3	3	2	2	3		3	2
CO2	3	2	1	1		3	3	3	2	2	3		3	2
CO3	3	2	1	1		3	3	3	2	2	3		3	2
CO4	3	2	1	1		3	3	3	2	2	3		3	2
CO5	3	2	1	1		3	3	3	2	2	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		70	30				100
CAT2		70	30				100
CAT3		70	30				100
ESE		70	30				100

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

22ITE25 - 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 essential for digital forensics investigation and security management.						
Unit – I	Digital Forensics Investigations						
Digital Investigations: Overview - Preparing a Digital forensic investigation – Procedures for private sector high-tech investigations – Conducting an Investigation – Completing the case							
Unit – II	Data Acquisition						
Understanding storage formats for digital evidence – Determining the best acquisition method - Contingency planning for image acquisitions – Using Acquisition tools– 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						
Identifying Digital Evidence – Collecting Evidence in Private Sector Incident Scenes – Processing Law Enforcement Crime Scenes – Preparing for a Search –Securing a Digital 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						
Evaluating Digital Forensics Tool Needs -Digital Forensics Software Tools – Digital Forensics Hardware Tools – Validating and Testing Forensic Software - Digital Forensics Analysis and Validation: Determining Data Collection and Analysis – Validating Forensic Data – Addressing Data-Hiding Techniques.							
Unit – V	Recovering Graphics Files, Email Investigations						
Recognizing Graphics File - Understanding Data Compression - Locating And Recovering Graphics Files - Identifying Unknown 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", 6 th Edition, Cengage Learning, USA, 2021.						
REFERENCES:							
1.	Marie-Helen Mara, "Computer Forensics", 2 nd Edition, Jones and Bartlett Learning, 2015.						
2.	Dejey, Murugan, "Cyber Forensics", 1 st Edition, Oxford University Press, 2018.						

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	explore the significance of digital evidence in a crime scene												Applying (K3)
CO4	apply forensic tools in forensic examination												Applying (K3)
CO5	build the recovery of graphic files and investigate 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	3	3	2	2	3		3	2
CO2	3	2	1	1		3	3	3	2	2	3		3	2
CO3	3	2	1	1		3	3	3	2	2	3		3	2
CO4	3	2	1	1		3	3	3	2	2	3		3	2
CO5	3	2	1	1		3	3	3	2	2	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		65	35				100
CAT2		65	35				100
CAT3		65	35				100
ESE		60	40				100

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

COURSE OUTCOMES: On completion of the course, the students will be able to												BT Mapped (Highest Level)	
CO1	investigate the limitations of ILP and the need for multicore architectures												Applying (K3)
CO2	analyze the importance of memory hierarchy and benefits of cache memory												Applying (K3)
CO3	explain the architecture of Vector/GPU processor and make use of loop level parallelism to achieve data level parallelism												Applying (K3)
CO4	analyze the cache coherence issues using different memory architectures and different types of inter connection networks												Applying (K3)
CO5	inspect the architectures of GPUs, warehouse scale computers and choose an appropriate model for a given problem												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	3	3	2	2	3		3	2
CO2	3	2	1	1		3	3	3	2	2	3		3	2
CO3	3	2	1	1		3	3	3	2	2	3		3	2
CO4	3	2	1	1		3	3	3	2	2	3		3	2
CO5	3	2	1	1		3	3	3	2	2	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		60	40				100
CAT2		60	40				100
CAT3		70	30				100
ESE		60	40				100

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

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 business intelligence concepts and techniques to experiment ETL process												Applying (K3)
CO3	illustrate OLTP, OLAP systems and design their multi-dimensional models												Applying (K3)
CO4	design model dashboard, balanced score card for performance management												Applying (K3)
CO5	apply business intelligence 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	1		3	3	3	2	2	3		3	2
CO2	3	2	1	1		3	3	3	2	2	3		3	2
CO3	3	2	1	1		3	3	3	2	2	3		3	2
CO4	3	2	1	1		3	3	3	2	2	3		3	2
CO5	3	2	1	1		3	3	3	2	2	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		60	40				100
CAT2		60	40				100
CAT3		60	40				100
ESE		60	40				100

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

COURSE OUTCOMES: On completion of the course, the students will be able to												BT Mapped (Highest Level)	
CO1	demonstrate the evolution of TQM principles												Understanding (K2)
CO2	illustrate the principles and strategies of TQM												Understanding (K2)
CO3	use control charts and identify process capability of a process												Applying (K3)
CO4	apply various quality tools and techniques in both manufacturing and service industry												Applying (K3)
CO5	choose appropriate quality standards and implement them in the respective industry												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	2	3	2	2	1	1		3
CO2	1	1				3	2	3	3	3	1	1	2	3
CO3	3	2	2	2	2	2		1	2	2	1	1	1	3
CO4	2	2	2	2	2	2		1	2	2	1	1	2	3
CO5						3	3	2	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	25	45	30				100
CAT2	20	40	40				100
CAT3	25	45	30				100
ESE	20	40	40				100

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

COURSE OUTCOMES: On completion of the course, the students will be able to												BT Mapped (Highest Level)	
CO1	outline different implementations of storage systems like virtualization and RAID												Applying (K3)
CO2	illustrate various storage networking technologies and demonstrate the effectiveness of NAS												Applying (K3)
CO3	interpret the concept of storage management and data backup in virtualized environment												Applying (K3)
CO4	outline the cloud architecture and practice on public clouds												Applying (K3)
CO5	interpret the need for security in storage networking												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	3	3	2	2	3		3	2
CO2	3	2	1	1		3	3	3	2	2	3		3	2
CO3	3	2	1	1		3	3	3	2	2	3		3	2
CO4	3	2	1	1		3	3	3	2	2	3		3	2
CO5	3	2	1	1		3	3	3	2	2	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		70	30				100
CAT2		65	35				100
CAT3		65	35				100
ESE		60	40				100

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

22ITE29 - 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 which include project evaluation, planning, estimation, monitoring and control essential for software projects.						
Unit - I	Introduction to Software Project Management						9
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, Identify project infrastructure – Analyse project characteristics – Identify project products and activities – Estimate effort for each activity – Identify activity risks - Allocate Resources – Review plan – Execute plan. Software Effort Estimation : Introduction – Estimates – Problems with over and under estimates – Basis for software estimation – Software effort estimation techniques – Bottom-up Estimating – Top down approach and parametric models – Expert Judgement – Estimating by analogy – Albrecht Function Point Analysis – Function Points Mark II - COSMIC Full Function Points – COCOMO II.							
Unit - III	Activity Planning						9
Activity Planning: Objectives – Project Schedule – Projects and Activities - Sequencing and Scheduling Activities – Network Planning Models – Formulating a network modes - 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 Genres – Communication Plans – Leadership.							
Total:45							
TEXT BOOK:							
1.	Bob Hughes, Mike Cotterell and Rajib Mall, "Software Project Management", 6 th Edition, Tata McGraw Hill, New Delhi, 2018.						
REFERENCES:							
1.	Pankaj Jalote, "Software Project Management in Practice", 8 th Edition, Pearson Education, 2002.						
2.	Watts S. Humphrey, "PSP: A self-improvement process for software engineers", 1 st Edition, Addison-Wesley, 2005.						

COURSE OUTCOMES: On completion of the course, the students will be able to												BT Mapped (Highest Level)	
CO1 carry out the process of software project management												Applying (K3)	
CO2 build a project plan and calculate the efforts required.												Applying (K3)	
CO3 organize planning, schedule and sequence activities and determine the risks.												Applying (K3)	
CO4 develop visualization charts to monitor the progress of projects and manage the contracts												Applying (K3)	
CO5 outline the methods of managing people and organising teams.												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	3	3	2	2	3		3	2
CO2	3	2	1	1		3	3	3	2	2	3		3	2
CO3	3	2	1	1		3	3	3	2	2	3		3	2
CO4	3	2	1	1		3	3	3	2	2	3		3	2
CO5	3	2	1	1		3	3	3	2	2	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		60	40				100
CAT2		60	40				100
CAT3		60	40				100
ESE		60	40				100

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

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 architecture												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	3	3	2	2	3		3	2
CO2	3	2	1	1		3	3	3	2	2	3		3	2
CO3	3	2	1	1		3	3	3	2	2	3		3	2
CO4	3	2	1	1		3	3	3	2	2	3		3	2
CO5	3	2	1	1		3	3	3	2	2	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		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)

COURSE OUTCOMES: On completion of the course, the students will be able to												BT Mapped (Highest Level)	
CO1	illustrate web security fundamentals, authentication and authorization												Applying (K3)
CO2	apply the principles of browser security and database security												Applying (K3)
CO3	make use of file security and secure development methodologies												Applying (K3)
CO4	build various testing techniques for web application												Applying (K3)
CO5	identify client side validation and secure session manipulation for 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	3	3	2	2	3		3	2
CO2	3	2	1	1		3	3	3	2	2	3		3	2
CO3	3	2	1	1		3	3	3	2	2	3		3	2
CO4	3	2	1	1		3	3	3	2	2	3		3	2
CO5	3	2	1	1		3	3	3	2	2	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		65	35				100
CAT2		60	40				100
CAT3		60	40				100
ESE		60	40				100

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

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 in real life applications												Applying (K3)
CO2	illustrate the basic architectural framework using physical and MAC layer protocols												Applying (K3)
CO3	utilize various ranking layer protocols for inter and intra communication patterns												Applying (K3)
CO4	apply different synchronization and localization algorithms for managing node and network level functions												Applying (K3)
CO5	plan how to tackle various challenges of security in wireless sensor 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	3	3	2	2	3		3	2
CO2	3	2	1	1		3	3	3	2	2	3		3	2
CO3	3	2	1	1		3	3	3	2	2	3		3	2
CO4	3	2	1	1		3	3	3	2	2	3		3	2
CO5	3	2	1	1		3	3	3	2	2	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		60	40				100
CAT2		60	40				100
CAT3		60	40				100
ESE		60	40				100

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

COURSE OUTCOMES: On completion of the course, the students will be able to												BT Mapped (Highest Level)	
CO1	interpret various hardware and software features in embedded programming using Raspberry Pi.												Applying (K3)
CO2	experiment with programming and interfacing of Raspberry Pi hardware.												Applying (K3)
CO3	manipulate cross compilation tools and bus communication of Raspberry Pi.												Applying (K3)
CO4	illustrate interfacing concepts with real physical environment and Arduino												Applying (K3)
CO5	apply embedded programming knowledge for IoT applications development												Applying (K3)

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	1		3	3	3	2	2	3		3	2
CO2	3	2	1	1		3	3	3	2	2	3		3	2
CO3	3	2	1	1		3	3	3	2	2	3		3	2
CO4	3	2	1	1		3	3	3	2	2	3		3	2
CO5	3	2	1	1		3	3	3	2	2	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		65	35				100
CAT2		65	35				100
CAT3		65	35				100
ESE		65	35				100

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

COURSE OUTCOMES: On completion of the course, the students will be able to												BT Mapped (Highest Level)	
CO1	illustrate AI-based problems, and identify its key competitive advantages and issues.												Applying (K3)
CO2	plan to relate machine learning basics and the importance of mathematics towards machine learning technologies.												Applying (K3)
CO3	use toolbox for basic methods for different AI-based applications												Applying (K3)
CO4	organize pre-processing on data to be used in machine learning models												Applying (K3)
CO5	formulate own learning model for a specified AI 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	3	3	2	2	3			
CO2	3	2	1	1		3	3	3	2	2	3			
CO3	3	2	1	1		3	3	3	2	2	3			
CO4	3	2	1	1		3	3	3	2	2	3			
CO5	3	2	1	1		3	3	3	2	2	3			

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

ASSESSMENT PATTERN - THEORY

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

TEXT BOOK:														
1.	Adrian Holovaty, Jacob Kaplan Moss, "The Django Book Release 2.0", A press, 2013. (For Units I,II,III)													
2.	Seema Acharya and Subhashini Chellappan, "Big Data and Analytics", 1 st Edition, Wiley India Pvt. Ltd, 2015. (For Units IV, V)													
REFERENCES/ MANUAL / SOFTWARE:														
1.	Andrew Pinkham, "Django unleashed", Sams Publishing, 1 st Edition, 2015													
2.	Beau Curtin, "Django Cookbook: Web Development with Django Step by Step Guide", 2 nd Edition, 2016													
COURSE OUTCOMES:														
On completion of the course, the students will be able to													BT Mapped (Highest Level)	
CO1	develop static and dynamic web content using Django templates with models													
CO2	create Django user models, templates and forms and develop simple web applications													
CO3	build Django applications using sessions and databases													
CO4	identify the significant features of NOSQL Databases													
CO5	apply the bigdata storage concepts using Hive													
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	3	3	3	2	2	3			
CO2	3	2	1	1	3	3	3	3	2	2	3			
CO3	3	2	1	1	3	3	3	3	2	2	3			
CO4	3	2	1	1	3	3	3	3	2	2	3			
CO5	3	2	1	1	3	3	3	3	2	2	3			
1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy														
ASSESSMENT PATTERN - THEORY														
Test / Bloom's Category*	Remembering (K1) %		Understanding (K2) %		Applying (K3) %		Analyzing (K4) %		Evaluating (K5) %		Creating (K6) %		Total %	
CAT1			30		70								100	
CAT2			30		70								100	
CAT3			25		75								100	
ESE			30		70								100	

COURSE OUTCOMES: On completion of the course, the students will be able to		BT Mapped (Highest Level)
CO1	build 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 air planes and display static models.	Applying (K3)

Mapping of COs with POs and PSOs

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

ASSESSMENT PATTERN - THEORY

COURSE OUTCOMES: On completion of the course, the students will be able to													BT Mapped (Highest Level)
CO1	Apply the Spring Boot and all its capabilities.												
CO2	Demonstrate the common annotations of the Spring Data and Spring Data JPA												
CO3	Build RESTful Microservices and Secured Web Application												
CO4	Implement Resilience4J and Swagger API and host the apps on Cloud.												
CO5	Learn to demonstrate Testing and Deploying a Spring Boot Application												

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

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

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1		25	75				100
CAT2		30	70				100
CAT3		30	70				100
ESE		30	70				100

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

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), Precision (S3)
CO2	develop programs using inheritance, packages, and interfaces												Applying (K3), Precision (S3)
CO3	make use of exception-handling mechanisms and multithreaded models to solve real-world problems												Applying (K3), Precision (S3)
CO4	develop Java applications with I/O packages and generics concepts												Applying (K3), Precision (S3)
CO5	apply string handling functions and collection classes and interfaces												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	1	1										
CO5	3	2	1	1										

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

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

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

ASSESSMENT PATTERN - THEORY

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

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

COURSE OUTCOMES: On completion of the course, the students will be able to											BT Mapped (Highest Level)	
CO1	plan for software construction prerequisites and key construction decisions											Applying (K3)
CO2	develop the ability to create high-quality code that adheres to best practices and standards in software development											Applying (K3)
CO3	acquire a comprehensive understanding of variables, data types, statements, and control structures to write efficient, organized, and error-free code for solving complex problems											Applying (K3)
CO4	gain a comprehensive understanding of software quality and effective techniques for improving it, including quality assurance, collaborative construction, testing, debugging, refactoring, and code tuning											Applying (K3)
CO5	develop skills in managing program size and construction, integrating software components, and using programming tools to develop efficient and scalable software solutions.											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	3	3	2	2	3			
CO2	3	2	1	1		3	3	3	2	2	3			
CO3	3	2	1	1		3	3	3	2	2	3			
CO4	3	2	1	1		3	3	3	2	2	3			
CO5	3	2	1	1		3	3	3	2	2	3			

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

ASSESSMENT PATTERN - THEORY

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

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

COURSE OUTCOMES: On completion of the course, the students will be able to												BT Mapped (Highest Level)	
CO1	Illustrate the steps to create android application and discuss its activity life cycle												Applying (K3)
CO2	develop an Android application using Layouts, UI components with event handling												Applying (K3)
CO3	design styles, themes and menu												Applying (K3)
CO4	plan to execute CRUD operations on SQLite												Applying (K3)
CO5	build applications using services, animations and sensors												Applying (K3)

Mapping of COs with POs and PSOs

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

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

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1		45	55				100
CAT2		50	50				100
CAT2		50	50				100
ESE		45	55				100

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

COURSE OUTCOMES: On completion of the course, the students will be able to												BT Mapped (Highest Level)	
CO1	summarize the main concepts, key technologies, strengths, and limitations of cloud computing and identify suitable scenarios for moving to the cloud platform.												Applying (K3)
CO2	interpret the role of virtualization as the key enabling technology that helped in the development of the cloud platform												Applying (K3)
CO3	develop the ability to understand and use the architecture of compute cloud and storage cloud services and delivery models												Applying (K3)
CO4	examine the core issues of cloud computing architecture namely resource management and security.												Applying (K3)
CO5	experiment with several public cloud offerings and cloud development tools to choose the appropriate service provider for one's requirements.												Applying (K3)

Mapping of COs with POs and PSOs

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

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

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1		70	30				100
CAT2		70	30				100
CAT3		70	30				100
ESE		55	45				100

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

COURSE OUTCOMES:												BT Mapped (Highest Level)	
On completion of the course, the students will be able to													
CO1	Organize a computer and network against a variety of attacks												Applying (K3)
CO2	Identify and explain the basic vulnerabilities in any computing system												Applying (K3)
CO3	Enumerate the Computer network services and determine the possible security attacks in Windows machine.												Applying (K3)
CO4	Identify and assess the vulnerabilities in hardware and wireless environment.												Applying (K3)
CO5	formulate research problems in the computer security 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	3	3	2	2	2	3			
CO2	3	2	1	1	3	3	3	2	2	2	3			
CO3	3	2	1	1	3	3	3	3	2	2	3			
CO4	3	2	1	1	3	3	3	3	2	2	3			
CO5	3	2	1	1	3	3	3	3	2	2	3			

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

ASSESSMENT PATTERN - THEORY

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

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

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

ASSESSMENT PATTERN - THEORY

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

COURSE OUTCOMES: On completion of the course, the students will be able to												BT Mapped (Highest Level)	
CO1	understand structure of language and introducing each other												Remembering (K1)
CO2	understand vocabulary on seasons and basic verbs												Understanding (K2)
CO3	ask for directions in a new place and avail transport as required												Understanding (K2)
CO4	understand food habits of German and ask for appointments.												Understanding (K2)
CO5	learn to socialize in a German speaking country												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)

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	greet and introduce oneself and other												Understanding (K2)
CO3	communicate day to day conversations – basic level												Understanding (K2)
CO4	understand the Kanjis in Japanese Script												Understanding (K2)
CO5	comprehend concept of numbers, days, months, time and counters												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)

COURSE OUTCOMES: On completion of the course, the students will be able to													BT Mapped (Highest Level)	
CO1	Construct design challenge and reframe the design challenge into design opportunity.													Applying (K3)
CO2	Interview the user, and know the feelings of users to foster deep user understanding and be able to uncover the deep user insights and needs.													Applying (K3)
CO3	Develop ideas and prototypes by brain storming using the ideation tools.													Applying (K3)
CO4	Organize the user walkthrough experience using ideal user experience journey.													Applying (K3)
CO5	Develop smart strategies & implementation plan that will deliver/achieve the idea/solution deduced from earlier phases.													Applying (K3)

Mapping of COs with POs and PSOs

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

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

ASSESSMENT PATTERN – THEORY

Tests	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT 1	10	20	70				100
CAT 2	10	15	75				100
CAT 3	10	15	75				100
ESE	10	15	75				100

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

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

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

ASSESSMENT PATTERN - THEORY

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

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

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	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)

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	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)

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	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)

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)

COURSE OUTCOMES: On completion of the course, the students will be able to													BT Mapped (Highest Level)	
CO1	read and understand Basic Vocabularies.													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)

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)

COURSE OUTCOMES: On completion of the course, the students will be able to												BT Mapped (Highest Level)	
CO1	Understand the grammatical structure of the language and introduce self to others.												Remembering (K1)
CO2	Understand basic verbs and appropriate vocabulary.												Understanding (K2)
CO3	Ask for directions and arrange for transportation, etc, as needed.												Understanding (K2)
CO4	Understand the food habits of France and ask for appointments												Understanding (K2)
CO5	Learn to socialize in French-speaking countries												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	2
CO2								1	2	3			3	2
CO3								1	2	3			3	2
CO4								1	2	3			3	2
CO5								1	2	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	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)

COURSE OUTCOMES: On completion of the course, the students will be able to												BT Mapped (Highest Level)	
CO1	Understand the French language in deep and its usage												Remembering (K1)
CO2	Preparation of their Favorite recipes, Know the Objects used in Kitchen and house.												Understanding (K2)
CO3	Converse about their vacation, their Favorite Destination												Understanding (K2)
CO4	Understand complex verbs and be able to communicate about their past experiences												Understanding (K2)
CO5	Know the difference between Past and Present and Compare them.												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)

COURSE OUTCOMES: On completion of the course, the students will be able to												BT Mapped (Highest Level)	
CO1	Learn on Future tense.												Remembering (K1)
CO2	Understand Permissions and Prohibitions.												Understanding (K2)
CO3	Knowing about Letter writing, Creating Ads, Expressing Desires, and Instructing Others.												Understanding (K2)
CO4	Understanding rules for travel and Enhancing communications.												Understanding (K2)
CO5	Expressing the feelings and emotions using advanced grammar												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	2
CO2								1	2	3			3	2
CO3								1	2	3			3	2
CO4								1	2	3			3	2
CO5								1	2	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	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)

COURSE OUTCOMES: On completion of the course, the students will be able to												BT Mapped (Highest Level)	
CO1	understand the grammatical structure of the language and introduce self to others.												Remembering (K1)
CO2	understand basic verbs and appropriate vocabulary.												Understanding (K2)
CO3	ask for directions and arrange for transportation, etc, as needed.												Understanding (K2)
CO4	understand the food habits of Spain and Latin countries and ask for appointments												Understanding (K2)
CO5	learn to socialize in Spanish speaking countries												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	2
CO2								1	2	3			3	2
CO3								1	2	3			3	2
CO4								1	2	3			3	2
CO5								1	2	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	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)

COURSE OUTCOMES: On completion of the course, the students will be able to												BT Mapped (Highest Level)	
CO1	understand the Spanish language in deep and its usage												Remembering (K1)
CO2	prepare for their Favorite recipes, Know the Objects used in Kitchen and house.												Understanding (K2)
CO3	converse about their vacation, their Favorite Destination												Understanding (K2)
CO4	understand complex verbs and be able to communicate about their past experiences												Understanding (K2)
CO5	know the difference between Past and Present and Comparing them.												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	2
CO2								1	2	3			3	2
CO3								1	2	3			3	2
CO4								1	2	3			3	2
CO5								1	2	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	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)

COURSE OUTCOMES: On completion of the course, the students will be able to												BT Mapped (Highest Level)	
CO1	learn on Future tense.												Remembering (K1)
CO2	understand about Permissions and Prohibitions.												Understanding (K2)
CO3	knowing about Letter writing, Creating Ads, Expressing Desires and Instructing Others.												Understanding (K2)
CO4	understanding rules for travel and Enhance communications.												Understanding (K2)
CO5	expressing the feelings and emotions using advanced grammar												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		2
CO2								1	2	3		3		2
CO3								1	2	3		3		2
CO4								1	2	3		3		2
CO5								1	2	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	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)

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		
CO2	1	2	2	2		2	2	1	1		3	2		
CO3	2	2	2	2	2	2	2	2	2	2	3	2		
CO4	1	1	2	1		2	1	1	1	2	3	2		
CO5	1	1	2	1		2	1	1	1	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	20	40	40				100
CAT2	20	30	30	20			100
CAT3	30	30	40				100
ESE	10	30	40	20			100

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

COURSE OUTCOMES: On completion of the course, the students will be able to													BT Mapped (Highest Level)	
CO1	understand the basics of Hindi language.													Understanding (K2)
CO2	read sentences and construct simple sentences in Hindi language.													Understanding (K2)
CO3	apply rules of Hindi grammar to write in Hindi language.													Applying (K3)
CO4	listen and express ideas using appropriate vocabulary in Hindi.													Applying (K3)
CO5	speak confidently in Hindi in different professional and real time contexts.													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	3		1		
CO2									2	3		2		
CO3									2	3		2		
CO4									2	3		3		
CO5									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	-	50	50	-	-	-	100
CAT2	-	50	50	-	-	-	100
CAT3	-	33	67	-	-	-	100
ESE	-	47	53	-	-	-	100

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

COURSE OUTCOMES: On completion of the course, the students will be able to													BT Mapped (Highest Level)	
CO1	understand the basics of Hindi language.													Understanding (K2)
CO2	read sentences and construct simple sentences in Hindi language.													Understanding (K2)
CO3	apply rules of Hindi grammar to write in Hindi language.													Applying (K3)
CO4	listen and express ideas using appropriate vocabulary in Hindi.													Applying (K3)
CO5	speak confidently in Hindi in different professional and real time contexts.													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	3		1		
CO2									2	3		2		
CO3									2	3		2		
CO4									2	3		3		
CO5									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	-	50	50	-	-	-	100
CAT2	-	50	50	-	-	-	100
CAT3	-	33	67	-	-	-	100
ESE	-	47	53	-	-	-	100

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

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

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

ASSESSMENT PATTERN - THEORY

COURSE OUTCOMES: On completion of the course, the students will be able to		BT Mapped (Highest Level)
CO1	build 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 air planes and display static models.	Applying (K3)

Mapping of COs with POs and PSOs

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

ASSESSMENT PATTERN - THEORY

COURSE OUTCOMES: On completion of the course, the students will be able to												BT Mapped (Highest Level)	
CO1	understand the conceptual frame work of cost accounting												Understanding (K2)
CO2	understand the basic concepts and process in determination of cost of product and services												Understanding (K2)
CO3	use the basic costing methods in different business situation												Applying (K3)
CO4	demonstrate the advanced costing methods in various decision making situation												Applying (K3)
CO5	prepare various types of budgets and determine variance in different situations.												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	3	1		
CO2										2	3	1		
CO3										2	3	1		
CO4										2	3	1		
CO5										2	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	60	--	--	--	100
CAT2	--	40	60	--	--	--	100
CAT 3	--	40	60	--	--	--	100
ESE	--	20	80	--	--	--	100

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

COURSE OUTCOMES: On completion of the course, the students will be able to												BT Mapped (Highest Level)	
CO1	Understand revenue, cost and profit relations and apply techniques to find best course of action.												Applying (K3)
CO2	Apply appropriate forecasting techniques for estimating sales, cost and revenue.												Applying (K3)
CO3	Understand the relation between inputs and output of production system and perform cost – volume – profit analysis												Applying (K3)
CO4	Apply market equilibrium concepts in monopoly and monopolistically competitive markets.												Applying (K3)
CO5	Understand game theory and apply in different strategic decisions												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		2			
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	--	40	60	--	--	--	100
CAT2	--	40	60	--	--	--	100
CAT 3	--	50	50	--	--	--	100
ESE	--	20	80	--	--	--	100

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

COURSE OUTCOMES: On completion of the course, the students will be able to												BT Mapped (Highest Level)	
CO1	Understand the importance of Analytics in Marketing, size and segment the market												Understanding (K2)
CO2	Understand the Business, competition and its related decisions.												Understanding (K2)
CO3	Identify important features of a product and suitable pricing methods.												Applying (K3)
CO4	Assess Channel performance and Promotion Metrics.												Applying (K3)
CO5	Assess sales performance.												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		2			
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	--	40	60	--	--	--	100
CAT2	--	40	60	--	--	--	100
CAT 3	--	40	60	--	--	--	100
ESE	--	20	80	--	--	--	100

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

KONGU ENGINEERING COLLEGE, PERUNDURAI, ERODE-638060

(AUTONOMOUS)

BOARD OF INFORMATION TECHNOLOGY

DEGREE & PROGRAMME: BTECH & INFORMATION TECHNOLOGY

HONOURS DEGREE TITLE: CYBER SECURITY

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

S.No.	Course Code	Course Title	Credits	Prerequisites	Semester
1.	22ITH01	Mathematical Foundations for Information Security	4	Nil	5
2.	22ITH02	Secure Coding	4	Nil	5
3.	22ITH03	Modern Cryptography	4	Nil	6
4.	22ITH04	Mobile and Wireless Security	3	Nil	6
5.	22ITH05	Computer Security Audit and Assurance	3	Nil	7
		TOTAL	18		

COURSE OUTCOMES: On completion of the course, the students will be able to												BT Mapped (Highest Level)	
CO1	construct number theory concepts in various security applications												Applying (K3)
CO2	apply symmetric key cryptography techniques for real world problems												Applying (K3)
CO3	build various public key cryptography, hashing and digital signature techniques for real case scenarios												Applying (K3)
CO4	Illustrate the techniques to generate, test and factories prime numbers												Applying (K3)
CO5	make use of elliptic curve, properties for security services												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	3	3	2	2	3			3	2
CO2	3	2	1		3	3	3	2	2	3			3	2
CO3	3	2	1		3	3	3	2	2	3			3	2
CO4	3	2	1		3	3	3	2	2	3			3	2
CO5	3	2	1		3	3	3	2	2	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		40	60				100
CAT2		40	60				100
CAT3		40	60				100
ESE		40	60				100

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

COURSE OUTCOMES: On completion of the course, the students will be able to											BT Mapped (Highest Level)	
CO1	demonstrate the string manipulation errors, vulnerabilities and mitigation strategies											Applying (K3)
CO2	implement arbitrary memory write exploits, programming defects, vulnerabilities and mitigation strategies in dynamic memory management											Applying (K3)
CO3	interpret the integral security issues, correct and incorrect use of formatted output functions.											Applying (K3)
CO4	demonstrate various vulnerabilities associated with file I/O and specific development practices for improving the overall security in C code											Applying (K3)
CO5	adopt the proactive security development process and language independent 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	1	1		3	3	3	2	2	3		3	2
CO2	3	2	1	1		3	3	3	2	2	3		3	2
CO3	3	2	1	1		3	3	3	2	2	3		3	2
CO4	3	2	1	1		3	3	3	2	2	3		3	2
CO5	3	2	1	1		3	3	3	2	2	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		65	35				100
CAT2		65	35				100
CAT3		65	35				100
ESE		65	35				100

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

COURSE OUTCOMES: On completion of the course, the students will be able to												BT Mapped (Highest Level)	
CO1	interpret the basic principles of cryptographic protocols												Applying (K3)
CO2	determine the ways of generating one way functions												Applying (K3)
CO3	identify the use of provably secure encryption and digital signatures												Applying (K3)
CO4	articulate the cryptographic algorithms to compose, build and analyze transport layer security												Applying (K3)
CO5	express the use of quantum and post quantum 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	1		3	3	3	2	2	3		3	2
CO2	3	2	1	1		3	3	3	2	2	3		3	2
CO3	3	2	1	1		3	3	3	2	2	3		3	2
CO4	3	2	1	1		3	3	3	2	2	3		3	2
CO5	3	2	1	1		3	3	3	2	2	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		60	40				100
CAT2		60	40				100
CAT3		60	40				100
ESE		60	40				100

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

COURSE OUTCOMES: On completion of the course, the students will be able to												BT Mapped (Highest Level)	
CO1	make use of the mathematical models of security algorithms to wireless and mobile environment												Applying (K3)
CO2	identify the specific vulnerabilities in wide range of WiFi systems												Applying (K3)
CO3	develop robust systems against state-of-the-art security attacks												Applying (K3)
CO4	plan for providing security in ad hoc networks												Applying (K3)
CO5	identify the security issues in mobile telecommunication 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	3	3	2	2	3		3	2
CO2	3	2	1	1		3	3	3	2	2	3		3	2
CO3	3	2	1	1		3	3	3	2	2	3		3	2
CO4	3	2	1	1		3	3	3	2	2	3		3	2
CO5	3	2	1	1		3	3	3	2	2	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		60	40				100
CAT2		60	40				100
CAT3		60	40				100
ESE		60	40				100

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

COURSE OUTCOMES: On completion of the course, the students will be able to												BT Mapped (Highest Level)	
CO1	Plan the organization's security needs with the CNSS security model.												Applying (K3)
CO2	apply legal aspects and code of ethics in Information Security.												Applying (K3)
CO3	Organize an audit and use the best practices of ISMS.												Applying (K3)
CO4	apply ISO 27001 and conduct a risk assessment.												Applying (K3)
CO5	illustrate Asset management in compliance with ISO 27001.												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	3	3	2	2	3		3	2
CO2	3	2	1	1		3	3	3	2	2	3		3	2
CO3	3	2	1	1		3	3	3	2	2	3		3	2
CO4	3	2	1	1		3	3	3	2	2	3		3	2
CO5	3	2	1	1		3	3	3	2	2	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		60	40				100
CAT2		60	40				100
CAT3		60	40				100
ESE		60	40				100

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