B.Tech. (Computer Technology)

2018 Regulations, Curriculum & Syllabi

BANNARI AMMAN INSTITUTE OF TECHNOLOGY

(An Autonomous Institution Affiliated to Anna University, Chennai
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CONTENTS

BANNARI AMMAN INSTITUTE OF TECHNOLOGY, SATHYAMANGALAM
REGULATIONS 2018
(CHOICE BASED CREDIT SYSTEM)

(Common to all B.E./B.Tech. Degree Programmes)

Regulation 2018 has been prepared in accordance with the guidelines given by the University Grants Commission, All India Council for Technical Education and affiliating University incorporating the features of the Choice Based Credit System (CBCS). The Regulation 2018 is applicable to the candidates admitted to the Bachelor of Engineering (B.E.) / Bachelor of Technology (B.Tech.) Degree Programmes of the Institution in the academic year 2019-2020 for Regular admission (Academic year 2020-2021 for Lateral Entry) and subsequently.

The regulations hereunder are subjected to amendments as may be decided by the Academic Council of the Institution from time to time. Any or all such amendments will be effective from such date and to such batches of students (including those already in the middle of the programme) as may be decided by the Academic Council.

1. ADMISSION

Candidate, seeking admission to the B.E./B.Tech. Programme, shall satisfy the conditions of admission prescribed by the Directorate of Technical Education and Anna University, Chennai as given below.

1.1 Regular Admission

Candidates, for admission to the first semester of the eight semesters B.E./B.Tech. Degree Programmes, shall be required to have passed:

- Higher Secondary Examination (10 +2) of curriculum (Regular Academic Stream) prescribed by the Government of Tamil Nadu with Mathematics, Physics, and Chemistry as three of the four subjects of the study prescribed under Part-III or any other examinations of any Board or University or authority accepted by the Syndicate of the University / Directorate of Technical Education (DoTE), Chennai as equivalent thereto.

(or)

- Should have passed Higher Secondary Examination of Vocational Stream (Engineering/Technology), prescribed by the Government of Tamil Nadu.

1.2 Lateral Entry Admission

1.2.1 The candidates who possess Diploma in Engineering / Technology awarded by the State Board of Technical Education and Training, Tamil Nadu or its equivalent are eligible to apply for Lateral Entry admission to the third semester of B.E. / B.Tech. Programmes in the branch of study as per the eligibility criteria prescribed by the Directorate of Technical Education from time to time.

(or)

1.2.2 The candidates who possess the Bachelor Degree in Science (B.Sc.) (10+2+3 stream) with Mathematics as a subject in B.Sc. is eligible to apply for Lateral Entry admission to the third semester of B.E./B.Tech. Programmes, as per the eligibility criteria prescribed by the Directorate of Technical Education from time to time. Such candidates shall undergo two additional Engineering subject(s) one each in third and fourth semesters, as bridge courses.

2. PROGRAMMES OFFERED

A candidate may be offered admission to any one of the programmes offered by the Institution for the candidates specified in Clause 1.1 and as per the eligibility criteria of DoTE for the candidates under Clause 1.2 from the list given below:

B.E. Programmes

i. Biomedical Engineering
ii. Information Science and Engineering

B.Tech. Programmes

i. Computer Science and Business Systems
ii. Computer Technology

3. STRUCTURE OF THE PROGRAMME

3.1 Every programme shall have a distinct curriculum with syllabi consisting of theory, laboratory, project, soft-skills and personality development courses, as prescribed by the respective Boards of Studies, broadly categorized under:

(i) **Basic Science** courses including Mathematics, Physics, Chemistry and further specialization in these subjects

(ii) **Basic Engineering** courses including Engineering Graphics, Engineering Practices, Basics of Electrical, Electronics, Civil, Mechanical Engineering, Engineering Mechanics and Computer Programming.

(iii) **Humanities and Social Science** courses including Language Courses, Management Courses, Soft Skills and Professional Ethics.

(iv) **Professional Courses** include Discipline Core Courses, Professional Electives, and Open Electives.

(v) **Employability Enhancement Courses (EEC)** includes Project Work and /or Internship, Seminar, Industrial /Practical Training, Value Added and Certificate Courses.

The medium of instruction is English for all the Courses, Examinations, Seminar Presentation, Projects and any other courses that a student registers for.

3.2 Each course is normally assigned a certain number of credits based on the following

Contact period per week	Credits
1 Lecture / 1 Tutorial period	1
2 Laboratory Periods (Laboratory / Seminar / Project Work / etc.)	1

3.3 All the B.E. / B.Tech. Students will study Communicative English I during the First Semester. In the Second Semester, they will be divided into two streams based on their English language proficiency assessed in the Continuous Assessment during semester I, in which the upper segment will be provided an option to enroll and study Communicative English II / German / Japanese / French / Chinese / Hindi while the lower segment will study Communicative English II.

3.4 Every student shall be required to opt for **Nine** electives from the list of electives. Students can opt for the electives (Core / Professional) from his / her own discipline courses, during V to VIII Semesters, if he/she satisfies the prerequisite for that particular course.

3.5 However, out of nine electives, every student shall be required to opt for, a minimum of one and subject to a maximum of three courses as open elective from

the list of electives of the branch / branches other than his / her branch of specialisation, if he/she satisfies the prerequisite for that particular course.

3.6 Students can also opt for one-credit courses of 15 to 20 hour duration, which will be offered by the experts from the industry on specialised topics. Students can opt for such one-credit courses during the semesters I to VII as and when these courses are offered. A student will also be permitted to register the one-credit courses offered by other Departments, provided the student has fulfilled the necessary pre- requisites or the courses that may not require any pre-requisites. Under no circumstances, the same one credit course shall be repeated in subsequent semesters in any Department / Centre for the same batch of the students and a maximum batch size for a given course shall not exceed 40. In case of disciplines with multiple divisions (intake more than 60) different course(s) shall be offered to other batch(es) of students.

On successful completion of one credit courses, Credits will be indicated in the Grade Sheet, but will not be considered for computing the Cumulative Grade Point Average (CGPA). However, if a student wishes to avail the exemption from any one of the Electives (other than open elective) of the Semester VIII, he / she can do so by exercising his / her option in writing to the respective Head of the Department during the beginning of the VIII Semester, following the equivalence norm, that one **regular elective** (in the **VIII Semester**) is equivalent to **three one-credit courses** completed by the student during the previous semesters, IV to VII. Details of the one credit courses offered by the department shall be forwarded to the Office of the Controller of Examinations. However one credit courses completed during I to III semesters shall be maintained in the Grade sheet as "Additional credits earned" (not considered for the computation of SGPA/CGPA).

3.7 A student can register for Self-Study Elective(s) over and above the electives from any branch of Engineering / Technology at the rate of one per semester starting from V semester onwards provided he/she maintains a Cumulative Grade Point Average (CGPA) of 8.50 or above till the previous semesters with no current arrears. Credits will be indicated for such courses in the grade sheets (additional credits) but will not be considered for computing the CGPA.

3.8 A Student may be permitted to credit only one online course with the approval of the Departmental Consultative Committee constituted by the Head of the Department, subject to a maximum of three credits. The student needs to obtain certification or credit to become eligible for writing the End Semester Examination to be conducted by the CoE. A student can get exemption for a maximum of 3 credits during the entire programme (in lieu of Core elective or Open elective). The Head of the Department may identify a faculty member as coordinator for the course, who is responsible for the evaluation process. The course shall be evaluated through the End Semester Examination only. The evaluation methodology may be decided by the course faculty coordinator.

3.9 **Industrial Training / Internship**

The students may undergo Industrial training / Internship optionally for a period as specified in the table during summer / winter vacation and the credits earned will be indicated in the Mark Sheet. If the student earns three credits in Industrial Training / Internship, the student may drop one Professional Elective. In such cases, Industrial Training / Internship need to be undergone continuously from one organization only. However, if the number of credits earned is 1 or 2, these credits shall not be considered for classification of the degree. The students may also undergo Internship at Research organization / University (after due approval from the Department Consultative Committee) during summer / winter vacation, in lieu of Industrial training.

Duration of Training / Internship	Credits
2 Weeks	1
1 Month	2
2 Months	3

3.10 **Socially Relevant Projects**

A Student may be permitted to carry out a socially relevant project during semester II to semester VI in consultation with the Faculty Guide and submit the project report, in the prescribed format, at the end of the Semester for the valuation.

On successful completion of socially relevant project work, one credit will be indicated in the grade sheet (Additional credits), but these credits will not be considered for computing the CGPA.

4. VALUE ADDED COURSES

A Student can opt for the Value Added Courses offered by the various Department / Centres from Semester II to VII. Head of the Department / Centre shall submit the list of such courses, duly approved / ratified by the Academic Council, to the Controller of Examinations to administer the examination process. A separate Certificate will be issued on successful completion of the course by the Office of the Controller of Examinations.

5. DURATION OF THE PROGRAMME

5.1 A regular student (admitted after 10+2) or equivalent is normally expected to satisfactorily fulfil the requirements for award of the degree B.E. / B.Tech. within four academic years (8 semesters) from the date of admission but in any case not more than 7 years (14 Semesters); lateral entry students shall fulfil such requirements within three academic years (6 semesters) from the date of admission but in any case not more than six years (12 Semesters) leading to the award of Degree of Bachelor of Engineering (B.E.) / Bachelor of Technology (B.Tech.) of Anna University, Chennai.

5.2 The total period for completion of the programme from the commencement of the semester, to which the student was admitted, shall not exceed the maximum period (Clause 5.1), regardless to the break-of-study (vide Clause 15) or period of prevention in order.

5.3 Each semester shall consist of minimum 90 working days. Head of the Department shall ensure that every faculty member teaches the subject / course as prescribed in the approved curriculum and syllabi.

5.4 Special Theory / Practical Sessions may be conducted for students who require additional inputs over and above the number of periods normally specified (Remedial Classes), as decided by the Head of the Department, within the specified duration of the Semester / Programme.

6. COURSE ENROLLMENT AND REGISTRATION

6.1 Each student, on admission shall be assigned to a Faculty Advisor (vide Clause 8) who shall advise / counsel the student about the details of the academic programme and the choice of course(s) considering the student's academic background and career objectives.

6.2 Every student shall enroll for the courses of the succeeding semester, in the current semester. However, the student shall confirm the enrollment by registering for the courses within the first five working days after the commencement of the semester concerned.

6.3 After registering for a course, a student shall attend the classes, satisfy the attendance requirements, earn Continuous Assessment marks and appear for the End Semester Examinations.

6.3.1 Each student, on admission to the programme, shall register for **all the courses prescribed in the curriculum** in the **first Semester of study (III Semester** for students admitted under **lateral entry stream).**

6.3.2 The enrollment for all the courses of the Semester II will commence 10 working days prior to the last working day of Semester I. The student shall confirm the enrollment by registering for the courses within the first five working days after the commencement of the Semester II. In case, if a student fails to register in course(s), he/ she may be permitted to register the same, as specified in the Clause 6.5, in the subsequent semesters or when it is offered.

6.3.3 The enrollment for the courses of the Semesters III to VIII will commence 10 working days prior to the last working day of the preceding semester. The student shall enroll for the courses with the guidance of the student's Faculty Advisor. If a student wishes, the student may drop or add courses (vide Clause 6.4) within **five** working days after the commencement of the semester concerned and complete the registration process duly authorized by the Faculty Advisor.

6.4 Flexibility to Add or Drop courses

6.4.1 A student 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 a student wishes, the student is permitted to earn more than the total number of credits prescribed in the curriculum by opting for one- credit courses, self study electives or additional courses.

6.4.2 From the III to VIII semesters (from IV to VIII Semesters in case of lateral entry students), the student has the option of registering for additional courses or dropping existing courses. The total number of credits that a student can add or drop is limited to 8, subject to a maximum of 2 courses in a given Semester. In such cases, the attendance requirement as stated in Clause 7 is mandatory.

6.4.3 The student shall register Project work I in semester VII and Project work II in semester VIII only.

6.5 Reappearance Registration

6.5.1 If a student fails in a theory course, the student shall do reappearance registration (Examination) for that course in the subsequent semesters or when it is offered next.

6.5.2 On registration, a student may attend the classes for the reappearance registration courses, if the student wishes, and the attendance requirement (vide Clause 7) is not compulsory for such courses.

6.5.3 However, if a student wishes to improve his/ her continuous assessment, in the second attempt during reappearance, he/she shall satisfy the Clause 6.5.5 and appear for continuous assessment as given for that particular course.

6.5.4 If the theory course, in which the student has failed, is either a professional elective or an open elective, the student may register for the same or any other professional elective or open elective course, respectively in the subsequent semesters. However, the change of elective courses is permitted only once.

6.5.5 In this case (Clause 6.5.4), the student shall attend the classes, satisfy the attendance requirements (vide Clause 7), earn Continuous Assessment marks and appear for the End Semester Examination.

6.5.6 The student who fails in any continuous assessment courses (Laboratory/ Project work / Seminar or any other HSS/EEC courses) shall register for the same in the subsequent semesters or when offered next, and **repeat** the course as per Clause 6.5.5.

6.5.7 If a student is prevented from writing the end semester examination of a course or several courses due to lack of attendance, the student has to register for that / those course(s) again, when offered next, attend the classes and fulfill the requirements as per Clause 6.5.5 & 6.5.6. If the course, in which the student has 'lack of attendance', is a Core Elective or an Open Elective, the student may register for the same or any other Core Elective or Open Elective course(s) respectively in the subsequent semesters and appear in the examination as per Clause 6.5.5.

6.5.8 If a student fails to secure a pass in any theory courses (including elective) he/she is given a maximum of three arrear attempts to complete the courses. If the student still fails to secure a pass, he/she shall register for the same when offered next and repeat the course.

7. REQUIREMENTS FOR APPEARING FOR THE END SEMESTER EXAMINATION OF A COURSE

A student who has fulfilled the following conditions (vide Clause 7.1 and 7.2) shall be deemed to have satisfied the attendance requirements for appearing for End Semester Examination of a particular course.

7.1 Every student is expected to attend all the periods and earn 100% attendance. However, a student shall secure not less than 80% attendance course wise taking into account the number of periods required for that course as specified in the curriculum.

7.2 If a student, secures attendance between 70% and 79% in any course(s) in the current semester due to medical reasons (prolonged hospitalization / accident / specific illness) or participation in Institution/ University/ State/ National/International level extra and co-curricular activities, with prior permission from the Head of the Department, shall be permitted to appear for the current semester examinations subject to the condition that the student shall submit the medical certificate / participation certificate attested by the Head of the Department (along with Condonation form). Such certificates along with the condonation forms shall be forwarded to the Controller of Examinations for verification and permission to attend the examinations. However during the entire

programme of study, a student can avail such Condonation in any two semesters only (regardless the number of courses).

7.3 A student shall normally be permitted to appear for End Semester Examination of the course(s) if the student has satisfied the attendance requirements (vide Clause 7.1 – 7.2) and has registered for examination in those courses of that semester by paying the prescribed fee.

7.4 Students who do not satisfy Clause 7.1 and 7.2 and who secure less than 70% attendance in a course will not be permitted to write the End-Semester Examination of that course. The student has to register and repeat this course in the subsequent semesters or when it is offered next (vide Clause 6.5).

7.5 If a student has shortage of attendance in all the registered courses, he/she would not be permitted to move to the higher semester and has to repeat the current semester in the subsequent year.

7.6 In the case of reappearance (Arrear) registration for a course, the attendance requirement as mentioned in Clauses 7.1 - 7.3 is not applicable. However, the student has to register for examination in that course by paying the prescribed fee.

7.7 A student 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 grades.

8. FACULTY ADVISOR

To help the students in planning their courses of study and for general advice on the academic programme, the Head of the Department will attach a certain number of students to a Faculty member of the Department who shall function as Faculty Advisor for those students. The Faculty Advisor shall advise and guide the students in registering of courses, reappearance of courses, monitor their attendance and progress and counsel them periodically. The Faculty Advisor also discusses with or informs the parents about the progress / performance of the students concerned.

The responsibilities of the faculty advisor shall be:

- To inform the students about the various facilities and activities available to enhance the student's curricular and co-curricular activities.
- To guide student enrollment and registration of the courses.

- To authorize the final registration of the courses at the beginning of each semester.
- To monitor the academic and general performance of the students including attendance and to counsel them accordingly.

9. COMMITTEES

9.1 Common Course Committee

9.1.1 A theory course handled by more than one faculty including the discipline with multiple divisions (greater than or equal to 2) shall have a "Common Course Committee" comprising of all members of faculty teaching that course with one of the members as the Course Coordinator, nominated by the Head of the Institution (Head of the Department in the case of multiple divisions of a discipline) and student representatives (one per specialization or division) registered for that course in the current semester.

First meeting of the Common Course Committee shall be held within fifteen days from the date of commencement of the semester. Two subsequent meetings in a semester may be held at suitable intervals. During these meetings, the student members shall meaningfully interact and express their opinions and suggestions of all the students to improve the effectiveness of the teaching-learning process. It is the responsibility of the student representatives to convey the proceedings of these meetings to all the students.

9.1.2 In addition, Common Course Committee (without the student representatives) shall meet to ensure uniform evaluation through the common question papers during Continuous Assessment and End Semester Examinations.

9.2 Class Committee Meeting

For all the courses taught, prescribed in the curriculum, Class Committee meeting shall be convened thrice in a semester (first meeting within 15 days from the commencement of the semester and other two meetings at equal interval after the first meeting) comprising members of the faculty handling all the courses and two student representatives from the class.

One of the members of the faculty (preferably not handling any courses to that class), nominated by the Head of the Department, shall coordinate the activities of the Committee. During these meetings, the student members shall meaningfully interact

and express their opinions and suggestions of all the students to improve the effectiveness of the teaching-learning process. It is the responsibility of the student representatives to convey the proceedings of these meetings to all other students.

10. SYSTEM OF EXAMINATION

10.1 Performance in each course of study shall be evaluated based on (i) Continuous Assessment throughout the semester and (ii) End Semester examination at the end of the semester for the regular courses or as given in the Clause 16. However, the final examination in the case of certificate / value added courses may be conducted, as and when the course is completed, through the office of the Controller of Examinations.

10.2 Each course, both theory and laboratory including project work, shall be evaluated as per the Scheme of Assessment given in Clause 16.

10.3 The End Semester Examinations shall normally be conducted after satisfying the Clause 5.2.

10.4 For the End Semester examinations, both theory and project work, the internal and external examiners (from Academia or Industry) shall be appointed by the Controller of Examinations as per the guidelines given by the Examination cum Evaluation committee of the Institute.

11. PASSING REQUIREMENTS AND PROVISIONS

11.1 The Passing requirement for a student in a course is determined based on the marks obtained both in Continuous Assessment and End Semester Examinations. If the student gets <50% of marks in End Semester Examination, then the student will be awarded only RA (Reappearance) grade. A student who earns a minimum of 6 grade points in a course is declared to have successfully passed the course.

11.1.1 If a student fails to secure a pass in a particular course, i.e., failing to obtain minimum marks, as stated above, it is mandatory that he/she shall reappear for the examination in that course in the subsequent semester(s) whenever the examinations are conducted for that course, till he / she secures a 'Pass'.

If a student fails to secure a pass in theory courses in the current semester examination, he/she is allowed to write arrear examinations for the next three

consecutive semesters and their internal marks shall be carried over for the above mentioned period of three consecutive semesters. If a student fails to secure a pass in a course even after three consecutive arrear attempts, the student has to repeat the course in the semester in which it is offered along with regular students. That is, the students should have successfully completed the courses of (n minus 4)th semester to register for courses in nth semester.

Based on the above, the following prerequisites shall be followed for completing the degree programme:

i. To enter into Semester V, the student should have no arrear in Semester I. Failing which the student shall repeat the Semester I course/courses along with the regular students.

ii. To enter into Semester VI, the student should have no arrear in Semester II. Failing which the student shall redo the Semester II course/courses along with the regular students.

iii. To enter into Semester VII, the student should have no arrear in Semester III. Failing which the student shall redo the Semester III course/courses along with the regular students.

iv. To enter into Semester VIII, the student should have no arrear in Semester IV. Failing which the student shall redo the Semester IV course/courses along with the regular students.

v. In case, if he/she has not successfully completed all the courses of semester V at the end of semester VIII, he/she shall redo the Semester V courses along with regular students. For the subsequent semesters of VI, VII and VIII, the same procedure shall be followed, subject to the maximum permissible period for this programme.

11.2 If a candidate fails in the seventh semester examinations of Project work I, he/she has to resubmit the Project Report within 30 days from the date of declaration of the results. If he / she fails in the End semester examination of Project work II, he/she shall resubmit the Project Report within 60 days from the date of declaration of the results. The resubmission of the project report and the subsequent viva-voce examination will be considered as reappearance with payment

of exam fee. In case a student fails in the resubmission of a project report and subsequent viva-voce examination, the student shall register for the course again, when offered next.

11.3 The passing requirement for the courses which are assessed only through continuous assessment (Laboratory and EEC courses except project work), shall be fixed as minimum 50% and the remaining grades are decided as per clause 12.4 . If a candidate fails in EEC courses (Except Project work), he/she has to register and repeat the course within 30 days from the date of declaration of the results. In case a student fails to register within 30 days, he/she shall register for the course again, when offered next.

11.4 The minimum number of total credits to be earned by a student to qualify for the award of Degree in the various branches of study as prescribed by the respective Boards of Studies is given below:

Branch of Study	**Minimum Credits**	
	Regular Admission	**Lateral Entry**
B.E. Programmes		
Biomedical Engineering	171	132
Information Science and Engineering	171	130
B.Tech. Programmes		
Computer Science and Business Systems	185	141
Computer Technology	170	128

11.5 Student Migration and Credit Transfer: Normalization of the Credits will be carried out in consultation with the Board of Studies of the programme concerned and approved by the Head of Institution, if a student migrates from other Autonomous institutions to Bannari Amman Institution of Technology or rejoins from previous regulation to this regulation.

11.6 A student shall be declared to have qualified for award of B.E/B.Tech. Degree if he/she successfully completes the course requirements (vide Clause 7, 10 and 11) and passed all the prescribed courses of study of the respective programme (listed in Clause 2), within the duration specified in Clause 5.1.

12. ASSESSMENT AND AWARD OF LETTER GRADES

12.1 The assessment shall be based on the performance in the End Semester Examinations and / or Continuous Assessment, carrying marks as specified in Clause 16. Letter Grades (based on Credit Point and Grade Point) are awarded to the students based on the performance in the evaluation process.

12.2 Credit Point is the product of Grade Point and number of credits for a course and Grade Point is a numerical weight allotted to each letter grade on a 10-point scale (as specified in the Clause 12.4), while the Letter Grade is an index of the performance of a student in a said course.

12.3 Condition for Relative Grading

The minimum number of students for applying relative grading system is 30. If the students strength is less than 30 then absolute grading system will be applied. The relative grading system shall not be applied for laboratory and EEC courses.

12.4 The performance of a student will be reported using Letter Grades in absolute grading, each carrying certain points as detailed below: In relative grading, grades will be decided by the faculty concerned. A student who earns a minimum of 6 grade points in a course is declared to have successfully passed the course.

Range of Total Marks (as specified in Clause 16) / Specific Reason	**Grade Points**	**Letter Grade**
91 to 100	10	O (Outstanding)
81 to 90	9	A + (Excellent)
71 to 80	8	A (Very Good)
61 to 70	7	B + (Good)
50 to 60	6	B (Above average)
0 to 49	0	RA (Reappearance Registration)
Incomplete	0	I
Withdrawal	0	W
Absent	0	AB
Shortage of Attendance	0	SA

'RA' ---Reappearance registration is required for that particular course

'I' --- Continuous evaluation is required for that particular course in the subsequent examinations.

'SA' --- shortage of attendance (Clause 7) and hence prevented from writing end semester examination.12.5 After completion of the evaluation process, Semester Grade Point Average (SGPA), and the Cumulative Grade Point Average (CGPA) is calculated using the formula:

$$SGPA/CGPA = \frac{\sum_1^n C_i * g_i}{\sum_1^n C_i}$$

Where

C_i : Credit allotted to the course.

g_i : Grade Point secured corresponding to the course.

n : number of courses successfully cleared during the particular semester in the case of SGPA and all the semesters, under consideration, in the case CGPA.

12.6 A student who does not appear for the End Semester Examinations in a course, after registering for the same, shall be deemed to have appeared for that examination for the purpose of classification (Subject to Clause 14 and 15).

12.7 For the non credit courses grades shall be indicated as given in the Clause 16 and shall not be counted for the computation of SGPA/CGPA.

For the Co-curricular activities such as NCC / NSS / NSO / YRC, a satisfactory / not satisfactory grading will appear in the mark sheet. Every student shall put in a minimum of 75% attendance in the training and attend the camp compulsorily. The training and camp shall be completed during the first year of the programme. However, for valid reasons, the Head of the Institution may permit a student to complete this requirement in the second year. A satisfactory grade in the above co-curricular activities is compulsory for the award of degree.

12.8 **Revaluation:** A student, who seeks the re-valuation of the answer script, is directed to apply through proper application to the Controller of Examinations in the prescribed format through the Head of the Department. The Controller of Examinations shall arrange for the revaluation and declare the results. Revaluation is not permitted to the courses other than theory courses. In the case of theory courses with laboratory component, a student can seek revaluation for the theory component only, following the procedure stated above.

12.9 **Supplementary Examinations**: If a student fails to secure a pass in theory course(s) of VIII semester examination, he/she is eligible to appear for a one time Supplementary Examination which shall be conducted at the end of VIII semester, for the subjects of VIII semester alone within 30 days from the date of declaration of the results.

12.10 **Eligibility for the Award of Degree**

A student shall be declared to be eligible for the award of the B.E. / B.Tech. Degree provided the student has

i. Successfully gained the required number of total credits as specified in the curriculum corresponding to the student's programme within the stipulated time.
ii. Successfully completed the course requirements, appeared for the End-Semester examinations and passed all the courses prescribed in all the 8 semesters within a maximum period of 7 years reckoned from the commencement of the first semester to which the candidate was admitted.
iii. Successfully completed the NCC / NSS / NSO / YRC / Extra-curricular/ Co-curricular requirements.
iv. No disciplinary action is pending against the student.
v. The award of Degree must have been approved by the Syndicate of the University.

13. CLASSIFICATION OF THE DEGREE AWARDED

For the purpose of the 'Award of Degree', the duration of completion of the programme shall be the total duration taken by a student for completing first time registration of all the required courses and satisfying Clause 11, regardless to the period of Break-of-study as per Clause 15 and satisfy any one of the conditions required as given below.

13.1 **First Class with Distinction**: A student 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 students) in the student's First Appearance within five years, which includes authorized break of study of one year. Withdrawal from examination (vide Clause 15) will not be considered as an appearance.
- Should have secured a CGPA of **not less than 8.50**
- Should **NOT** have been prevented from writing end semester examination due to lack of attendance in any of the courses.

13.2 **First Class**: A student 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 students) within five years, which includes one year of authorized break of study (if availed) or prevention from writing the End Semester Examination due to lack of attendance (if applicable).
- Should have secured a CGPA of **not less than 7.00**

13.3 **Second Class**: All other students (not covered in clauses 13.1 and 13.2) who qualify for the award of the degree shall be declared to have passed the examination in **Second Class.**

14. WITHDRAWAL FROM THE EXAMINATION

14.1 A student may, for valid reasons, be granted permission by the Head of the Department to withdraw from appearing in the examination in any course(s) only once during the entire duration of the degree programme.

14.2 Withdrawal application shall be valid only, if the student is eligible to write the examination as per Clause 7 and, if it is made within TEN working days before the commencement of the end semester examination in that course or courses and also recommended by the Head of the Department.

14.3 Notwithstanding the requirement of mandatory TEN working days' notice, applications for withdrawal for special cases under extraordinary conditions will be considered on the merit of the case.

14.4 If a student 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 examination(s).

14.5 Withdrawal shall not be considered as an appearance in the examination for the eligibility of a student for First Class with Distinction or First Class.

14.6 Withdrawal is permitted for the end semester examinations in the final semester, only if the period of study of the student concerned does not exceed 5 years as per clause 13.1 & 13.2.

15. AUTHORIZED BREAK OF STUDY FROM A PROGRAMME

15.1 A student is permitted to go on break of study for a fixed period of one year as a single break in the entire course of study.

15.2 A student is normally not permitted to break the period of study temporarily. However, if a student happens to discontinue the programme temporarily during the middle of programme of study, for reasons such as personal accident or hospitalization due to ill health or in need of health care, he/she shall apply to the Head of the Institution in advance, in any case, not later than the last date for registering for the semester examination, through the Head of the Department stating the reasons for the break-of-study (for one academic semester or 6 months, whichever is earlier). However, a student detained for want of minimum attendance requirement as per Clause 7 shall not be considered as permitted 'Break of Study' and Clause 15.3 is not applicable for such case.

15.3 The student is permitted to rejoin the programme after the break / prevention due to lack of attendance, shall be governed by the Curriculum and Regulations in force at the time of rejoining. The students rejoining in new Regulations shall apply to the Dean Academics in the prescribed format through the 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.

15.4 Authorized break of study will be counted towards the duration specified for passing all the courses (vide Clause 5.1 and 5.2) and for the purpose of classification of Degree (vide Clause 13).

15.5 The total period for completion of the programme reckoned from the commencement of the first semester to which the student is admitted shall not exceed the maximum period specified in Clause 5.1, irrespective of the period of break of study in order that he / she may be eligible, for the award of the degree (vide Clause 13).

15.6 In case of valid reasons (as stated in Clause 15.2) extended break-of-study may be granted by the Head of the Institution for a period not more than one year in addition to the earlier authorized break of study.

15.7 If a student does not report back to the Institute, even after the extended Break of Study, the name of the student shall be deleted permanently from the college

enrollment. Such students are not entitled to seek readmission under any circumstances.

16. SCHEME OF ASSESSMENT

Courses offered under B.E. / B.Tech. Programmes are assessed as given below:

I	**THEORY COURSES**	**Marks**
	Continuous Assessment	**50**
	Distribution of marks for Continuous Assessment:	
	Periodical Test I (10)	
	Periodical Test II (10)	
	Innovative Practices (30)	
	End Semester Examination	**50**
	Total Marks	**100**

II	**THEORY COURSES WITH LAB COMPONENT**	**Marks**
	Continuous Assessment	**50**
	Distribution of marks for Continuous Assessment:	
	Periodical Test I (10)	
	Periodical Test II (10)	
	Innovative Practices (30)	
	(Laboratory Assessment & Report)	
	End Semester Examination (QP pattern as per (I))	**50**
	Total Marks	**100**

III	**LABORATORY COURSES**	**Marks**
	Continuous Assessment	**100**
	Distribution of marks for Continuous Assessment:	
	Conduct of Experiment	
	i. Preparation (20)	
	ii. Experiment and Analysis of Results (20)	
	iii. Record (10)	
	Test – Cycle I (25)	
	Test – Cycle II (25)	
	Total Marks	**100**

IV	**PROJECT WORK I**	**Marks**
	Continuous Assessment	**50**
	Distribution of marks for Continuous Assessment:	
	<u>Review I</u>	
	Literature Survey (5)	
	Identification of topic and Justification (5)	
	Work plan (10)	
	<u>Review II</u>	
	Approach & Results (15)	
	Conclusion (15)	

	End Semester Examination	**50**
	Report[#] (20)	
	Presentation (20)	
	Viva voce (10)	
	Total Marks	**100**

V	**PROJECT WORK II**	**Marks**
	Continuous Assessment	**50**
	Distribution of marks for Continuous Assessment:	
	Review I	
	Progress (10)	
	Review II	
	Approach & Results (10)	
	Review III	
	Conclusion & Final Presentation (10)	
	Report (15)	
	Publication of Paper in Conferences / Journals (5)	
	End Semester Examination	
	Presentation (30)	**50**
	Viva voce (20)	
	Total Marks	**100**

VI	**LANGUAGE ELECTIVE**	**Marks**
	(CONTINUOUS ASSESSMENT ONLY)	
	Test 1	**25**
	Listening (5)	
	Speaking (10)	
	Reading (5)	
	Writing (5)	
	Test 2	**25**
	Listening (5)	
	Speaking (10)	
	Reading (5)	
	Writing (5)	
	Oral Exam	**50**
	Total Marks	**100**

VII	**ONE-CREDIT COURSE**	**Marks**
	(CONTINUOUS ASSESSMENT ONLY)	
	Test I	**50**
	Quiz/ Assignment	**50**
	Total Marks	**100**

[#] *Reports / Record Note / Integrated Lab Manual to be retained for 1 year for Academic Audit, by respective Department*

VIII	**INDUSTRIAL TRAINING/ INTERNSHIP (CONTINUOUS ASSESSMENT ONLY)**	**Marks**
	Assessment by Industry	**30**
	Viva-voce	**20**
	Presentation	**30**
	Case Study / Report	**20**
	Total Marks	**100**

IX	**SOFT SKILLS (CONTINUOUS ASSESSMENT ONLY)**	**Marks**
	Test I	**25**
	Test II	**25**
	Final Examination	**50**
	Total Marks	**100**
	Grades (Excellent / Good / Satisfactory)	

X	**VALUE ADDED / CERTIFICATE COURSES (CONTINUOUS ASSESSMENT ONLY)**	**Marks**

Test I	**25**
Test II	**25**
Final Evaluation / Test	**50**
Total Marks	**100**
Grades (Excellent / Good / Satisfactory)	

XI	**ENGINEERING GRAPHICS**	**Marks**
	Continuous Assessment	**100**
	Distribution of marks for Continuous Assessment:	
	Exercise (Minimum 10 Exercises/Modelling)	**60**
	Model Examination	**40**
	Total Marks	**100**

Optional Test: *A student becomes eligible to appear for an optional test conducted after the Periodical Test II, only under the following circumstances: (i) absent for Test I or Test II or both on account of medical reasons (hospitalization / accident / specific illness), or (ii) participation in the College / University / State / National / International level Sports events with prior permission from the Head of the Institution and (iii) on satisfying the conditions (i) or (ii), the student should have registered for the Optional Test, through the concerned member of faculty who handles the course or through the respective Head of the Department, submitted to the Controller of Examinations. Such Optional Tests are not conducted for the courses under the categories III, IV, V, VI, VII, VIII, IX, X and XI listed above.*

17. FIELD / INDUSTRIAL VISIT / INTERNSHIP

In order to provide the experiential learning to the students, Head of the Department shall take efforts to arrange at least two industrial visits / field visits. The students may also undergo in-plant training / internship during summer / winter vacation between III and VII semesters.

18. PERSONALITY AND CHARACTER DEVELOPMENT

Every student shall be required to undergo a minimum of 40 hours of Personality Development Programmes viz, NSS / NCC / YRC / YOGA / Sports and Games / Technical and Non-technical Club activities during the first year. The attendance of the personality and character development courses / events shall be maintained on the regular basis by the concerned First Year Co-ordinators and made available in the Office of the Controller of

Examinations before the commencement of Semester examinations of Semester I or Semester II.

19. DISCIPLINE

A student is expected to follow the rules and regulations laid down by the Institute and the affiliating University, as published from time to time. Any violations, if any, shall be treated as per the procedures stated thereof.

If a student indulges in malpractice in any of the End Semester / Continuous Assessments, he / she shall be liable for punitive action as prescribed by the Institution / University from time to time.

20. REVISION OF REGULATIONS, CURRICULUM AND SYLLABI

The Institution reserves the right to revise/amend/change the Regulations, Curriculum, Syllabi, Scheme of Examinations and date of implementation and to introduce Additional Electives, Open Electives, One Credit Courses and Value Added Courses through the Academic Council.

VISION

To build a conducive academic and research environment, to make students adapt to the changing needs of the 21st century, and to foster innovation and entrepreneurship in the field of computer technology

MISSION

1. To provide undergraduate and post graduate programmes with strong, need-based, theoretical foundations as well as practical exposure.
2. To train the students to effectively apply this education in real-world problems and enhance their potential for lifelong learning and career enhancement.
3. To give the students a competitive edge in the challenging global work environment through exposure to state-of-the-art industrial practices and preparation for global technology competitions.
4. To facilitate research activities in collaboration with reputed national and international organizations.
5. To instill best managerial skills and entrepreneurial practices and encourage students towards business start-ups.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

The Graduates will be

I. engineering professionals, innovators or entrepreneurs engaged in technology development, technology deployment, or engineering system implementation in industry.

II. capable of interacting with their peers in other disciplines in industry and society and contribute to the economic growth of the country.

III. successful in pursuing higher studies in engineering or management and pursue career paths in teaching or research.

PROGRAMME OUTCOMES (POs)

Engineering Graduates will be able to:

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

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

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

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

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

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

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

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

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

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

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

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

PROGRAMME SPECIFIC OUTCOMES (PSOs)

- PSO1: Demonstrate the knowledge and technical skills in software development.
- PSO2: Develop practical competencies in Software and Hardware Design.

MAPPING OF PEOs AND POs

POs	a	b	c	d	e	f	g	h	i	j	k	l	PSO1	PSO2
PEO 1	X	X	X	X	X	X	X	X	X					X
PEO 2	X	X	X	X	X	X		X	X	X	X		X	
PEO 3								X	X	X	X	X	X	X

B.Tech Computer Technology
Minimum Credits to be Earned : 170

I SEMESTER

Code No.	Course	L	T	P	C	Hours/ Week	Maximum Marks			Category
							CA	ES	Total	
19CT101	ENGINEERING MATHEMATICS I	3	1	0	4	4	50	50	100	BS
19CT102	ENGINEERING PHYSICS I	2	0	2	3	4	50	50	100	BS
19CT103	ENGINEERING CHEMISTRY I	2	0	2	3	4	50	50	100	BS
19CT104	COMPUTER PROGRAMMING	2	0	2	3	4	50	50	100	ES
19HS101	COMMUNICATIVE ENGLISH I	1	0	2	2	3	100	0	100	HS
19CT106	BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING	2	0	2	3	4	50	50	100	ES
19CT107	PC HARDWARE AND TROUBLESHOOTING	0	0	2	1	2	100	0	100	ES
Total		**12**	**1**	**12**	**19**	**25**	**-**	**-**	**-**	**-**

II SEMESTER

Code No.	Course	L	T	P	C	Hours/ Week	Maximum Marks			Category
							CA	ES	Total	
19CT201	ENGINEERING MATHEMATICS II	3	1	0	4	4	50	50	100	BS
19CT202	ENGINEERING PHYSICS II	2	0	2	3	4	50	50	100	BS
19CT203	ENGINEERING CHEMISTRY II	2	0	2	3	4	50	50	100	BS
19CT204	PROBLEM SOLVING AND PROGRAMMING USING PYTHON	3	0	2	4	6	50	50	100	ES
	LANGUAGE ELECTIVE	1	0	2	2	3	100	0	100	HS
19CT206	DIGITAL SYSTEM DESIGN	3	0	2	4	5	50	50	100	ES
19CT207	ENGINEERING GRAPHICS	1	0	4	3	5	100	0	100	ES
Total		**15**	**1**	**14**	**23**	**31**	**-**	**-**	**-**	**-**

THIRD SEMESTER										
Code No.	**Course**	**L**	**T**	**P**	**C**	**Hours/ Week**	**Maximum Marks**			**Category**
							CA	**ES**	**Total**	
19CT301	ENGINEERING MATHEMATICS III	3	1	0	4	4	50	50	100	BS
19CT302	COMPUTER ORGANIZATION AND ARCHITECTURE	3	0	0	3	3	50	50	100	PC
19CT303	DATA STRUCTURES & ALGORITHMS	3	0	0	3	3	50	50	100	PC
19CT304	DATABASE TECHNOLOGY	3	0	0	3	3	50	50	100	PC
19CT305	OPERATING SYSTEMS	3	1	0	4	4	50	50	100	PC
19CT306	JAVA PROGRAMMING	2	0	4	4	6	50	50	100	PC
19CT307	DATA STRUCTURES & ALGORITHMS LABORATORY	0	0	4	2	4	100	0	100	PC
19CT308	DATABASE TECHNOLOGY LABORATORY	0	0	4	2	4	100	0	100	PC
18GE301	SOFT SKILLS - VERBAL ABILITY	0	0	2	-	2	100	0	100	EEC
Total		**17**	**2**	**14**	**25**	**33**	**-**	**-**	**-**	**-**
FOURTH SEMESTER										
Code No.	**Course**	**L**	**T**	**P**	**C**	**Hours/ Week**	**Maximum Marks**			**Category**
							CA	**ES**	**Total**	
19CT401	PROBABILITY AND STATISTICS	3	1	0	4	4	50	50	100	BS
19CT402	ANALYSIS OF ALGORITHMS	3	1	0	4	4	50	50	100	PC
19CT403	THEORY OF COMPUTATION	3	1	0	4	4	50	50	100	PC
19CT404	SOFTWARE ENGINEERING	3	0	0	3	3	50	50	100	PC
19CT405	MICROPROCESSORS AND MICROCONTROLLERS	3	0	0	3	3	50	50	100	ES
19CT406	COMPUTER NETWORKS	3	0	2	4	5	50	50	100	PC
19CT407	MICROPROCESSORS AND MICROCONTROLLERS LABORATORY	0	0	4	2	4	100	0	100	ES
18HS001	ENVIRONMENTAL SCIENCE	2	0	0	0	2	100	0	100	HS
18GE401	SOFT SKILLS- BUSINESS ENGLISH	0	0	2	-	2	100	0	100	EEC
Total		**20**	**3**	**10**	**24**	**31**	**-**	**-**	**-**	**-**

FIFTH SEMESTER										
Code No.	**Course**	**L**	**T**	**P**	**C**	**Hours/ Week**	**Maximum Marks**			**Category**
							CA	**ES**	**Total**	
19CT501	COMPILER DESIGN	3	1	0	4	4	50	50	100	PC
19CT502	WEB TECHNOLOGY	2	0	0	2	2	50	50	100	PC
19CT503	EMBEDDED SYSTEMS	3	0	2	4	5	50	50	100	PC
19CT504	ARTIFICIAL INTELLIGENCE	3	0	0	3	3	50	50	100	PC
	PROFESSIONAL ELECTIVE I	3	0	0	3	3	50	50	100	PE
	PROFESSIONAL ELECTIVE II	3	0	0	3	3	50	50	100	PE
19CT507	WEB TECHNOLOGY LABORATORY	0	0	2	1	2	100	0	100	PC
19CT508	ARTIFICIAL INTELLIGENCE LABORATORY	0	0	2	1	2	100	0	100	PC
18GE501	SOFT SKILLS – APTITUDE I	0	0	2	-	2	100	0	100	EEC
Total		**17**	**1**	**8**	**21**	**26**	**-**	**-**	**-**	**-**

SIXTH SEMESTER										
Code No.	**Course**	**L**	**T**	**P**	**C**	**Hours/ Week**	**Maximum Marks**			**Category**
							CA	**ES**	**Total**	
18HS003	PRINCIPLES OF MANAGEMENT	2	0	0	2	2	50	50	100	HSS
19CT602	MACHINE LEARNING TECHNIQUES	2	1	0	3	3	50	50	100	PC
19CT603	SECURITY IN COMPUTING	2	0	0	2	2	50	50	100	PC
19CT604	PARALLEL AND DISTRIBUTED COMPUTING	3	0	0	3	3	50	50	100	PC
	PROFESSIONAL ELECTIVE III	3	0	0	3	3	50	50	100	PE
	PROFESSIONAL ELECTIVE IV	3	0	0	3	3	50	50	100	PE
19CT607	MACHINE LEARNING LABORATORY	0	0	2	1	2	100	0	100	PC
19CT608	SECURITY LABORATORY	0	0	2	1	2	100	0	100	PC
18GE601	SOFT SKILLS - APTITUDE II	0	0	2	-	2	100	0	100	EEC
Total		**15**	**1**	**6**	**18**	**22**	**-**	**-**	**-**	**-**

SEVENTH SEMESTER										
Code No.	**Course**	**L**	**T**	**P**	**C**	**Hours/ Week**	**Maximum Marks**			**Category**
							CA	**ES**	**Total**	
18HS002	PROFESSIONAL ETHICS IN ENGINEERING	2	0	0	2	2	50	50	100	HSS
19CT702	DATA SCIENCE	3	0	0	3	3	50	50	100	PC
19CT703	BLOCKCHAIN TECHNOLOGY	3	0	0	3	3	50	50	100	PC
19CT704	CLOUD COMPUTING TECHNIQUES	3	0	0	3	3	50	50	100	PC
	PROFESSIONAL ELECTIVE V	3	0	0	3	3	50	50	100	PE
	PROFESSIONAL ELECTIVE VI	3	0	0	3	3	50	50	100	PE
19CT707	BLOCKCHAIN TECHNOLOGY LABORATORY	0	0	2	1	2	100	0	100	PC
19CT708	CLOUD COMPUTING LABORATORY	0	0	2	1	2	100	0	100	PC
19CT709	PROJECT WORK I	-	-	6	3	6	50	50	100	EEC
Total		**17**	**0**	**10**	**22**	**27**	**-**	**-**	**-**	**-**
EIGHTH SEMESTER										
Code No.	**Course**	**L**	**T**	**P**	**C**	**Hours/ Week**	**Maximum Marks**			**Category**
							CA	**ES**	**Total**	
	PROFESSIONAL ELECTIVE VII	3	0	0	3	3	50	50	100	PE
	PROFESSIONAL ELECTIVE VIII	3	0	0	3	3	50	50	100	PE
	PROFESSIONAL ELECTIVE IX	3	0	0	3	3	50	50	100	PE
19CT804	PROJECT WORK II	0	0	18	9	18	50	50	100	EEC
Total		**9**	**0**	**18**	**18**	**27**	**-**	**-**	**-**	**-**

ELECTIVES

LANGUAGE ELECTIVES

Code No.	Course	L	T	P	C	Hours /week	CA	ES	Total	Categor
18HS201	COMMUNICATIVE ENGLISH II	1	0	2	2	3	100	0	100	HSS
18HSC01	CHINESE	1	0	2	2	3	100	0	100	HSS
18HSF01	FRENCH	1	0	2	2	3	100	0	100	HSS
18HSG01	GERMAN	1	0	2	2	3	100	0	100	HSS
18HSH01	HINDI	1	0	2	2	3	100	0	100	HSS
18HSJ01	JAPANESE	1	0	2	2	3	100	0	100	HSS
PHYSICS ELECTIVES										
18GE0P1	NANOMATERIALS SCIENCE	3	0	0	3	3	50	50	100	BS
18GE0P2	SEMICONDUCTOR PHYSICS AND DEVICES	3	0	0	3	3	50	50	100	BS
18GE0P3	APPLIED LASER SCIENCE	3	0	0	3	3	50	50	100	BS
18GE0P4	BIO-PHOTONICS	3	0	0	3	3	50	50	100	BS
18GE0P5	PHYSICS OF SOFT MATTER	3	0	0	3	3	50	50	100	BS
CHEMISTRY ELECTIVES										
18GE0C1	CORROSION SCIENCE AND ENGINEERING	3	0	0	3	3	50	50	100	BS
18GE0C2	ENERGY STORING DEVICES	3	0	0	3	3	50	50	100	BS
18GE0C3	POLYMER SCIENCE	3	0	0	3	3	50	50	100	BS
MATHEMATICS ELECTIVES										
18GE0M1	GRAPH THEORY AND COMBINATORICS	3	0	0	3	3	50	50	100	BS
18GE0M2	ALGEBRA AND NUMBER THEORY	3	0	0	3	3	50	50	100	BS

18GE0M3	MATHEMATICAL FINANCE AND QUEUEING THEORY	3	0	0	3	3	50	50	100	BS
ENTREPRENEURSHIP ELECTIVES										
18GE0E1	ENTREPRENEURSHIP DEVELOPMENT I	3	0	0	3	3	50	50	100	PE
18GE0E2	ENTREPRENEURSHIP DEVELOPMENT II	3	0	0	3	3	50	50	100	PE
HUMANITIES AND SOCIAL SCIENCE ELECTIVES I										
18HS011	PROJECT MANAGEMENT AND ENTREPRENEURSHIP	2	0	0	2	2	50	50	100	HSS
18HS012	ORGANIZATIONAL BEHAVIOUR	2	0	0	2	2	50	50	100	HSS
18HS013	INTRODUCTION TO INDUSTRIAL MANAGEMENT	2	0	0	2	2	50	50	100	HSS
18HS014	FUNDAMENTALS OF MANAGEMENT FOR ENGINEERS	2	0	0	2	2	50	50	100	HSS
18HS015	MACRO ECONOMICS	2	0	0	2	2	50	50	100	HSS
18HS016	QUANTITATIVE METHODS FOR DECISION MAKING	2	0	0	2	2	50	50	100	HSS
HUMANITIES AND SOCIAL SCIENCE ELECTIVES II										
18HS021	POLITICAL AND ECONOMIC THOUGHT FOR A HUMAN SOCIETY	2	0	0	2	2	50	50	100	HSS
18HS022	EDUCATION, TECHNOLOGY AND SOCIETY	2	0	0	2	2	50	50	100	HSS
18HS023	PSYCHOLOGICAL PROCESS	2	0	0	2	2	50	50	100	HSS
18HS024	VALUES AND ETHICS	2	0	0	2	2	50	50	100	HSS
18HS025	ETHICS AND HOLISTIC LIFE	2	0	0	2	2	50	50	100	HSS
18HS026	CONTEMPORARY INDIA IN GLOBALIZED ERA: CHALLENGES OF DEMOCRACY AND DEVELOPMENT	2	0	0	2	2	50	50	100	HSS
18HS027	UNIVERSAL HUMAN VALUES : SELF, SOCIETY AND NATURE	2	0	0	2	2	50	50	100	HSS
DISCIPLINE ELECTIVES										
19CT001	MOBILE APPLICATION DEVELOPMENT	3	0	0	3	3	50	50	100	PE
19CT002	PROGRESSIVE WEB APP	3	0	0	3	3	50	50	100	PE

19CT003	NATURAL LANGUAGE PROCESSING	3	0	0	3	3	50	50	100	PE
19CT004	DEEP LEARNING	3	0	0	3	3	50	50	100	PE
19CT005	ROBOTICS	3	0	0	3	3	50	50	100	PE
19CT006	ENTERPRISE APPLICATION DEVELOPMENT	3	0	0	3	3	50	50	100	PE
19CT007	ENTERPRISE COMPUTING	3	0	0	3	3	50	50	100	PE
19CT008	SOFTWARE TESTING	3	0	0	3	3	50	50	100	PE
19CT009	XML AND WEB SERVICES	3	0	0	3	3	50	50	100	PE
19CT010	SOCIAL NETWORK ANALYSIS	3	0	0	3	3	50	50	100	PE
19CT011	OPEN STACK ESSENTIALS	3	0	0	3	3	50	50	100	PE
19CT012	CLOUD WEB SERVICES	3	0	0	3	3	50	50	100	PE
19CT013	REACTJS AND REACT NATIVE	3	0	0	3	3	50	50	100	PE
19CT014	NOSQL DATABASE	3	0	0	3	3	50	50	100	PE
19CT015	ADVANCED COMPUTER ARCHITECTURE	3	0	0	3	3	50	50	100	PE
19CT016	INDUSTRIAL AUTOMATION	3	0	0	3	3	50	50	100	PE
19CT017	SOFT COMPUTING	3	0	0	3	3	50	50	100	PE
19CT018	DISTRIBUTED COMPUTING	3	0	0	3	3	50	50	100	PE
19CT019	IONIC FUNDAMENTALS	3	0	0	3	3	50	50	100	PE
19CT020	OPEN SOURCE TECHNOLOGY	3	0	0	3	3	50	50	100	PE
19CT021	HIGH PERFORMANCE COMPUTING	3	0	0	3	3	50	50	100	PE
19CT022	COMPUTER GRAPHICS	3	0	0	3	3	50	50	100	PE
19CT023	ETHICAL HACKING	3	0	0	3	3	50	50	100	PE
19CT024	DATA MINING AND DATA WAREHOUSING	3	0	0	3	3	50	50	100	PE
19CT025	AUGMENTED AND VIRTUAL REALITY	3	0	0	3	3	50	50	100	PE

19CT026	HUMAN COMPUTER INTERACTION	3	0	0	3	3	50	50	100	PE
19CT027	CYBER FORENSICS	3	0	0	3	3	50	50	100	PE
OPEN ELECTIVES										
19CT0YA	PYTHON PROGRAMMING	3	0	0	3	3	50	50	100	PE
19CT0YB	ADVANCED MOBILE COMPUTING	3	0	0	3	3	50	50	100	PE
19CT0YC	WEB PROGRAMMING	3	0	0	3	3	50	50	100	PE
19CT0YD	GPU ARCHITECTURE AND PROGRAMMING	3	0	0	3	3	50	50	100	PE
19CT0YE	CLOUD COMPUTING	3	0	0	3	3	50	50	100	PE
ONE CREDIT COURSES										
19CT0XA	GRAPHQL USING REST API	-	-	-	1	-	100	0	100	EEC
19CT0XB	COMPUTER VISION	-	-	-	1	-	100	0	100	EEC
19CT0XC	GAME PROGRAMMING	-	-	-	1	-	100	0	100	EEC
19CT0XD	LARAVEL	-	-	-	1	-	100	0	100	EEC
19CT0XE	DEVOPS	-	-	-	1	-	100	0	100	EEC
19CT0XF	TRANSFER LEARNING IN DATA SCIENCE	-	-	-	1	-	100	0	100	EEC
19CT0XG	DATABASE INTEGRATION IN WEB DEVELOPMENT	-	-	-	1	-	100	0	100	EEC
19CT0XH	VIDEO ANALYTICS USING EDGE COMPUTING	-	-	-	1	-	100	0	100	EEC
19CT0XI	NLP WITH CHATGPT	-	-	-	1	-	100	0	100	EEC
ADDITIONAL ONE CREDIT COURSES(I to III Semesters)										
18GE0XA	ETYMOLOGY	-	-	-	1	-	100	0	100	EEC
18GE0XB	GENERAL PSYCHOLOGY	-	-	-	1	-	100	0	100	EEC
18GE0XC	NEURO BEHAVIORAL SCIENCE	-	-	-	1	-	100	0	100	EEC
18GE0XD	VISUAL MEDIA AND FILM MAKING	-	-	-	1	-	100	0	100	EEC
18GE0XE	YOGA FOR HUMAN EXCELLENCE	-	-	-	1	-	100	0	100	EEC

18GE0XF	VEDIC MATHEMATICS	-	-	-	1	-	100	0	100	EEC
18GE0XG	HEALTH AND FITNESS	-	-	-	1	-	100	0	100	EEC
18GE0XH	CONCEPT, METHODOLOGY AND APPLICATIONS OF VERMICOMPOSTING	-	-	-	1	-	100	0	100	EEC
18GE0XI	BLOG WRITING	-	-	-	1	-	100	0	100	EEC
18GE0XJ	INTERPERSONAL SKILLS	-	-	-	1	-	100	0	100	EEC
18GE0XK	NEW AGE INNOVATION AND ENTREPRENEURSHIP	-	-	-	1	-	100	0	100	EEC
18GE0XL	NATIONAL CADET CORPS	-	-	-	1	-	100	0	100	EEC
18GE0XM	COMMUNITY SERVICE AND LEADERSHIP DEVELOPMENT	-	-	-	1	-	100	0	100	EEC
18GE0XN	DISRUPTIVE INNOVATION BASED STARTUP ACTIVITIES	-	-	-	1	-	100	0	100	EEC
18GE0XO	SOCIAL PSYCHOLOGY	-	-	-	1	-	100	0	100	EEC

BRIDGE COURSES

19CTB01	COMPUTER PROGRAMMING
19CTB02	BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING

VALUE ADDED COURSES

19CTV01	VFX ANIMATION
19CTV02	MULTIMEDIA AND WEB DEVELOPMENT
19CTV03	ORACLE CLOUD INFRASTRUCTURE (OCI) CERTIFICATION
19CTV04	ORACLE CERTIFIED PROFESSIONAL: JAVA SE 11
19CTV05	IBM CERTIFIED: INFOSPHERE OPTIM FOR DISTRIBUTED SYSTEMS FUNDAMENTALS
19CTV06	VMWARE CERTIFIED TECHNICAL ASSOCIATE

SUMMARY OF CREDIT DISTRIBUTION

S.No	CATEGORY	CREDITS PER SEMESTER								TOTAL CREDIT	CREDITS in %	Range of Total Credits	
		I	II	III	IV	V	VI	VII	VIII			Min	Max
1	BS	10	10	4	4					28	16.4	15%	20%
2	ES	7	11		5					26	13.5	15%	20%
3	HSS	2	2				2	2		8	4.6	5%	10%
4	PC			21	15	15	10	11		72	42.4	30%	40%
5	PE					6	6	6	9	27	15.7	10%	15%
6	EEC							3	9	12	7.5	10%	15%
Total		19	23	25	24	21	18	22	18	170	100	-	-

BS - Basic Sciences

ES - Engineering Sciences

HSS - Humanities and Social Sciences

PC - Professional Core

PE - Professional Elective

EEC - Employability Enhancement Course

CA - Continuous Assessment

ES - End Semester Examination

19CT101 ENGINEERING MATHEMATICS I 3 1 0 4

Course Objectives

- Interpret the introductory concepts of Matrices and Calculus, which will enable them to model and analyze physical phenomena involving continuous changes of variables
- Summarize and apply the methodologies involved in solving problems related to fundamental principles of Matrices and Calculus.
- Develop enough confidence to identify and model mathematical patterns in real world and offer appropriate solutions, using the skills learned in their interactive and supporting environment.

Programme Outcomes (POs)

a. Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
b. Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

Course Outcomes (COs)

1. Apply the idea of Eigen value and Eigen vectors in data science, data visualisation in graphics and solve application problems that can be modelled by systems of linear equations. find the extreme values of the given function
2. Analyze the reliability, safety analysis of engineering systems and design of engineering structures using first order linear differential equations.
3. Analyze the reliability, design of engineering structures using higher order linear differential equations.
4. Apply the techniques of multivariable calculus to problems in mathematics, the physical sciences, and optimize the constrained engineering problems.
5. Compute the area, volume for two dimensional and three dimensional solid structures through the multiple integral techniques.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1	3												
2	2	3												
3	2	3												
4	3	3												
5	1	3												

UNIT I **9 Hours**

MATRICES AND DETERMINANTS

Matrices and determinants- evaluation of determinants, Eigen Values and Eigen Vectors of a real matrix - Properties of Eigen Values, Cayley - Hamilton Theorem.

UNIT II **9 Hours**

ORDINARY DIFFERENTIAL EQUATION OF FIRST ORDER

Formation of differential equations- Leibnitz and Bernoullis first order differential equations-Exact differential equations.

UNIT III **9 Hours**

ORDINARY DIFFERENTIAL EQUATION OF HIGHER ORDER

Higher order linear differential equation with constant coefficients -Higher order linear differential equations with variable coefficients: Cauchy's differential equation - Method of variation of parameter for second order differential equations.

UNIT IV **9 Hours**

MULTIVARIABLE CALCULUS

Partial Derivatives - Total Derivatives - Jacobians and Properties- Unconstrained maxima and minima.

UNIT V **9 Hours**

MULTIPLE INTEGRALS

Double integration with constant and variable limits - Region of integration - Area as double integral in Cartesian coordinates. Volume as triple integral in Cartesian coordinates

FOR FURTHER READING

Applications of mass spring system in ordinary differential equations of higher order

Total: 60 Hours

Reference(s)

1. C. Ray Wylie and C Louis Barrett, Advanced Engineering Mathematics, Sixth Edition, Tata McGraw-Hill Publishing Company Ltd, 2003.
2. Erwin Kreyszig , Advanced Engineering Mathematics, Tenth Edition, Wiley India Private Limited,New Delhi 2015
3. Peter V. O'Neil , Advanced Engineering Mathematics, Seventh Edition , Cengage Learning India Private Limited, 2012
4. B.S. Grewal, Higher Engineering Mathematics, Forty Third Edition, Khanna Publications , New Delhi 2014
5. Glyn James, AdvancedEngineering Mathematics, Third Edition,Wiley India, 2014.
6. M.D. Greenberg, AdvancedEngineering Mathematics, Second Edition, Pearson Education, Inc. 2002.

19CT102 ENGINEERING PHYSICS I 2 0 2 3

Course Objectives

- Understand the transport mechanism of solids based on band gap
- Implement the principles of laser in engineering fields
- Impart knowledge in fiber optics and ultrasonics

Programme Outcomes (POs)

a. Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
b. Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
i. Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

Course Outcomes (COs)

1. Outline the electrical and thermal properties of materials based on band theory
2. Apply the phenomenon of superconductivity in memory storage device
3. Analyze the three different types of optical fibers for data networking
4. Infer the interaction of radiation with matter for optical data storage
5. Illustrate the properties, generation of ultrasonic waves for the transducer applications

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2	1							2					
2	2	1							2					
3	2	2							2					
4	2	1							2					
5	2	2							2					

UNIT I **6 Hours**

TRANSPORT PROPERTIES

Classification of solids based on band theory - concept of free electron - law of mass action - classification of semiconductor based on electrical conductivity - variation of Fermi level with temperature in extrinsic semiconductors

UNIT II **5 Hours**

SUPER CONDUCTING COMPUTER ELEMENTS

Superconductivity - transition temperature - Meissner effect - effect of magnetic field - effect of heavy current - classification of critical magnetic field - computer memory: Cryotron - Josephson junction computer

UNIT III **7 Hours**

OPTICAL FIBERS IN DIGITAL DATA NETWORKING

Basic Principles - dielectric waveguides - types - computations of light accepting angle and figure of merit - optical spectral bands (mobile, aero navigation and earth to satellite radar) - schematic representation of digital communication networks - merits

UNIT IV **6 Hours**

LASER PHYSICS FOR INFORMATION SCIENCE

Properties - interaction of radiation with matter - pumping methods - types of coherent light sources - data storage in compact disc: basic configuration - numerical aperture - CD and optical disc - bar code scanners - laser printing

UNIT V **6 Hours**

ULTRASONIC TRANSDUCERS

Classification of sound waves - properties - piezoelectric transducer: generation and detection of ultrasound waves - scan displays: A scan - B scan - C scan - sonogram

1 **2 Hours**

INTRODUCTION

Exposure to engineering physics laboratory and precautionary measures

2 **6 Hours**

EXPERIMENT 1

Find the band gap value of the given semiconductor diode. Based on the band gap value, identify the given semiconductor

3 **6 Hours**

EXPERIMENT 2

Based on Hall effect, calculate the charge carrier density of a given material

4 **6 Hours**

EXPERIMENT 3

Find the refractive index of a transparent solid with the aid of travelling microscope

5 **4 Hours**

EXPERIMENT 4

Determine the wavelength of given laser source by applying the principle of diffraction

6 **6 Hours**

EXPERIMENT 5

Determine the
(i) wavelength of ultrasonic in a liquid medium,
(ii) velocity of ultrasonic waves in the given liquid
(iii) compressibility of the given liquid using ultrasonic interferometer.

Total: 60 Hours

Reference(s)

1. Basics of laser physics: for students of science and engineering http://www.springer.com/978-3-319- 50650-0.
2. Charles Kittel, Introduction to Solid State Physics, 8th edition, Wiley India Pvt. Ltd., New Delhi, 2014.
3. Arthur Beiser, Shobhit Mahajan and S Rai Choudhury, Concepts of Modern Physics, 6th Edition, Tata McGraw Hill Education Pvt. Ltd., New Delhi, 2014.
4. B. K. Pandey and S. Chaturvedi, Engineering Physics, 1st edition, Cengage Learning India Pvt. Ltd., New Delhi, 2017.
5. Halliday and Resnick, Fundamentals of Physics, 11 th edition, John Wiley and Sons, Inc, 2018.

19CT103 ENGINEERING CHEMISTRY I **2 0 2 3**

Course Objectives

- Identify the properties and applications of optical materials for smart screen
- Summarize the terminologies of electrochemistry and explain the applications of electrochemical instruments
- Classify the materials for data storage in electronic devices
- Outline the applications of organic materials in data storage
- Choose the suitable materials for the fabrications of microprocessors in electronic devices

Programme Outcomes (POs)

a. Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
b. Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
g. Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

Course Outcomes (COs)

1. Compare the inorganic and organic materials used for smart screen fabrication
2. Demonstrate the fabrication of smart screen using conducting material
3. Analyze the type of materials for data storage in electronic devices
4. Identify various organic nanoscale materials in data storage
5. Select suitable materials for fabrication of microprocessor

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2	2					1							
2	2	3												
3	2	2					1							
4	2	2												
5	2	2												

UNIT I **6 Hours**

OPTICAL MATERIAL FOR SMART SCREEN

Types: Inorganic: Rare earth metals [yttrium, lanthanum, cerium, praseodymium, neodymium, europium, terbium and dysprosium] - organic: Organic dielectric material [Polystyrene, PMMA] - organic light emitting diodes [polythiopene].

UNIT II **6 Hours**

CONDUCTING MATERIALS FOR SMART SCREEN

Conductive components: Indium tin oxide [properties and applications] - touch screen [resistive and capacitive]. Chemical components in glass - alumino silicate - gorilla glass.

UNIT III **5 Hours**

MATERIALS FOR DATA STORAGE

Classification - magnetic storage [Iron oxide, cobalt alloy, chromium oxide and barium ferrite] - optical storage [photochromic materials] - solid storage.

UNIT IV **5 Hours**

ORGANIC NANOSCALE MATERIAL FOR DATA STORAGE

Data Storage - classification [media, access, information and volatility] - flexible data storage [transistor Structure] - flexible floating gate - flexible charge trap- flexible ferroelectric- flexible resistive memory with organic material.

UNIT V **7 Hours**

MATERIALS FOR MICROPROCESSOR FABRICATION

Micro electrical components: Fabrication (CVD method) and use of metal oxide materials. Integrated circuit manufacturing - preparation of silicon wafer - masking - photo-resistant materials - classification. Doping: Atomic diffusion, ion implantation, making successive layers. Microcapacitors: Types - electrochemical capacitors, electrolytic capacitors and super capacitors. Soldering materials: copper, tin and silver.

FURTHER READING

Applications of advanced data storage materials in electronic devices. Conducting materials for smart screen

Applications of smart material for microprocessor fabrication.

1 **5 Hours**

EXPERIMENT 1

Estimation of copper content in a sample solution prepared from copper doped optical light emitting diodes

2 **5 Hours**

EXPERIMENT 2

Determination of conductivity of aluminium chloride, aluminium silicate and tin oxide compounds using conductivity meter

3 **5 Hours**

EXPERIMENT 3

Estimation of barium content in a sample solution prepared from iron alloy used in magnetic storage material

4 **4 Hours**

EXPERIMENT 4

Estimation of iron content in sample solution prepared from ferro electric materials using spectrophotometer

5 **6 Hours**

EXPERIMENT 5

Electroless plating of copper on polymeric material used in IC fabrication

6 **6 Hours**

EXPERIMENT 6

Electroless plating of nickel on polymeric material used in IC fabrication

Total: 60 Hours

Reference(s)

1. Smart Materials Taxonomy, Victor Goldade, Serge Shil'ko, Aleksander Neverov, CRC publication, 2015
2. https://www.dmccoltd.com/english/museum/touchscreens/technologies/projected.asp
3. Advanced Magnetic and Optical Materials, edited by Ashutosh Tiwari, Parameswar K. Iyer, Vijay Kumar, Hendrik Swart, wiley publication, 2016
4. Recent Advances of Flexible Data Storage Devices Based on Organic Nanoscaled Materials- Li Zhou, Jingyu Mao, Yi Ren, Su-Ting Han, V A. L. Roy and Ye Zhou, Small 1703126, 2018
5. Padma L Nayak, Polymer Science, 1st Edition, Kalyani Publishers, New Delhi, 2005
6. G.M. Crean, R. Stuck, J.A. Woollam . Semiconductor Materials Analysis and Fabrication Process Control Elsevier publication, 2012

19CT104 COMPUTER PROGRAMMING 2 0 2 3

Course Objectives

- Understand the basics of C primitives, operators, expressions and user defined data types.
- Gain knowledge about the structural programming concepts.
- Develop C++ applications using OOP concepts, files, templates and exceptions

Programme Outcomes (POs)

a. Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
b. Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
c. Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
e. Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
m. PSO1: Demonstrate the knowledge and technical skills in software development.

Course Outcomes (COs)

1. Analyze the basic C programming concepts and implement the control statements
2. Apply the concepts of arrays, strings and functions
3. Analyze the concepts of structures, unions and files in C
4. Apply the features of object oriented programming and basic files and templates.
5. Create applications with advanced concepts like inheritance, virtual functions and exceptions.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	3		3										
2	2	3		3										
3	2	3		3										
4	2	3		3										
5	2	3		3										

UNIT I **6 Hours**

BASICS OF C LANGUAGES

Overview of 'C' Language - Constants, Variables and Data Types - Operators, Expressions and Assignment statements - Managing Input/Output Operations - Formatted I/O - Decision Making – Branching - Looping

UNIT II **6 Hours**

ARRAYS, POINTERS and FUNCTIONS

Arrays - dynamic and multi-dimensional arrays - Character arrays and Strings - String handling Functions - User defined Functions - Categories of Functions – Recursion - Pointers - Declaration, Accessing a variable, dynamic memory allocation – Array Pointer – Pointers and Functions

UNIT III **6 Hours**

STRUCTURES AND UNIONS AND FILE HANLDING

Structures, Unions –File Management in C - Data hierarchy- Files and Streams - Sequential access file- Random access file - Preprocessors.

UNIT IV **6 Hours**

INTRODUCTION TO C++

Basics of C++ - Classes and Objects - Constructor and destructor - Function overloading - Operator overloading - Copy constructor - Assignment operator - Template classes - Static class members - File streams

UNIT V **6 Hours**

INHERITANCE AND POLYMORPHISM

Inheritance - Base classes and derived classes - Inherited member access - Base class initialization - Protected members of a class - Virtual functions - Virtual destructors - Virtual base classes - Virtual base class member access - Exception handling - try...throw...catch block - Nested catch handlers

EXPERIMENT 1 **2 Hours**

Write a C program to perform arithmetic operations on integers and floating point numbers.

EXPERIMENT 2 **2 Hours**

Write a C program to implement ternary operator and relational operators.

EXPERIMENT 3 **2 Hours**

Write a C program to read the values of A,B,C through the keyboard. Add them and after addition check if it is in the range of 100 to 200 or not. Print separate message for each.

EXPERIMENT 4 **2 Hours**

Write a C program to display the roots of a quadratic equation with their types using switch case.

EXPERIMENT 5 **2 Hours**

Write a C program to generate the following triangle. 1

1 2 3

1 2 3 4 5

1 2 3 4 5 6 7

EXPERIMENT 6 **2 Hours**

Write a C program to get a matrix of order 3x3 and display a matrix of order of 4x4, with the fourth row and column as the sum of rows and columns respectively.

EXPERIMENT 7 **2 Hours**

Write a C program to remove the occurrence of "the" word from entered string.

EXPERIMENT 8 **2 Hours**

Write a C program to find the factorial of given number.

EXPERIMENT 9 **2 Hours**

Design a structure to hold the following details of a student. Read the details of a student and display them in the following format Student

details: rollno, name, branch, year, section, cgpa.
****

NAME: ROLL NO: BRANCH: YEAR: SECTION: CGPA:

EXPERIMENT 10 **2 Hours**

Create two files test1.txt and test2.txt and write a C program to read the file text1.txt character by character on the screen and paste it at the end of test2.txt.

EXPERIMENT 11 **2 Hours**

Implementation of operator overloading with class and objects.
1. Write a program to find the square and cube of a number using class and object.
2. Write a program to find the area of rectangle and circle using class and object.
3. Write a program to find whether the given number is an Armstrong number using classes and objects.

EXPERIMENT 12 **2 Hours**

Implementation of operator and function overloading.
1. Write a program to perform conversion from integer to complex number by operator overloading.
2. Write a program to perform from complex number to integer using operator overloading.
3. Write a program to perform addition of two numbers using function overloading.

EXPERIMENT 13 **2 Hours**

Implementation of Class templates and Function templates.
1. Write a program to perform insertion sort using class template.
2. Write a program to perform quick sort using function template.
3. Write a program to perform merge sort using template.

EXPERIMENT 14 **2 Hours**

Implementation of types of Inheritance.
1. Write a program to generate employee payroll using inheritance.
2. Write a program to student details using multilevel inheritances.
3. Write a program to employee details using multiple inheritance.

EXPERIMENT 15 **2 Hours**

Develop a program to implement the concepts in inheritance, virtual functions and exceptions.

Total: 60 Hours

Reference(s)

1. Byron C Gottried, "Programming with C", Schuams' outline series, 2nd edition, Tata McGraw Hill, 2006.
2. Yashavant P. Kanetkar "Understanding Pointers in C", BPB Publications, NewDelhi, 2009.
3. Richard Johnsonbaugh, "Applications Programming In ANSI C", 3rd edition, Pearson Education, 2003.
4. E.Balagurusamy, " Programming in ANSI C " , 4th Edition, Tata McGraw Hill, 2007.
5. Al Kelley, Ira Pohl, "A Book on C: Programming in C", 4th edition, Addison- Wesley Professional, 2010.
6. M.T. Somashekara, "Programming in C", Prentice-Hall of India Pvt.Ltd, 2005.

19HS101 COMMUNICATIVE ENGLISH I 1 0 2 2

Course Objectives

- Read and understand the main points on familiar matters regularly encountered in work, school, or leisure
- Listen and respond in most common situations where English is spoken
- Write simple connected texts on topics which are familiar or of personal interest
- Describe experiences and events, hopes and ambitions and briefly give reasons and explanations for opinions and plans

Programme Outcomes (POs)

i. Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

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

Course Outcomes (COs)

1. Use appropriate grammar & vocabulary that is expected at the BEC Preliminary exam level
2. Understand the general meaning of non-routine letters within own work area, and short reports of a predictable nature
3. Write straightforward, routine letters of a factual nature, and make notes on routine matters, such as taking/placing orders
4. Follow simple presentations/demonstrations
5. Deal with predictable requests from a visitor, state routine requirements, and offer advice within own job area on simple matters

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1									1					
2									2					
3									3					
4										1				
5										2				

UNIT I **9 Hours**

GRAMMER

Tenses Future continuous, Past continuous, Past perfect, Past simple, Past tense responses, Present perfect continuous, Present perfect/past simple Reported speech Adverbs intensifiers Comparatives and superlatives Conditionals 2nd and 3rd Connecting words expressing cause and effect, contrast Phrasal verbs Prepositions of place Simple passive - Wh-questions in the past Question tags Will and going to, for prediction.

UNIT II **9 Hours**

READING

Understanding short real-world notices, messages Detailed comprehension of factual material; skimming and scanning skills - Interpreting visual information Reading for detailed factual information Reading for gist and specific information - Grammatical accuracy and understanding of text structure - Reading and information transfer.

UNIT III **9 Hours**

WRITING

Internal communication including note, message, memo or email - arranging / rearranging appointments, asking for permission, giving instructions - Business correspondence including letter, fax, email apologising and offering compensation, making or altering reservations, dealing with requests, giving information about a product.

UNIT IV **9 Hours**

LISTENING

Listening for specific information Listening for numbers and letters Note completion Listening for gist listening to monologues (presentations, lectures, announcements and briefings) listening to interacting speakers (telephone conversations, face-to-face conversations, interviews and discussions).

UNIT V **9 Hours**

SPEAKING

Exchanging personal and factual information expressing and finding out about attitudes and opinions organise a larger unit of discourse Turn-taking, negotiating, collaborating, exchanging information, expressing and justifying opinions, agreeing and/or disagreeing, suggesting, speculating, comparing and contrasting, and decision-making.

Total: 45 Hours

Reference(s)

1. Alexander Garrett, Cambridge BEC Preliminary Students Book with Answers, Cambridge University Press, 2016.
2. Lan Wood, Anne Williams and Anna Cowper. Pass Cambridge BEC Preliminary, Second Edition, New Delhi, 2014.
3. Norman Whitby. Cambridge Business Benchmark. Pre-Intermediate to Intermediate, Students Book. South Asian Edition, 2018.

19CT106 BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING 2 0 2 3

Course Objectives

- To understand the basic concepts of electric circuits and magnetic circuits.
- To illustrate the construction and operation of various electrical machines and semiconductor devices.
- To learn the fundamentals of communication systems.

Programme Outcomes (POs)

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

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

Course Outcomes (COs)

1. Apply the basic concepts of electric and magnetic circuits.
2. Analyze the types of DC machines.
3. Evaluate the static and dynamic AC machines and explain their operation.
4. Apply the operation of AC and DC drives
5. Apply the characteristics of semiconductor devices and communication systems

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1													
2	2													
3	2													
4	2													
5	2													

UNIT I **7 Hours**

ELECTRIC CIRCUITS

Definition of Voltage, Current, Electromotive force, Resistance, Power & Energy, Ohms law and Kirchoffs Law & its applications - Series and Parallel circuits - Voltage division and Current division techniques - Generation of alternating emf - RMS value, average value, peak factor and form factor- Definition of real, reactive and apparent power.

UNIT II **5 Hours**

DC MACHINES

Introduction of magnetic circuits - Law of Electromagnetic induction, Flemings Right & Left hand rule- Types of induced emf - Definition of Self and Mutual Inductance - DC Motor- Contruction - Working Principle- Applications.

UNIT III **6 Hours**

AC MACHINES

Single Phase Transformer - Alternator - Three phase induction motor - Single phase induction motor - Contruction - Working Principle - Applications.

UNIT IV **5 Hours**

ELECTRICAL DRIVES

Speed control of dc shunt motor and series motor - Armature voltage control - Flux control - Construction and operation of DC servo motor - Construction and operation of DC servo motor stepper motor.

UNIT V **7 Hours**

ELECTRON DEVICES AND COMMUNICATION

Characteristics of PN Junction diode and Zener diode - Half wave and Full wave Rectifiers - Bipolar Junction Transistor - Operation of NPN and PNP transistors - Logic gates - Introduction to communication systems.

FOR FURTHER READING

Voltage Regulator - Stepper motor - Energy meter - SMPS, Satellite and Optical communication.

4 Hours

EXPERIMENT 1

Analyze the VI characteristics of a fixed resistor and a lamp by varying its temperature.

3 Hours

EXPERIMENT 2

Apply the voltage division techniques for series and parallel connections of lamp loads.

3 Hours

EXPERIMENT 3

Apply the current division techniques for series and parallel connections of lamp loads.

4 Hours

EXPERIMENT 4

Understand the concept of electromagnetic induction using copper coil.

4 Hours

EXPERIMENT 5

Understand the construction and working principle of DC machines.

4 Hours

EXPERIMENT 6

Determine the VI Characteristics of PN Junction diode and plot the input and output wave shapes of a half wave rectifier.

4 Hours

EXPERIMENT 7

Realize the working of transistor as an electronic switch through experiments.

4 Hours

EXPERIMENT 8

Lighting applications using logic gates principle.

Total: 60 Hours

Reference(s)

1. T. K. Nagsarkar and M. S. Sukhija, Basic of Electrical Engineering, Oxford University Press, 2011.
2. Smarjith Ghosh, Fundamentals of Electrical and Electronics Engineering, Prentice Hall (India) Pvt. Ltd., 2010
3. A. Sudhakar, Shyammohan S Palli, Circuits and Networks Analysis and Synthesis, Tata McGraw Hill, 2010
4. R. S. Sedha, A Textbook of Applied Electronics, S.Chand & Company Ltd, 2013
5. Muthusubramanian & Salivahanan, Basic Electrical and Electronics Engineering and Communication Engineering, Seventh Edition, Tata MCGraw Hill Education Private Limited, 2011

19CT107 PC HARDWARE AND TROUBLESHOOTING 0 0 2 1

Course Objectives

- Understand the basic hardware components.
- Gain knowledge about installation of operating systems.
- Impart knowledge about hardware assembling and troubleshooting.

Programme Outcomes (POs)

a. Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
b. Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
e. Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

Course Outcomes (COs)

1. Identify the basic hardware components.
2. Install and configure Windows and Linux operating systems.
3. Install and configure software packages and drivers.
4. Assemble and troubleshoot hardware devices.
5. Install and work with office automation software.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	2												
2					3									
3		2			3									
4	3				1									
5	2	2			3									

LIST OF EXPERIMENTS

1. Exploring the Functions and Components of a PC
2. Disassembling/Assembling the System Unit and Identifying Internal Components and Connections.
3. Exploring Motherboard Features with CPU
4. Install, upgrade and configure Windows operating systems.
5. Install and configure computer drivers and system components.
6. Install, upgrade and configure Linux operating systems.
7. Disk formatting, partitioning and Configuring the Command-Line Window

8. Remote desktop connections and file sharing.
9. Identify, install and manage network connections Configuring IP address and Domain name system
10. Installation Antivirus and configure the antivirus.
11. Installation of printer and scanner software.
12. Troubleshooting and Managing Systems

Total: 30 Hours

Reference(s)

1. Mike Meyers, "CompTIA A+® Guide to Managing and Troubleshooting PCs Lab Manual", Fifth Edison,Tata McGraw-Hill, 2016.
2. Craig Zacker& John Rourke, "The complete reference: PC hardware", Tata McGraw-Hill, 2017.
3. Mike Meyers, "Introduction to PC Hardware and Troubleshooting", Tata McGraw-Hill, 2017.

3 1 0 4

19CT201 ENGINEERING MATHEMATICS II

Course Objectives

- Understand the concepts of partial derivatives and multiple integrals to define the area, volume and extreme values of various surfaces in engineering fields.
- Classify the sequences and series in linear systems is convergent or divergent.
- Formulate the real time engineering problem into mathematical model using ordinary differential equation and solve it by appropriate method.

Programme Outcomes (POs)

a. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems
b. Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

Course Outcomes (COs)

1. Illustrate the various parameters in partial differentiation and characterize the maxima and minima functions for signals and systems.
2. Apply multiple integral concepts to calculate the area and volume by appropriate vector integral theorems.
3. Analyze the convergence and divergence of sequences and series by various tests.
4. Construct first order differential equations from real time phenomena and solve it by suitable method.
5. Execute the appropriate method to solve the second order differential equations.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	1	3										
2	3	1										
3	1											
4	2											
5		3										

9 Hours

UNIT I

PARTIAL DIFFERENTIATION

Functions of several variables, plotting of 2-variable functions, introduction to cylindrical and spherical coordinates, chain rule, total differential, gradient, directional derivatives, normal lines and tangent planes, extreme of functions of two variables, applications.

UNIT II **9 Hours**

MULTIPLE INTEGRALS

Double integrals, regions of integrations, triple integrals, applications (Cartesian coordinates only- Greens theorem and Gauss Divergence theorem).

UNIT III **9 Hours**

SEQUENCES AND SERIES

Sequences and series, convergence and divergence of series, absolute convergence, conditional convergence, test for convergence and divergence. Power series for functions, interval of convergence, Taylor and Maclaurin series, Taylors Theorem with remainder.

UNIT IV **9 Hours**

FIRST ORDER DIFFERENTIAL EQUATIONS

Separable differential equations, homogeneous differential equations, exact differential equations, integrating factor, Bernoullis equation, applications

UNIT V **9 Hours**

SECOND ORDER DIFFERENTIAL EQUATIONS

Second order homogeneous and non-homogeneous equations with constant coefficients, variation of parameters, method of undetermined coefficients, series solutions of differential equations, applications.

FOR FURTHER READING

Applications of mass spring system in ordinary differential equations of higher order

Total: 60 Hours

Reference(s)

1. Finney RL, Weir MD and Giordano FR, Thomas Calculus, 10th edition, Addison-Wesley, 2001
2. Smith RT and Minton RB, Calculus, 2nd Edition, McGraw Hill, 2002.Kreysgiz E, Advanced Engineering Mathematics, 8th edition, John Wiley & Sons, 1999.
3. Ray Wylie and C Louis Barrett, Advanced Engineering Mathematics, Sixth Edition, Tata McGraw-Hill Publishing Company Ltd, 2003.
4. Peter V. O Neil , Advanced Engineering Mathematics, Seventh Edition , Cengage Learning India Private Limited, 2012.
5. Glyn James, Advanced Engineering Mathematics, Third Edition,Wiley India, 2014.

19CT202 ENGINEERING PHYSICS II **2 0 2 3**

Course Objectives

- Understand the conduction mechanism of conductors, semiconductors and insulators
- Implement the principles of magnetism for data storage
- Impart knowledge in electronic display devices

Programme Outcomes (POs)

a. Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

b. Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

i. Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

Course Outcomes (COs)

1. Attribute the thermal and electrical properties of conducting materials to their resistivity
2. Assess the characteristics of semiconductors and classify based on Fermi level
3. Outline the types of polarization and breakdown mechanisms in dielectrics
4. Explain the Hysteresis curve of ferromagnetic materials for magnetic storage devices
5. Illustrate the working principle of LED, OLED and LCD

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2	1							2					
2	2	1							2					
3	2	2							2					
4	2	1							2					
5	2	1							2					

UNIT I **6 Hours**

CONDUCTING MATERIALS

Electrical Conductivity: classification of materials based on resistivity- relaxation and collision time- mean free path - Fermi function. Thermal conductivity: temperature coefficient of resistance - lattice vibrations- conducting properties of copper and aluminum.

UNIT II **6 Hours**

SEMICONDUCTING MATERIALS

Characteristics of semiconductors - Classification based on combination and electrical conductivity- formation of N type and P type semiconductors- variation of energy level with impurities concentration.

UNIT III **7 Hours**

DIELECTRIC MATERIALS

Characteristics-Types of polarization mechanisms - polar and non-polar molecules –breakdown mechanisms: Thermal and electrochemical breakdown – ferroelectric materials.

UNIT IV **6 Hours**

MAGNETIC MATERIALS

Ferro magnetic materials- Hysteresis curve- Hard and soft magnetic materials- magnetic recording and read out process in hard disc– giant magneto resistance (GMR) effect.

UNIT V **5 Hours**

DISPLAY DEVICES

Luminescence – types of luminescence - LED, OLED and LCD: principle, construction, working, advantages and disadvantages.

LAB EXERCISES

EXPERIMENT 1 **2 Hours**

Exposure to Engineering Physics Laboratory and precautionary measures

EXPERIMENT 2 **4 Hours**

Determine the coefficient of thermal conductivity of a bad conductor using Lees disc apparatus

EXPERIMENT 3 **4 Hours**

Determine the V-I characteristics of a solar cell

EXPERIMENT 4 **4 Hours**

Find the refractive index of a transparent liquid with the aid of travelling microscope

EXPERIMENT 5 **4 Hours**

Draw the B-H curve of a ferromagnetic material subjected to external magnetic field and hence identify the nature of the material.

EXPERIMENT 6 **4 Hours**

Determine the wavelength of polychromatic source in the visible region using spectrometer

EXPERIMENT 7 **4 Hours**

Find the refractive index of a transparent solid with the aid of travelling microscope

EXPERIMENT 8 **4 Hours**

Determination of energy loss per cycle of a ferromagnetic material using hysteresis curve

Total: 60 Hours

Reference(s)

1. Balasubramaniam, R. “Callister's Materials Science and Engineering”. Wiley India Pvt.Ltd., 2014.
2. Kasap, S.O. “Principles of Electronic Materials and Devices”. McGraw-Hill Education, 2017.
3. Wahab, M.A. “Solid State Physics: Structure and Properties of Materials”. Alpha Science International Ltd., 2017.
4. Donald A. Neamen. “Semiconductor Physics and Devices”, Mc Graw-Hill, 2011.
5. Palanisamy P. K. “Physics for electronics and information science”. Dipti Press Pvt. Ltd.2018.

19CT203 ENGINEERING CHEMISTRY II 2 0 2 3

Course Objectives

- Classify the traditional and advanced materials used to manage heat developed in electronic devices
- Summaries the terminologies of electrochemistry and explain the applications of energy storage devices for computers
- Indicate the types, properties and applications of nanochips and carbon nanotubes used in electronic devices
- Outline sources of e-wastes and its effects on environment and its management

Programme Outcomes (POs)

a. Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
b. Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
g. Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

Course Outcomes (COs)

1. compare the metals and alloys used as thermal management materials in electronic devices
2. interpret the advanced thermal management materials for microelectronics and optoelectronics
3. analyze the importance of primary, secondary batteries and fuel cells used in energy storage devices in computers
4. identify suitable nanomaterial used for diverse applications in electronic devices
5. select a suitable technology to manage e-wastes from various electronic devices

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2	2					1							
2	2	3												
3	2	2					1							
4	2	2												
5	2	2												

UNIT I **6 Hours**

THERMAL MANAGEMENT MATERIALS

Heat Generation – purpose - classification of electronic packaging –- types of thermal management materials - traditional thermal management materials : metals [Cu, Al, W and Mo] – compounds [Al_2O_3, BeO, AlN, SiC and Kovar Alloy]

UNIT II **6 Hours**

ADVANCED THERMAL MANAGEMENT MATERIALS

Alloys : W-Cu, Mo-Cu, Cu/MoCu/Cu, AlSiC, Cu/SiC and W85-Cu. fiber-reinforced material - sandwich structure of composite – thermal management materials for microelectronics and optoelectronics: carbon nanotubes and aluminium/diamond composites

UNIT III **6 Hours**

ENERGY STORAGE DEVICES FOR COMPUTERS

Cell – cell potential – determination of potential. Batteries –types: primary battery [Zinc-carbon]. Secondary battery: lead-sulphur. Modern battery: lithium polymer battery and fuel cells.

UNIT IV **6 Hours**

NANOMATERIALS

Nano chips – types of material - properties - applications. Carbon nanotubes, fullerene, graphene: types and applications

UNIT V **6 Hours**

E- WASTE MANAGEMENTS

Sources – toxicity due hazardous substances – impact to environment. E-waste management- Hazardous materials recycling (Gallium, Arsenic, etc.,).

LAB EXERCISES

EXPERIMENT1 **6 Hours**
Determination of thermal stability of aluminium oxide using thermo gravimetric analysis

EXPERIMENT2 **6 Hours**
Determination of thermal stability of copper alloys using thermo gravimetric analysis

EXPERIMENT3 **6 Hours**
Determination of single electrode potential of zinc and copper electrodes 6 Hours

EXPERIMENT4 **6 Hours**
Preparation of cadmium nanoparticles and its characterization

EXPERIMENT5 **6 Hours**
Estimation of chromium and lead content in sample solution prepared from e-waste [PCB] using spectrophotometer

Total: 60 Hours

Reference(s)

1. Ravi Kandasamy, Arun S. Mujumdar. Thermal Management of Electronic Components. Lap Lambert Academic Publishing GmbH KG, 2010.
2. Guosheng Jiang, Liyong Diao, Ken Kuang. Advanced Thermal Management Materials. Springer Science & Business Media, 2012.
3. Nihal Kularatna. Energy Storage Devices for Electronic Systems: Rechargeable Batteries and Supercapacitors. Academic Press, 2014.
4. Odne Stokke Burheim. Engineering Energy Storage. Academic Press, 2017.

5. M. S. Dresselhaus, G. Dresselhaus, P. C. Eklund. Science of Fullerenes and Carbon Nanotubes: Their Properties and Applications. Elsevier, 1996.
6. Kazuyoshi Tanaka, S. Iijima. Carbon Nanotubes and Graphene. Edition 2, Newnes, 2014.

19CT204 PROBLEM SOLVING AND PROGRAMMING USING PYTHON 3 0 2 4

Course Objectives

- Design, write, debug and run python programs using IDE tools
- Develop applications to manipulate the data available in list and set
- Develop applications to manipulate files

Programme Outcomes (POs)

a. Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
b. Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
d. Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

Course Outcomes (COs)

1. Analyze simple python programs using input output operations.
2. Create python programs using expressions and statements.
3. Create python programs using control flow statements and strings.
4. Apply the concepts of functions and files in python programming.
5. Create applications using list, sets, tuples and dictionaries in python.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	3		3										
2	2	3		3										
3	2	3		3										
4	2	3		3										
5	2	3		3										

UNIT I **9 Hours**

THEORY COMPONENT CONTENTS BASICS OF PYTHON PROGRAMMING

Introduction-Python interpreter- interactive and script mode; values and types, operators, expressions, statements, precedence of operators, Multiple assignments, comments.

UNIT II **9 Hours**

CONTROL STATEMENTS AND FUNCTIONS IN PYTHON

Conditional (if), alternative (if-else), chained conditional (if-elif-else); Iteration: state, while, for, Break, continue, pass; Functions: Introduction, inbuilt functions, user defined functions, passing parameters, return values, recursion.

UNIT III **9 Hours**

DATA STRUCTURES: STRINGS, LISTS, SET

Strings: string slices, immutability, string methods and operations; Lists: creating lists, list operations, list methods, mutability, aliasing, cloning lists, list and strings, list and functions ; list processing : list comprehension, searching and sorting, Sets: creating sets, set operations.

UNIT IV **9 Hours**

DATA STRUCTURES: TUPLES, DICTIONARIES

Tuples: Tuple assignment, Operations on Tuples, lists and tuples, Tuple as return value; Dictionaries: operations and methods, Nested Dictionaries.

UNIT V **9 Hours**

FILES, MODULES, PACKAGES

Files and exception: text files, reading and writing files, format operator, exception handling, modules, packages.

EXPERIMENT 1 **2 Hours**

Programs using expressions and input and output statements.

EXPERIMENT 2 **2 Hours**

Programs using operators and built in functions.

EXPERIMENT 3 **2 Hours**

Programs using conditional statements.

EXPERIMENT 4 **2 Hours**

Programs performing all string operations.

EXPERIMENT 5 **2 Hours**

Programs using functions

EXPERIMENT 6 **2 Hours**

Programs to find square root, GCD, exponentiation, sum an array of numbers

EXPERIMENT 7 **2 Hours**

Programs to perform linear search, binary search

EXPERIMENT 8 **2 Hours**

Programs to perform operations on list

EXPERIMENT 9 **2 Hours**

Programs using dictionary and set

EXPERIMENT 10 **2 Hours**

Programs to work with Tuples.

2 Hours

EXPERIMENT 11

Programs to sort elements (Selection, Insertion, Merge, Quick)

2 Hours

EXPERIMENT 12

Program to perform word count in file.

2 Hours

EXPERIMENT 13

Program to perform file operations

2 Hours

EXPERIMENT 14

Program to count the number of characters, words and lines in a text file

2 Hours

EXPERIMENT 15

Programs using modules and packages

Total: 75 Hours

Reference(s)

1. Ashok NamdevKamthane,Amit Ashok Kamthane, Programming and Problem Solving with Python , Mc-Graw Hill Education,2018.
2. Allen B. Downey, Think Python: How to Think Like a Computer Scientist, Second edition, Updated for Python 3, Shroff / O'Reilly Publishers, 2016
3. Robert Sedgewick, Kevin Wayne, Robert Dondero, Introduction to Programming in Python: An Inter-disciplinary Approach, Pearson India Education Services Pvt. Ltd., 2016.
4. Timothy A. Budd, Exploring Python, Mc-Graw Hill Education (India) Private Ltd., 2015.
5. Kenneth A. Lambert, Fundamentals of Python: First Programs, CENGAGE Learning, 2012.
6. Charles Dierbach, Introduction to Computer Science using Python: A Computational Problem Solving Focus, Wiley India Edition, 2013.

19CT206 DIGITAL SYSTEM DESIGN 3 0 2 4

Course Objectives

- Understand the fundamentals of digital logic
- Understand the implementation of logic circuits.
- Analyse and design various combinational and sequential circuits.

Programme Outcomes (POs)

a. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems
b. Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
c. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations

Course Outcomes (COs)

1. Apply the boolean algebra and logic gates.
2. Analyze and design combinational circuits.
3. Analyze synchronous sequential logic
4. Apply the procedures in Asynchronous sequential logic
5. Create the design with MSI devices

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2	1												
2	2	2	3											
3	2	2	3											
4	2	1	1											
5	2	2	3											

UNIT I **9 Hours**

BOOLEAN ALGEBRA AND LOGIC GATES

Number systems and conversions - Boolean algebra - Minterm - Maxterm - SOP and POS forms - NAND and NOR implementation - Simplification of Boolean functions: K Map - Don't care conditions - Five variable K map - Quine Maccluskey method - Logic gates.

UNIT II **9 Hours**

COMBINATIONAL LOGIC

Combinational circuits - Analysis procedures - Design procedures - Adders - Subtractors - Binary adder - Carry Look Ahead Adder - BCD Adder - Magnitude comparator - Code Converters - Multiplexers and Demultiplexers- Function realization using multiplexers - Decoders and encoders.

10 Hours

UNIT III

SYNCHRONOUS SEQUENTIAL LOGIC

Sequential circuits - Flip flops - Flip Flop Conversion - Analysis procedures - Design procedures - Moore and Mealy models - State reduction and state assignment - Shift Registers - Counters.

UNIT IV **10 Hours**

ASYNCHRONOUS SEQUENTIAL LOGIC

Design of Asynchronous sequential circuits - Analysis procedure: Transition Table - Flow Table - Race Condition- stability, Design Procedure: Primitive Flow Table- Reduction- Transition Table- Race Free State Assignment- Hazards

7 Hours

UNIT V

DESIGN WITH MSI DEVICES

Programmable Logic Devices (PLD) - Programmable Logic Array (PLA) - Programmable Array Logic (PAL) - Field Programmable Gate Arrays (FPGA) - Implementation of combinational logic circuits using ROM, PLA, PAL

FOR FURTHER READING

Design of a simple CPU - ASM charts - Hardware Description Language - RTL Design

2 Hours

EXPERIMENT 1

Implement Boolean Laws using Logic Gates

4 Hours

EXPERIMENT 2

Implement arithmetic circuits (Adder, Subtractor)

2 Hours

EXPERIMENT 3

Construct Code convertors (BCD, Gray, Excess -3)

4 Hours

EXPERIMENT 4

Construct Parity generator and parity checker

2 Hours

EXPERIMENT 5

Construct Magnitude comparator

4 Hours

EXPERIMENT 6

Demonstrate Multiplexer and Demultiplexers

2 Hours

EXPERIMENT 7

Function realization using multiplexers

4 Hours

EXPERIMENT 8

Demonstrate Encoder and Decoder

2 Hours

EXPERIMENT 9

Construct synchronous and Ripple counter

4 Hours

EXPERIMENT 10

Implement shift register (SISO, SIPO, PISO, PIPO)

Total: 75 Hours

Reference(s)

1. M.Morris Mano and Michael D Ciletti, Digital Design with an introduction to the VHDL, Pearson Education, 5th Edition, 2013
2. A Anand Kumar, Fundamentals of Digital Circuits, 3rd Edition,2014
3. Charles H.Roth, Jr., Fundamentals of Logic Design, 4th Edition, Jaico Publishing House, 2000
4. Mandal, Digital Electronics Principles & Application, McGraw Hill Edu, 2013.
5. Donald D.Givone, Digital Principles and Design, Tata McGraw-Hill, 2003
6. John M.Yarbrough, Digital Logic, Application & Design, Thomson, 2002.

19CT207 ENGINEERING GRAPHICS **1 0 4 3**

Course Objectives

- Provide knowledge on projection of points and lines.
- Impart skill in drawing projection of simple solids.
- Build the proficiency to create two dimensional sketches using software.

Programme Outcomes (POs)

a. Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
i. Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
m. PSO1: Demonstrate the knowledge and technical skills in software development.

Course Outcomes (COs)

1. Illustrate the projection of points and lines in different quadrants.
2. Construct orthographic projections of simple solids.
3. Create the orthographic and isometric projections of simple solids.
4. Sketch the two dimensional views of engineering components using software.
5. Construct three dimensional models of engineering components and its orthographic views using software.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2								1				1	
2	2								1				1	
3	2								1				1	
4	2								1				1	
5	2								1				1	

UNIT I **10 Hours**

PROJECTION OF POINTS

Practices on lettering, numbering and dimensioning of drawings. Principles of projection, Projection of points in four quadrants, first angle projection of straight lines – parallel, perpendicular and inclined to anyone plane.

UNIT II **12 Hours**

PROJECTION OF SOLIDS

Orthographic projection of simple solids – parallel, perpendicular and inclined to one plane using change of position method.

UNIT III **14 Hours**

ISOMETRIC AND PERSPECTIVE PROJECTION

Conversion of isometric to orthographic projection and vice versa. Perspective projection of simple solids.

UNIT IV **10 Hours**

CREATION OF 2D SKETCHES USING SOFTWARE

Sketch Entities – line, circle, arc, rectangle, slots, polygon, text, snap, and grid. Sketch Tools-fillet, chamfer, offset, convert entities, trim, extend, mirror, move, copy, rotate, scale, stretch, sketch pattern. Geometrical constraints, Dimensioning - smart, horizontal, vertical, ordinate.

UNIT V **14 Hours**

PART MODELING AND DRAFTING USING SOFTWARE

Part Modeling- extrude, cut, revolve, creation of planes, fillet, chamfer, shell, rib, pattern, mirror, loft, draft and swept. Drafting - Converting 3D models to orthographic views with dimensions.

Total: 75 Hours

Reference(s)

1. K Venugpoal, Engineering Drawing and Graphics, Third edition, New Age International, 2005.
2. BasantAgrawal, Mechanical drawing, Tata McGraw-Hill Education, 2008.
3. Engineering Drawing Practice for Schools & Colleges, Bureau of Indian Standards-Sp46, 2008.
4. N. D. Bhatt and V. M. Panchal, Engineering Drawing, Charotar Publishing House Pvt. Limited, 2008.
5. K.V. Natarajan, A Text Book of Engineering Graphics, Dhanalakshmi Publishers, 2013.

19CT301 ENGINEERING MATHEMATICS III 3 1 0 4

Course Objectives

- Interpret the introductory concepts of Logic, which will enable them to model and analyze physical phenomena involving continuous changes of variables
- Implement the definitions of relevant vocabulary from graph theory and Combinatory and be able to perform related calculations.
- Summarize and apply the methodologies involved in solving problems related to fundamental principles of polynomial equations and Implement the mathematical ideas for interpolation numerically.

Programme Outcomes (POs)

a. Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
b. Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

Course Outcomes (COs)

1. Interpret the concepts of direct proof, indirect proof and proof by contradiction and verify the validity of an argument using propositional and predicate logic.
2. Apply graph theory models of data structures and state machines to solve problems of connectivity and constraint satisfaction.
3. Demonstrate the equations into Algebraic, Transcendental or simultaneous and apply the techniques to solve them numerically and implement an appropriate numerical method for interpolation.
4. Apply numerical computational techniques to obtain the solutions of first order ordinary differential equations, numerically
5. Develop the identification of Numerical errors arise during computations due to round-off errors and truncation errors.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1	2												
2	2	2												
3	2	1												
4	2	2												
5	1	2												

UNIT I **12 Hours**

LOGIC

Propositional Logic- Truth tables- Tautologies and Contradictions- Rules of inference- Predicate Logic.

UNIT II **10 Hours**

SET THEORY AND GRAPHS

Sets: Relations- Equivalence relations- Functions- Graphs: Graph- Isomorphism- connected graphs Trees- Shortest path problem

UNIT III **9 Hours**

NUMERICAL SOLUTION OF LINEAR EQUATIONS AND INTERPOLATION

Algebraic and transcendental equations: Newton - Raphson method - Solution of system of linear equations: Gauss elimination method - Matrix inversion: Gauss- Jordan method - Eigen value of a matrix by power method-Polynomial interpolation and cubic spline interpolation.

UNIT IV **10 Hours**

NUMERICAL SOLUTIONS OF ORDINARY DIFFERENTIAL EQUATIONS

Single and multi-variable nonlinear equations- convergence of fixed point iterations- Least squares approximation- Normal equations- Single step methods- Runge-Kutta methods- Multi-step methods- Finite Difference Methods

UNIT V **4 Hours**

ERROR ANALYSIS

Errors- Truncation and round off errors- measurement errors- Chebychev Polynomial and data filtering.

Total: 60 Hours

Reference(s)

1. Greenberg Michael D,Advanced Engineering Mathematics, Prentice-Hall International Inc, 1998.
2. James Glyn, Advanced Modern Engineering Mathematics, Addison-Wesley, 1993.
3. Kreyszig Erwin, Advanced Engineering Mathematics, 7th Edition, John Wiley, 1993
4. Kenneth H Rosen, Discrete Mathematics and its Applications with Combinatorics and Graph Theory, Seventh Edition, Seventh Edition, Mc Graw Hill Education India Private Limited, New Delhi, 2013.
5. An Introduction to Error Analysis: The Study of Uncertainties Measurements, John R. Taylors University of Science Books, 1996.

19CT302 COMPUTER ORGANIZATION AND ARCHITECTURE 3 0 0 3

Course Objectives

- Understand of the basic structure and operation of a digital computer
- Impart knowledge about the operation of the arithmetic unit including the algorithms & implementation addition, subtraction, multiplication & division.
- Acquire knowledge about the diverse ways of communicating with I/O devices and standard I/O Interfaces

Programme Outcomes (POs)

a. Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
b. Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
c. Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

Course Outcomes (COs)

1. Apply the basic structure of a digital computer and instruction sets with addressing modes
2. Apply the arithmetic operations of binary number system.
3. Analyze the organization of the basic processing unit and examine the basic concepts of pipe- lining
4. A n alyze the standard I/O interfaces and peripheral devices
5. Evaluate the performance of different types of memory

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	2	2											
2	3	3	2											
3	2	3	3											
4	2	2	2											
5	2	2	2											

UNIT I **9 Hours**

STRUCTURE OF COMPUTERS

Functional units-Basic operational concepts-Bus structures-Software-performance-Memory locations and addresses- Memory operations- Instruction and instruction sequencing- Addressing modes- Basic I/O operations

UNIT II **9 Hours**

ARITHMETIC OPERATIONS

Addition and subtraction of signed numbers- Design of fast adders- Multiplication of positive numbers- Signed operand multiplication and fast multiplication-Integer division

UNIT III **11 Hours**

BASIC PROCESSING UNIT

Fundamental concepts-Execution of a complete instruction-Multiple bus organization-Hardwired control- Microprogrammed control-Pipelining: Basic concepts-Data hazards-Instruction hazards-Influence on Instruction sets-Data path and control consideration-Superscalar operation

UNIT IV **8 Hours**

INPUT/OUTPUT ORGANIZATION

Accessing I/O devices - Interrupts - Direct Memory Access-Buses - Interface I/O-Interfaces (PCI, SCSI, USB)

UNIT V **8 Hours**

MEMORY UNIT

Basic concepts - Semiconductor RAMs-ROM's-Speed-size and cost-Cache memories-Performance consideration-Virtual memory-Memory Management requirements-Secondary storage.

FOR FURTHER READING

Categories of Instruction Set Architectures (ISA)- Multistage pipelines with variable latencies-branch prediction- Very large Instruction Word (VLIW) architectures- Instruction Level Parallelism (ILP)- Examples of modern processors- Hyper threading (HT)- Simultaneous Multithreading (SMT)- Multicore chips (Chip Multiprocessing)

Total: 45 Hours

Reference(s)

1. CarlHamacher, Zvonko Vranesicand Safwat Zaky, Computer Organization, McGraw-Hill,Third Reprint2015
2. William Stallings,Computer Organization and Architecture Designing for Performance, Pearson Education,2003
3. DavidA, Pattersonand JohnL, Hennessy, Computer Organization and Design: The hardware/software interface, MorganKaufmann,4th edition, 2014.
4. John P.Hayes, Computer Architecture and Organization, McGraw Hill,3rd edition, 2002.

19CT303 DATA STRUCTURES & ALGORITHMS 3 0 0 3

Course Objectives

- Implement abstract data types for linear data structures.
- Apply the different linear and non-linear data structures to problem solutions.
- Critically analyze the various sorting algorithms.

Programme Outcomes (POs)

a. Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
b. Identify, formulate, review research literature, and analyse complex engineering problems reaching
substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
c. Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
m. PSO1: Demonstrate the knowledge and technical skills in software development.

Course Outcomes (COs)

1. Apply the basic concept of data structure and identify the need for list data structures and its operations
2. Apply the concept of stacks and queues with suitable applications.
3. Analyze the types of tree data structures and explain its functionalities.
4. Apply the concept of graph data structures with examples.
5. Create the algorithms for searching and sorting techniques

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2	3											1	
2	2	2	3										2	
3	2	3	3										3	
4	2	3	3										3	
5	2	3	3										3	

UNIT I **9 Hours**

LINEAR DATA STRUCTURES - LIST

Pseudo code-Algorithm efficiency -Designing recursive algorithms - Recursive examples. -Abstract Data Types (ADTs) - List ADT - array-based implementation - linked list implementation -singly linked lists- circularly linked lists- doubly-linked lists -applications of lists -Polynomial Manipulation -All operations (Insertion, Deletion, Merge, Traversal).

UNIT II **9 Hours**

LINEAR DATA STRUCTURES - STACKS, QUEUES

Stack ADT - Operations - Applications - Evaluating arithmetic expressions- Conversion of Infix to postfix expression - Queue ADT - Operations - Circular Queue - Priority Queue- deQueue - applications of queues.

UNIT III **9 Hours**

NON LINEAR DATA STRUCTURES - TREES

Tree ADT - tree traversals - Binary Tree ADT - expression trees - applications of trees - binary search tree ADT - AVL Trees - B-Tree - Heap - Applications of heap.

UNIT IV **9 Hours**

NON LINEAR DATA STRUCTURES - GRAPHS

Definition - Representation of Graph - Types of graph - Breadth-first traversal - Depth-first traversal - Topological Sort - Shortest Path Algorithms: Unweighted Shortest Paths - Dijkstra's Algorithm. Minimum Spanning Tree: Prim's Algorithm Kruskal's Algorithm.

UNIT V **9 Hours**

SEARCHING, SORTING AND HASHING TECHNIQUES

Searching- Linear Search - Binary Search. Sorting - Bubble sort - Selection sort - Insertion sort – Shell sort - Radix sort. Hashing- Hash Functions - Separate Chaining - Open Addressing - Rehashing - Extendible Hashing.

FOR FURTHER READING

Applications of list - Red-Black trees - Splay trees- Bucket hashing - Introduction to NP Completeness

Total: 45 Hours

Reference(s)

1. Mark Allen Weiss, Data Structures and Algorithm Analysis in C, 2nd Edition, Pearson Education,2016.
2. Richard F. Gilberg, and Behrouz A. Forouzan, Data Structures - A Pseudocode Approach with C, Thomson 2011.
3. Aho, J.E.Hopcroft and J.D.Ullman, Data Structures and Algorithms, Pearson education, Asia, 2010.
4. Reema Thareja, Data Structures Using C, Second Edition, Oxford University Press, 2011

19CT304 DATABASE TECHNOLOGY 3 0 0 3

Course Objectives

- Understand the data models, conceptualize and depict a database system using E-R diagram.
- Gain knowledge on the design principles of a relational database system and SQL.
- Impart knowledge in transaction processing, concurrency control and recovery techniques.

Programme Outcomes (POs)

a. Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
b. Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
c. Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
e. Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
m. PSO1: Demonstrate the knowledge and technical skills in software development

Course Outcomes (COs)

1. Analyze database systems from file system by understanding the features of database system and design a ER model for a database system.
2. Apply the solutions to a broad range of query and data update problems using relational algebra, relational calculus and SQL.
3. Apply the normalization theory in relational databases for removing anomalies.
4. Analyze database storage and access techniques for file organization, indexing methods and Query Processing.
5. Analyze the basic issues of transaction processing, concurrency control, deadlock and its recovery schemes

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1	2	3											
2	1	2	3		2								3	
3	2	3											2	
4	2	3												
5	1	3	2										1	

UNIT I **8 Hours**

INTRODUCTION

Introduction: Database system application, purpose of database system View of Data - Database Languages-Data Storage and Querying-Database Architecture - Database design and ER model: Overview of the design process-The ER Model - Constraints - Removing redundant attributes in Entity Sets-ER Diagram - Reduction to Relational Schemas - ER Design Issues.

UNIT II **9 Hours**

RELATIONAL MODEL AND DATABASE DESIGN

Introduction to Relational Model - Formal Relational Query Languages - Introduction to SQL: Data definition-Basic structure of SQL Queries-Additional Basic operations -Set operations-Aggregate functions Nested sub queries-Intermediate SQL: Joins-Views-Integrity Constraints.

UNIT III **8 Hours**

NORMAL FORMS

Functional Dependencies - Normal Forms Based on primary Keys-General Definition of Second and Third Normal Form - Boyce Codd Normal Form - Multi valued dependencies and Fourth Normal Form.

UNIT IV **9 Hours**

DATA STORAGE AND QUERY PROCESSING

Overview of Physical Storage Media - Magnetic disk Flash storage -RAID-File and Record Organization -Indexing and Hashing :Ordered Indices - B+Tree Index File-Static Hashing - Dynamic Hashing-Query Processing: Overview-measures of Query Cost.

UNIT V **11 Hours**

TRANSACTION MANAGEMENT

Transactions: Transaction concept-Transaction Atomicity and Durability-Transaction Isolation- Serializability-Transaction Isolation and Atomicity-Transaction Isolation levels-Implementation of Isolation Levels-Concurrency Control: Lock based protocols -Deadlock handling-Time stamp based protocols-Recovery system: Failure classification -Storage-Recovery and atomicity.

FOR FURTHER READING

Introduction to Parallel, Distributed and Object Oriented Databases- Introduction to MySQL and PHP.

Total: 45 Hours

Reference(s)

1. Abraham Silberschatz, Henry F. Korth and S. Sudarshan, Database System Concepts , McGraw - Hill, 2015
2. Ramez Elmasri and Shamkant B. Navathe, Fundamental Database Systems,Pearson Education, 2008
3. Raghu Ramakrishnan, Database Management System, Tata McGraw-Hill Publishing Company, 2003
4. C.J.Date,An Introduction to Database system, Pearson Education, 2006
5. Peter Rob and Corlos Coronel, Database System, Design, Implementation and Management , Thompson Learning Course Technology, 2003

19CT305 OPERATING SYSTEMS 3 1 0 4

Course Objectives

- To make the students to learn different types of operating systems along with the components and services provided.
- To understand the concept of process management and implementation of process scheduling in a multi-programming environment using scheduling algorithms.
- To provide knowledge on the structure and operations of memory management and storage management.

Programme Outcomes (POs)

a. Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
c. Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
e. Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations
m. PSO1: Demonstrate the knowledge and technical skills in software development.

Course Outcomes (COs)

1. Analyze the evolution of operating systems over time from primitive batch systems to sophisticated multi-user systems and implement the usage of different system calls to manage the resources.
2. Analyze the process scheduling algorithms used in a multi-programming environment and explore interprocess communication using shared memory and message passing.
3. Analyze the activities of process synchronization and deadlock towards increasing the throughput of the system.
4. Apply the memory-management method for a specific system depends on the hardware design and explore the various memory management techniques of allocating memory to processes.
5. Evaluate an appropriate file system and disk organizations methods for a computing and storage scenario.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	-		-										1	
2	-		-		1								2	
3	-		-		2								3	
4	-		-		3								1	
5	-		-		1								2	

UNIT I **10 Hours**

INTRODUCTION

Components of Computer System - Evolution of operating System. Operating System Components & Services: Process management -Memory Management- Storage Management - Protection & Security - Operating System Services. Computing Environments-Open source operating systems -System Calls & System programs

UNIT II **9 Hours**

PROCESS MANAGEMENT

Process Concepts: The process - Process State - Process Control Block. Process Scheduling: Scheduling Queues -Scheduler - Context Switch. Operations on Processes - Process creation - Process Termination - Cooperating Processes. Interprocess Communication. CPU Scheduling: Basic Concepts - Scheduling Criteria - Scheduling Algorithms.

UNIT III **9 Hours**

PROCESS SYNCHRONIZATION AND DEADLOCK

Process Synchronization: The Critical-Section Problem - Synchronization Hardware - Semaphores - Classic problems of Synchronization. Deadlock: System Model - Deadlock Characterization - Methods for handling Deadlocks –Deadlock Prevention - Deadlock avoidance - Deadlock detection - Recovery from Deadlocks.

UNIT IV **9 Hours**

MEMORY MANAGEMENT

Address Binding - Logical Versus Physical Address Space - Swapping- Contiguous Memory allocation – Fragmentation- Paging - Segmentation. Virtual Memory: Demand Paging - Page Replacement Algorithms - Allocation of frames-Thrashing.

UNIT V **8 Hours**

STORAGE MANAGEMENT

File Management: File Concept - Access Methods - Directory and Disk Structure - File System Mounting- File Sharing. File System Implementation: File system structure - Directory implementation- Allocation Methods - Free-space Management. Secondary Storage Structure: Disk Structure - Disk Scheduling - Disk Management.

FOR FURTHER READING

Case Studies: The Linux System, Windows 7, Influential Operating Systems

Total:60 Hours

Reference(s)

1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, Operating System Concepts, 9th Edition, John Wiley & Sons Pvt. Ltd, 2015
2. Andrew S. Tanenbaum, Modern Operating Systems, Fourth Edition, Prentice Hall of India Pvt. td, 2014
3. William Stallings, Operating System, Seventh Edition Prentice Hall of India, 2012
4. Harvey M. DeitelM ,Operating Systems, Pearson Education Pvt. Ltd, 2007

19CT306 JAVA PROGRAMMING 2 0 4 4

Course Objectives

- Understand the basic features of OOP in Java
- Summarize the types of Inheritance supported by Java
- Recognize the multithreading process supported by Java

Programme Outcomes (POs)

a. Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
b. Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
c. Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
m. PSO1: Demonstrate the knowledge and technical skills in software development.

Course Outcomes (COs)

1. Apply the basic structure of Java program.
2. Apply various types of inheritance and packages under different accessibility
3. Apply the concept of interfaces, exceptions and multithreading nature of Java.
4. Create applications in Java with files and Strings handling
5. Create desktop based java applications using Java Applet, AWT and its components

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1	2											1	
2	2	2	1										2	
3	2	2	2										2	
4	1	2	1										1	
5	2	2	2										2	

UNIT I **6 Hours**

JAVA BASICS

The Genesis of Java - Overview of Java - Data Types, Variables, and Arrays - Operators – Control Statements - Introducing Classes - Methods and Classes. I/O Basics - Reading Console Input –Writing Console output.

Unit II **6 Hours**

INHERITANCE AND PACKAGES

Inheritance: Basics - Using Super - Creating a Multilevel Hierarchy - Method overriding - Using Abstract Classes - Packages and Interfaces: Packages - Access Protection - Importing Packages

UNIT III **6 Hours**

INTERFACES, EXCEPTIONS AND THREAD

Interfaces Definitions and Implementations - Exception Handling: Types - Try and Catch - Throw - Multi-threaded Programming: Creating Threads - Inter Thread Communication

UNIT IV **6 Hours**

STRING HANDLING AND FILES

File - The Byte Streams - The Character Streams - Using Stream I/ O - Serialization. String Handling: Special String operations and Methods - String Buffer - Exploring java.lang: Simple type Wrappers - System - Math - Utility Classes: String Tokenizer - Date and Time - Collection Interfaces –Collection Classes

UNIT V **6 Hours**

APPLETS, EVENT HANDLING AND AWT

Applet Basics - Applet Architecture - Applet Display Methods - Event Handling Mechanisms – Event Classes - Event Listener - Working with Windows, Graphics, Colors and Fonts - AWT Controls - Layout Managers and Menus - JDBC Concepts

FOR FURTHER READING

Spring framework - Container concepts - DAO Support and JDBC Framework - An introduction to Hibernate 3.5 - Integrating and configuring Hibernate - Building a Sample Application

1 **6 Hours**

EXPERIMENT 1

Program on Classes and Method

2 **4 Hours**

EXPERIMENT 2

Implementation of Inheritance

3 **6 Hours**

EXPERIMENT 3

Implementation of Interfaces and Packages

4 **6 Hours**

EXPERIMENT 4

Implementation of Multithreaded Programming

5 **4 Hours**

EXPERIMENT 5

Develop a program to implement String Handling Methods

6 **4 Hours**

EXPERIMENT 6
Implementation of Exception handling mechanisms

7 **6 Hours**

EXPERIMENT 7
Implementation of Collections Interfaces and Classes

8 **4 Hours**

EXPERIMENT 8
Implementation of I/O Streams

9 **4 Hours**

EXPERIMENT 9
Implementation of Applet Programs

10 **6 Hours**

EXPERIMENT 10
Implementation of AWT controls

11 **4 Hours**

EXPERIMENT 11
Write a program to implement Event classes

12 **6 Hours**

EXPERIMENT 12
Implementation of JDBC concepts

Total: 90 Hours

Reference(s)

1. Herbert Schildt, Java 2-Complete Reference, Tata Mc Graw Hill, 2015
2. Deitel & Deitel, Java How to Program, Prentice Hall of India, 2010
3. Gary Cornell and Cay S.Horstmann, Core Java Vol.1 and Vol.2, Sun Microsystems Press, 2008
4. Jeff Linwood and Dave Minter, Beginning Hibernate Second Edition, Apress 2010
5. Rod Johnson, Juergen Hoeller, Alef Arendsen, Thomas Risberg, Colin Sampaleanu, Java Development with the Spring Framework, Wiley-India, 2012

19CT307 DATA STRUCTURES & ALGORITHMS LABORATORY 0 0 4 2

Course Objectives

- Understand the principles of linear and non linear data structures.
- Build an applications using sorting and searching.

Programme Outcomes (POs)

e. Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

m. PSO1: Demonstrate the knowledge and technical skills in software development.

Course Outcomes (COs)

1. Implement the concept of recursion using C programs.
2. Implement C programs to illustrate linear data structures.
3. Develop C programs to implement nonlinear data structures.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1					3								2	
2					3								3	
3					3								3	

1 **4 Hours**

EXPERIMENT 1

Program to Solve Tower-of-Hanoi Problem using Recursion

2 **4 Hours**

EXPERIMENT 2

a) Program to implement a Stack ADT using array and write the routine for push operation which represent a function PUSH(X, S), Check for the condition whether S-full or not, if yes display the message otherwise insert the elements into the Stack. Perform POP operation which represents a function POP(S), Check for the condition whether S-Empty, if stack is empty, display the message otherwise delete an element from the Stack. Test your program with at least 5 elements and provide the output.

b) Program to implement the Queue ADT using array and write the routine to enqueue an element X into queue, Check for the conditions Q-full, if yes display the message otherwise insert the data into the queue and dequeue an element from queue, check for the conditions Q-empty, if yes display the message otherwise deleting the element from the queue and display the elements from the Queue ADT. Test your program with at least 6 elements and provide the output

3 **6 Hours**

EXPERIMENT 3

Linked List Implementation of stack and queue.

4 **4 Hours**

EXPERIMENT 4

Write a function program to perform the following operations on a singly linked list
i. Create a list
ii. Insert an element to the list
iii. Delete the maximum element from the list iv. Arrange the list as sorted order
v. Display the elements of the list
Write a main method to demonstrate the above functionalities.

5 **4 Hours**

EXPERIMENT 5

Write a function program to perform the following operations on a doubly linked list
i. Create a list
ii. Insert an element to the list
iii. Delete the maximum element from the list iv. Arrange the list as sorted order
v. Display the elements of the list
Write a main method to demonstrate the above functionalities.

6 **4 Hours**

EXPERIMENT 6

Program to sort the elements in ascending order using selection sort and bubble sort

7 **4 Hours**

EXPERIMENT 7

Implementation of quick sort.

8 **4 Hours**

EXPERIMENT 8

Implementation of heap sort.

9 **4 Hours**

EXPERIMENT 9

Implementation of shell sort.

10 **4 Hours**

EXPERIMENT 10

Develop a program to perform linear and binary search

11 **6 Hours**

EXPERIMENT 11

Program to construct an expression tree for a given expression and perform various tree traversal methods.

12 **6 Hours**

EXPERIMENT 12

Implement Prims algorithm with the following functionalities

i. Read a set of vertices minimum of six from the keyboard
ii. Get the number of edges and form the graph
iii. Find the value of each edge by using distance formula for two points
iv. Develop a Minimum Spanning Tree for the graph
v. Find the total length of all edges.

Write a main method to execute the above functionalities

13 **6 Hours**

EXPERIMENT 13

Implementation of hashing technique

Total: 60 Hours

Reference(s)

1. Mark Allen Weiss, Data Structures and Algorithm Analysis in C, 2nd Edition, Pearson Education,2016.
2. Richard F. Gilberg, and Behrouz A. Forouzan, Data Structures - A Pseudocode Approach with C, Thomson 2011.
3. Aho, J.E.Hopcroft and J.D.Ullman, Data Structures and Algorithms, Pearson education, Asia, 2010.
4. Reema Thareja, Data Structures Using C, Second Edition , Oxford University Press, 2011

19CT308 DATABASE TECHNOLOGY LABORATORY 0 0 4 2

Course Objectives

- Understand the DDL, DML, TCL and DCL commands in SQL.
- Understand the design principles of a relational database system and SQL.
- Implement programs using SQL and PL/SQL.

Programme Outcomes (POs)

a. Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

b. Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

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

e. Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

m. PSO1: Demonstrate the knowledge and technical skills in software development.

Course Outcomes (COs)

1. Differentiate database systems from file system by understanding the features of database system and design a ER model for a database system.
2. Develop solutions to a broad range of query and data update problems using relational algebra, relational calculus and SQL.
3. Apply the normalization theory in relational databases for removing anomalies.
4. Compare database storage and access techniques for file organization, indexing methods and Query Processing.
5. Analyze the basic issues of transaction processing, concurrency control, deadlock and its recovery schemes

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1														
2					2								3	
3													2	
4														
5													1	

1 **4 Hours**

EXPERIMENT 1
Working with SQL commands like DDL, DML, TCL, and DCL

2 **8 Hours**

EXPERIMENT 2
Performing Single- row functions and group functions in SQL.

3 **4 Hours**

EXPERIMENT 3
Execute simple queries using joins and Integrity constraints.

4 **8 Hours**

EXPERIMENT 4
Creation and manipulation of database objects.

5 **4 Hours**

EXPERIMENT 5
Simple programs using PL/SQL block.

6 **8 Hours**

EXPERIMENT 6
Implementation of cursor in PL/SQL block.

7 **8 Hours**

EXPERIMENT 7
Generate trigger in PL/SQL block.

8 **8 Hours**

EXPERIMENT 8
Write PL/SQL block Programs using exception handling.

9 **8 Hours**

EXPERIMENT 9
Design a PL/SQL blocks using subprograms namely functions and procedures

Total: 60 Hours

Reference(s)

1. Abraham Silberschatz, Henry F. Korth and S. Sudarshan, Database System Concepts, McGraw - Hill, 2015
2. Ramez Elmasri and Shamkant B. Navathe, Fundamental Database Systems, Pearson Education, 2008
3. Raghu Ramakrishnan, Database Management System, Tata McGraw-Hill Publishing Company, 2003
4. C.J.Date,An Introduction to Database system, Pearson Education, 2006
5. Peter Rob and Corlos Coronel, Database System, Design, Implementation and Management, Thompson Learning Course Technology, 2003

19CT401 PROBABILITY AND STATISTICS 3 1 0 4

Course Objectives

- Understand the basic concepts of probability and the distributions with characteristics and also two-dimensional random variables.
- Apply the basic rules and theorems of probability theory to determine probabilities that help to solve engineering problems.
- Determine the expectation and variance of a random variable from its distribution.
- Learn how to formulate and test hypotheses about means, variances and proportions and to draw conclusions based on the results of statistical tests.

Programme Outcomes (POs)

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

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

Course Outcomes (COs)

1. Demonstrate and apply the basic probability axioms and concepts in their core areas of random phenomena in their core areas.
2. Calculate the relationship of two dimensional random variables using Correlation techniques and to study the properties of two dimensional random variables
3. Formulate the testing of hypothesis based on different types of hypothesis.
4. Implement one-way and two-way classifications.
5. Summarize the measurements for statistical quality control.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1	3												
2	3	1												
3	1													
4	2													
5		3												

UNIT I **9 Hours**

PROBABILITY AND RANDOM VARIABLES

Introduction to probability concepts, Types of Events, axioms, theorems, Conditional probability, Multiplication theorem, Applications. Characteristics of random variables - Discrete case, Probability Mass function, Cumulative distribution function, Applications, Characteristics of random variables - Continuous case, , Probability density function, Cumulative distribution function, Applications, Central and Raw Moments, Expectation, variance, Applications, Moment generating function of discrete and continuous random variable

UNIT II **9 Hours**

TWO - DIMENSIONAL RANDOM VARIABLES

Joint Distributions - Marginal And Conditional Distributions - Covariance - Correlation And Linear Regression - Transformation Of Random Variables - Central Limit Theorem (For Independent And Identically Distributed Random Variables).

UNIT III **9 Hours**

TESTING OF HYPOTHESIS

Sampling Distributions - Estimation Of Parameters - Statistical Hypothesis - Large Sample Test Based On Normal Distribution For Single Mean And Difference Of Means -Tests Based On T, Chisquare And F Distributions For Mean, Variance And Proportion - Contingency Table (Test For Independent) - Goodness Of Fit.

UNIT IV **9 Hours**

DESIGN OF EXPERIMENTS

One Way And Two Way Classifications - Completely Randomized Design - Randomized Block Design - Latin Square Design - 22 Factorial Design.

UNIT V **9 Hours**

STATISTICAL QUALITY CONTROL

Control Charts For Measurements (X And R Charts) - Control Charts For Attributes (P, C And NP Charts) - Tolerance Limits - Acceptance Sampling.

Total: 60 Hours

Reference(s)

1. Devore. J.L., Probability And Statistics For Engineering And The Sciences, Cengage Learning, New Delhi, 8th Edition, 2012.
2. Walpole. R.E., Myers. R.H., Myers. S.L. And Ye. K., “Probability And Statistics For Engineers And Scientists”, Pearson Education, Asia , 8th Edition, 2007.
3. Ross, S.M., Introduction To Probability And Statistics For Engineers And Scientists, 3rd Edition, Elsevier, 2004.
4. Spiegel. M.R., Schiller. J. And Srinivasan. R.A., Schaum S Outline Of Theory And Problems Of Probability And Statistics, Tata McGraw Hill Edition, 2004.

19CT402 ANALYSIS OF ALGORITHMS 3 1 0 4

Course objectives

- Identify various algorithm design techniques
- Impart knowledge on runtime analysis of algorithms
- Empathize the limits of computation.

Programme Outcomes POs)

a. Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
b. Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
c. Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

Course Outcomes COs)

1. Analyze the fundamentals of Algorithmic problem solving methods based on Data Structures
2. Analyze the algorithm efficiency by means of mathematical notations
3. Apply different types of sorting and searching algorithms.
4. Analyze the different techniques in the design of Graph Algorithms
5. Evaluate algorithms design techniques of NP complete with NP hard problems

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2	2	2											
2	3	3	3											
3	3	3	3											
4	2	2	3											
5	3	3	3											

UNIT I **7 Hours**

INTRODUCTION

Introduction Fundamentals of Algorithmic Problem Solving Important Problem types: Sorting problem- searching problems - string processing - graph problems - combinatorial problems- Geometric Problems - Numerical problems Fundamental Data structures-Trees and Graphs.

UNIT II **9 Hours**

FUNDAMENTALS OF THE ANALYSIS OF ALGORITHM EFFICIENCY

Analysis Framework - Asymptotic notations - Basic Efficiency classes - Mathematical Analysis of Non-recursive Algorithm - Mathematical Analysis of Recursive Algorithm - Example: Fibonacci Numbers - Empirical Analysis of Algorithms-Algorithm visualization

UNIT III **10 Hours**

ANALYSIS OF SORTING AND SEARCHING ALGORITHMS

Brute Force Strategy: Selection Sort and Bubble Sort, Sequential Search and Brute-force string matching - Divide and conquer: Merge sort, Quick Sort, Binary Search, Binary tree Traversal and Related Properties Decrease and Conquer: Insertion Sort, Depth first Search and Breadth First Search-Pair and Convex-Hull

UNIT IV **10 Hours**

ANALYSIS OF GRAPH ALGORITHMS

Transform and conquer: Presorting, Balanced Search trees AVL Trees, Heaps and Heap sort Dynamic Programming: Warshalls and Floyd Algorithm, Optimal Binary Search trees Greedy Technique: Prims Algorithm, Kruskals Algorithm, Dijkstra Algorithm Huffman trees-The Simplex Method-The Maximum- Flow Problem Ã¢?? Maximum Matching in Bipartite Graphs- The Stable marriage Problem.

UNIT V **9 Hours**

ALGORITHM DESIGN TECHNIQUES TO NP COMPLETE AND NP HARD PROBLEMS

NP Complete problems Backtracking: n-Queens Problem Hamiltonian Circuit problem Subset-Sum problem Branch and bound: Assignment problem, Knapsack problem Traveling salesman problem- Approximation algorithms for NP hard problems: Travelling salesman and knapsack problem-Limitations of Algorithm Power-Lower-Bound Arguments-Decision Trees-P, NP and NP-Complete Problems-Coping with the Limitations.

Total: 60 Hours

Reference(s)

1. Anany Levitin, Introduction to the Design and Analysis of Algorithms, Third Edition, Pearson Education Asia, 2011
2. T.H. Cormen, C.E. Leiserson, R.L. Rivest and C. Stein, Introduction to Algorithms, PHI Pvt. Ltd., 2009
3. Sara Baase and Allen Van Gelder, Computer Algorithms Introduction to Design and Analysis, Pearson Education Asia, 2010
4. A.V.Aho, J.E. Hopcroft and J.D.Ullman, The Design and Analysis of Computer Algorithms, Pearson Education Asia, 2003

19CT403 THEORY OF COMPUTATION 3 1 0 4

Course Objectives

- Understand the mathematical models of computation and design grammars and recognizer for different formal languages
- Identify the relation among regular language, context free language and the corresponding recognizers
- Determine the decidability and intractability of computational problems

Programme Outcomes (POs)

a. Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
b. Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
c. Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

Course Outcomes (COs)

1. Apply proofing techniques and construct finite automata
2. Analyze finite automata for regular expression using its properties
3. Apply context free grammars and languages
4. Create Push down Automata and Turing machine
5. Analyze the undecidability of languages.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1		1	1											
2	1		2											
3		1												
4		2	1											
5			2											

UNIT I **9 Hours**

AUTOMATA

Introduction to formal proof - Additional forms of proof - Inductive proofs - Finite Automata (FA) - Deterministic Finite Automata (DFA) - Non-deterministic Finite Automata (NFA) - Finite Automata with Epsilon transitions

UNIT II **9 Hours**

REGULAR EXPRESSIONS AND LANGUAGES

Regular Expression - FA and Regular Expressions - Arden's theorem - Applications of Regular Expression - Algebraic Laws for Regular Expression - Proving languages not to be regular - Closure properties of regular languages.

UNIT III **9 Hours**

CONTEXT-FREE GRAMMAR AND LANGUAGES

Grammar Introduction- Types of Grammar - Context-Free Grammar (CFG) - Parse Trees – Applications of Context-Free Grammar -Ambiguity in grammars and languages - Normal forms for CFG – Pumping Lemma for CFL - Closure Properties of CFL.

UNIT IV **9 Hours**

PUSH DOWN AUTOMATA AND TURING MACHINES

Definition of the Pushdown automata - Languages of a Pushdown Automata - Equivalence of Pushdown automata and CFG. Turing Machines (TM)- Programming Techniques for TM - Storage in finite control - Multiple tracks - Checking off symbols - Subroutines.

UNIT V **9 Hours**

UNDECIDABILITY

A language that is not Recursively Enumerable (RE) - An undecidable problem that is RE – Undecidable problems about Turing Machine - Post's Correspondence Problem - Rice Theorem.

FOR FURTHER READING

Application of Finite Automata - Text Search Decision Properties of Regular Languages – Ambiguity Resolution in YACC- Extensions to the Basic Turing Machine Introduction to classes - P and NP- completeness

Total: 60 Hours

Reference(s)

1. John E.Hopcroft, Rajeev Motwani and Jeffrey.D Ullman, Introduction to Automata Theory, Languages and Computations, Pearson Education, Third Edition, 2014
2. Harry R.Lewis and Christos.H.Papadimitriou, Elements of The theory of Computation,Pearson Education/PHI, 2007
3. C.Martin, Introduction to Languages and the Theory of Computation, TMH, 2007
4. Micheal Sipser, Introduction of the Theory and Computation, Thomson Brokecole, 2005

19CT404 SOFTWARE ENGINEERING 3 0 0 3

Course Objectives

- Understand detailed concepts related to software engineering life cycle.
- Gain knowledge about the concepts of software designing and testing.
- Acquire knowledge about an overview of object oriented analysis and design, modeling language.

Programme Outcomes (POs)

a. Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

b. Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

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

Course Outcomes (COs)

1. Analyze and identify a suitable software development life cycle model for an application.
2. Analyze software requirements specification and cost estimation for an application.
3. Apply the design models and testing techniques for implementing a software
4. Apply the object orientation concepts in software development
5. Apply the concept of object oriented methodologies and unified modeling language in software development.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1	3												
2	1	1	3											
3		3	2											
4	1	1	2											
5		3	2											

UNIT I **7 Hours**

SOFTWARE PROCESS MODELS

The Nature of Software-Software Process Models-Waterfall Model-Incremental Process Models-Evolutionary Process Models- Prototyping-Spiral Model-Concurrent Model-Introduction to Agile Process

UNIT II **11 Hours**

REQUIREMENT ENGINEERING

Requirements Engineering - Establishing the Groundwork - Eliciting Requirements - Building the Requirements Model - Requirements Analysis - Metrics in the Process and Project Domains - Software Measurements - Metrics for Software Quality - Software Project Estimation - Decomposition Techniques - Empirical Estimation Models - The Make/Buy Decision.

UNIT III **8 Hours**

DESIGN CONCEPTS AND PRINCIPLES

The Design Concepts - The Design Model - Architectural Design - User Interface Design: Interface Analysis - Interface Design Steps - Risk Management - Software Engineering Practice - Core Principles - Coding Principles and Concepts.

UNIT IV **10 Hours**

TESTING TACTICS

Software Testing Fundamentals - Internal and External Views of Testing - White-Box Testing – Basis Path Testing - Control Structure Testing - Black Box Testing - Unit Testing - Integration Testing - Validation Testing - System Testing - The Art of Debugging.**NIT V**
9 Hours

QUALITY MANAGEMENT

Software Quality Assurance - Software Reviews - Formal Technical Reviews - Informal Reviews - Software Reliability - Software Configuration Management - The SCM Process - The Cleanroom Strategy - Software Reengineering Process Model - Reverse Engineering - Forward Engineering.

FOR FURTHER READING

Software Process Improvement - SPI Process - The CMMI - SPI Frameworks.

Total: 45 Hours

Reference(s)

1. Roger S.Pressman, Software Engineering: A Practitioners Approach, McGraw Hill International edition, Seventh edition, 2010
2. Ali Bahrami, Object Oriented Systems Development, Tata McGraw-Hill, 2010
3. Ian Sommerville, Software Engineering, 8th Edition, Pearson Education,2008.
4. Stephan Schach, Software Engineering, Tata McGraw Hill, 2007
5. Pfleeger and Lawrence Software Engineering: Theory and Practice, Pearson Education,second edition, 2001

19CT405 MICROPROCESSORS AND MICROCONTROLLER 3 0 0 3

Course Objectives

- Understand the architecture and software aspects of 8085, 8086 microprocessors and 8051 microcontroller
- Implement assembly language programs for various applications using the instructions of 8085, 8086 microprocessors and 8051 microcontroller
- Impart knowledge on the methods of interfacing 8085 and 8086 microprocessors with various peripheral devices

Programme Outcomes (POs)

b. Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
e. Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
n. PSO2: Develop practical competencies in Networking and Hardware design.

Course Outcomes (COs)

1. Analyze the architectural features and develop an ALP using instruction set of 8085
2. Analyze the architecture and timing diagram for minimum and maximum mode in 8086 and classify its addressing modes
3. Create assembly language programs using 8086 microprocessor instructions
4. Analyze the modes of operations of I/O interface devices
5. Create programs using the register set and instruction set of 8051 microcontroller

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1		1			2									1
2		1			2									1
3		2			3									3
4		2			3									2
5		1			3									1

UNIT I **8 Hours**

THE 8085 MICROPROCESSOR

Microprocessor Architecture and its Operations - The 8085 MPU - 8085 Instruction Set – Programming Techniques with Additional Instructions of 8085 microprocessor - The 8085 Interrupt Process – 8085 Vectored Interrupts

UNIT II **11 Hours**

THE 8086 MICROPROCESSOR

Register Organisation of 8086 - Architecture - Signal Descriptions of 8086 - Physical memory organization - General bus Operation - I/O Addressing Capability - Special Processor Activities - Minimum Mode 8086 Architecture - Read/Write Cycle Timing Diagram for Minimum mode - Maximum Mode 8086 Architecture - Read/Write Cycle Timing Diagram for Maximum Mode - Addressing Modes of 8086 - Instruction set of 8086

UNIT III **7 Hours**

8086 SYSTEM DESIGN AND RECENT ADVANCES IN MICROPROCESSOR ARCHITECTURES

The Art of Assembly Language Programming with 8086: A few Machine Level Programs – Programming with an Assembler - Special Architecture Features and Related Programming: Introduction to stack - Stack Structure of 8086 - Interrupt and Interrupt Service Routines - Non-Maskable Interrupt – Maskable interrupt – Interrupt programming - Macros. Intel Pentium 80586 architecture-Branch prediction-Instruction set of Pentium-MMX-Architecture-Data types and Instruction set.

UNIT IV **10 Hours**

PERIPHERAL DEVICES AND I/O INTERFACING

Programmable Interrupt Controller 8259A: Architecture and Signal Descriptions of 8259A – Command Words of 8259A - Operating modes of 8259A - The Keyboard/Display Controller 8279: Architecture and Signal Descriptions of 8279 - Modes of Operation of 8279 - DMA Controller 8257: Internal Architecture and Signal Descriptions of 8257 - DMA Transfers and Operations.

UNIT V **9 Hours**

8051 MICROCONTROLLER

Architecture of 8051 - Signal Descriptions of 8051 - Register Set of 8051 - Memory Addressing - External I/O Interfacing - Addressing modes of 8051 - Instruction Set of 8051.

FOR FURTHER READING

Introduction to PIC Microcontrollers - Architecture of PIC Microcontrollers - Instruction Set of PIC Microcontroller - I/O Port Configuration - PIC Programming.

Total: 45 Hours

Reference(s)

1. Ramesh S.Gaonkar, Microprocessor Architecture, Programming and Applications with the 8085, Penram International publishing private limited, 2013
2. A.K.Ray and K.M.Bhurchandi, Advanced Microprocessors and peripherals-Architectures, Programming and Interfacing, Tata McGraw Hill Education Private Limited, 2013
3. Douglas V.Hall, Microprocessors and Interfacing: Programming and Hardware, TMH, 2010
4. Yu-cheng Liu and Glenn A. Gibson, Microcomputer systems: The 8086 / 8088 Family architecture, Programming and Design, PHI, 2011
5. Mohamed Ali Mazidi, Janice Gillispie Mazidi, The 8051 microcontroller and embedded systems, Pearson education, 2009.

19CT406 COMPUTER NETWORKS 3 0 2 4

Course Objectives

- Understand the state-of-the-art in network protocols, architectures and applications
- Gain knowledge about the functions of different network layers
- Familiarize in the various aspects of computer networks

Programme Outcomes (POs)

e. Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
g. Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
n. PSO2: Develop practical competencies in Networking and Hardware design.

Course Outcomes (COs)

1. Apply the basic concept in modern data communication and computer networking
2. Apply the functions of different layers and in depth knowledge of data link layer
3. Analyze the different protocols and network layer components
4. Apply the basic functions of transport layer and congestion in networks
5. Analyze the working of application layer along with the protocols used

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1														2
2					1		2							2
3					2		2							2
4					2		2							2
5					1		2							2

UNIT I **10 Hours**

INTRODUCTION

Data Communications - Data Flow - Networks - The Internet - Protocols and Standards – Network Models: Layered Tasks - The OSI Model - TCP/IP Protocol Suite - Addressing - Transmission Media - Connecting LANs, Backbone Networks, and Virtual LANs: Connecting Devices-Circuit Switching and Packet Switching

UNIT II **10 Hours**

DATA LINK AYER

Introduction - Block Coding - Cyclic codes - Checksum -Data Link Control: Framing - Flow and Error Control - Noiseless Channels - Noisy Channels - HDLC -Multiple Access: Random Access - Channelization -Wired LANs: IEEE Standards- Standard Ethernet - Encoding (NRZ, NRZI, Manchester, 4B/5B- WiMax.

UNIT III **9 Hours**

NETWORK LAYER

IPv4 Addresses- IPv6 Addresses - Internetworking - IPv4 - IPv6 - Transition from IPv4 to IPv6 – Network Layer: Delivery, Forwarding, and Routing: Address Mapping - Internet Control Message Protocol (ICMP) - Internet Group Management Protocol (IGMP) - Network Layer: Delivery, Forwarding, and Routing.

UNIT IV **9 Hours**

TRANSPORT LAYER

Process-to-Process Delivery - User Datagram Protocol (UDP) - Transmission Control Protocol (TCP) - Stream Control Transmission Protocol (SCTP) - Congestion Control and Quality of Service: Data Traffic - Congestion Control - Quality of Services (QoS)-POP3- IMAP.

UNIT V **7 Hours**

APPLICATION LAYER

Domain Name System (DNS): Domain Name Space - Distribution of Name Space - DNS in the Internet World Wide Web and HTTP - Simple Mail Transfer Protocol - File Transfer Protocol -Secure Shell (SSH)- TELNET - PGP - Firewalls.

FOR FURTHER READING

Network Management: Simple Network Management Protocol (SNMP) - Symmetric key cryptography - Security services - PGP - Firewalls.

1 **4 Hours**

EXPERIMENT 1

Study of Color coding Jack RJ45 and do the following Cabling works in a network a. Cable Crimping b. Standard Cabling c. Cross Cabling and d. Establish a LAN connection using three systems using any topology.

2 **2 Hours**

EXPERIMENT 2

Configure IP Address in a system in LAN (TCP/IP Configuration) and Implement the client server communication using socket connection.

3 **2 Hours**

EXPERIMENT 3

Write a program for transferring a file between nodes in a network.

4 **2 Hours**

EXPERIMENT 4

Perform Bit Stuffing and CRC computation.

5 **2 Hours**

EXPERIMENT 5

By varying the no of frames, design the Sliding Window Protocol.

6 **2 Hours**

EXPERIMENT 6
Simulation of ARP/RARP

7 **2 Hours**

EXPERIMENT 7
Display the routing table for the nodes in a network using Distance Vector Routing (DVR) algorithm.

8 **2 Hours**

EXPERIMENT 8
Find the minimum cost in the node to node communication by Open Shortest Path First (OSPF) protocol

9 **2 Hours**

EXPERIMENT 9
Write a program for downloading a file from HTTP server

10 **4 Hours**

EXPERIMENT 10
Develop a client that contacts a given DNS server to resolve a given host name.

11 **2 Hours**

EXPERIMENT 11
Configure a Network topology using Packet tracer software.

12 **4 Hours**

EXPERIMENT 12
Study of Network simulator (NS) and Simulation of any one of routing protocol using NS2.

Total: 75 Hours

Reference(s)

1. Behrouz A.Forouzan, Data Communication and Networking, 5th Edition, Tata McGraw-Hill, 2014
2. James F.Kurose and Keith W.Ross, Computer Networking: A Top-Down Approach Featuring the Internet, Pearson Education, 2005
3. Larry L.Peterson and Bruce S.Davie, Computer Networks, Elsevier, 2009
4. Andrew S.Tanenbaum, Computer Networks, Pearson Education, 2008
5. William Stallings, Data and Computer Communication, Pearson Education, 2007
6. Douglas E.Comer and M.S.Narayanan, Computer Networks and Internets, Pearson Education, 2008

19CT407 MICROPROCESSORS AND MICROCONTROLLER LABORATORY 0 0 4 2

Course Objectives

- Understand the working of 85 x 86 microprocessors and 8051 microcontrollers.
- Develop ability in assembly language programming using 85x86 microprocessors and 8051 microcontroller.
- Work with I/O interfacing devices

Programme Outcomes (POs)

a. Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
b. Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
c. Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
e. Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations. f. Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
g. Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
h. Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
i. Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
n. PSO2: Develop practical competencies in Networking and Hardware design.

Course Outcomes (COs)

1. Develop assembly language programs using 8085/86 microprocessors and 8051 microcontroller
2. Implement interface between 8085 microprocessor and peripheral devices.
3. Design an interface between LED and 8051 microcontrollers.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1	2	2		1	2		2						2
2		2	2		2		2		3					2
3		2	2		2		2		3					2

1 **3 Hours**

EXPERIMENT 1

8085-Arithmetic operations

2 **3 Hours**

EXPERIMENT 2

8085-Code conversions

3 **3 Hours**

EXPERIMENT 3

8085-Matrix Multiplication

4 **6 Hours**

EXPERIMENT 4

8086-Arithmetic operations

5 **3 Hours**

EXPERIMENT 5

8086-String Manipulation

6 **6 Hours**

EXPERIMENT 6

Stepper motor interfacing with 8086

7 **6 Hours**

EXPERIMENT 7

Counters and time delay using 8086

8 **6 Hours**

EXPERIMENT 8

Interfcaing 8085 with 8255

9 **6 Hours**

EXPERIMENT 9

Interfcaing 8085 with 8279

10 **6 Hours**

EXPERIMENT 10

8051-Arithmetic operations

11 **3 Hours**

EXPERIMENT 11

8051-Fibonacci series and square of a number

12 **3 Hours**

EXPERIMENT 12

Unpacked BCD to ASCII

13 **6 Hours**

EXPERIMENT 13

Interfacing LED with 8051

Total:60 Hours

Reference(s)

1. Ramesh S.Gaonkar, Microprocessor Architecture, Programming and Applications with the 8085, Penram International publishing private limited, 2013
2. K.Ray and K.M.Bhurchandi, Advanced Microprocessors and peripherals- Architectures, Programming and Interfacing, Tata McGraw Hill Education Private Limited, 2013
3. Douglas V.Hall, Microprocessors and Interfacing: Programming and Hardware, TMH, 2010
4. Yu-cheng Liu and Glenn A. Gibson, Microcomputer systems: The 8086 / 8088 Family architecture, Programming and Design, PHI 2011
5. Mohamed Ali Mazidi, Janice Gillispie Mazidi, The 8051 microcontroller and embedded systems, Pearson education, 2009

18HS001 ENVIRONMENTAL SCIENCE 2 0 0 0

Course Objectives

- Understand the interdisciplinary and holistic nature of the environment
- Identify the significance of natural resources and environment on the quality of life and stimulate the quest for sustainable development
- Assess the socio-economic, political and ethical issues in environmental science

Programme Outcomes (POs)
Course Outcomes (COs)

1. Examine the importance of interdisciplinary nature of environment studies, uses and exploitation of natural resources
2. Analyze the different types of ecosystems and biodiversity, its values and also role of professionals in protecting the environment from degradation
3. Impact the existing environmental challenges related to pollution and its management
4. Select suitable strategies for sustainable management of components of environmental science
5. Correlate the impacts of population and human activities on environment

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1														
2														
3														
4														
5														

UNIT I **6 Hours**

NATURAL RESOURCES

Forest resources: Use - over exploitation - deforestation - case studies. Water resources: Use - over utilization of surface and ground water - conflicts over water. Mineral resources: Use - exploitation - environmental effects of extracting and using mineral resources - case studies. Food resources: Effects of modern agriculture - fertilizer-pesticide problems (eutrophication, blue baby syndrome, biomagnification). Energy resources: renewable (solar, wind, and hydro).

UNIT II **6 Hours**

ECOSYSTEMS AND BIODIVERSITY

Concept of an ecosystem: Structure and function of an ecosystem - producers - consumers - decomposers - food chains - food webs and ecological pyramids - Types of ecosystem: Introduction - characteristic features: desert ecosystem. Biodiversity - value of biodiversity - threats to biodiversity - endangered and endemic species - Conservation of biodiversity: In-situ and ex-situ conservation of biodiversity.

UNIT III **6 Hours**

ENVIRONMENTAL POLLUTION

Pollution: Definition - causes - effects - control measures of air pollution - water pollution : (Sewage water treatment by activated sludge and trickling filter process) - noise pollution- thermal pollution. Disaster management: causes - effects - control measures of floods Ã¢?? earthquake

UNIT IV **7 Hours**

SOCIAL ISSUES AND ENVIRONMENT

Sustainable development : Definition - Unsustainable to sustainable development - solid waste management - causes - effects - 5R Principles (landfills, incineration, composting). Water conservation - rain water harvesting - watershed management. Climate change - global warming - acid rain - ozone layer depletion. E-waste.

UNIT V **5 Hours**

HUMAN POPULATION AND ENVIRONMENT

Human population: Population growth - characteristics - variation among nations - population explosion - value education - HIV / AIDS. Role of information technology in environment and human health - occupational safety and health administration (OSHA)

FOR FURTHER READING

Human rights:Biomedical waste -Identification of adulterants in food materials

Total: 30 Hours

Reference(s)

1. Anubha Kaushik, C.P. Kaushik, Environmental Science and Engineering , 4th Multi Colour Edtion, New Age International Publishers, New Delhi, 2014
2. Raven, P.H., Hassenzahl, D.M. & Berg, L.R. 2012. Environment. 8th edition. John Wiley & Sons
3. T. G. Jr. Miller, S. Spoolman, New Environmental Science, 14th Edition, Wadsworth Publishing Co, New Delhi, 2014
4. Pepper, I.L., Gerba, C.P. & Brusseau, M.L. 2011. Environmental and Pollution Science. Academic Press
5. A. K. De, Environmental Chemistry, 7th Edition , New age international publishers, New Delhi, 2014

18GE401 SOFT SKILLS- BUSINESS ENGLISH 0 0 2 0

Course Objectives

- To acquire command of both the receptive skills (Listening, Reading) and the productive skills (Writing and Speaking) of English language
- To understand and make effective use of English language in business contexts

Course Outcomes (COs)

1. Listen, Read, Speak, and Write Business English at the level of independent users
2. Appear for the Business English Certificate (BEC) Vantage level examination conducted by the Cambridge Assessment English

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1														
2														

UNIT I **15 Hours**

LISTENING AND READING

Listening for writing short answers - filling gaps in sentences - identifying topic, context and function - identify different functions of language in business situations - identify prompts -identify paraphrases of required information

Scanning - reading for gist - understanding sentence structure - error identification - identify paraphrases - cohesive words and phrases - understand the importance of analysing the distractors - identify grammatical and semantic relationships

UNIT II **15 Hours**

WRITING AND SPEAKING

Business emails - notes - memos to colleagues or friends - giving instructions - explaining a development - asking for comments - requesting information - agreeing to requests - explaining - apologising - reassuring - complaining - describing - summarising - recommending - persuading turn - taking - sustaining interaction - initiating - responding - giving personal information - talking about present circumstances, past experiences and future plans - expressing opinion - speculating - organising a larger unit of discourse - giving information - expressing and justifying opinions - speculating - comparing and contrasting - agreeing and disagreeing

1 **15 Hours**

LISTENING AND READING

Listening for writing short answers - filling gaps in sentences - identifying topic, context and function - identify different functions of language in business situations - identify prompts -identify paraphrases of required information - Scanning - reading for gist - understanding sentence structure - error identification - identify paraphrases - cohesive words and phrases - understand the importance of analysing the distractors - identify grammatical and semantic relationships

2 **15 Hours**

WRITING AND SPEAKING

Business emails - notes - memos to colleagues or friends - giving instructions - explaining a development - asking for comments - requesting information - agreeing to requests - explaining - apologising - reassuring - complaining - describing - summarising - recommending - persuading turn - taking - sustaining interaction - initiating - responding - giving personal information - talking about present circumstances, past experiences and future plans - expressing opinion - speculating - organising a larger unit of discourse - giving information - expressing and justifying opinions - speculating - comparing and contrasting - agreeing and disagreeing

Total: 60 Hours

Reference(s)

1. Whitehead, Russell and Michael Black. Pass Cambridge BEC Vantage Self - study Practice Tests with Key, Heinle - a part of Cengage Learning, Delhi, 2003.

19CT501 COMPILER DESIGN 3 1 0 4

Course Objectives

- Acquire knowledge in different phases of a Compiler and its applications.
- Understand the categorization of tokens using lexical analyzer and pattern recognition using parsers.
- Familiar with the code generation schemes and optimization methods.

Programme Outcomes (POs)

b. Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

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

e. Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

Course Outcomes (COs)

1. Analyze the output generated in each phase of the compiler
2. Create Finite automata for Regular Expression and apply minimization techniques.
3. Create Top down and Bottom up parser for context free grammars.
4. Create intermediate code for programming constructs
5. Apply optimization techniques in code generation and analyze the issues in code generation.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1		1	1											
2		2	3		1									
3		3	3		1									
4		2	2											
5		2	1											

UNIT I 8 Hours

INTRODUCTION TO COMPILER

Language processors - Structure of a compiler - Grouping of phases into passes- Compiler construction tools - Applications of compiler technology: Implementation of high-level programming languages - Optimizations for computer architectures - Design of new computer architecture - Program Translations- Software productivity tools.

UNIT II **9 Hours**

LEXICAL ANALYSIS

Lexical Analysis: Role of Lexical Analyzer - Input Buffering - Lexical Errors - Specification of tokens - Recognition of Tokens - Finite automata - Regular expression to finite automation- Optimization of DFA based Pattern Matchers-LEX-Design of Lexical Analyzer for a sample Language.

UNIT III **11 Hours**

SYNTAX ANALYSIS

Introduction-Role of the parser - Context-Free Grammars -Writing a Grammar-Top Down parsing - Recursive Descent Parsing – Non-recursive Predictive Parsing - Bottom-up parsing - Shift Reduce Parsing- LR Parsers: Simple LR Parser - Canonical LR Parser - LALR Parser - Error Handling and Recovery in Syntax Analyzer-YACC-Design of a syntax Analyzer for a Sample Language.

UNIT IV **8 Hours**

SEMANTIC ANALYSIS

Syntax Directed Translation - Construction of Syntax Tree - Variants of Syntax Trees -Three-Address Code - Types and Declarations - Translation of Expressions - Control Flow - Backpatching - Switch- Statements - Intermediate Code for Procedures.

UNIT V **9 Hours**

CODE OPTIMIZATION

Principal Sources of Optimization-DAG- Optimization of Basic Blocks- Global Data Flow Analysis - Issues in Design of a Code Generator - A Simple Code Generator Algorithm.

FOR FURTHER READING

The evolution of programming languages-The science of building a compiler - Run Time Environments -Storage Organization - Stack Allocation of Space- Heap Management.

Total: 60 Hours

Reference(s)

1. Alfred V. Aho, Ravi Sethi and Jeffrey D. Ullman Compilers: Principles, Techniques and Tools , 2nd Edition, Pearson, 2012.
2. D. Grune, H.E. Bal, C.J.H. Jacobs, K.G. Langendoen, Modern Compiler Design, Wiley, 2008
3. Kennath C. Louden, Compiler Construction Principles and Practice. New Delhi: Vikas publishing House, 2003.
4. Allen I. Holub, Compiler Design in C, Prentice Hall of India, 2003.

19CT502 WEB TECHNOLOGY **2 0 0 2**

Course Objectives

- Understand the scripting languages XHTML, JavaScript and PHP.
- Familiar with the different server technologies.
- Gain knowledge in the concepts of web services.

Programme Outcomes (POs)

a. Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
c. Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
e. Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
f. Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
m. PSO1: Demonstrate the knowledge and technical skills in software development.

Course Outcomes (COs)

1. Analyze the technologies used to create web pages.
2. Create dynamic and interactive web pages by embedding Java Script in XHTML.
3. Apply server side programming and build web applications using PHP.
4. Create interactive web applications using ASP.Net.
5. Apply web services and its technologies

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2		3		2	2							3	
2	2		3		3	2							3	
3	2		3		3	3							3	
4	2		3		3	3							3	
5	1		2		3	2							3	

UNIT I 6 Hours

INTRODUCTION TO WEB AND XHTML

Introduction - Blogging - Social Networking - Social media - Tagging - Software development - Introduction to XHTML and Editing XHTML Headings - Linking - Images - Special characters and Horizon rules - Lists - Tables - Forms -Internal Linking- Meta Elements - Cascading Style Sheets.

UNIT II **6 Hours**

JAVASCRIPT

Introduction to scripting - Control statements I, II - Functions: Definition - Random Number Generation - Global function - Recursion - Arrays: Declaring and allocating arrays Multidimensional arrays - Objects : Math object - String object - Date object - Boolean, Number object - Document object - Window object - Events.

UNIT III **6 Hours**

INTERNET APPLICATION SERVER TECHNOLOGIES

Web server (IIS and Apache): Multitier Architecture - Client/ Server side scripting - Accessing web services - Microsoft IIS - Apache HTTP server - Database: Relational database - SQL - PHP: Basics - String and Form Processing - connecting to database.

UNIT IV **6 Hours**

ASP .NET AND JSP WEB APPLICATIONS

Introduction - creating and running a simple web form - Web controls - session tracking - case study: Connecting to a database in ASP.NET. - Introduction to AJAX- AJAX XML Http request- AJAX Events- Java web technologies(Servlets, JSP)-creating and running a simple application in Netbeans - JSF components.

UNIT V **6 Hours**

WEB SERVICES

Introduction - Java web services Basics - Creating Publishing, Testing and describing web service - Consuming web service - SOAP - Session Tracking in web services - Consuming a Database driven web service from a web application - Passing an object of a User defined type to a web service

FOR FURTHER READING

Introduction - Java web technologies - Creating and running a simple application in Netbeans – JSF components - Session tracking: cookies

Total: 30 Hours

Reference(s)

1. P.J. Deitel and H.M. Deitel, Internet and World Wide Web - How to Program, Pearson Education, 2009.
2. Deitel, Deitel and Nieto, Internet and World Wide Web How to Program, Pearson Education,2002.
3. Uttam K.Roy, Web Technologies, Oxford University Press, 2010.
4. Rajkamal, Web Technology, Tata McGraw-Hill, 2009.
5. www.w3schools.com/ajax.

19CT503 EMBEDDED SYSTEMS 3 0 2 4

Course Objectives

- To be familiar with 8051 microcontrollers.
- Understand the basic OS concepts.
- Design and develop embedded systems.

Programme Outcomes (POs)

a. Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
c. Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
d. Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

Course Outcomes (COs)

1. Apply the concepts of embedded computing with 8051 microcontrollers.
2. Analyze the memory and I/O operations.
3. Analyze the processes and operating system concepts.
4. Analyze the embedded software concepts
5. Create embedded systems using case studies.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3													
2			3											
3			3											
4				2										
5				2										

UNIT I 9 Hours

EMEDDED COMPUTING

Challenges of Embedded Systems - Embedded system design process. Embedded processors - 8051 Microcontroller, ARM processor - Architecture, Instruction sets and programming.

UNIT II 9 Hours

MEMORY AND I/O MANAGEMENT

Programming Input and Output - Memory system mechanisms - Memory and I/O devices and interfacing Interrupts handling.

UNIT III **9 Hours**

PROCESSES AND OPERATING SYSTEMS

Multiple tasks and processes - Context switching - Scheduling policies - Interprocess communication mechanisms - Performance issues.

UNIT IV **9 Hours**

EMBEDDED SOFTWARE

Programming embedded systems in assembly and C - Meeting real time constraints - Multi-state systems and function sequences. Embedded software development tools - Emulators and debuggers.

UNIT V **9 Hours**

EMBEDDED SYSTEM DEVELOPMENT

Design issues and techniques - Case studies - Complete design of example embedded systems.

FOR FURTHER READING

Embedded programming in C,C++ - Real time operating systems - study of Micro C/OS II.

1 **4 Hours**

EXPERIMENT 1

Study of ARM evaluation system

2 **2 Hours**

EXPERIMENT 2

Interfacing ADC and DAC.

3 **4 Hours**

EXPERIMENT 3

Interfacing LED and PWM.

4 **2 Hours**

EXPERIMENT 4

Interfacing real time clock and serial port.

5 **4 Hours**

EXPERIMENT 5

Interfacing keyboard and LCD.

6 **2 Hours**

EXPERIMENT 6

Interfacing EPROM and interrupt.

7 **2 Hours**

EXPERIMENT 7

Display the Mailbox.

8 **4 Hours**

EXPERIMENT 8

Interrupt performance characteristics of ARM and FPGA.

9 **2 Hours**

EXPERIMENT 9
Flashing of LEDS.

10 **4 Hours**

EXPERIMENT 10
Interfacing stepper motor and temperature sensor and Implementing zigbee protocol with ARM.

Total: 75 Hours

Reference(s)

1. Wayne Wolf, Computers as Components: Principles of Embedded Computer System Design, Elsevier, 2008.
2. Michael J. Pont, Embedded C, Pearson Education, 2007.
3. Steve Heath, Embedded System Design, Elsevier, 2005.
4. Muhammed Ali Mazidi, Janice Gillispie Mazidi and Rolin D. McKinlay, The 8051 Microcontroller and Embedded Systems, Pearson Education, Second edition, 2007.

19CT504 ARTIFICIAL INTELLIGENCE 3 0 0 3

Course Objectives

- Provide comprehensive and in-depth knowledge of AI principles and techniques by introducing AI fundamental problems
- Understand the basic concepts of analytic functions and method of construction in complex analysis
- Acquire the knowledge of complex integration to apply them in areas such as networking, and Machine Learning

Programme Outcomes (POs)

a. Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

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

f. Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

Course Outcomes (COs)

1. Apply AI with human intelligence and traditional information processing, and discuss its strengths and limitations and its application to complex and human-centered problems
2. Analyze the structures and algorithms selection in Artificial Intelligence techniques related to searching, reasoning and inference
3. Analyze the Importance of machine learning techniques, training models and its types
4. Apply and evaluate regression, classification and clustering models to given real time dataset
5. Analyze the structures of Neural Networks and discuss its applications

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1	2	1	2		1						1		
2	2	2	3		3									
3	2	1	3	1	2									
4	1	2	2	1	3				1				1	
5	2	2	1		2				1					

UNIT I **9 Hours**

INTRODUCTION TO AL

Introduction to AI-Problem formulation, Problem Definition -Production systems, Control strategies, Search strategies. Problem characteristics, - Problem solving methods - Problem graphs, Matching, Indexing and Heuristic functions -Hill Climbing-Depth first and Breath first, Constraints satisfaction - Related algorithms

UNIT II **9 Hours**

KNOWLEDGE REPRESENTATION AND INFERENCE

Game playing - Knowledge representation, Knowledge representation using Predicate logic. Inference - Backward chaining, Forward chaining, Rule value approach, Fuzzy reasoning.

UNIT III **9 Hours**

MACHINE LEARNING INTRODUCTION

Definition of learning systems. Goals and applications of machine learning. Aspects to develop a Learning system: training data, concept representation, function approximation. Learning Techniques Supervised learning, unsupervised learning and Reinforcement learning

UNIT IV **9 Hours**

MACHINE LEARNING ALGORITHMS

Regression- Simple Linear Regression, Logistic Regression, Mean Square Error. Classification - Decision Tree Information Gain and Entropy. Support Vector Machines, Clustering - K Means, Hierarchical Agglomerative Clustering

UNIT V **9 Hours**

ARTIFICIAL NEURAL NETWORKS

Neurons and biological motivation. Linear threshold units. Perceptrons: representational limitation and gradient descent training. Multilayer networks and backpropagation. Hidden layers and constructing intermediate, distributed representations. Overfitting, learning network structure, recurrent networks

FOR FURTHER READING

Text Classification - Information Retrieval, Natural Language Processing

Total: 45 Hours

Reference(s)

1. Deepak Khemani,Artificial Intelligence,, Tata McGraw Hill Education 2013
2. Mishra R B, Artificial Intelligence, PHI Learning Pvt. Ltd., New Delhi, 2013.
3. Kevin P. Murphy, Machine Learning: A Probabilistic Perspective, MIT Press, 2012
4. Christopher M.Bishop, Pattern Recognition and Machine Learning, Springer, 2006
5. Stuart Russel and Peter Norvig,AI A Modern Approach, 2nd Edition, Pearson Education 2007.
6. Christopher D. Manning, Prabhakar Raghavan and Hinrich Schutze, Introduction to Information Retrieval, Cambridge University Press, Cambridge, 2008

19CT507 WEB TECHNOLOGY LABORATORY 0 0 2 1

Course Objectives

- Understand and apply the role of scripting languages like XHTML, CSS, JavaScript, ASP, JSP and PHP for designing interactive web applications.
- Familiar with the different types of server technologies.
- Gain knowledge about the concepts of web services.

Programme Outcomes (POs)

a. Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
c. Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
e. Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
f. Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
m. PSO1: Demonstrate the knowledge and technical skills in software development.

Course Outcomes (COs)

1. Acquire the knowledge about the usage of various elements used in XHTML.
2. Use Cascading style sheets to implement a variety of presentation effects in XHTML including explicit positioning of elements
3. Create dynamic web pages by incorporating JavaScript in XHTML
4. Design the interactive web applications by connecting SQL with ASP.NET
5. Demonstrate the concepts of web services to build and consume it.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1		1		1	1							1	
2	2		2		2	2							2	
3	2		1		1	1							1	
4	2		2		2	2							2	
5	2		2		2	2							2	

EXPERIMENT 1 **2 Hours**

Create a XHTML document for the college website with Text styling, Linking, Images, Lists, Table by highlighting the facilities in the department.

EXPERIMENT 2 **2 Hours**

Create an XHTML document for an online Bookstore that has a Registration form with text box, Radio Button, Selection box, Checkbox, Submit and reset buttons.

EXPERIMENT 3 **4 Hours**

Design a web page using CSS which includes the following:

a) Use different font styles
b) Set background image for both the page and single elements on page.
c) Control the repetition of image with background-repeat property
d) Define style for links as a: link, a: active, a: hover, a: visited

EXPERIMENT 4 **4 Hours**

Write a java script to validate the following fields in a registration page

a) Name (should contains alphabets and the length should not be less than 6 characters)
b) Password (should not be less than 6 characters)
c) E-mail (should not contain invalid addresses)

EXPERIMENT 5 **2 Hours**

Write a JavaScript function to get nth largest element from an unsorted array.

EXPERIMENT 6 **4 Hours**

Create a web page with real time clock using Java script event handling mechanism.

EXPERIMENT 7 **2 Hours**

Write a JSP code to retrieve the xhtml form values and print those values in JSP pages.

EXPERIMENT 8 **2 Hours**

Write a program with ASP .net by connecting with SQL

a. Create login form to enter into website
b. Building web form that displays data from a database

EXPERIMENT 9 **4 Hours**

Write a PHP program for an web application that

a. takes a name as input and on submit it shows a hello page where is taken from the request
b. shows a start time at the right top corner of the page and
c. provides the logout button on clicking this button it should show a logout page with thank you message along with the duration of usage session

EXPERIMENT 10 **4 Hours**

Create a SOAP based web service for a simple Java Calculator class with operations add and subtract then create a web service client which then consumes the web service and displays the result of the invoked web service.

Total: 30 Hours

Reference(s)

1. P.J. Deitel and H.M. Deitel, Internet and World Wide Web - How to Program, Pearson Education, 2009.
2. Deitel, Deitel and Nieto, Internet and World Wide Web How to Program, Pearson Education,2002.
3. Uttam K.Roy, Web Technologies, Oxford University Press, 2010.
4. Rajkamal, Web Technology, Tata McGraw-Hill, 2009.
5. www.w3schools.com/ajax.

19CT508 ARTIFICIAL INTELLIGENCE LABORATORY 0 0 2 1

Course Objectives

- To design and Implement algorithms that allow computers to automatically learn from data to improve their performance of applications
- Learn Techniques for problem specific approaches and design a learning environment and evaluate the goodness of the learned solution

Programme Outcomes (POs)

a. Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
c. Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
d. Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

Course Outcomes (COs)

1. To Design and Implement machine learning solutions to classification, regression and clustering problems, evaluate and Interpret the results of the algorithms
2. To carryout forecasting with use of statistics to measure the Seasonality and Stationarity in real time data

Articulation Matrix

CONo	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2	2	3	1	3					1				2
2	2	3	3	2	3									2

3 Hours

EXPERIMENT 1

Loading Real Time data Set and Python Libraries, Installing Libraries through Anaconda Prompt

3 Hours

EXPERIMENT 2

Perform Slicing, Filtering, Group by and other basic operation through Pandas Library

3 Hours

EXPERIMENT 3

Linear Regression Model to car dataset with One dependent Variables to predict the relationship between distance and speed

3 Hours

EXPERIMENT 4

Perform Multi-linear Regression to predict the Price of a House using Boston House Price Prediction Dataset.

3 Hours

EXPERIMENT 5

To detect outliers in the cars dataset and compare the results of Linear regression models without outliers

3 Hours

EXPERIMENT 6

Apply Binary Classification Algorithms to predict the Onset of diabetes in female Indians from medical data record

3 Hours

EXPERIMENT 7

Perform Fruit Classification Algorithms to predict the fruit based on the Classification Algorithms

3 Hours

EXPERIMENT 8

Logistic Regression model to predict the outcome whether he will earn more than 50K$ based on the Professional data

3 Hours

EXPERIMENT 9

Apply Binary Classification Algorithms to predict the Onset of diabetes in female Indians from medical data record.

3 Hours

EXPERIMENT 10

Extract the Trend, Seasonality and Error for a Stock market Time series data

Total: 30 Hours

Reference(s)

1. Deepak Khemani, Artificial Intelligence,, Tata McGraw Hill Education 2013
2. Mishra R B, Artificial Intelligence, PHI Learning Pvt. Ltd., New Delhi, 2013.
3. Kevin P. Murphy, Machine Learning: A Probabilistic Perspective, MIT Press, 2012
4. Stuart Russel and Peter Norvig,AI A Modern Approach, 2nd Edition, Pearson Education 2007.
5. Christopher D. Manning, Prabhakar Raghavan and Hinrich Schutze, Introduction to Information Retrieval, Cambridge University Press, Cambridge, 2008

18GE501 SOFT SKILLS - APTITUDE I 0 0 2 0

Course Objectives

- Expose the undergraduate students to such methods and practices that help, develop and nurture qualities such as character, effective communication, aptitude and holding ethical values. It will provide a lot of activities and examples for a student to learn and develop these life skills.

Programme Outcomes (POs)

a. Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
b. Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

Course Outcomes (COs)

1. Explain various concepts of number systems and their techniques in solving the percentage, average and age problems.
2. Analyse the profit and loss of real time situations and the relation between ratio, proportion and variation.
3. Apply different techniques to find the distance, speed and time of various moving objects.
4. Understand the concepts of coding, sequences and series, data interpretation and critical reasoning to solve real time logical reasoning problems.

1 **2 Hours**

NUMBER SYSTEMS

Introduction - Definition - Classification on Numbers- Power cycles and remainders - Short cut process- Concept of Highest Common Factor-Concept of Least Common Multiple- Divisibility- Number of zeros in an expression.

2 **2 Hours**

PERCENTAGE

Introduction - Definition and Utility of Percentage - Importance of base/denominator for percentage calculations-Concept of percentage values through additions-Fraction to percentage conversion table.

3 **3 Hours**

AVERAGES AND AGES

Introduction-Average of different groups-Addition or removal of items and change in average- Replacement of some of the items.

4 **3 Hours**

RATIO, PROPORTIONS AND VARIATION

Introduction- Ratio- Properties-Dividing a given number in the given ratio-Comparison of ratios-Proportions-Useful results on proportion- Continued proportion-Relation among the quantities more than two-Variation.

5 **2 Hours**

PROFIT AND LOSS

Gain/Loss and percentage gain or percentage loss-Multiplying equivalents to find sale price-Relation among cost price, sale price, gain/loss and percentage gain or percentage loss-An article sold at two different selling price-Two different articles sold at same selling price-Percentage gain or percentage loss on selling price-Percentage gain or percentage loss on whole property.

6 **2 Hours**

TIME AND WORK

Introduction-Basic concepts-Concepts on working with different efficiencies-Pipes and Cisterns-Work Equivalence (Man Days) -Alternative approach.

7 **2 Hours**

TIME, SPEED AND DISTANCE

Definition-Basics of Time, Speed and Distance - Relative speed-Problems based on Trains-Problems based on Boats and Streams-Problems based on Races-Time taken with two difference modes of transport-Time and distance between two moving bodies.

8 **3 Hours**

CODING AND DECODING

Introduction-Description of Coding method-Coding patterns - Concepts of Coding and Decoding-Problems involving Coding and Decoding methods.

9 **2 Hours**

SEQUENCE AND SERIES

Introduction-Sequences of real numbers - Number and Alphabet series-Description of Number and Alphabet series-Analogy-Odd man out-Power series.

10 **3 Hours**

DATA SUFFICIENCY

Introduction to Data Sufficiency - Overview of the wide variety of Data Sufficiency problems - Basic introduction on how to determine what information is sufficient to solve a given problem - Common pitfalls to avoid.

11 **3 Hours**

DIRECTION

Introduction to Direction - sense test - Overview of the wide variety of Direction problems-Direction-Plotting diagrams.

12 **3 Hours**

CRITICAL REASONING

Introduction-Basic concept of critical reasoning- Weaken the argument-Strengthen the argument-Flaw in the argument-Evaluate the conclusion.

Total: 30 Hours

Reference(s)

1. Abhijit Guha, Quantitative Aptitude for Competitive Examinations, Fourth Edition, Mc Graw Hill Publications.
2. U. Mohan Rao, Quantitative Aptitude for Competitive Examinations, Scitech Publications Pvt Ltd, India.
3. Dinesh Khattar, The Pearson Guide to Quantitative Aptitude for Competitive Examinations, Third Edition, Pearson Education Pvt Ltd, India, 2016.
4. Dr. R S Aggarwal, A Modern Approach to Verbal and Non Verbal Reasoning, Revised Edition, S Chand Publications.
5. Arun Sharma, How to prepare for Logical Reasoning for CAT & other Management Exams, Fifth Edition, Mc Graw Hill Publications.
6. Jaikishan and Premkishan, How to Crack Test of Reasoning in all Competitive Examinations, Revised Edition, Arihant Publications.

18HS003 PRINCIPLES OF MANAGEMENT **2 0 0 2**

Course Objectives

- To develop cognizance about importance of management principles.
- Extract the functions and responsibilities of managers.
- To Study and understand the various HR related activities.
- Learn the application of the theories in an organization.
- Analyze the position of self and company goals towards business.

Course Outcomes (COs)

1. Students will be able to understand the basic concepts of Management.
2. Have some basic knowledge on planning process and its Tools & Techniques.
3. Ability to understand management concept of organizing and staffing.
4. Ability to understand management concept of directing.
5. Ability to understand management concept of controlling.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1			1											
2			2		3									
3					2									
4														
5														

UNIT I **9 Hours**

INTRODUCTION TO MANAGEMENT AND ORGANIZATIONS

Definition of Management-Science or Art - Manager Vs Entrepreneur-types of managers- Managerial roles and skills-Evolution of Management-Scientific, Human Relations, System and Contingency approaches-Types of Business organization- Sole proprietorship, partnership, Company-public and private sector enterprises-Organization culture and Environment-Current Trends and issues in Management.

UNIT II **9 Hours**

PLANNING

Nature and purpose of planning-Planning process-Types of planning-Objectives-Setting objectives- Policies-Planning premises - Strategic Management- Planning Tools and Techniques-Decision making steps and process.

UNIT III **9 Hours**

ORGANISING

Nature and purpose-Formal and informal organization-Organization chart-Organization Structure – Types - Line and staff authority-Departmentalization-delegation of authority- Centralization and decentralization-Job Design-Human Resource Management-HR Planning, Recruitment, selection, Training and Development, Performance Management, Career planning and management.

UNIT IV **9 Hours**

DIRECTING

Foundations of individual and group behavior - Motivation-Motivation theories- Motivational techniques- Job satisfaction-Job enrichment-Leadership-types and theories of leadership-Communication-Process of communication – Barrier in communication -Effective communication-Communication and IT.

UNIT V **9 Hours**

CONTROLLING

System and process of controlling-Budgetary and non-Budgetary control techniques-Use of Computers and IT in Management control-Productivity problems and management-Control and Performance-Direct and preventive control-Reporting.

Total: 45 Hours

Reference(s)

1. Robbins, S. (2017). Management, (13th ed.), Pearson Education, New Delhi.
2. Stephen A. Robbins and David A. Decenzo and Mary Coulter, Fundamentals of Management, Pearson Education,7th Edition, 2011.
3. Robert Kreitner and Mamata Mohapatra, Management, Biztantra, 2008.
4. L. M. Prasad, Principles and Practice of Management. 7th Edition, Sultan Chand & Sons, 2007.
5. P. C. Tripathi and P. N. Reddy, Principles of Management, Fourth Edition, Tata McGraw Hill, 2008

19CT602 MACHINE LEARNING TECHNIQUES 2 1 0 3

Course Objectives

- Define machine learning and problems relevant to machine learning.
- Differentiate supervised, unsupervised and reinforcement learning
- Apply neural networks, Bayes classifier and k nearest neighbor, for problems appear in machine learning.
- Perform statistical analysis of machine learning techniques.

Programme Outcomes (POs)

a. Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
b. Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
c. Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
d. Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
e. Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
f. Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
m. PSO1: Demonstrate the knowledge and technical skills in software development.

Course Outcomes (COs)

1. Analyze the problems for machine learning and select the either supervised, unsupervised or reinforcement learning.
2. Analyze theory of probability and statistics related to machine learning
3. Evaluate concept learning, ANN, Bayes classifier, k nearest neighbor.
4. Create classification algorithms using R
5. Evaluate hypothesis and implementing various learning algorithms

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1	2	1	2										
2	1	2	2	2	1	1								
3	1		2	1	1	1							2	
4														
5	1	2	2	2									2	

UNIT I **9 Hours**

INTRODUCTION

Well posed learning problems, Designing a Learning system, Perspective and Issues in Machine Learning. Concept Learning: Concept learning task, Concept learning as search, Find-S algorithm, Version space, Candidate Elimination algorithm, Inductive Bias.

UNIT II **9 Hours**

DECISION TREE LEARNING

Decision tree representation, Appropriate problems for decision tree learning, Basic decision tree learning algorithm, hypothesis space search in decision tree learning, Inductive bias in decision tree learning, Issues in decision tree learning.

UNIT III **9 Hours**

ARTIFICIAL NEURAL NETWORKS

Introduction, Neural Network representation, Appropriate problems, Perceptrons, Back propagation algorithm.

UNIT IV **9 Hours**

BAYESIAN LEARNING

Introduction, Bayes theorem, Bayes theorem and concept learning, ML and LS error hypothesis, ML for predicting probabilities, MDL principle, Naive Bayes classifier, Bayesian belief networks, EM algorithm

UNIT V **9 Hours**

HYPOTHESIS, INSTANCE BASED AND REINFORCEMENT LEARNING

Evaluating Hypothesis: Motivation, estimating hypothesis accuracy, Basics of sampling theorem, General approach for deriving confidence intervals, Difference in error of two hypothesis, Comparing learning algorithms. Instance Based Learning: Introduction, k-nearest neighbor learning, locally weighted regression, radial basis function, cased-based reasoning Reinforcement Learning: Introduction, Learning Task, Q Learning

Total: 45 Hours

Reference(s)

1. Tom M. Mitchell, Machine Learning, India Edition 2013, McGraw Hill Education.
2. Trevor Hastie, Robert Tibshirani, Jerome Friedman, h The Elements of Statistical Learning, 2nd edition, springer series in statistics.
3. Ethem AlpaydÃ„Â±n, Introduction to machine learning, second edition, MIT press.
4. John M. Chambers, Software for Data Analysis: Programming with R (Statistics and Computing), Springer, 2008.
5. Jiawei Han, Micheline Kamber and Jian Pei, Data Mining Concepts and Techniques, Second Edition, Elsevier, 2012.
6. Norman Matloff, The Art of R Programming - A Tour of Statistical Software Design, 2011.

19CT603 SECURITY IN COMPUTING **2 0 0 2**

Course Objectives

- To introduce the basic concepts and challenges in security
- To illustrate the use of modern tools to resolve the security issues
- To implement the cyber security principles and methods in organization.

Programme Outcomes (POs)

a. Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
b. Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
c. Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

Course Outcomes (COs)

1. Apply the concept of cybercrime in mobile devices
2. Analyze the cyber security challenges in the modern devices.
3. Analyze the working principle of cyber security tools and methods
4. Apply the concept of cyber forensics to set a cyber-forensics laboratory
5. Evaluate the process of cyber security systems in the organizations.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2													
2	3													
3	2													
4		2												
5		3	2											

UNIT I **6 Hours**

INTRODUCTION TO SECURITY AND ATTACKS

The Importance of Information Protection, The Evolution of Information Security, Justifying Security Investment, Security Methodology, How to Build a Security Program, The Impossible Job, The Weakest Link, Strategy and Tactics, Business Processes vs. Technical Controls. Risk Analysis: Threat Definition, Types of Attacks, Risk Analysis. Secure Design Principles: The CIA Triad and Other Models, Defense Models, Zones of Trust, Best Practices for Network Defense.

UNIT II **6 Hours**

AUTHENTICATION & AUTHORIZATION AND DATABASE SECURITY

Authentication, Authorization, Encryption: A Brief History of Encryption, Symmetric-Key Cryptography, Public Key Cryptography, Public Key Infrastructure - Storage Security: Storage Security Evolution, Modern Storage Security, Risk Remediation, Best Practices - Database Security: General Database Security

Concepts, Understanding Database Security Layers, Understanding Database-Level Security, Using Application Security, Database Backup and Recovery, Keeping Your Servers Up to Date, Database Auditing and Monitoring.

UNIT III **6 Hours**

INTRODUCTION TO SECURE NETWORK DESIGN

Introduction to Secure Network Design, Performance, Availability, Security. Network Device Security: Switch and Router Basics, Network Hardening. Firewalls: Overview, The Evolution of Firewalls, Core Firewall Functions, Additional Firewall Capabilities, Firewall Design. Wireless Network Security: Radio Frequency Security Basics, Data-Link Layer Wireless Security Features, Flaws, and Threats, Wireless Vulnerabilities and Mitigations, Wireless Network Hardening Practices and Recommendations, Wireless Intrusion Detection and Prevention, Wireless Network Positioning and Secure Gateways.

UNIT IV **6 Hours**

INTRUSION DETECTION AND PREVENTION SYSTEMS

IDS Concepts, IDS Types and Detection Models, IDS Features, IDS Deployment Considerations, Security Information and Event Management (SIEM). Voice over IP (VoIP) and PBX Security: Background, VoIP Components, VoIP Vulnerabilities and Countermeasures, PBX, TEM: Telecom Expense Management. Operating System Security Models: Operating System Models, Classic Security Models, Reference Monitor, Trustworthy Computing, International Standards for Operating System Security.

UNIT V **6 Hours**

SECURITY IN VIRTUAL MACHINES AND CLOUD COMPUTING

Virtual Machines, Cloud Computing. Secure Application Design: Secure Development Lifecycle, Application Security Practices, Web Application Security, Client Application Security, Remote Administration Security. Physical Security: Classification of Assets, Physical Vulnerability Assessment, Choosing Site Location for Security, Securing Assets: Locks and Entry Controls, Physical Intrusion Detection.

FOR FURTHER READING

Impact of security breaches Secure operating systems

Total: 30 Hours

Reference(s)

1. Josiah Dykstra, Essential Cybersecurity Science, O'Reilly, 5th Ed, 2017.
2. Mark Rhodes-Ousley, The Complete Reference: Information Security, McGraw-Hill, 2nd Ed, 2013.
3. Wm.Arthur Conklin, Greg White, Principles of Computer Security: CompTIA Security+ and Beyond, McGraw Hill, 2nd Ed, 2010.
4. MS.M.K.Geetha&Ms.SwapneRaman Cyber Crimes and Fraud Management, MACMILLAN,2012.
5. Pankaj Agarwal : Information Security & Cyber Laws (Acme Learning), Excel, 2013.
6. VivekSood, Cyber Law Simplified, TMH, 2012.

19CT604 PARALLEL AND DISTRIBUTED COMPUTING 3 0 0 3

Course Objectives

- To understand the need and fundamentals of parallel computing paradigms
- To learn the nuances of parallel algorithm design
- To implement the programming principles in parallel and distributed computing architectures

Programme Outcomes (POs)

d. Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

e. Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

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

Course Outcomes (COs)

1. Apply parallel and distributed computing architectures for any given problem
2. Apply problem solving (analysis, design, and development) skills to distributed applications
3. Create applications by incorporating parallel and distributed computing architectures
4. Create applications by incorporating fault tolerance
5. Create a sequential algorithm to a parallel one

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2													
2	3													
3	2													
4		2												
5		3	2											

UNIT I 9 Hours

INTRODUCTION TO PARALLEL COMPUTING

Scope of Parallel Computing – Parallel Programming Platforms – Implicit Parallelism – Limitations of Memory System Performance – Control Structure of Parallel Platforms – Communication Model of Parallel Platforms – Physical Organization of Parallel Platforms – Communication Costs in Parallel Machines – Impact of Process - Processor Mapping and Mapping Techniques.

UNIT II 9 Hours

PARALLEL ALGORITHM DESIGN

Preliminaries – Decomposition Techniques – Characteristics of Tasks and Interactions – Mapping Techniques for Load Balancing – Methods for Containing Interaction Overheads – Parallel Algorithm Models – Basic Communication Operations – One-to-All Broadcast and All-to-One Reduction – All-to-

All Broadcast and Reduction – All-Reduce and Prefix Sum Operations – Scatter and Gather – All-to-All Personalized Communication- Circular Shift – Improving the Speed of some Communication Operations

UNIT III **9 Hours**

PROGRAMMING USING MESSAGE PASSING AND SHARED ADDRESS SPACE

Principles of Message Passing Programming – Building Blocks – Send and Receive Operations – MPI – Message Passing Interface – Topologies and Embedding – Overlapping Communication with Computation – Collective Communication and Computation Operations – Groups and Communicators – POSIX thread API – OpenMP: a Standard for Directive based Parallel Programming – Applications of Parallel Programming - Matrix-Matrix Multiplication – Solving Systems of Equations – Sorting Networks - Bubble Sort Variations – Parallel Depth First Search.

UNIT IV **9 Hours**

DISTRIBUTED COMPUTING PARADIGM

Paradigms for Distributed applications – Basic algorithms in Message passing Systems – Leader Election in Rings – Mutual Exclusion in Shared Memory

UNIT V **9 Hours**

FAULT TOLERANT DESIGN

Synchronous Systems with Crash Failures – Byzantine Failures – Impossibility in Asynchronous Systems - Formal Model for Simulation – Broadcast and Multicast – Specification of a Broadcast Service – Implementing a Broadcast Service – Multicast in Groups – Distributed Shared Memory – Linearizable – Sequentially Consistent Shared Memory – Algorithms

FOR FURTHER READING

Impact of distributed computing in real world problems.

Total: 45 Hours

Reference(s)

1. Ananth Grama, Anshul Gupta, George Karypis and Vipin Kumar, ―Introduction to Parallel Computing‖, Second Edition, Pearson Education, 2009.
2. Haggit Attiya and Jennifer Welch, ―Distributed Computing – Fundamentals, Simulations and Advanced Topics‖, Second Edition, Wiley, 2012.
3. Norman Matloff, ―Parallel Computing for Data Science – With Examples in R, C++ and CUDA‖, Chapman and Hall/CRC, 2015.
4. Wan Fokkink, ―Distributed Algorithms: An Intuitive Approach‖, MIT Press, 2013.
5. M.L. Liu, ―Distributed Computing – Principles and Applications‖, First Edition, Pearson Education, 2011.

19CT607 MACHINE LEARNING LABORATORY 0 0 2 1

Course Objectives

- Make use of Data sets in implementing the machine learning algorithms
- Implement the machine learning concepts and algorithms in any suitable language of choice

Programme Outcomes (POs)

a. Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
b. Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
c. Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
d. Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

Course Outcomes (COs)

1. Implement machine learning algorithms using Java or python.
2. Solve machine learning and problems relevant to machine learning.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1	2	2											
2	2	1	2		2			3						

1 **2 Hours**

EXPERIMENT 1

Implement and demonstrate the FIND-S algorithm for finding the most specific hypothesis based on a given set of training data samples. Read the training data from a .CSV file.

2 **4 Hours**

EXPERIMENT 2

For a given set of training data examples stored in a .CSV file, implement and demonstrate the Candidate-Elimination algorithm to output a description of the set of all hypotheses consistent with the training examples

3 **2 Hours**

EXPERIMENT 3

Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this
knowledge to classify a new sample.

4 **4 Hours**

EXPERIMENT 4

Build an Artificial Neural Network by implementing the Back propagation algorithm and test the same using appropriate data sets.

5 **2 Hours**

EXPERIMENT 5

Write a program to implement the naive Bayesian classifier for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets.

6 **4 Hours**

EXPERIMENT 6

Assuming a set of documents that need to be classified, use the naive Bayesian Classifier model to perform this task. Built-in Java classes/API can be used to write
the program. Calculate the accuracy, precision, and recall for your data set.

7 **2 Hours**

EXPERIMENT 7

Write a program to construct a Bayesian network considering medical data. Use this model to demonstrate the diagnosis of heart patients using standard Heart Disease Data Set. You can use Java/Python ML library classes/API.

8 **4 Hours**

EXPERIMENT 8

Apply EM algorithm to cluster a set of data stored in a .CSV file. Use the same data set for clustering using k-Means algorithm. Compare the results of these two
algorithms and comment on the quality of clustering. You can add Java/Python ML library classes/API in the program.

9 **2 Hours**

EXPERIMENT 9

Write a program to implement k-Nearest Neighbour algorithm to classify the iris data set. Print both correct and wrong predictions. Java/Python ML library classes can be used for this problem.

10 **4 Hours**

EXPERIMENT 10

Implement the non-parametric Locally Weighted Regression algorithm in order to fit data points. Select appropriate data set for your experiment and draw graphs.

Total: 30 Hours

19CT608 SECURITY LABORATORY **0 0 2 1**

Course Objectives

- Make use of basic concepts and challenges in security
- Implement the use of modern tools to resolve the security issues
- Implement the cyber security principles and methods in organization.

Programme Outcomes (POs)

a. Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
c. Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal and environmental considerations.
e. Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
f. Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

Course Outcomes (COs)

1. Acquire the knowledge about the usage of routers and Internet Protocol to implement the connectivity among the devices.
2. Implement the concept of security in computing using security tools to configure the devices.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1		1		1	1							1	
2	2		2		2	2							2	

1 **4 Hours**

EXPERIMENT 1

Configure Routers:

a) OSPF MD5 authentication
b) NTP
c) To log messages to the syslog server
d) To support SSH connections.

2 **4 Hours**

EXPERIMENT 2

Configure AAA Authentication:

a) Configure a local user account on Router and configure authenticate on the console and vty lines using local AAA
b) Verify local AAA authentication from the Router console and the PC-A client

3 **2 Hours**

EXPERIMENT 3

Configuring Extended ACLs: Configure, Apply and Verify an Extended Numbered ACL

4 **4 Hours**

EXPERIMENT 4

Configure IP ACLs to Mitigate Attacks and IPV6 ACLs

a) Verify connectivity among devices before firewall configuration.
b) Use ACLs to ensure remote access to the routers is available only from management station PC-C.
c) Configure ACLs on to mitigate attacks.
d) Configuring IPv6 ACLs

5 **2 Hours**

EXPERIMENT 5

Configuring a Zone-Based Policy Firewall.

6 **2 Hours**

EXPERIMENT 6

Configure IOS Intrusion Prevention System (IPS) Using the CLI

a) Enable IOS IPS.
b) Modify an IPS signature.

7 **4 Hours**

EXPERIMENT 7

Layer 2 Security:

a) Assign the Central switch as the root bridge.
b) Secure spanning-tree parameters to prevent STP manipulation attacks.
c) Enable port security to prevent CAM table overflow attacks.

8 **2 Hours**

EXPERIMENT 8

Layer 2 VLAN Security

9 **2 Hours**

EXPERIMENT 9

Configure and Verify a Site-to-Site IPsec VPN Using CLI

10 **4 Hours**

EXPERIMENT 10

Configuring ASA Basic Settings and Firewall Using CLI

a) Configure basic ASA settings and interface security levels using CLI
b) Configure routing, address translation, and inspection policy using CLI
c) Configure DHCP, AAA, and SSH
d) Configure a DMZ, Static NAT, and ACLs

Total: 30 Hours

Reference(s)

1. Josiah Dykstra, Essential Cybersecurity Science, O'Reilly, 5th Ed, 2017.
2. Mark Rhodes-Ousley, The Complete Reference: Information Security, McGraw-Hill, 2nd Ed, 2013.
3. Wm.Arthur Conklin, Greg White, Principles of Computer Security: CompTIA Security+ and Beyond, McGraw Hill, 2nd Ed, 2010.
4. MS.M.K.Geetha&Ms.SwapneRaman Cyber Crimes and Fraud Management, MACMILLAN,2012.
5. Pankaj Agarwal : Information Security & Cyber Laws (Acme Learning), Excel, 2013.
6. VivekSood, Cyber Law Simplified, TMH, 2012.

18GE601 SOFT SKILLS-APTITUDE II 0 0 2 0

Course Objectives

- Expose the undergraduate students to such methods and practices that help, develop and nurture qualities such as character, effective communication, aptitude and holding ethical values. It will provide a lot of activities and examples for a student to learn and develop these life skills.

Programme Outcomes (POs)

a. Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
b. Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

Course Outcomes (COs)

1. Apply the concepts of probability, Sets, Permutation and Combinations in estimating data for real time problems.
2. Understand the concept of logarithms, progressions and Simple and Compound interest to solve various practical problems.
3. Analyse objects involving cubes and cuboids in determining the number of sides colored.
4. Interpret various data from graphs and tables to determine ratio, percentage and averages.
5. Apply the logical reasoning skills for identifying age, relations, visual relations and puzzles.

Articulation Matrix

CO No	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2
1	-	-												
2	-	-												
3	-	-												
4	-	-												
5	-	-												

1 **2 Hours**

PERMUTATION AND COMBINATION

Definition-Fundamental rules-Theorems on Permutation-Theorems on Combination.

2 **2 Hours**

PROBABILITY

Concept and Importance of Probability-Underlying factors for real Life estimation of probability-Basic facts about probability-Some important consideration while defining event.

3 **2 Hours**

SYLLOGISM AND VENN DIAGRAM

Concepts on Syllogisms-Venn diagram-Interpretation-Venn diagram-solving.

4 **2 Hours**

SIMPLE INTEREST AND COMPOUND INTEREST

Introduction-Definition - Effect of change of P, R, T on simple interest-Amount-Amount becomes N times the principle-Repayment of debt in equal installments-Rate and time are numerically equal-Compound nterest-Conversion period-Basic formula-Special cases-To find the principle / Time /Rate-Difference between Compound Interest and Simple Interest-Equal annual installment to pay the borrowed amount.

5 **2 Hours**

MIXTURES AND ALLIGATION

Definition - Alligation rule-Mean value (cost price) of the mixture-Some typical situations where allegation can be used.

6 **2 Hours**

CUBE AND LOGARITHM

Introduction-Basic Concepts of Cube and Cuboid-Problems involving cubes and cuboids of various dimensions-Problems involving coloured cubes and cuboids - Basic concepts of Logarithm-Laws of Logarithms including change of base-Common logarithm (base 10) - Properties of Logarithms to solve equations involving logarithmic expressions.

7 **2 Hours**

DATA INTERPRETATION

Introduction-Ratio-Percentage-Average-Tables - Graphs and Charts.

8 **2 Hours**

PROGRESSION AND LOGICAL REASONING

Arithmetic progression-Geometric progression-Harmonic progression-Theorems related with progressions.

9 **2 Hours**

PROBLEM ON AGES

Introduction-Basic concept-Usage of Percentage and Averages -Applications.

10 **2 Hours**

ANALYTICAL REASONING

Introduction-Basic concept-Non verbal Analytical Reasoning -Arrangements.

11 **2 Hours**

BLOOD RELATION

Introduction-Basic concept-Kinds of relation-Tree diagram -Relations.

12 **4 Hours**

VISUAL REASONING

Introduction-Basic concepts-Odd man out-Next series-Mirror image and water image

13 **4 Hours**

SIMPLIFICATIONS

Introduction-Basic concepts-Arithmetic operations-Equation solving methods-Puzzles.

Total: 30 Hours

Reference(s)

1. Abhijit Guha, Quantitative Aptitude for Competitive Examinations, Fourth Edition, Mc Graw Hill Publications.
2. U. Mohan Rao, Quantitative Aptitude for Competitive Examinations, Scitech Publications Pvt Ltd, India.
3. Dinesh Khattar, The Pearson Guide to Quantitative Aptitude for Competitive Examinations, Third Edition, Pearson Education Pvt Ltd, India, 2016.
4. Dr. R S Aggarwal, A Modern Approach to Verbal and Non Verbal Reasoning, Revised Edition, S Chand Publications.
5. Arun Sharma, How to prepare for Logical Reasoning for CAT & other Management Exams, Fifth Edition, Mc Graw Hill Publications.
6. Jaikishan and Premkishan, How to Crack Test of Reasoning in all Competitive Examinations, Revised Edition, Arihant Publications.

18HS002 PROFESSIONAL ETHICS IN ENGINEERING 2 0 0 2

Course Objectives

- To understand Human Values and ethical theory.
- To understand codes of ethics, work place responsibilities, rights, engineering experimentation, global issues and contemporary ethical issues.
- To understand personal ethics, legal ethics, cultural ethics and engineer's responsibility.

Course Outcomes (COs)

1. Articulate engineering ethics theory with sustained lifelong learning.
2. Adopt a good character and follow high professional ethical life.
3. Contribute to shape a better character by following ethical actions.
4. Confront and resolve moral issues occurred during technological activities.
5. Resolve moral and ethical problems through exploration and assessment by established experiments.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1	2												
2	1		2		3									
3	2	3	3											
4	1	2	2											
5	1				3									

UNIT I **6 Hours**

HUMAN VALUES

Morals and Ethics - Honesty - Integrity - Values - Work Ethic - Civic Virtue - Respect for Others - Living Peacefully - Caring and Sharing - Self-Confidence - Courage - Co-operation - Commitment - Empathy

UNIT II **6 Hours**

ENGINEERING ETHICS AND PROFESSIONALISM

Scope of Engineering Ethics- Variety of moral issues - Types of inquiry - Accepting and sharing responsibility - Ethical dilemmas - Moral autonomy - Kohlbergs and Gilligan's theory - Consensus and controversy - Profession and Professionalism - Models of Professional Roles - Right action theories - Senses of corporate responsibility - Codes of ethics: Importance - justification - limitation - Abuse

UNIT III **6 Hours**

ENGINEERING AS SOCIAL EXPERIMENTATION

Engineering as experimentation - Engineers as responsible experimenters - Balanced outlook on law - Cautious optimism - Safety and risk - Assessing and reducing risk - Safe exits - The Challenger case study- Bhopal Gas Tragedy - The Three Mile Island and Chernobyl

UNIT IV **6 Hours**

WORKPLACE RESPONSIBILITIES AND RIGHTS

Fundamental Rights - Responsibilities and Duties of Indian Citizens - Teamwork - Ethical corporate Climat - Collegiality and loyalty - Managing conflict - Respect for authority - Collective bargaining – Confidentiality, Conflicts of interest - Occupational crime - Professional rights - Employee rights

UNIT V **6 Hours**

GLOBAL ISSUES

Multinational corporations: Technology transfer and appropriate technology - International rights - promoting morally just measures - Environmental ethics: Engineering, ecology - economics - Human and sentient centred - and bio and eco centric ethics - Computer ethics and internet - Engineers as managers - Consulting engineers - Engineers as expert witnesses and advisors - Moral leadership

FOR FURTHER READING

Sample code of ethics like IETE,ASME, ASCE, IEEE, Institution of Engineers (India), Indian Institute of Materials Management.

Total: 30 Hours

Reference(s)

1. Mike W Martin and Roland Schinzinger, Ethics in Engineering, 4th edition, Tata McGraw Hill Publishing Company Pvt Ltd, New Delhi, 2014.
2. M Govindarajan, S Natarajan and V S Senthil Kumar, Engineering Ethics, PHI Learning Private Ltd, New Delhi, 2012.
3. R S Naagarazan, A text book on professional ethics and human values, New age international (P)limited, New Delhi,2006.
4. Charles D Fleddermann, Engineering Ethics, Pearson Education/ Prentice Hall of India, New Jersey,2004.
5. Charles E Harris, Michael S Protchard and Michael J Rabins, Engineering Ethics - Concepts and Cases, Wadsworth Thompson Learning, United States, 2005.
6. http://www.slideworld.org/slidestag.aspx/human-values-and- Professional-ethics

19CT702 DATA SCIENCE **3 0 0 3**

Course Objectives

- Familiarize with the fundamentals of data science and related concepts
- Acquaint the students with the knowledge to construct complex statistical models, assess the fit of such models to the data, and apply the models in real-world contexts
- Apply quantitative modeling and data analysis techniques to the solution of real world business problems, communicate findings, and effectively present results using data visualization techniques

Course Outcomes (COs)

1. Analyze data science fundamentals and apply them to day-to-day business and industrial needs
2. Apply appropriate probability and statistical tests using R
3. Apply supervised and unsupervised algorithms in the data analysis process
4. Create the mathematical models for data analysis and also perform mining in text data
5. Create the visualization models using Tableau and d3.js tools

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1	2	2											
2	1	2	2		3									
3	2	3	3	2										
4	1	2	2	3										
5	1	2	3	2	3									

UNIT I **7 Hours**

INTRODUCTION TO DATA SCIENCE

Data Science Fundamentals, Exploring data engineering pipelines, Applying data science and data warehousing to business and industry

UNIT II **9 Hours**

INTRODUCTION TO PROBABILITY AND R

Introduction to Probability, Conditional Probability, Random Variable, Statistical Modelling, Probability Distribution, R Introduction, Data Structures in R, Working with Data in R

UNIT III **10 Hours**

SUPERVISED AND UNSUPERVISED LEARNING

Linear Regressions, Classification- Decision Tree, Naive Bayes, K-Nearest Neighbors, Clustering- Identifying Clusters, K-Means Clustering, Hierarchical Clustering

UNIT IV **10 Hours**

MATHEMATICAL MODELLING

Association Rule Mining, Time Series Analysis, Dimensionality Reduction, Principal Component Analysis, Linear Discriminant Analysis, Sentiment Analysis on text data

UNIT V **9 Hours**

VISUALIZATION TOOLS

Introduction to Visualization - Types of visualizations, Working with Tableau, Creating views in Tableau, using d3.js for data visualization

FOR FURTHER READING

Data Analysis using Python, Natural Language Processing, Google Charts.

Total: 45 Hours

Reference(s)

1. Lillian Pierson, Data Science for Dummies, John Wiley,2015
2. Garrett Grolemund, Hadley Wickham, R for Data Science, O Reilly in January 2017.
3. Andrie de Vries, Joris Meys, R for Dummies, John Wiley and Sons, 2012
4. Jiawei Han, Micheline Kamber, Jian Pei, Data Mining: Concepts and Techniques, Elsevier Inc., 2012.
5. David Baldwin, Mastering Tableau, Packt Publishing, 2016.

19CT703 BLOCKCHAIN TECHNOLOGY **3 0 0 3**

Course Objectives

- Understand the concepts of block chain technology (mainly Bitcoin and Ethereum).
- Develop the models for block chain design for an application.
- Apply the security in block chain applications.
- Apply the concept of implementation support and design the evaluation techniques for block chain
- Analyze the cognitive models and explicate the concept of cognitive architecture.

Programme Outcomes (POs)

a. Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
b. Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
c. Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
d. Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
e. Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
m. PSO1: Demonstrate the knowledge and technical skills in software development.

Course Outcomes (COs)

1. Analyze the functional/operational aspects of cryptocurrency ECOSYSTEM.
2. Apply the emerging abstract models for block chain Technology.
3. Apply the research challenges and technical gaps existing between theory and practice in cryptocurrency domain.
4. Apply the concept of implementation block chain system by sending and reading transactions.
5. Design, build, and deploy a distributed application.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2	2												
2		2	2	2										
3	3	3	3		2								2	
4		2	2		3								2	
5		2	3		2									

UNIT I **9 Hours**

BASICS

The consensus problem - Asynchronous Byzantine Agreement - AAP protocol and its analysis - Nakamoto Consensus on permission-less, nameless, peer-to-peer network - Abstract Models for Blockchain - Garay model - RLA Model - Proof of Work (PoW) as random oracle - formal treatment of consistency, liveness and fairness - Proof of Stake (PoS) based Chains - Hybrid models (PoW + PoS).

UNIT II **9 Hours**

CRYPTOCURRENCY

cryptographic basics for cryptocurrency - short overview of Hashing, signature schemes, encryption schemes and elliptic curve cryptography

UNIT III **9 Hours**

CRYPTOCURRENCY REGULATION

Bitcoin - Wallet - Blocks - Merkley Tree - hardness of mining - transaction verifiability - anonymity - forks - double spending - mathematical analysis of properties of Bitcoin

UNIT IV **9 Hours**

ETHEREUM

Ethereum - Ethereum Virtual Machine (EVM) - Wallets for Ethereum - Solidity - Smart Contracts - some attacks on smart contracts

UNIT V **9 Hours**

TRENDS AND MODELS

Zero Knowledge proofs and protocols in Blockchain - Succinct non interactive argument for Knowledge (SNARK) - pairing on Elliptic curves - Zcash

Total: 45 Hours

Reference(s)

1. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller, and Steven Goldfeder. Bitcoin and cryptocurrency technologies: a comprehensive introduction. Princeton University Press, 2016.
2. Joseph Bonneau et al, SoK: Research perspectives and challenges for Bitcoin and cryptocurrency, IEEE Symposium on security and Privacy, 2015
3. J.A.Garay et al, The bitcoin backbone protocol - analysis and applications EUROCRYPT 2015 LNCS VOl 9057, (Vol. II), pp 281-310.
4. R.Pass et al, Analysis of Blockchain protocol in Asynchronous networks , EUROCRYPT 2017, (eprint.iacr.org/2016/454) . A significant progress and consolidation of several principles)
5. Dr. Gavin Wood, "ETHEREUM: A Secure Decentralized Transaction Ledger,"Yellow paper.2014.

19CT704 CLOUD COMPUTING TECHNIQUES 3 0 0 3

Course Objectives

- Analyze the basic concepts of virtualization technology to derive the best practice model for deploying cloud based applications
- Create an application by utilizing cloud platforms such as Amazon Web Services and Windows Azure
- Identify major security and privacy problems in cloud computing environment

Programme Outcomes (POs)

a. Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
b. Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
c. Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
d. Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
e. Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
m. PSO1: Demonstrate the knowledge and technical skills in software development.

Course Outcomes (COs)

1. Analyze the components of cloud computing showing how business agility in an organization can be created.
2. Design and develop highly scalable cloud-based applications by creating and configuring virtual machines on the cloud.
3. Analyze the key concepts of AWS storage for load balancing in cloud architecture.
4. Analyze how a Windows Azure solution can be optimized so that it can be delivered successfully from the windows cloud
5. Evaluate the risks and benefits of implementing cloud computing.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1		2	3										
2			1	3	2									
3			2	1	3				1					
4	1		2	1	3									
5	1		3		2									

UNIT I **9 Hours**

INTRODUCTION TO CLOUD COMPUTING

Cloud computing at a glance - Historical developments -building cloud computing environments -Cloud Computing Architecture: The cloud reference model, deployment model & service model - computing platforms and technologies.

UNIT II **9 Hours**

VIRTUALIZATION

Introduction & benefit of Virtualization -Implementation Levels of Virtualization- Virtualization at OS level - Virtualization structure - Xen Virtualization Architecture - Binary Translation with full Virtualization - Para Virtualization with Compiler Support - Virtualization in Intex x86processor

UNIT III **9 Hours**

AMAZON WEB SERVICES

AWS Infrastructure - AWS ecosystem - AWS API & security - Amazon Storage - Simple Storage Service(S3) - Elastic Block Storage (EBS) - AWS Security policies, AWS compliance initiatives, Understanding public/private keys - AWS networking and databases service.

UNIT IV **9 Hours**

WINDOWS AZURE

Windows Azure Architecture and components of the Windows Azure Platform, Role of the Fabric Controller - Web worker, VM in Windows Azure, Azure Storage, SQL Azure - Windows Azure Web roles - Windows Azure API- Windows Azure local storage- Blob Storage & Table Storage

UNIT V **9 Hours**

SECURITY

Security for Virtualization Platform - Host security for SaaS, PaaS and IaaS - Data Security - Data Security Concerns - Data Confidentiality and Encryption - Data Availability - Data Integrity - Cloud Storage Gateways - Cloud Firewall.

Total: 45 Hours

Reference(s)

1. Matthew Portney, virtualization Essentials, John Wiley & Sons, Second Edition, 2016
2. Kailash Jayaswal, Jagannath Kallakurchi,Donald J.Houde,Dr.devan Shah, Cloud Computing Black Book, Dreamtech press ,2015
3. Rajkumar Buyya, Christian Vecchiola and Thamarai Selvi S,Mastering in Cloud Computing, McGraw Hill Education, (India) Private Limited, 2013.
4. Bernard Golden, Amazon Web Services for Dummies, John Wiley & Sons, First Edition,2013
5. http//www.microsoft.com/learning/default.mspx.
   https://www.oreilly.com/library/view/cloud-security-and/9780596806453/ch04.html

19CT707 BLOCKCHAIN TECHNOLOGY LABORATORY **0 0 2 1**

Course Objectives

- Develop the models for block chain design for an application.
- Apply the security in block chain applications.
- Apply the concept of implementation support and design the evaluation techniques for block chain

Programme Outcomes (POs)

f. Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
g. Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
h. Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
i. Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
j. Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
m. PSO1: Demonstrate the knowledge and technical skills in software development.

Course Outcomes (COs)

1. Analyze the functional/operational aspects of cryptocurrency ECOSYSTEM.
2. Develop the emerging abstract models for block chain Technology.
3. Apply the research challenges and technical gaps existing between theory and practice in cryptocurrency domain.
4. Apply the concept of implementation block chain system by sending and reading transactions.
5. Design, build, and deploy a distributed application.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2	2												
2		2	2	2										
3	3	3	3		2								2	
4		2	2		3								2	
5		2	3		2									

1 **4 Hours**

EXPERIMENT1

Creating wallets and sending cryptocurrency

2 **4 Hours**

EXPERIMENT 2

Starting a Wordpress website

3 **4 Hours**

EXPERIMENT 3

Create blockchain explorer, Introduction to bitcoin (history, distributed P2P network, immutable ledger, forks and Byzantine Fault Tolerance

4 **4 Hours**

EXPERIMENT 4

Create your own cryptocurrency

5 **4 Hours**

EXPERIMENT 5

Tokenization and trading cryptocurrencies

6 **4 Hours**

EXPERIMENT 6

Start your own ICO

7 **6 Hours**

EXPERIMENT 7

Business applications and assessing blockchain projects

Total: 30 Hours

19CT708 CLOUD COMPUTING LABORATORY 0 0 2 1

Course Objectives

- Understand the basic networking fundamentals to use different devices to build network
- To install, use, and manage virtual machines in Oracle VirtualBox
- To deploy applications on Windows Azure, Amazon Webservices and Google Cloud

Programme Outcomes (POs)

a. Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
b. Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
c. Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
d. Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
e. Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

Course Outcomes (COs)

1. Understand the fundamental concepts of networking and analyze the networking components for communication
2. To Install,Configure and administer Windows and Linux OS on Virtualbox
3. Deploy virtual machines in openstack cloud through horizon dashboard.
4. Deploy applications in Microsoft Windows Azure platform
5. Deploy applications in Amazon Web Services and Google Cloud

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2	1	3											
2	3	2	3											
3	2	2	2										2	
4	2	3	1											2
5	2	3	3											2

EXPERIMENT1

Experiments on Networking Fundamentals

3 Hours

EXPERIMENT 2

Installation and configuration of Oracle Virtualbox

5 Hours

EXPERIMENT 3

Installation of Operating System in Virtualbox

3 Hours

EXPERIMENT 4

Openstack Administration- I

6 Hours

EXPERIMENT 5

Openstack Administration- II

4 Hours

EXPERIMENT 6

Create and Deploy applications on Microsoft Windows Azure

3 Hours

EXPERIMENT 7

Create and Deploy applications on Amazon Web Services

3 Hours

EXPERIMENT 8

Create and Deploy applications on Google Cloud

Total: 30 Hours

Reference(s)

1. Matthew Portney, virtualization Essentials, John Wiley & Sons, Second Edition, 2016
2. Kailash Jayaswal, Jagannath Kallakurchi,Donald J.Houde,Dr.devan Shah, Cloud Computing Black Book, Dreamtech press, 2015
3. Rajkumar Buyya, Christian Vecchiola and Thamarai Selvi S,Mastering in Cloud Computing, McGraw Hill Education, (India) Private Limited, 2013
4. Bernard Golden, Amazon Web Services for Dummies, John Wiley & Sons, First Edition, 2013
5. http//www.microsoft.com/learning/default.mspx
   https://www.oreilly.com/library/view/cloud-security-and/9780596806453/ch04.html

19CT709 PROJECT WORK I 0 0 6 3

Course Objectives

- Work in teams to propose, formulate, and solve a challenging open-ended design problem of significant scope, depth, and breadth.
- Understand and incorporate engineering standards and multiple realistic constraints, within realistic design time, budget, and performance objectives.
- Develop a prototype of the proposed design and demonstrate the prototype in accordance with the specifications.
- Effectively communicate information relating to all aspects of the design process in written, oral, and graphical form.

Course Outcomes (COs)

1. Formulate a real world problem, identify the requirement and develop the design solutions.
2. Identify technical ideas, strategies and methodologies.
3. Utilize the new tools, algorithms, techniques that contribute to obtain the solution of the project.
4. Test and validate through conformance of the developed prototype and analysis the cost effectiveness.
5. Prepare report and present the oral demonstrations.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2	2	3	3	1	3	3	3	3	3		2	3	3
2	2	2	3	3	1	3	3	3	3	3	-	2	3	3
3	2	2	3	3	3	3	3	3	3	3	3	2	3	3
4	2	2	3	3	3	3	3	3	3	3	3	2	3	3
5	2	2			2			3	3	3		2	3	3

19CT804 PROJECT WORK II 0 0 18 9

Course Objectives

- Work in teams to propose, formulate, and solve a challenging open-ended design problem of significant scope, depth, and breadth.
- Understand and incorporate engineering standards and multiple realistic constraints, within realistic design time, budget, and performance objectives.
- Develop a prototype of the proposed design and demonstrate the prototype in accordance with the specifications.
- Effectively communicate information relating to all aspects of the design process in written, oral, and graphical form.

Course Outcomes (COs)

1. Formulate a real world problem, identify the requirement and develop the design solutions.
2. Identify technical ideas, strategies and methodologies.
3. Utilize the new tools, algorithms, techniques that contribute to obtain the solution of the project.
4. Test and validate through conformance of the developed prototype and analysis the cost effectiveness.
5. Prepare report and present the oral demonstrations.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2	2	3	3	1	3	3	3	3	3		2	3	3
2	2	2	3	3	1	3	3	3	3	3		2	3	3
3	2	2	3	3	3	3	3	3	3	3	2	2	3	3
4	2	2	3	3	3	3	3	3	3	3	2	2	3	3
5	2	2			2			3	3	3		2	3	3

18HS201 COMMUNICATIVE ENGLISH II 1 0 2 2

Course Objectives

- Read and understand ideas of complex text on both concrete and abstract topics
- Listen and understand technical discussions in his/her field of specialisation
- Produce clear, detailed text on a wide range of subjects and explain a viewpoint on a topical issue giving the advantages and disadvantages of various options
- Interact with a degree of fluency and spontaneity that makes regular interaction without strain

Programme Outcomes (POs)
Course Outcomes (COs)

1. Use appropriate grammar and vocabulary that is expected at the BEC Vantage exam level.
2. Understand the general meaning of non-routine letters, and of a report of predictable / unpredictable topic
3. Write simple reports of factual nature and factual non-routine letters
4. Ask for factual information and understand the answer; and take/pass on workplace messages
5. Express opinions and present arguments to a limited extent; and give simple, prepared presentations on familiar topics

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1														
2														
3														
4														
5														

UNIT I **9 Hours**

GRAMMAR3

Tenses - Future continuous, Future perfect, Future perfect continuous, Past perfect, Past perfect continuous - Adjectives and adverbs - Mixed conditionals - Modals - can't have, needn't have - Modals of deduction and speculation - Narrative tenses - Passives - Phrasal verbs, extended - Relative clauses - Reported speech - Will and going to, for prediction - Wish - Would expressing habits, in the past.

UNIT II **9 Hours**

READING

Scanning and reading for gist - Understanding text structure - Reading for gist and specific information - Vocabulary and structure - Understanding sentence structure and error identification

UNIT III **9 Hours**

WRITING

A message, memo or email, Giving instructions, explaining a development, asking for comments, requesting information, agreeing to requests - Business correspondence: explaining, apologising, reassuring, complaining, short report: describing, summarising - proposal: describing, summarising, recommending, persuading.

UNIT IV **9 Hours**

LISTENING

Listening for and noting specific information - Listening to identify topic, context, Function - Following the main points and retrieving specific information from the text.

UNIT V **9 Hours**

SPEAKING

Giving personal information: Talking about present circumstances, past experiences and future plans, expressing opinions, speculating - Organising a larger unit of discourse: Giving information and expressing and justifying opinions - Turn-taking: negotiating, collaborating, exchanging information, expressing and justifying opinions, agreeing/disagreeing, suggesting, speculating, comparing and contrasting, and decision-aking. 1.A Horse and Two Goats - R K Narayan 2.My Lord the Baby - Rabindranath Tagore 3.Twist in the Tale - Jeffery Archer.4.The Third and Final Continent - Jhumpa Lahiri 5.The Gift of the Magi - O Henry

Total: 45 Hours

Reference(s)

1. Guy Brook-Hart, "BEC Vantage: Business Benchmark Upper-Intermediate- Student's Books" 1st Edition, Cambridge University Press, New Delhi, 2006.
2. Ian Wood, Paul Sanderson, Anne Williams with Marjorie Rosenberg, "Pass Cambridge BEC Vantage- Student's Book" 2nd Edition, Cengage Learning, New Delhi, 2014
3. Michael Handford, Martin Lisboa, Almut Koester, Angela Pitt, "Business Advantage - Student's Book Upper-Intermediate" Cambridge University Press, New Delhi, 2014.
4. Cambridge Examinations Publishing, "Cambridge BEC VANTAGE - Self-study Edition", Cambridge University Press, UK, 2005.

18HSC01 CHINESE **1 0 2 2**

Course Objectives

- To help students appear for HSK Level 1 Exam
- To help students acquire the basics of Chinese language
- To teach the students how to converse in Chinese in various situations

Programme Outcomes (POs)
Course Outcomes (COs)

1. listen and identify individual sounds of Chinese
2. use basic sounds and words while speaking
3. read and understand short passages on familiar topics
4. use basic sentence structures while writing
5. understand and use basic grammar and appropriate vocabulary in completing language tasks

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1														
2														
3														
4														
5														

UNIT I **9 Hours**

UNIT 1

Hello | 1.Initials and Finals of Chinese | b,p,m,f,d,,n,l,g,k,h,j,q,x | 2. Tones Four | 3.Chinese Syllables | 4.Tone S

UNIT II **9 Hours**

UNIT 2

Thank you | Initials and Finals of Chinese | The Neutral Tone | Rules of Tone Marking and Abbreviation

UNIT III **9 Hours**

UNIT 3

1. What""s your name - In the school; -In the classroom; -In the school | The Interrogative Pronoun | 2 The Sentence | 3 Interrogative Sentences with

UNIT IV **9 Hours**

UNIT 4

She is my Chinese teacher | In the library | The Interrogative Pronouns | The Structural Particle | The interrogative Particle

UNIT V **9 Hours**

UNIT 5

Her daughter is 20 years old this year | 1.The Interrogative Pronoun | 2. Numbers below 100 | 3.Indicating a Change | The Interrogative Phrase

Total: 45 Hours

18HSF01 FRENCH **1 0 2 2**

Course Objectives

- To prepare the students for DELF A1 Examination
- To teach them to converse fluently in French in day-to-day scenarios

Programme Outcomes (POs)
Course Outcomes (COs)

1. To help students acquire familiarity in the French alphabet & basic vocabulary
2. listen and identify individual sounds of French
3. Use basic sounds and words while speaking
4. Read and understand short passages on familiar topics
5. Understand and use basic grammar and appropriate vocabulary in completing language tasks

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1														
2														
3														
4														
5														

UNIT I **9 Hours**

ENTRER EN CONTACT

La langue francaise, alphabets, les numeros, les jours, les mois.| Grammaire Les verbes s appeler,etre, avoir, les articles definis, indefinis | Communication - Saluer, s informer sur quelquun, demander de se presenter | Lexique - Les alphabets, les nationalites, age, les pays, les couleurs, les jours de la semaine, les mois de l annee, les professions

UNIT II **9 Hours**

PARTAGER SON LIEU DE VIE

Les francais et leur habitat, des habitations insolites | Grammaire - Verbes - Conjugaison : Present (Avoir / etre / ER, IR, RE : Regulier et Irregulier) - Adjectifs les propositions de lieu | Communication - Chercher un logement, d ecrire son voisin, s informer sur un logement | Lexique - L habitat, les pieces, l equipement, la description physique

UNIT III **9 Hours**

VIVRE AU QUOTIDIEN

Grammaire - Articles contractes, verbes vouloir, pouvoir, devoir, adjective interrogative, future proche | Communication- Exprimer ses gouts, parler de ses loisirs, justifier un choix, exprimer une envie | Lexique - le temps libre et les loisirs, les saisons, les activites quotidiennes, le temps (le matin, le soir, la nuit)

UNIT IV **9 Hours**

COMPRENDRE SON ENVIRONNEMENT - OUVRIR -Ãƒ?Ã‚Â LA CULTURE

Grammaire - Verbes - Finir, Sortir, les adjectifs demonstratifs, le passe compose, l imparfait | Communication - Propose quelqu un de faire quelque chose, raconteur une sortie au passe parler un film | Lexique - Les sorties, la famille, art, les vetements et les accessoires

UNIT V **9 Hours**

GOUTER A LA CAMPAGNE

Grammaire La forme negative, les verbes acheter, manger, payer, articles partitifs, le pronom en de quantite | Communication Accepter et refuse rune invitation, donner des instructions, commander au restaurant | Lexique Les services et les commerces, les aliments, les ustensiles, argent

Total: 45 Hours

Reference(s)

1. Saison A1, Methode de francais
2. Hachette FLE

18HSG01 GERMAN **1 0 2 2**

Course Objectives

- To help students appear for the A1 level Examination
- To teach them how to converse fluently in German in day-to-day scenarios

Programme Outcomes (POs)
Course Outcomes (COs)

1. Listen and identify individual sounds of German
2. Use basic sounds and words while speaking
3. Read and understand short passages on familiar topics
4. Use basic sentence structures while writing
5. Understand and use basic grammar and appropriate vocabulary in completing language tasks

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1														
2														
3														
4														
5														

UNIT I **9 Hours**

UNIT 1

Introduction to German language: Alphabet - Numbers - Greetings - Days and Seasons- Working with Dictionary.

UNIT II **9 Hours**

UNIT 2

Nouns - articles - Speaking about one self - Listening to CD supplied with the books, paying special attention to pronunciation

UNIT III **9 Hours**

UNIT 3

Regular & Irregular verbs - Personal pronouns - family - Introduction to types of sentences

UNIT IV **9 Hours**

UNIT 4

Question words-Types of Questions - Nominative case- Verb Conjugation - country - nationalities

UNIT V **9 Hours**

UNIT 5

Verbs - to be & to have - conjugation - Hobbys - Framing basic Questions and answers

Total: 45 Hours

Reference(s)

1. Kursbuch and Arbeitsbuch, NETZWERK A1 DEUTSCH ALS FREMDSPRACHE, Goyal Publishers & Distributers Pvt. Ltd., New Delhi, 2015
2. Langenscheidt Eurodictionary - German - English / English - German, Goyal Publishers & Distributers Pvt. Ltd., New Delhi, 2009
3. Grundkurs, DEUTSCH Lehrbuch Hueber Munichen, 2007.

18HSH01 HINDI **1 0 2 2**

Course Objectives

- To help students acquire the basics of Hindi
- To teach them how to converse in Hindi on simple day-to-day situations
- To help students acquire the ability to understand a simple technical text in Hindi

Programme Outcomes (POs)
Course Outcomes (COs)

1. Construct simple sentences and use vocabulary required for day-to-day conversation.
2. Distinguish and understand the basic sounds of Hindi language.
3. Appear for Hindi examinations conducted by Dakshin Bharat Hindi Prachar Sabha.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1														
2														
3														

UNIT I **9 Hours**

UNIT 1

Hindi Alphabet: Introduction - Vowels - Consonants - Plosives - Fricatives - Nasal sounds - Vowel Signs - Chandra Bindu & Visarg -Table of Alphabet -Vocabulary.

UNIT II **9 Hours**

UNIT 2

Nouns: Genders (Masculine & Feminine Nouns long vowels and short vowels - -Masculine & Feminine - Reading Exercises.

UNIT III **9 Hours**

UNIT 3

Pronouns and Tenses: Categories of Pronouns - Personal Pronouns - Second person (you & honorific) - Definite & Indefinite pronouns - Relative pronouns - Present tense - Past tense - Future tense - Assertive & Negative Sentences - Interrogative Sentences.

UNIT IV **9 Hours**

UNIT 4

Classified Vocabulary: Parts of body - Relatives - Spices - Eatables - Fruit & Vegetables - Clothes - Directions - Seasons - Professions.

UNIT V **9 Hours**

UNIT 5

Speaking: Model Sentences and Rhymes - Speaking practice for various occasions.

Total: 45 Hours

Reference(s)

1. Hindi Prachar Vahini-1 by Dakshin Bharat Hindi Prachar Sabha Chennai
2. B.R. Kishore, Self Hindi Teacher for Non-Hindi Speaking People,Vee Kumar Publications(P)Ltd., New Delhi,2009
3. Videos, Stories, Rhymes and Songs

18HSJ01 JAPANESE **1 0 2 2**

Course Objectives

- To train students for N5 Level Examination
- To teach them use basic Japanese sentences in day-to-day conversation
- To make students familiar with the Japanese cultural facets and social etiquettes

Programme Outcomes (POs)
Course Outcomes (COs)

1. Recognise and write Japanese alphabet
2. Speak using basic sounds of the Japanese language
3. Apply appropriate vocabulary needed for simple conversation in Japanese language
4. Apply appropriate grammar to write and speak in Japanese language
5. Comprehend the conversation and give correct meaning

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1														
2														
3														
4														
5														

UNIT I **9 Hours**

UNIT I

Introduction to Japanese - Japanese script- Pronunciation of Japanese(Hiragana)- (Katakana) Long vowels - Pronunciation of in,tsu,ga - Letters combined with ya,yu,yo - Daily Greetings and Expressions - Numerals. N1 wa N2 desu - N1 wa N2 ja arimasen - S ka N1 mo - N1 no N2 - san - Kore - Sore - Are - Kono N - Sono N - Ano N - Sou desu - Sou ja Arimasen - S1 ka - S2 ka - N1 no N2 - Sou desu ka - Koko - Soko - Asoko - Kochira - Sochira Achira - N1 wa N2 (place) desu - Doko - Dochira - N1 no N2 - Ko - So - A - Do (Demonstrative words) - O kuni Kanji10 - Technical Japanese Vocabulary (30 Numbers)

UNIT II **9 Hours**

UNIT II

Introduction to time - Ji - Fun - Pun - Introduction of verbs - V Masu - V Masen - V Mashita - V Masendeshita N (Time) Ni V - N1 Kara - N2 Made - N1 to N2 - S Ne - N (Place) e Ikimasu - Kimasu - Kaerimasu - Doko (e) Mo Ikimasen - Ikimasendeshita - N (Vechile) de Ikimasu - Kimasu - Kaerimasu - N (Person / Animal) to V - Itsu - S Yo N o (transitive) - N o Shimasu - Nani o Shimasuka - Nan and Nani - N (place) de V - V Masenka - V Mashou - o - Kanji 10 - Technical Japanese Vocabulary (30 Numbers) .

UNIT III **9 Hours**

UNIT III

N (tool/means) de V - Word/Sentence wa Go de Nani desu ka - N (person) Ni Agemasu, etc - N (person) Ni Moraimasu etc - Mou V Mashita - Introduction to Adjectives - N wa Na adj (Na) desu - N wa II adj (II) desu - Na adj Na n - II adj (II) N - Totemo - Amari - N wa Dou desuka - N1 wa Donna N2 desuka - S1 Ga S2 - Dore N ga Arimasu - Wakarimasu - N Ga Sukidesu - Kiraidesu - Jozu desu - Heta desu - Donna N - Yoku - Daitai - Takusan - Sukoshi - Amari - Zenzen - S1 kara S2 - Doushite - Kanji 10 - Technical Japanese Vocabulary (30 Numbers)

UNIT IV **9 Hours**

UNIT IV

N ga Arimasu - Imasu - N1 (place) Ni N2 ga Arimasu - Imasu - N1 (thing/person/place) no N2 (position) - N1 ya N2 - Word (s) desuka - Chirisosu wa Arimasuka - Saying numbers - Quantifier (period) Ni kai V - Quantifier Dake - N dake - Past tense of Noun sentences and Na adjective sentences - Past tense of ii adjective sentences - N1 wa N2 yori adjective desu - N1 to N2 to dochira ga adjective desu ka - N1/N2 no houga adjective desu - Kanji 10 - Technical Japanese Vocabulary (30 Numbers)

UNIT V **9 Hours**

UNIT V

N ga hoshi desu - V masu form tai desu - N (place) e V masu form - N Ni - ikimasu - kimasu - kaerimasu N ni V - N o V - dou ko ka - nani ka - go chuu mon - Verb conjugation - Verb groups - Verb te form - V te form kudasai - V te form imasu - V masu from mashouka - S1 ga S2 - N ga V - V te form mo ii desu - V te form wa ikemasen - V te form imasu Shrimasen - Kanji 10 - Technical Japanese Vocabulary (30 Numbers)

Total: 45 Hours

Text Book(s)

1. Japanese for Everyone: Elementary Main Textbook 1-2, Goyal Publishers and Distributors Pvt. Ltd., Delhi, 2007.

Reference(s)

1. Japanese for Everyone: Elementary Main Textbook1-1, Goyal Publishers and Distributors Pvt. Ltd., Delhi, 2007.

DISCIPLINE ELECTIVES

19CT001 MOBILE APPLICATION DEVELOPMENT 3 0 0 3

Course Objectives

- Understand the basics of mobile application development
- Work with mobile app development platforms

Programme Outcomes (POs)

b. Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
c. Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

Course Outcomes (COs)

1. Apply the basics of mobile application development
2. Design the architecture of android application development
3. Develop software using android
4. Develop applications using components of android framework
5. Develop android applications including files and databases

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1		2	2											
2		2	2											
3		3	3											
4		2	2											
5		2	2											

UNIT I **9 Hours**

INTRODUCTION

Introduction to Android, Android versions and its feature set The various Android devices on the market , The Android Market application store ,Android Development Environment - System Requirements, Android SDK, Installing Java, and ADT bundle - Eclipse Integrated Development Environment (IDE), Creating Android Virtual Devices (AVDs)

UNIT II **9 Hours**

ANDROID ARCHITECTURE OVERVIEW AND CREATING AN EXAMPLE ANDROID APPLICATION

The Android Software Stack, The Linux Kernel, Android Runtime - Dalvik Virtual Machine, Android Runtime Ã¢?? Core Libraries, Dalvik VM Specific Libraries, Java Interoperability Libraries, Android Libraries, Application Framework, Creating a New Android Project ,Defining the Project Name and SDK Settings, Project Configuration Settings, Configuring the Launcher Icon, Creating an Activity, Running the Application in the AVD, Stopping a Running Application, Modifying the Example Application, Reviewing the Layout and Resource Files

UNIT III **9 Hours**

ANDROID SOFTWARE DEVELOPMENT PLATFORM

Understanding Java SE and the Dalvik Virtual Machine , The Directory Structure of an Android Project , Common Default Resources Folders , The Values Folder , Leveraging Android XML, Screen Sizes , Launching Your Application: The AndroidManifest.xml File ,Creating Your First Android Application

UNIT IV **9 Hours**

ANDROID FRAMEWORK OVERVIEW

Android Application Components, Android Activities: Defining the UI, Android Services: Processing in the Background, Broadcast Receivers: Announcements and Notifications Content Providers: Data Management, Android Intent Objects: Messaging for Components,Android Manifest XML: Declaring Your Components, Views and View Groups, Android Layout Managers, The View Hierarchy, Designing an Android User Interface using the Graphical Layout Tool

UNIT V **9 Hours**

FILES, CONTENT PROVIDERS, AND DATABASES

Saving and Loading Files, SQLite Databases, Android Database Design, Exposing Access to a Data Source through a Content Provider, Content Provider Registration, Native Content Providers

FOR FURTHER READING

Mobile networking applications-network emulators

Total: 45 Hours

Reference(s)

1. Code Complete: A Practical Handbook of Software Construction, 2nd Edition by Steve McConnell.
2. Mobile Apps Made Simple: The Ultimate Guide to Quickly Creating, Designing and Utilizing Mobile Apps for Your Business, 2nd Edition by Jonathan McCallister
3. Android Application Development Cookbook- Second Edition by Rick Boyer and Kyle Mew

19CT002 PROGRESSIVE WEB APP 3 0 0 3

Course Objectives

- Understand the purpose of PWAs and the problems they solve
- Implement existing web apps to pwas using service workers, caches API and web app manifests
- Apply the core technologies behind Progressive Web Apps

Programme Outcomes (POs)

b. Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
c. Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
e. Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

Course Outcomes (COs)

1. Apply knowledge for web app manifest
2. Develop a app using dynamic content cache and PWA
3. Apply the cache and offline support and service worker for web app
4. Evaluate the deploy to firebase of web app
5. Apply PWA with spa and notification technique in web app.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1			2	2										1
2		2												2
3		3				2								3
4		2	2			2								3
5			2			3								2

UNIT I **9 Hours**

INTRODUCTION TO WEB APP MANIFEST

Introduction to Web App Manifest: Add Properties for Safari - Prerequisites for Installing Web App - Understanding App Manifest Properties - Add Properties to Manifest.json - Add Properties for Internet Explorer - Run the Android Emulator and Leverage Chrome Dev Tools to debug

UNIT II **8 Hours**

DYNAMIC CONTENT CACHE AND INTRODUCTION TO PWA

Indexed DB or Write Data - Tools to Help Create Service Worker as well as Cache - Indexed DB or Retrieve and Delete - Responsive UI - PWA -Demo of Final Course Project - PWA Core Concepts - Tools Overview and Setup - PRPL Pattern.

UNIT III **9 Hours**

CACHE AND OFFLINE SUPPORT AND SERVICE WORKER

Cache API - Pre-Caching or Static Caching - Add and Update Cache - Respond with Cache - Storage Options - ES6 Overview - Dynamic Caching Upon Fetch - Offline Respond Place holders - Remove/Clean up Caches - Fetch API

Events in Service Worker - Promise API - Service Worker Lifecycle - Debug the Service Worker - Register, pdate, Activate SW - Install App Banner and Control it - Service Worker introduction - Working of an SW

UNIT IV **10 Hours**

DEPLOYMENT TO FIREBASE AND BACKGROUND SYNC

Deploy to Firebase - Setup Firebase CLI - Make App Ready to Deploy - Periodic Sync Register a Synchronization Task - How Background Sync Helps - Syncing Data in Server Worker with Server

UNIT V **9 Hours**

PWA with SPA and Notification

PWA in an Ember App - PWA in an Angular App - PWA in a Vue App - PWA in a React App - Clean Up Subscriptions - Push Notification Fundamentals - Store the Client Subscription and Secure in Back-end - Request Permission, Subscription, and Display Notification - Send a notification from the Server and Listen from the SW

Total: 45 Hours

Reference(s)

1. Dean Hume and Jason Grigsby, Progressive Web Apps, black & white - 2018
2. Chris Love, Progressive Web Application Development by Example: Develop Fast, Reliable, and Engaging User Experiences for the Web, Packt, 2018
3. Tal Ater, Building Progressive Web Apps: Bringing the Power of Native to the Browser, O'Reilly - 2017
4. Dennis Sheppard, Beginning Progressive Web App Development: Creating a Native App Experience on the Web, Apress, 2017
5. John M. Wargo, Learning Progressive Web Apps, Pearson Education, 2017

19CT003 NATURAL LANGUAGE PROCESSING 3 0 0 3

Course Objectives

- To provide a self-contained introduction to the central issues of Natural Language Processing (NLP).
- To introduce various practical skills associated with the design and implementation of NLP Systems.

Programme Outcomes (POs)

a. Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
b. Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
c. Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
d. Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
m. PSO1: Demonstrate the knowledge and technical skills in software development.

Course Outcomes (COs)

1. Apply the concept of language processing and algorithms.
2. Analyze the Morphology and Finite-State Transducers.
3. Apply the logic of syntax parsing methods.
4. Apply the semantics for language processing.
5. Evaluate the approaches for machine translation and applications of NLP.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2	2											2	
2	2	2	2										2	
3	3	3	2										3	
4	2	2	3	2									2	
5	2	2	2	3									2	

UNIT I **9 Hours**

INTRODUCTION

Knowledge in Speech and Language Processing- Ambiguity- Models and Algorithms- Language,Thought, and Understanding- The State of the Art and the Near-Term Future - Regular Expressions-Basic Regular Expression Patterns- Disjunction, Grouping, and Precedence- Using an FSA to Recognize Sheeptalk- Formal Languages

UNIT II **9 Hours**

MORPHOLOGY AND FINITE-STATE TRANSDUCERS

Inflectional Morphology - Derivational Morphology- Finite-State Morphological Parsing- The Lexicon and Morphotactics - Morphological Parsing with Finite-State Transducers- Combining FST Lexicon and Rules- Lexicon-free FSTs: The Porter Stemmer- Human Morphological Processing- Speech Sounds and Phonetic Transcription- The Phoneme and Phonological Rules

UNIT III **9 Hours**

SYNTAX PARSING

Tagsets for English - Part of Speech Tagging- Rule-based Part-of-speech Tagging- Stochastic Part-of speech Tagging- Transformation-Based Tagging- Context-Free Grammars for English - Context-Free Rules and Trees- The Noun Phrase. The Verb Phrase and Subcategorization- Grammar Equivalence &Normal Form- Finite State & Context-Free Grammars

UNIT IV **9 Hours**

SEMANTICS

Computational Desiderata for Representations- Meaning Structure of Language- First Order Predicate Calculus- Elements of FOPC- The Semantics of FOPC- Syntax-Driven Semantic Analysis- Attachments for a Fragment of English

UNIT V **9 Hours**

MACHINE TRANSLATION AND APPLICATIONS

Basic Issues in Machine Translation- Statistical Translation- Word Alignment- Phrase based Translation- Synchronous Grammars- Applications of Natural Language Processing: Spell Check- Summarization- Language Translation

Total: 45 Hours

Reference(s)

1. Daniel Jurafsky and James H. Martin "Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech recognition", Prentice Hall, 2nd edition, 2008.
2. Steven Bird, Ewan Klein and Edward Loper "Natural Language Processing with Python", O'Reilly Media; 1 edition, 2009.
3. Roland R. Hausser "Foundations of Computational Linguistics: Human- Computer Communication in Natural Language", Paperback, MIT Press, 2011.
4. Christopher D. Manning and Hinrich Schuetze, "Foundations of Statistical Natural Language Processing" by MIT Press, 1999.
5. Pierre M. Nugues, "An Introduction to Language Processing with Perl and Prolog: An Outline of Theories, Implementation, and Application with Special Consideration of English, French, and German (Cognitive Technologies)", Softcover reprint, 2010.

19CT004 DEEP LEARNING 3 0 0 3

Course Objectives

- To impart basic knowledge on Neural Networks and AI.
- To familiarize with implementation of methods and algorithms of Deep Learning techniques.
- To understand CNN and RNN models in analyzing visual imagery.

Course Outcomes (COs)

1. Analyze the working of Unsupervised Learning and Supervised Learning Neural Network.
2. Apply Regression and Classification predictive models for function approximation.
3. Apply the Probability theory a mathematical framework for representing uncertain statements.
4. Analyse and Design the Convolutional Neural Network models to recognize, model, and solve problems in the analysis and design of information systems.
5. Apply the Recurrent Neural Network models to recognize, model, and solve problems in the analysis and design of information systems.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1	2	2	3										
2	1	3	2	2	1									
3		3	2	2										
4		2	1	2	1									
5		2	2	1	1							1		

UNIT I **8 Hours**

NEURAL NETWORKS

Neural Network- Multilayer neural networks-Unsupervised Learning-Supervised Learning- Boltzmann Machine- Optimization using Hopfield Network- Genetic Algorithm- Applications of Neural Networks.

UNIT II **9 Hours**

AI AND MACHINE LEARNING

Intelligent agents, Agents and environments, Structure of agents - Problem Solving - Problem solving agent-Machine Learning-Supervised and Unsupervised learning-Regression and Classification-K-Means Clustering.

UNIT III **10 Hours**

DEEP LEARNING TECHNIQUES

Introduction-History of Deep Learning-Linear Model Regression-Deep Learning Working-Perceptron-Back Propagation-Probability and Information Theory: Random variable and distributed Probability - Bayes Rule - Information Theory and structured probabilistic models.

UNIT IV **9 Hours**

CONVOLUTIONAL NEURAL NETWORK

Convolutional Neural Network-Architecture- Backpropagation- ConvNets for spatial – localization - Object detection.

UNIT V **9 Hours**

RECURRENT NEURAL NETWORK

Recurrent Neural Networks (RNN)-Long Short Term Memory (LSTM)-RNN language models-Image captioning.

FURTHER READING

Deep Boltzmann Machines- Gradient-Based Learning- Industrial automation-Feed Forward Neural Network- FMS and Robotics-Business Intelligence **Total: 45 Hours**

Reference(s)

1. Bengio, Yoshua, Ian J. Goodfellow, and Aaron Courville. "Deep learning." An MIT Press book (2015).
2. Mishra R B, Artificial Intelligence, PHI Learning Pvt. Ltd., New Delhi, 2011
3. Bengio, Yoshua. "Learning deep architectures for AI." Foundations and trends in Machine Learning 2.1 (2009): 1127.
4. Kevin Knight, Elaine Rich and Nair, Artificial Intelligence, Tata McGraw Hill, New Delhi, 2008
5. Russell, S. and Norvig, N. Artificial Intelligence: A Modern Approach. Prentice Hall Series in Artificial Intelligence. 2003.

19CT005 ROBOTICS 3 0 0 3

Course Objectives

- To acquire knowledge on the fundamentals of robotic systems

Programme Outcomes (POs)

b. Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
c. Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
d. Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
e. Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

Course Outcomes (COs)

1. Analyze fundamental terminology used in robotics
2. Apply major types of end effectors and controls used in robot
3. Apply fundamental transformation matrix for kinematic solution and sensors used in robotics
4. Evaluate major robot work cell design and robot applications for manufacturing and assembly sectors
5. Create micro and nano robots and its application

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1		2												3
2			2		1									3
3			1		2								1	3
4			2										2	2
5		2			1								2	1

UNIT I **9 Hours**

INTRODUCTION TO ROBOTICS

Robot anatomy-Definition, law of robotics, History and Terminology of Robotics-Accuracy and repeatability of Robots-Simple problems- Specifications of Robot-Speed of Robot-Robot joints and links-Robot classifications-Architecture of robotic systems-Robot Drive systems- Hydraulic, Pneumatic and Electric system.

UNIT II **10 Hours**

END EFFECTORS AND ROBOT CONTROLS

Mechanical grippers-Slider crank mechanism, Screw type, Rotary actuators, cam type-Magnetic grippers-Vacuum grippers-Air operated grippers-Gripper force analysis-Gripper design-Simple problems-Robot controls-Point to point control, Continuous path control, Intelligent robot-Control system for robot joint-Control actions-Feedback devices-Encoder, Resolver, LVDT-Motion Interpolations-Adaptive control.

UNIT III **8 Hours**

ROBOT KINEMATICS

Robot kinematics-Types- 2D, 3D Transformation-Scaling, Rotation, Translation- Homogeneous coordinates, multiple transformation-Simple problems. Denavit- Hartenberg convention, forward and inverse kinematics solution for SCARA configured robot.

UNIT IV **10 Hours**

ROBOT CELL DESIGN AND APPLICATIONS

Robot work cell design and control-Sequence control, Operator interface, Safety monitoring devices in Robot-Mobile robot working principle, actuation using software. Introductions-Robot applications Material handling, Machine loading and unloading, assembly, Inspection, Welding, Spray painting and underwater robot.

UNIT V **9 Hours**

SERVICE AND FIELD ROBOTICS

History of service robotics - Present status and future trends - Need for service robots - applicationsexamples and Specifications of service and field Robots.Non-conventional industrial robots.

FOR FURTHER READING

Medical robot, Nuclear material handling robot, Robots for thermal and chemical plants, Autonomous Vehicles, Application of collaborative robots

Total: 45 Hours

Reference(s)

1. S.R. Deb, Robotics Technology and flexible automation, 2nd Edition, Tata McGraw-Hill Education, 2017
2. Mikell P Groover & Nicholas G Odrey, Mitchell Weiss, Roger N Nagel, Ashish Dutta, Industrial Robotics, Technology programming and Applications, 2nd Edition, Tata McGrawHill Education, 2017.
3. Richard D. Klafter, Thomas .A, Chri Elewski, Michael Negin, Robotics Engineering an Integrated Approach, PHI Learning, 2009.
4. Francis N. Nagy, Andras Siegler, Engineering foundation of Robotics, Prentice Hall Inc., 1986
5. Carl D. Crane and Joseph Duffy, Kinematic Analysis of Robot manipulators, Cambridge University press, 2008
6. NPTEL - https://nptel.ac.in/courses/112105249/

19CT006 ENTERPRISE APPLICATION DEVELOPMENT 3 0 0 3

Course Objectives

- Understanding the work flow of various components of Enterprise Resource Planning in Industrial environment.
- Design and development of Enterprise Resource Planning (ERP) Applications using Advanced Business Application Programming (ABAP) Language in SAP.
- Develop dictionary objects with global data structure for business process and resource maintenance
- Create reports based on the requirement of the business needs and analyze the ABAP code through code inspector
- Design applications using Screen programming components to develop End to end Enterprise business applications.

Programme Outcomes (POs)

b. Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

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

e. Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

Course Outcomes (COs)

1. Apply the components of SAP architecture and analyze functionalities of Enterprise Resource Planning.
2. Apply Business logic for enterprise applications using ABAP Programming Language.
3. Apply dictionary objects with global data structure for business process and resource maintenance
4. Create reports based on the requirement of the business needs and analyze the ABAP code through code inspector
5. Create applications using Screen programming components to develop End to end Enterprise business applications.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1		2												3
2			2		1									3
3			1		2								1	3
4			2										2	2
5		2			1								2	1

UNIT I **9 Hours**

INTRODUCTION

IT Overview- ERP Basics - SAP Overview- SAP project: ASAP Methods - Project types – System - Landscape- SAP Portfolio- Architecture - Login Procedure.

UNIT II **9 Hours**

ABAP/4 WORKBENCH

ABAP Statements -Key words- Data Types -Data Objects-Elementary Data Types-User defined Data - types -Write Statement -Control Statements - System Variables-Simple ABAP Programs - Modularization Techniques -Complex data objects.

UNIT III **9 Hours**

ABAP/4 DICTIONARY

Introduction to ABAP Dictionary -Dictionary Objects: domain ?data element - Structure- Table Type - type group - Data base table- Input Check - Performance Analysis- object dependencies- Views - Search helps -Lock objects-Primary Key and Foreign Key -Table Maintenance Generator.

UNIT IV **9 Hours**

REPORTING

Open SQL Statements- Selection Screens - Authorization Check-Classic ABAP Report – Code - Inspector - BAPI - BOR - RFC - ALE - ESOA - Web service - Lock Objects - LUW.

UNIT V **9 Hours**

DIALOG PROGRAMMING

Screen Programming - Program Interface - Screen Elements-Error Handling -Subscreens -Menus-TABstrip Control.

FOR FURTHER READING

Exploring Search Helps: Elementary search help - collective search help - append search help.

Total: 45 Hours

Reference(s)

1. ABAP workbench Part-I and Part-II
2. www. sap.com
3. www. help.sap.com
4. www.scn.sap.com
5. www.service.sap.com

19CT008 SOFTWARE TESTING 3 0 0 3

Course Objectives

- Familiarize with the various test design strategies.
- Understand the levels of testing and defect classes.
- Impart knowledge on the testing and debugging policies with the types of review.

Programme Outcomes (POs)

d. Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

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

f. Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

Course Outcomes (COs)

1. Analyze the fundamentals and activities in software testing.
2. Evaluate the various test design strategies.
3. Evaluate the levels of testing and defect classes.
4. Analyze the techniques in test management.
5. Apply the testing and debugging policies with the types of review.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1		1	1		1									
2		2	2		2									
3		2	2		2									
4		2	2		2									
5		1	1		1									

UNIT I 8 Hours

SOFTWARE TESTING FUNDAMENTALS

Testing as an Engineering Activity - Role of Process in Software Quality - Testing as a Process- The six essentials of software testing - Basic Definitions: Software Testing Principles - The role of a software tester - Origins of Defects- Defect Classes the Defect Repository

UNIT II 8 Hours

TESTING DESIGN STRATEGIES

Introduction to Testing Design Strategies - The Smarter Tester - Test Case Design Strategies - Black Box testing - Random Testing - Equivalence Class Partitioning - Boundary Value Analysis - Cause and error graphing and state transition testing - Error Guessing - Black-box testing and COTS - White-Box testing - Test Adequacy Criteria - Coverage and Control Flow Graphs.

UNIT III **9 Hours**

LEVELS OF TESTING

The Need for Levels of Testing- Unit Test - Unit Test Planning- Designing the Unit Tests. The Class as a Testable Unit - The Test Harness - Running the Unit tests and Recording results- Integration tests- Designing Integration Tests - Integration Test Planning - System Test - Types-of system testing - Regression Testing.

UNIT IV **10 Hours**

TEST MANAGEMENT

People and organizational issues in testing - organization structures for testing teams - testing services - Test Planning - Test Plan Components - Test Plan Attachments - Locating Test Items - test management - test process - Reporting Test Results - The role of three groups in Test Planning and Policy Development - Introducing the test specialist - Skills needed by a test specialist - Building a Testing Group.

UNIT V **10 Hours**

TEST MEASUREMENTS AND REVIEWS

Defining Terms - Measurements and Milestones for Controlling and Monitoring- Status Meetings- Reports and Control Issues - Criteria for Test Completion- SCM - Types of reviews - developing a review program - Components of Review Plans- Reporting review results. Testing Tools-Case Selenium, Autoit

FOR FURTHER READING

Software test automation, skills needed for automation scope of automation, design and architecture for automation, requirements for a test tool challenges in automation.

Total: 45 Hours

Reference(s)

1. S Limaye, Software Testing Principles, Techniques and Tools, McGraw Hill, 2009.
2. Ilene Burnstein, Practical Software Testing, Springer International, 2003.
3. Boris Beiser, Software Testing Techniques, Dreamtech press, New Delhi, 2009.
4. Aditya P.Mathur, Foundations of Software Testing, Pearson Education,2008.
5. Srinivasan Desikan and Gopalaswamy Ramesh, Software Testing , Principles and Practices, pearson Education,2008.

19CT009 XML AND WEB SERVICES 3 0 0 3

Course Objectives

- Construct the web page using XML and service oriented architecture
- Implement the real time applications using XML technologies
- Analyze the design principles and applications of SOAP based Web Services
- Use the key technologies in web services.
- Evaluate the security issues in XML.

Programme Outcomes (POs)

b. Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
c. Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
e. Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

Course Outcomes (COs)

1. Create the web page using XML and service oriented architecture
2. Create the real time applications using XML technologies.
3. Analyze the design principles and applications of SOAP based Web Services.
4. Apply the key technologies in web services.
5. Evaluate the security issues in XML

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1		2	2		2									
2		2	2		2									
3		3	3		3									
4		2	2		2									
5		2	2		2									

UNIT I **8 Hours**

INTRODUCTION

Role of XML - XML and the Web - XML Language Basics - SOAP - Web Services - Revolutions of XML - Service Oriented Architecture (SOA)

UNIT II **9 Hours**

XML TECHNOLOGY

XML - Name Spaces - Structuring with Schemas and DTD - Presentation Techniques - Transformation.

UNIT III **9 Hours**

SOAP SERVICES

Overview of SOAP - HTTP - XML - RPC - SOAP: Protocol - Message Structure - Intermediaries -Actors - Design Patterns and Faults - SOAP with Attachments.

UNIT IV **11 Hours**

WEB SERVICES

Overview - Architecture - Key Technologies - UDDI - WSDL - ebXML - SOAP and Web Services in ECom - Overview of .NET and J2EE.

UNIT V **8 Hours**

XML SECURITY

Security Overview - Canonicalization - XML Security Framework - XML Encryption - XML Digital Signature - XKMS Structure - Guidelines for Signing XML Documents - XML in Practice.

Total: 45 Hours

Reference(s)

1. Frank. P. Coyle, XML, Web Services and the Data Revolution, Pearson Education, 2007.
2. David Hunter, Jeff Rafter, Joe Fawcett, Eric Van der Vlist, Danny Ayers, Jon Duckett, Andrew Watt, Linda McKinnon, Begining XML , Fourth Edition, Wrox publication.
3. Deitel H M, Deitel P J, Nirto T R, Lin T M, XML How to Program, Pearson Edition, 2011

19CT010 SOCIAL NETWORK ANALYSIS 3 0 0 3

Course Objectives

- Apply knowledge for current web development in the era of Social Web
- Develop a model for integrating data for knowledge representation
- Apply the tools and an algorithm for mining in social networks
- Examine the human behavior and trust disputes of social networks
- Apply visualization technique in Social networks

Programme Outcomes (POs)

a. Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
b. Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
c. Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
d. Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
e. Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
f. Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

Course Outcomes (COs)

1. Apply knowledge for current web development in the era of Social Web
2. Analyze a model for integrating data for knowledge representation
3. Apply the tools and an algorithm for mining in social networks
4. Evaluate the human behavior and trust disputes of social networks
5. Apply visualization technique in Social networks

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2	2	2	2										
2	3	2			2									
3	2	3			2	2								
4		2	2			2								
5		2	2			3								

UNIT I **9 Hours**

INTRODUCTION TO SOCIAL NETWORK ANALYSIS

Introduction to Web: Limitations of current Web- Development of Semantic Web - Emergence of the Social Web - Social Network analysis: Development of Social Network Analysis - Key concepts and measures in network analysis - Electronic sources for network analysis: Electronic discussion networks, Blogs and online communities, Web-based networks.

UNIT II **8 Hours**

MODELLING, AGGREGATING AND KNOWLEDGE REPRESENTATION

Ontology languages for the Semantic Web: RDF and OWL - Modelling and aggregating social network data: State-of-the-art in network data representation, Ontological representation of social individuals, Ontological representation of social relationships, Aggregating and reasoning with social network data, Advanced Representations.

UNIT III **9 Hours**

EXTRACTION AND MINING COMMUNITITES IN WEB SOCIAL NETWORKS

Extracting evolution of Web Community from a Series of Web Archive - Detecting Communities in Social Networks: Definition of Community - Evaluating Communities - Methods for Community Detection- Applications of Community Mining Algorithms - Tools for Detecting Communities Social Network Infrastructures and Communities - Decentralized Online Social Networks: Introduction- Challenges for DOSNs- General purpose DOSNs.

UNIT IV **10 Hours**

PREDICTING HUMAN BEHAVIOR AND PRIVACY ISSUES

Understanding and Predicting Human Behavior for Social Communities - User Data Management- Inference and Distribution - Enabling New Human Experiences: Reality Mining - Context Awareness - Privacy in Online Social Networks: Trust in Online Environment - Trust Models Based on Subjective Logic - Trust Network Analysis - Trust Transitivity Analysis - Combining Trust and Reputation - Trust Derivation Based on Trust Comparisons

UNIT V **9 Hours**

VISUALIZATION AND APPLICATIONS OF SOCIAL NETWORKS

Graph Theory- Centrality- Clustering - Node-Edge Diagrams, Matrix representation, Visualizing Online Social Networks - Visualizing Social Networks with Matrix-Based Representations: Matrix and Node-Link Diagrams - Hybrid Representations - Applications of social network analysis: Covert Networks - Community Welfare - Collaboration Networks.

Total: 45 Hours

Reference(s)

1. Borko Furht, -Handbook of Social Network Technologies and Applications, Springer, 1st edition, 2010. Peter Mika - Social Networks and the Semantic Web, Springer, 1st edition 2007.
2. Guandong Xu, Yanchun Zhang and Lin Li,Web Mining and Social Networking Techniques and applications, Springer, 1st edition, 2011.
3. Dion Goh and Schubert Foo, Social information retrieval systems: Emerging technologies and applications for searching the Web effectively, IGI Global snippet, 2008.
4. Max Chevalier, Christine Julien and Chantal Soul-Dupuy, Collaborative and Social Information Retrieval and Access: Techniques for Improved User Modelling, IGI Global snippet, 2009

19CT011 OPEN STACK ESSENTIALS 3 0 0 3

Course Objectives

- Familiarize students with the practical aspects of IaaS (Infrastructure as a Service) cloud computing model
- Familiarize students with the installation and configuration procedure of compute, storage and networking components of openstack platform for establishing enterprise private cloud

Programme Outcomes (POs)

b. Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
c. Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
d. Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
n. PSO2: Develop practical competencies in Networking and Hardware design.

Course Outcomes (COs)

1. Analyze Openstack Architecture and list the components in it.
2. Apply Identity Management and the role of image management using web interface.
3. Apply network management in neutron.
4. Analyze the block storage to the instance using Dashboard.
5. Apply the architecture of swift and its role in object storage.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1		2	2											3
2		2	2	2										3
3		3	3	3										3
4		2	2	2										2
5		2	2	3										2

UNIT I **9 Hours**

ARCHITECTURE AND COMPONENT OVERVIEW

OpenStack Architecture - DashBoard - Keystone - Glance - Neutron - Nova - Cinder - swift - ceilometer - Heat - Summary

UNIT II **9 Hours**

IDENTITY MANAGEMENT

RDO Installation: Installing RDO using packstack - Identity Management:Services and End Points - Hierarchy of User,tenants and roles - creating a user - creating a tenant - Granting a role - Interacting with keystone in dashboard - End Points in the dashboard - Image Management:Glance as a registry of images - using the web interface - Building an image

UNIT III **9 Hours**

NETWORK MANAGEMENT

Networking and Neutron - Open VSwitch Configuration - Creating a network - Web Interface Management - External Network Access - Web Interface External Network Setup

UNIT IV **9 Hours**

INSTANCE MANAGEMENT AND BLOCK STORAGE

Instance Management: Managing Flavors - Managing Key Pairs - Launching an Instance - Managing Floating IP address - Managing Security groups - Communicating with Instances - Launching an Instances using Web Interface - Creating and Using block storage - Attaching the block storage to an Instance - Managing Cinder Volumes in the Web Interface - Backing Storages

UNIT V **9 Hours**

OBJECT STORAGE AND TELEMETRY

Object Storage: Architecture of swift cluster - Creating and Using Object Storage - Object File Management in Web Interface - Using Object Storage on an Instance - Ring Files - Telemetry: Understanding Data Store - Ceilometer's Configuration Terms - Graphing the data

FOR FURTHER READING

Telemetry, Orchestration, Scaling Horizontally, Monitoring, Troubleshooting

Total: 45 Hours

Reference(s)

1. Dan Radez, OpenStack Essentials, PackT publishing, 2015
2. Omar Khedhar, "Mastering Openstack", PackT Publishing, 2015
3. docs.openstack.org

19CT014 NOSQL DATABASE **3 0 0 3**

Course Objectives

- To introduce the fundamental techniques based on parallel processing.
- To develop the foundations for analyzing the benefits of design options in computer architecture.
- To gain knowledge about the application of the various computing techniques.

Programme Outcomes (POs)

- b. Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
- c. Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
- d. Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

Course Outcomes (COs)

1. Analyze different types of NoSQL Databases
2. Analyze and contrast RDBMS with different NoSQL databases.
3. Analyze the detailed architecture and performance tune of Document-oriented NoSQL databases.
4. Apply performance tune of Key-Value Pair NoSQL databases.
5. Apply Nosql development tools on different types of NoSQL Databases.

UNIT I **9 Hours**

INTRODUCTION TO NoSQL

Definition of the Four Types of NoSQL Database -The Value of Relational Databases - Getting at Persistent Data – Concurrency –Integration - Impedance Mismatch - Application and Integration Databases - Attack of the Clusters - The Emergence of NoSQL.

UNIT II **9 Hours**

AGGREGATE AND DISTRIBUTION MODELS

Comparison of relational databases to new NoSQL stores – MongoDB – Cassandra – HBASE - Neo4j use and deployment – Application - RDBMS approach - Challenges NoSQL approach - Key-Value and Document Data Models - Column-Family Stores – Aggregate - Oriented Databases - Replication and sharding - MapReduce on databases - Distribution Models - Single Server – Sharding - Master-Slave Replication - Peer-to-Peer Replication - Combining Sharding and Replication.

UNIT III **10 Hours**

NoSQL KEY/VALUE DATABASES USING MongoDB

Document Databases, Document oriented Database - Features, Consistency – Transactions – Availability - Query Features – Scaling - Suitable Use Cases - Event Logging - Content Management Systems - Blogging Platforms - Web Analytics or Real-Time Analytics - E-Commerce Applications - Complex Transactions Spanning Different Operations - Queries against Varying Aggregate Structure.

UNIT IV **8 Hours**

COLUMN- ORIENTED NoSQL DATABASES USING APACHE HBASE

Column-oriented NoSQL databases using Apache Cassandra - Architecture of HBASE, Column-Family Data Store Features – Consistency – Transactions – Availability - Query Features – Scaling - Suitable Use Cases - Event Logging - Content Management Systems - Blogging Platforms – Counters - Expiring Usage.

UNIT V **9 Hours**

NOSQL KEY/VALUE DATABASES USING RIAK

Key-Value Databases - Key-Value Store - Key-Value Store Features – Consistency – Transactions - Query Features - Structure of Data – Scaling - Suitable Use Cases - Storing Session Information - User Profiles – Preferences - Shopping Cart Data - Relationships among Data - Multi operation Transactions - Query by Data - Operations by Sets - Graph NoSQL databases using Neo4 - NoSQL database development tools and programming languages - Graph Databases - Graph Database – Features – Consistency- Transactions – Availability - Query Features – Scaling - Suitable Use Cases.

FOR FURTHER READING

File Systems, Event Sourcing, Memory Image, Version Control, XML Databases, Object Databases

Total: 45 Hours

Reference(s)

1. Sadalage, P. & Fowler, NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence, Wiley Publications, 1st Edition ,2019.
2. https://www.ibm.com/cloud/learn/nosql-databases
3. https://www.coursera.org/lecture/nosql-databases/introduction-to-nosql-VdRNp
4. https://www.geeksforgeeks.org/introduction-to-nosql/
5. https://www.javatpoint.com/nosql-database

19CT015 ADVANCED COMPUTER ARCHITECTURE 3 0 0 3

Course Objectives

- To introduce the fundamental techniques based on parallel processing.
- To develop the foundations for analyzing the benefits of design options in computer architecture.
- To gain knowledge about the application of the various computing techniques.

Programme Outcomes (POs)

b. Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
c. Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
d. Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

Course Outcomes (COs)

1. Analyze the working principle of ILP.
2. Apply the advanced techniques for exploiting ILP.
3. Analyze the different multiprocessor architectures.
4. Apply the cache optimizations and virtual memory.
5. Analyze the different storage systems and its performance measures.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1		2											1
2	3		1		2									3
3	2		1		2									3
4	3		2											3
5	3		1		3									3

UNIT I **9 Hours**

PIPELINING AND ILP

Fundamentals of computer design-Basic and intermediate concepts of pipelining- Measuring and reporting performance -Instruction level parallelism and its exploitation - Concepts and challenges –Basic compiler techniques for ILP-Reducing branch costs with prediction-Overcoming data hazards with dynamic scheduling -Dynamic branch prediction.

UNIT II **9 Hours**

ADVANCED TECHNIQUES FOR EXPLOITING ILP

Speculation-Multiple issue processors-Compiler techniques for exposing ILP -Limitations on ILP for realizable processors - Hardware versus software speculation-Multithreading: Using ILP support to exploit thread-level parallelism -Performance of advanced multiple issue processors-Efficiency in advanced multiple issue processors

UNIT III **9 Hours**

MULTIPROCESSORS

A taxonomy of parallel architectures- Models for communication and memory architecture – Symmetric and distributed shared memory architectures - Cache coherence issues - Performance issues - Synchronization issues - Models of memory consistency - Interconnection networks - Buses, crossbar- Multi-stage switches.

UNIT IV **9 Hours**

MEMORY HIERARCHY

Introduction - Eleven advanced Optimizations of cache performance - Memory technology and optimizations - SRAM technology-DRAM technology-Protection: Virtual memory and virtual machines- Protection via virtual memory-Protection via virtual machine-Virtual machine monitor-Design of memory hierarchies.

UNIT V **9 Hours**

STORAGESYSTEMS

Advanced topics in disk storage -Disk power-Advanced topics in disk arrays-Definition and examples of real faults and failures- I/O performance, reliability measures and benchmarks-Throughput versus response time-Transaction processing benchmarks-A Little queuing theory.

FOR FURTHER READING

Hardware and software for VLIW and EPIC-Large scale multiprocessors and scientific applications

Total: 45 Hours

Reference(s)

1. John L. Hennessey and David A. Patterson, Computer Architecture - A quantitative approach. Noida: Morgan Kaufmann / Elsevier, 2019.
2. William Stallings, Computer Organization and Architecture - Designing for Performance. New
3. Delhi: Pearson Education, 2009 seventh edition. 3. John L. Hennessey and David A. Patterson, Computer Organization and Design: The
4. Hardware/Software Interface, Third Edition, 2004.
5. David E. Culler and Jaswinder Pal Singh, Parallel Computing Architecture: A hardware/ software
6. approach. Noida: Morgan Kaufmann / Elsevier, 1999. 5. Harvey G. Cragon, Memory systems and pipelined processors,1999

19CT016 INDUSTRIAL AUTOMATION 3 0 0 3

Course Objectives

1. To understand the need of automation in various industrial sectors
2. To learn about the various technology developments such as PLC, SCADA and DCS in Industrial automation
3. To understand the basics of communication with its protocol.

Programme Outcomes (POs)

a. Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
c. Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

Course Outcomes (COs)

1. Analyze the need of automation in industries
2. Analyze different instructions available in PLC for various applications
3. Apply supervisory control and data acquisition systems for particular applications
4. Apply the distributed control system and to differentiate the DCS over other automation systems
5. Create the proper communication buses and its protocol for industrial applications

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1		2											1
2	3		1											3
3	3		1											3
4	3		2											3
5	3		1											3

UNIT I **9 Hours**

BASICS OF AUTOMATION

Automation in Production System-Principles and Strategies of Automation-Basic Elements of an Automated System-Advanced Automation Functions-Levels of Automation-Flow lines, Transfer Mechanisms-Fundamentals and Analysis of Transfer Lines, Fundamentals of IoT

UNIT II **9 Hours**

PROGRAMMABLE LOGIC CONTROLLER

PLC Architecture - Processor Memory Organization: Program Files, Data Files- Programming Languages-Wiring Diagrams and Ladder Logic Programs- Instructions: Simple Instructions, Timer, Counter, Program Control, Data Manipulation, Math Instructions - Selection of PLC

UNIT III **9 Hours**

SUPERVISORY CONTROL AND DATA ACQUISITION

Elements of SCADA-Functionalities of SCADA-Architecture: Hardware, Software: Development, Runtime mode functions-Tools: Tag database-Recipe database- Alarm Logging-Trends: Real Time, Historical Trends-Security and User Access Management-Management Information System-Report Function

UNIT IV **9 Hours**

DISTRIBUTED CONTROL SYSTEM

Evolution of DCS - Types of Architecture - Local Control Unit - Communication Facilities - Operator and Engineering Interfaces - Operator Displays - Process Interfacing issues.

UNIT V **9 Hours**

COMMUNICATION PROTOCOLS

Introduction - Communication Hierarchy, Communication System Requirements - Network Topologies - Communication Modes HART Networks and OSI models- Communication buses - Fieldbus, Modbus, Profibus - Device net - CAN network - System Operation and Troubleshooting.

FOR FURTHER READING

24 Hour Clock Design, Automatic Control of Warehouse Door, Automatic Lubrication of Supplier Conveyor Belt, Automatic Stacking Process.

Total: 45 Hours

Reference(s)

1. M. P. Groover, Automation, Production Systems and Computer Integrated Manufacturing, Fourth Edition, Pearson Education, UK, 2016
2. Webb J.W, Programmable Controller Principles and applications, Fifth Edition, Morrill Publishing Co, USA, 2002
3. Petruzella, FD, Programmable Logic Controllers, Fifth Edition, McGraw-Hill, New York, 2016.
4. Stuart A. Boyer, SCADA: Supervisory Control and Data Acquisition, Fourth Edition, ISA Publication, Europe, 2009
5. Lucas M.P, Distributed control systems, Van Nostrand Reinhold Company, Newyork, 1986

19CT017 SOFT COMPUTING 3 0 0 3

Course Objectives

- Apply suitable soft computing techniques for various applications
- Integrate various soft computing techniques for complex problems

Programme Outcomes (POs)

b. Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

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

Course Outcomes (COs)

1. Apply the basic concepts of soft computing
2. Analyze the architecture and working principles of specialized neural networks
3. Apply the concept of fuzzification and defuzzification in fuzzy systems
4. Analyze the fundamental concepts of genetic algorithm and classify its types
5. Apply hybrid soft computing techniques to solve real time problems

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1		2	3											
2		2	3											
3		3	2											
4		2	3											
5		2	2											

UNIT I **10 Hours**

INTRODUCTION TO SOFT COMPUTING

Introduction-Artificial Intelligence-Artificial Neural Networks-Fuzzy Systems-Genetic Algorithm and Evolutionary Programming-Swarm Intelligent Systems-Classification of ANNs-McCulloch and Pitts Neuron Model-Learning Rules: Hebbian and Delta- Perceptron Network-Adaline Network-Madaline Network.

UNIT II **10 Hours**

ARTIFICIAL NEURAL NETWORKS

Back propagation Neural Networks- Kohonen Neural Network -Learning Vector Quantization - Hamming Neural Network - Hopfield Neural Network- Bi-directional Associative Memory -Adaptive Resonance Theory Neural Networks- Support Vector Machines - Spike Neuron Models.

UNIT III **9 Hours**

FUZZY SYSTEMS

Introduction to Fuzzy Logic, Classical Sets and Fuzzy Sets - Classical Relations and Fuzzy Relations - Membership Functions -Defuzzification- Fuzzy Arithmetic and Fuzzy Measures -Fuzzy Rule Base and Approximate Reasoning - Introduction to Fuzzy Decision Making

UNIT IV **8 Hours**

GENETIC ALGORITHMS

Basic Concepts- Working Principles -Encoding- Fitness Function - Reproduction -Inheritance Operators - Cross Over - Inversion and Deletion -Mutation Operator- Bit-wise Operators -Convergence of Genetic Algorithm.

UNIT V **8 Hours**

HYBRID OF SYSTEMS

Hybrid Systems -Neural Networks, Fuzzy Logic and Genetic -GA Based Weight Determination - LR-Type Fuzzy Numbers - Fuzzy Neuron- Fuzzy BP Architecture - Learning in Fuzzy BP- Inference by Fuzzy BP - Fuzzy ArtMap: A Brief Introduction - Soft Computing Tools - GA in Fuzzy Logic Controller Design - Fuzzy Logic Controller

FOR FURTHER READING

Neural network implementation - Fuzzy logic implementation - Genetic algorithm implementation - MATLAB environment for Soft Computing Techniques.

Total: 45 Hours

Reference(s)

1. N.P.Padhy, S.P.Simon, "Soft Computing with MATLAB Programming", Oxford University Press, 2015
2. S.N.Sivanandam , S.N.Deepa, "Principles of Soft Computing", Wiley India Pvt. Ltd., 3rd Edition, 2018.
3. Kwang H.Lee, "First course on Fuzzy Theory and Applications, Springer, 2005.
4. James A. Freeman and David M. Skapura, "Neural Networks Algorithms, Applications, and Programming Techniques, Addison Wesley, 2003.

19CT018 DISTRIBUTED COMPUTING 3 0 0 3

Course Objectives

- Understand the basic client server communication
- Design and implement a distributed system over other networks
- Diagnose the cause of defects in the deadlocks

Programme Outcomes (POs)

a. Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
c. Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
e. Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

Course Outcomes (COs)

1. Apply the various distributed computing system strategies
2. Apply the inter-process communication and communication between distributed objects.
3. Analyze the concept of distributed transactions and concurrency control.
4. Analyze the resource management techniques in distributed system.
5. Analyze the concept of distributed file system, name services and multimedia systems.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1		1		1									
2	2		2		2									
3	2		2		2									
4	2		2		2									
5	2		2		2									

UNIT I **8 Hours**

BASIC CONCEPTS

Characterization of Distributed Systems - Examples - Resource Sharing and the Web - Challenges - System Models - Architectural and Fundamental Models - Networking and Internetworking - Types of Networks - Network Principles-Internet Protocols.

UNIT II **10 Hours**

INTERPROCESS COMMUNICATION AND DISTRIBUTED OBJECTS

Interprocess Communication - The API for the Internet Protocols - External Data Representation and Marshalling - Client - Server Communication - Group Communication - Case Study - Distributed Objects and Remote Invocation - Communication Between Distributed Objects - Remote Procedure Call - Events and Notifications

UNIT III **9 Hours**

DISTRIBUTED TRANSACTIONS AND CONCURRENCY CONTROL

Transactions - Locks - Optimistic Concurrency Control - Timestamp Ordering - Comparison - Flat and Nested - Distributed Transactions - Atomic Commit Protocols - Concurrency Control in Distributed Transactions - Distributed Deadlocks - Transaction Recovery

UNIT IV **9 Hours**

RESOURCE MANAGEMENT

Time and Global States-Introduction - Clocks, Events and Process states - Synchronizing physical clocks - Logical time and logical clocks - Global states-Distributed debugging - Coordination and Agreement-Introduction - Distributed mutual exclusion - Elections Algorithm - Multicast communication - Consensus and related problems.

UNIT V **9 Hours**

DISTRIBUTED FILE SYSTEM AND NAME SERVICES

Distributed File Systems - Introduction - File service architecture - Network File System- Name Services and the Domain Name System - Directory Services. Distributed multimedia systems- characteristics - Quality of service management - Resource management

FOR FURTHER READING

Ethernet and WiFi - Interprocess Communication in UNIX and Java RMI - Transactions with Replicated Data - Amoeba- Mach - Sun Network File System - Global Name Service

Total: 45 Hours

Reference(s)

1. George Coulouris, Jean Dollimore and Tim Kindberg, Distributed Systems Concepts and Design, Pearson Education, 2012.
2. Andrew S. Tanenbaum, Maartenvan Steen, Distibuted Systems, Principles and Paradigms, Pearson Education, 2007
3. Mugesh Singhal, Niranjan G Shivaratri, Advanced Concepts in Operating Systems, Tata McGraw Hill Edition, 2008
4. M. L. Liu, Distributed Computing Principles and Applications, Pearson Education, 2004.

19CT019 IONIC FUNDAMENTALS **3 0 0 3**

Course Objectives

- To impart the basic knowledge on Ionics open source framework
- To understand the usage of CSS & JavaScript components for design Mobile Applications.
- To understand Cordova SDK to work with Ionics

Programme Outcomes (POs)

a. Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

b. Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

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

d. Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

e. Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

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

Course Outcomes (COs)

1. Apply the basics of Ionic open source framework for Mobile Application Development
2. Analyze the usage of various CSS components by Ionics for App Design
3. Analyze the usage of various JavaScript components by Ionics for App Design.Analyze the resource management techniques in distributed system.
4. Create Cordova SDK to start working with Ionics Framework
5. Create Mobile Applications with Ionics Framework

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1	3		2										
2	1	2	1		3									
3	2	3	2	1										
4		2	1	2	3									
5		1	3									2		

UNIT I **9 Hours**

IONIC - BASICS

Ionic Framework Features, Advantages and Limitations- Ionic Environment setup – Installing Cardova and Ionic – Creating Apps – Tab Apps- Blank Apps – Side Menu App – Test App in Browser – Project Folder Structure.

UNIT II **9 Hours**

IONIC – CSS COMPONENTS

Ionic Colors – Content – Ionic Header, Footer and Buttons – Lists- Cards – Forms – Toggle – Checkbox – Radio Button – Range – Select- Tabs – Grid – Iconic Padding- Integrating Ionic CSS components with AngularJS.

UNIT III

IONIC – JAVASCRIPT COMPONENTS **9 Hours**

Ionic JavaScript Action Sheet-back drop-Contents-Forms-Events-Header- Footer keyboard-List-Model-Navigation- Scroll – Side Menu - Slide Box – Tabs.

UNIT IV **9 Hours**

ADVANCED CONCEPTS - CORDOVA

Ionic Cordova Integration – AdMob – Camera – Facebook – InApp Browser – Native Audio – Geolocation –Cordova Media – Cordova Icon and Splash Scree

UNIT V **9 Hours**

BUILDING APPLICATIONS WITH IONICS

An introduction to sample Application – Architecture of the App – Server and Client Architecture –Setting up the Server – Steps involved in building the application - – Scaffolding the side menu template - Refactoring the template - Building authentication, local Storage, and the REST API factory - Creating controllers for each route and integrating with the factory - – Creating templates and integrating with the controller data

FOR FURTHER READING

Ethernet and WiFi - Interprocess Communication in UNIX and Java RMI - Transactions with Replicated Data - Amoeba- Mach - Sun Network File System - Global Name Service

Total: 45 Hours

Reference(s)

1. Chris Griffith, “Mobile App Development with Ionic “, Oreilly Media, 2017
2. Michael Bohner , “Ionic Framework: Building Mobile Apps with Ionic Framework”, 2016

19CT020 OPEN SOURCE TECHNOLOGY 3 0 0 3

Course Objectives

- Understand the basics of open source software.
- Gain the knowledge of working with Linux platform and database.
- Familiar with different programming concepts in Linux.

Programme Outcomes (POs)

b. Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
g. Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

Course Outcomes (COs)

1. Analyze the components of Linux operating system with the basic commands that are used to perform operations with the terminal in Linux.
2. Apply the steps to install Linux in a system and explore the softwares to be used with the Linux system.
3. Analyze networking in Linux for user account management and user account protection.
4. Evaluate how to compile C and C++ programs in Linux using GNU Debugger on consideration with make files.
5. Create programs using ruby, python and GTK for working with Linux and explore the architecture of X Windows in Linux.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1		2					2							
2		2					3							
3		2					3							
4		2					2							
5		2					2							

UNIT I **8 Hours**

INTRODUCTION

Introduction to Linux Operating System - Basic UNIX Commands - File Filters: File Related Commands - Piping -Joining, awk and backup Commands - Processes in Linux: User Process and Terminal Handling.

UNIT II **10 Hours**

CONFIGURING LINUX SERVICES

Debian Linux Installation - Installing Apache: The Web Server - Samba Installation and Configuration: File Sharing -Compiling from Sources -Installing - NFS - Installing SMTP Mail Server - Installing Common Unix printing System.

UNIT III **10 Hours**

NETWORKS IN LINUX

Installing Squid Proxy and Firewalls - Users and Account Management: Configuration - Creating - Testing - Removing - Allocating - System Logging: Logging - Accounting - Graphical Tools.

UNIT IV **8 Hours**

COMPILING AND DEBUGGING

Compiling C and C++ Programs under Linux - GNU Debugger: Debugger using GDB - Make: Syntax of makefiles - Automake and Autoconf.

UNIT V **9 Hours**

PROGRAMMING IN LINUX

Introduction to Python - Ruby - OOPS through Ruby - Calling UNIX System Calls from Ruby - X Windows Architecture and GUI Programming: GTK Programming

FOR FURTHER READING

Qt Programming - Create Interface - Accessing - Connecting - Merging.

Total: 45 Hours

Reference(s)

1. N. B. Venkateshwarlu, Introduction to Linux: Installation and Programming, B S Publishers; 2014. (An NRCFOSS Publication)
2. Steve Suchring, MySQL Bible, John Wiley, 2015
3. Wesley J. Chun, Core Python Programming, Prentice Hall, 2010
4. Martin C. Brown, Perl: The Complete Reference, 2nd Edition, Tata McGrawHill Publishing Company Limited, Indian Reprint 2009.
5. Steven Holzner, PHP: The Complete Reference, 2nd Edition, Tata McGrawHill Publishing Company Limited, Indian Reprint 2009.

19CT021 HIGH PERFORMANCE COMPUTING 3 0 0 3

Course Objectives

- Understand the challenges in parallel and multi-threaded programming
- Acquire the knowledge about the various parallel programming paradigms, and solutions
- Acquaint the knowledge of Parallel Programming using OpenMP and MPI

Course Outcomes (COs)

1. Apply parallelization to process data in parallel in order to execute faster
2. Apply the Program for Parallel Processors
3. Create programs using OpenMP in Shared Memory
4. Create programs using MPI in Distributed Memory
5. Analyze and contrast programming for serial processors and programming for parallel processors

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2	3	2											
2	3	2	2											
3	1	3	2											
4	1	3	2											
5	1	2	2											

UNIT I **9 Hours**

MULTI-CORE PROCESSORS

Single core to Multi-core architectures - SIMD and MIMD systems - Interconnection networks - Symmetric and Distributed Shared Memory Architectures - Cache coherence - Performance Issues - Parallel program design

UNIT II **9 Hours**

PARALLEL PROGRAM

Performance - Scalability - Synchronization and data sharing - Data races - Synchronization primitives (mutexes, locks, semaphores, barriers)- deadlocks and livelocks - communication between threads (condition variables, signals, message queues and pipes).

UNIT III **9 Hours**

SHARED MEMORY PROGRAMMING WITH OPENMP

OpenMP Execution Model - Memory Model - OpenMP Directives - Work-sharing Constructs - Library functions - Handling Data and Functional Parallelism - Handling Loops - Performance Considerations

UNIT IV **9 Hours**

DISTRIBUTED MEMORY PROGRAMMING WITH MPI

MPI program execution - MPI constructs - libraries - MPI send and receive - Point-to-point and Collective communication - MPI derived datatypes - Performance evaluation

UNIT V **9 Hours**

PARALLEL PROGRAM DEVELOPMENT

Case studies n-Body solvers Tree Search OpenMP and MPI implementations and comparison.

FURTHER READING

Parallel architecture: Inter-process communication, Synchronization, Mutual exclusion, Basics of parallel architecture, Parallel programming with message passing using MPI

Total: 45 Hours

Reference(s)

1. Peter S. Pacheco, "An Introduction to Parallel Programming", Morgan-Kauffman/Elsevier, 2011
2. Darryl Gove, "Multicore Application Programming for Windows, Linux, and Oracle Solaris",Pearson, 2011 (unit 2)
3. Michael J Quinn,"Parallel programming in C with MPI and OpenMP", Tata McGraw Hill, 2003. Shameem Akhter and Jason Roberts, Multi-core Programming, Intel Press, 2006
4. Georg Hager, Gerhard Wellein, "Introduction to High Performance Computing for Scientists and Engineers", Chapman & Hall / CRC Computational Science series, 2011.
5. Charles Severance, Kevin Dowd, High Performance Computing, O'Reilly Media, 2nd Edition, 1998
6. Kai Hwang, Faye Alaye Briggs, Computer Architecture and Parallel Processing, McGraw Hill, 1984

19CT022 COMPUTER GRAPHICS 3 0 0 3

Course Objectives

- Understand the fundamental theories and algorithms of computer graphics and apply them to develop graphics primitives.
- Design and Implement 3D graphical model algorithms using OpenGL
- Acquire knowledge of Illumination models and create an interactive animation using various techniques.

Course Outcomes (COs)

1. Apply the structure of modern computer graphics systems and primitives.
2. Evaluate various algorithms to scan, convert the basic geometrical primitives, transformations, Area filling, clipping.
3. Create 3D UI computer graphics programs using OpenGL
4. Analyze various algorithms used for modelling and rendering graphical 3D data.
5. Create interactive animations using various animation techniques.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	2	1											
2		2	1	3										
3		2	1		3									
4		1		2		3								
5			2		1				3					

UNIT I **9 Hours**

INTRODUCTION TO COMPUTER GRAPHICS AND GRAPHICS PRIMITIVES

Basic of Computer Graphics- Applications of computer graphics, Display devices, Random and Raster scan systems, Graphics input devices, Graphics software and standards. Graphics Primitives: Points, lines, circles and ellipses as primitives, scan conversion algorithms for primitives, Fill area primitives: scan-line polygon filling, inside-outside test, boundary and flood-fill, character generation, line attributes, area-fill attributes, character attributes.

UNIT II **9 Hours**

2D TRANSFORMATION AND VIEWING

Transformations (translation, rotation, scaling), matrix representation, homogeneous coordinates, composite transformations, reflection and shearing, viewing pipeline and coordinates system, window-to- viewport transformation, clipping including point clipping, line clipping (cohen-sutherland, liang-bersky, NLN), polygon clipping.

UNIT III **9 Hours**

INTRODUCTION TO 3D GRAPHICS AND OPENGL

Introduction to 3D graphics: 3D display methods, polygon surfaces, tables, equations, meshes, curved lies and surfaces, quadric surfaces, spline representation, Bazier curves and surfaces, B-spline curves and surfaces. OpenGL: Basic Rendering- Basic Texturing- Shader uniforms- Build-in Functions- Simulating Light- Accessing Textures.

UNIT IV **9 Hours**

3D TRANSFORMATION AND VIEWING

Visible surface detection methods: back-face detection - depth sorting- BSP tree methods. Translation, rotation, scaling, reflection and shear transformations, composite transformations, 3-D viewing: Viewing pipeline, viewing coordinates, view volume and general projection transforms and clipping.

UNIT V **9 Hours**

ILLUMINATION MODELS AND COMPUTER ANIMATION

Basic illumination models- Light intensities- Radiosity lighting model. Computer animation: Design of animation sequence, raster animation, computer animation languages, key frame systems, motion specifications.

FURTHER READING

Advanced rendering techniques, Modelling Techniques, Mathematics for computer graphics.

Total: 45 Hours

Reference(s)

1. Edward Angel, Interactive Computer Graphics: A Top-Down Approach with OpenGL, 4th edition, Addison-Wesley, 2005.
2. Sumanta Guha, Computer Graphics Through OpenGL: From Theory to Experiments, 3rd edition,2018
3. Fabio Ganovelli, et.al, Introduction to Computer Graphics: A Practical Learning Approach, Taylor and Francis group, 2015
4. Donald Hearn, M. Pauline Baker, Computer Graphics, 2nd edition, C version, Prentice Hall, 1996
5. Peter Shirley, Michael Ashikhmin, Michael Gleicher, Stephen R Marschner, Erik Reinhard, Kelvin Sung, and AK Peters, Fundamental of Computer Graphics, CRC Press, 2010.

19CT023 ETHICAL HACKING 3 0 0 3

Course Objectives

- Understand the concepts of Information security threats & coutermeasures
- Design and Develop a model to perform security auditing and testing
- Apply the tools and an algorithm for issues relating to ethical hacking

Programme Outcomes (POs)

a. Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
b. Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
c. Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
e. Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

Course Outcomes (COs)

1. Apply the knowledge and analyse Information security threats & countermeasures
2. Analyze a model to perform security auditing and testing
3. Apply the tools and an algorithm for issues relating to ethical hacking
4. Apply employ network defense measures
5. Apply the penetration and security testing issues

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1		1	1											1
2		2												3
3		3			1	2								3
4		2	2			2								3
5		2	2			3								3

UNIT I **9 Hours**

ETHICAL HACKING OVERVIEW & VULNERABILITIES

Understanding the importance of security, Concept of ethical hacking and essential Terminologies Threat, Attack, Vulnerabilities, Target of Evaluation, Exploit. Phases involved in hacking

UNIT II **9 Hours**

FOOTPRINTING & PORT SCANNING

Footprinting - Introduction to foot printing, Understanding the information gathering methodology of the hackers, Tools used for the reconnaissance phase. Port Scanning - Introduction, using port scanning tools, ping sweeps, Scripting Enumeration-Introduction, Enumerating windows OS & Linux OS

UNIT III **9 Hours**

SYSTEM HACKING

Aspect of remote password guessing, Role of eavesdropping, Various methods of password cracking, Keystroke Loggers, Understanding Sniffers, Comprehending Active and Passive Sniffing, ARP Spoofing and Redirection, DNS and IP Sniffing, HTTPS Sniffing.

UNIT IV **9 Hours**

HACKING WEB SERVICES & SESSION HIJACKING

Web application vulnerabilities, application coding errors, SQL injection into Back-end Databases, cross-site scripting, cross-site request forging, authentication bypass, web services and related flaws, protective http headers Understanding Session Hijacking, Phases involved in Session Hijacking, Types of Session Hijacking, Session Hijacking Tools

UNIT V **9 Hours**

HACKING WIRELESS NETWORKS

Introduction to 802.11, Role of WEP, Cracking WEP Keys, Sniffing Traffic, Wireless DOS attacks, WLAN Scanners, WLAN Sniffers, Hacking Tools, Securing Wireless Networks.

Total: 45 Hours

Reference(s)

1. Kimberly Graves, "Certified Ethical Hacker", Wiley India Pvt Ltd, 2010
2. Michael T. Simpson, "Hands-on Ethical Hacking & Network Defense", Course Technology, 2010
3. Rajat Khare, "Network Seuciryt and Ethical Hacking", Luniver Press, 2006
4. Ramachandran V, BackTrack 5 Wireless Penetration Testing Beginner’s Guide (3rd ed.). Packt Publishing, 2011
5. Thomas Mathew, "Ethical Hacking", OSB publishers, 2003

19CT024 DATA MINING AND DATA WAREHOUSING 3 0 0 3

Course Objectives

- Understand the basic concepts of data mining.
- Apply the data mining functionalities
- Assess the strengths and weaknesses of various data mining techniques

Programme Outcomes (POs)

a. Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

Course Outcomes (COs)

1. Analyze the data warehouse architecture
2. Analyze the functionalities of data mining
3. Apply the different data preprocessing techniques
4. Apply the association rules using frequent item set mining algorithms
5. Evaluate the classification and clustering techniques

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1													
2	2													
3	1													
4	2													
5	2													

UNIT I **7 Hours**

DATA WAREHOUSING

Data Warehouse: Basic Concepts, Differences between Operational Database Systems and Data Warehouses- A Multitiered Architecture - Data Warehouse Models : Extraction, Transformation and Loading - Metadata Repository -Data Cube and OLAP -Data Warehouse Design and Usage - Data warehouse implementation

UNIT II **9 Hours**

INTRODUCTION TO DATA MINING

Introduction - The evolution of database system technology - Steps in knowledge discovery from database process - Architecture of a data mining systems - Data mining on different kinds of data - Different kinds of pattern - Technologies used - Applications - Major issues in data mining - Classification of data mining systems - Data mining task primitives - Integration of a data mining system with a database or datawarehouse system

UNIT III **10 Hours**

DATA PREPROCESSING

Data Objects and attribute types - Basic statistical description of data - Data visualization – Measuring data similarity and dissimilarity - Data cleaning - Integration - Data reduction - Data transformation and data discretization

UNIT IV **9 Hours**

ASSOCIATION RULE MINING

Basic concepts - Frequent itemset mining methods - Apriori algorithm, A Pattern growth approach for mining frequent itemsets, Mining frequent itemsets using vertical data format, Mining closed and max patterns - Pattern mining in multilevel and multidimensional space – Constraint based Frequent patternmining - Mining High-Dimensional Data and Colossal Patterns

UNIT V **10 Hours**

CLASSIFICATION AND CLUSTERING

Classification: Basic concepts - Decision tree induction - Bayes classification methods-Rule Based Classification- Model Evaluation and Selection - Techniques to Improve Classification Accuracy - Bayesian Belief Networks - Classification by Backpropagation - Cluster Analysis – Partitioning methods Hierarchical methods

FOR FURTHER READING

Applications of data mining - Social impacts of data mining-Tools

Total: 45 Hours

Reference(s)

1. Jiawei Han, Micheline Kamber and Jian Pai, Data Mining: Concepts and Techniques, Morgan Kauffman, 2013
2. Alex Berson and Stephen J Smith, Data Warehousing, Data Mining, and OLAP, Mcgraw-Hill,2008
3. David Hand, Heikki Manila, Padhraic Symth, Principles of Data Mining, MIT Press, 2004
4. Margaret H.Dunham, Data Mining: Introductory and Advanced Topics, Pearson Education 2008

3 0 0 3

19CT025 AUGMENTED AND VIRTUAL REALITY

Course Objectives

- Understand the concept of augmented and virtual reality and its classic components.
- Impart image virtualization having big data.
- Compute high performance system with virtual reality.

Programme Outcomes (POs)

b. Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
d. Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
e. Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

Course Outcomes (COs)

1. Analyze the components of the virtual reality system
2. Apply various input and output devices used for virtual reality
3. Apply the different modelling concepts to visual virtualization
4. Analyze the performance of given simple applications related to virtual reality
5. Create 3D technology with virtual programming concepts

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1		2		2	2									
2		2		2	2									
3		3		3	3									
4		2		2	2									
5		2		2	2									

UNIT I **9 Hours**

INTRODUCTION

The three I's of virtual reality, commercial VR technology and the five classic components of a VR system, Augmented Reality and Telepresence.

UNIT II **9 Hours**

INPUT AND OUTPUT DEVICES

Input Devices: (Trackers, Navigation, and Gesture Interfaces): Three-dimensional position trackers, navigation and manipulation, interfaces and gesture interfaces. Output Devices: Graphics displays, sound displays & haptic feedback.

UNIT III **9 Hours**

MODELING

Geometric modeling, kinematics modeling, physical modeling, behaviour modeling, model management and Modeling real-life from sensors.

UNIT IV **9 Hours**

HUMAN FACTORS

Methodology and terminology, user performance studies, VR health and safety issues. Applications:Medical applications, military applications, robotics applications, Virtual product design (CAD display, process simulation, virtual prototyping)

UNIT V **9 Hours**

VR PROGRAMMING

VR Programming-I: Introducing Unity 3D, Project panel, Scene hierarchy, Simple game object, Scene editor. VR Programming-II: Middle VR, device management, graphics card limitation, 3D user interactions, deployment, VR software: VRPN, VR Juggler.

Total: 45 Hours

Reference(s)

1. Virtual Reality Technology, Gregory C. Burdea & Philippe Coiffet, John Wiley & Sons, Inc., Second Edition,2006
2. Killer Game Programming in Java, Andrew Davison, O'reilly-SPD, 2005.
3. Understanding Virtual Reality, interface, Application and Design, William R.Sherman, Alan Craig, Elsevier (Morgan Kaufmann), First edition, 2002.
4. 3D Modeling and surfacing, Bill Fleming, Elsevier (Morgan Kauffman), 1999.
5. 3D Game Engine Design, David H.Eberly, Elsevier, Second Edition, 2006.

19CT026 HUMAN COMPUTER INTERACTION 3 0 0 3

Course Objectives

- Co-relate the Human input-output channels and identify the suitable methods and devices for Human Computer Interaction.
- Develop the models for interaction design for an application.
- Apply the software engineering principles for Human Computer Interaction.
- Apply the concept of implementation support and design the evaluation techniques for Interactions.
- Analyze the cognitive models and explicate the concept of cognitive architecture.

Programme Outcomes (POs)

a. Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
b. Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
c. Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
d. Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
e. Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
m. PSO1: Demonstrate the knowledge and technical skills in software development.

Course Outcomes (COs)

1. Analyze capabilities of human and computer in terms of human information processing.
2. Analyze the models for interaction design for an application.
3. Apply the software engineering principles for Human Computer Interaction.
4. Apply the concept of implementation support and design the evaluation techniques for Interactions.
5. Analyze the cognitive models and explicate the concept of cognitive architecture

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2	2												
2		2	2	2										
3	3	3	3		2								2	
4		2	2		3								2	
5		2	3		2									

UNIT I **9 Hours**

FOUNDATIONS

The Human - Input-output channels - Human Memory - Thinking - Emotions - Psychology and design of interactive systems; Computer - Text entry devices - Positioning, Pointing & drawing - Display devices for Virtual reality and 3D interaction.

UNIT II **9 Hours**

INTERACTION

Introduction- Models of introduction, Frameworks and HCI, Ergonomics, Interaction styles, Elements of the WIMP interface, Interactivity. Interaction Design Basics: The process design, User focus, Scenarios, Navigation design, Screen design and layout, Iteration and prototyping.

UNIT III **9 Hours**

SOFTWARE PROCESS AND DESIGN RULES

HCI in the software process: Introduction, The software life cycle, Usability engineering, Iterative design and prototyping. Design Rules: Introduction- Principles to support Usability - Standards - Guidelines - Golden rules.

UNIT IV **9 Hours**

IMPLEMENTATION SUPPORT AND EVALUATION TECHNIQUES

Implementation support - Windowing system elements- Using tool kits - User interface management - Evaluation techniques - Goals of Evaluation - Evaluation through expert analysis - Evaluation through User Participation - Universal design principles - Multimodal interaction.

UNIT V **9 Hours**

MODELS AND THEORIES

Cognitive models - Goal & task hierarchies - Linguistic models - Physical and device models - Cognitive Architectures - Socio-Organizational issues and stakeholder requirements- Organizational issues-capturing Requirements- Communication and collaboration Models - Face-to-Face communication - Conversation -Text based communication -Group working;

Total: 45 Hours

Reference(s)

1. Alan Dix , Janet Finlay, Gregory D.Abowd, Russell Beale, Human Computer Interaction, Third Edition, Pearson Education, 2017.
2. Julie A. Jacko and Andrew Sears, The human-computer interaction handbook: fundamentals, evolving Technologies, and emerging applications, Lawrence Erlbaum Associates, Inc., Publishers, 2003
3. Lloyd P. Rieber, Computers, Graphics, & Learning, Brown & Benchmark publishers, 2005.
4. Yvonne Rogers, Helen Sharp, Jenny Preece, Interaction Design: beyond human-computer interaction, Second Edition, John-Wiley and Sons Inc., 2009
5. DovTe-eni, Jane Carey, Ping Zhang, Human-Computer Interaction: Developing Effective Organizational Information Systems, John-Wiley and Sons Inc., 2007

19CT027 CYBER FORENSICS **3 0 0 3**

Course Objectives

- To understand the basic concepts and cite appropriate instances for the application of computer forensics and analyze computer forensic evidence
- To illustrate the evidence in a short time frame, and estimate the overall menace and impact of the malicious cyber activity on the victim user or organization.
- To implement the suggestions for protection against the attack and tools.

Programme Outcomes (POs)

a. Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
b. Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
c. Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

Course Outcomes (COs)

1.Analyze the concept of computer forensics in organization
2. Analyze the computer forensics evidence and capture in the modern world.
3. Analyze the working principle of computer forensics
4. Apply the concept of cyber forensics in computer related crime.
5. Create the process of cyber forensics systems in the organizations with modern tools.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2	2												
2		2	2	2										
3	3	3	3		2								2	
4		2	2		3								2	
5		2	3		2									

UNIT 1 **8 Hours**

INTRODUCTION

Computer Forensics Fundamentals - Types of Computer Forensics Technology - Types of Computer Forensics Systems - Vendor and Computer Forensics Services.

UNIT II **9 Hours**

COMPUTER FORENSICS EVIDENCE AND CAPTURE

Data Recovery - Evidence Collection and Data Seizure - Duplication and Preservation of Digital Evidence - Computer Image Verification and Authentication.

UNIT III **9 Hours**

COMPUTER FORENSIC ANALYSIS

Discover of Electronic Evidence Identification of Data - Reconstructing Past Events - Fighting against Macro Threats - Information Warfare Arsenal - Tactics of the Military - Tactics of Terrorist and Rogues - Tactics of Private Companies

UNIT IV **9 Hours**

INFORMATION WARFARE

Arsenal - Surveillance Tools - Hackers and Theft of Components - Contemporary Computer Crime-Identity Theft and Identity Fraud - Organized Crime &Terrorism - Avenues Prosecution and Government Efforts - Applying the First Amendment to Computer Related Crime - The Fourth Amendment and other Legal Issues.

UNIT V **10 Hours**

COMPUTER FORENSIC TOOLS AND CASES

Developing Forensic Capabilities – Searching and Seizing Computer Related Evidence –Processing Evidence and Report Preparation – Future Issues. Computer Forensic Tools: Disk analysis: Autopsy/The Sleuth Kit, Image creation: FTK Imager, Memory forensics: Volatility, Mobile forensics: Cellebrite UFED, Network analysis: Wireshark

Total: 45 Hours

Reference(s)

1. Charles P. Fleeger, "Security in Computing", Prentice Hall, New Delhi, 2015.
2. MariE-Helen Maras, “Computer Forensics: Cybercriminals, Laws, and Evidence”, Jones & Bartlett Learning; 2nd Edition, 2014.
3. Chad Steel, “Windows Forensics”, Wiley, 1st Edition, 2006. 3) Majid Yar, “Cybercrime and Society”, SAGE Publications Ltd, Hardcover, 2nd Edition, 2013.
4. John R. Vacca, “Computer Forensics: Computer Crime Scene Investigation”, Cengage Learning, 4th Edition, 2013
5. Marjie T Britz, “Computer Forensics and Cyber Crime: An Introduction”, Pearson Education, 2nd Edition, 2011.

PHYSICS ELECTIVES
18GE0P1 NANOMATERIALS SCIENCE 3 0 0 3

Course Objectives

- Impart knowledge on Nanoscience
- Explore different techniques of producing nanomaterials
- Create expertise on the applications of nanomaterials in various fields

Programme Outcomes (POs)

Course Outcomes (COs)

1. Summarize the origin and advance of nanomaterials and its classification
2. Compare the different types of methods adopted for synthesizing nanomaterials
3. Analyze the characterization techniques for analyzing nanomaterials
4. Explain the physical properties exhibited by nanomaterials
5. Organize the nanomaterials developed for advanced technological applications

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1														
2														
3														
4														
5														

UNIT I **9 Hours**

NANO SCALE MATERIALS

Introduction-Feynman's vision-national nanotechnology initiative (NNI) - past, present, future -classification of nanostructures, nanoscale architecture - effects of the nanometer length scale - changes to the system total energy, and the system structures- effect of nanoscale dimensions on various properties -differences between bulk and nanomaterials and their physical properties.

UNIT II **9 Hours**

NANOMATERIALS SYNTHESIS METHODS

Top down processes - mechanical milling, nanolithography and types based on radiations - Bottom up process ÃƒÂ¢?? physical method: physical vapour deposition, RF sputtering, CVD- chemical method: colloidal and sol-gel methods - template based growth of nanomaterials - ordering of nanosystems, self-assembly and self-organization.

UNIT III **9 Hours**

CHARACTERIZATION TECHNIQUES

General classification of characterization methods - analytical and imaging techniques - microscopy techniques - electron microscopy, scanning electron microscopy, transmission electron microscopy, atomic force microscopy - diffraction techniques - X-ray spectroscopy – thermo gravimetric analysis of nanomaterials.

UNIT IV **9 Hours**

SEMICONDUCTOR NANOSTRUCTURES

Quantum confinement in semiconductor nanostructures - quantum wells, quantum wires, quantum dots, super lattices-epitaxial growth of nanostructures-MBE, metal organic VPE, LPE - carbon nano tubes- structure, synthesis and electrical properties -applications- fuel cells - quantum efficiency of semiconductor nanomaterials

UNIT V **9 Hours**

NANOMACHINES AND NANODEVICES

Microelectromechanical systems (MEMS) and Nanoelectromechanical systems (NEMS)-fabrication, actuators-organic FET- principle, description, requirements, integrated circuits- organic LED: basic processes, carrier injection, excitons, optimization - organic photovoltaic cells- particulate and geometrical nanomagnets-magneto resistance.

Total: 45 Hours

Reference(s)

1. Willam A. Goddard, Donald W.Brenner, "Handbook of Nanoscience, Engineering, and Technology", CRC Press, 2012
2. Charles P. Poole Jr and. Frank J. Owens, "Introduction to Nanotechnology", Wiley Interscience, 2007
3. Guozhong Cao, Y. Wang, "Nanostructures and Nanomaterials-Synthesis, Properties & Applications", Imperials College Press, 2011.
4. T. Pradeep, "NANO: The Essentials Understanding Nanoscience and Nanotechnology", McGraw - Hill Education (India) Ltd, 2012
5. Robert W. Kelsall, Ian W. Hamley, Mark Geoghegan, "Nanoscale Science and Technology", John Wiley and Sons Ltd, 2006
6. Viswanathan B, Aulice Scibioh M, "Fuel cells: Principles and Applications", University Press, 2009.

18GE0P2 SEMICONDUCTOR PHYSICS AND DEVICES 3 0 0 3

Course Objectives

- Impart knowledge in physical properties of semiconducting materials
- Analyze the factors affecting the operation of semiconductor devices
- Apply the physics of semiconductors to develop semiconductor devices

Programme Outcomes (POs)

Course Outcomes (COs)

1. Exemplify the band gap, drift and diffusion current densities due to carrier transport in semiconductors
2. Analyze the energy band diagram in thermal equilibrium and space charge width of PN junction
3. Illustrate the operation of Bipolar Junction transistor at different modes and different configurations
4. Illustrate the operation of metal oxide field effect transistor and their memory devices
5. Represent the working mechanism of opto-electronic devices

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1														
2														
3														
4														
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UNIT I **9 Hours**

ENERGY BANDS AND CARRIER TRANSPORT PROPERTIES

Energy Bands: Formation of energy bands - doping effects - energy levels - electron and hole concept in semiconductor. Carrier transport: Carrier drift-drift current density - conductivity- diffusion current density - total current density

UNIT II **9 Hours**

P-N JUNCTION

Basic structure and fabrication process of p-n junction - current - voltage characteristics - energy band diagram - equilibrium Fermi levels - depletion region - junction breakdown phenomena - zener - avalanche breakdown.

UNIT III **9 Hours**

BIPOLAR JUNCTION TRANSISTOR

The basic transistor action - operation in the active mode - current gain - static characteristics - carrier distribution in emitter, base and collector region - modes of operation - current - voltage characteristics of common base and emitter configuration - frequency response and switching of bipolar transistor

UNIT IV **9 Hours**

MOSFET

The ideal MOS diode - basic fundamentals and characteristics - types - CMOS and BiCMOS - CMOS inverter - MOSFET on insulator - thin film transistor (TFT) - silicon on insulators (SOI) devices - MOS Memory structures - DRAM and SRAM

UNIT V **9 Hours**

PHOTONIC DEVICES

Radiative transitions and optical absorption-light emitting diodes-organic LED - infrared LED - semiconductor laser - temperature effect - photo detector - photo diode - silicon and compound semiconductor solar cells - efficiency

Total: 45 Hours

Reference(s)

1. Donald A Neamen, "Semiconductor Physics and Devices", Tata McGraw Hill, 2012
2. S. M. Sze and M. K. Lee, "Semiconductor Devices, Physics and Technology", John-Wiley & Sons, 2015
3. Ben. G. Streetman and S. K. Banerjee , "Solid State Electronic Devices", Pearson Education Ltd, 2015
4. C. Kittel, "Introduction to Solid State Physics", John-Wiley & Sons, 2012
5. J. Millman and C. Halkias, "Electronic Devices and Circuits", Tata McGraw Hill, 2010
6. Hagen Klauk, "Organic Electronics: Materials, Manufacturing and Applications", Wiley-VCH, 2006

18GE0P3 APPLIED LASER SCIENCE 3 0 0 3

Course Objectives

- Impart knowledge on laser science
- Explore different strategies for producing lasers
- Create expertise on the applications of lasers in various fields

Programme Outcomes (POs)

1. Illustrate the transition mechanisms and the components of a laser system
2. Compare the different types of lasers based on pumping method, active medium and energy levels
3. Compute the rotation of earth, velocity and distance using lasers and apply the same for day today applications
4. Analyze the role of lasers in surgical and endoscopy applications
5. Apply the laser techniques in industrial applications

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1														
2														
3														
4														
5														

UNIT I **9 Hours**

LASER FUNDAMENTALS

Introduction - principle - absorption and emission of light - thermal equilibrium - Einstein's prediction - Einstein's relations - A and B coefficients - condition for large stimulated emission - spontaneous and stimulated emission in optical region - light amplification - condition for light amplification - population inversion. Components of lasers - pumping methods - pumping mechanisms - optical resonator

UNIT II **9 Hours**

LASER BEAM CHARACTERISTICS AND TYPES

Characteristics of laser - Classification of lasers - principle, construction, working, energy level diagram and applications of molecular gas laser (CO2 laser) - liquid laser (dye laser) - excimer laser - Solid state laser (Nd:YAG laser) - semiconductor laser (homojunction laser).

UNIT III **9 Hours**

LASERS IN SCIENCE

Introduction - Harmonic generation (SHG) - Stimulated Raman emission - lasers in chemistry - laser in nuclear energy - lasers and gravitational waves - rotation of the earth - measurement of distance - Light detection And Ranging (LIDER) - velocity measurement - holography

UNIT IV **9 Hours**

LASERS IN MEDICINE AND SURGERY

Light induced biological hazards: Eye and skin - Eye laser surgery - photocoagulations - homeostasis - dentistry - laser angioplasty - different laser therapies - advantages & disadvantages - laser endoscopy.

UNIT V **9 Hours**

LASERS IN INDUSTRY

Applications in material processing: laser welding - hole drilling - laser cutting. Lasers in electronics industry: information storage - bar code scanner. Lasers in defence: laser based military weapons - laser walls.

Total: 45 Hours

Reference(s)

1. K. Thiyagarajan and A. K. Ghatak, "LASERS: Fundamentals and Applications", Springer, USA, 2015
2. M. N. Avadhanulu, "An Introduction to Lasers Theory and Applications", S. Chand Publisher, 2013
3. W. Koechner, M. Bass, "Solid State Lasers: a graduate text", Springer Verlag, New York, 2006
4. K. P. R. Nair, "Atoms, Molecules and Lasers", Narosa Publishing House, 2009
5. K. R. Nambiar, "Lasers: Principles Types and Applications", New Age International Publications, 2006
6. A. Sennaroglu, "Solid-State Lasers and Applications", CRC Press, 2006.

CHEMISTRY ELECTIVES

18GE0C1 CORROSION SCIENCE AND ENGINEERING 3 0 0 3

Course Objectives

- Understand the loss incurred due to corrosion in different sectors and terminologies related to corrosion
- Identify forms and types of corrosion with suitable mechanism
- Apply various methods of corrosion control, corrosion testing and monitoring

Programme Outcomes (POs)

a. Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
b. Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
g. Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

Course Outcomes (COs)

1. Explain if corrosion can occur under specific operating conditions in a given equipment or construction and indicate regions of immunity, corrosion and passivity of a metal
2. Compare different corrosion types on metals when exposed to air, water and at high temperatures (> 100 C)
3. Identify the corrosion mechanism on steel, iron, zinc and copper metal surfaces
4. Calculate the rate of corrosion on metals using electrochemical methods of testing
5. Propose the correct materials, design and operation conditions to reduce the likelihood of corrosion in new equipment and constructions

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2	1												
2	2						1							
3	1	3												
4	2	2												
5	3	3					1							

UNIT I **9 Hours**

CORROSION

Importance of corrosion - spontaneity of corrosion - units of corrosion rate (mdd and mpy) - direct and indirect damage by corrosion - importance of corrosion prevention in industries - Pilling Bedworth ratio and its significance - passivation - area relationship in both active and passive states of metals - Pourbaix digrams of Mg, Al and Fe and their advantages and disadvantages

UNIT II **7 Hours**

TYPES OF CORROSION

Eight forms of corrosion: uniform, galvanic, crevice corrosion, pitting, intergranular corrosion, selective leaching, erosion corrosion and stress corrosion. Catastrophic oxidation corrosion

UNIT III **9 Hours**

MECHANISM OF CORROSION

Hydrogen embrittlement - corrosion fatigue - filiform corrosion - fretting damage and microbes induced corrosion. Corrosion mechanism on steel, iron, zinc and copper metal surfaces

UNIT IV **10 Hours**

CORROSION RATE AND ITS ESTIMATION

Rate of corrosion: Factors affecting corrosion. Electrochemical methods of polarization: Tafel extrapolation polarization and linear polarization. Weight loss method - testing for intergranular susceptibility and stress corrosion. Non destructive testing methods: Visual testing - liquid penetrant testing - magnetic particle testing and eddy current testing

UNIT V **10 Hours**

CORROSION CONTROL METHODS

Fundamentals of cathodic protection - types of cathodic protection(sacrificial anodic and impressed current cathodic protection). Stray current corrosion, problems and its prevention. Protective coatings: Metal coatings: Hot dipping (galvanizing, tinning and metal cladding) - natural inhibitors. Selection of suitable design for corrosion control

FOR FURTHER READING

Corrosion issues in supercritical water reactor (SCWR) systems

Total: 45 Hours

Reference(s)

1. Mouafak A. Zaher, "Introduction to Corrosion Engineering", CreateSpace Independent Publishing Platform, 2016.
2. E.McCafferty, "Introduction to Corrosion Science", Springer; 2010 Edition, January 2010.
3. R. Winstone Revie and Herbert H. Uhlig, "Corrosion and Corrosion Control: An Introduction to Corrosion Science and Engineering", 4th Edition, John Wiley & Science, 2008.
4. Mars G. Fontana, "Corrosion Engineering", Tata McGraw Hill, Singapore, 2008
5. David E.J. Talbot (Author), James D.R. Talbot, "Corrosion Science and Technology", Second Edition (Materials Science & Technology), CRC Press; 2nd Edition, 2007.
6. http://corrosion-doctors.org/Corrosion-History/Eight.htm

18GE0C2 ENERGY STORING DEVICES 3 0 0 3

Course Objectives

- Understand the concept, working of different types of batteries and analyze batteries used in electric vehicles
- Identify the types of fuel cells and to relate the factors of energy and environment
- Analyze various energy storage devices and fuel cells

Programme Outcomes (POs)

Course Outcomes (COs)

1. Explain the parameters required for operation of a cell to evaluate the capacity of energy storage devices
2. Identify the electrodes, electrolyte and cell reactions of different types of primary, secondary batteries and infer the selection criteria for commercial battery systems with respect to commercial applications
3. Differentiate fuel cells based on its construction, production of current and applications
4. Compare different methods of storing hydrogen fuel and its environmental applications
5. Relate energy and environmental based on the importance and types of renewable energy for sustainable development

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1														
2														
3														
4														
5														

UNIT I **6 Hours**

BASICS OF CELLS AND BATTERIES

Components - classification - operation of a cell - theoretical cell voltage - capacity - specific energy - energy density of lithium and lead acid battery - charge efficiency- charge rate - charge retention - closed circuit voltage, open circuit voltage current density - cycle life - discharge rate-over charge-over discharge

UNIT II **10 Hours**

BATTERIES FOR PORTABLE DEVICES AND ELECTRIC VEHICLES

Primary batteries - zinc-carbon, magnesium, and mercuric oxide - recycling/safe disposal of used cells. Secondary batteries - introduction, cell reactions, cell representations and applications - lead acid, nickel-cadmium and lithium ion batteries - rechargeable zinc alkaline battery. Reserve batteries: Zinc-silver oxide, lithium anode cell, photogalvanic cells. Battery specifications for cars and automobiles

UNIT III **10 Hours**

TYPES OF FUEL CELLS

Importance and classification of fuel cells - description, working principle, components, applications and environmental aspects of the following types of fuel cells: alkaline fuel cells, phosphoric acid, solid oxide, molten carbonate and direct methanol fuel cells

UNIT IV **10 Hours**

HYDROGEN AS A FUEL

Sources and production of hydrogen - electrolysis - photocatalytic water splitting - methods of hydrogen storage- high pressurized gas - liquid hydrogen type - metal hydride - hydrogen as engine fuel - features, application of hydrogen technologies in the future - limitations

UNIT V **9 Hours**

ENERGY AND ENVIRONMENT

Future prospects of renewable energy and efficiency of renewable fuels - economy of hydrogen energy. Solar Cells: First, second, third and fourth generation solar cell - photobiochemical conversion cell

Total: 45 Hours

Reference(s)

1. M. Aulice Scibioh and B. Viswanathan, Fuel Cells: Principles and Applications, University Press, India, 2009
2. F. Barbir,PEM fuel cells: Theory and practice, Elsevier, Burlington, MA, Academic Press, 2013
3. M. R. Dell Ronald and A. J. David, Understanding Batteries, Royal Society of Chemistry, 2001
4. J. S. Newman and K. E. Thomas-Alyea, Electrochemical Systems, Wiley, Hoboken, NJ, 2012
5. Shripad T. Revankar, Pradip Majumdar, Fuel Cells: Principles, Design, and Analysis, CRC Press, 2016
6. Thomas B. Reddy, Linden's Handbook of Batteries, 4th Edition, McGraw Hill Professional, 2010

18GE0C3 POLYMER SCIENCE 3 0 0 3

Course Objectives

- Explain the properties of different polymers with its mechanism
- Select the appropriate polymerization techniques to synthesize the polymers and its processing
- Identify suitable polymers for various industrial applications

Programme Outcomes (POs)

Course Outcomes (COs)

1. Illustrate the types of mechanism of polymerization reactions and analyze the natural and synthetic polymers
2. Identify the suitable polymerization techniques to synthesize the high quality polymers
3. Characterize the polymers to identify the structural, thermal ,mechanical and electrical features for specific applications
4. Apply the polymer processing methods to design polymer products
5. Identify and analyze the polymers used in electronic and biomedical applications

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1														
2														
3														
4														
5														

UNIT I **10 Hours**

POLYMERS AND ELASTOMERS

Classification of polymers - Mechanism: Addition polymerization - free radical, cationic, anionic and co-ordination (Ziegler-Natta) polymerization - copolymerization - condensation polymerization (nylon-6,6) -ring opening polymerization (nylon-6). Elastomers: Natural rubber and synthetic rubber: styrene -butadiene rubber (SBR), butyl, neoprene, thiocol rubbers. High performance polymers: polyethers, polyether ether ketone (PEEK), polysulphones and polyimides

UNIT II **8 Hours**

POLYMERIZATION TECHNIQUES

Homogeneous and heterogeneous polymerization - bulk polymerization (PMMA, PVC) - solution polymerization - polyacrylic acid, suspension polymerization (ion-exchange resins) - emulsion polymerization (SBR) - advantages and disadvantages of bulk and emulsion polymerization. Melt solution and interfacial poly-condensation

UNIT III **8 Hours**

CHARACTERIZATION AND TESTING

Characterization of polymers by Infrared Spectroscopy (IR) and Nuclear Magnetic Spectroscopy (NMR) - Thermal properties: TGA and DSC - Testing tensile strength - Izod impact - Compressive strength - Rockwell hardness - Vicot softening point. Test for electrical resistance, dielectric constant, dissipation factor, arc resistance and dielectric strength - water absorption

UNIT IV **9 Hours**

POLYMER PROCESSING

Moulding: Compression - injection - extrusion and blow mouldings. Film casting - calendering. Thermoforming and vacuum formed polystyrene - foamed polyurethanes. Fibre spinning: melt, dry and wet spinning. Fibre reinforced plastics fabrication: hand-layup - filament winding and pultrusion

UNIT V **10 Hours**

SPECIALITY POLYMERS

Preparation and properties of heat resistant and flame retardant polymers. Polymers for electronic applications: liquid crystalline, conducting and photosensitive polymers. Polymer for biomedical applications: artificial organs, controlled drug delivery, hemodialysis and hemofiltration

FOR FURTHER READING

Biodegradable polymers

Total: 45 Hours

Reference(s)

1. V. R. Gowarikar, N. V. Viswanathan and Jayadev Sreedhar, "Polymer Science", New Age International (P) Ltd., New Delhi, 2015
2. Joel R. Fried, "Polymer Science and Technology", Prentice Hall of India (P). Ltd., 2014
3. F. W. Billmeyer,"Text Book of Polymer Science", John Wiley & Sons, New York, 2007
4. Barbara H. Stuart, "Polymer Analysis", John Wiley & Sons, New York, 2008
5. George Odian , "Principles of Polymerization", John Wiley & Sons, New York, 2004
6. R. J. Young and P. A. Lovell, "Introduction to Polymers", CRC Press, New York, 2011

18GE0M1 GRAPH THEORY AND COMBINATORICS 3 0 0 3

Course Objectives

- This course comprehends the graphs as a modeling and analysis tool in computer science & Engineering
- It introduces the structures such as graphs & trees and techniques of counting and combinations, which are needed in number theory based computing and network security studies in Computer Science.

Programme Outcomes (POs)
Course Outcomes (COs)

1. Recognize the basic ideas of Graph and its characteristics.
2. Assess the characteristics of trees and its properties.
3. Predict the coloring of graphs and its applications in the respective areas of engineering.
4. Compute the permutations and combinations in the engineering field.
5. Demonstrate the types of generating functions and their applications in engineering.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	2													
2	2	2													
3	2	2													
4	2	2													
5	2	2													

UNIT I **9 Hours**

INTRODUCTION

Graphs - Introduction - Isomorphism - Sub graphs - Walks, Paths, Circuits - Connectedness - Components - Euler graphs - Hamiltonian paths and circuits - Trees - Properties of trees - Distance and centers in tree - Rooted and binary trees.

UNIT II **9 Hours**

TREES, CONNECTIVITY

Spanning trees - Fundamental circuits - Spanning trees in a weighted graph - cut sets - Properties of cut set - All cut sets - Fundamental circuits and cut sets - Connectivity and separability - Network flows - 1-Isomorphism - 2-Isomorphism - Combinational and geometric graphs - Planer graphs - Different representation of a planer graph.

UNIT III **9 Hours**

MATRICES, COLOURING AND DIRECTED GRAPH

Chromatic number - Chromatic partitioning - Chromatic polynomial - Matching - Covering - Four color problem - Directed graphs - Types of directed graphs - Digraphs and binary relations - Directed paths and connectedness - Euler graphs.

UNIT IV **9 Hours**

PERMUTATIONS

Fundamental principles of counting - Permutations and combinations - Binomial theorem - combinations with repetition - Combinatorial numbers - Principle of inclusion and exclusion - Derangements - Arrangements with forbidden positions.

UNIT V **9 Hours**

GENERATING FUNCTIONS

Generating functions - Partitions of integers - Exponential generating function - Summation operator - Recurrence relations - First order and second order - Non-homogeneous recurrence relations - Method of generating functions.

Total: 45 Hours

Reference(s)

1. Narsingh Deo, Graph Theory: With Application to Engineering and Computer Science, Prentice Hall of India, 2003
2. Grimaldi R.P., Discrete and Combinatorial Mathematics: An Applied Introduction, Addison Wesley, 1994.
3. Rosen K.H., Discrete Mathematics And Its Applications, McGraw Hil, 2007
4. Clark J. & Holton D.A., A First Look at Graph Theory, Allied Publishers, 1995.
5. Mott J.L., Kandel A. & Baker T.P., Discrete Mathematics for Computer Scientists and Mathematicians, Prentice Hall of India, 1996.
6. Liu C.L., Elements of Discrete Mathematics, McGraw Hill, 1985.

18GE0M2 ALGEBRA AND NUMBER THEORY 3 0 0 3

Course Objectives

- Understand the basic notions of groups, rings, fields which will then be used to solve related problems.
- Examine the key questions in the Theory of Numbers.
- Implement the integrated approach to number theory and abstract algebra, and provide a firm basis for further reading and study in the subject.

Programme Outcomes (POs)
Course Outcomes (COs)

1. Exemplify the concepts of groups and fields in the areas of Engineering.
2. Classify the different types of fields.
3. Organize the divisibility in number theory in various areas of Engineering.
4. Identify the solution of some kinds of equations.
5. Demonstrate the theorems in number theory.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	2													
2	2	2													
3	2	2													
4	2	2													
5	2	2													

UNIT I **9 Hours**

FIELDS

Group Theory - Rings and Polynomials - Fields.

UNIT II **9 Hours**

FINITE FIELDS AND POLYNOMIALS

Finite Fields - Irreducible Polynomials over Finite fields - Factorization of Polynomials over Finite Fields.

UNIT III **9 Hours**

DIVISIBILITY THEORY AND CANONICAL DECOMPOSITIONS

Division algorithm- Base-b representations - number patterns - Prime and composite numbers - Fibonacci and Lucas numbers - Fermat numbers - GCD - Euclidean Algorithm - Fundamental theorem of Arithmetic - LCM.

UNIT IV **8 Hours**

DIOPHANTINE EQUATIONS AND CONGRUENCES

Linear Diophantine equations - Congruence s - Linear Congruence s - Applications: Divisibility tests - Modular Designs - Chinese remainder theorem - 2x2 linear systems.

UNIT V **10 Hours**

CLASSICAL THEOREMS AND MULTIPLICATIVE FUNCTIONS

Wilson s theorem - Fermat s Little theorem - Euler s theorem - Euler s Phi functions - Tau and Sigma functions - Perfect numbers - Mersenne Primes - Mobius Function.

Total: 45 Hours

Reference(s)

1. Lidl.R., and Pilz. G., Applied Abstract Algebra, Springer-Verlag, New Delhi, 2nd Edition, 2006.
2. Thomas Koshy, Elementary Number Theory with Applications, Elsevier Publications, New Delhi, 2002.
3. San Ling and Chaoping Xing, Coding Theory: A first Course, Cambridge Publications, Cambridge, 2004.
4. Niven.I, Zuckerman.H.S., and Montgomery, H.L., An Introduction to Theory of Numbers, John Wiley and Sons, Singapore, 2004.

18GE0M3 MATHEMATICAL FINANCE AND QUEUEING THEORY

3 0 0 3

Course Objectives

- To provide the required fundamental concepts in probability and queueing models and apply these techniques in networks, image processing etc.
- Acquire skills in analyzing queueing models.

Programme Outcomes (POs)
Course Outcomes (COs)

1. Identify the properties of stochastic process in finance
2. Interpret the concept and applications of Statistics in finance.
3. Demonstrate the basics of finance using the notions of statistics.
4. Assess the classifications and the properties of queues.
5. Implement the concepts of queue in open and closed networks.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	2													
2	2	2													
3	2	2													
4	2	2													
5	2	2													

UNIT I **9 Hours**

APPLIED STOCHASTIC CALCULUS

Brownian motion - Constructions - Non differentiability - Quadratic variation - Stochastic integration - Construction of Ito integral and properties ,the Ito formula - Feynman-Kac formula

UNIT II **9 Hours**

STATISTICS

Basic parameter estimation - Maximum likelihood estimation - Distributions - Regression techniques - Tests for normality - QQ plots - Hypothesis testing - Numerical examples in R.

UNIT III **9 Hours**

CONTINUOUS-TIME FINANCE

Black-Scholes-Merton model of stock prices as geometric Brownian motion, derivation of the Black-Scholes-Merton partial differential equation, the Black-Scholes formula and simple extensions of the model, self-financing strategies and model completeness, risk neutral measures, the fundamental theorems of asset pricing, continuous time optimal stopping and pricing of American options, forwards and futures in Black-Scholes-Merton model.

UNIT IV **9 Hours**

QUEUEING THEORY

Markovian queues - Birth and Death processes - Single and multiple server queueing models - Little s formula - Queues with finite waiting rooms - Finite source models.

UNIT V **9 Hours**

NON-MARKOVIAN QUEUES AND QUEUEING NETWORKS

M/G/1 queue - Pollaczek Khinchin formula - M/D/1 and M/EK/1 as special cases - Series queues - Open and closed Jackson networks.

Total: 45 Hours

Reference(s)

1. M. Capinski and T. Zastawniak, Mathematics for Finance: An Introduction to Financial Engineering, Springer, 2005.
2. S. Shreve, Stochastic Calculus for Finance, Vol. 1 and Vol. 2, Springer, 2004.
3. G. R. Grimmett and D. R. Stirzaker, Probability and Random Processes, 3rd Edition, Oxford University Press, 2001.
4. Taha, H.A., Operations Research, Pearson Education, Asia, 8th Edition, 2007.

18GE0E1 ENTREPRENEURSHIP DEVELOPMENT I 3 0 0 3

Course Objectives

- Study of this subject provides an understanding of the scope of an entrepreneur, key areas of development, financial assistance by the institutions, methods of taxation and tax benefits, etc

Programme Outcomes (POs)
Course Outcomes (COs)

1. Analyze the role of entrepreneurship in economic development.
2. Explain the types of ideas that to be used for entrepreneurship development.
3. Examine the legal aspects of business and its association.
4. Examine the sources of business and its analysis.
5. Analyse the different modes of operation management.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1						1	2		2						
2						1	2		2						
3						1	2		2						
4						1	2		2						
5						1	2		2						

UNIT I **9 Hours**

BASICS OF ENTREPRENEURSHIP

Nature, scope and types of Entrepreneurship, Entrepreneur Personality Characteristics, Entrepreneurship process. Role of entrepreneurship in economic development

UNIT II **9 Hours**

GENERATION OF IDEAS

Creativity and Innovation, Lateral Thinking, Generation of Alternatives, Fractional, Reversal Method, Brain Storming, Analogies

UNIT III **9 Hours**

LEGAL ASPECTS OF BUSINESS

Contract act-Indian contract act, Essential elements of valid contract, classification of contracts, sale of goods act-Formation of contract of sale, negotiable instruments- promissory note, bills and cheques, partnership, limited liability partnership (LLP), companies act-kinds, formation, memorandum of association, articles of association.

UNIT IV **9 Hours**

BUSINESS FINANCE

Project evaluation and investment criteria (cases), sources of finance, financial statements, break even analysis, cash flow analysis.

UNIT V **9 Hours**

OPERATIONS MANAGEMENT

Importance- functions-deciding on the production system- facility decisions: plant location, plant layout (cases), capacity requirement planning- inventory management (cases)-lean manufacturing, Six sigma.

Total: 45 Hours

Reference(s)

1. Hisrich, Entrepreneurship, Tata McGraw Hill, New Delhi: 2005
2. Prasanna Chandra, Projects Planning, Analysis, Selection, Implementation and Reviews, Tata McGraw-Hill Publishing Company Limited, New Delhi: 2000.
3. Akhileshwar Pathak, Legal Aspects of Business, Tata McGraw Hill: 2006

18GE0E2 ENTREPRENEURSHIP DEVELOPMENT II 3 0 0 3

Course Objectives

- Evolve the marketing mix for promoting the product / services
- Handle the human resources and taxation
- Understand Government industrial policies / support provided and prepare a business plan

Programme Outcomes (POs)
Course Outcomes (COs)

1. Examine the strategies and plans in marketing management.
2. Analyse the cases involved in human resource management.
3. Classify the direct and indirect taxes in business.
4. Analyze the supports given by government for improving the business.
5. Examine the various steps involved in preparing the business plan.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1						1	2		2						
2							2		2						
3						1	2		2						
4						1	2		2						
5						1	2		2						

UNIT I **9 Hours**

MARKETING MANAGEMENT

Marketing environment,Segmentation, Targeting and positioning, Formulating marketing strategies,Marketing research, marketing plan, marketing mix (cases)

UNIT II **9 Hours**

HUMAN RESOURCE MANAGEMENT

Human Resource Planning (Cases), Recruitment, Selection, Training and Development, HRIS, Factories Act 1948 (an over view)

UNIT III **9 Hours**

BUSINESS TAXATION

Direct taxation, Income tax, Corporate tax, MAT, Tax holidays, Wealth tax, Professional tax (Cases).Indirect taxation, Excise duty, Customs, Sales and Service tax, VAT, Octroi, GST (Cases

UNIT IV **9 Hours**

GOVERNMENT SUPPORT

Industrial policy of Central and State Government, National Institute-NIESBUD, IIE, EDI. State Level Institutions-TIIC, CED, MSME, Financial Institutions

UNIT V **9 Hours**

BUSINESS PLAN PREPARATION

Purpose of writing a business plan, Capital outlay, Technical feasibility, Production plan, HR plan, Market survey and Marketing plan, Financial plan and Viability, Government approvals, SWOT analysis.

Total: 45 Hours

Reference(s)

1. Hisrich, Entrepreneurship, Tata McGraw Hill, New Delhi: 2005
2. Philip Kotler., Marketing Management, Prentice Hall of India, New Delhi: 2003
3. Aswathappa K, Human Resource and Personnel Management - Text and Cases, Tata McGraw Hill: 2007.
4. Jain P C., Handbook for New Entrepreneurs, EDII, Oxford University Press, New Delhi: 2002.
5. Akhileshwar Pathak, Legal Aspects of Business, Tata McGraw Hill: 2006.
6. http://niesbud.nic.in/agencies.htm

ONE CREDIT COURSES

19CT0XA GRAPHQL USING REST API 1 0 0 1

Course Objectives

- Demonstrate the fundamental concepts of GraphQL.
- Understand the concepts and semantics of REST API.
- Learn about API language that executes queries by using a type system based on defined input data.

Course Outcomes (COs)

1.Apply the basic concepts of GraphQL
2. Analyze GraphQL API using Apollo server
3. Create jQuery client applications to consume the API.

UNIT 1 **20 Hours**

GRAPHQL USING REST API

Introduction to GraphQL - Environment Setup - Characteristics of GraphQL using REST API - Architecture - Application Components - REST API vs GraphQL - GraphQL in Canvas - Type system in GraphQL using REST API – Schema – Resolver – Query – Mutation – Validation - JQuery Integration – React Integration - GraphQL to build client applications: Apollo Client - Setting up Server - Setting up the Client - Authenticating Client-Caching.

Total: 20 Hours

References

1. Robin Wieruch," The Road to GraphQL", Nov 05, 2018.
2. Kelly Goetsch, "GraphQL for Modern Commerce",O'Reilly Media, Inc., 2020.
3. Samer Buna," GraphQL in Action", Manning Publications. 2021

19CT0XB COMPUTER VISION 1 0 0 1

Course Objectives

- Understand shape and region analysis, Hough Transform lines, circles, ellipses
- Create Hough Transform for line, circle, and ellipse detections
- Develop an applications using of computer vision algorithms

Course Outcomes (COs)

1. Analyze fundamental image processing techniques required for computer vision
2. Apply Hough Transform for line, circle, and ellipse detections and motion related techniques
3. Create applications using computer vision techniques

UNIT 1 **20 Hours**

COMPUTER VISION

Review of Image Processing Techniques – Binary Shape Analysis – Size Filtering – Distance Functions – Skeletons and Thinning – Boundary Tracking Procedures – Shape Models and Recognition – Centroidal Profiles – Handling Occlusion – Boundary Length Measures and Descriptors – Region Descriptors – Hough Transform (HT) for Line Detection – HT Based Circular Object Detection – Accurate Center Location – Ellipse Detection - Methods for 3D Vision – Projection Schemes – Photometric Stereo – Shape from Shading , Texture and Focus – Active Range Finding – 3D Object Recognition and Reconstruction – Introduction to Motion – Triangulation – Bundle Adjustment – Translational Alignment – Parametric Motion – Spline - Based Motion – Optical Flow – Layered Motion - Face Detection – Face Recognition - 3D Shape Models of Faces - Locating Roadway – Locating Pedestrians.

Total: 20 Hours

References

1. E. R. Davies, “Computer & Machine Vision”, Fourth Edition, Academic Press, 2012.
2. Simon J. D. Prince, “Computer Vision: Models, Learning, and Inference”, Cambridge University Press, 2012.
3. R. Szeliski, “Computer Vision: Algorithms and Applications”, Springer 2011.

19CT0XC UNITY GAME PROGRAMMING 1 0 0 1

Course Objectives

- Demonstrate the basic and fundamental concepts in Unity 3D.
- Understand the 3D concepts for game play, modeling, and programming.
- Learn the basics of Modeling like object creation, collision with Unity.

Course Outcomes (COs)

1. Apply the basic concepts of Unity development environment.
2. Apply the scripting programming concepts in real world problems..
3. Analyze the modeling and programming concepts for 2D and 3D objects.

UNIT 1 **20 Hours**

INTRODUCTION TO UNITY DEVELOPMENT ENVIRONMENT

Game Engines: Engine Concepts - Development Tools - Introducing Unity, Unity Development Environment: IDE Basics - Unity Concepts – Sprites, Setup And Unity Features - Introduction to Game Design and Production - Unity Production Basics: Lighting, Materials, Effects, etc. - Setting up Game and Adding Script - Adding Script - Unity Camera- Unity Identifying Collision.

Total 20 Hours

Reference(s)

1. Joe Hocking, Unity in Action. Multiplatform game development in C# with Unity 5.1, 1st Edition, 2015.
2. Ben Tristem and Mike Geig, Unity Game Development in 24 Hours, 2nd Edition, Sams, 2013.
3. Andy Beane, 3D Animation Essentials, John Wiley & Sons, 2012.

19CT0XD LARAVEL **1 0 0 1**

Course Objectives

- To Understand the PHP concepts
- To Familiar with Laravel framework
- To Gain knowledge about how to build a website using its features

Course Outcomes (COs)

1. Analyze how to create a database and how to use appropriate SQL statements to create tables and store data using PHP
2. Apply Laravel templates to create an authentication system for your application.
3. Create highly responsive websites with appropriate forms and authentications.

UNIT I **20 Hours**

INTRODUCTION TO PHP AND LARAVEL

Introduction to PHP – Basics - Web concepts - String and Form Processing - PHP MySQL Database – Laravel: Introduction, Installation, Application Structure, Routing and Middleware, Working with Database, HTML Template to Laravel Blade Template - Forms – Session – Validation – Error Handling – Exceptions and Event Handling - Encryption/ Decryption - Eloquent ORM - Composer Packages – Security.

Total 20 Hours

Reference(s)

1. Martin Bean, “Laravel 5 Essentials”, Packet Publishing, ISBN 978-1-78528-301-7
2. Fernando Monteiro, “Hands-On Full-Stack Web Development with Angular 6 and Laravel 5 ", Packt Publishing, ISBN 9781788833912
3. Web Technologies: HTML, CSS3, JavaScript, jQUERY, AJAX, PHP, XML, MVC and LARAVEL), Black Book, 2018, Dreamtech, ISBN 9789386052490

19CT0XE DEVOPS **1 0 0 1**

Course Objectives

- To understand the DevOps Concepts and DevOps Tools
- To implement automated system update and DevOps lifecycle
- To understand virtualization and performance

Course Outcomes (COs)

1. Explain the drivers responsible for the emergence of DevOps
2. Perform various Git commands
3. Build and deploy codes using Jenkins
4. Deploy a multi-container application using Docker Compose

UNIT 1 **20 Hours**

DEVOPS ENVIRONMENT AND TOOLS

Introduction to DevOps- Lifecycle - Delivery Pipeline,Version Control with Git-Git, Jenkins & Maven Integration: Branching and Merging-Merge Conflicts-Stashing, Rebasing, Reverting, and Reseting - Configuring Maven.Docker Architecture- Container Lifecycle-CLI-Port Binding-Detached and Foreground Mode- Container Storage-Volumes-Docker Compose-Docker Swarm

Total: 20 Hours

Reference(s)

1. Gene Kim, Jez Humble the DevOps Handbook: How to Create World-Class Agility, Reliability, and Security in Technology Organizations
2. Jez Humble, Continuous Delivery: Reliable Software Releases through Build, Test, and Deployment Automation
3. Jeniffer Davis, Ryn Daniels, Effective DevOps

19CT0XF TRANSFER LEARNING IN DATASCIENCE 1 0 0 1

Course Objectives

- The main objective of the course is to understand the multiclass approaches in Machine Learning and build a transfer learning model to achieve reusability .

Course Outcomes (COs)

1. Understand the basic concepts of Multiclass approaches
2. Apply various transfer learning techniques such as fine-tuning, feature extraction, domain adaptation, and multi-task learning to different scenarios.

Articulation Matrix

CO No	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
1		2	2											
2			2	2	2									

Datasets and Pre-Processing on Data - Neural Networks Framework - Transfer Learning Framework - Training a Model - Develop Model Approach - Pre-Trained Model Approach – Introduction - Transfer in Inductive Learning - Inductive Transfer - Bayesian Transfer - Hierarchical Transfer - Transfer with Missing Data or Class Labels - Transfer in Reinforcement Learning - Imitation Methods - Hierarchical Methods - Alteration Methods - Avoiding Negative Transfer - Automatically Mapping Tasks - Transfer Learning with Image Data - Transfer Learning for Image Recognition - Transfer Learning with Language Data - Feature Extraction - Popular Pre-Trained Models - Oxford VGG Model - Google Inception Model - Microsoft ResNet Model

Total: 15 Hours

Reference(s)

1. Transfer Learning Handbook, Lisa Torrey and Jude Shavlik, University of Wisconsin, Madison WI, USA
2. https://towardsdatascience.com/a-comprehensive-hands-on-guide-to-transfer-learning-with-real-world-applications-in-deep-learning-212bf3b2f27a
3. https://machinelearningmastery.com/transfer-learning-for-deep-learning/
4. https://www.kaggle.com/code/nicholasjhana/tensorflow-multi-classification-transfer-learning/input.

19CT0XG DATABASE INTEGRATION IN WEBDEVELOPMENT 1 0 0 1

Course Objectives

- To Understand the data integration concepts, including data warehousing, schema matching, data exchange, and provenance.
- To Learn how to identify and align schemas from different data sources to facilitate data integration.

Course Outcomes (COs)

1. Apply the principles of designing and implementing data warehouses to support efficient data integration and analysis.
2. Apply schema matching and mapping to resolve structural heterogeneity for successful data integration.

Articulation Matrix

CO No	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2
1		2	2											
2			2	2										

Introduction to Data Integration - Data Warehousing and Provenance - Resolving Structural Heterogeneity through Schema Matching and Mapping - Techniques for Querying Several Heterogeneous Data Sources at once (Data Integration) - Translating Data between Databases with different Data Representations (Data Exchange) - Data-Warehouse Paradigm including Extract Transform Load (ETL) Process - Data Cube Model and its Relational Representations (Such as Snowflake and Star Schema) - Efficient Processing of Analytical Queries - Big Data Analytics Approaches - Representing and Keeping Track of Origin and Creation Process Of Data (Provenance)

Total: 15 Hours

Reference(s)

1. Lillian Pierson, Data Science for Dummies, John Wiley,2015
2. Garrett Grolemund, Hadley Wickham, R for Data Science, O Reilly in January 2017
3. Andrie de Vries, Joris Meys, R For Dummies, John Wiley and Sons, 2012
4. Jiawei Han, Micheline Kamber, Jian Pei, Data Mining: Concepts and Techniques, Elsevier Inc., 2012
5. David Baldwin, Mastering Tableau, Packt Publishing, 2016
6. Java Development with the Spring Framework, Wiley-India, 2012

19CT0XH VIDEO ANALYTICS USING EDGE COMPUTING 1 0 0 1

Course Objectives

- To develop a custom trained model using Jetson Nano
- To measure and improve video AI application performance

Course Outcomes (COs)

1. Apply transfer learning to develop a custom video AI model that is configured for optimal performance
2. Apply and analyze algorithms for developing solutions for real world problems.

Articulation Matrix

CO No	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
1		2	3											
2			3	2	2									

Set Up Jetson Nano and Camera - Collect Image Data for Classification Models - Annotate Image Data for Regression Models - Train a Neural Network to Create Own Models - Run Inference on the Jetson Nano with the Models - Build End-To-End Deep Stream Pipelines - Configure Multiple Video Streams Simultaneously - Configure Inference Engines (Yolo) - Video Analytics in Healthcare: At Home Patient Monitoring, Mental Health Analysis, Video Analytics in Smart Cities.

Total: 15 Hours

Reference(s)

1. “Deep Learning: Algorithms and Applications”, I. Good fellow, Y. Bengio and A. Courvill
2. “Video analytics using Deep Learning”, Charan. Puvvala, 2018.
3. “Jetson Nano developer- User guide”,Daniel Wilson, 2021.

19CT0XI NLP WITH CHAT 1 0 0 1

Course Objectives

- This course will help learners to understand the basics of the GPT architecture and how it can be used for natural language processing tasks
- The course covers various modules that explain the libraries and models used in ChatGPT, text and code completion, image generation, fine-tuning, embedding, moderation and best practices

Course Outcomes (COs)

1. Analyze ChatGPT for various Natural Language Processing tasks
2. Apply ChatGPT in Chatbot development, dialogue systems, or text generation.

Articulation Matrix

CO No	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
1		2	2											
2			2	2	2									

Introduction to ChatGPT - Setting Up ChatGPT Environment and Creating a Chatbot Interface - Understanding different Programming Languages used for ChatGPT - Natural Language Processing and Learn how ChatGPT Processes Language - Building a basic Chatbot using ChatGPT - Learn best practices for Writing Prompts and Integrating ChatGPT into Writing Exercises - Building Arduino Projects using ChatGPT - Creating Charts and Graphs using ChatGPT

Total: 15 Hours

Reference(s)

1. ChatGPT content creation: SEO, youtube, book writing and more made easy by CeoWest
2. The Power of ChatGPT: Leveraging the potential of AI in social media by KP Panchal

OPEN ELECTIVES

19CT0YA PYTHON PROGRAMMING 3 0 0 3

Course Objectives

- Understand the history and basics of python.
- Gain knowledge about the different data types and control flow statements.
- Impart knowledge about the functions, files, list, set tuples and dictionaries.

Programme Outcomes (POs)

a. Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
b. Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
d. Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

Course Outcomes (COs)

1. Analyze simple python programs using input output operations.
2. Analyze python programs using expressions and statements.
3. Analyze python programs using control flow statements and strings.
4. Apply the concepts of functions and files in python programming.
5. Create applications using list, sets, tuples and dictionaries in python.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	3		3										
2	2	3		3										
3	2	3		3										
4	2	3		3										
5	2	3		3										

UNIT I **8 Hours**

INTRODUCTION

What is Python - History of Python - Features of Python - Simple Program in Python - Commenting in Python - Quotations in Python - Lines and Indentation - Multi-Line Statements - Input Operations - Output Operations.

UNIT II **10 Hours**

DATA, EXPRESSIONS, STATEMENTS

Python interpreter and interactive mode; values and types: int, float, boolean, string, and list; variables, expressions, statements, tuple assignment, precedence of operators, comments; Illustrative programs: exchange the values of two variables, circulate the values of n variables, distance between two points.

UNIT III **10 Hours**

CONTROL FLOW STATEMENTS AND STRINGS

if statement - if-else statement - if-elif-else statement - Nested if - While loop - for loop - else statement used with loops - break statement - continue - pass statement - Strings: string slices - immutability - string functions and methods - In-built string methods - string formatting operations - string module.

UNIT IV **8 Hours**

FUNCTIONS AND FILES

Functions: return values - parameters - local and global scope - function composition - recursion; Files: Reading and Writing-Format Operators-Filenames and paths.

UNIT V **9 Hours**

LIST, SET, TUPLES AND DICTIONARIES

Lists as arrays - Lists: list operations - list slices -list methods - list loop - mutability - aliasing - cloning lists - list parameters; Set; Tuples: tuple assignment, tuple as return value; Dictionaries: operations and methods.

Total: 45 Hours

Reference(s)

1. Allen B. Downey, Think Python: How to Think Like a Computer Scientist, 2nd edition, Updated for Python 3, Shroff/O'Reilly Publishers, 2016 (http://greenteapress.com/wp/think- python/)
2. Guido van Rossum and Fred L. Drake Jr, Ã¢??An Introduction to Python Ã¢??Revised and updated for Python 3.2, Network Theory Ltd., 2014.
3. Charles Dierbach, Ã¢??Introduction to Computer Science using Python: A Computational Problem-Solving Focus, Wiley India Edition, 2015.
4. John V Guttag, Ã¢??Introduction to Computation and Programming Using PythonÃ¢??Ã¢??, Revised and expanded Edition, MIT Press , 2017

19CT0YB ADVANCED MOBILE COMPUTING 3 0 0 3

Course Objectives

- Understand the concepts of wireless communication and networking principles, that support connectivity to cellular networks and wireless devices
- Gain the use of transaction principles over wireless devices to support mobile business concepts.
- Impart knowledge the working of various cellular networks through the transmission protocols.

Programme Outcomes (POs)

a. Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
b. Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
d. Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

Course Outcomes (COs)

1. Analyze the physical properties of wireless communication system and analyze the medium access control mechanisms for wireless communication.
2. Apply the various standards of telecommunication networks and broadcast systems.
3. Analyze the performance of IEEE 802.11 and HIPERLAN for wireless local area networks.
4. Create a network for Mobile IP and apply the routing algorithms for the given network scenario.
5. Analyze the different mechanisms of the transmission control protocol that influence the efficiency of mobile environment.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1		1												
2		2		3										
3	2	3		3										
4	2			3										
5														

UNIT I **9 Hours**

WIRELESS COMMUNICATION FUNDAMENTALS

Need and Application of wireless communication - Wireless Data Technologies Market for mobile Wireless transmission - Frequencies for radio transmission- Signals - Antennas - Signal Propagation- Multiplexing - Modulations - Spread spectrum - MAC - SDMA - FDMA - TDMA - CDMA.

UNIT II **9 Hours**

TELECOMMUNICATION NETWORKS

Telecommunication systems - GSM - DECT systems - Architecture and protocols - Tetra frame structure - UMTS basic architecture and UTRA modes - Broadcast Systems - DAB - DVB.

UNIT III **9 Hours**

WIRLESS LAN

Introduction Infrared v/s Radio transmission - Infrastructure and ad-hoc network - IEEE 802.11 - Architecture - services - MAC - Physical layer - IEEE 802.11a - 802.11b standards HIPERLAN - Blue Tooth.

UNIT IV **9 Hours**

MOBILE NETWORK LAYER

Mobile IP (Goals, assumptions, entities and terminology, IP packet delivery, agent advertisement and discovery, registration, tunneling and encapsulation, optimizations) - Dynamic Host Configuration Protocol - Routing - DSDV - DSR - Alternative Metrics.

UNIT V **9 Hours**

TRANSPORT AND APPLICATION LAYERS

Traditional TCP - Indirect TCP - Snooping TCP - Mobile TCP - Fast retransmit/fast Recovery - Transmission/time - out freezing - Selective retransmission - Transaction oriented-Classical TCP improvements.

FOR FURTHER READING

Mobile WiMax - Multihop relay networks - Femtocells and fixed-mobile convergence

Total: 45 Hours

Reference(s)

1. Jochen Schiller, Mobile Communications, PHI/Pearson Education, 2003.
2. William Stallings, Wireless Communications and Networks, PHI/Pearson Education, 2005.
3. Kaveh Pahlavan and Prasanth Krishnamoorthy, Principles of Wireless Networks- A Unified Approach, PHI/Pearson Education, 2002.
4. Uwe Hansmann, Lothar Merk, Martin S. Nicklons and Thomas Stober, Principles of Mobile Computing, Springer, New York, 2003.
5. Hazysztof Wesolowshi, Mobile Communication Systems, John Wiley and Sons Ltd, 2002.

3 0 0 3

19CT0YC WEB PROGRAMMING

Course Objectives

- Study about designing web pages with the help of frames and scripting languages
- Develop web sites which are secure and dynamic in nature using Javascript
- Learn the importance of server-side scripts like JSP and servlets for web Interactivity and Web Hosting

Programme Outcomes (POs)

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

e. Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

Course Outcomes (COs)

1. Analyse and determine an appropriate web server configuration based on stated user needs
2. Create web-applications using open source technologies such as HTML, DHTML CSS and PHP.
3. Apply static, dynamic and interactive web pages and web applications using Javascript, Jquery and Ajax.
4. Apply dynamic page functionality in web pages using Servlets.
5. Create JSP applications with Model View Control architecture.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1			1		1									
2			2		2									
3			2		2									
4			1		1									
5			2		2									

UNIT I **8 Hours**

INTRODUCTION TO WEB

Web Concepts - Web Technology Protocols - Web Servers - Internet Web Server - Personal Web Server - Apache Web Server - JBOSS - XAMP - Emerging Technologies in web.

UNIT II 9 Hours

SCRIPTING BASICS

HTML Basics - Forms - Tables - Links - DHTML - XHTML - CSS - Internal Style sheets – External Style sheets- PHP Basics - Dynamic Content - Form processing - XML - DTD - XSD.

UNIT III 10 Hours

SCRIPTING LANGUAGES

JavaScript - Variables - Statements - Popup Boxes - Functions - Loops - Error Handling - Date and String objects - Ajax Basics, Accessing database - Jquery.

UNIT IV **9 Hours**

SERVLETS

Introduction- Servlet features - Servlet Overview Architecture - Three Tier Applications – Servlet package and API - Configuring Servlet - Handling HTTP Request - Get and post request – Redirecting request- Session Tracking and Cookies.

UNIT V **9 Hours**

JAVA SERVER PAGES

Introduction - JSP architecture - Life cycle - JSP Tags and Implicit objects - JSTL - Core Tags – SQL Tags - Formatting Tags - JDBC - Accessing database

FOR FURTHER READING

Web Hosting - Web Configuration - Web Development Tools - Web database controls - JSF - Tags - Event Handling - AJAX Integration

Total: 45 Hours

Reference(s)

1. Kogent Learning Solutions, Web Technologies: Black Book, Dreamtech press, 2014.
2. Harvey M Deitel and Paul J Deitel, Internet and World Wide Web - How to Program, Fifth Edition, Pearson Education, 2012.
3. John Pollock, JavaScript- A Beginners Guide,Fourth Edition, Tata McGraw-Hill, 2010.
4. Jeffrey C Jackson, Web Technologies: A Computer Science Perspective,Second Edition, Pearson, 2009.

19CT0YD GPU ARCHITECTURE AND PROGRAMMING 3 0 0 3

Course Objectives

- Understand the basic of GPU Programming
- Learn the advanced GPU programming model and techniques
- Acquire the knowledge in GPU programming and applications

Programme Outcomes (POs)

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

e. Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

Course Outcomes (COs)

1. Analyze the fundamental concepts of GPU programming
2. Apply the knowledge to providing a computing engine for high performance Computing
3. Create the real-world application development

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1			1		1									
2			2		2									
3			2		2									
4			1		1									
5			2		2									

UNIT I **9 Hours**

INTRODUCTION

Architecture of a GPU – Single Instruction Multiple Data execution model - Scalar and vector instruction

UNIT II **9 Hours**

INTRODUCTION TO OPENCL

Thread divergence - Nested control flow - Introduction to OpenCL - GPU computing - The OpenCL programming model

UNIT III **9 Hours**

OPENCL ALGORITHMS AND MODELS

Host program and device kernel - OpenCL objects - Basic program: vector addition - Algorithms in OpenCL - Square matrix - transpose and multiplication - Work-groups - OpenCL synchronization model – OpenCL - memory model-

UNIT IV **9 Hours**

MEMORY ALGORITHMS

Matrix multiplication with local memory- Parallel reduction algorithms - Sorting algorithms - Memory hierarchies and coherence protocols on APUs

9 Hours

UNIT V

NETWORKS AND GRAPHICS IN GPUs

Interconnection networks on GPUs - Rendering graphics using OpenGL - The GPU graphics pipelines - Simulation of new GPU architectures.

Total: 45 Hours

Reference(s)

1. Brian Tuomanen, Hands-On GPU Programming with Python and CUDA: Explore High-performance Parallel Computing with CUDA, Packt, 2018
2. Nikolaos Ploskas and Nikolaos Samaras, GPU Programming in MATLAB, MK Publications, 2016
3. Gerassimos Barlas, Multicore and GPU Programming: An Integrated Approach, MK Publications, 2015

19CT0YE CLOUD COMPUTING 3 0 0 3

Course Objectives

- Analyze the architecture and features of different cloud models
- Be familiar with the underlying principles of virtualization, cloud applications and cloud storage
- Gain knowledge on security issues and risk management

Programme Outcomes (POs)

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

e. Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

Course Outcomes (COs)

1. Analyze the different types of cloud models and services for building an efficient cloud computing environment
2. Analyze the virtualization technologies and capacity planning techniques to create shared resource pools
3. Apply the best features to move to the cloud and categorize the cloud storage types
4. Evaluate the cloud security concerns
5. Analyze the risks involved in virtualization security management.

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1			1		1									
2			2		2									
3			2		2									
4			1		1									
5			2		2									

UNIT I **9 Hours**

INTRODUCTION

Defining Cloud Computing-Cloud Types: The NIST Model-The Cloud Cube Model -Deployment Models-Service Models-Essential Characteristics of Cloud Computing-Benefits of Cloud Computing-Measuring the Cloud's Value: Measuring Cloud Computing Costs-Understanding Services and Applications by Type: Defining IaaS-Defining PaaS-Defining SaaS.

UNIT II **8 Hours**

VIRTUALIZATION AND CAPACITY PLANNING

Using Virtualization Technologies-Load Balancing and Virtualization-Advanced Load Balancing-Understanding Hypervisors: Virtual Machine Types-VMware vSphere-Capacity Planning: Defining Baseline and Metrics-Network Capacity.

UNIT III **10 Hours**

CLOUD APPLICATIONS AND CLOUD STORAGE

Moving Applications to the Cloud: Applications in the Cloud-Functionality Mapping-Application Attributes-Cloud Service Attributes-System Abstraction-Cloud Bursting-Cloud APIs-Working with Cloud-Based Storage: Cloud Storage Definition-Provisioning Cloud Storage-Cloud Backup Types-Cloud Backup Features-Cloud Data Management Interface (CDMI)-Open Cloud Computing Interface (OCCI).

UNIT IV **10 Hours**

CLOUD SECURITY FUNDAMENTALS

Cloud Information Security Objectives-Cloud Security Services-Cloud Security Design Principles-Secure Cloud Software Requirements: Secure Development Practices-Approaches to Cloud Secure Software Requirements Engineering-Cloud Computing and Business Continuity Planning/Disaster Recovery

UNIT V **8 Hours**

CLOUD RISK MANAGEMENT

Cloud Computing Risk Issues: The CIA Triad-Threats to Infrastructure, Data and Access Control-Cloud Service Provider Risks-Cloud Computing Security Challenges: Security Policy Implementation-Virtualization Security Management.

FOR FURTHER READING

Cloud evolution- Data center requirements- vmware virtualization- Google Infrastructure- Google Cloud Security

Total: 45 Hours

Reference(s)

1. Barrie Sosinsky, Cloud Computing Bible, Wiley-India,2014.
2. Ronald L.Krutz and Russell Dean Vines, Cloud Security: A Comprehensive Guide to Secure Cloud Computing, Wiley-India, 2013.
3. Anthony T Velte, Cloud Computing: A practical Approach, Tata McGraw Hill, 2009.
4. Halper Fern, Kaufman Marcia, Bloor Robin, Hurwit Judith, Cloud Computing for Dummies, Wiley India, 2009.