B.E. (Information Science and Engineering)

2018 Regulations, Curriculum & Syllabi

Academic Year: 2019 – 2020 Onwards

Stay Ahead

BANNARI AMMAN INSTITUTE OF TECHNOLOGY

An Autonomous Institution Affiliated to Anna University - Chennai • Approved by AICTE • Accredited by NAAC with "A+" Grade

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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 2018-2019 for Regular admission (Academic year 2019-2020 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. Aeronautical Engineering
ii. Agricultural Engineering
iii. Automobile Engineering
iv. Biomedical Engineering
v. Civil Engineering
vi. Computer Science and Engineering
vii. Electronics and Communication Engineering
viii. Electrical and Electronics Engineering
ix. Electronics and Instrumentation Engineering
x. Information Science and Engineering
xi. Mechanical Engineering
xii. Mechatronics

B. Tech. Programmes

i. Artificial Intelligence and Data Science
ii. Artificial Intelligence and Machine Learning
iii. Biotechnology
iv. Computer Science and Business Systems
v. Computer Technology

vi. Fashion Technology
vii. Food Technology
viii. Information Technology
ix. Textile 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.

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'.

Continuous Assessment (CA) marks obtained by the student in the first appearance shall be retained and considered valid for one subsequent attempt, except Clause 6.5.4, 6.5.5, 6.5.6 and 6.5.7. However, from the third attempt onwards, the student shall be declared to have passed the course if he/she secures a minimum of 6 Grade Points (B Grade) in the course prescribed during the End Semester Examinations.

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		
Aeronautical Engineering	172	135
Agricultural Engineering	172	134
Automobile Engineering	170	133
Biomedical Engineering	171	132
Civil Engineering	171	133
Computer Science and Engineering	171	133
Electronics and Communication Engineering	172	131
Electrical and Electronics Engineering	170	131
Electronics and Instrumentation Engineering	170	131
Information Science and Engineering	172	131
Mechanical Engineering	170	131
Mechatronics	170	132
B.Tech. Programmes		
Artificial Intelligence and Data Science	172	134
Artificial Intelligence and Machine Learning	172	135
Biotechnology	172	134
Computer Science and Business Systems	172	128
Computer Technology	170	128
Fashion Technology	172	134
Food Technology	170	132
Information Technology	170	132
Textile Technology	171	133

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:	
	Review I	
	Literature Survey (5)	
	Identification of topic and Justification (5)	
	Work plan (10)	
	Review II	
	Approach & Results (15)	
	Conclusion (15)	

	End Semester Examination	
	Report[#] (20)	**50**
	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	
	Listening (5)	
	Speaking (10)	**25**
	Reading (5)	
	Writing (5)	
	Test 2	
	Listening (5)	
	Speaking (10)	**25**
	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 promote innovative centric education through excellence in scientific & technical education and research aimed towards improvement of society

MISSION

1. Develop human potential with sound knowledge in theory and practice of Information Science & Engineering.
2. Facilitate the development of Industry Institute collaborations and societal outreach programmes.
3. Promote research based activities in the emerging areas of technology convergence

PROGRAMME EDUCATIONAL OBJECTIVES (PEOS)

I. Competent professional with the knowledge of Information Science and Engineering by designing innovative solutions to real life problems that are technically sound, economically viable and socially acceptable.

II. Capable of pursuing higher studies, research activities and entrepreneurial skills by adapting to new technologies and constantly upgrade their skills with an attitude towards lifelong learning.

III. Proficient team leaders, effective communicators and capable of working in multidisciplinary projects and diverse professional activities following ethical values.

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)

- Excel in processing the information using data management with security features.
- Demonstrate and develop applications on data analysis.

MAPPING OF PEOs AND POs

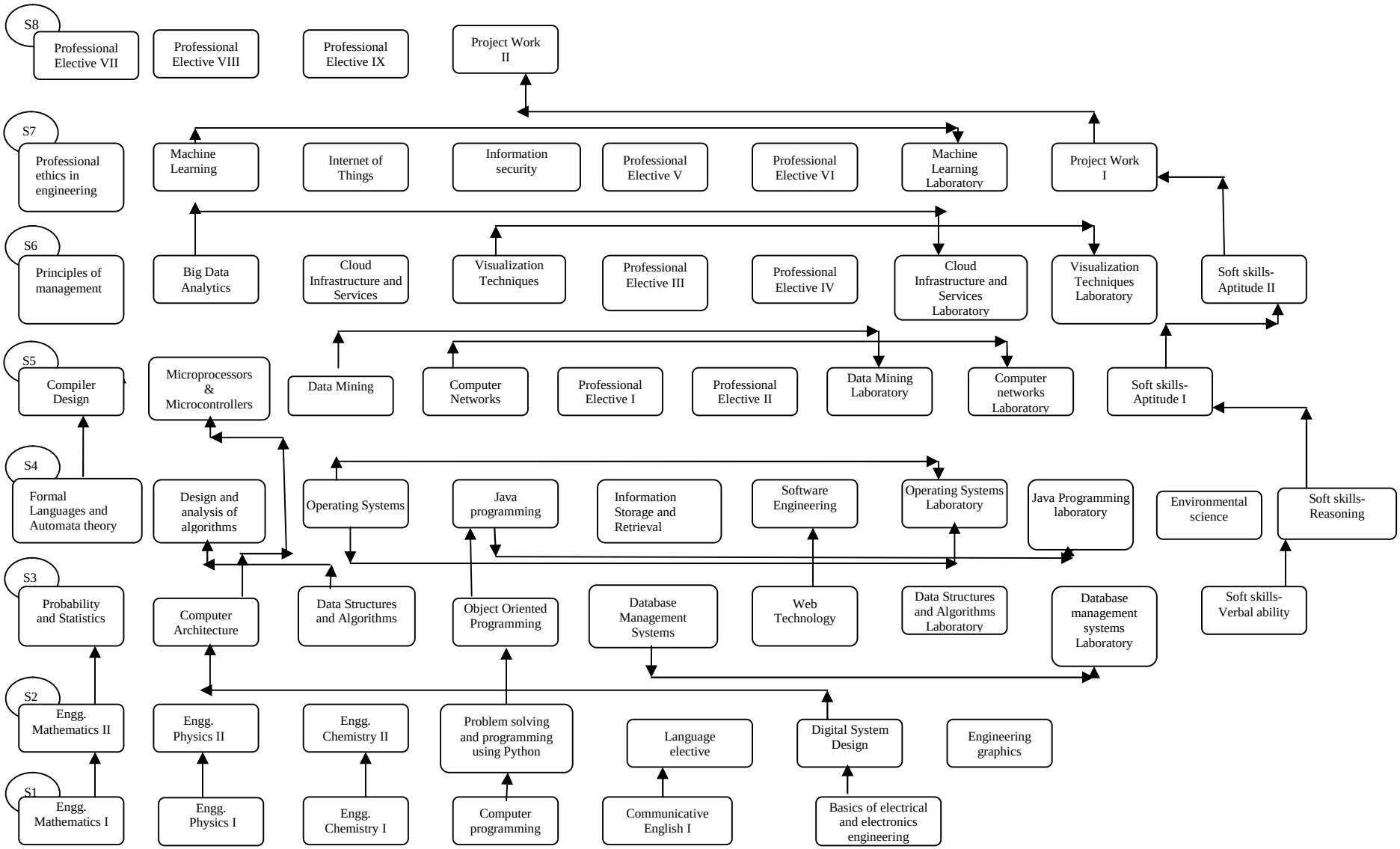
POs	a	b	c	d	e	f	g	h	i	j	k	l	PSO1	PSO2
PEO 1	X	X	X	X	X	X	X							X
PEO 2	X	X	X	X	X	X					X	X	X	
PEO 3								X	X	X	X		X	X

CONNECTIVITY CHART

DEPARTMENT OF INFORMATION SCIENCE AND ENGINEERING

CURRICULUM DESIGN & INTERLINKING OF COURSES

360^0 FLEXIBLE LEARNING FRAMEWORK



DEPARTMENT OF INFORMATION SCIENCE AND ENGINEERING
Minimum Credits to be Earned : 172

I SEMESTER

Code No.	Course	L	T	P	C	Hours / Week	Maximum Marks			Category
							CA	ES	Total	
19IS101	ENGINEERING MATHEMATICS I	3	1	0	4	4	50	50	100	BS
19IS102	ENGINEERING PHYSICS I	2	0	2	3	4	50	50	100	BS
19IS103	ENGINEERING CHEMISTRY I	2	0	2	3	4	50	50	100	BS
19IS104	COMPUTER PROGRAMMING	2	0	2	3	4	50	50	100	ES
19HS101	COMMUNICATIVE ENGLISH I	1	0	2	2	3	100	0	100	HS
19IS106	BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING	2	0	2	3	4	50	50	100	ES
Total		**12**	**1**	**10**	**18**	**23**	**-**	**-**	**-**	**-**

II SEMESTER

Code No.	Course	L	T	P	C	Hours/ Week	Maximum Marks			Category
							CA	ES	Total	
19IS201	ENGINEERING MATHEMATICS II	3	1	0	4	4	50	50	100	BS
19IS202	ENGINEERING PHYSICS II	2	0	2	3	4	50	50	100	BS
19IS203	ENGINEERING CHEMISTRY II	2	0	2	3	4	50	50	100	BS
19IS204	PROBLEM SOLVING AND PROGRAMMING USING PYTHON	3	0	2	4	5	50	50	100	ES
	LANGUAGE ELECTIVE	-	-	-	2	3	100	0	100	HS
19IS206	DIGITAL SYSTEM DESIGN	3	0	2	4	5	50	50	100	ES
19IS207	ENGINEERING GRAPHICS	1	0	4	3	5	100	0	100	ES
Total		**14**	**1**	**12**	**23**	**30**	-	-	-	**-**

III SEMESTER										
Code No.	**Course**	**L**	**T**	**P**	**C**	**Hours/ Week**	**Maximum Marks**			**Category**
							CA	**ES**	**Total**	
19IS301	PROBABILITY AND STATISTICS	3	1	0	4	4	50	50	100	BS
19IS302	COMPUTER ARCHITECTURE	3	0	0	3	3	50	50	100	PC
19IS303	DATA STRUCTURES AND ALGORITHMS	3	0	0	3	3	50	50	100	PC
19IS304	OBJECT ORIENTED PROGRAMMING	2	0	2	3	4	50	50	100	PC
19IS305	DATABASE MANAGEMENT SYSTEMS	3	0	0	3	3	50	50	100	PC
19IS306	WEB TECHNOLOGY	2	0	2	3	4	50	50	100	PC
19IS307	DATA STRUCTURES AND ALGORITHMS LABORATORY	0	0	4	2	4	100	0	100	PC
19IS308	DATABASE MANAGEMENT SYSTEMS LABORATORY	0	0	4	2	4	100	0	100	PC
18GE301	SOFT SKILLS - VERBAL ABILITY	0	0	2	-	2	100	0	100	EEC
Total		**16**	**1**	**14**	**23**	**31**	**-**	**-**	**-**	**-**
IV SEMESTER										
Code No.	**Course**	**L**	**T**	**P**	**C**	**Hours/ Week**	**Maximum Marks**			**Category**
							CA	**ES**	**Total**	
19IS401	FORMAL LANGUAGES AND AUTOMATA THEORY	3	1	0	4	4	50	50	100	ES
19IS402	DESIGN AND ANALYSIS OF ALGORITHMS	3	0	0	3	3	50	50	100	PC
19IS403	OPERATING SYSTEMS	3	0	0	3	3	50	50	100	PC
19IS404	JAVA PROGRAMMING	3	0	0	3	3	50	50	100	PC
19IS405	INFORMATION STORAGE AND RETRIEVAL	3	0	0	3	3	50	50	100	PC
19IS406	SOFTWARE ENGINEERING	3	0	0	3	3	50	50	100	PC
19IS407	OPERATING SYSTEMS LABORATORY	0	0	4	2	4	100	0	100	PC
19IS408	JAVA PROGRAMMING LABORATORY	0	0	4	2	4	100	0	100	PC
18HS001	ENVIRONMENTAL SCIENCE	2	0	0	0	2	100	0	100	HSS
18GE401	SOFT SKILLS - REASONING	0	0	2	-	2	100	0	100	EEC
Total		**20**	**1**	**10**	**23**	**33**	**-**	**-**	**-**	**-**

V SEMESTER										
Code No.	**Course**	**L**	**T**	**P**	**C**	**Hours/ Week**	**Maximum Marks**			**Category**
							CA	**ES**	**Total**	
19IS501	COMPILER DESIGN	3	1	0	4	4	50	50	100	PC
19IS502	MICROPROCESSORS AND MICROCONTROLLER	3	0	2	4	5	50	50	100	ES
19IS503	DATA MINING	3	0	0	3	3	50	50	100	PC
19IS504	COMPUTER NETWORKS	3	0	0	3	3	50	50	100	PC
	PROFESSIONAL ELECTIVE I	-	-	-	3	3	50	50	100	PE
	PROFESSIONAL ELECTIVE II	-	-	-	3	3	50	50	100	PE
19IS507	DATA MINING LABORATORY	0	0	4	2	4	100	0	100	PC
19IS508	COMPUTER NETWORKS LABORATORY	0	0	4	2	4	100	0	100	PC
18GE501	SOFT SKILLS - APTITUDE I	0	0	2	-	2	100	0	100	EEC
Total		**18**	**1**	**12**	**24**	**31**	**-**	**-**	**-**	**-**
VI 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
19IS602	BIG DATA ANALYTICS	3	0	0	3	3	50	50	100	PC
19IS603	CLOUD INFRASTRUCTURE AND SERVICES	3	0	0	3	3	50	50	100	PC
19IS604	VISUALIZATION TECHNIQUES	3	0	0	3	3	50	50	100	PC
	PROFESSIONAL ELECTIVE III	-	-	-	3	3	50	50	100	PE
	PROFESSIONAL ELECTIVE IV	-	-	-	3	3	50	50	100	PE
19IS607	CLOUD INFRASTRUCTURE AND SERVICES LABORATORY	0	0	4	2	4	100	0	100	PC
19IS608	VISUALIZATION TECHNIQUES LABORATORY	0	0	4	2	4	100	0	100	PC
18GE601	SOFT SKILLS - APTITUDE II	0	0	2	-	2	100	0	100	EEC
Total		**17**	**0**	**10**	**21**	**27**	**-**	**-**	**-**	**-**

VII 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
19IS702	MACHINE LEARNING	3	0	0	3	3	50	50	100	EEC
19IS703	INTERNET OF THINGS	3	0	0	3	3	50	50	100	PC
19IS704	INFORMATION SECURITY	3	0	0	3	3	50	50	100	PC
	PROFESSIONAL ELECTIVE V	-	-	-	3	3	50	50	100	PE
	PROFESSIONAL ELECTIVE VI	-	-	-	3	3	50	50	100	PE
19IS707	MACHINE LEARNING LABORATORY	0	0	4	2	4	100	0	100	EEC
19IS708	PROJECT WORK I	0	0	6	3	6	100	0	100	EEC
Total		**17**	**0**	**10**	**22**	**27**	**-**	**-**	**-**	**-**
VIII SEMESTER										
Code No.	**Course**	**L**	**T**	**P**	**C**	**Hours /Week**	**Maximum Marks**			**Category**
							CA	**ES**	**Total**	
	PROFESSIONAL ELECTIVE VII	-	-	-	3	3	50	50	100	PE
	PROFESSIONAL ELECTIVE VIII	-	-	-	3	3	50	50	100	PE
	PROFESSIONAL ELECTIVE IX	-	-	-	3	3	50	50	100	PE
19IS804	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**	**Category**
18HS201	COMMUNICATIVE ENGLISH II	1	0	2	2	3	100	0	100	HSS
18HSH01	HINDI	1	0	2	2	3	100	0	100	HSS
18HSG01	GERMAN	1	0	2	2	3	100	0	100	HSS
18HSJ01	JAPANESE	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
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
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
DISCIPLINE ELECTIVES										
19IS001	AGILE SOFTWARE DEVELOPMENT	3	0	0	3	3	50	50	100	PE
19IS002	COMPUTATIONAL INTELLIGENCE	3	0	0	3	3	50	50	100	PE
19IS003	SOCIAL NETWORK ANALYSIS	3	0	0	3	3	50	50	100	PE
19IS004	INFORMATION CODING TECHNIQUES	3	0	0	3	3	50	50	100	PE
19IS005	DIGITAL MARKETING	3	0	0	3	3	50	50	100	PE
19IS006	OPEN SOURCE SOFTWARE	3	0	0	3	3	50	50	100	PE
19IS007	COMPUTER VISION	3	0	0	3	3	50	50	100	PE

19IS008	NATURAL LANGUAGE PROCESSING	3	0	0	3	3	50	50	100	PE
19IS009	COMPUTER GRAPHICS	3	0	0	3	3	50	50	100	PE
19IS010	ROBOTICS PROCESS AUTOMATION	3	0	0	3	3	50	50	100	PE
19IS011	STREAMING ANALYTICS	3	0	0	3	3	50	50	100	PE
19IS012	DATA COMPRESSION	3	0	0	3	3	50	50	100	PE
19IS013	EMBEDDED SYSTEMS	3	0	0	3	3	50	50	100	PE
19IS014	OPEN STACK ESSENTIALS	3	0	0	3	3	50	50	100	PE
19IS015	DEEP LEARNING	3	0	0	3	3	50	50	100	PE
OPEN ELECTIVES										
19IS0YA	WEB PROGRAMMING	3	0	0	3	3	50	50	100	PE
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
18GE0XP	FM RADIO BROADCASTING TECHNOLOGY	-	-	-	1	-	100	0	100	EEC
ONE CREDIT COURSES										
19IS0XA	FULL STACK DEVELOPMENT	-	-	-	1	-	100	0	100	EEC
19IS0XB	GRAPHICAL PROCESSING UNIT PROGRAMMING	-	-	-	1	-	100	0	100	EEC
19IS0XC	PROJECT MANAGEMENT TOOLS AND	-	-	-	1	-	100	0	100	EEC

	TECHNIQUES									
19IS0XD	GAME PROGRAMMING	-	-	-	1	-	100	0	100	EEC
19IS0XE	SALESFORCE APP BUILDER FUNDAMENTALS	-	-	-	1	-	100	0	100	EEC

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	-	-	-	-	-	24	13.95	15%	20%
2	ES	6	11	-	4	4	-	-	-	25	14.53	15%	20%
3	HSS	2	2	-	-	-	2	2	-	8	4.65	5%	10%
4	PC	-	-	19	19	14	13	6		71	41.28	30%	40%
5	PE	-	-	-	-	6	6	6	9	27	15.69	10%	15%
6	EEC	-	-	-	-	-	-	8	9	17	9.88	7%	10%
Total		18	23	23	23	24	21	22	18	172	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

SYLLABI

19IS101 ENGINEERING MATHEMATICS I 3 1 0 4

Course Objectives

- Understand the concepts of vectors and Eigenvectors for different matrices to describe the stability of the linear systems in engineering fields
- Exemplify the concepts of differentiation and integration to identify the area of 2D and 3D surfaces in engineering problems.
- Explain the concepts of analytic functions in complex domain to predict the nature of different engineering 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.

Course Outcomes (COs)

1. Represent the different forms of coordinate system in complex plane and characteristics of linear systems by Eigenvalues and Eigenvectors.
2. Analyse various types of functions and their differentiation techniques involved in engineering fields.
3. Implement different methods of integration used in engineering problems.
4. Execute the suitable integration technique to calculate the area and volume of different surfaces.
5. Apply the concept of analytic function to estimate the integral in complex plane.

Articulation Matrix

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

UNIT I **9 Hours**

COMPLEX NUMBERS, VECTORS AND MATRICES

Complex plane, polar coordinates and polar form of complex numbers, powers and roots, fundamental theorem of algebra. Vector algebra in 2-D and 3-D space, dot product and cross product. Matrices : Eigen values and Eigen vectors, Properties of eigen values and eigen vectors.

UNIT II **9 Hours**

CALCULUS

Limits and Continuity of Functions: Limits of functions, types of limits, evaluation of limits, continuity of functions, properties of continuous functions. Derivatives: Derivatives, differentiability, rules and properties, differentiation of transcendental functions, higher order derivatives, implicit differentiation, and differentiation of hyperbolic functions. Integration: Anti-derivatives, Riemann Sum, indefinite and definite integration, Mean Value Theorem for definite integral, Fundamental Theorem of Calculus.

UNIT III **9 Hours**

INTEGRATION METHODS

Basic integration formulae for algebraic and transcendental functions. Integration by special devices: integration by parts, rationalizing substitution or trigonometric substitution, partial fractions, reduction formulas, improper integrals, convergence tests.

UNIT IV **9 Hours**

APPLICATIONS OF DERIVATIVES AND INTEGRATIONS

Extreme values, points of inflection and curve sketching, Rolles Theorem, Mean Value Theorem, optimization, indeterminate forms, L Hopitals Rule. Area between curves, volume of a general solid by slicing and cylindrical shell methods, volume of a solid of revolution, length of plane curves, area of a surface of revolution.

UNIT V **9 Hours**

COMPLEX ANALYSIS

Analytic Functions- Properties of Analytic function - Determination of Analytic Function using Milne Thompson method. Cauchys Integral Formula - Classification of Singularities - Cauchys Residue Theorem.

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.
3. Kreysgiz E, Advanced Engineering Mathematics, 8th edition, John Wiley & Sons, 1999.
4. Anton H, Calculus with Analytic Geometry, 5th edition, John Wiley & Sons, 1995.
5. Ayres F Jr and Mendelson E, Schaums Outline of Theory and Problems of Calculus, 4th edition, McGraw Hill, 1999.
6. S.C. Gupta, Fundamentals of Statistics, 7th Edition, Himalaya Publishing House Pvt. Ltd. 2018.

19IS102 ENGINEERING PHYSICS I 2 0 2 3

Course Objectives

- Illustrate the Newton's laws of motion and wave motion with applications
- Understand the basic properties of electricity, magnetism and optics
- Differentiate the special theory of relativity and quantum physics from classical physics

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.

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

Course Outcomes (COs)

1. Illustrate the Newtons three laws of motion and apply the same to solve the real world problems involving elevator, atwood machine and acceleration of objects
2. Exemplify the physical characteristics of simple harmonic motion, wave motion and find the solutions for wave equations
3. Infer the fundamental laws, properties of electricity and magnetism and apply the same to electric and magnetic elements
4. Apply the principles of physical and geometrical optics in the mirrors, lenses, microscopes and diffraction gratings
5. Outline the importance of special theory of relativity, quantum physics and analyse the wave and particle nature of matter

Articulation Matrix

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

UNIT I **6 Hours**

MECHANICS

Newtons laws of motion: Concept of force and its nature-Newtons first law and inertial frames- definition of

mass -Newtons second law-gravitational force and weight -Newtons third law. Applications of Newtons laws: particle in equilibrium, particle under net force-weighing a mass in an elevator, the atwood machine and acceleration of two objects connected by a cord

UNIT II **6 Hours**

OSCILLATIONS AND WAVES

Fundamentals of simple harmonic motion -energy of simple harmonic oscillator -spring mass system -time period of simple pendulum, compound pendulum and torsional pendulum - Damped oscillations. Travelling wave motion -sinusoidal waves on strings -speed of a wave -reflection and transmission -rate of energy transfer in wave motion.

UNIT III **6 Hours**

ELECTRICITY AND MAGNETISM

Point charges-electric fields -Gauss law and its applications -electric potential -capacitance -energy stored in a capacitor. Concept and source of magnetic fields -Amperes theorem -determination of magnetic field due to different current distributions -Faradays law -self-induction and mutual induction -energy stored in an inductor

UNIT IV **6 Hours**

LIGHT AND OPTICS

Nature of light -laws of reflection and refraction -refractive index and Snells law -dispersion of light -total internal reflection -image formation:concave mirrors -convex mirrors -thin lenses -compound microscope -human eye. Conditions of interference -Youngs double slit experiment - intensity distribution of interference -phase change due to reflection -diffraction-narrow slit diffraction -single slit and two slit -intensity distribution -diffraction grating -applications

UNIT V **6 Hours**

MODERN PHYSICS

Special theory of relativity -simultaneity and time dilation -twin paradox -length contraction -relativistic mass variation -space time graph. Black body radiation and Planck hypothesis -allowed energy levels -thermal radiation from different objects -photoelectric and Compton effect. Matter waves -de-Broglie hypothesis -wave nature of particles -Davission-Germer experiment.

1 **5 Hours**

EXPERIMENT 1

Determination of resultant of system of concurrent coplanar forces-Parallelogram law of forces

2 **5 Hours**

EXPERIMENT 2

Determination of moment of inertia-Torsional pendulum

3 **5 Hours**

EXPERIMENT 3

Determination of wavelength of mercury spectral lines-spectrometer

4 **4 Hours**

EXPERIMENT 4

Determination of refractive index of solid and liquid-travelling microscope

5 **3 Hours**

EXPERIMENT 5

Determination of wavelength of laser-diffraction grating

6 **4 Hours**

EXPERIMENT 6

Determination of frequency of a tuning fork-Meldes apparatus

7 **4 Hours**

EXPERIMENT 7

Thickness of a thin wire using interference of light-Air wedge method

Total: 60 Hours

Reference(s)

1. R A Serway and J W Jewitt, Physics for Scientists and Engineers, Thomson Brooks/Cole, 2011
2. Halliday and Resnick, Fundamentals of Physics, John Wiley and Sons, Inc, 2011
3. H C Verma, Concepts of Physics (Vol I & II), BharathiBhawan Publishers & Distributors, New Delhi, 2017
4. H D Young and R A Freedman, Sears and Zemanskys University Physics with Modern Physics, Pearson education, 2016
5. R K Gaur and S L Gupta, Engineering Physics, DhanpatRai Publications, 2012

19IS103 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
- Summarize the terminologies of electrochemistry and explain the applications of electrochemical instruments
- Outline the applications of organic materials in data storage
- Choose the suitable materials for the fabrications of micro processors in electronic devices

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.

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

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 microprocesser

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 supercapacitors. 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, AleksanderNeverov, 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 Elsevierpublication, 2012

19IS104 COMPUTER PROGRAMMING 2 0 2 3

Course Objectives

- Understand the basics of C primitives, operators and expressions.
- Gain knowledge about the different primitive and user defined data types.
- Impart knowledge about the structural programming concepts.

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. Explain the basic C programming concepts
2. Implement C programs using control statements
3. Implement the concepts of Arrays and strings in C
4. Implement the concepts of functions and pointers in C
5. Analyze the concepts of structures, unions and files in C

Articulation Matrix

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

UNIT I **6 Hours**

INTRODUCTORY CONCEPTS

C Primitives: Introduction to C- planning and writing a C program- Character Set - Keywords and Identifiers - Data Types - Variables and Constants - Compiling and executing the C program. Operators and

Expressions: Arithmetic - Relational - Logical - Increment and decrement - Conditional - Bitwise - Comma - Sizeof() - Assignment - Shift operator - Precedence and order of evaluation “TypeConversion-Input and Output Operations: Formatted I/O functions - getchar and putchar function - gets and puts functions

UNIT II **6 Hours**

CONTROL STATEMENTS

Decision Making and Branching: simple if statement - if else statement - nesting of if else Statement - Switch Statement. Decision Making and Looping: while statement - do while statement - for statement - Nested for statement Jump Statements: goto - break - continue - return statement

UNIT III **6 Hours**

ARRAYS AND STRINGS

Arrays: Introduction, one dimensional array, declaration - Initialization of one dimensional array, two-dimensional arrays, initializing two dimensional arrays, multi-dimensional arrays. Strings: Declaring and initializing string variables- Reading strings from terminal - writing string to screen - String handling functions.

UNIT IV **6 Hours**

FUNCTIONS AND POINTERS

User Defined Functions: Elements of user defined functions - Definition of functions - return values and their types - function calls - function declaration - categories of function - call by value and call by reference -recursion - Pre-processor directives and macros. Pointers: Understanding Pointers - accessing the address of the variable - declaring pointer variables - Initialization of pointer variables - Accessing a variable through its pointer

UNIT V **6 Hours**

STRUCTURES AND FILES

Storage Class Specifiers: Auto - registers - static - extern – typedef Structures and Unions: Introduction - defining a structure - declaring structure variables - accessing structure members - structure initialization - Unions - Enumerated data type. File Management in C: Defining and opening a file - closing a file - Input/output operations on files - Command line arguments.

1 **4 Hours**

EXPERIMENT 1

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

2 **4 Hours**

EXPERIMENT 2

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

3 **2 Hours**

EXPERIMENT 3

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.

4 **2 Hours**

EXPERIMENT 4

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

5 **2 Hours**

EXPERIMENT 5

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

6 **4 Hours**

EXPERIMENT 6

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.

7 **2 Hours**

EXPERIMENT 7

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

8 **2 Hours**

EXPERIMENT 8

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

9 **4 Hours**

EXPERIMENT 9

Design a structure to hold the following details of a student. Read the details of a student and display them in the following format Studentdetails: rollno, name, branch, year, section, cgpa.

****

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

10 **4 Hours**

EXPERIMENT 10

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

Total: 60 Hours

Reference(s)

1. Herbert Schildt, C -The complete Reference, Tata McGraw-Hill, 2013
2. Byron Gottfried, Programming with C, Schaum"s Outlines, Tata Mcgraw-Hill, 2013
3. E.Balagurusamy, Programming in ANSI C, Tata McGraw-Hill, 2012
4. Kernighan B W and Ritchie O M, The C programming Language. Prentice-Hall of India, 2009
5. Kelley A and I. Pohl, A Book on C: Programming in C, Pearson Education, 1998
6. Ashok.N.Kamthane,Programming in C,Pearson education,2013

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. 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.

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**

GRAMMAR

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.

19IS106 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. Understand the basic concepts of electric and magnetic circuits.
2. Summarize the types of DC machines.
3. Classify the static and dynamic AC machines and explain their operation.
4. Interpret the operation of AC and DC drives
5. Illustrate 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 - Construction - 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.

1 **4 Hours**

EXPERIMENT 1

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

2 **4 Hours**

EXPERIMENT 2

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

3 **4 Hours**

EXPERIMENT 3

Understand the concept of electromagnetic induction using copper coil.

4 **4 Hours**

EXPERIMENT 4

Understand the construction and working principle of DC machines.

5 **6 Hours**

EXPERIMENT 5

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

6 **4 Hours**

EXPERIMENT 6

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

7 **4 Hours**

EXPERIMENT 7

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. 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.

19IS201 ENGINEERING MATHEMATICS II 3 1 0 4

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. Analyse 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	PSO1	PSO2
1	1	3												
2	3	1												
3	1													
4	2													
5		3												

UNIT I **9 Hours**

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.

19IS202 ENGINEERING PHYSICS II 2 0 2 3

Course Objectives

- understand the applications of laser and fiber optics in the field of engineering
- impart knowledge in crystallography and semiconductors
- differentiate the different types of magnetic materials and their applications

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

Course Outcomes (COs)

1. Understand the principle, characteristics, different types of lasers and apply the same for optical data storage and retrieval techniques
2. Illustrate the propagation of light through different optical fibers, applications of optical fibers in communication and sensors
3. Identify the seven crystal systems, crystal planes and the stacking sequences in metallic crystal structures
4. Analyse the characteristics of semiconducting materials interms of crystal lattice, charge carriers and energy band diagrams
5. Outline the properties of magnetic materials, domain theory of ferromagnetism and the applications for recording and readout process

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	1												
4	2	1							2					
5	2	1							2					

UNIT I **7 Hours**

LASER

Principle - interaction of radiation with matter - characteristics of laser radiation - pumping mechanisms - types: CO2 laser -homo junction GaAs laser -applications: optical data storage and retrieval techniques - holography: principle -types - comparison of holography with photography - construction - reconstruction of hologram -applications

UNIT II **7 Hours**

FIBER OPTICS

Principle- conditions to achieve total internal reflection- structure- acceptance angle and numerical aperture (qualitative treatment only)- types- modes of propagation- refractive index profile- block diagram of fiber optic communication system- fiber optic sensors- intensity modulated sensor-endoscopy - merits of fiber cables over conventional communication systems

UNIT III **5 Hours**

CRYSTAL PHYSICS

Crystalline and amorphous materials - lattice -lattice point -basis - unit cell - crystal systems - Bravais lattices -planes in crystals- Miller indices -procedure for finding Miller indices- important features of Miller indices-unit cell characteristics of SC, BCC, FCC and HCP structures

UNIT IV **6 Hours**

SEMICONDUCTING MATERIALS

Characteristics -elemental and compound semiconductors- energy band description and current conduction in intrinsic semiconductors- energy band description of n-type and p-type semiconductors- conductivity of extrinsic semiconductors - variation of Fermi level with temperature and impurity concentration- temperature dependence on carrier concentration - Hall effect-applications - solar cells - photodiodes

UNIT V **5 Hours**

MAGNETIC MATERIALS

Fundamental definitions -Bohr magneton- classification of dia, para and ferromagnetic materials - domain theory - hysteresis curve - soft and hard magnetic materials -energy product and its importance - anti-ferromagnetic materials - ferrites -giant magneto resistance (GMR) effect -application: Principles of Magnetic Recording- Magnetic Digital Recording- Magneto-Optic Recording

1 **2 Hours**

EXPERIMENT 1

Exposure to Engineering Physics Laboratory and precautionary measures

2 **4 Hours**

EXPERIMENT 2

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

3 **4 Hours**

EXPERIMENT 3

Determination of acceptance angle and numerical aperture of a given fiber

4 **4 Hours**

EXPERIMENT 4

Evaluation of bandgap of given material using bandgap kit.

5 **4 Hours**

EXPERIMENT 5

Determine the V-I characteristics of a solar cell

6 **4 Hours**

EXPERIMENT 6

Using Hall effect, determine the nature of given material

7 **4 Hours**

EXPERIMENT 7

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

8 **4 Hours**

EXPERIMENT 8

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

Total: 60 Hours

Reference(s)

1. Balasubramaniam, R. Callisters 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, McGraw-Hill, 2011
5. K. Thiyagarajan and A. K. Ghatak, LASERS: Fundamentals and Applications, Springer, USA, 2015
6. B.D. Cullity, Introduction to Magnetic Materials, Addison-Wesley

19IS203 ENGINEERING CHEMISTRY II 2 0 2 3

Course Objectives

- Classify the traditional and advanced materials used to manage heat developed in electronic devices
- Summarize 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. 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.

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

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														
3							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 [Al2O3, BeO, AlN, SiC and Kovar alloy]

UNIT II **7 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 **7 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 **5 Hours**

NANOMATERIALS

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

UNIT V **5 Hours**

E- WASTE MANAGEMENTS

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

1 **8 Hours**

EXPERIMENT 1

General introduction and Determination of thermal stability of aluminium oxide using thermo gravimetric analysis

2 **4 Hours**

EXPERIMENT 2

Determination of thermal stability of copper alloys using thermo gravimetric analysis

3 **6 Hours**

EXPERIMENT 3

Determination of single electrode potential of zinc and copper electrodes

4 **6 Hours**

EXPERIMENT 4

Preparation of cadmium nanoparticles and its characterization

5 **6 Hours**

EXPERIMENT 5

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, LiyongDiao, Ken Kuang. Advanced Thermal Management Materials. Springer Science & Business Media, 2012.
3. NihalKularatna. Energy Storage Devices for Electronic Systems: Rechargeable Batteries and Supercapacitors. Academic Press, 2014.
4. OdneStokkeBurheim. 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.

19IS204 PROBLEM SOLVING AND PROGRAMMING USING PYTHON 3 0 2 4

Course Objectives

- Develop a basic understanding Python programming language
- Solve problems requiring the writing of well-documented programs in the Python language, including use of the logical constructs of that language
- Demonstrate significant experience in data structures with the Python program

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. Explain the basic concepts of Python programming
2. Implement Python programs using control statement and functions
3. Develop Python programs for the data structures String, List and Set
4. Implement Python programs for tuples and dictionaries data structures
5. Develop Python programs for files, modules and packages

Articulation Matrix

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1	2												
2	2	2	2											
3	2	2	2											
4	2	2	2											
5	3	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 **8 Hours**

DATA STRUCTURES: TUPLES, DICTIONARIES, ARRAYS

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

UNIT V **10 Hours**

FILES, MODULES, PACKAGES

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

1 **2 Hours**

EXPERIMENT 1

Programs using expressions and input and output statements.

2 **2 Hours**

EXPERIMENT 2

Programs using operators and built in functions.

3 **2 Hours**

EXPERIMENT 3

Programs using conditional statements.

4 **2 Hours**

EXPERIMENT 4

Programs performing all string operations.

5 **2 Hours**

EXPERIMENT 5

Programs using functions

6 **2 Hours**

EXPERIMENT 6

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

7 **2 Hours**

EXPERIMENT 7

Programs to perform linear search, binary search

8 **2 Hours**

EXPERIMENT 8

Programs to perform operations on list

9 **2 Hours**

EXPERIMENT 9

Programs using dictionary and set

10 **2 Hours**

EXPERIMENT 10

Programs to work with Tuples.

11 **2 Hours**

EXPERIMENT 11

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

12 **2 Hours**

EXPERIMENT 12

Program to perform word count in file.

13 **2 Hours**

EXPERIMENT 13

Program to perform file operations

14 **2 Hours**

EXPERIMENT 14

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

15 **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. John V Guttag, Introduction to Computation and Programming Using Python, Revised and expanded Edition, MIT Press , 2013.
4. Robert Sedgewick, Kevin Wayne, Robert Dondero, Introduction to Programming in Python: An Inter-disciplinary Approach, Pearson India Education Services Pvt. Ltd., 2016.
5. Timothy A. Budd, Exploring Python, Mc-Graw Hill Education (India) Private Ltd., 2015.
6. Kenneth A. Lambert, Fundamentals of Python: First Programs, CENGAGE Learning, 2012.

19HS201 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)

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.

Course Outcomes (COs)

1. Use appropriate grammar & 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									1					
2									2					
3									3					
4										1				
5										2				

UNIT I **9 Hours**

GRAMMAR

Tenses - Future continuous, Future perfect, Future perfect continuous, Past perfect, Past perfect continuous - Adjectives and adverbs - Mixed conditionals - Modals cant 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-making.

Total: 45 Hours

Reference(s)

1. Guy Brook-Hart,-BEC Vantage: Business Benchmark Upper-Intermediate - Student"s Book, 1st Edition, Cambridge University Press, New Delhi, 2006.
2. Ian Wood, Paul Sanderson, Anne Williams with Marjorie Rosenberg, Pass Cambridge BEC Vantage - Student Book 2nd Edition, Cengage Learning, New Delhi, 2014
3. Michael Handford, Martin Lisboa, Almut Koester, Angela Pitt, Business Advantage - Students Book Upper-Intermediate Cambridge University Press, New Delhi, 2014.
4. Cambridge Examinations Publishing, Ãƒ ¢??Cambridge BEC VANTAGE Self-study Edition, Cambridge University Press, UK, 2005.

19IS206 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. Understand the boolean algebra and logic gates.

2. Design and analyze combinational circuits.
3. Implement synchronous sequential logic
4. Understand the procedures in Asynchronous sequential logic
5. Implement 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 - QuineMaccluskey 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.

UNIT III **10 Hours**

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.

UNIT V **7 Hours**

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

1 **2 Hours**

EXPERIMENT 1

Implement Boolean Laws using Logic Gates

2 **4 Hours**

EXPERIMENT 2

Implement arithmetic circuits (Adder, Subtractor)

3 **2 Hours**

EXPERIMENT 3

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

4 **4 Hours**

EXPERIMENT 4

Construct Parity generator and parity checker

5 **2 Hours**

EXPERIMENT 5

Construct Magnitude comparator

6 **4 Hours**

EXPERIMENT 6

Demonstrate Multiplexer and Demultiplexers

7 **2 Hours**

EXPERIMENT 7

Function realization using multiplexers

8 **4 Hours**

EXPERIMENT 8

Demonstrate Encoder and Decoder

9 **2 Hours**

EXPERIMENT 9

Construct synchronous and Ripple counter

10 **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.

19IS207 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. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems

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

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					
2	2								1					
3	2								1					
4	2								1					
5	2								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.

19IS301 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.

19IS302 COMPUTER 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. 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. Identify the basic structure of a digital computer and instruction sets with addressing modes.
2. Comprehend the arithmetic operations of binary number system.
3. Recognize the organization of the basic processing unit and examine the basic concepts of pipelining. 4. Explicate the standard I/O interfaces and peripheral devices.
4. Explicate the standard I/O interfaces and peripheral devices
5. Determine 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-Assembly language-Basic I/O operations - Stacks and queues.

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- Floating point Numbers and Operations.

UNIT III **9 Hours**

BASIC PROCESSING UNIT

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

UNIT IV **9 Hours**

INPUT/OUTPUT ORGANIZATION

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

UNIT V **9 Hours**

MEMORY UNIT

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

Total: 45 Hours

Reference(s)

1. Carl Hamacher, Zvonko Vranesic and Safwat Zaky, Computer Organization, McGraw-Hill, Third Reprint 2015.
2. William Stallings, Computer Organization and Architecture Designing for Performance, Pearson Education, 2003.
3. David A.Patterson and John L.Hennessy, Computer Organization and Design: The hardware / software interface, Morgan Kaufmann, 4th edition, 2014.
4. John P.Hayes, Computer Architecture and Organization, McGraw Hill, 3rd edition, 2002.

19IS303 DATA STRUCTURES AND 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. 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. Identify the basic concept of data structure and identify the need for list data structures and its operations
2. Exemplify the concepts of stacks and queues with suitable applications.
3. Classify the types of tree data structures and explain its functionalities.
4. Outline the concept of graph data structure with examples.
5. Design the algorithms for searching ans 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										1	
3	2	3	3										2	
4	2	3	3										2	
5	2	3	3										2	

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

19IS304 OBJECT ORIENTED PROGRAMMING 2 0 2 3

Course Objectives

- Understand the features of Object oriented programming.
- Recognize the need of the concepts inheritance and polymorphism.
- Develop C++ applications using OOP concepts, files, templates and exceptions

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

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.

Course Outcomes (COs)

1. Interpret the features of object oriented programming and basic structure of C++ program.
2. Develop a program using objects and classes.
3. Implement programs using operator overloading and inheritance.
4. Execute the concepts of polymorphism and File streams.
5. Develop applications with advanced concepts like files, templates and exceptions.

Articulation Matrix

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

UNIT I **6 Hours**

INTRODUCTION

Need for object oriented programming - Procedural Languages vs. Object oriented approach - Characteristics Object oriented programming - C++ Programming Basics: Basic Program Construction - Output Using cout - Input with cin - Data types - Variables and Constants - Operators - Control Statements-Manipulators - Type conversion.

UNIT II **6 Hours**

OBJECTS AND CLASSES

Objects and Classes Simple Class - C++ Objects as Physical Objects - C++ Object as Data types- Constructors and Destructors- Object as Function Arguments - Returning Objects from Functions - Structures and Classes - Arrays and Strings

UNIT III **6 Hours**

OPERATOR OVERLOADING AND INHERITANCE

Operator overloading and Inheritance Need of operator overloading- Overloading Unary Operators- Overloading binary Operators - Overloading Special Operators - Data Conversion Inheritance: Derived Class and Base Class - Derived Class Constructors-Overriding Member Functions-Class Hierarchies-Public and Private Inheritance-Levels of Inheritance-Multiple Inheritance.

UNIT IV **6 Hours**

POLYMORPHISM AND FILE STREAMS

Polymorphism and File Streams Virtual Function - Friend Function - Static Function-Assignment and Copy Initialization- Memory Management: new and delete Pointers to Objects, this Pointer- Streams - String I/O - Character I/O - Object I/O - I/O with Multiple Objects - File Pointers - Disk I/O with Member Functions- Error Handling in File I/O.

UNIT V **6 Hours**

TEMPLATES AND EXCEPTION HANDLING

Templates: Introduction - Function Templates - Overloading Function Templates - Class Templates - Exception Handling - Syntax, multiple exceptions, exceptions with arguments.

1 **5 Hours**

EXPERIMENT 1

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.

2 **5 Hours**

EXPERIMENT 2

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.

3 **5 Hours**

EXPERIMENT 3

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.

4 **5 Hours**

EXPERIMENT 4

Implementation of two different classes for adding a private data member using friend function.

1. Write a program to multiply two matrices using static member function with friend function.
2. Write a program to perform complex number subtraction by overloading an operator using friend function.
3. Write a program to perform arithmetic operations using friend function.

5 **5 hours**

EXPERIMENT 5

Implementation of file handling operations.

1. Write a program to reading and writing a file contents.
2. Write a program to open a file and append data to the end of file.
3. Write a program to write the class objects to a file.

6 **5 Hours**

EXPERIMENT 6

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.

Total: 60 Hours

Reference(s)

1. Robert Lafore, "Object Oriented Programming in C++", Galgotia Publication, 2010.
2. E.Balagurusamy, "Object Oriented Programming with C++", Tata McGraw Hill Publishing, New Delhi, 2011.
3. B. Trivedi, "Programming with ANSI C++", Oxford University Press, 2010.
4. H.M Deitel and P.J Deitel, "C++ How to Program", Seventh Edition, Prentice Hall, 2010.
5. Herbert Schildt, "C++: The Complete Reference", Fourth Edition, Tata McGraw-Hill, 2010.
6. K.R. Venugopal, Rajkumar and T.Ravishankar, "Mastering C++", Tata McGraw Hill Publishing, New Delhi, 2010.

19IS305 DATABASE MANAGEEMNT SYSTEMS 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. 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

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.

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 organizations, 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	2
2	1	2	3										2	2
3	2	3											2	2
4	2	3											2	2
5	1	3	2										2	2

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 - Algorithms for relational database schema design 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 IsolationSerializability-Transaction Isolation and Atomicity-Transaction Isolation levels-Implementation of

Isolation Levels-Concurrency Control: Lock based protocols -Deadlock handling-Multiple GranularityTime stamp based protocols-Recovery system: Failure classification -Storage-Recovery and atomicity Recovery Algorithms.

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
4. Peter Rob and Corlos Coronel, Database System, Design, Implementation and Management , Thompson Learning Course Technology, 2003.

19IS306 WEB TECHNOLOGY 2 0 2 3

Course Objectives

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

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

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

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.

Course Outcomes (COs)

1. Demonstrate the technologies used to create web pages.
2. Design dynamic and interactive web pages by embedding Java Script in XHTML.
3. Implement server side programming and build web applications using PHP.
4. Develop interactive web applications using ASP.Net.
5. Explain 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								1
2	2		3		3	2								1
3	2		3		3	3								1
4	2		3		3	3								1
5	1		2		3	2								1

UNIT I **10 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 **10 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 **8 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 **9 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 **8 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

1 **1 Hours**

EXPERIMENT 1

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

2 **1 Hours**

EXPERIMENT 2

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.

3 **1 Hours**

EXPERIMENT 3

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

4 **2 Hours**

EXPERIMENT 4

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)

5 **2 Hours**

EXPERIMENT 5

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

6 **1 Hours**

EXPERIMENT 6

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

7 **1 Hours**

EXPERIMENT 7

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

8 **2 Hours**

EXPERIMENT 8

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

9 **2 Hours**

EXPERIMENT 9

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

10 **2 Hours**

EXPERIMENT 10

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: 60 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.

19IS307 DATA STRUCTURES AND ALGORITHM 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.

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								2	
3					3								2	

1 **4 Hours**

EXPERIMENT 1

Program to Solve Tower-of-Hanoi Problem using Recursion

2 **4 Hours**

EXPERIMENT 2

a) Write a C 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) Write a C 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

19IS308 DATABASE MANAGEMENT SYSTEMS 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.

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	PO 1	PO 2	PO3	PO 4	PO5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO1	PSO2
1	2	1	2										2	2
2	2	1	2		2								2	2
3	2	2	1		2								2	2
4	2	2	2		2								2	2
5	2	2	2										2	2

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. C.J.Date,An Introduction to Database system, Pearson Education, 2006

18GE301 SOFT SKILLS – VERBAL AABILITY 0 0 2 0

Course Objectives

- To help students gain adequate proficiency in vocabulary
- To read and understand unabridged text
- To help students become proficient in basic writing skills related to work place communication

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.

k. 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.

Course Outcomes (COs)

1. Take up verbal ability part of the placement tests with confidence
2. Write with confidence in professional and workplace communication
3. Distinguish fact from opinion by reading passages from a text

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	PSO1	PSO2
1										1				
2											2			
3									2					

UNIT I **15 Hours**

INTRODUCTION

Synonyms - Antonyms - Word Groups - Verbal Analogies - Etymology - Critical Reasoning - Cloze Test - One Word Substitution - Idioms and Phrases - Text & Paragraph Completion.

UNIT II15 Hours

BASICS OF VERBAL APTITUDE

Sentence Formation - Paragraph Formation - Change of Voice - Change of Speech - Reading Comprehension - Sentence Equivalence - Jumbled Sentences - Spotting Errors -Homophones Homonyms - Commonly Mispronounced/Misspelt Words.

Total: 30 Hours

Reference(s)

1. Murphy, Raymond. English Grammar in Use A Self-Study Reference and Practice Book for
2. Intermediate Learners of English. IV Edition. United Kingdom: Cambridge University Press.
3. 2012.
4. Lewis, Norman. Word Power Made Easy. New York: Pocket Books. 1991.
5. Baron"s The Official Guide for New GMAT Review, New Jersey: John Wiley & Sons, Inc. 2015.

19IS401 FORMAL LANGUAGES AND AUTOMATA THEORY

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. Explain proofing techniques and construct finite automata
2. Generate finite automata for regular expression using its properties
3. Apply context free grammars and languages
4. Construct 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

19IS402 DESIGN AND ANALYSIS OF ALGORITHMS 3 0 0 3

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. Classify the fundamentals of Algorithmic problem solving methods based on Data Structures
2. Analyze the algorithm efficiency by means of mathematical notations
3. Develop different types of sorting and searching algorithms.
4. Analyze the different techniques in the design of Graph Algorithms
5. Differentiate 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-f orce 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 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: 45 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.

19IS403 OPERATING SYSTEM 3 0 0 3

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 limitationsm.

Course Outcomes (COs)

1. Describe 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. Select 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. Suggest 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	2	2												
2	2	2			1									
3	2	2			2									
4	2	2			3									
5	2	2			1									

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:45 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

19IS404 JAVA PROGRAMMING 3 0 0 3

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.

Course Outcomes (COs)

1. Interpret the basic structure of Java program.
2. Implement various types of inheritance and packages under different accessibility
3. Describe the concept of interfaces, exceptions and multithreading nature of Java.
4. Develop applications in Java with files and Strings handling
5. Design 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												
2	2	2	1											2
3	2	2	2											2
4	1	2	1											2
5	2	2	2											2

UNIT I **9 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 **9 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 **9 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 **9 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 **9 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

Total: 45 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.

19IS405 INFORMATION STORAGE AND RETRIEVAL 3 0 0 3

Course Objectives

- To make the students to learn different types of storage and retrieval concept.
- To understand the concept of indexing and clustering process and the data structure concept behind it.
- To provide knowledge on the structure and operations of retrieval process on multimedia information.

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. Infer the various information retrieval systems, its objectives and capabilities.
2. Interpret the data structure behind the retrieval systems and indexing techniques.
3. Analyze the document clustering and different searching techniques
4. Demonstrate search algorithms and data visualization techniques.
5. Interpret the techniques in multimedia retrieval process and the measures and metrics used in evaluation process.

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									2
3	2		3		3									2
4	2		3		3									2
5	2		3		3									2

UNIT I **9 Hours**

INFORMATION RETRIEVAL SYSTEMS

Introduction to Information Retrieval Systems: Definition of Information Retrieval Systems – Objectives of Information Retrieval Systems – Functional Overview – Relationship to Database Management Systems – Digital Libraries and Warehouses. Information Retrieval Systems Capabilities: Search Capabilities – Browse Capabilities – Miscellaneous Capabilities – WAIS Standards. Cataloging and Indexing: Objectives of Indexing – Indexing Process – Automatic Indexing.

UNIT II **9 Hours**

DATA STRUCTURE AND AUTOMATIC INDEXING

Introduction to Data Structure – Stemming Algorithm – Inverted File Structure – N-Gram data structure - PAT Data Structure – Signature File Structure – Hypertext and XML Data Structures – Hidden Makov Models. Automatic Indexing: Classes of Automatic Indexing – Statistical Indexing – Natural Language – Concept Indexing – Hypertext Linkages.

UNIT III **9 Hours**

CLUSTERING AND SEARCHING TECHNIQUES

Document and Term Clustering: Introduction to Clustering – Thesaurus Generation – Item Clustering – Hierarchy of clusters. User Search Techniques: Search statements and Binding – Similarity measures and ranking – Relevance Feedback – Selective dissemination of Information search – Weighted Searches of Boolean systems – Searching the INTERNET and Hypertext.

UNIT IV **9 Hours**

SEARCH ALGORITHMS AND VISUALIZATION

Information Visualization: Introduction to Information Visualization – Cognition and Perception – Background – Aspects of Visualization process - Information Visualization Technologies. Text Search Algorithms: Introduction to Text Search Techniques – Software text search Algorithms - Hardware text search Algorithms

UNIT V **9 Hours**

MULTIMEDIA INFROMATION RETRIEVAL

Spoken Language Audio Retrieval – Non-speech Audio Retrieval – Graph Retrieval – Imagery Retrieval – Video Retrieval. Information System Evaluation: Introduction to Information System Evaluation – Measures used in System Evaluations – Measurement Example – TREC Results.

Total: 45 Hours

Reference(s)

1. Gerald J. Kowalski, Mark T. Maybury, “Information Storage and Retrieval Systems”, Second edition, Kluwer Academic Publishers, 2002.
2. Robert R. Korfhage, “Information Storage and Retrieval Systems”, Wiley India, 2006.
3. Robert M. Hayes, “Information Storage and Retrieval: Tools, Elements, Theories”, Society for Industrial and Applied Mathematics, 2006.
4. Pollitt AS, “Information storage & Retrieval Systems : Origin Development & Applications, John Wiley & Sons, 1989.
5. Philip K. C. Tse, “Multimedia Information Storage and Retrieval: Techniques and Technologies”, IGI Global United States, 2008.

19IS406 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 quality management processes and methods.

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. Develop software requirements specification and cost estimation for an application.
3. Analyze the software design concepts and principles to develop a high quality software.
4. Apply the testing methods to identify errors during software development.
5. Identify the activities that improve the quality of the software.

Articulation Matrix

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

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.

UNIT 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. Ian Sommerville, Software Engineering, 8th Edition, Pearson Education,2008
3. Stephan Schach, Software Engineering, Tata McGraw Hill, 2007
4. Pfleeger and Lawrence Software Engineering: Theory and Practice, Pearson Education, second edition, 2001

19IS407 OPERATING SYSTEM LABORATORY 0 0 4 2

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 limitationsm.

Course Outcomes (COs)

1. Describe 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. Select 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. Suggest 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	2	2												
2	2	2			1									
3	2	2			2									
4	2	2			3									
5	2	2			1									

1 **6 Hours**

EXPERIMENT 1

Basic UNIX commands

2 **8 Hours**

EXPERIMENT 2

Fork, wait, exec, stat, readdir, open, read, write system calls

3 **6 Hours**

EXPERIMENT 3

ls, grep, cp, rm commands

4 **8 Hours**

EXPERIMENT 4

Shell programming.

5 **4 Hours**

EXPERIMENT 5

FCFS Scheduling.

6 **8 Hours**

EXPERIMENT 6

SJF and Priority Scheduling.

7 **4 Hours**

EXPERIMENT 7

Roundrobin scheduling

8 **4 Hours**

EXPERIMENT 8

Semaphore Implementation.

9 **12 Hours**

EXPERIMENT 9

Inter-process Communication, Producer-Consumer problem, Banker's Algorithms

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

19IS408 JAVA PROGRAMMING LABORATORY 0 0 4 2

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.

Course Outcomes (COs)

1. Interpret the basic structure of Java program.
2. Implement various types of inheritance and packages under different accessibility
3. Describe the concept of interfaces, exceptions and multithreading nature of Java.
4. Develop applications in Java with files and Strings handling
5. Design 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												
2	2	2	1											2
3	2	2	2											2
4	1	2	1											2
5	2	2	2											2

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: 60 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

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)

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 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. Identify 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	1	2												
2	1	1												
3	2	2					1							
4	1													
5	2													

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) - water logging - salinity - case studies. Energy resources: renewable(solar, wind, tidal, geothermal and hydroelectric power) - non renewable energy sources

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: forest ecosystem - desert ecosystem - ecological succession. Biodiversity - value of biodiversity - threats to biodiversity-endangered and endemic species-Conservation of biodiversity: In - situ and ex- situ conservation of biodiversity - field study

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) - marine pollution - thermal pollution - noise pollution. Disaster management: causes - effects - control measures of floods - earthquake – cyclone - landslides

UNIT IV **7 Hours**

SOCIAL ISSUES AND ENVIRONMENT

Sustainable development : Definition - Unsustainable to sustainable development - urban problems related to energy. Environmental ethics - issues and possible solutions - solid waste management – causes - effects - 3R Principles (landfills, incineration, composting). Water conservation - rain water harvesting - watershed management. Climate change - global warming - acid rain - ozone layer depletion. Environment protection act: Air (Prevention and control of pollution) act - wildlife protection act.

UNIT V **5 Hours**

HUMAN POPULATION AND ENVIRONMENT

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

FOR FURTHER READING

Human rights: E - waste and 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 - REASONING **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

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. 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									1					
2										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

Total: 30 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.

19IS501 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. Construct Finite automata for Regular Expression and apply minimization techniques.
3. Construct Top down and Bottom up parser for context free grammars.
4. Generate 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 - Nonrecursive 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.

19IS502 MICROPROCESSOR AND MICROCONTROLLER 3 0 2 4

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.

Course Outcomes (COs)

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

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.

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 **3 Hours**

EXPERIMENT 4

8086-Arithmetic operations

5 **3 Hours**

EXPERIMENT 5

8086-String Manipulation

6 **3 Hours**

EXPERIMENT 6

Stepper motor interfacing with 8086

7 **3 Hours**

EXPERIMENT 7

Counters and time delay using 8086

8 **3 Hours**

EXPERIMENT 8

Interfcaing 8085 with 8255

9 **3 Hours**

EXPERIMENT 9

Interfcaing 8085 with 8279

10 **3 Hours**

EXPERIMENT 10

8051-Arithmetic operations

Total: 75 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.

19IS503 DATA MINING **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. Implement the data warehouse architecture
2. Explain the functionalities of data mining
3. Explore the different data preprocessing techniques
4. Identify the association rules using frequent itemset mining algorithms
5. Describe 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, APattern growth approach for mining frequent itemsets,Mining frequent itemsets using vertical data format, Mining closed and maxpatterns - Pattern mining in multilevel and multidimensional space - ConstraintbasedFrequentpatternmining -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, PadhraicSymth, Principles of Data Mining, MIT Press, 2004
4. Margaret H.Dunham, Data Mining: Introductory and Advanced Topics, Pearson Education 2008

19IS504 COMPUTER NETWROKS **3 0 0 3**

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.

Course Outcomes (COs)

1. Illustrate 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. Outline 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					1		2							
3					2		2							
4					2		2							
5					1		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 LAYER

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.

Total: 45 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

19IS507 DATA MINING LABORATORY 0 0 4 2

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. Implement the data warehouse architecture

2. Explain the functionalities of data mining
3. Explore the different data preprocessing techniques
4. Identify the association rules using frequent itemset mining algorithms
5. Describe 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													

1 **8 Hours**

EXPERIMENT 1

Working with attributes and filters

2 **8 Hours**

EXPERIMENT 2

Associating - Apriori algorithm and FP-Growth
a.Learning Associations

3 **8 Hours**

EXPERIMENT 3

Classification - Bayesian, Decision tree, SVM
a.Selecting a Classifier, b.Test Options, c.Training a Classifier, d.Classifier Output, e.Result list

4 **8 Hours**

EXPERIMENT 4

Clustering - K-means clustering, Agglomerative clustering a.Selecting a Cluster
b.Cluster Modes c.Ignoring Attributes
d.Working with Filters e.Learning Clusters

5 **8 Hours**

EXPERIMENT 5

Visualizing methods in data mining

6 **10 Hours**

EXPERIMENT 6

Applications of classification for web mining.

7 **10 Hours**

EXPERIMENT 7

Case Study on Text Mining or any commercial application.

Total: 60 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, PadhraicSymth, Principles of Data Mining, MIT Press, 2004
4. Margaret H.Dunham, Data Mining: Introductory and Advanced Topics, Pearson Education 2008

19IS508 COMPUTER NETWORKS LABORATORY 0 0 4 2

Course Objectives

- Understand the concepts of computer networks and to study the functions of different layers.
- Familiarize with different protocols and network components.
- 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.

Course Outcomes (COs)

1. Predict the different types of cables in networks.
2. Configure networking in a system.
3. Implement and simulate protocols.
4. Develop applications using packet tracer software

Articulation Matrix

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

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 **4 Hours**

EXPERIMENT 2

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

3 **6 Hours**

EXPERIMENT 3

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

4 **4 Hours**

EXPERIMENT 4

Perform Bit Stuffing and CRC computation.

5 **4 Hours**

EXPERIMENT 5

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

6 **6 Hours**

EXPERIMENT 6

Simulation of ARP/RARP

7 **4 Hours**

EXPERIMENT 7

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

8 **4 Hours**

EXPERIMENT 8

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

9 **6 Hours**

EXPERIMENT 9

Write a program for downloading a file from HTTP server

10 **6 Hours**

EXPERIMENT 10

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

11 **6 Hours**

EXPERIMENT 11

Configure a Network topology using Packet tracer software.

12 **6 Hours**

EXPERIMENT 12

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

Total: 60 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

18GE501 SOFT SKILLS - APTITUDE I 00 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.

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												
4	2	2												

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.

Programme Outcomes (POs)

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 inmultidisciplinary settings.

k. Demonstrate knowledge and understanding of the engineering and management principles and applythese to ones own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

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								3			2			
2								2			2			
3								2			2			
4								2			2			
5								2			2			

UNIT I **6 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 **6 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 **6 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 **6 Hours**

DIRECTING

Foundations of individual and group behaviour-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 **6 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: 30 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

19IS602 BIG DATA ANALYTICS 3 0 0 3

Course Objectives

- Understand the basic ideas of Big Data
- Analyze the data analytics life cycle and methodology.
- Design unstructured data analytics

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. Demonstrate the concepts and applications of big data
2. Create and Manage data using NoSQL databases.
3. Develop the basic idea of the Hadoop and HDFS
4. Implement programs using Map reduce concepts
5. Design machine learning techniques to resolve the issue by Hadoop related tools.

Articulation Matrix

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

UNIT I **10 Hours**

UNDERSTANDING BIG DATA

Data Storage and Analysis, Comparison with Other Systems, Rational Database Management System , Grid Computing, Volunteer Computing- unstructured data - industry examples of big data- web analytics-big data and marketing -fraud and big data - risk and big data - credit risk management- big data and algorithmic trading - big data and healthcare - big data in medicine- advertising and big data - big data technologies -introduction to Hadoop - open source technologies

UNIT II **7 Hours**

NOSQL DATA MANAGEMENT

Introduction to NoSQL- aggregate data models- aggregates -key-value and document data models - relationships- graph databases-schema less databases-materialized views-distribution models -sharding - version - Map reduce- partitioning and combining -composing map-reduce calculations

UNIT III **8 Hours**

BASICS OF HADOOP

Data format - analyzing data with Hadoop -scaling out-Hadoop streaming- Hadoop pipes - design of

Hadoop distributed file system (HDFS)- HDFS concepts-Java interface- data flow-Hadoop I/O -data integrity -compression-serialization

UNIT IV **10 Hours**

MAP REDUCE APPLICATIONS

MapReduce workflows - unit tests with MR Unit -test data and local tests - anatomy of MapReduce job run - classic Map- reduce - YARN - failures in classic Map- reduce and YARN - job scheduling - shuffle and sort - task execution - MapReduce types -input formats -output formats

UNIT V **10 Hours**

HADOOP RELATED TOOLS

Hbase- data model and implementations- Hbase clients - Hbase examples - praxis. Cassandra- cassandra data model- cassandra examples- cassandra clients -Hadoop integration. Pig - Grunt - pigdata model- Pig Latin -developing and testing Pig Latin scripts. Hive - data types and file formats -HiveQL data definition- HiveQL data manipulation -HiveQL queries

FOR FURTHER READING

Cloud and big data - mobile business intelligence - Crowd sourcing analytics - inter and Trans firewall analytics

Total: 45 Hours

Reference(s)

1. Tom White, "Hadoop: The Definitive Guide", Third Edition, O'Reilley, 2012.
2. Eric Sammer, "Hadoop Operations", O'Reilley, 2012.
3. Vignesh Prajapati, Big data analytics with R and Hadoop, SPD 2013
4. E. Capriolo, D. Wampler, and J. Rutherglen, "Programming Hive", O'Reilley, 2012.
5. Alan Gates, "Programming Pig", O'Reilley, 2011.

19IS603 CLOUD INFRASTRUCTURE AND SERVICES 3 0 0 3

Course Objectives

- Understand 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. Describe 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. Determine the best features to move to the cloud and categorize the cloud storage types
4. Explore the cloud security concerns
5. Examine 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.

19IS604 VISUALIZATION TECHNIQUES **3 0 0 3**

Course Objectives

- Apply data transformations such as aggregation and filtering for visualization.
- Identify opportunities for application of data visualization in various domains.
- Critique existing visualizations based on data visualization theory and principles.

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. Design and create data visualizations.
2. Conduct exploratory data analysis using visualization.
3. Craft visual presentations of data for effective communication.
4. Use knowledge of perception and cognition to evaluate visualization design alternatives.
5. Design and evaluate color palettes for visualization based on principles of perception.

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									
4			2		2									
5			2		2									

UNIT I **9 Hours**

ABSTRACTION

What's Vis, and Why Do It? – Data Abstraction: Data types – Dataset types – Tables, Network and Trees, Fields, Geometry, Other combinations, Dataset availability – Attribute types – Semantics – Task Abstraction: Actions – Analyze, Produce, Search, Query – Targets – Analyzing and Deriving examples

UNIT II **9 Hours**

ANALYSIS, MARKS AND CHANNELS

Validation – Four levels of design – Angles of attack – Threats to validity – Validation approaches – Examples. Marks and Channels: Defining marks and channels – channel types and mark types – Expressiveness and Effectiveness – Channel Rankings – Channel Effectiveness – Relative versus Absolute Judgments.

NIT III **9 Hours**

TABLES

Rules of Thumb: No Unjustified 3D, Resolution over Immersion, Overview First, Zoom and Filter, Details on Demand – Arrange Tables: Arrange by Keys and Values - Express: Quantitative Values - Separate, Order, and Align: Categorical Regions - Spatial Axis Orientation - Spatial Layout Density -

UNIT IV **9 Hours**

SPATIAL DATA, NETWORKS, TREES

Arrange Spatial data: Geometry - Scalar Fields: One Value - Vector Fields: Multiple Values - Tensor Fields: Many Values – Arrange Networks and Trees: Connection: Link Marks - Matrix Views - Costs and Benefits: Connection versus Matrix - Containment: Hierarchy Marks.

UNIT V **9 Hours**

VIEWS

Manipulate View: Change View over Time - Select Elements - Navigate: Changing Viewpoint - Navigate: Reducing Attributes – Facet into Multiple views: Juxtapose and Coordinate Views - Partition into Views - Superimpose Layers - Visually Distinguishable Layers - Static Layers - Dynamic Layers – Reduced Items and Attributes: Filter – Aggregate.

Total: 45 Hours

Reference(s)

1. Tamara Munzner, "Visualization Analysis & Design", CRC Press Taylor & Francis Group, 2014.
2. Andy Kirk, "Data Visualisation: A Handbook for Data Driven Design", 2016.
3. Kieran Healy, "Data Visualization: A Practical Introduction", Princeton University Press, 2018.
4. Cole Nussbaumer Knaflic, "Storytelling with Data: A Data Visualization Guide for Business Professionals", John Wiley & Sons, 2015
5. Stephanie D. H. Evergreen, "Effective Data Visualization: The Right Chart for the Right Data", SAGE Publications, 2016.

19IS607 CLOUD INFRASTRUCTURE AND SERVICES LABORATORY 0 0 4 2

Course Objectives

- To develop web applications in cloud
- To learn the design and development process involved in creating a cloud based application
- To learn to implement and use parallel programming using Hadoop

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.

Course Outcomes (COs)

1. Configure various virtualization tools such as Virtual Box, VMware workstation.
2. Design and deploy a web application in a PaaS environment.
3. Learn how to simulate a cloud environment to implement new schedulers.
4. Install and use a generic cloud environment that can be used as a private cloud.
5. Manipulate large data sets in a parallel environment.

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											

1 **8 Hours**

EXPERIMENT 1

Install Virtualbox/VMware Workstation with different flavours of linux or windows OS on top of windows7 or 8.

2 **8 Hours**

EXPERIMENT 2

Install a C compiler in the virtual machine created using virtual box and execute Simple Programs

3 **8 Hours**

EXPERIMENT 3

Install Google App Engine. Create hello world app and other simple web applications using python/java.

4 **7 Hours**

EXPERIMENT 4

Use GAE launcher to launch the web applications.

5 **7 Hours**

EXPERIMENT 5

Simulate a cloud scenario using CloudSim and run a scheduling algorithm that is not present in CloudSim.

6 **7 Hours**

EXPERIMENT 6

Find a procedure to transfer the files from one virtual machine to another virtual machine.

7 **7 Hours**

EXPERIMENT 7

Find a procedure to launch virtual machine using trystack (Online Openstack Demo Version)

8 **8 Hours**

EXPERIMENT 8

Install Hadoop single node cluster and run simple applications like wordcount.

Total: 60 Hours

Reference(s)

1. Anthony T Velte, Cloud Computing: A practical Approach, Tata McGraw Hill, 2009.
2. Halper Fern, Kaufman Marcia, Bloor Robin, Hurwit Judith, Cloud Computing for Dummies, Wiley India, 2009.
3. Barrie Sosinsky, Cloud Computing Bible,Wiley-India,2014.

19IS608 VISUALIZATION TECHNIQUES LABORATORY 0 0 4 2

Course Objectives

- Apply data transformations such as aggregation and filtering for visualization.
- Identify opportunities for application of data visualization in various domains.
- Critique existing visualizations based on data visualization theory and principles.

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. Design and create data visualizations.
2. Conduct exploratory data analysis using visualization.
3. Craft visual presentations of data for effective communication.
4. Use knowledge of perception and cognition to evaluate visualization design alternatives.
5. Design and evaluate color palettes for visualization based on principles of perception.

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									
4			2		2									
5			2		2									

1 **10 Hours**

EXPERIMENT 1

2D, 3D plots

2 **10 Hours**

EXPERIMENT 2

Revealing business trends by analyzing the data

3 **10 Hours**

EXPERIMENT 3

Visualizing wealth and personal finance based on real dataset

4 **10 Hours**

EXPERIMENT 4

Visualizing maps and locations.

5 **10 Hours**

EXPERIMENT 5

Python for Data Visualization.

6 **10 Hours**

EXPERIMENT 6

Gephi visualization on real data sets.

Total: 60 Hours

Reference(s)

1. Tamara Munzner, "Visualization Analysis & Design", CRC Press Taylor & Francis Group, 2014.
2. Andy Kirk, "Data Visualisation: A Handbook for Data Driven Design", 2016.
3. Kieran Healy, "Data Visualization: A Practical Introduction", Princeton University Press, 2018.
4. Cole Nussbaumer Knaflic, "Storytelling with Data: A Data Visualization Guide for Business Professionals", John Wiley & Sons, 2015.

18GE601 SOFT SKILS – 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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2	2												
2	2	2												
3	2	2												
4	2	2												
5	2	2												

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 **4 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 Interest-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 **4 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 **2 Hours**

VISUAL REASONING

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

13 **2 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 engineers responsibility.

Programme Outcomes (POs)

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

k. Demonstrate knowledge and understanding of the engineering and management principles and apply these to ones own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

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								2			2			
2								2			2			
3								2			2			
4								2			2			
5								2			2			

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 Gilligans 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 climate - Collegiality and loyalty - Managing conflict - Respect for authority - Collective bargaining - Confidentiality - Conflicts of interest - Occupational crime - Professional rights - Employee rights.

NIT 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

19IS702 MACHINE LEARNING 3 0 0 3

Course Objectives

- Illustrate concept learning and linear regression.
- Apply the different machine learning techniques to problem solutions.
- Analyze the datasets and apply appropriate machine learning techniques.

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. Classify the supervised and unsupervised machine learning.
2. Identify machine learning techniques suitable for a given problem.
3. Solve the problems using various machine learning techniques.
4. Apply Dimensionality reduction techniques.
5. Design application using machine learning techniques.

Articulation Matrix

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

UNIT I **9 Hours**

INTRODUCTION

Introduction to machine Learning – Types of Machine Learning –Applications - Supervised Learning – The Brain and the Neuron – Design a Learning System – Perspectives and Issues in Machine Learning – Concept Learning Task – Concept Learning as Search –Finding a Maximally Specific Hypothesis – Version Spaces and the Candidate Elimination Algorithm- Perceptron – Linear Separability – Linear Regression.

UNIT II **9 Hours**

UNSUPERVISED LEARNING

Clustering–Applications- Metrics - Partitional Clustering - K means Algorithms – K- mediods - Hierarchical clustering – Density based clustering: DBSCAN –Mean shift clustering – Vector quantization – Self Organising Feature Map

UNIT III **9 Hours**

CLASSIFICATION METHODS

Classification metrics –Confusion matrix - Neural Network model - Multi-layer Perceptron - Decision tree - Support Vector Machines- K-Nearest Neighbor – Boosting and Bagging – Convolutional Neural Network.

UNIT IV **9 Hours**

DIMENSIONALITY REDUCTION

Dimensionality Reduction - Linear Discriminant Analysis - Principal Component Analysis (PCA)- Factor Analysis- Independent Component Analysis- Feature selection: Filter and Wrapper methods-Rank based algorithms

UNIT V **9 Hours**

REINFORCEMENT LEARNING

Reinforcement learning - Non deterministic rewards and Actions - Q Learning – Genetic Algorithm- Tools for machine learning- Case study IRIS dataset using Weka: Classification

FOR FURTHER READING

Feature selection – Feature ranking and subset selection- Machine Learning for Big data: Big Data and Map Reduce.

Total: 45 Hours

Reference(s)

1. T.M. Mitchell, “Machine Learning”, McGraw-Hill 2017.
2. Ethem Alpaydin, “Introduction to Machine Learning”, MIT Press, Third edition 2014
3. Stephen Marsland, “Machine Learning -An Algorithmic Perspective”, Second Edition, Chapman and Hall/CRC Machine Learning and Pattern Recognition Series, 2014

19IS703 INTERNET OF THINGS **3 0 0 3**

Course Objectives

- Understand the components and protocols used in IOT.
- To Understand the IoT Reference Architecture and Real World Design Constraints.
- Ability to understand the Security requirements in IoT.

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. Identify physical design, components and communication models used in IOT.
2. Understand the protocol architecture of IOT.
3. Implement sensor interfacing and collaborate them with network devices.

4. Identify protocols used for connecting devices to cloud and web servers.
5. Understand the security requirements and threats in IOT.

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		3									2
4		2	2		2								1	
5		2	2		2								1	

UNIT I **8 Hours**

INTRODUCTION TO INTERNET OF THINGS

IOT Fundamentals - Characteristics of IoT - Physical Design of IoT - IoT Protocols - IoT communication models - IOT Communication APIs -IOT enabled Technologies - Wireless Sensor Networks, Cloud Computing, Big data analytics, and Communication protocols, Embedded Systems, IOT Levels and Templates.

UNIT II **10 Hours**

IOT REFERENCE ARCHITECTURE

Introduction - State of the art - Architecture Reference Model- IOT reference Model - IOT Protocols: Zigbee, RFID, BLE, NFC, BACnet, 6LowPAN, RPL, XMPP, CoAP, and QTT.

UNIT III **9 Hours**

IOT DEVICES AND INTERFACING

IOT components - Sensors - Actuators - Hardware Platforms - Interfacing with devices: Setting up the board -Programming for IOT - Reading from Sensors, Communication: Connecting microcontroller with mobile devices - communication through Bluetooth, wifi, Ethernet.

UNIT IV **9 Hours**

IOT CLOUD, WEB SERVICES AND DATA ANALYTICS

Introduction to Cloud Storage models - Cloud services and IOT - communication APIs - Cloud for IOT - Web server: Web server for IOT - Amazon Web services for IOT- Data analytics for IOT.

UNIT V **9 Hours**

IOT SECURITY

Security Requirements in IOT - Security Concerns in IOT Applications - Security Architecture in the Internet of Things - Insufficient Authentication/Authorization - Insecure Access Control - Threats to Access Control, Privacy, and Availability - Attacks Specific to IOT. Vulnerabilities - Secrecy and Secret-Key Capacity - Authentication/Authorization for Smart Devices - Transport Encryption

Total: 45 Hours

Reference(s)

1. Jan Holler, VlasiosTsiatsis, Catherine Mulligan, Stefan Avesand, StamatisKarnouskos, David Boyle,From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence, 1st Edition, Academic Press, 2014.
2. Vijay Madisettiand ArshdeepBahga, Internet of Things (A Hands-on-Approach), 1stEdition, VPT, 2014.
3. Olivier Hersent, David Boswarthick, Omar Elloumi , The Internet of Things Key applications and Protocols, Wiley, 2012.
4. Getting Started with the Internet of Things: Connecting Sensors and Microcontrollers to the Cloud (Make: Projects) [Kindle Edition] by CunoPfister, 2011.
5. Practical Internet of Things Security (Kindle Edition) by Brian Russell, Drew Van Duren.
6. Security and Privacy in Internet of Things (IOTs): Models, Algorithms, and Implementations.

19IS704 INFORMATION SECURITY 3 0 0 3

Course Objectives

- Understand information security's importance in our data-driven digital world.
- Acquire the knowledge of key concepts of information security and how they work.
- Develop a Security mindset learn how to critically analyze situations of computer and network usage from a security perspective, identifying the salient issues, technologies, policies, laws, standards, and practices.

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. 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. 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. 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. Examines the business drivers behind the information security analysis design process.
2. Illustrate the major components, scope, and target audience for each of the levels of security policy
3. Apply the suitable security technologies to segregate the organizations systems from the insecure Internet.

4. Identify the underlying foundations of modern cryptosystems and analyze the traditional symmetric encryption systems with more modern asymmetric encryption systems.
5. Interpret the several key laws, policies, standards and practices that shape the field of information security.

Articulation Matrix

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

UNIT I **9 Hours**

INTRODUCTION TO INFORMATION SECURITY

The History of Information Security-Key Information Security Concepts-The Security Systems Development Life Cycle- Security Professionals and the Organization- Need for Security.

UNIT II **9 Hours**

INFORMATION SECURITY POLICY, STANDARDS AND PRACTICES

Information Security Planning and Governance - Information Security Policy, Standards, and Practices – The Information Security Blueprint -Security Education, Training, and Awareness Program – Continuity Strategies.

UNIT III **9 Hours**

SECURITY TECHNOLOGIES

Introduction-Access Control, Identification, Authentication, Authorization and Accountability-Firewalls Virtual Private Networks (VPNs)- Intrusion Detection and Prevention Systems - Scanning and Analysis Tools- Biometric Access Controls.

UNIT IV **9 Hours**

CRYPTOGRAPHY

Foundations of Cryptology-Cipher Methods-Cryptographic Algorithms-Cryptographic Tools-Protocols for Secure Communications-Attacks on Cryptosystems.

UNIT V **9 Hours**

LEGAL, ETHICAL, AND PROFESSIONAL ISSUES IN INFORMATION SECURITY

Law and Ethics in Information Security - General Computer Crime Laws - International Laws and Legal Bodies - Agreement on Trade-Related Aspects of Intellectual Property Rights - Digital Millennium Copyright Act (DMCA) - Ethics and Information Security-Codes of Ethics and Professional Organizations.

Total: 45 Hours

Reference(s)

1. Michael E Whitman, Herbert J Mattord , Principles of Information Security ,Sixth Edition, Cengage Learning,2017.
2. Mark Stamp, Information Security : Principles and Practices, Wiley ,Second edition,2011
3. William Stallings, Cryptography and Network Security: Principles and Practice, Prentice Hall of India/Pearson Education, New Delhi, 2007.
4. Charles B.fleeger and Shari Lawrence Pfleeger, Security in Computing, Pearson Education, 2014.
5. Dieter Gollmann, Computer Security, John Wiley & Sons Ltd., 2011.
6. SunitBelapure and Nina Godbole , Cyber Security, Wiley, 2011.

19IS707 MACHINE LEARNING LABORATORY 0 0 4 2

Course Objectives

- Make use of data sets in implementing the machine learning algorithms.
- Apply the different machine learning techniques to problem solutions.
- Implement the machine learning concepts and algorithms in any suitable language of choice.

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

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 implementation procedures for the machine learning algorithms.
2. Apply appropriate data sets to the machine learning algorithms
3. Design Java/Python programs for various learning algorithms.
4. Identify and apply Machine learning algorithms to solve real world problems
5. Implement clustering algorithms to solve real world problems

Articulation Matrix

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

1 **6 Hours**

EXPERIMENT 1

Study and usage of python and R tools.

2 **6 Hours**

EXPERIMENT 2

Implement a classifier for the sales data.

3 **6 Hours**

EXPERIMENT 3

Develop a predictive model for predicting house prices

4 **6 Hours**

EXPERIMENT 4

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

5 **6 Hours**

EXPERIMENT 5

Implement and demonstrate the Candidate-Elimination algorithm to output a description of the set of all hypotheses consistent with the training examples. Read the training data from a specific .CSV file

6 **6 Hours**

EXPERIMENT 6

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. (Using Java/Python ML library classes)

7 **6 Hours**

EXPERIMENT 7

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

8 **6 Hours**

EXPERIMENT 8

Write a program to implement k-Nearest Neighbour algorithm to classify the iris data set. Print both correct and wrong predictions

9 **6 Hours**

EXPERIMENT 9

Implement clustering algorithm for identifying cancerous data

10 **6 Hours**

EXPERIMENT 10

Apply reinforcement learning and develop a game of your own.

Total: 60 Hours

Reference(s)

1. T.M. Mitchell, "Machine Learning", McGraw-Hill 2017.
2. Ethem Alpaydin, "Introduction to Machine Learning", MIT Press, Third edition 2014
3. Stephen Marsland, "Machine Learning -An Algorithmic Perspective", Second Edition, Chapman and Hall/CRC Machine Learning and Pattern Recognition Series, 2014

NOTE: Datasets for the above exercises available in Kaggle and UCI repository mentioned below

i. https://www.kaggle.com
ii. http://archive.ics.uci.edu/ml/datasets.html

19IS708 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.

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.

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.

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. 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		2										
2		2		2	2						2			
3			2		3	2					2	2		
4			2		3		3	2			2	2		
5									2	3	2			

19IS804 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.

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.

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.

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. 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		2										
2		2		2	2						2			
3			2		3	2					2	2		
4			2		3		3	2			2	2		
5									2	3	2			

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)

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 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									1					
2									2					
3									3					
4										1				
5										2				

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-making.

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.

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)

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. 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				
2										2				
3										2				

UNIT I 9 Hours

Hindi Alphabet: Introduction - Vowels - Consonants - Plosives - Fricatives - Nasal sounds - Vowel Signs - Chandra Bindu & Visarg -Table of Alphabet -Vocabulary.

UNIT II 9 Hours

Nouns: Genders (Masculine & Feminine Nouns long vowels and short vowels - -Masculine & Feminine - Reading Exercises.

UNIT III 9 Hours

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**

Classified Vocabulary: Parts of body - Relatives - Spices - Eatables - Fruit & Vegetables - Clothes - Directions - Seasons - Professions.

UNIT V **9 Hours**

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

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)

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. 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				
2										2				
3										3				
4										2				
5										3				

UNIT I **9 Hours**

Introduction to German language: Alphabet - Numbers - Greetings - Days and Seasons- Working with Dictionary.

UNIT II **9 Hours**

Nouns - articles - Speaking about one self - Listening to CD supplied with the books, paying special attention to pronunciation

UNIT III **9 Hours**

Regular & Irregular verbs - Personal pronouns - family - Introduction to types of sentences

UNIT IV **9 Hours**

Question words-Types of Questions - Nominative case- Verb Conjugation - country - nationalities

UNIT V **9 Hours**

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.

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)

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. 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				
2										2				
3										2				
4										2				
5										2				

UNIT I **9 Hours**

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**

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**

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**

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**

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

Reference(s)

1. Japanese for Everyone: Elementary Main Textbook1-1, Goyal Publishers and Distributors Pvt. Ltd., Delhi, 2007.

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)

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. 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				
2										2				
3										3				
4										2				
5										3				

UNIT I **9 Hours**

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**

Thank you | Initials and Finals of Chinese | The Neutral Tone | Rules of Tone Marking and Abbreviation

UNIT III **9 Hours**

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**

She is my Chinese teacher | In the library | The Interrogative Pronouns | The Structural Particle | The interrogative Particle

UNIT V **9 Hours**

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)

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. 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				
2										2				
3										3				
4										2				
5										3				

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

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)

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. 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	1	1												
2	2	2												
3	3	1												
4	1	1												
5	2	3												

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 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 - thermogravimetric 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)

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. 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	1												
2	1	2												
3	1	1												
4	1	1												
5	2	1												

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)

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. 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	1	1												
2	1	2												
3	2	1												
4	1	1												
5	1	2												

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.

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)

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 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	3	1												
2	2	3												
3	3	1												
4	2	2												
5	3	3												

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)

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. 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	1												
2	1	2												
3	2	2												
4	1	1	2											
5	1	3	2											

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)

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. 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
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)

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. 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
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)

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. 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
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)

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.

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

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
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)

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.

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

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
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

19IS001 AGILE SOFTWARE DEVELOPMENT **3 0 0 3**

Course Objectives

- To understand the fundamentals of Agile Software & Agile testing
- To develop a Scrum framework
- To learn the agile software design and programming

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. Understand the background and driving forces for taking an Agile approach to software development
2. Understand the Agile development practices
3. Apply design principles and refactoring to achieve Agility
4. Deploy automated build tools, version control and continuous integration
5. Perform testing activities within an Agile project

Articulation Matrix

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

UNIT I **9 Hours**

FUNDAMENTALS OF AGILE

The Genesis of Agile-Introduction and background-Agile Manifesto and Principles-Overview of Scrum-Extreme Programming- Feature Driven development-Lean Software Development-Agile project management- Design and development practices in Agile projects-Test Driven Development-Continuous Integration-Refactoring-Pair Programming- Simple Design- User Stories-Agile Testing-Agile Tools.

UNIT II **9 Hours**

AGILE SCRUM FRAMEWORK

Introduction to Scrum-Project phase- Agile Estimation- Planning game-Product backlog-Sprint backlog-Iteration planning- User story definition- Characteristics and content of user stories-Acceptance tests and Verifying stories- Project velocity- Burn down chart- Sprint planning and retrospective- Daily scrum-Scrum roles.

UNIT III **9 Hours**

AGILE SOFTWARE DESIGN AND DEVELOPMENT

Agile design practices- Role of design Principles including Single Responsibility Principle-Open Closed Principle- Interface Segregation Principles- Dependency Inversion Principle in Agile Design-Need and significance of Refactoring- Refactoring Techniques-automated build tools.

UNIT IV **9 Hours**

AGILE TESTING

The Agile lifecycle and its impact on testing- Test-Driven Development (TDD)- Testing user stories - acceptance tests and scenarios-Planning and managing testing cycle- Exploratory testing, Risk based testing- Regression tests-Test Automation- Tools to support the Agile tester

UNIT V **9 Hours**

DEVOPS

History of DevOps, Key themes and principles - Understanding Value Stream, Organization principles & patterns - Flow - Continuous Build, Continuous Integration, Automated Testing & Continuous Delivery - Feedback - Effective Production Telemetry, working model of Dev & Ops, Increase overall quality - Continuous Learning - Establishing Continuous learning culture and relentless improvement. Information Security , Change Management and Compliance Controls

FOR FURTHER READING

Scaled Agile Framework (SAFe) - Lean and Kanban Software development

Total: 45 Hours

Reference(s)

1. Ken Schawber, Mike Beedle- "Agile Software Development with Scrum "- Pearson 2014
2. Robert C. Martin- " Agile Software Development, Principles, Patterns and Practices"-Prentice Hall 2002
3. Lisa Crispin, Janet Gregory – "Agile Testing: A Practical Guide for Testers and Agile Teams"- Addison Wesley 200
4. The DevOps Handbook by Gene Kim, Jez Humble, Patrik Debois & John Willis.
5. Web References: http://martinfowler.com/agile.html
6. Web References: https://www.scaledagileframework.com/

19IS002 COMPUTATIONAL INTELLIGENCE **3 0 0 3**

Course Objectives

- Understand basics of computational intelligence.
- Analyze the concepts in artificial neural networks.
- Understand the working principle of genetic algorithms and optimization.

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. Acquire the basic knowledge in computational intelligence
2. Interpret the models in fuzzy set theory
3. Discover the learning methods and rules in neural network
4. Assess the methods deployed in neural network based learning
5. Discover the models and applications in genetic algorithms

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											
3		2	1											
4	1	2	2											
5		3	2											

UNIT I **8 Hours**

FUZZY SET AND MEMBERSHIP FUNCTION

Basic components of Computational Intelligence: ANN, Fuzzy System, Swarm Intelligence, Artificial Immune System - Evolutionary computation - Fuzzy sets – Membership functions: γ -function, s- function, L-function, Triangular function, π-function, Gaussian function – Operations of Fuzzy sets: T- Norm, S-Norm, Complement – Fuzzy relations – Linguistic Hedges

UNIT II **8 Hours**

FUZZY RULE AND CONTROL SYSTEM

Fuzzy Rules - Fuzzy Control system – Architecture – Fuzzification – reasoning - Defuzzification – Mamadani Fuzzy control System – Takagi - Sugeno Fuzzy control system

UNIT III **10 Hours**

NEURAL NETWORKS AND LEARNING RULE

Biological Neural Network – Artificial Neural Network – Activation function – Types of Learning in a NN: Supervised Learning, Unsupervised Learning, Reinforcement learning – Augmented Vectors – Gradient Descent Learning Rule – Widrow-Hoff Learning Rule – Generalized Delta learning rule – Error-correction learning rule

UNIT IV **10 Hours**

NEURAL NETWORK MODELS

Supervised Neural Network – Mculloch-Pitts model – Perceptron learning model - linear classification by Perceptron – Multilayer Perceptron classifier – Widrow-Hoff's ADALINE model – Back propagation Learning algorithm – Radial basis function neural network Unsupervised Neural Network – Hebbian rule - Principal component analysis (PCA) rule – Self organizing training rule - Discrete Hopfield neural network – Boltman machine – Bidirectional Associative Memory – Fuzzy Associative Memory - Reinforcement Learning – Learning through awards – Model Free Reinforcement learning model - Temporal Difference learning – Q learning

UNIT V **9 Hours**

GENETIC ALGORITHM

Genetic Algorithm (GA) - Schema Theorem - Markov Model for convergence analysis – Application of GA in optimization problem – Application of GA in Machine learning – Application of GA in intelligent search using robots – Genetic programming - Behavioral Synergism in soft computing – Neuro-Fuzzy synergism – Fuzzy-GA synergism – Neuro-GA synergism

Total: 45 Hours

Reference(s)

1. Timothy J. Ross, Fuzzy Logic with Engineering Applications, McGraw-Hill, 2011.
2. S. Rajasekaran and G.A.V.Pai, Neural Networks, Fuzzy Logic and Genetic Algorithms, PHI, 2003.
3. Kumar S, "Neural Networks - A Classroom Approach", Tata McGraw Hill, 2004.
4. Konar. A, "Computational Intelligence: Principles, Techniques and Applications", Springer Verlag, 2005
5. Engelbrecht, A.P, "Fundamentals of Computational Swarm Intelligence", John Wiley & Sons, 2006.
6. Eiben A E and Smith J E, "Introduction to Evolutionary Computing", Second Edition, Springer, Natural Computing Series, 2007.
7. Jang J S R and Sun C T, Mizutani E, "Neuro - Fuzzy and Soft Computing", PHI, 2002.

19IS003 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 toolsincluding 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. Develop a model for integrating data for knowledge representation
3. Apply the tools and an algorithm for mining in social networks
4. Examine 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

19IS004 INFORMATION CODING TECHNIQUES **3 0 0 3**

Course Objectives

- Acquire a complete understanding of error–control coding.

- Understand encoding and decoding of digital data streams.
- Interpret methods for the generation of these codes and their decoding techniques.
- Understand compression and decompression 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.

Course Outcomes (COs)

1. Interpret the basics of Information entropy.
2. Discover the data and voice coding techniques.
3. Assess the fundamental coding methods for error control.
4. Evaluate the text and image compression techniques.
5. Identify the audio and video coding techniques.

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											
3		2	1											
4	1	2	2											
5		3	2											

UNIT I **9 Hours**

INFORMATION ENTROPY FUNDAMENTALS

Uncertainty, Information and Entropy – Source coding Theorem – Huffman coding –Shannon Fano coding – Discrete Memory less channels – channel capacity – channel coding Theorem – Channel capacity Theorem.

UNIT II **9 Hours**

DATA AND VOICE CODING

Differential Pulse code Modulation – Adaptive Differential Pulse Code Modulation – Adaptive subband coding – Delta Modulation – Adaptive Delta Modulation – Coding of speech signal at low bit rates (Vocoders, LPC).

UNIT III **9 Hours**

ERROR CONTROL CODING

Linear Block codes – Syndrome Decoding – Minimum distance consideration – cyclic codes Generator Polynomial – Parity check polynomial – Encoder for cyclic codes – calculation of syndrome – Convolutional codes.

UNIT IV **9 Hours**

COMPRESSION TECHNIQUES

Principles – Text compression – Static Huffman Coding – Dynamic Huffman coding –Arithmetic coding – Image Compression – Graphics Interchange format – Tagged Image File Format – Digitized documents – Introduction to JPEG standards.

UNIT V **9 Hours**

AUDIO AND VIDEO CODING

Linear Predictive coding – code excited LPC – Perceptual coding, MPEG audio coders – Dolby audio coders – Video compression – Principles – Introduction to H.261 & MPEG Video standards.

Total: 45 Hours

Reference(s)

1. Simon Haykin, Communication Systems, John Wiley and Sons, 4th Edition, 2014
2. Fred Halsall, Multimedia Communications, Applications Networks Protocols and Standards, Pearson Education, 2012
3. Mark Nelson, Data Compression Book, BPB Publication, 2010
4. Rafael C.Gonzalez and Richard E.Woods, Digital image processing, PHI, 2013

19IS005 DIGITAL MARKETING 3 0 0 3

Course Objectives

- To Provide an Overview of Digital Marketing plans.
- To Provide a Foundation of a Greater market share and Increasing brand awareness.

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. Identify some of the latest digital marketing trends and skills sets needed for today's Marketer.
2. Discover the hottest techniques to help to successfully plan, predict, and manage your digital Marketing campaigns
3. Evaluate the importance of your digital marketing assets, which ones actually matter the most to your business
4. Assess digital marketing as a term career opportunity
5. Understand experiments using A/B testing

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 OF DIGITAL MARKETING

Introduction of Digital Marketing - Planning Digital Marketing Campaigns - Website designing with Word Press - Essentials of a website.

UNIT II **9 Hours**

SEARCH ENGINE OPTIMIZATION

Introduction to Search Engines - Keyword Research and Competition - On page Optimization - Off page Optimization - Local SEO - Search Engine Algorithm Updates - SEO Reporting

UNIT III **9 Hours**

GOOGLE ADWORDS

PPC Advertising (Online Advertisement) - Display Advertising - Google Shopping Ads -Introduction to Bing Ads - Mobile Marketing - Video Marketing - Google online Advertisement program - Certification

UNIT IV **9 Hours**

SOCIAL MEDIA MARKETING

Introduction to SMM - Facebook Marketing - Facebook Advertising - Twitter Marketing & Ads - YouTube Marketing - LinkedIn Marketing - InstaGram Marketing - Email Marketing - Pinterest

Marketing - Online Reputation Management -Inbound Marketing - Google Analytics - Audience Reports - Traffic Reports - Behavior Reports

UNIT V **9 Hours**

EXPERIMENTAL TESTING

Conversion Tracking - Personality Development - Google AdSense - Getting Started as Freelancer - Affiliate Marketing

Total: 45 Hours

Reference(s)

1. Shivani Karwal, Digital Marketing Handbook: A Guide to Search Engine Optimization Paperback - Import, 25 Nov 2015.
2. Philip kolter and Gary Armstrong, Principles of marketing, Pearson education, 2010.
3. Michael Millerth, B2B Digital Marketing: Using the Web to Market Directly to Businesses,first edition, Que Biz-Tech series2012.
4. Dave Chaffey, Fiona Ellis Chadwick, Digital Marketing: Strategy, Implementation & Practice, Paperback - Import, 2012.

19IS006 OPEN SOURCE SOFTWARE **3 0 0 3**

Course Objectives

- Introduce open source technology for development of web applications.
- Understand open source scripting language for programming in web environment i.e. PHP.
- Familiar with the open source management system and connection with database.
- Learn open source web server, software tools.

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 need of open source technology, open source development model, application of open sources, aspects of open source movement.
2. Apply the basic syntax of PHP, common PHP scripts elements.
3. Implement open source database management system - MySQL.
4. Demonstrate the creation of the server side scripting using PHP, implement PHP database connectivity, perform operation on database and open source database management system.
5. Analyze the software tool and process like Eclipse IDE, Selenium ID and open source web servers.

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 **9 Hours**

INTRODUCTION

The need of open Sources, advantages of Open sources application , Open Source Development Model Licences and Patents ,FOSS, BSD, Free Software Movement, commercial software vs. Open Source software, Commercial aspects of Open Source movement - Certification courses issues - global and Indian. Copyrights and copy lefts, Application of Open Sources. Problems with traditional commercial software

UNIT II **9 Hours**

OPEN SOURCE SCRIPTING LANGUAGE

Introduction: What is PHP? - Basic Syntax of PHP – programming in web environment - Common PHP Script Elements - Using Variables - Constants – Data types - Operators ; Statements - Working With Arrays -Using Functions – OOP - String Manipulation and Regular Expression , File and Directory Handling , Working With Forms , Introduction to advanced PHP concepts

UNIT III **9 Hours**

OPEN SOURCE DATABASE MANAGEMENT SYSTEM

MySQL: Introduction - Setting up an account - Starting, Terminating and writing your own MySQL Programs - Record Selection Technology - Working with Strings - Date and Time - Sorting Query Results module - Generating Summary - Working with Metadata - Using Sequences – MySQL and Web

UNIT IV **9 Hours**

PHP AND SQL DATABASE

PHP and LDAP ; PHP Connectivity ; Sending and receiving emails , PHP Database Connectivity: Retrieving data from MySQL - Manipulating data in MySQL using PHP

UNIT V **9 Hours**

WEB SERVER AND OPEN SOURCE TOOLS

Apache Web server – Working with web server – Configuring and using apache web server, WAMP server, Lighttpd, Fnord, Nginx, Savant, tornado. Open Source Software tools and Processors: Introduction – Eclipse IDE Platform – Compilers – Model driven architecture tools – Selenium ID – Features and uses Government

Policy toward Open Source (E- Governance) – Wikipedia as an open Source Project Case Studies: Apache, BSD, Linux, Mozilla (Firefox), Wikipedia, Joomla, GCC, Open Office.

Total: 45 Hours

Reference(s)

1. The Linux Kernel Book Rem Card,Eric Dumas and Frank Mevel Wiley Publications sons, 2003
2. MySQL Bible Steve Suchring John Wiley sons, 2002
3. Programming PHP Rasmus Lerdorf and Levin Tatroe O'Reilly Publications, 2002

19IS007 COMPUTER VISION 3 0 0 3

Course Objectives

- Understand image formation and camera calibration.
- Analyze and select image features and apply for image matching.
- Understand recognition algorithms through case studies.

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. Acquire the basic knowledge in image formation
2. Interpret the image processing methods and techniques
3. Discover the techniques in detection and matching features from images
4. Assess the methods to estimate the structure from motion
5. Understand the object detection and recognition techniques.

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											
3		2	1											
4	1	2	2											
5		3	2											

UNIT I **9 Hours**

INTRODUCTION

Introduction to Computer Vision – Image Formation: Geometric primitives and transformations – Geometric primitives – 2D and 3D transformations – 3D transformations – 3D rotations – 3D to 2D projections – Photometric image formation.

UNIT II **9 Hours**

IMAGE PROCESSING

Point operators – Pixel transforms – Color transforms – Composing and matting – Linear filtering – non-linear filtering – Interpolation – Decimation – Multi-resolution representations – Parametric transformations – Global optimizations.

UNIT III **9 Hours**

FEATURE DETECTION AND MATCHING

Points and patches – Feature detectors – Feature descriptors – Feature matching – Feature tracking – Edges – Edge detection – Edge linking – Lines – Successive approximation – Hough transforms – Vanishing points.

UNIT IV **9 Hours**

STRUCTURE FROM MOTION

Triangulation – Two-frame structure from motion – Factorization – Bundle adjustment – Constrained structure and motion – Dense motion estimation: Translational alignment – Spline-based motion.

UNIT V **9 Hours**

RECOGNITION

Object detection – Face detection – Pedestrian detection – Face recognition – Eigen faces – Instance recognition – Geometric alignment – Category recognition – Bag of words – Part-based models – Recognition with segmentation.

Total: 45 Hours

Reference(s)

1. Szeliski R. Computer Vision: Algorithms and Applications Springer. New York. 2010.
2. Shapiro LG, Stockman GC. Computer Vision: Theory and Applications. 2001.
3. Forsyth DA, Ponce J. Computer Vision: a modern approach;2012.
4. Davies ER. Machine vision: theory, algorithms, practicalities. Elsevier; 2004 Dec 22.
5. Jain R, Kasturi R, Schunck BG. Machine vision. New York: McGraw-Hill; 1995 Mar 1.

19IS008 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.

Course Outcomes (COs)

1. Explain the concept of language processing and algorithms.
2. Exemplify the Morphology and Finite-State Transducers.
3. Implement the logic of syntax parsing methods.
4. Represent the semantics for language processing.
5. Summarize 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.

19IS009 COMPUTER GRAPHICS 3 0 0 3

Course Objectives

- Gain knowledge about graphics hardware devices and software used.
- Understand the two dimensional graphics and their transformations.
- Understand the three dimensional graphics and their transformations.
- Appreciate illumination and color models.
- Be familiar with understand clipping techniques.

Program 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.

Course Outcomes (COs)

1. Design two dimensional graphics.
2. Apply two dimensional transformations.
3. Design three dimensional graphics.
4. Apply Illumination and color models.
5. Design animation sequences.

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		1	1											
4				3										
5			2											

UNIT I **9 Hours**

INTRODUCTION

Survey of computer graphics, Overview of graphics systems – Video display devices, Raster scan systems, Random scan systems, Graphics monitors and Workstations, Input devices, Hard copy Devices, Graphics Software; Output primitives – points and lines, line drawing algorithms, loading the frame buffer, line function; circle and ellipse generating algorithms; Pixel addressing and object geometry, filled area primitives.

UNIT II 9 **Hours**

TWO DIMENSIONAL GRAPHICS

Two dimensional geometric transformations – Matrix representations and homogeneous coordinates, composite transformations; Two dimensional viewing – viewing pipeline, viewing coordinate reference frame; widow-to-viewport coordinate transformation, Two dimensional viewing functions; clipping operations – point, line, and polygon clipping algorithms.

UNIT III **10 Hours**

THREE DIMENSIONAL GRAPHICS

Three dimensional concepts; Three dimensional object representations – Polygon surfaces- Polygon tables- Plane equations – Polygon meshes; Curved Lines and surfaces, Quadratic surfaces; Blobby objects; Spline representations – Bezier curves and surfaces -B-Spline curves and surfaces. TRANSFORMATION AND VIEWING: Three dimensional geometric and modeling transformations – Translation, Rotation, Scaling, composite transformations; Three dimensional viewing – viewing pipeline, viewing coordinates, Projections, Clipping; Visible surface detection methods.

UNIT IV **7 Hours**

ILLUMINATION AND COLOUR MODELS

Light sources – basic illumination models – halftone patterns and dithering techniques; Properties of light – Standard primaries and chromaticity diagram; Intuitive colour concepts – RGB colour model – YIQ colour model – CMY colour model – HSV colour model – HLS colour model; Colour selection.

UNIT V **10 Hours**

ANIMATIONS & REALISM

ANIMATION GRAPHICS: Design of Animation sequences – animation function – raster animation – key frame systems – motion specification –morphing – tweening. COMPUTER GRAPHICS REALISM: Tiling the plane – Recursively defined curves – Koch curves – C curves – Dragons – space filling curves – fractals– Grammar based models – fractals – turtle graphics – ray tracing.

Total: 45 Hours

Reference(s)

1. John F. Hughes, Andries Van Dam, Morgan Mc Guire ,David F. Sklar , James D. Foley, Steven K. Feiner and Kurt Akeley ,"Computer Graphics: Principles and Practice", , 3rd Edition, Addison-Wesley Professional,2013.
2. Donald Hearn and Pauline Baker M, "Computer Graphics", Prentice Hall, New Delhi, 2007
3. Donald Hearn and M. Pauline Baker, Warren Carithers, "Computer Graphics with Open GL", 4th Edition, Pearson Education, 2010.
4. Jeffrey McConnell, "Computer Graphics: Theory into Practice", Jones and Bartlett Publishers, 2006.
5. Hill F S Jr., "Computer Graphics", Maxwell Macmillan", 1990.
6. Peter Shirley, Michael Ashikhmin, Michael Gleicher, Stephen R Marschner, Erik Reinhard, KelvinSung, and AK Peters, Fundamental of Computer Graphics, CRC Press, 2010.

7. William M. Newman and Robert F.Sproull, "Principles of Interactive Computer Graphics", Mc GrawHill 1978.
8. http://nptel.ac.in/

19IS010 ROBOTICS PROCESS AUTOMATION 3 0 0 3

Course Objectives

- Understand the concept of software automation of the day to day activities performed using RPA Tools
- Perform analysis on the information retrieved from various sources that fits the requirement of the application.

Program 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.

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 modeling 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. Understand the basic principles of software automation and different types of applications that are integrated with automation.
2. Develop applications based on various Planning and process methodology to automate the tasks that are to be performed repeatedly.
3. Develop a software BOT with integration with different input sources based on the process requirement.
4. Apply debugging and exception handling techniques to perform application without error during the execution.
5. Apply BOT Insight to implement the artificial intelligence techniques in software automation.

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	2	1	2								
3			2	3	2	1								
4			1	2	1	1								
5			3	3	3	1								

UNIT I **6 Hours**

RPA FOUNDATION

RPA: History, Benefits, and Comparison – RPA Skills: On-Premise Vs Cloud, Web Technology, Optical Character Recognition, Databases, Application Programming Interfaces.

UNIT II **9 Hours**

PROCESS METHODOLOGY AND PLANNING

Lean- Six Sigma- Implementation of Six Sigma- Roles and Levels in Six Sigma – Lean Six Sigma – Applying Lean and Six sigma in RPA- Planning: ROI for RPI, Use Cases of RPA.

UNIT III **12 Hours**

BoT DEVELOPMENT

Introduction – Recorders – Smart Recorders – Web Recorders – Screen Recorders - Task Editor – Variables - Command Library – Loop Command – Excel Command – Database Command - String Operation Command - XML Command - Terminal Emulator Command - PDF Integration Command - FTP Command - PGP Command - Object Cloning Command.

UNIT IV **9 Hours**

EXCEPTION HANDLING, DEBUGGING AND LOGGING

Assistant bots: Monitoring system event triggers, Monitoring image and element triggers - Exception handling - Exception handling Commands – Logging - Debugging techniques - Collecting crash dumps - Error reporting

UNIT V **9 Hours**

META BoT AND BoT INSIGHT

Introduction - MetaBot Designer - MetaBot with AI Sense - Bot Insight -Transactional Analytics - Operational Analytics - Course Key Points

Total: 45 Hours

Reference(s)

1. Alok Mani Tripathi, Learning Robotic Process Automation UiPath Kindle Edition, 2018.
2. Tom Taulli, Robotic Process Automation Handbook, Kindle Edition, 2020.
3. Richard Murdoch, Robotic Process Automation, 2018.
4. Mary C. Lacity and Leslie P. Willcocks, Robotic Process and Cognitive Automation, 2018.
5. Lim Mei Ying, Robotic Process Automation with Blue Prism Quick, 2018.

19IS011 STREAMING ANALYTICS **3 0 0 3**

Course Objectives

- Gain knowledge about the Streaming Data and Static Data used in a business environment.
- Impart knowledge on the Data flows, processing & storing streaming data.

- Understand the knowledge on streaming metrics.

Program Outcomes (POs)

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.

Course Outcomes (COs)

1. Understand the need for stream computing
2. Comprehend the architecture of stream analytics
3. Explore the new initiatives for enhancing data flow management pipelines for streams.
4. Recognize the Processing streaming data
5. Apply the knowledge of streaming metrics for delivery of the results.

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		2		1										
4		2		1										
5			1	2										

UNIT I **9 Hours**

INTRODUCTION TO STREAM COMPUTING

Streaming Data - Sources - Difference between Streaming Data and Static Data. Overview of Large Scale Stream Processing Engines - Issues in Stream Processing.

UNIT II **9 Hours**

STREAMING ANALYTICS ARCHITECTURE

Phases in Streaming Analytics Architecture - Vital Attributes - High Availability - Low Latency - Horizontal Scalability-Fault Tolerance - Service Configuration and Management – Apache ZooKeeper.

UNIT III **9 Hours**

DATA FLOW MANAGEMENT

Distributed Data Flows - At Least One Delivery - Apache Kafka - Apache Flume - Zero MQ - Messages, Events, Tasks & File Passing.

UNIT IV **9 Hours**

PROCESSING

Distributed Stream Data Processing: Co-ordination, Partition and Merges, Transactions - The Classic "Word Count" Example - Duplication Detection using Bloom Filters - Apache Spark Streaming Examples Choosing a storage system – NoSQL Storage Systems - Warehousing

UNIT V **9 Hours**

DELIVERING STREAMING METRICS

Streaming Web Applications - Visualizing Data - Mobile Streaming Apps -Times Counting and Summation – Stochastic Optimization - Delivering Time Series Data.

Total: 45 Hours

Reference(s)

1. Byron Ellis, Real-Time Analytics: Techniques to Analyze and Visualize Streaming Data, Wiley, 2014.
2. Sherif Sakr, Large Scale and Big Data: Processing and Management, CRC Press, 2014.
3. Bill Franks, Taming The Big Data Tidal Wave Finding Opportunities In Huge Data Streams With Advanced Analytics, Wiley, 2012.
4. Jure Leskovec, Anand Rajaraman, Jeffrey D. Ullman, Mining of Massive Datasets, Cambridge University Press, 2014.
5. Paul C Zikopoulos, Chris Eaton, Paul Zikopoulos , Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data, McGraw-Hill, 2011.

19IS012 DATA COMPRESSION 3 0 0 3

Course Objectives

- Understand the important issues in data compression.
- Develop a reasonably sophisticated data compression application.
- Learn different types of compression techniques used for audio, image and video compression.

Program 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 modeling to complex engineering activities with an understanding of the limitations.

Course Outcomes (COs)

1. Understand the basic mathematical models used in data compression.
2. Implement the Lossless compression techniques to compress different raw data
3. Understand the conceptual basis for commonly used Lossy compression techniques
4. Apply various audio compression techniques over real world data
5. Analyze different types of image and video compression techniques

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	1	2												
4	2	1	3	3	2									
5	1	2		2										

UNIT I **9 Hours**

INTRODUCTION

Mathematical Preliminaries, Lossy and Lossless compression, Application of compression Huffman coding: Overview; The Huffman coding algorithm, Minimum variance Huffman codes; Application of Huffman coding for text compression

UNIT II **9 Hours**

LOSSLESS COMPRESSION

Dictionary Techniques: Overview; Introduction; Static dictionary; Adaptive dictionary; Applications: UNIX compress, GIF, PNG, V.42. Lossless image compression: Overview; Introduction; Basics; CALIC; JPEG-LS; Multiresoution approaches; Facsimile encoding: Run-length coding, T.4 and T.6

UNIT III **9 Hours**

BASICS OF LOSSY CODING

Some mathematical concepts: Introduction-Distortion criteria-Models. Scalar quantization: Overview-The quantization problem- Uniform quantizer- Adaptive quantization.

UNIT IV **9 Hours**

AUDIO COMPRESSION

High quality digital audio, frequency and temporal masking, lossy sound compression,mu-law and A-law,companding, and MP3 audio standard.

UNIT V **9 Hours**

IMAGE AND VIDEO COMPRESSION

PCM, DPCM JPEG, JPEG - LS , and JPEG 2000 standards- Intra frame coding, motion estimation and compensation, introduction to MPEG -2 H-264 encoder and decoder.

Total: 45 Hours

Reference(s)

1. Khalid Sayood, Introduction to Data Compression, Morgan Kaufmann Publishers, Third Edition
2. David Saloman,Data Compression: The complete reference, 3rd Edition,Springer publication
3. W.B.Pennebaker: JPEG still image compression standard, 1993

19IS013 EMBEDDED SYSTEMS 3 0 0 3

Course Objectives

- To be familiar with 8051 microcontoller.
- 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. Explore the concepts of embedded computing with 8051 microcontroller.
2. Illustrate the memory and I/O operations.
3. Explain the processes and operating system concepts.
4. Elucidate the embedded software concepts
5. Develop 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.

Total: 45 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.

19IS014 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: Demonstrate and develop applications on data analysis.

Course Outcomes (COs)

1. Explain Openstack Architecture and list the components in it.
2. Interpret Identity Management and the role of image management using web interface.
3. Summarize network management in neutron.
4. Implement the block storage to the instance using Dashboard.
5. Exemplify 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**

ARCHITECTUREAND COMPONENTOVERVIEW

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

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

19IS015 DEEP LEARNING **3 0 0 3**

Course Objectives

- Gain knowledge in Machine Learning Basics
- Understand and apply Optimization on Deep Models and Networks
- Understand and analyze Recurrent and Recursive Networks
- Understand the representation of neural networks in 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.
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.
m. PSO1: Excel in processing the information using data management with security features.

Course Outcomes (COs)

1. Analyze deep learning Mathematical Models
2. Explore the Basic fundamentals of Machine Learning Algorithms

3. Elucidate the Deep Feed forward Networks
4. Apply knowledge for Optimization on Deep Models and Convolutional Networks
5. Elucidate the Recurrent and Recursive Networks and Natural language Processing

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		2	2								2	
3	3	3		3	3								3	
4	2	2		2	2								2	
5	2	2		2	2								2	

UNIT I **8 Hours**

INTRODUCTION

Introduction : Historical Trends in Deep Learning - Linear Algebra: Scalars - Vectors - Matrices - Tensors - Matrices - Norms - Eigendecomposition - Probability and Information Theory: Random variable and distributed Probability - Bayes Rule - Information Theory and structured probabilistic models.

UNIT II **10 Hours**

MACHINE LEARNING BASICS

Numerical Computation: Overflow and Underflow - Gradient based Optimization – Constrained Optimization - Learning Algorithms: Capacity - Overfitting - Under fitting – Bayesian Classification - Supervised - unsupervised algorithms - Building machine learning algorithm.

UNIT III **9 Hours**

ADVANCED NEURAL NETWORKS

Deep Feed forward Networks : Gradient based learning - Hidden Units - Architectural design – Back Propagation algorithms - Regularization for deep learning: Dataset Augmentation - Noise Robustes –Semi supervised learning - Multitask learning - Adserial training.

UNIT IV **9 Hours**

OPTIMIZATIONON DEEP MODELS

Optimization for training Deep Models: Challenges in Neural Networks optimization - Basic Algorithms - Algorithms Adaptive learning Rates - Approximate Second Order Methods - Optimization Strategies and Meta Algorithms -Convolutional Networks: Motivation - Structured Output - Unsupervised features - Neuroscientific basics for Convolutional Networks.

UNIT V **9 Hours**

RECURRENT AND RECURSIVE NETWORKS

Computational graphs - Recurrent Neural networks - Bidirectional RNN - Deep Recurrent Networks - Echo State Networks - Practical Methodology - Applications: Large Scale Deep Learning – Computer Vision - Speech Recognition - Natural language Processing, Case studies in classification, Regression and deep networks.

Total: 45 Hours

Reference(s)

1. Duda, R.O., Hart, P.E., and Stork, D.G. Pattern Classication. Wiley-Interscience. 2nd Edition.2001
2. Theodoridis, S. and Koutroumbas, K. Pattern Recognition. Edition 4. Academic Press, 2008.
3. Russell, S. and Norvig, N. Articial Intelligence: A Modern Approach. Prentice Hall Series in Articial Intelligence. 2003.
4. Bishop, C. M. Neural Networks for Pattern Recognition. Oxford University Press. 1995.
5. Hastie, T., Tibshirani, R. and Friedman, J. The Elements of Statistical Learning. Springer. 2001.

19IS0YA WEB PROGRAMMING **3 0 0 3**

Course Objectives

- Understand the concepts and architecture of the World Wide Web.
- Familiar with the different server technologies.
- Understand the scripting languages XHTML, JavaScript and PHP.

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. Create a basic website using HTML and Cascading Style Sheets.
2. Design and implement dynamic web page with validation using JavaScript objects and by applying different event handling mechanisms.
3. Design rich client presentation using AJAX.
4. Design and implement simple web page in PHP, and to present data in XML format.
5. Design front end web page and connect to the back end databases

Articulation Matrix

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

UNIT I **9 Hours**

INTRODUCTION TO WWW

Internet Standards – Introduction to WWW – WWW Architecture – SMTP – POP3 – File Transfer Protocol - Overview of HTTP, HTTP request – response – Generation of dynamic web pages.

UNIT II **9 Hours**

UI DESIGN

Markup Language (HTML5): Basics of Html -Syntax and tags of Html- Introduction to HTML5 - Semantic/Structural Elements -HTML5 style Guide and Coding Convention– Html Svg and Canvas – Html API's - Audio & Video - Drag/Drop - Local Storage - Web socket API– Debugging and validating Html.

UNIT IV **9 Hours**

UI DESIGN-CSS

Cascading Style Sheet (CSS3): The need for CSS – Basic syntax and structure Inline Styles – Embedding Style Sheets - Linking External Style Sheets - Introduction to CSS3 – Backgrounds - Manipulating text - Margins and Padding - Positioning using CSS.

UNIT IV **9 Hours**

OVERVIEW OF JAVASCRIPT

Introduction - Core features - Data types and Variables - Operators, Expressions, and Statements Functions - Objects - Array, Date and Math Related Objects - Document Object Model - Event Handling - Controlling Windows & Frames and Documents - Form validations.

UNIT V **9 Hours**

PHP

Introduction - How web works - Setting up the environment (LAMP server) - Programming basics Print/echo - Variables and constants – Strings and Arrays – Operators, Control structures and looping structures – Functions – Reading Data in Web Pages - Embedding PHP within HTML - Establishing connectivity with MySQL database.

Total : 45 Hours

Reference(s)

1. David Flanagan, "JavaScript: The Definitive Guide, Sixth Edition", O'Reilly Media, 2011
2. Harvey & Paul Deitel& Associates, Harvey Deitel and Abbey Deitel, "Internet and World Wide Web - How To Program", Fifth Edition, Pearson Education, 2011
3. James Lee, BrentWare , "Open Source Development with LAMP: Using Linux, Apache, MySQL, Perl, and PHP" AddisonWesley, Pearson 2009
4. Thomas A. Powell, "HTML & CSS: The Complete Reference", Fifth Edition, 2010
5. Thomas A Powell, Fritz Schneider, "JavaScript: The Complete Reference", Third Edition, Tata McGraw Hill, 2013
6. Thomas A Powell, "Ajax: The Complete Reference", McGraw Hill, 2008

18GE0XA ETYMOLOGY 1 0 0 1

Course Objectives

- To increase vocabulary and enhance use, knowledge, and understanding of the English language.
- To stimulate an appreciation for the English language, including how it developed, how new wordsenter the language, and how it continues to be dynamic.
- To demonstrate the importance of a broad-based vocabulary for effective oral and written communication.

Programme Outcomes (POs)

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. Examine prefixes, roots, and suffixes of Latin, Greek, Germanic, and Anglo-Saxon origin.
2. Explore the historical aspects of language, including the infusion of Indo-European languages, semantic changes, and the influence of world events.

Articulation Matrix

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

UNIT I **7 Hours**

CONVENTIONS

Acronyms, Abbreviations, Initialises, Jargon Neologisms - Idiomatic Expressions, Euphemisms Spoonerisms Malapropisms ; Mondegreens - Words Derived from Latin - Words Derived from Greek - Words Derived from - Germanic/Anglo-Saxon - Abstract word Acronym - Affix Analogy - Antonym Apheresis - Blend word Assimilation - Colloquial language Clipped word

UNIT II **8 Hours**

WORD ANALYSIS

Concrete word Derivative - Dialect Diminutive suffix - Dissimilation Doublet - Etymology Euphemism - Figurative word Homonym - Hybrid word Inflection - Informal language Infusion - Jargon Linguistics - Loan words Metathesis ; Modify - Philology Onomatopoeia - Romance language Prefix - Semantics - Root-base word - Suffix Slang - Word component Synonym

Total: 15 Hours

Reference(s)

1. Norman, Lewis. Word Power Made Easy, Goyal Publisher. Edition 2. 2014.
2. C T Onions. The Oxford Dictionary of English Etymology, Volume 11, Issue 1.70, Wynford Drive, Don Mills, Ont, Oxford University Press.1965.
3. Nurnberg W, Maxwell and Rosenblum, Morris, How to build a better Vocabulary, Completely Revised and Updated, Popular Library. 1961.

18GE0XB GENERAL PSYCHOLOGY 1 0 0 1

Course Objectives

- To provide a basic understanding of psychology.
- Defining Psychology and the subject matter of psychology.
- To provide an awareness of various methods and branches of psychology.
- To explain social and work psychology of people and the need for mental health.

Programme Outcomes (POs)

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.

Course Outcomes (COs)

1. Understand the basics of human behavior in the workplace and society at large.
2. Understand the different fields of psychology and its uses.
3. Deal people effectively in their personal and social life.

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								2	3					

UNIT I **15 Hours**

GENERAL PSYCOLOGY

Psychology - Introduction - Mind body relationship - Methods and Scope of Psychology -Motivation- Types of Needs- Motivational Cycle- Intelligence: Concept of Intelligence and IQ- measurement - Social psychology: individual behavior and group behavior - Group dynamics- group formation- social influence- social cognition, stereotypes- prejudice- discrimination - Definitions, formation of attitude, factors of attitude formation-change of attitude.

Total: 15 Hours

Reference(s)

1. Atkinson & Atkinson, Introduction to Psychology, 6th Ed McGraw-Hill Publications. 1975
2. Mishra, B. K, Psychology: The study of human behavior, 2nd Ed New Delhi: Prentice Hall of India Learning Pvt. Ltd. 2016.
3. Baron, R.A., Branscombe. N.R, Social Psychology, 14th Ed. New Delhi; Pearson Education. 2016
4. Morgan, C.T., King, R.A., Weisz, J.R., & Schopler, J. Introduction to Psychology, 7th Ed. New Delhi: Tata McGraw Hill. 1993

18GE0XC NEURO BEHAVIORAL SCIENCE 1 0 0 1

Course Objectives

- To provide an introduction to the Cognitive Neuro Science of languages.
- To provide an understanding of the Cognitive processes.

Programme Outcomes (POs)

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

Course Outcomes (COs)

1. Identify the psychological problems that will impact mental health.
2. Value ethical conduct in professional and personal life.
3. Recognize the need for rationale and evidence in decision-making.

Articulation Matrix

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

UNIT I **15 Hours**

NEURO BEHAVIOURAL SCIENCE

Introduction to physiology - Anatomy - Neuro Biology - Psycho Neuro Science Behaviour and Hormones - Behaviour Modifications - Relaxation Therapy - Psycho Education for minds.

Total: 15 Hours

Reference(s)

1. Beck, Robert. Handbook of Physiology. Vol I. Oxford University Press March 15,1996
2. Horon C Philip. Sexology and Mind. Academic Press. 1993
3. Blatteis M.Clark and Melvin J. Fregly. Handbook of Physiology Sect 4, Oxford University Press. March 15, 1996

18GE0XD VISUAL MEDIA AND FILM MAKING 1 0 0 1

Course Objectives

- To acquire fundamental knowledge on development of filmmaking as an art
- To provide students a basic understanding of the techniques and nuances of visual medium
- To inculcate an ability to plan and produce a short film

Programme Outcomes (POs)

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.

Course Outcomes (COs)

1. Understand the significance and techniques of visual medium
2. Analyse and produce visual clippings

Articulation Matrix

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

UNIT I **15 Hours**

ART OF FILMMAKING

History of Cinema (Origin and Narrative) Cinema as a visual medium -Significance of Editing Styles of Editing Editing as a methodology (Hollywood s Invisible Editing) Technical Aspects of Editing (Final Cut Pro (FCP), AVID and Premire Pro) - Basics of video production (pre-production to post-production) Different types of shots and angles - Film style and Narrative (Italian Neo-realism, Avant Garde, Russain Formalism, Alternative Cinema etc.,) Regional Cinema to National Cinema Basics of Script Writing (Double and Single Column) Basics of Video Production (script to screen) Final submission of a script for five minutes short film.

Total: 15 Hours

Reference(s)

1. Monaco, James, How to Read a Film: Movies, Media, and Beyond. Auckland: OUP, 2009.
2. Belavadi, Vasuki, Video Production. India: OUP, 2013.

18GE0XE YOGA FOR HUMAN EXCELLENCE 1 0 0 1

Course Objectives

- To know about the history and schools of yoga
- To know the difference between supreme consciousness and individual consciousness
- To apply the knowledge by the way of practice and introspection

Programme Outcomes (POs)

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.

Course Outcomes (COs)

1. Understand the historical aspects and schools of yoga
2. Ensure their physical & mental wellness through yoga practice
3. Develop the power to concentrate and have stress free mind

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					

UNIT I **15 Hours**

YOGA FOR HUMAN EXCELLENCE

What is Yoga , History of Yoga - Yoga in todays scenario- Schools of Yoga - Eight Limbs of Yoga - Sathvic, Rajasic, Tamasic Foods and Thoughts - Science of Yoga Loosening Exercises - Yogasanas & Benefits - Super Brain Yoga - Surya Namaskar Standing Asanas - Sitting Asanas - Prone Asanas - Supine Asanas - MudrasRelaxation - Pranayama - Meditation

Total: 15 Hours

Reference(s)

1. Vethathiri Publications, Yoga Practices-2, Erode, 2012.
2. Iyengar B.K.S. Yoga: Wisdom & Practice, B.K.S. Iyengar, 2009.
3. Ramesh Partani, The Complete Secret, Ru Education, 2013.
4. http://www.sarvyoga.com/
5. http://www.wikihow.com/Do-Superbrain-Yoga

18GE0XF VEDIC MATHEMATICS 1 0 0 1

Course Objectives

- To improve their calculation speed, analytical thinking and numerical 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. Solve problems creatively in mathematics and its applications

Articulation Matrix

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

UNIT I **15 Hours**

VEDIC MATHEMATICS

Addition- Subtraction- System of Multiplication- Squaring numbers- Cube roots- Square roots- Solution of simultaneous equations- Solutions of Quadratic equations

Total: 15 Hours

Reference(s)

1. Dhaval Bathia, Vedic Mathematics, JAICO Publishing House, 29th Edition, Mumbai, 2014
2. Jagadguru Swami Sri Bharathi Krsna Tirthaji Maharaja, Vedic Mathematics, Motilal Banarsidass Publishers Private Limited, New Delhi, 1997

18GE0XG HEALTH AND FITNESS 1 0 0 1

Course Objectives

- To understand the fundamental concepts about physical fitness & its types, training and assessment of physical fitness

Programme Outcomes (POs)

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.

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.

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

Course Outcomes (COs)

1. Acquire the knowledge and training of the individual physical, mental and social concepts
2. Understand the fundamental concepts of yogic practice and physical fitness
3. To acquire the knowledge about nutrition and health consciousness.

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			2					

UNIT I **5 Hours**

FITNESS

Meaning & Definition, Need & importance of Physical fitness, Types Physical fitness - Exercise, Training and Conditioning and it is important

UNIT II **5 Hours**

YOGA AND MEDITATION

Meaning and definition; Principles of practicing;Basic Asana and it important; Pranayama and Meditation - Relaxation Techniques

UNIT III **5 Hours**

NUTRITION AND BALANCE DIET

Nutrition and Balance Diet: Needs and Important, Significant of Nutritional Food - Tips for balance diet. Common Diseases for IT professionals: Common diseases - cause prevention-First aid for common sports injuries.

Total: 15 Hours

Reference(s)

1. Anderson, Bob., Pearl, Bill.,&Burke, Edmund R., (2001). Getting in Shape Workout Programs for Men&Women. Mumbai: Jaico Publishing House
2. Baechle, Thomas. R, & Earle, Roger. W., (2000). Essentials of Strength Training and Conditioning. Champaign: Human Kinetics

3. Iyengar, BKS., (2003). The Art of Yoga. New Delhi: Harper Collins Publishers
4. Singh, Hardayal, (1995). Science of Sports training. New Delhi: D.V.S. Publications
5. Begum, Raheena. M., (2002). A Textbook of Foods, Nutrition and Dietetics. New Delhi: Sterling Publishers Private Limited

18GE0XH CONCEPT, METHODOLOGY AND APPLICATIONS OF VERMICOMPOSTING **1 0 0 1**

Course Objectives

- To understand the importance of safe methods of treating solid wastes generated through various human activities
- To appreciate the skills / devices / practices associated with the compact proceedures of biodegradation of unwanted solid residues

Programme Outcomes (POs)

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. Understand the role of recycling of garbage leading to the sustenance of our healthand environment.
2. Recognize the organic farming practices and production of healthy food products.
3. Prepare and maintain tips for small scale compost units and thereby becoming more environmentally conscious

Articulation Matrix

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

UNIT I **15 Hours**

VERMICOMPOSTING TECHNOLOGY

Ecological roles and economic importance of earthworms - need for earthworm culture, scope and importance of vermiculture , limiting factors - types of worm culturing and the relative benefits Small scale and commercial methods: process & advantages , Vermicomposting equipments, devices, Design and maintenance of vermi bed - Products from vermiculture (matter & humus cycle), vermicastings in organic farming/horticulture - Marketing the products of vermiculture quality control, market research, marketing techniques , Applied vermiculture: use of urban solids & farm/ industrial residues for vermicomposting - Constraints of vermiculture and its future perspectives Artificial Earthworm as a standalone biodegradation assembly.

Total: 15 Hours

Reference(s)

1. Sultan Ahmed Ismail, 2005. The Earthworm Book, Second Revised Edition. Other India Press, Goa, India.4
2. Vermiculture Technology; Earthworms, Organic Wastes and Environmental Management, 2011, Edited by Clive A Edwards, Norman Q Arancon & Rhonda Sherman, CRC Press
3. www.organicgrowingwithworms.com.au
4. New York Times , Scientists Hope to Cultivate and Immune System for Crops

18GE0XI BLOG WRITING 1 0 0 1

Course Objectives

- To sharpen and improve writing skills, including draft writing, voice, and format.
- To develop general and global knowledge.
- To experiment with non-written forms of online communications, including images, audio and video.
- To be able to add content to your website without the assistance of a web designer.

Programme Outcomes (POs)

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.

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. Understand the flow of language in natural manner.
2. Understand the elements of a blog and be able to use them effectively.
3. Find a niche for a long-term blog.
4. Gain insight into the strategies, methods and writing of successful bloggers.
5. Develop their creative thinking.

Articulation Matrix

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

UNIT I **7 Hours**

Concept: What is blog writing? Types of blog posts -personal experience, opinion, reviews, advice, news/updates. Focusing your blog - concept, audience, uniqueness, posts. Company blogs. Structure: Types of structure - inverted pyramid, feature article, list, story, other options. Creating effective openings. Planning a post.

UNIT II **8 Hours**

Voice: Defining and achieving voice. Exploring various voices. Stylistic tipsÃƒÂ¢??rhythm, verbs, interesting words, senses, emphasis. Smartness and sarcasm. Reliability - accuracy, provability, specificity. Transparency about payments. Sample Blogs and Activities

Total: 15 Hours

Reference(s)

1. The Elements of Blogging: Expanding the Conversation of Journalism, by Mark Leccese and Jerry Lanson. (Taylor & Francis, 2015) ISBN: 978-1-13-802154-9. $29.95 paperback.
2. Blogging Heroes, by Michael Banks. Choose 15 of the 30 interviews/profile segments to read, be sure to include the segments on Chris Anderson and Brian Lam.
3. Complete Guide to Blogging, Huffinghton Post

18GE0XJ INTERPERSONAL SKILLS **1 0 0 1**

Course Objectives

- To communicate and work effectively, both individually and in groups
- To be able to understand and manage ones own and others emotions
- To define and solve problems by making decisions about the best course of action

Programme Outcomes (POs)

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

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

Course Outcomes (COs)

1. Express themselves clearly and confidently
2. Listen to others completely and with empathy
3. Assert an opinion without diminishing others opinion
4. Be responsible and timely with a willingness to collaborate
5. Develop innate personality traits to handle certain social situations

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					
4							2		2					
5							2		2					

UNIT I **7 Hours**

INTRODUCTION

Conversational Skills - Active Listening - Team working Empathy - Emotional Intelligence

UNIT II **8 Hours**

SKILLS

Conflict Resolution and Mediation skills - Decision making and Problem Solving - Negotiation and Persuasion skills

Total: 15 Hours

Reference(s)

1. Stephen P. Robbins, Phillip L. Hunsaker, Training in Interpersonal Skills, Pearson, 2015
2. Robert B. Cialdini, Influence: The Psychology of Persuasion, Harper Business; Revised Edition, 2006
3. Suzanne C De Janasz, Karen O Dowo & Beth Z Schneder, Interpersonal Skills in Organisations, McGraw-Hill Education; 5th Edition, 2014

18GE0XK COMMUNITY SERVICE AND LEADERSHIP DEVELOPMENT 1 0 0 1

Course Objectives

- Understand the role of National Service Scheme in community
- Identify the needs and problems of the community and involve in problem solving
- Develop competence required for group living and acquire leadership qualities

Programme Outcomes (POs)

Course Outcomes (COs)

1. Understand the community in which they work and render their service
2. Develop among themselves a sense of social and civic responsibility

Articulation Matrix

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

UNIT I **15 Hours**

COMMUNITY SERVICE AND LEADERSHIP DEVELOPMENT

Introduction and Basic Concepts of NSS: History-philosophy-aims & objectives of NSS- Emblem, flag, motto, song, badge- Organizational structure - roles and responsibilities functionaries. NSS Programmes and Activities: Concept of regular activities, special camping, Day Camps-Basis of adoption of village/slums-Methodology of conducting Survey -Financial pattern of the scheme -Coordination with different agencies-Maintenance of the Diary. Community Mobilization: Mapping of community stakeholders-Designing the message in the context of the problem and the culture of the community- Identifying methods of mobilization-Youth-adult partnership. Health, Hygiene & Sanitation: Definition, needs and scope of health education- Food and Nutrition - Safe drinking water, water borne diseases and sanitation (Swachh Bharat Abhiyan). Entrepreneurship Development: Definition & Meaning – Qualities of good entrepreneur - Steps/ways in opening an enterprise -Role of financial and support service Institutions.

Total: 15 Hours

Reference(s)

1. A Hand book on National Service Scheme, Anna University, Chennai, 2012
2. http://nss.nic.in/intro.asp
3. Delgado-Gaitn and Concha, The Power of Community: Mobilizing for Family and SchoolingNew York: Rowman & Littlefield Publishing, Inc. 2001
4. James Bailey,Guide to Hygiene and Sanitation in Aviation, World health organization, 2nd edition. 1980
5. AnuradhaBasu, Mark Casson, Nigel wadeson and Bernard Yeung, The oxford hand book of entrepreneurship, Oxford Press. 2009.

18GE0XL NATIONAL CADET CORPS **1 0 0 1**

Course Objectives

- To understand the importance of NCC and its organization.
- To realize the skills in the applications of drill and weapon training.
- To analyze the factors in National unity
- To identify the utility of smart materials in engineering applications.

Programme Outcomes (POs)

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

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

Course Outcomes (COs)

1. Recall the motto and aim of NCC.
2. Implement synergy in disaster management.
3. Execute an example patriotic leader to serve nation

Articulation Matrix

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

UNIT I **12 Hours**

NCC STRUCTURE AND TRAINING

NCC ORGANIZATION:National Cadet Corps: Aim and Objectives - Administrative and Organizational pattern - NCC flag and NCC song - Duties, Responsibilities and Conduct by NCC Cadets - Badges of ranks in NCC and Armed forces- Types of NCC camps - Eligibility conditions for writing B and C certificate examinations. Cadet welfare society and Career opportunities for NCC cadets. DRILL AND WEAPON TRAINING Drill: Aims of drill - Types of drill - Foot drill, Arms drill and Ceremonial drill. Word of commands, Guard of honour. Weapon training - Rifles used in NCC: Parts and Characteristics of 0.22 and INSAS - Stripping, Assembling and Cleaning of weapons.NATIONAL INTEGRATION AND SOCIAL AWARENESS National Integration: Introduction - Constitution of India- Importance and Necessity - Factors affecting National integration - Role of NCC in National integration. Social service and its need - Rural development programs - NGOs role and Contribution - Social Security schemes.

UNIT II **8 Hours**

PERSONALITY DEVELOPMENT AND LEADERSHIP

PERSONALITY DEVELOPMENT AND LEADERSHIP : Personality Development: Introduction - Factor influences in personality development. Leadership: Leadership traits and Skills - Indicator of good leader - Honour code concept - Type of leaders - Case studies of effective leader.DISASTER MANAGEMENT AND FIRST AID Disaster types - Natural and Manmade disasters. Role of NCC cadets in disaster management. Civil defence: Civil defence measures - Civil defence services. First aid: First aid kits and Equipments - First aid for snake bite, Sun stroke and Drowning - Respiration -Types of respiration.

Total: 20 Hours

Reference(s)

1. Cadets Hand book Common subject, DG NCC, New Delhi.

2. Cadets Hand book Special subject, DG NCC, New Delhi
3. Misra R.C and Sanjaykumar Mishra, A HAND BOOK OF NCC(English), Kanti Prakashan, 2016
4. Gupta R. K, NCC: Handbook of NCC Cadets for A, B and C Certificate Examinations (English) RPH Editorial Board, 2018.

18GE0XM NEW AGE INNOVATION AND ENTREPRENEURSHIP 1 0 0 1

Course Objectives

- To make the participants understand as to how to get along with the task of setting independent business units and on the various facets of running a business
- To get the budding young entrepreneurs to appreciate the structured knowledge of the dynamics of operationalizing a business opportunity

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.

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.

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

Course Outcomes (COs)

1. Understanding entrepreneurship as an important career option
2. Concept and methodology of idea translation to viable start-ups
3. Events to occur in the building of a technology based venture for students or working professionals or women
4. Overview of Indian trends in the start-up scene

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					
4						2			2					

UNIT I **15 Hours**

NEW AGE INNOVATION AND ENTREPRENEURSHIP

Introduction to Entrepreneurship - Opportunity Identification ideation -MVPPositioning as an Entrepreneur Starting own Business - Developing Effective Business Model - Industry and Competitor Analysis - Building Business PlanMentoring Session with Investors- Legal and Ethical Foundation for Startup. Types of startups and licensing systems - MSME -Evaluating the Financial Strength of a New Venture/Project - Getting Funding - Types of Sources VCs, Angel funding, PE etc. -Marketing Strategies for New Ventures - IT Systems - IPR - Strategies for New Venture Growth - Talent Acquisition and Management for New Ventures - Valuation Challenge in Entrepreneurship - Intrapreneurship Sustainability - Exit strategiesand Start-up trends in India.

Total: 15 Hours

Reference(s)

1. Kathleen R. Allen, Launching New Ventures, South-WesternCengage Learning, 6th Edition, 2012
2. Alex Osterwalder and Yves Pigneur, Business Model Generation, publishedby the authors, 2010
3. Branson. R. Business stripped bare, New York, Penguin books, 2011
4. Moris MH, Kuratko DF and Covin JG, Corporate entrepreneurship and innovation, 3 edition, Mason, Oh; CENGAGE/SOUTH WESTERN publisher, 2011

18GE0XN DISRUPTIVE INNOVATION BASED STARTUP ACTIVITIES **1 0 0 1**

Course Objectives

- To make the participants understand as to how to get along with the task disruption led innovations.
- To get the budding young entrepreneurs to appreciate the structured knowledge of the dynamics of operationalizing creativity based disruption strategy

Programme Outcomes (POs)

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.

Course Outcomes (COs)

1. Understanding contemporary entrepreneurship as an important career option
2. Concept and methodology of creative disruption to viable start-ups
3. Events to occur in the building of a technology based venture for students or working professionals or women with disruptive technology option
4. Overview of Indian trends with reference to disruptive innovation based start-ups.

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						
4							2	2						

UNIT I **15 Hours**

DISRUPTIVE INNOVATION

Creativity linked innovation - Differences between Disruptive & incremental Innovations - Historical, theoretical, and practical evolution of disruptive innovation (DI). - Idea generation & communication of creativity leading to DI. Innovation management concepts in DI based entrepreneur generation - How do firms bring in new business models and get new products and services to the market? - Investor preferences in core versus new or disruptive business models - disruptors and the disrupted frameworks for assessing company"s capabilities and rethinking product, market and strategy - Right customers for DI: strategy in a world that is changing so rapidly - Application of disruptive theories to complex problems and opportunities.

Total: 15 Hours

Reference(s)

1. https://onlinelibrary.wiley.com/doi/pdf/10.1111/j.1540-5885.2005.00177.x
2. http://www.brinq.com/workshop/archives/2005/01/08/what-is-disruptive-innovation
3. https://hbr.org/2006/12/disruptive-innovation-for-social-change

18GE0XO SOCIAL PSYCHOLOGY 1 0 0 1

Course Objectives

- To provide a basic understanding of social psychology.
- Defining psychological & physical changes during puberty age.
- To provide an awareness of various psychological problems and social problems.
- To explain social and work psychology of people and the need for mental health.

Programme Outcomes (POs)

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.

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

Course Outcomes (COs)

1. Understand the basics of human behavior in the workplace and society at large
2. Understand the various psychological, physical, social problems and management skills.
3. Deal people effectively in their personal and social life.

Articulation Matrix

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

UNIT I **7 Hours**

INTRODUCTION

Introduction - Ice breaker - Time Line - Tasks and Challenges of the age(Erik Erikson)Physical changes - Introduction to Reproductive Health - Reproductive Organs - Menstruation - Changes during Puberty - Abortions - Contraception - Difference between Sex and Gender - Introduction to the origins of Patriarchy - Gender.

UNIT II **8 Hours**

PSYCHOLOGY

Developmental changes - Attraction - Friendship - Differences and Similarities - Images of Beauty and Body Image -Introduction to Media-Feedback - Sexuality - Boundaries Relationships - Marriage - Love - Emotional Health - Sexual Abuse and Safety - Role of Media - Abortions, Contraception, Wrapping up the Course.

Total: 15 Hours

Reference(s)

1. Baron, R. A.,Branscombe.N.R.(2016).Social Psychology,14th Ed. New Delhi;Pearson Education
2. Morgan,C.T., King,R.A.,Weisz,J.R.,&Schopler,J.(1993). Introduction to Psychology,7th Ed.New Dehi:Tata McGraw Hill.

18GE0XP FM RADIO BROADCASTING TECHNOLOGY 1 0 0 1

Course Objectives

- The course focuses on community radio technology and various program productions techniques for FM Radio Broadcasting.

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. Understand the hardware required for field recording and setting up a studio and carry out studio and field recording.
2. Examine the available options for telephony interfaces for radio.
3. Demonstrate proper techniques of wiring, fixing of connectors, soldering and use of tools and equipment for studio work.

Articulation Matrix

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

UNIT I **3 Hours**

INTRODUCTION TO AM/ FM RADIO

History of Radio-Types of Radio and its Reach- Entertainment Radio- Community Radio- Internet Radio-Satellite Radio. Evolution of Community Radio (CR) in India- principles behind setting up of FM/CR-policy guidelines and their impact on technology and content of a CR station- fundamental principles behind deciding the technology for a CR station.

UNIT II **3 Hours**

STUDIO TECHNOLOGY

Use of Microphones-Console handling-OB Recordings & Live Shows-Properties and components of sound-difference between analogue and digital audio-hardware required for field recording and setting up a studio-fundamental principles for setting up an audio studio.

UNIT III **3 Hours**

AUDIO PRODUCTION

Concept of recording and storing audio-hardware related to audio recording-open source software solutions for audio production-telephony interfaces for radio- audio Post Production. Voice Culture Exercise- Radio Production Techniques & Tools.

UNIT IV **3 Hours**

STUDIO OPERATIONS

Wiring, fixing of connectors, soldering and use of tools and equipment- preventive and corrective maintenance of studio and equipment.

UNIT V **3 Hours**

RADIO TRANSMISSION TECHNOLOGY

Components of the FM transmission chain- FM transmitter-different types of FM antenna - coaxial cable-propagation and coverage of RF signals-FM transmitter setup- Radio audience -measurements systems.

Total: 15 Hours

Reference(s)

1. UNESCO (2001). Community Radio Handbook.
2. Vinod Pavarala, Kanchan K Malik, Other Voices: The Struggle for Community Radio in India, SAGE Publications India, 2007.
3. Steve Buckley, Mark Raboy, Toby Mendel, Kreszentia Duer, Monroe E. Price, Sean O Siochru, Broadcasting, Voice, and Accountability: A Public Interest Approach to Policy, Law, and Regulation, University of Michigan Press, 2008.
4. www.floridasound.com
5. www.mediacollege.com

19IS0XA FULL STACK DEVELOPMENT 1 0 0 1

Course Objectives

- Give learning opportunity on front and back end development.

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. Understand website development using HTML and CSS.
2. Analyze the scripting concepts in Java script.

Articulation Matrix

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

UNIT I **15 Hours**

FULL STACK DEVELOPMENT

Introduction to Web Development – Getting started with HTML – Introduction to CSS – Intermediate CSS – Advanced CSS: Building and Styling website – Learning to code with Javascript – Introduction to Bootstrap 4 – Creating a login portal – Skate or Die website – Flexbox – CSS Grids – Sass – Hosting for Web apps – Node - Mongo – REST APIs – React.

Total: 15 Hours

Reference

1. https://www.udemy.com/course/ultimate-web/

19IS0XB GRAPHICAL PROCESSING UNIT PROGRAMMING 1 0 0 1

Course Objectives

- Understand the basic of GPU Programming.
- Gain knowledge about the advanced GPU programming model and techniques.

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. Elucidate the architecture of GPU programming.
2. Explore the openCL programming model.

Articulation Matrix

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

UNIT I **15 Hours**

GRAPHICAL PROCESSING UNIT PROGRAMMING

Introduction to GPU – Difference between GPU and CPU – Advantages of GPU – CUDA – Example of Vector Addition – Device code – Compilation and Execution – Vector Addition with Blocks - Vector Addition with Blocks and Threads – Advanced concepts in Thread – CUDA in two-dimension – Ray tracing and constant memory.

Total: 15 Hours

Reference(s)

1. http://selkie.macalester.edu/csinparallel/modules/GPUProgramming/build/html/index.html

19IS0XC PROJECT MANAGEMENT TOOLS AND TECHNIQUES 1 0 0 1

Course Objectives

- Understand the methods and tools of project management.
- Understand the realistic application of project management methods.

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.

Course Outcomes (COs)

1. Identify the tools of project management.
2. Implement the concept of PERT and CPM.

Articulation Matrix

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

UNIT I **15 Hours**

PROJECT MANAGEMENT TOOLS AND TECHNIQUES

PMTT applications - PMTT as critical success factors – Life cycle – Project size – Project Types – Four important types of projects - Contingency Model of the Use of PMTT - Gantt chart - Logic Network - PERT chart - Product Breakdown Structure - Work Breakdown Structure - SWOT – RACI – Stakeholder matrix – Cause and Effect Diagram – Risk map – Summary Risk profile

Total: 15 Hours

Reference(s)

1. https://www.finance-ni.gov.uk/articles/programme-and-project-management-tools-and-techniques
2. https://www.projectsmart.co.uk/project-management-tools.php
3. https://www.projectcentral.com/blog/project-management-techniques/
4. https://www.pmi.org/learning/library/project-management-tools-techniques-impact-success-8349

19IS0XD 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.

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.

Course Outcomes (COs)

1. Explain the basic concepts of Unity development environment.
2. Apply the scripting programming concepts in real world problems.
3. Implement the modeling and programming concepts for 2D and 3D objects.

Articulation Matrix

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

UNIT I **15 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: 15 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

19IS0XE SALESFORCE APP BUILDER FUNDAMENTALS 1 0 0 1

Course Objectives

- Understand the basics and tools of Salesforce App
- Understand the realistic applications of Salesforce App.

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.

Course Outcomes (COs)

1. Determine the solution for a given set of business requirements.
2. Apply features and capabilities available to restrict and extend object, record, and field access

Articulation Matrix

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

UNIT I **15 Hours**

SALESFORCE FUNDAMENTALS

Boundaries of declarative customization and the use cases for programmatic customization-Common scenarios for extending an org using the AppExchange-Apply features and capabilities available to restrict and extend object, record, and field access-Determine the appropriate sharing solution for a given set of business requirements -Identify the features and capabilities available when creating reports, report types, and dashboards-determine the appropriate global, object-specific actions and layouts to optimize the Salesforce mobile user experience-Customizations and use cases for Chatter.

Total: 15 Hours

Reference(s)

1. https://focusonforce.com/salesforce-certifications/platform-app-builder/
2. https://developer.salesforce.com/resources2/certification-site/files/SGCertifiedPlatformAppBuilder.pdf