DEPARTMENT OF CSE (IOT & CYBER SECURITY WITH BLOCK CHAIN TECH)

ACADEMIC REGULATIONS (R23)

FOR

B. Tech Four Year Degree Programme

(Applicable for the batches admitted from the A.Y. 2023-24)

PACE INSTITUTE OF TECHNOLOGY AND SCIENCES (Autonomous)

Approved by AICTE and Govt. of Andhra Pradesh, Accredited by NAAC (A Grade)
Recognized under 2(f) & 12(B) of UGC, Permanently Affiliated to JNTUK, Kakinada
NH-16, Near Valluramma Temple, Ongole-523272
Andhra Pradesh, India.

Academic Regulations (R23) for B. Tech (Regular-Full time)
(Effective for the students admitted into I year from the Academic Year 2023-24 onwards)

1. **Award of the Degree**

   (a) Award of the B.Tech. Degree / B.Tech. Degree with a Minor if he/she fulfils the following:

      i. Pursues a course of study for not less than four academic years and not more than eight academic years. However, for the students availing Gap year facility this period shall be extended by two years at the most and these two years would in addition to the maximum period permitted for graduation (Eight years).

      ii. Registers for 160 credits and secures all 160 credits.

   (b) **Award of B.Tech. degree with Honors** if he/she fulfils the following:

      i. Student secures additional 15 credits fulfilling all the requisites of a B.Tech. program i.e., 160 credits.

      ii. Registering for Honors is optional.

      iii. Honors is to be completed simultaneously with B.Tech. programme.

2. Students, who fail to fulfil all the academic requirements for the award of the degree within eight academic years from the year of their admission, shall forfeit their seat in B.Tech. course and their admission stands cancelled. This clause shall be read along with clause 1 a) i).

3. **Courses of study:**
   The following courses of study are offered at Pace Institute of Technology and Sciences,Ongole

Sl No	Branch	Short name	Code
1	Civil Engineering	CE	01
2	Electrical and Electronics Engineering	EEE	02
3	Mechanical Engineering	ME	03
4	Electronics & Communication Engineering	ECE	04
5	Computer Science and Engineering	CSE	05
6	Computer Science and Information Technology	CSIT	07
7	Information Technology	IT	12
8	Computer Science and Engineering (Internet of Things and Cyber Security Including Block Chain Technology)	CSE(IoT&CSBT)	47
9	Artificial Intelligence and Data Science	AIDS	54
10	Artificial Intelligence and Machine Learning	AIML	61
11	Computer Science and Engineering (Indian Language)	CSE-R	63
12	Electronics Engineering (VLSI Design & Technology)	EE(VLSID&T)	66

4. **Admissions**
   Admission to the B. Tech Program shall be made subject to the eligibility, qualifications and specialization prescribed by the A.P. State Government/University from time to time. Admissions shall be made either based

on the merit rank obtained by the student in the common entrance examination conducted by the A.P. Government/University or any other order of merit approved by the A.P. Government/University, subject to reservations as prescribed by the Government/University from time to time.

5. **Program related terms**

   (a) **Credit:** A unit by which the course work is measured. It determines the number of hours of instruction required per week. One credit is equivalent to one hour of teaching (Lecture/Tutorial) or two hours of practical work/field work per week.

   (b) **Credit Definition:**

1 Hr. Lecture (L) per week	1 credit
1 Hr. Tutorial (T) per week	1 credit
1 Hr. Practical (P) per week	0.5 credit
2 Hrs. Practical (Lab) per week	1 credit

   (c) **Academic Year:** Two consecutive (one odd + one even) semesters constitute one academic year.

   (d) **Choice Based Credit System (CBCS):** The CBCS provides a choice for students to select from the prescribed courses.

6. **Semester/Credits:**

   (a) A semester comprises 90 working days and an academic year is divided into two semesters.

   (b) The summer term is for eight weeks during summer vacation. Internship/ apprenticeship / work-based vocational education and training can be carried out during the summer term, especially by students who wish to exit after two semesters or four semesters of study.

   (c) Regular courses may also be completed well in advance through MOOCs satisfying prerequisites.

7. **Structure of the Undergraduate Programme**

   All courses offered for the undergraduate program (B. Tech.) are broadly classified as follows:

S.No.	Category	Breakup of Credits (Total 160)	Percentage of total credits	AICTE Recommendation (%)
1	Humanities and Social Science including Management (HM)	13	8%	8-9%
2	Basic Sciences (BS)	20	13%	12-16%
3	Engineering Sciences (ES)	23.5	14%	10-18%
4	Professional Core (PC)	54.5	34%	30-36%
5	Electives – Professional (PE) & Open (OE); Domain Specific Skill Enhancement Courses (SEC)	33	21%	19-23%
6	Internships & Project work (PR)	16	10%	8-11%
7	Mandatory Courses (MC)	Non-credit	Non-credit	-

8. **Course Classification:** All subjects/ courses offered for the undergraduate programme in Engineering & Technology (B.Tech. degree programmes) are broadly classified as follows:

S.No.	Broad Course Classification	Course Category	Description
1	Foundation Courses	Foundation courses	Includes Mathematics, Physics and Chemistry; fundamental engineering courses; humanities, social sciences and management courses
2	Core Courses	Professional Core Courses (PC)	Includes subjects related to the parent discipline/department/branch of Engineering
3	Elective Courses	Professional Elective Courses (PE)	Includes elective subjects related to the parent discipline/department/ branch of Engineering
		Open Elective Courses (OE)	Elective subjects which include interdisciplinary subjects or subjects in an area outside the parent discipline/ department/ branch of Engineering
		Domain specific skill enhancement courses (SEC)	interdisciplinary/job-oriented/domain courses which are relevant to the industry
4	Project & Internships	Project	B.Tech. Project or Major Project
		Internships	Summer Internships – Community based and Industry Internships; Industry oriented Full Semester Internship
5	Audit Courses	Mandatory non-credit courses	Covering subjects of developing desired attitude among the learners

9. **Programme Pattern**

(a) Total duration of the of B. Tech (Regular) Programme is four academic years.

(b) Each academic year of study is divided into two semesters.

(c) Minimum number of instruction days in each semester is 90 days.

(d) There shall be mandatory student induction program for freshers, with a three-week duration before the commencement of first semester. Physical activity, Creative Arts, Universal Human Values, Literary, Proficiency Modules, Lectures by Eminent People, Visits to local Areas, Familiarization to Dept./Branch & Innovations etc., are included as per the guidelines issued by AICTE.

(e) Health/wellness/yoga/sports and NSS /NCC /Scouts & Guides / Community service activities are made mandatory as credit courses for all the undergraduate students.

(f) Courses like Environmental Sciences, Indian Constitution, Technical Paper Writing & IPR are offered as non-credit mandatory courses for all the undergraduate students.

(g) Design Thinking for Innovation & Tinkering Labs are made mandatory as credit courses for all the undergraduate students.

(h) Increased flexibility for students through an increase in the elective component of the curriculum, with 05 Professional Elective courses and 04 Open Elective courses.

(i) Professional Elective Courses, include the elective courses relevant to the chosen specialization/branch. Proper choice of professional elective

courses can lead to students specializing in emerging areas within the chosen field of study.

(j) A total of 04 Open Electives are offered in the curriculum. A student can complete the requirement for B.Tech. Degree with a Minor within the 160 credits by opting for the courses offered through various verticals/tracks under Open Electives.

(k) While choosing the electives, students shall ensure that they do not opt for the courses with syllabus contents similar to courses already pursued.

(l) A pool of interdisciplinary/job-oriented/domain skill courses which are relevant to the industry are integrated into the curriculum of all disciplines. There shall be 05 skill-oriented courses offered during III to VII semesters. Among the five skill courses, four courses shall focus on the basic and advanced skills related to the domain/interdisciplinary courses and the other shall be a soft skills course.

(m) Students shall undergo mandatory summer internships, for a minimum of eight weeks duration at the end of second and third year of the programme. The internship at the end of second year shall be community oriented and industry internship at the end of third year.

(n) There shall also be mandatory full internship in the final semester of the programme along with the project work.

(o) Undergraduate degree with Honors is introduced by the University for the students having good academic record.

(p) Each college shall take measures to implement Virtual Labs (https://www.vlab.co.in) which provide remote access to labs in various disciplines of Engineering and will help student in learning basic and advanced concept through remote experimentation. Student shall be made to work on virtual lab experiments during the regular labs.

(q) Each college shall assign a faculty advisor/mentor after admission to a group of students from same department to provide guidance in courses registration/career growth/placements/opportunities for higher studies /GATE /other competitive exams etc.

(r) Preferably 25% of course work for the theory courses in every semester shall be conducted in the blended mode of learning.

10. **Evaluation Process**

The performance of a student in each semester shall be evaluated subject wise with a maximum of 100 marks for theory and 100 marks for practical subject. Summer Internships shall be evaluated for 50 marks, Full Internship & Project work in final semester shall be evaluated for 200 marks, mandatory courses with no credits shall be evaluated for 30 mid semester marks.

A student has to secure not less than 35% of marks in the end examination and a minimum of 40% of marks in the sum total of the mid semester and end

examination marks taken together for the theory, practical, design, drawing subject or project etc. In case of a mandatory course, he/she should secure 40% of the total marks.

(A) **Theory Courses**

Assessment Method	Marks
Continuous Internal Assessment	30
Semester End Examination	70
Total	100

i. For theory subject, the distribution shall be 30 marks for Internal Evaluation and 70 marks for the End-Examination.

ii. For practical subject, the distribution shall be 30 marks for Internal Evaluation and 70 marks for the End- Examination.

iii. If any course contains two different branch subjects, the syllabus shall be written in two parts with 3 units each (Part-A and Part-B) and external examination question paper shall be set with two parts each for 35 marks.

iv. If any subject is having both theory and practical components, they will be evaluated separately as theory subject and practical subject. However, they will be given same subject code with an extension of 'T' for theory subject and 'P' for practical subject.

(a) **Continuous Internal Evaluation**

i. For theory subjects, during the semester, there shall be two midterm examinations. Each midterm examination shall be evaluated for 30 marks of which 10 marks for objective paper (20 minutes duration), 15 marks for subjective paper (90 minutes duration) and 5 marks for assignment.

ii. Objective paper shall contain for 05 short answer questions with 2 marks each or maximum of 20 bits for 10 marks. Subjective paper shall contain 3 either or type questions (totally six questions from 1 to 6) of which student has to answer one from each either-or type of questions. Each question carries 10 marks. The marks obtained in the subjective paper are condensed to 15 marks.

Note:

- The objective paper shall be prepared in line with the quality of competitive examinations questions.
- The subjective paper shall contain 3 either or type questions of equal weightage of 10 marks. Any fraction shall be rounded off to the next higher mark.
- The objective paper shall be conducted by the respective institution on the day of subjective paper test.
- Assignments shall be in the form of problems, mini projects, design problems, slip tests, quizzes etc., depending on the course

content. It should be continuous assessment throughout the semester and the average marks shall be considered.

iii. If the student is absent for the mid semester examination, no re-exam shall be conducted and mid semester marks for that examination shall be considered as zero.

iv. First midterm examination shall be conducted for I, II units of syllabus with one either or type question from each unit and third either or type question from both the units. The second midterm examination shall be conducted for III, IV and V units with one either or type question from each unit.

v. Final mid semester marks shall be arrived at by considering the marks secured by the student in both the mid examinations with 80% weightage given to the better mid exam and 20% to the other.

For Example:

* Marks obtained in first mid: 25
* Marks obtained in second mid: 20
* Final mid semester Marks: (25x0.8) + (20x0.2) = 24

If the student is absent for any one midterm examination, the final mid semester marks shall be arrived at by considering 80% weightage to the marks secured by the student in the appeared examination and zero to the other. For Example:

⋆ Marks obtained in first mid: Absent
⋆ Marks obtained in second mid: 25
⋆ Final mid semester Marks: (25x0.8) + (0x0.2) =20

(b) **Semester End Examination Evaluation:**

End examination of theory subjects shall have the following pattern:

i. There shall be 6 questions and all questions are compulsory.

ii. Question I shall contain 10 compulsory short answer questions for a total of 20 marks such that each question carries 2 marks.

iii. There shall be 2 short answer questions from each unit.

◇ In each of the questions from 2 to 6, there shall be either/or type questions of 10 marks each. Student shall answer any one of them.

iv. The questions from 2 to 6 shall be set by covering one unit of the syllabus for each question.

End examination of theory subjects consisting of two parts of different subjects, for Example: Basic Electrical & Electronics Engineering shall have the following pattern:

i. Question paper shall be in two parts viz., Part A and Part B with equal weightage of 35 marks each.

ii. In each part, question 1 shall contain 5 compulsory short answer questions for a total of 5 marks such that each question carries 1mark.

iii. In each part, questions from 2 to 4, there shall be either/or type questions of 10 marks each. Student shall answer any one of them.

iv. The questions from 2 to 4 shall be set by covering one unit of the syllabus for each question.

(B) **Practical Courses**

Assessment Method	Marks
Continuous Internal Assessment	30
Semester End Examination	70
Total	100

(a) For practical courses, there shall be a continuous evaluation during the semester for 30 sessional marks and end examination shall be for 70 marks.

(b) Day-to-day work in the laboratory shall be evaluated for 15 marks by the concerned laboratory teacher based on the record/viva and 15 marks for the internal test.

(c) The end examination shall be evaluated for 70 marks, conducted by the concerned laboratory teacher and a senior expert in the subject from the same department.

i. Procedure: 20 marks

ii. Experimental work & Results: 30 marks

iii. Viva voce: 20 marks.

In a practical subject consisting of two parts (Eg: Basic Electrical & Electronics Engineering Lab), the end examination shall be conducted for 70 marks as a single laboratory in 3 hours. Mid semester examination shall be evaluated as above for 30 marks in each part and final mid semester marks shall be arrived by considering the average of marks obtained in two parts.

(d) For the subject having design and/or drawing, such as Engineering Drawing, the distribution of marks shall be 30 for mid semester evaluation and 70 for end examination. Day-to-day work shall be evaluated for 15 marks

Assessment Method	Marks
Continuous Internal Assessment	30
Semester End Examination	70
Total	100

by the concerned subject teacher based on the reports/submissions prepared in the class. And there shall be two midterm examinations in a semester for duration of 2 hours each for 15 marks with weightage of 80% to better mid marks and 20% for the other. The subjective paper shall contain 3 either or type questions of equal weightage of 5 marks. There shall be no objective paper in mid semester examination. The sum

of day-to-day evaluation and the mid semester marks will be the final sessional marks for the subject.

The end examination pattern for Engineering Graphics, shall consists of 5 questions, either/or type, of 14 marks each. There shall be no objective type questions in the end examination. However, the end examination pattern for other subjects related to design/drawing , multiple branches, etc is mentioned along with the syllabus.

(e) There shall be no external examination for mandatory courses with zero credits. However, attendance shall be considered while calculating aggregate attendance and student shall be declared to have passed the mandatory course only when he/she secures 40% or more in the internal examinations. In case, the student fails, a re=examination shall be conducted for failed candidates for 30 marks satisfying the conditions mentioned in item 1 & 2 of the regulations.

(f) The laboratory records and mid semester test papers shall be preserved for a minimum of 3 years in the respective institutions as per the University norms and shall be produced to the Committees of the University as and when the same are asked for.

11. **Skill oriented Courses**

(a) There shall be five skill-oriented courses offered during III to VII semesters.

(b) Out of the five skill courses two shall be skill-oriented courses from the same domain. Of the remaining three skill courses, one shall be a soft skill course and the remaining two shall be skill-advanced courses from the same domain/Interdisciplinary/Job oriented.

(c) The course shall carry 100 marks and shall be evaluated through continuous assessments during the semester for 30 sessional marks and end examination shall be for 70 marks. Day-to-day work in the class / laboratory shall be evaluated for 30 marks by the concerned teacher based on the regularity/assignments/viva/mid semester test. The end examination similar to practical examination pattern shall be conducted by the concerned teacher and an expert in the subject nominated by the principal.

(d) The Head of the Department shall identify a faculty member as coordinator for the course. A committee consisting of the Head of the Department, coordinator and a senior Faculty member nominated by the Head of the Department shall monitor the evaluation process. The marks/grades shall be assigned to the students by the above committee based on their performance.

(e) The student shall be given an option to choose either the skill courses being offered by the college or to choose a certificate course being offered by industries/Professional bodies or any other accredited bodies. If a student chooses to take a Certificate Course offered by external agencies,

the credits shall be awarded to the student upon producing the Course Completion Certificate from the agency. A committee shall be formed at the level of the college to evaluate the grades/marks given for a course by external agencies and convert to the equivalent marks/grades.

(f) The recommended courses offered by external agencies, conversions and appropriate grades/marks are to be approved by the principal at the beginning of the semester. The Head of the Department shall forward such proposals to the principal for approval.

(g) If a student prefers to take a certificate course offered by external agency, the department shall mark attendance of the student for the remaining courses in that semester excluding the skill course in all the calculations of mandatory attendance requirements upon producing a valid certificate as approved by the principal.

12. **Massive Open Online Courses (MOOCs):**

A Student has to pursue and complete one course compulsorily through MOOCs approved by the principal. A student can pursue courses other than core through MOOCs and it is mandatory to complete one course successfully through MOOCs for awarding the degree. A student is not permitted to register and pursue core courses through MOOCs.

A student shall register for the course (Minimum of either 8 weeks or 12 weeks) offered through MOOCs with the approval of Head of the Department. The Head of the Department shall appoint one mentor to monitor the student's progression. The student needs to earn a certificate by passing the exam. The student shall be awarded the credits assigned in the curriculum only by submission of the certificate. Examination fee, if any, will be borne by the student.

Students who have qualified in the proctored examinations conducted through MOOCs platform can apply for credit transfer as specified and are exempted from appearing internal as well as external examination (for the specified equivalent credit course only) conducted by the college.

Necessary amendments in rules and regulations regarding adoption of MOOC courses would be proposed from time to time.

13. **Credit Transfer Policy**

Adoption of MOOCs is mandatory, to enable Blended model of teaching-learning as also envisaged in the NEP 2020. As per University Grants Commission (Credit Framework for Online Learning Courses through SWAYAM) Regulation, 2016, the institute shall allow up to a maximum of 20% of the total courses being offered in a particular programme i.e., maximum of 32 credits through MOOCs platform.

(a) The institute shall offer credit mobility for MOOCs and give the equivalent credit weightage to the students for the credits earned through online

learning courses.

(b) Student registration for the MOOCs shall be only through the respective department of the institution, it is mandatory for the student to share necessary information with the department.

(c) Credit transfer policy will be applicable to the Professional & Open Elective courses only.

(d) The concerned department shall identify the courses permitted for credit transfer.

(e) The institution shall notify at the beginning of semester the list of the online learning courses eligible for credit transfer.

(f) The department shall designate a faculty member as a Mentor for each course to guide the students from registration till completion of the credit course.

(g) The institution shall ensure no overlap of MOOC exams with that of the semester end examination schedule. In case of delay in results, the institution will re-issue the marks sheet for such students.

(h) Student pursuing courses under MOOCs shall acquire the required credits only after successful completion of the course and submitting a certificate issued by the competent authority along with the percentage of marks and grades.

(i) The department shall submit the following to the examination cell & systems:

  i. List of students who have passed MOOC courses in the current semester along with the certificate of completion.

  ii. Undertaking form filled by the students for credit transfer.

(j) The institution shall resolve any issues that may arise in the implementation of this policy from time to time and shall review its credit transfer policy in the light of periodic changes brought by UGC, SWAYAM, NPTEL and state government.

Note: Students shall be permitted to register for MOOCs offered through online platforms approved by the University from time to time.

14. **Academic Bank of Credits (ABC)**

The institute has implemented Academic Bank of Credits (ABC) to promote flexibility in curriculum as per NEP 2020 to

(a) provide option of mobility for learners across the universities of their choice

(b) provide option to gain the credits through MOOCs from approved digital platforms.

(c) facilitate award of certificate/diploma/degree in line with the accumulated credits in ABC

(d) execute Multiple Entry and Exit system with credit count, credit transfer and credit acceptance from students' account.

15. **Mandatory Internships**

Summer Internships : Two summer internships either onsite or virtual each with a minimum of 08 weeks duration, done at the end of second and third years, respectively are mandatory. It shall be completed in collaboration with local industries, Govt. Organizations, construction agencies, Power projects, software MNCs or any industries in the areas of concerned specialization of the Undergraduate program. One of the two summer internships at the end of second year (Community Service Project) shall be society oriented and shall be completed in collaboration with government organizations/NGOs & others. The other internship at the end of third year is Industry Internship and shall be completed in collaboration with Industries. The student shall register for the internship as per course structure after commencement of academic year. The guidelines issued by the APSCHE / University shall be followed for carrying out and evaluation of Community Service Project and Industry Internship.

Evaluation of the summer internships shall be through the departmental committee. A student will be required to submit a summer internship report to the concerned department and appear for an oral presentation before the departmental committee comprising of Head of the Department, supervisor of the internship and a senior faculty member of the department. A certificate of successful completion from industry shall be included in the report. The report and the oral presentation shall carry 50% weightage each. It shall be evaluated for 50 external marks. There shall be no internal marks for Summer Internship. A student shall secure minimum 40% of marks for successful completion. In case, if a student fails, he/she shall reappear as and when semester supplementary examinations are conducted by the institution.

Full Semester Internship and Project work: In the final semester, the student should mandatorily register and undergo internship (onsite/virtual) and in parallel he/she should work on a project with well-defined objectives. At the end of the semester the candidate shall submit an internship completion certificate and a project report. A student shall also be permitted to submit project report on the work carried out during the internship.

The project report shall be evaluated with an external examiner. The total marks for project work 200 marks and distribution shall be 60 marks for internal and 140 marks for external evaluation. The supervisor assesses the student for 30 marks (Report: 15 marks, Seminar: 15 marks). At the end of the semester, all projects shall be showcased at the department for the benefit of all students and staff and the same is to be evaluated by the departmental Project Review Committee consisting of supervisor, a senior faculty and HOD for 30 marks. The external evaluation of Project Work is a Viva-Voce Exami-

nation conducted in the presence of internal examiner and external examiner appointed by the principal and is evaluated for 140 marks.

The college shall facilitate and monitor the student internship programs. Completion of internships is mandatory, if any student fails to complete internship, he/she will not be eligible for the award of degree. In such cases, the student shall repeat and complete the internship.

16. **Guidelines for offering a Minor**

To promote interdisciplinary knowledge among the students, the students admitted into B.Tech. in a major stream/branch are eligible to obtain degree in Minor in another stream.

(a) The Minor program requires the completion of 12 credits in Minor stream chosen.

(b) Two courses for 06 credits related to a Minor are to be pursued compulsorily for the minor degree, but maybe waived for students who have done similar/equivalent courses. If waived for a student, then the student must take an extra elective course in its place. It is recommended that students should complete the compulsory courses (or equivalents) before registering for the electives.

(c) Electives (minimum of 2 courses) to complete a total of 12 credits.

Note: A total of 04 Open Electives are offered in the curriculum. A student can complete the requirement for Minor by opting for the courses offered through various verticals/tracks under Open Electives.

17. **Guidelines for offering Honors**

The objective of introducing B.Tech. (Hons.) is to facilitate the students to choose additionally the specialized courses of their choice and build their competence in a specialized area in the UG level. The programme is a best choice for academically excellent students having good academic record and interest towards higher studies and research.

(a) Honors is introduced in the curriculum of all B. Tech. programs offering a major degree and is applicable to all B. Tech (Regular and Lateral Entry) students admitted in Engineering & Technology.

(b) A student shall earn additional 15 credits for award of B.Tech.(Honors) degree from same branch/department/discipline registered for major degree. This is in addition to the credits essential for obtaining the Undergraduate degree in Major Discipline (i.e., 160 credits).

(c) A student is permitted to register for Honors in IV semester after the results of III Semester are declared and students may be allowed to take maximum two subjects per semester pertaining to the Honors from V Semester onwards.

(d) The concerned Head of The Department shall arrange separate class work and timetable of the courses offered under Honors program.

(e) Courses that are used to fulfil the student's primary major may not be double counted towards the Honors. Courses with content substantially equivalent to courses in the student's primary Major may not be counted towards the Honors.

(f) Students can complete the courses offered under Honors either in the college or in online platforms like SWAYAM with a minimum duration of 12 weeks for a 3-credit course and 8 weeks duration for a 2-credit course satisfying the criteria for credit mobility. If the courses under Honors are offered in conventional mode, then the teaching and evaluation procedure shall be similar to regular B. Tech courses.

(g) The attendance for the registered courses under Honors and regular courses offered for Major degree in a semester are to be considered separately.

(h) A student shall maintain an attendance of 75% in all registered courses under Honors to be eligible for attending semester end examinations.

(i) **A student registered for Honors shall pass in all subjects that constitute the requirement for the Honors** degree program. No class/division (i.e., second class, first class and distinction, etc.) shall be awarded for Honors degree programme.

(j) If a student drops or is terminated from the Honors program, the additional credits so far earned cannot be converted into open or core electives; they will remain extra. However, such students will receive a separate grade sheet mentioning the additional courses completed by them.

(k) The Honors will be mentioned in the degree certificate as Bachelor of Technology (Honors) in XYZ. For example, B.Tech. (Honors) in Mechanical Engineering

Enrolment into Honors:

(a) Students of a Department/Discipline are eligible to opt for Honors program offered by the same Department/Discipline

(b) The enrolment of student into Honors is based on the CGPA obtained in the major degree program. CGPA shall be taken up to III semester in case of regular entry students and only III semester in case of lateral entry students. Students having 7 CGPA without any backlog subjects will be permitted to register for Honors.

(c) If a student is detained due to lack of attendance either in Major or in Honors, registration shall be cancelled.

(d) Transfer of credits from Honors to regular B. Tech degree and vice-versa shall not be permitted.

(e) Honors is to be completed simultaneously with a Major degree program.

Registration for Honors:

(a) The eligible and interested students shall apply through the HOD of his/her parent department. The whole process should be completed within one week before the start of every semester. Selected students shall be permitted to register the courses under Honors.

(b) The selected students shall submit their willingness to the principal through his/her parent department offering Honors. The parent department shall maintain the record of student pursuing the Honors.

(c) The students enrolled in the Honors courses will be monitored continuously. An advisor/mentor from parent department shall be assigned to a group of students to monitor the progress.

(d) There is no fee for registration of subjects for Honors program offered in offline at the respective institutions.

18. **Attendance Requirements:**

(a) A student shall be eligible to appear for the semester end examinations if he/she acquires a minimum of 40% attendance in each subject and 75% of attendance in aggregate of all the subjects. Condonation of shortage of attendance in aggregate up to 10% (65% and above and below 75%) in each semester may be granted by the College Academic Committee.

(b) Shortage of Attendance below 65% in aggregate shall in NO CASE be condoned.

(c) A stipulated fee shall be payable towards condonation of shortage of attendance to the University.

(d) Students whose shortage of attendance is not condoned in any semester are not eligible to take their end examination of that class and their registration shall stand cancelled.

(e) A student will not be promoted to the next semester unless he satisfies the attendance requirements of the present semester. They may seek readmission for that semester from the date of commencement of class work.

(f) If any candidate fulfils the attendance requirement in the present semester, he shall not be eligible for readmission into the same class.

(g) If the learning is carried out in blended mode (both offline & online), then the total attendance of the student shall be calculated considering the offline and online attendance of the student.

(h) For induction programme attendance shall be maintained as per AICTE norms.

19. **Promotion Rules:**

The following academic requirements must be satisfied in addition to the attendance requirements mentioned in section 16.

(a) A student shall be promoted from first year to second year if he/she fulfils the minimum attendance requirement as per university norms.

(b) student will be promoted from II to III year if he/she fulfils the academic requirement of securing 40% of the credits (any *decimal* fraction should be *rounded off* to *lower* digit) up to in the subjects that have been studied up to III semester.

(c) A student shall be promoted from III year to IV year if he/she fulfils the academic requirements of securing 40% of the credits (any *decimal* fraction should be *rounded off* to *lower* digit) in the subjects that have been studied up to V semester.

And in case a student is detained for want of credits for a particular academic year by ii) & iii) above, the student may make up the credits through supplementary examinations and only after securing the required credits he/she shall be permitted to join in the V semester or VII semester respectively as the case may be.

(d) When a student is detained due to lack of credits/shortage of attendance he/she may be re-admitted when the semester is offered after fulfilment of academic regulations. In such case, he/she shall be in the academic regulations into which he/she is readmitted.

20. **Grading:**

As a measure of the student's performance, a 10-point Absolute Grading System using the following Letter Grades and corresponding percentage of marks shall be followed:

After each course is evaluated for 100 marks, the marks obtained in each course will be converted to a corresponding letter grade as given below, depending on the range in which the marks obtained by the student fall.

Structure of Grading of Academic Performance

Range in which the marks in the subject fall	Grade	Grade points Assigned
90 & above	S (Superior)	10
80 - 89	A (Excellent)	9
70 - 79	B (Very Good)	8
60 - 69	C (Good)	7
50 - 59	D (Average)	6
40 - 49	E (Pass)	5
<40	F (Fail)	0
Absent	Ab (Absent)	0

(a) A student obtaining Grade 'F' or Grade 'Ab' in a subject shall be considered failed and will be required to reappear for that subject when it is offered the next supplementary examination.

(b) For non-credit audit courses, "Satisfactory" or "Unsatisfactory" shall be indicated instead of the letter grade and this will not be counted for the computation of SGPA/CGPA/Percentage.

Computation of Semester Grade Point Average (SGPA) and Cumulative Grade Point Average (CGPA):

The Semester Grade Point Average (SGPA) is the ratio of sum of the product of the number of credits with the grade points scored by a student in all the courses taken by a student and the sum of the number of credits of all the courses undergone by a student, i.e.,

$$SGPA = \frac{\sum(C_i \times G_i)}{\sum(C_i)}$$

where, C_i is the number of credits of the i^{th} subject and G_i is the grade point scored by the student in the i^{th} course.

The Cumulative Grade Point Average (CGPA) will be computed in the same manner considering all the courses undergone by a student over all the semesters of a program, i.e.,

$$CGPA = \frac{\sum(C_i \times S_i)}{\sum(C_i)}$$

where "S_i" is the SGPA of the i^{th} semester and C_i is the total number of credits up to that semester.

Both SGPA and CGPA shall be rounded off to 2 decimal points and reported in the transcripts.

While computing the SGPA the subjects in which the student is awarded Zero grade points will also be included.

Grade Point: It is a numerical weight allotted to each letter grade on a 10-point scale. Letter Grade: It is an index of the performance of students in a said course. Grades are denoted by the letters S, A, B, C, D and F.

Award of Class:

After a student has satisfied the requirements prescribed for the completion of the program and is eligible for the award of B. Tech. Degree, he/she shall be placed in one of the following four classes:

Class Awarded	CGPA Secured
First Class with Distinction	$\geq$ 7.5
First Class	$\geq$ 6.5 <7.5
Second Class	$\geq$ 5.5 <6.5
Pass Class	$\geq$ 5.0 <5.5

CGPA to Percentage conversion Formula – (CGPA – 0.5) x 10

21. **With–holding of Results**

If the candidate has any dues not paid to the university or if any case of indiscipline or malpractice is pending against him/her, the result of the candidate shall be withheld in such cases.

22. **Multiple Entry / Exit Option**

(a) **Exit Policy:** The students can choose to exit the four-year programme at the end of first/second/third year.

i. **UG Certificate in (Field of study/discipline) -** Programme duration: First year (first two semesters) of the undergraduate programme, 40 credits followed by an additional exit 10-credit bridge course(s) lasting two months, including at least 6-credit job-specific internship/ apprenticeship that would help the candidates acquire job-ready competencies required to enter the workforce.

ii. **UG Diploma (in Field of study/discipline) -** Programme duration: First two years (first four semesters) of the undergraduate programme, 80 credits followed by an additional exit 10-credit bridge course(s) lasting two months, including at least 6-credit job-specific internship/ apprenticeship that would help the candidates acquire job-ready competencies required to enter the workforce.

iii. **Bachelor of Science (in Field of study/discipline) i.e., B.Sc. Engineering in (Field of study/discipline)-** Programme duration: First three years (first six semesters) of the undergraduate programme, 120 credits.

(b) **Entry Policy:**

Modalities on multiple entry by the student into the B.Tech. programme will be provided in due course of time.

Note: The Universities shall resolve any issues that may arise in the implementation of Multiple Entry and Exit policies from time to time and shall review the policies in the light of periodic changes brought by UGC, AICTE and State government.

23. **Gap Year Concept:**

Gap year concept for Student Entrepreneur in Residence is introduced and outstanding students who wish to pursue entrepreneurship / become entrepreneur are allowed to take a break of one year at any time after II year to pursue full-time entrepreneurship programme/to establish startups. This period may be extended to two years at the most and these two years would not be counted for the time for the maximum time for graduation. The Head of The Department shall forward such proposals submitted by the students to the principal. An evaluation committee constituted by the principal shall evaluate the proposal submitted by the student and the committee shall decide whether to permit the student(s) to avail the Gap Year or not

24. **Transitory Regulations**

Discontinued, detained, or failed candidates are eligible for readmission as and when the semester is offered after fulfilment of academic regulations. Candidates who have been detained for want of attendance or not fulfilled

academic requirements or who have failed after having undergone the course in earlier regulations or have discontinued and wish to continue the course are eligible for admission into the unfinished semester from the date of commencement of class work with the same or equivalent subjects as and when subjects are offered, subject to Section 2 and they will follow the academic regulations into which they are readmitted.

Candidates who are permitted to avail Gap Year shall be eligible for re-joining into the succeeding year of their B. Tech from the date of commencement of class work, subject to Section 2 and they will follow the academic regulations into which they are readmitted.

25. **Minimum Instruction Days for a Semester:**

The minimum instruction days including exams for each semester shall be 90 days.

26. **Medium of Instruction:**

The medium of instruction of the entire B. Tech undergraduate programme in Engineering & Technology (including examinations and project reports) will be in English only. Similarly, the medium of instruction and examinations in AICTE approved Indian language B.Tech programme are in Telugu and English.

27. **Student Transfers:**

Student transfers shall be as per the guidelines issued by the Government of Andhra Pradesh and the Universities from time to time.

28. **General Instructions:**

(a) The academic regulations should be read as a whole for purpose of any interpretation.

(b) Malpractices rules-nature and punishments are appended.

(c) Where the words “he”, “him”, “his”, occur in the regulations, they also include “she”, “her”, “hers”, respectively.

(d) In the case of any doubt or ambiguity in the interpretation of the above rules, the decision of the competent authorities of institution is final.

(e) The institution may change or amend the academic regulations or syllabi at any time and the changes or amendments shall be made applicable to all the students on rolls with effect from the dates notified by the institute.

(f) In the case of any doubt or ambiguity in the interpretation of the guidelines given, the decision of the Head of the institution is final.

Academic Regulations (R23)
for B. Tech (Lateral Entry Scheme)

(Effective for the students admitted into II year through Lateral Entry Scheme from the Academic Year 2024-25 onwards)

1. **Award of the Degree**

   (a) Award of the B.Tech. Degree / B.Tech. Degree with a Minor if he/she fulfils the following:

      i. Pursues a course of study for not less than three academic years and not more than six academic years. However, for the students availing Gap year facility this period shall be extended by two years at the most and these two years would in addition to the maximum period permitted for graduation (Six years).
      ii. Registers for 120 credits and secures all 120 credits.

   (b) **Award of B.Tech. degree with Honors** if he/she fulfils the following:

      i. Student secures additional 15 credits fulfilling all the requisites of a B.Tech. program i.e., 120 credits.
      ii. Registering for Honors is optional.
      iii. Honors is to be completed simultaneously with B.Tech. programme.

2. Students, who fail to fulfil the requirement for the award of the degree within six consecutive academic years from the year of admission, shall forfeit their seat.

3. **Minimum Academic Requirements** The following academic requirements have to be satisfied in addition to the requirements mentioned in item no.2

   (a) A student shall be deemed to have satisfied the minimum academic requirements and earned the credits allotted to each theory, practical, design, drawing subject or project if he secures not less than 35% of marks in the end examination and a minimum of 40% of marks in the sum total of the mid semester evaluation and end examination taken together.

   (b) A student shall be promoted from III year to IV year if he/she fulfils the academic requirements of securing 40% of the credits (any decimal fraction should be rounded off to lower digit) in the subjects that have been studied up to V semester.

   And in case if student is already detained for want of credits for particular academic year, the student may make up the credits through supplementary exams of the above exams before the commencement of IV year I semester class work of next year.

4. **Course Pattern**

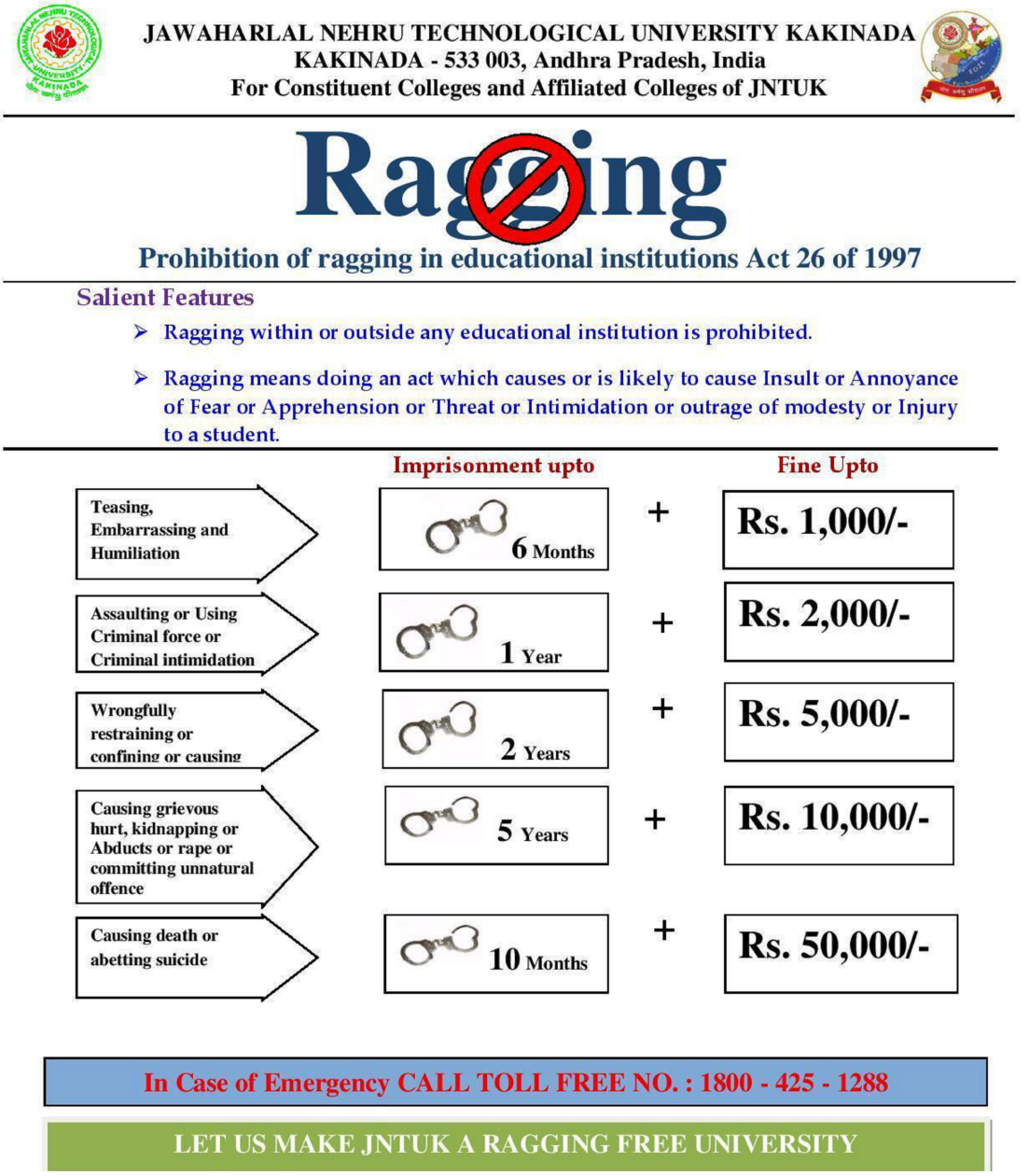
   (a) The entire course of study is three academic years on semester pattern.

(b) A student eligible to appear for the end examination in a subject but absent at it or has failed in the end examination may appear for that subject at the next supplementary examination offered.

(c) When a student is detained due to lack of credits/shortage of attendance the student may be re-admitted when the semester is offered after fulfilment of academic regulations, the student shall be in the academic regulations into which he/she is readmitted.

5. All other regulations as applicable for B. Tech. Four-year degree course (Regular) will hold good for B. Tech. (Lateral Entry Scheme).

Annexure-I


JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA - 533 003, Andhra Pradesh, India
For Constituent Colleges and Affiliated Colleges of JNTUK
Ragging
Prohibition of ragging in educational institutions Act 26 of 1997
Salient Features
Ragging within or outside any educational institution is prohibited.
Ragging means doing an act which causes or is likely to cause Insult or Annoyance of Fear or Apprehension or Threat or Intimidation or outrage of modesty or Injury to a student.
Imprisonment upto
Fine Upto
Teasing, Embarrassing and Humiliation
6 Months
+
Rs. 1,000/-
Assaulting or Using Criminal force or Criminal intimidation
1 Year
+
Rs. 2,000/-
Wrongfully restraining or confining or causing
2 Years
+
Rs. 5,000/-
Causing grievous hurt, kidnapping or Abducts or rape or committing unnatural offence
5 Years
+
Rs. 10,000/-
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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA - 533 003, Andhra Pradesh, India
For Constituent Colleges and Affiliated Colleges of JNTUK

Ragging

ABSOLUTELY NO TO RAGGING

1. **Ragging is prohibited as per Act 26 of A.P. Legislative Assembly, 1997.**
2. **Ragging entails heavy fines and/or imprisonment.**
3. **Ragging invokes suspension and dismissal from the College.**
4. **Outsiders are prohibited from entering the College and Hostel without permission.**
5. **Girl students must be in their hostel rooms by 7.00 p.m.**
6. **All the students must carry their Identity Cards and show them when demanded**
7. **The Principal and the Wardens may visit the Hostels and inspect the rooms any time.**

Jawaharlal Nehru Technological University Kakinada
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DEPARTMENT OF CSE (IOT & CYBER SECURITY WITH BLOCK CHAIN TECH)
R-23 UNDER GRADUATE (B.Tech) COURSE STRUCTURE

Induction Programme			
S.No.	Course Name	**Category**	L-T-P-C
1	Physical Activities – Sports, Yoga and Meditation, Plantation	MC	0-0-6-0
2	Career Counselling	MC	2-0-2-0
3	Orientation to all branches – career options, tools, etc.	MC	3-0-0-0
4	Orientation on admitted Branch – corresponding labs, tools and platforms	EC	2-0-3-0
5	Proficiency Modules & Productivity Tools	ES	2-1-2-0
6	Assessment on basic aptitude and mathematical skills	MC	2-0-3-0
7	Remedial Training in Foundation Courses	MC	2-1-2-0
8	Human Values & Professional Ethics	MC	3-0-0-0
9	Communication Skills – focus on Listening, Speaking, Reading, Writing skills	BS	2-1-2-0
10	Concepts of Programming	ES	2-0-2-0

DEPARTMENT OF CSE (IOT & CYBER SECURITY WITH BLOCK CHAIN TECH)
R-23 UNDER GRADUATE (B.Tech) COURSE STRUCTURE

I Year - I Semester						
S.No	**Course Code**	**Course Title**	**L**	**T**	**P**	**C**
1	P23BST04	Engineering Physics	3	0	0	3
2	P23BST02	Linear Algebra & Calculus	3	0	0	3
3	P23EST03	Basic Electrical and Electronics Engineering	3	0	0	3
4	P23EST04	Engineering Graphics	1	0	4	3
5	P23EST02	Introduction to Programming	3	0	0	3
6	P23ESL04	IT Workshop	0	0	2	1
7	P23BSL02	Engineering Physics Lab	0	0	2	1
8	P23ESL03	Electrical and Electronics Engineering Workshop	0	0	3	1.5
9	P23ESL02	Computer Programming Lab	0	0	3	1.5
10	P23BST08	NSS/NCC/Scouts & Guides/Community Service	-	-	1	0.5
Total Credits						20.5

I Year - II Semester						
S.No	**Course Code**	**Course Title**	**L**	**T**	**P**	**C**
1	P23BST01	Communicative English	2	0	0	2
2	P23BST06	Chemistry	3	0	0	3
3	P23BST03	Differential Equations & Vector Calculus	3	0	0	3
4	P23EST01	Basic Civil & Mechanical Engineering	3	0	0	3
5	P23CST01	Data Structures	3	0	0	3
6	P23BSL01	Communicative English Lab	0	0	2	1
7	P23BSL04	Chemistry Lab	0	0	2	1
8	P23ESL01	Engineering Workshop	0	0	3	1.5
9	P23CSL01	Data Structures Lab	0	0	3	1.5
10	P23BST07	Health and wellness, Yoga and sports	-	-	1	0.5
Total Credits						19.5

DEPARTMENT OF CSE (IOT & CYBER SECURITY WITH BLOCK CHAIN TECH)
R-23 UNDER GRADUATE (B.Tech) COURSE STRUCTURE

II Year I Semester						
S.No.	**Course Code**	**Title**	**L**	**T**	**P**	**C**
1	P23BST10	Discrete Mathematics and Graph Theory	3	0	0	3
2	P23BST12	Universal Human Values – Understanding Harmony	2	1	0	3
3	P23EST09	Digital Logic & Computer Organization	3	0	0	3
4	P23CST03	Object Oriented Programming through Java	3	0	0	3
5	P23CST04	Operating Systems	3	0	0	3
6	P23ACT01	Environmental Science (Audit)	2	0	0	-
7	P23CSL03	Object Oriented Programming through Java Lab	0	0	3	1.5
8	P23CSL04	Operating Systems Lab	0	0	3	1.5
9	P23CBS01	Python Programming (Skill Enhancement)	0	1	2	2
10						
Total Credits			16	2	8	20

II Year II Semester						
S.No.	**Course Code**	**Title**	**L**	**T**	**P**	**C**
1	P23MBT01	Managerial Economics and Financial Analysis	2	0	0	2
2	P23CST02	Advanced Data Structures and Algorithms Analysis	3	0	0	3
3	P23CBT01	Computer Networks	3	0	0	3
4	P23CST05	Database Management Systems	3	0	0	3
5	P23BST15	Number Theory and Its Applications	3	0	0	3
6	P23CBL01	Computer Networks Lab	0	0	3	1.5
7	P23CBL05	Database Management Systems Lab	0	0	3	1.5
8	P23CBS02	Full Stack Development	1	0	2	2
9	P23BST17	Design Thinking & Innovation	1	0	2	2
Total Credits			15	1	12	22
Mandatory Community Service Project Internship of 08 weeks duration during summer vacation						

DEPARTMENT OF CSE (IoT & CYBER SECURITY WITH BLOCKCHAIN TECH)
R-23 UNDER GRADUATE (B.Tech) COURSE STRUCTURE

III Year – I Semester						
S.No.	**Course Code**	**Title**	**L**	**T**	**P**	**C**
1	P23CBT02	Designing the IOT	3	0	0	3
2	P23CBT03	Wireless Sensor Networks	3	0	0	3
3	P23CBT04	Crypotography & Networks Security	3	0	0	3
4	P23XXXXX	Professional Elective–I	3	0	0	3
5	P23XXXXX	Open Elective–I	3	0	0	3
6	P23CBL02	Internet of Things Lab	0	0	0	1.5
7	P23CBL03	Cyber security Lab	0	0	0	1.5
8	P23CBS03	Full Stack Development – II (Skill Enhancement Course)	1	0	2	2
9	P23XXXXX	User Interface Design using Flutter (Engineeting Science)	0	0	2	1
Evaluation of community Service Internship			0	0	0	2
Total Credits			16	0	4	23

Professional Elective - I		
S.No.	**Course Code**	**Course Title**
1	P23CBE01	Object Oriented Analysis and Design
2	P23CBE02	Artificial Intelligence
3	P23CBE03	Microprocessors & Microcontrollers
4	P23CBE04	Automata Theory & Compiler Design
5	P23CBN01	MOOCS [NPTEL]

Open Elective - I		
S.No.	**Course Code**	**Course Title**
1	P23EOE01	Electronic Devices & Circuits
2	P23EOE05	Introduction to Simulation Software
3	P23ADO04	Introduction to Data Science
4	P23MBO01	Entrepreneurship Development & Venture Creation

DEPARTMENT OF CSE (IoT & CYBER SECURITY WITH BLOCKCHAIN TECH)
R-23 UNDER GRADUATE (B.Tech) COURSE STRUCTURE

III Year – II Semester						
S.No.	**Course Code**	**Title**	**L**	**T**	**P**	**C**
1	P23XXXXX	IoT Architecture and its Protocols	3	0	0	3
2	P23XXXXX	Cloud Computing	3	0	0	3
3	P23XXXXX	Blockchain Technology	3	0	0	3
4	P23XXXXX	Professional Elective–II	3	0	0	3
5	P23XXXXX	Professional Elective–III	3	0	0	3
6	P23XXXXX	Open Elective–II	3	0	0	3
7	P23XXXXX	Cloud Computing Lab	0	0	2	1
8	P23XXXXX	Blockchain Technology Lab	0	0	2	1
9	P23XXXXX	Soft Skills (Skill Enhancement Course)	0	1	2	2
10	P23XXXXX	Audit Course – Technical Paper Writing & IPR	2	0	0	-
Total Credits			23	1	4	25
Mandatory Community Service Project Internship of 08 weeks duration during summer vacation						

Professional Elective - II		
S.No.	**Course Code**	**Course Title**
1	P23XXXXX	Privacy & Security in IoT
2	P23XXXXX	DevOps
3	P23XXXXX	Machine Learning
4	P23XXXXX	Light Weight Cryptography

Professional Elective - III		
S.No.	**Course Code**	**Course Title**
1	P23XXXXX	Software Project Management
2	P23XXXXX	Cyber Security & Digital Forensics
3	P23XXXXX	Mobile Adhoc Networks
4	P23XXXXX	Natural Language Processing

Open Elective - II		
S.No.	**Course Code**	**Course Title**
1	P23XXXXX	Digital Marketing
2	P23XXXXX	Principles of Communication
3	P23XXXXX	Management Science
4	P23XXXXX	Principles of Signal Processing

DEPARTMENT OF CSE(IOT & CYBER SECURITY WITH BLOCK CHAIN TECH)
R-23 UNDER GRADUATE (B.Tech) COURSE STRUCTURE

IV Year I Semester						
S.No.	**Category**	**Title**	**L**	**T**	**P**	**C**
1	Professional Core		3	0	0	3
2	Professional Core		3	0	0	3
3	Management Course - II		2	0	0	2
4	Professional Elective - IV		3	0	0	3
5	Professional Elective - V		3	0	0	3
6	Open Elective - IV		3	0	0	3
7	Professional Core		0	0	2	1
8	Professional Core		0	0	2	1
9	Skill Enhancement Course		0	1	2	2
10	Audit Course	Constitution of India	2	0	0	-
11	Internship	Evaluation of Industry Internship	-	-	-	2
Total Credits			19	1	6	23

IV Year II Semester						
S.No.	**Category**	**Title**	**L**	**T**	**P**	**C**
1	Internship & Project Work	Full semester Internship & Project Work	0	0	24	12

Course Code	Course Name	Course Structure			
		L	T	P	C
P23BST02	Linear Algebra & Calculus (Common to All Branches of Engineering)	3	0	0	3

Internal Marks: 30 External Marks: 70

Course Objectives: To equip the students with standard concepts and tools at an intermediate to advanced level mathematics to develop the confidence and ability among the students to handle various real-world problems and their applications.

Course Outcomes: At the end of the course, the student will be able to

CO1: Demonstrate the understanding of rank of a matrix. Analyze the solutions of the system of linear equations.

CO2: Find the Eigen values and Eigen vectors of a matrix, apply Cayley-Hamilton theorem to determine inverse and power of a matrix and identify the nature of quadratic form.

CO3: Utilize mean value theorems to real life problems.

CO4: Familiarize with functions of several variables which are useful in optimization.

CO5: Familiarize with double and triple integrals of functions of several variables in two dimensions using Cartesian and polar coordinates and in three dimensions using cylindrical and spherical coordinates.

UNIT–I: Matrices

Rank of a matrix by echelon form, normal form. Cauchy–Binet formulae (without proof). Inverse of Non- singular matrices by Gauss-Jordan method, System of linear equations: Solving system of Homogeneous and Non-Homogeneous equations by Gauss elimination method, Jacobi and Gauss Seidel Iteration Methods.

UNIT–II: Eigenvalues, Eigenvectors and Orthogonal Transformation

Eigenvalues, Eigenvectors and their properties, Diagonalization of a matrix, Cayley-Hamilton Theorem (without proof), finding inverse and power of a matrix by Cayley-Hamilton Theorem, Quadratic forms and Nature of the Quadratic Forms, Reduction of Quadratic form to canonical forms by Orthogonal Transformation.

UNIT–III: Calculus

Mean Value Theorems: Rolle's Theorem, Lagrange's mean value theorem with their geometrical interpretation, Cauchy's mean value theorem, Taylor's and Maclaurin theorems with remainders (without proof), Problems and applications on the above theorems.

UNIT–IV: Partial differentiation and Applications (Multi variable calculus)

Functions of several variables: Continuity and Differentiability, Partial derivatives, total derivatives, chain rule, Taylor's and Maclaurin's series expansion of functions of two variables. Jacobians, Functional dependence, maxima and minima of functions of two variables, method of Lagrange multipliers.

UNIT–V: Multiple Integrals (Multi variable Calculus)

Double integrals, triple integrals, change of order of integration, change of variables to polar, cylindrical and spherical coordinates. Finding areas by double integrals and volumes by double integrals and triple integrals.

Text Books:

1. Higher Engineering Mathematics, B. S. Grewal, Khanna Publishers, 2017, 44^{th} Edition
2. Advanced Engineering Mathematics, Erwin Kreyszig, John Wiley & Sons, 2018, 10^{th} Edition.

Reference Books:

1. Thomas Calculus, George B. Thomas, Maurice D. Weir and Joel Hass, Pearson Publishers, 2018, 14^{th} Edition.
2. Advanced Engineering Mathematics, R. K. Jain and S. R. K. Iyengar, Alpha ScienceInternational Ltd., 2021 5^{th} Edition (9^{th} reprint).
3. Advanced Modern Engineering Mathematics, Glyn James, Pearson publishers, 2018, 5^{th} Edition.
4. Advanced Engineering Mathematics, Micheael Greenberg, , Pearson publishers, 9^{th} edition.
5. Higher Engineering Mathematics, H. K Das, Er. Rajnish Verma, S. Chand Publications, 2014, Third Edition (Reprint 2021)

Course Code	Course Name	Course Structure			
		L	T	P	C
P23EST03	Basic Electrical & Electronics Engineering (Common to All branches of Engineering)	3	0	0	3

Internal Marks: 30 External Marks: 70

Course Objectives:

To expose to the field of electrical & electronics engineering, laws and principles of electrical/ electronic engineering and to acquire fundamental knowledge in the relevant field.

Course Outcomes: At the end of the course, the student will be able to

CO1: Describe fundamental laws, operating principles of motors/generators, MC/MI instruments (L2)

CO2: Demonstrate the working of electrical machines, measuring instruments and power generation stations. (L2)

CO3: Apply mathematical tools and fundamental concepts to derive various equations related to electrical circuits and machines. (L3)

CO4: Calculate electrical load and electricity bill of residential and commercial buildings. (L4)

PART A: BASIC ELECTRICAL ENGINEERING

UNIT–I: DC & AC Circuits

DC Circuits: Electrical circuit elements (R, L and C), Ohm's Law and its limitations, KCL & KVL, series, parallel, series-parallel circuits, Super Position theorem, Simple numerical problems.

AC Circuits: A.C. Fundamentals: Equation of AC Voltage and current, waveform, time period, frequency, amplitude, phase, phase difference, average value, RMS value, form factor, peak factor, Voltage and current relationship with phasor diagrams in R, L, and C circuits, Concept of Impedance, Active power, reactive power and apparent power, Concept of power factor (Simple Numerical problems).

UNIT–II: Machines and Measuring Instruments

Machines: Construction, principle and operation of (i) DC Motor, (ii) DC Generator, (iii) Single Phase Transformer, Applications.

Measuring Instruments: Construction and working principle of Permanent Magnet Moving Coil (PMMC), Moving Iron (MI) Instruments and Wheat Stone bridge.

UNIT–III: Energy Resources, Electricity Bill & Safety Measures

Energy Resources: Conventional and non-conventional energy resources; Layout and operation of various Power Generation systems: Hydel, Solar & Wind power generation.

Electricity bill: Power rating of household appliances including air conditioners, PCs, Laptops, Printers, etc. Definition of "unit" used for consumption of electrical

energy, two-part electricity tariff, calculation of electricity bill for domestic consumers.

Equipment Safety Measures: Working principle of Fuse and Miniature circuit breaker (MCB), merits and demerits. Personal safety measures: Electric Shock, Earthing and its types, Safety Precautions to avoid shock.

Text Books:

1. Basic Electrical Engineering, D. C. Kulshreshtha, Tata McGraw Hill, 2019, First Edition
2. Power System Engineering, P.V. Gupta, M.L. Soni, U.S. Bhatnagar and A. Chakrabarti, Dhanpat Rai & Co, 2013
3. Fundamentals of Electrical Engineering, Rajendra Prasad, PHI publishers, 2014, Third Edition

Reference Books:

1. Basic Electrical Engineering, D. P. Kothari and I. J. Nagrath, Mc Graw Hill, 2019, Fourth Edition
2. Principles of Power Systems, V.K. Mehtha, S.Chand Technical Publishers, 2020
3. Basic Electrical Engineering, T. K. Nagsarkar and M. S. Sukhija, Oxford University Press, 2017.
4. Basic Electrical and Electronics Engineering, S. K. Bhatacharya, Person Publications, 2018, Second Edition.

Web Resources:

1. https://nptel.ac.in/courses/108105053
2. https://nptel.ac.in/courses/108108076

PART B: BASIC ELECTRONICS ENGINEERING

Course Objectives:

To teach the fundamentals of semiconductor devices and its applications, principles of digital electronics.

Course Outcomes: At the end of the course, the student will be able to

CO1: Compare the operation and characteristics of various semiconductor devices and their utilization.

CO2: Implement various power supply circuits using diodes and amplifier circuits using BJT.

CO3: Categorize various types of Logic gates and implement simple combinational logic circuits.

UNIT–I: SEMICONDUCTOR DEVICES

Introduction - Evolution of electronics – Vacuum tubes to nano electronics - Characteristics of PN Junction Diode — Zener Effect — Zener Diode and its Characteristics. Bipolar Junction

Transistor — CB, CE, CC Configurations and Characteristics.

UNIT–II: BASIC ELECTRONIC CIRCUITS AND INSTRUMENTTAION

Rectifiers and power supplies: Block diagram description of a dc power supply, working of a full wave bridge rectifier, capacitor filter (no analysis), working of simple zener voltage regulator.

Electronic Instrumentation: Block diagram of an electronic instrumentation system.

UNIT–III: DIGITAL ELECTRONICS

Overview of Number Systems, Logic gates including Universal Gates, BCD codes, Excess-3 code, Gray code, Hamming code. Boolean Algebra, Basic Theorems and properties of Boolean Algebra, Truth Tables and Functionality of Logic Gates – NOT, OR, AND, NOR, NAND, XOR and XNOR. Simple combinational circuits–Half and Full Adders.

Text Books:

1. R. L. Boylestad & Louis Nashlesky, Electronic Devices & Circuit Theory, Pearson Education, 2021.
2. R. P. Jain, Modern Digital Electronics, 4^{th} Edition, Tata Mc Graw Hill, 2009

Reference Books:

1. R. S. Sedha, A Textbook of Electronic Devices and Circuits, S. Chand & Co, 2010.
2. Santiram Kal, Basic Electronics- Devices, Circuits and IT Fundamentals, Prentice Hall, India, 2002.
3. R. T. Paynter, Introductory Electronic Devices & Circuits – Conventional Flow Version, Pearson Education,2009.

Semester end examination pattern:

1. Question paper shall be in two parts viz., Part A and Part B with equal weightage of 35 marks each.
2. In each part, question 1 shall contain 5 compulsory short answer questions for a total of 5 marks such that each question carries 1 mark.
3. In each part, questions from 2 to 4, there shall be either/or type questions of 10 marks each. Student shall answer any one of them.
4. The questions from 2 to 4 shall be set by covering one unit of the syllabus for each question.

Course Code	Course Name	Course Structure			
		L	T	P	C
P23EST04	Engineering Graphics (Common to All branches of Engineering)	1	0	4	3

Internal Marks: 30 External Marks: 70

Course Objectives:

1. To enable the students with various concepts like dimensioning, conventions and standards related to Engineering Drawing
2. To impart knowledge on the projection of points, lines and plane surfaces
3. To improve the visualization skills for better understanding of projection of solids
4. To develop the imaginative skills of the students required to understand Section of solids and Developments of surfaces.
5. To make the students understand the viewing perception of a solid object in Isometric and orthographic projections.

Course Outcomes: At the end of the course, the student will be able to

CO1: Understand the principles of engineering drawing, including polygons, engineering curves, scales.

CO2: Draw and interpret orthographic projections of points, lines, planes.

CO3: Understand and draw projection of solids in various positions in first quadrant.

CO4: Explain principles behind sections of solids and development of surfaces.

CO5: Convert the isometric view into orthographic view and vice versa.

UNIT–I:

Introduction: Lines, Lettering and Dimensioning, Geometrical Constructions and Constructing regular polygons by general methods.

Curves: construction of ellipse, parabola and hyperbola by general, Cycloids, Involutes, Normal and tangent to Curves.

Scales: Plain scales, diagonal scales and vernier scales.

UNIT–II:

Orthographic Projections: Reference plane, importance of reference lines or Plane, Projections of a point situated in any one of the four quadrants.

Projections of Straight Lines: Projections of straight lines parallel to both reference planes, perpendicular to one reference plane and parallel to other reference plane, inclined to one reference plane and parallel to the other reference plane. Projections of Straight Line Inclined to both the reference planes

Projections of Planes: regular planes Perpendicular to both reference planes, parallel to one reference plane and inclined to the other reference plane; plane inclined to both the reference planes.

UNIT–III:

Projections of Solids: Types of solids: Polyhedra and Solids of revolution. Projections of solids in simple positions: Axis perpendicular to horizontal plane, Axis perpendicular to vertical plane and Axis parallel to both the reference planes, Projection of Solids with axis inclined to one reference plane and parallel to another plane.

UNIT–IV:

Sections of Solids: Perpendicular and inclined section planes, Sectional views and True shape of section, Sections of solids in simple position only.

Development of Surfaces: Methods of Development: Parallel line development and radial line development. Development of a cube, prism, cylinder, pyramid and cone.

UNIT–V: Semiconductors

Conversion of Views: Conversion of isometric views to orthographic views; Conversion of orthographic views to isometric views.

Computer graphics: Creating 2D&3D drawings ofobjects including PCB and Transformations using Auto CAD (Not for end examination).

Text Books:

1. N. D. Bhatt, Engineering Drawing, Charotar Publishing House, 2016.

Reference Books:

1. Engineering Drawing, K.L. Narayana and P. Kannaiah, Tata McGraw Hill, 2013.
2. Engineering Drawing, M.B.Shah and B.C. Rana, Pearson Education Inc,2009.
3. Engineering Drawing with an Introduction to AutoCAD, Dhananjay Jolhe, Tata McGraw Hill, 2017.

Course Code	Course Name	Course Structure			
		L	T	P	C
P23EST02	Introduction To Programming (Common to All branches of Engineering)	3	0	0	3

Internal Marks: 30 External Marks: 70

Course Objectives:

1. To introduce students to the fundamentals of computer programming.
2. To provide hands-on experience with coding and debugging.
3. To foster logical thinking and problem-solving skills using programming.
4. To familiarize students with programming concepts such as data types, control structures, functions, and arrays.
5. To encourage collaborative learning and teamwork in coding projects.

Course Outcomes: At the end of the course, the student will be able to

CO1: Understand basics of computers, the concept of algorithm, flowcharts and algorithmic thinking.

CO2: Analyse a problem and develop programs involving decision structures and loops.

CO3: Implement different operations on arrays and solve problems using Strings.

CO4: Design the programs by applying the features of pointers, structures and unions.

CO5: Develop problem-solving skills and the ability to debug and optimize the code by using functions and files.

UNIT–I: Introduction to Programming and Problem Solving

History of Computers, Basic organization of a computer: ALU, input-output units, memory, program counter, Introduction to Programming Languages, Basics of a Computer Program- Algorithms, flowcharts (Using Dia Tool), pseudo code. Introduction to Compilation and Execution, Primitive Data Types, Variables, and Constants, Basic Input and Output, Operations, Type Conversion, and Casting.

Problem solving techniques: Algorithmic approach, characteristics of algorithm, Problem solving strategies: Top-down approach, Bottom-up approach, Time and space complexities of algorithms

UNIT–II: Control Structures

Simple sequential programs Conditional Statements (if, if-else, switch), Loops (for, while, do- while) Break and Continue.

UNIT–III: Arrays and Strings

Arrays indexing, memory model, programs with array of integers, two dimensional arrays, Introduction to Strings.

UNIT–IV: Pointers & User Defined Data types

Pointers, dereferencing (Pointer to Pointer) and address operators, pointer and address arithmetic, array manipulation using pointers, User-defined data types-Structures and Unions.

UNIT–V: Functions & File Handling

Introduction to Functions, Function Declaration and Definition, Function call Return Types and Arguments, modifying parameters inside functions using pointers, arrays as parameters. Scope and Lifetime of Variables, Basics of File Handling

Note: The syllabus is designed with C Language as the fundamental language of implementation.

Text Books:

1. "The C Programming Language", Brian W. Kernighan and Dennis M. Ritchie, Prentice- Hall, 1988
2. Schaum's Outline of Programming with C, Byron S Gottfried, McGraw-Hill Education, 1996

Reference Books:

1. Computing fundamentals and C Programming, Balagurusamy, E., McGraw-Hill Education, 2008.
2. Programming in C, Rema Theraja, Oxford, 2016, 2^{nd} edition
3. C Programming, A Problem Solving Approach, Forouzan, Gilberg, Prasad, CENGAGE, 3rd edition

Course Code	Course Name	Course Structure			
		L	T	P	C
P23ESL04	IT Workshop (Common to All branches of Engineering)	0	0	2	1

Internal Marks: 30 External Marks: 70

Course Objectives:

1. To introduce the internal parts of a computer, peripherals, I/O ports, connecting cables
2. To demonstrate configuring the system as Dual boot both Windows and other Operating Systems Viz. Linux, BOSS
3. To teach basic command line interface commands on Linux.
4. To teach the usage of Internet for productivity and self-paced life-long learning
5. To introduce Compression, Multimedia and Antivirus tools and Office Tools such as Word processors, Spread sheets and Presentation tools.

Course Outcomes:

CO1: Understand the fundamental principles of computer hardware components and their interconnections.

CO2: Analyze the historical development of the Internet and its impact on global communication.

CO3: Analyze the underlying principles and structure of LaTeX and Word documents.

CO4: Implement essential toolbars and ribbons for common spreadsheet tasks.

CO5: Understand the principles of effective content organization in presentations.

CO6: Implement AI tools like ChatGPT into their professional workflows for content creation and translation.

PC Hardware & Software Installation

Task 1: Identify the peripherals of a computer, components in a CPU and its functions. Draw the block diagram of the CPU along with the configuration of each peripheral and submit to your instructor.

Task 2: Every student should disassemble and assemble the PC back to working condition. Lab instructors should verify the work and follow it up with a Viva. Also students need to go through the video which shows the process of assembling a PC. A video would be given as part of the course content.

Task 3: Every student should individually install MS windows on the personal computer. Lab instructor should verify the installation and follow it up with a Viva.

Task 4: Every student should install Linux on the computer. This computer should have windows installed. The system should be configured as dual boot

(VMWare) with both Windows and Linux. Lab instructors should verify the installation and follow it up with a Viva

Task 5: Every student should install BOSS on the computer. The system should be configured as dual boot (VMWare) with both Windows and BOSS. Lab instructors should verify the installation and follow it up with a Viva

Internet & World Wide Web

Task1: Orientation & Connectivity Boot Camp: Students should get connected to their Local Area Network and access the Internet. In the process they configure the TCP/IP setting. Finally students should demonstrate, to the instructor, how to access the websites and email. If there is no internet connectivity preparations need to be made by the instructors to simulate the WWW on the LAN.

Task 2: Web Browsers, Surfing the Web: Students customize their web browsers with the LAN proxy settings, bookmarks, search toolbars and pop up blockers. Also, plug-ins like Macromedia Flash and JRE for applets should be configured.

Task 3: Search Engines & Netiquette: Students should know what search engines are and how to use the search engines. A few topics would be given to the students for which they need to search on Google. This should be demonstrated to the instructors by the student.

Task 4: Cyber Hygiene: Students would be exposed to the various threats on the internet and would be asked to configure their computer to be safe on the internet. They need to customize their browsers to block pop ups, block active x downloads to avoid viruses and/or worms.

LaTeX and WORD

Task 1 – Word Orientation: The mentor needs to give an overview of LaTeX and Microsoft (MS) office or equivalent (FOSS) tool word: Importance of LaTeX and MS office or equivalent (FOSS) tool Word as word Processors, Details of the four tasks and features that would be covered in each, Using LaTeX and word – Accessing, overview of toolbars, saving files, Using help and resources, rulers, format painter in word.

Task 2: Using LaTeX and Word to create a project certificate. Features to be covered:- Formatting Fonts in word, Drop Cap in word, Applying Text effects, Using Character Spacing, Borders and Colors, Inserting Header and Footer, Using Date and Time option in both LaTeX and Word.

Task 3: Creating project abstract Features to be covered:- Formatting Styles, Inserting table, Bullets and Numbering, Changing Text Direction, Cell alignment, Footnote, Hyperlink, Symbols, Spell Check, Track Changes.

Task 4: Creating a Newsletter: Features to be covered:- Table of Content, Newspaper columns, Images from files and clipart, Drawing toolbar and Word Art, Formatting Images, Textboxes, Paragraphs and Mail Merge in word.

EXCEL

Excel Orientation: The mentor needs to tell the importance of MS office or equivalent (FOSS) tool Excel as a Spreadsheet tool, give the details of the four tasks and features that would be covered in each. Using Excel – Accessing, overview of

toolbars, saving excel files, Using help and resources.

Task 1: Creating a Scheduler - Features to be covered: Gridlines, Format Cells, Summation, auto fill, Formatting Text

Task 2: Calculating GPA -. Features to be covered:- Cell Referencing, Formulae in excel – average, std. deviation, Charts, Renaming and Inserting worksheets, Hyper linking, Count function,

LOOKUP/VLOOKUP

Task 3: Split cells, freeze panes, group and outline, Sorting, Boolean and logical operators, Conditional formatting

POWER POINT

Task 1: Students will be working on basic power point utilities and tools which help them create basic power point presentations. PPT Orientation, Slide Layouts, Inserting Text, Word Art, Formatting Text, Bullets and Numbering, Auto Shapes, Lines and Arrows in PowerPoint.

Task 2: Interactive presentations - Hyperlinks, Inserting –Images, Clip Art, Audio, Video, Objects, Tables and Charts.

Task 3: Master Layouts (slide, template, and notes), Types of views (basic, presentation, slide slotter, notes etc), and Inserting – Background, textures, Design Templates, Hidden slides.

AI TOOLS – ChatGPT

Task 1: Prompt Engineering: Experiment with different types of prompts to see how the model responds. Try asking questions, starting conversations, or even providing incomplete sentences to see how the model completes them.

◦ Ex: Prompt: "You are a knowledgeable AI. Please answer the following question: What is the capital of France?"

Task 2: Creative Writing: Use the model as a writing assistant. Provide the beginning of a story or a description of a scene, and let the model generate the rest of the content. This can be a fun way to brainstorm creative ideas

◦ Ex: Prompt: "In a world where gravity suddenly stopped working, people started floating upwards. Write a story about how society adapted to this new reality."

Task 3: Language Translation: Experiment with translation tasks by providing a sentence in one language and asking the model to translate it into another language. Compare the output to see how accurate and fluent the translations are.

◦ Ex: Prompt: "Translate the following English sentence to French: 'Hello, how are you doing today?'"

Reference Books:

1. Comdex Information Technology course tool kit, Vikas Gupta, WILEY Dream tech, 2003
2. The Complete Computer upgrade and repair book, Cheryl A Schmidt, WILEY Dream tech, 2013, 3^{rd} edition
3. Introduction to Information Technology, ITL Education Solutions limited, Pearson Education, 2012, 2^{nd} edition

4. PC Hardware - A Handbook, Kate J. Chase, PHI (Microsoft)
5. LaTeX Companion, Leslie Lamport, PHI/Pearson.
6. IT Essentials PC Hardware and Software Companion Guide, David Anfins on and Ken Quamme. – CISCO Press, Pearson Education, 3^{rd} edition
7. IT Essentials PC Hardware and Software Labs and Study Guide, Patrick Regan– CISCO Press, Pearson Education, 3^{rd} edition

Course Code	Course Name	Course Structure			
		L	T	P	C
P23BSL02	Engineering Physics Lab (Common to All Branches of Engineering)	0	0	2	1

Internal Marks: 30 External Marks: 70

Course Objectives:

To bridge the gap between the Physics in school at 10+2 level and UG level engineering courses by identifying the importance of the optical phenomenon like interference, diffraction etc, enlightening the periodic arrangement of atoms in crystalline solids and concepts of quantum mechanics, introduce novel concepts of dielectric and magnetic materials, physics of semiconductors.

Course Outcomes: At the end of the course, the student will be able to

CO1: Apply the concepts of wave optics to get wavelength of light.

CO2: Apply the concept of resonance in sonometer and melde's experiments for getting frequency.

CO3: Study the earth's gravity and rigidity modulus of material.

CO4: Study electrostatics and magnetism to determine its dependent properties.

CO5: Determine the properties of semiconductors and Planks constant.

List of Experiments:

1. Determination of radius of curvature of a given Plano-convex lens by Newton's rings.
2. Determination of wavelengths of different spectral lines in mercury spectrum using diffraction grating in normal incidence configuration.
3. Verification of Brewster's law
4. Determination of dielectric constant using charging and discharging method.
5. Study the variation of B versus H by magnetizing the magnetic material (B-H curve).
6. Determination of wavelength of Laser light using diffraction grating.
7. Estimation of Planck's constant using photoelectric effect.
8. Determination of the resistivity of semiconductors by four probe methods.
9. Determination of energy gap of a semiconductor using p-n junction diode.
10. Magnetic field along the axis of a current carrying circular coil by Stewart Gee's Method.
11. Determination of Hall voltage and Hall coefficient of a given semiconductor using Hall effect.

12. Determination of temperature coefficients of a thermistor.
13. Determination of acceleration due to gravity and radius of Gyration by using a compound pendulum.
14. Determination of magnetic susceptibility by Kundt's tube method.
15. Determination of rigidity modulus of the material of the given wire using Torsional pendulum.
16. Sonometer: Verification of laws of stretched string.
17. Determination of young's modulus for the given material of wooden scale by non- uniform bending (or double cantilever) method.
18. Determination of Frequency of electrically maintained tuning fork by Melde's experiment.

Note: Any TEN of the listed experiments are to be conducted. Out of which any TWO experiments may be conducted in virtual mode.

References:

1. A Textbook of Practical Physics - S. Balasubramanian, M.N. Srinivasan, S. Chand Publishers, 2017.

Web Resources:

1. www.vlab.co.in
2. https://phet.colorado.edu/en/simulations/filter?subjects=physics&type=html,prototype

Course Code	Course Name	Course Structure			
		L	T	P	C
P23ESL03	Electrical & Electronics Engineering Workshop (Common to All branches of Engineering)	0	0	3	1.5

Internal Marks: 30 External Marks: 70

Course Objectives:

To impart knowledge on the fundamental laws & theorems of electrical circuits, functions of electrical machines and energy calculations.

Course Outcomes: At the end of the course, the student will be able to

CO1: Measure voltage, current and power in an electrical circuit. (L3)

CO2: **CO2:** Measure of Resistance using Wheat stone bridge (L4)

CO3: Discover critical field resistance and critical speed of DC shunt generators. (L4)

CO4: Investigate the effect of reactive power and power factor in electrical loads. (L5)

Activities:

1. Familiarization of commonly used Electrical & Electronic Workshop Tools: Bread board, Solder, cables, relays, switches, connectors, fuses, Cutter, plier, screwdriver set, wire stripper, flux, knife/blade, soldering iron, de-soldering pump etc.

   ◦ Provide some exercises so that hardware tools and instruments are learned to be used by the students.

2. Familiarization of Measuring Instruments like Voltmeters, Ammeters, multimeter, LCR-Q meter, Power Supplies, CRO, DSO, Function Generator, Frequency counter.

   ◦ Provide some exercises so that measuring instruments are learned to be used by the students.

3. Components:

   ◦ Familiarization/Identification of components (Resistors, Capacitors, Inductors, Diodes, transistors, IC's etc.) – Functionality, type, size, colour coding package, symbol, cost etc.

   ◦ Testing of components like Resistor, Capacitor, Diode, Transistor, ICs etc. - Compare values of components like resistors, inductors, capacitors etc with the measured values by using instruments

PART A: ELECTRICAL ENGINEERING LAB

List of experiments:

1. Verification of KCL and KVL
2. Verification of Superposition theorem
3. Measurement of Resistance using Wheat stone bridge
4. Magnetization Characteristics of DC shunt Generator
5. Measurement of Power and Power factor using Single-phase wattmeter
6. Measurement of Earth Resistance using Megger
7. Calculation of Electrical Energy for Domestic Premises

Reference Books:

1. Basic Electrical Engineering, D. C. Kulshreshtha, Tata McGraw Hill, 2019, First Edition
2. Power System Engineering, P.V. Gupta, M.L. Soni, U.S. Bhatnagar and A. Chakrabarti, Dhanpat Rai & Co, 2013
3. Fundamentals of Electrical Engineering, Rajendra Prasad, PHI publishers, 2014, Third Edition

Note: Minimum Six Experiments to be performed.

PART B: ELECTRONICS ENGINEERING LAB

Course Objectives:

To impart knowledge on the principles of digital electronics and fundamentals of electron devices & its applications.

Course Outcomes: At the end of the course, the student will be able to

CO1: Identify & testing of various electronic components.

CO2: Understand the usage of electronic measuring instruments.

CO3: Plot and discuss the characteristics of various electron devices.

CO4: Explain the operation of a digital circuit.

List of Experiments:

1. Plot V-I characteristics of PN Junction diode A) Forward bias B) Reverse bias.
2. Plot V – I characteristics of Zener Diode and its application as voltage Regulator.
3. Implementation of half wave and full wave rectifiers

4. Plot Input & Output characteristics of BJT in CE and CB configurations
5. Frequency response of CE amplifier.
6. Simulation of RC coupled amplifier with the design supplied
7. Verification of Truth Table of AND, OR, NOT, NAND, NOR, Ex-OR, Ex-NOR gates using ICs.
8. Verification of Truth Tables of S-R, J-K& D flip flops using respective ICs.

Tools / Equipment Required: DC Power supplies, Multi meters, DC Ammeters, DC Voltmeters, AC Voltmeters, CROs, all the required active devices.

References:

1. R. L. Boylestad & Louis Nashlesky, Electronic Device & Circuit Theory, Pearson Education, 2021.
2. R. P. Jain, Modern Digital Electronics, 4^{th} Edition, Tata Mc Graw Hill, 2009
3. R. T. Paynter, Introductory Electronic Devices & Circuits – Conventional Flow Version, Pearson Education, 2009.

Note: Minimum Six Experiments to be performed. All the experiments shall be implemented using both Hardware and Software.

Course Code	Course Name	Course Structure			
		L	T	P	C
P23ESL02	Computer Programming Lab (Common to All branches of Engineering)	0	0	3	1.5

Internal Marks: 30 External Marks: 70

Course Objectives:

The course aims to give students hands – on experience and train them on the concepts of the C- programming language.

Course Outcomes: At the end of the course, the student will be able to

CO1: Understand and trace the execution of programs written in C language.

CO2: Analyze the right control structure for solving the problem.

CO3: Develop C programs which utilize memory efficiently using programming constructs like pointers and structures

CO4: Develop, Debug and Execute programs to demonstrate the applications of arrays, functions, basic concepts of pointers in C.

UNIT–I:

WEEK 1

Objective: Getting familiar with the programming environment on the computer and writing the first program.

Suggested Experiments/Activities:

Tutorial 1: Problem-solving using Computers.

Lab1: Familiarization with programming environment

1. Basic Linux environment and its editors like Vi, Vim & Emacs etc.
2. Exposure to Turbo C, gcc
3. Writing simple programs using printf(), scanf()

WEEK 2

Objective: Getting familiar with how to formally describe a solution to a problem in a series of finite steps both using textual notation and graphic notation.

Suggested Experiments/Activities:

Tutorial 2: Problem-solving using Algorithms and Flow charts.

Lab2: Converting algorithms/flow charts into C Source code.

Developing the algorithms/flowcharts for the following sample programs

1. Sum and average of 3 numbers
2. Conversion of Fahrenheit to Celsius and vice versa
3. Simple interest calculation

WEEK 3

Objective: Learn how to define variables with the desired data-type, initialize them with appropriate values and how arithmetic operators can be used with variables and constants.

Suggested Experiments/Activities:
Tutorial 3: Variable types and type conversions:
Lab3: Simple computational problems using arithmetic expressions.

1. Finding the square root of a given number
2. Finding compound interest
3. Area of a triangle using heron's formulae
4. Distance travelled by an object

UNIT II
WEEK 4

Objective: Explore the full scope of expressions, type-compatibility of variables & constants and operators used in the expression and how operator precedence works.

Suggested Experiments/Activities:
Tutorial4: Operators and the precedence and as associativity:
Lab4: Simple computational problems using the operator' precedence and associativity

1. Evaluate the following expressions.
   (a) A+B*C+(D*E) + F*G
   (b) A/B*C-B+A*D/3
   (c) A+++B—A
   (d) J= (i++) + (++i)
2. Find the maximum of three numbers using conditional operator
3. Take marks of 5 subjects in integers, and find the total, average in float

WEEK 5

Objective: Explore the full scope of different variants of "if construct" namely if-else, null- else, if-else if*-else, switch and nested-if including in what scenario each one of them can be used and how to use them. Explore all relational and logical operators while writing conditionals for 'if construct'.

Suggested Experiments/Activities:
Tutorial 5: Branching and logical expressions:
Lab5: Problems involving if-then-else structures.

1. Write a C program to find the max and min of four numbers using if-else.

2. Write a C program to generate electricity bill.
3. TFind the roots of the quadratic equation.
4. Write a C program to simulate a calculator using switch case.
5. Write a C program to find the given year is a leap year or not.

WEEK 6

Objective: Explore the full scope of iterative constructs namely while loop, do-while loop and for loop in addition to structured jump constructs like break and continue including when each of these statements is more appropriate to use.

Suggested Experiments/Activities:
Tutorial 6: Loops, while and for loops
Lab6: Iterative problems e.g., the sum of series

1. Find the factorial of given number using any loop.
2. Find the given number is a prime or not.
3. Compute sine and cos series
4. Checking a number palindrome
5. Construct a pyramid of numbers.

UNIT III
WEEK 7

Objective: Explore the full scope of Arrays construct namely defining and initializing 1-D and 2-D and more generically n-D arrays and referencing individual array elements from the defined array. Using integer 1-D arrays, explore search solution linear search.

Suggested Experiments/Activities:
Tutorial 7: 1 D Arrays: searching.
Lab7: 1D Array manipulation, linear search

1. Find the min and max of a 1-D integer array.
2. Perform linear search on1D array.
3. The reverse of a 1D integer array
4. Find 2's complement of the given binary number.
5. Eliminate duplicate elements in an array.

WEEK 8

Objective: Explore the difference between other arrays and character arrays that can be used as Strings by using null character and get comfortable with string by doing experiments that will reverse a string and concatenate two strings. Explore sorting solution bubble sort using integer arrays.

Suggested Experiments/Activities:
Tutorial 8: 2 D Arrays: sorting and Strings.
Lab 8: Matrix problems, String operations, Bubble sort

1. Addition of two matrices
2. Multiplication two matrices
3. Sort array elements using bubble sort
4. Concatenate two strings without built-in functions
5. Reverse a string using built-in and without built-in string functions

UNIT IV
WEEK 9

Objective: Explore pointers to manage a dynamic array of integers, including memory allocation & value initialization, resizing changing and reordering the contents of an array and memory de-allocation using malloc (), calloc (), realloc () and free () functions. Gain experience processing command-line arguments received by C

Suggested Experiments/Activities:
Tutorial 9: Pointers, structures and dynamic memory allocation
Lab 9: Pointers and structures, memory dereference.

1. Write a C program to find the sum of a 1D array using malloc()
2. Write a C program to find the total, average of n students using structures
3. Enter n students data using calloc() and display failed students list
4. Read student name and marks from the command line and display the student details along with the total.
5. Write a C program to implement realloc()

WEEK 10

Objective: Experiment with C Structures, Unions, bit fields and self-referential structures (Singly linked lists) and nested structures

Suggested Experiments/Activities:
Tutorial 10: Bitfields, Self-Referential Structures, Linked lists
Lab10 : Bitfields, linked lists
Read and print a date using dd/mm/yyyy format using bit-fields and differentiate the same without using bit- fields

1. Create and display a singly linked list using self-referential structure.
2. Demonstrate the differences between structures and unions using a C program.
3. Write a C program to shift/rotate using bitfields.
4. Write a C program to copy one structure variable to another structure of the same type.

UNIT V
WEEK 11

Objective: Explore the Functions, sub-routines, scope and extent of variables, doing some experiments by parameter passing using call by value. Basic methods of numerical integration

Suggested Experiments/Activities:
Tutorial 11: Functions, call by value, scope and extent,
Lab 11: Simple functions using call by value, solving differential equations using Eulers theorem.

1. Write a C function to calculate NCR value.
2. Write a C function to find the length of a string.
3. Write a C function to transpose of a matrix.
4. Write a C function to demonstrate numerical integration of differential equations using Euler's method

WEEK 12

Objective: Explore how recursive solutions can be programmed by writing recursive functions that can be invoked from the main by programming at-least five distinct problems that have naturally recursive solutions.

Suggested Experiments/Activities:
Tutorial 12: Recursion, the structure of recursive calls
Lab 12: Recursive functions

1. Write a recursive function to generate Fibonacci series.
2. Write a recursive function to find the lcm of two numbers.
3. Write a recursive function to find the factorial of a number.
4. Write a C Program to implement Ackermann function using recursion.
5. Write a recursive function to find the sum of series.

WEEK 13

Objective: Explore the basic difference between normal and pointer variables, Arithmetic operations using pointers and passing variables to functions using pointers

Suggested Experiments/Activities:
Tutorial 13: Call by reference, dangling pointers
Lab 13: Simple functions using Call by reference, Dangling pointers.

1. Write a C program to swap two numbers using call by reference.
2. Demonstrate Dangling pointer problem using a C program.
3. Write a C program to copy one string into another using pointer.
4. Write a C program to find no of lowercase, uppercase, digits and other characters using pointers.

WEEK 14

Objective: To understand data files and file handling with various file I/O functions. Explore the differences between text and binary files.

Suggested Experiments/Activities:
Tutorial 12: Recursion, the structure of recursive calls
Lab 14: File operations

1. Write a C program to write and read text into a file.
2. Write a C program to write and read text into a binary file using fread() and fwrite()
3. Copy the contents of one file to another file.
4. Write a C program to merge two files into the third file using command-line arguments.
5. Find no. of lines, words and characters in a file
6. Write a C program to print last n characters of a given file.

Text Books:

1. Ajay Mittal, Programming in C: A practical approach, Pearson.
2. Byron Gottfried, Schaum & 39; Outline of Programming with C, McGraw Hill

Reference Books:

1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice- Hall of India
2. C Programming, A Problem-Solving Approach, Forouzan, Gilberg, Prasad, CENGAGE

Course Code	Course Name	Course Structure			
		L	T	P	C
P23BST08	NSS/NCC/SCOUTS & Guides/Community Service (Common to All branches of Engineering)	0	0	1	0.5

Course Objectives:

The objective of introducing this course is to impart discipline, character, fraternity, teamwork, social consciousness among the students and engaging them in selfless service.

Course Outcomes: At the end of the course, the student will be able to

CO1: Understand the importance of discipline, character and service motto.

CO2: Solve some societal issues by applying acquired knowledge, facts, and techniques.

CO3: Explore human relationships by analyzing social problems.

CO4: Determine to extend their help for the fellow beings and downtrodden people.

CO5: Develop leadership skills and civic responsibilities.

UNIT–I: Orientation

General Orientation on NSS/NCC/ Scouts & Guides/Community Service activities, career guidance.

Activities:

1. Conducting –ice breaking sessions-expectations from the course-knowing personal talents and skills
2. Conducting orientations programs for the students –future plans-activities-releasing road map etc.
3. Displaying success stories-motivational biopics- award winning movies on societal issues etc.
4. Conducting talent show in singing patriotic songs-paintings- any other contribution.

UNIT–II: Nature & Care :

Activities:

1. Best out of waste competition.
2. Poster and signs making competition to spread environmental awareness.
3. Recycling and environmental pollution article writing competition.
4. Organising Zero-waste day.
5. Digital Environmental awareness activity via various social media platforms.
6. Virtual demonstration of different eco-friendly approaches for sustainable living.

7. Write a summary on any book related to environmental issues.

UNIT–III: Community Service
Activities:

1. Conducting One Day Special Camp in a village contacting village-area leaders- Survey in the village, identification of problems- helping them to solve via media- authorities- experts-etc.
2. Conducting awareness programs on Health-related issues such as General Health, Mental health, Spiritual Health, HIV/AIDS,
3. Conducting consumer Awareness. Explaining various legal provisions etc.
4. Women Empowerment Programmes- Sexual Abuse, Adolescent Health and Population Education.
5. Any other programmes in collaboration with local charities, NGOs etc.

Reference Books:

1. Nirmalya Kumar Sinha & Surajit Majumder, A Text Book of National Service Scheme Vol;.I, Vidya Kutir Publication, 2021 (ISBN 978-81-952368-8-6)
2. Red Book - National Cadet Corps – Standing Instructions Vol I & II, Directorate General of NCC, Ministry of Defence, New Delhi
3. Davis M. L. and Cornwell D. A., "Introduction to Environmental Engineering", McGraw Hill, New York 4/e 2008
4. Masters G. M., Joseph K. and Nagendran R. "Introduction to Environmental Engineering and Science", Pearson Education, New Delhi. 2/e 2007
5. Ram Ahuja. Social Problems in India, Rawat Publications, New Delhi.

General Guidelines:

1. Institutes must assign slots in the Timetable for the activities.
2. Institutes are required to provide instructor to mentor the students.

Evaluation Guidelines:

1. Evaluated for a total of 100 marks.
2. A student can select 6 activities of his/her choice with a minimum of 01 activity per unit. Each activity shall be evaluated by the concerned teacher for 15 marks, totalling to 90 marks.
3. A student shall be evaluated by the concerned teacher for 10 marks by conducting viva voce on the subject.

Course Code	Course Name	Course Structure			
		L	T	P	C
P23BST01	Communicative English (Common to All Branches of Engineering)	2	0	0	2

Internal Marks: 30 External Marks: 70

Course Objectives: The main objective of introducing this course, Communicative English, is to facilitate effective listening, Reading, Speaking and Writing skills among the students. It enhances the same in their comprehending abilities, oral presentations, reporting useful information and providing knowledge of grammatical structures and vocabulary. This course helps the students to make them effective in speaking and writing skills and to make them industry ready.

Course Outcomes:

CO1: Understand the context, topic, and pieces of specific information from social or Transactional dialogues.

CO2: Apply grammatical structures to formulate sentences and correct word forms.

CO3: Analyze discourse markers to speak clearly on a specific topic in informal discussions.

CO4: Evaluate reading / listening texts and to write summaries based on global comprehension of these texts.

CO5: Create a coherent paragraph, essay, and resume

UNIT I

Lesson: HUMAN VALUES: Gift of Magi **(Short Story)**

Listening: Identifying the topic, the context and specific pieces of information by listening to short audio texts and answering a series of questions.

Speaking: Asking and answering general questions on familiar topics such as home, family, work, studies and interests; introducing oneself and others.

Reading: Skimming to get the main idea of a text; scanning to look for specific pieces of information.

Writing: Mechanics of Writing-Capitalization, Spellings, Punctuation-Parts of Sentences.

Grammar: Parts of Speech, Basic Sentence Structures-forming questions

Vocabulary: Synonyms, Antonyms, Affixes (Prefixes/Suffixes), Root words.

UNIT II

Lesson: NATURE: The Brook by Alfred Tennyson (Poem)

Listening: Answering a series of questions about main ideas and supporting ideas after listening to audio texts

Speaking: Discussion in pairs/small groups on specific topics followed by short structure talks.

Reading: Identifying sequence of ideas; recognizing verbal techniques that help to link the ideas in a paragraph together.

Writing: Structure of a paragraph - Paragraph writing (specific topics)
Grammar: Cohesive devices - linkers, use of articles and zero article; prepositions.
Vocabulary: Homonyms, Homophones, Homographs.

UNIT III

Lesson: BIOGRAPHY: Elon Musk

Listening: Listening for global comprehension and summarizing what is listened to.
Speaking: Discussing specific topics in pairs or small groups and reporting what is discussed
Reading: Readinga text in detail by making basic inferences -recognizing and interpreting specific context clues; strategies to use text clues for comprehension.
Writing: Summarizing, Note-making, paraphrasing
Grammar: Verbs - tenses; subject-verb agreement; Compound words, Collocations
Vocabulary: Compound words, Collocations

UNIT IV

Lesson: INSPIRATION: The Toys of Peace by Saki

Listening: Making predictions while listening to conversations/ transactional dialogues without video; listening with video.
Speaking: Role plays for practice of conversational English in academic contexts (formal and informal) - asking for and giving information/directions.
Reading: Studying the use of graphic elements in texts to convey information, reveal trends/patterns/relationships, communicate processes or display complicated data.
Writing: Letter Writing: Official Letters, Resumes
Grammar: Reporting verbs, Direct & Indirect speech, Active & Passive Voice
Vocabulary: Words often confused, Jargons

UNIT V

Lesson: MOTIVATION: The Power of Intrapersonal Communication (An Essay)
Listening: Identifying key terms, understanding concepts and answering a series of relevant questions that test comprehension.
Speaking: Formal oral presentations on topics from academic contexts
Reading: Reading comprehension.
Writing: Writing structured essays on specific topics.
Grammar: Editing short texts –identifying and correcting common errors in grammar and usage (articles, prepositions, tenses, subject verb agreement)
Vocabulary: Technical Jargons

Text Books:

1. Pathfinder: Communicative English for Undergraduate Students, 1^{st} Edition, Orient Black Swan, 2023 (Units 1,2 & 3)
2. Empowering with Language by Cengage Publications, 2023 (Units 4 & 5)

Reference Books:

1. Dubey, Sham Ji & Co. English for Engineers, Vikas Publishers, 2020
2. Bailey, Stephen. Academic writing: A Handbook for International Students. Routledge, 2014.
3. Murphy, Raymond. English Grammar in Use, Fourth Edition, Cambridge University Press, 2019.
4. Lewis, Norman. Word Power Made Easy- The Complete Handbook for Building a Superior Vocabulary. Anchor, 2014.

Web Resources:

1. www.bbc.co.uk/learningenglish
2. https://dictionary.cambridge.org/grammar/british-grammar/
3. www.eslpod.com/index.html
4. https://www.learngrammar.net/
5. https://english4today.com/english-grammar-online-with-quizzes/
6. https://www.talkenglish.com/grammar/grammar.aspx
7. https://www.youtube.com/c/DailyVideoVocabulary/videos

VOCABULARY

1. https://www.youtube.com/c/DailyVideoVocabulary/videos
2. https://www.youtube.com/channel/UC4cmBAit8i_NJZE8qK8sfpA

Course Code	Course Name	Course Structure			
		L	T	P	C
P23BST06	Chemistry (Common to EEE, ECE, CSE, IT & allied branches)	3	0	0	3

Internal Marks: 30 External Marks: 70

Course Objectives: At the end of the course the student can be able

1. To predict the Fundamentals of Quantum mechanics, energy level diagrams in homo, hetero nuclear molecules.
2. To Illustrate the commonly used industrial materials.
3. To train the students on the principles and applications of electrochemistry.
4. To train the students on the principles and applications of polymers.
5. To introduce instrumental methods, molecular machines and switches.

Course Outcomes: At the end of the course, the student will be able to

CO1: Explain the Fundamentals of Quantum mechanics, energy level diagrams in homo, hetero nuclear molecules.
CO2: Explain the. commonly used industrial materials.
CO3: Explain the principles and applications of electrochemistry.
CO4: Explain the principles and applications of polymers.
CO5: Explain the instrumental methods and applications.

UNIT–I: Structure and Bonding Models

Fundamentals of Quantum mechanics, Schrodinger Wave equation, significance of ψ and $\psi 2$, particle in one dimensional box, molecular orbital theory – bonding in homo- and heteronuclear diatomic molecules – energy level diagrams of O_2, N_2 and CO, etc. π-molecular orbitals of butadiene and benzene, calculation of bond order.

UNIT–II: Modern Engineering materials

Semiconductors – Introduction, basic concept, application

Super conductors-Introduction basic concept, applications.

Supercapacitors: Introduction, Basic Concept-Classification – Applications.

Nano materials: Introduction, classification, properties and applications of Fullerenes, carbon nano tubes and Graphines nanoparticles.

UNIT–III: Electrochemistry and Applications

Electrochemical cell, Nernst equation, cell potential calculations and numerical problems, potentiometry- potentiometric titrations (redox titrations), concept of conductivity, conductivity cell, conductometric titrations (acid-base titrations).

Electrochemical sensors – potentiometric sensors with examples, amperometric sensors with examples.

Primary cells – Zinc-air battery, Secondary cells –lithium-ion batteries- working of the batteries including cell reactions; Fuel cells, hydrogen-oxygenfuel cell– working of the cells. Polymer Electrolyte Membrane Fuel cells (PEMFC).

UNIT–IV: Polymer Chemistry

Introduction to polymers, functionality of monomers, chain growth and step growth polymerization, coordination polymerization, with specific examples and mechanisms of polymer formation.

Plastics –Thermo and Thermosetting plastics, Preparation, properties and applications of – PVC, Teflon, Bakelite, Nylon-6,6, carbon fibres.

Elastomers–Buna-S, Buna-N–preparation, properties and applications.

Conducting polymers – polyacetylene, polyaniline, – mechanism of conduction and applications. Bio-Degradable polymers - Poly Glycolic Acid (PGA), Polyl Lactic Acid (PLA).

UNIT–V: Instrumental Methods and Applications

Electromagnetic spectrum. Absorption of radiation: Beer-Lambert's law. UV-Visible Spectroscopy, electronic transition, Instrumentation, IR spectroscopies, fundamental modes and selection rules, Instrumentation. Chromatography-Basic Principle, Classification-HPLC: Principle, Instrumentation and Applications.

Text Books:

1. Jain and Jain, Engineering Chemistry, 16/e, DhanpatRai, 2013.
2. Peter Atkins, Julio de Paula and James Keeler, Atkins' Physical Chemistry, 10/e, Oxford University Press, 2010.

Reference Books:

1. Skoog and West, Principles of Instrumental Analysis, 6/e, Thomson, 2007.
2. J.D. Lee, Concise Inorganic Chemistry, 5^{th} Edition, Wiley Publications, Feb.2008
3. Textbook of Polymer Science, Fred W. Billmayer Jr, 3^{rd} Edition

Course Code	Course Name	Course Structure			
		L	T	P	C
P23BST03	Differential Equations and Vector Calculus (Common to All Branches of Engineering)	3	0	0	3

Internal Marks: 30 External Marks: 70

Course Objectives:

1. To enlighten the learners in the concept of differential equations and multivariable calculus.
2. To furnish the learners with basic concepts and techniques at plus two level to lead them into advanced level by handling various real-world applications.

Course Outcomes: At the end of the course, the student will be able to

CO1: Solve the differential equations related to various engineering fields.

CO2: Find the complete solution to the higher order linear differential equations and apply these methods to find the current in complex electrical circuits.

CO3: Identify solution methods for partial differential equations that model physical processes.

CO3: Interpret the physical meaning of different operators such as gradient, curl and divergence.

CO4: Estimate the work done against a field, circulation and flux using vector calculus.

UNIT–I: Differential equations of first order and first degree

Linear differential equations – Bernoulli's equations- Exact equations and equations reducible to exact form. Applications: Newton's Law of cooling – Law of natural growth and decay- Electrical circuits.

UNIT–II: Linear differential equations of higher order (Constant Coefficients)

Definitions, homogenous and non-homogenous, complimentary function, particular integral, general solution, Wronskian, Method of variation of parameters, Applications to L-C-R Circuit problems and Simple Harmonic motion.

UNIT–III: Partial Differential Equations

Introduction, Formation of Partial Differential Equations by elimination of arbitrary constants and arbitrary functions, solutions of first order linear equations using Lagrange's method and non-linear(standard types) equations, Second order PDE: solution of linear PDE with constant coefficients- RHS term of the type $e^{ax+by}, sin(ax+by), cos(ax+by), x^m y^n$

UNIT–IV: Vector differentiation

Scalar and vector point functions, vector operator Del, Del applies to scalar point functions-Gradient, Directional derivative, del applied to vector point functions-Divergence and Curl, Scalar potential functions, Vector identities.

UNIT–V: Vector integration

LWithoutegral-circulation-work done, surface integral-flux, Green's theorem in the plane (without proof), Stoke's theorem (without proof), volume integral, Divergence theorem (without proof) and related problems.

Text Books:

1. Higher Engineering Mathematics, B. S. Grewal, Khanna Publishers, 2017, 44^{th} Edition
2. Advanced Engineering Mathematics, Erwin Kreyszig, John Wiley & Sons, 2018, 10^{th} Edition.

Reference Books:

1. Thomas Calculus, George B. Thomas, Maurice D. Weir and Joel Hass, Pearson Publishers, 2018, 14^{th} Edition.
2. Advanced Engineering Mathematics, R. K. Jain and S. R. K. Iyengar, Alpha ScienceInternational Ltd., 2021 5^{th} Edition(9^{th} reprint).
3. Advanced Modern Engineering Mathematics, Glyn James, Pearson publishers, 2018, 5^{th} Edition.
4. Advanced Engineering Mathematics, Micheael Greenberg, , Pearson publishers, 9^{th} edition
5. Higher Engineering Mathematics, B. V. Ramana, McGraw Hill Education, 2017

Course Code	Course Name	Course Structure			
		L	T	P	C
P23EST01	Basic Civil and Mechanical Engineering (Common to All branches of Engineering)	3	0	0	3

Internal Marks: 30 External Marks: 70

Course Objectives:

1. Get familiarized with the scope and importance of Civil Engineering sub-divisions.
2. Introduce the preliminary concepts of surveying.
3. Acquire preliminary knowledge on Transportation and its importance in nation's economy.
4. Get familiarized with the importance of quality, conveyance and storage of water.
5. Introduction to basic civil engineering materials and construction techniques.

Course Outcomes: At the end of the course, the student will be able to

CO1: Summarize various sub-divisions of Civil Engineering and to appreciate their role in ensuring better society.

CO2: Identity the concepts of surveying and to understand the measurement of distances, angles and levels through surveying.

CO3: Realize the importance of Transportation in nation's economy and the engineering measures related to Transportation.

UNIT–I:

Basics of Civil Engineering: Role of Civil Engineers in Society- Various Disciplines of Civil Engineering- Structural Engineering- Geo-technical Engineering-Transportation Engineering • Hydraulics and Water Resources Engineering - Environmental Engineering-Scope of each discipline - Building Construction and Planning- Construction Materials-Cement - Aggregate - Bricks- Cement concrete-Steel. Introduction to Prefabricated construction Techniques.

UNIT–II:

Surveying: Objectives of Surveying- Horizontal Measurements- Angular Measurements - Introduction to Bearings Levelling instruments used for levelling -Simple problems on levelling and bearings-Contour mapping.

UNIT–III: Polymers and Fuel Chemistry

Transportation Engineering Importance of Transportation in Nation's economic development- Types of Highway Pavements- Flexible Pavements and Rigid Pavements - Simple Differences. Basics of Harbour, Tunnel, Airport, and Railway Engineering.

Water Resources and Environmental Engineering: Introduction, Sources of water- Quality of water- Specifications- Introduction to Hydrology–Rainwater Harvesting-Water Storage and Conveyance Structures (Simple introduction to Dams and Reservoirs).

Text Books:

1. Basic Civil Engineering, M.S.Palanisamy, , Tata Mcgraw Hill publications (India) Pvt. Ltd. Fourth Edition.
2. Introduction to Civil Engineering, S.S. Bhavikatti, New Age International Publishers. 2022. First Edition.
3. Basic Civil Engineering, Satheesh Gopi, Pearson Publications, 2009, First Edition.

Reference Books:

1. Surveying, Vol- I and Vol-II, S.K. Duggal, Tata McGraw Hill Publishers 2019. Fifth Edition.
2. Hydrology and Water Resources Engineering, Santosh Kumar Garg, Khanna Publishers, Delhi. 2016
3. Irrigation Engineering and Hydraulic Structures - Santosh Kumar Garg, Khanna Publishers, Delhi 2023. 38^{th} Edition.
4. Highway Engineering, S.K.Khanna, C.E.G. Justo and Veeraraghavan, Nemchand and Brothers Publications 2019. 10^{th} Edition.
5. Indian Standard DRINKING WATER — SPECIFICATION IS 10500-2012.

PART B: BASIC MECHANICAL ENGINEERING

Course Objectives: The students after completing the course are expected to

1. Get familiarized with the scope and importance of Mechanical Engineering in different sectors and industries.
2. Explain different engineering materials and different manufacturing processes.
3. Provide an overview of different thermal and mechanical transmission systems and introduce basics of robotics and its applications.

Course Outcomes: At the end of the course, the student will be able to

CO1: Understand the role of mechnical engineering and different engineering materials.

CO2: Explain the basics of manufacturing processes, thermal engineering and its applications.

CO3: Describe the working of different mechanical power transmission systems,power plants, basics of robotics and its applications.

UNIT–I:

Introduction to Mechanical Engineering: Role of Mechanical Engineering in Industries and Society- Technologies in different sectors such as Energy, Manufacturing, Automotive, Aerospace, and Marine sectors.

Engineering Materials - Metals-Ferrous and Non-ferrous, Ceramics, Composites, Smart materials.

UNIT–II:

Manufacturing Processes: Principles of Casting, Forming, joining processes, Machining, Introduction to CNC machines, 3D printing, and Smart manufacturing.

Thermal Engineering – Working principle of Boilers, Otto cycle, Diesel cycle, Refrigeration and air-conditioning cycles, IC engines, 2-Stroke and 4-Stroke engines, SI/CI Engines, Components of Electric and Hybrid Vehicles.

UNIT–III:

Power plants – Working principle of Steam, Diesel, Hydro, Nuclear power plants.

Mechanical Power Transmission - Belt Drives, Chain, Rope drives, Gear Drives and their applications.

Introduction to Robotics - Joints & links, configurations, and applications of robotics.

(**Note:** The subject covers only the basic principles of Civil and Mechanical Engineering systems. The evaluation shall be intended to test only the fundamentals of the subject.)

Text Books:

1. Internal Combustion Engines by V.Ganesan, By Tata McGraw Hill publications (India) Pvt.
2. A text book of Theory of Machines by S.S. Rattan, Tata McGraw Hill Publications, (India) Pvt. Ltd.
3. An introduction to Mechanical Engg by Jonathan Wicker and Kemper Lewis, Cengage learning India Pvt.

Reference Books:

1. Shanmugam and M.S.Palanisamy, Basic Civil and the Mechanical Engineering, Tata McGraw Hill publications (India) Pvt.
2. Thermal Engineering by Mahesh M Rathore Tata McGraw Hill publications (India) Pvt. Ltd.
3. 3D printing & Additive Manufacturing Technology- L. Jyothish Kumar, Pulak M Pandey, Springer publications
4. Appuu Kuttan KK, Robotics, I.K. International Publishing House Pvt. Ltd. Volume-I

Course Code	Course Name	Course Structure			
		L	T	P	C
P23CST01	Data Structures (Common to CSE, IT & allied branches)	3	0	0	3

Internal Marks: 30 External Marks: 70

Course Objectives:

1. To provide the knowledge of basic data structures and their implementations.
2. To understand importance of data structures in context of writing efficient programs.
3. To develop skills to apply appropriate data structures in problem solving.

Course Outcomes: At the end of the course, the student will be able to

CO1: Understand the role of linear data structures in organizing and accessing data efficiently in algorithms.

CO2: Design, implement, and apply linked lists for dynamic data storage, demonstrating understanding of memory allocation.

CO3: Develop programs using stacks to handle recursive algorithms, manage program states, and solve related problems.

CO4: Apply queue-based algorithms for efficient task scheduling and breadth-first traversal in graphs and distinguish between deques and priority queues, and apply them appropriately to solve data management challenges.

CO5: Devise novel solutions to small scale programming challenges involving data structures such as stacks, queues, Trees and Recognize scenarios where hashing is advantageous, and design hash-based solutions for specific problems.

UNIT–I:

Introduction to Linear Data Structures: Definition and importance of linear data structures, Abstract data types (ADTs) and their implementation, Overview of time and space complexity analysis for linear data structures. Searching Techniques: Linear & Binary Search, Sorting Techniques: Bubble sort, Selection sort, Insertion Sort

UNIT–II:

Linked Lists: Singly linked lists: representation and operations, doubly linked lists and circular linked lists, Comparing arrays and linked lists, Applications of linked lists.

UNIT–III:

Stacks: Introduction to stacks: properties and operations, implementing stacks using arrays and linked lists, Applications of stacks in expression evaluation, backtracking, reversing list etc.

UNIT–IV:

Queues: Introduction to queues: properties and operations, implementing queues using arrays and linked lists, Applications of queues in breadth-first search, scheduling, etc.

Deques: Introduction to deques (double-ended queues), Operations on deques and their applications.

UNIT–V:

Trees: Introduction to Trees, Binary Search Tree – Insertion, Deletion & Traversal

Hashing: Brief introduction to hashing and hash functions, Collision resolution techniques: chaining and open addressing, Hash tables: basic implementation and operations, Applications of hashing in unique identifier generation, caching, etc.

Text Books:

1. Data Structures and algorithm analysis in C, Mark Allen Weiss, Pearson, 2^{nd} Edition.
2. Fundamentals of data structures in C, Ellis Horowitz, Sartaj Sahni, Susan Anderson- Freed, Silicon Press, 2008

Reference Books:

1. Algorithms and Data Structures: The Basic Toolbox by Kurt Mehlhorn and Peter Sanders
2. C Data Structures and Algorithms by Alfred V. Aho, Jeffrey D. Ullman, and John E. Hopcroft
3. Problem Solving with Algorithms and Data Structures" by Brad Miller and David Ranum
4. Introduction to Algorithms by Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein
5. Algorithms in C, Parts 1-5 (Bundle): Fundamentals, Data Structures, Sorting, Searching, and Graph Algorithms" by Robert Sedgewick

Course Code	Course Name	Course Structure			
		L	T	P	C
P23BSL01	Communicative English Lab (Common to All Branches of Engineering)	0	0	2	1

Internal Marks: 30 External Marks: 70

Course Objectives: The main objective of introducing this course, Communicative English Laboratory, is to expose the students to a variety of self-instructional, learner friendly modes of language learning. The students will get trained in basic communication skills and also make them ready to face job interviews.

Course Outcomes:

CO1: Understand the different aspects of the English language proficiency with emphasis on LSRW skills.

CO2: Apply communication skills through various language learning activities.

CO3: Analyze the English speech sounds, stress, rhythm, intonation and syllable division for better listening and speaking comprehension.

CO4: Evaluate and exhibit professionalism in participating in debates and group discussions.

CO5: Create effective Course Objectives

List of Topics:

1. Vowels & Consonants
2. Neutralization/Accent Rules
3. Communication Skills & JAM
4. Role Play or Conversational Practice
5. E-mail Writing
6. Resume Writing, Cover letter, SOP
7. Group Discussions-methods & practice
8. Debates - Methods & Practice
9. PPT Presentations/ Poster Presentation
10. Interviews Skills

Suggested Software:

1. Walden Infotech
2. Young India Films

Reference Books:

1. Raman Meenakshi, Sangeeta-Sharma. Technical Communication. Oxford Press.2018.
2. Taylor Grant: English Conversation Practice, Tata McGraw-Hill Education India, 2016
3. Hewing's, Martin. Cambridge Academic English (B2). CUP, 2012.
4. J. Sethi & P.V. Dhamija. A Course in Phonetics and Spoken English, (2nd Ed), Kindle, 2013

Web Resources:

Spoken English:

1. www.esl-lab.com
2. www.englishmedialab.com
3. www.englishinteractive.net
4. https://www.britishcouncil.in/english/online
5. http://www.letstalkpodcast.com/
6. https://www.youtube.com/c/mmmEnglish_Emma/featured
7. https://www.youtube.com/c/ArnelsEverydayEnglish/featured
8. https://www.youtube.com/c/engvidAdam/featured
9. https://www.youtube.com/c/EnglishClass101/featured
10. https://www.youtube.com/c/SpeakEnglishWithTiffani/playlists
11. https://www.youtube.com/channel/UCV1h_cBE0Drdx19qkTM0WNw

Voice & Accent:

1. https://www.youtube.com/user/letstalkaccent/videos
2. https://www.youtube.com/c/EngLanguageClub/featured
3. https://www.youtube.com/channel/UC_OskgZBoS4dAnVUgJVexc
4. https://www.youtube.com/channel/UCNfm92h83W2i2ijc5Xwp_IA

Course Code	Course Name	Course Structure			
		L	T	P	C
P23BSL04	Chemistry Lab (Common to EEE, ECE, CSE, IT & allied branches)	3	0	0	3

Internal Marks: 30 External Marks: 70

Course Objectives:

- To verify the fundamental concepts with experiments

Course Outcomes: At the end of the course, the student will be able to

CO1: Determine the cell constant and conductance of solutions.
CO2: Prepare advanced polymer Bakelite materials.
CO3: Measure the strength of an acid present in secondary batteries
CO4: Analyse the IR spectra of some organic compounds.
CO5: Calculate strength of acid in Pb-Acid battery

List of Experiments:

1. Measurement of 10Dq by spectrophotometric method
2. Conductometric titration of strong acid vs. strong base
3. Conductometric titration of weak acid vs. strong base
4. Determination of cell constant and conductance of solutions
5. Potentiometry - determination of redox potentials and emfs
6. Determination of Strength of an acid in Pb-Acid battery
7. Preparation of a Bakelite
8. Verify Lambert-Beer's law
9. Wavelength measurement of sample through UV-Visible Spectroscopy
10. Identification of simple organic compounds by IR
11. Preparation of nanomaterials by precipitation method
12. Estimation of Ferrous Iron by Dichrometry

References:

1. "Vogel's Quantitative Chemical Analysis 6^{th} Edition" Pearson Publications by J. Mendham, R.C. Denney, J.D. Barnes and B. Sivasankar

Course Code	Course Name	Course Structure			
		L	T	P	C
P23ESL01	Engineering Workshop (Common to All branches of Engineering)	0	0	3	1.5

Internal Marks: 30 External Marks: 70

Course Objectives:

To familiarize students with wood working, sheet metal operations, fitting, electrical house wiring skills, and basic repairs of two-wheeler vehicle.

Course Outcomes: At the end of the course, the student will be able to

CO1: Identify workshop tools and their operational capabilities.

CO2: Practice on manufacturing of components using workshop trades including fitting, carpentry, foundry, welding and plumbing.

CO3: Apply sheet metal working operations in various applications and basic repairs of two weeler vehicle.

CO4: Apply basic electrical engineering knowledge for House Wiring Practice.

SYLLABUS

1. **Demonstration:** Safety practices and precautions to be observed in workshop.
2. **Wood Working:** Familiarity with different types of woods and tools used in wood working and make following joints.

   a) Half – Lap joint b) Mortise and Tenon joint c) Corner Dovetail joint or Bridle joint
3. **Sheet Metal Working:** Familiarity with different types of tools used in sheet metal working, Developments of following sheet metal job from GI sheets.

   a) Tapered tray b) Conical funnel c) Elbow pipe d) Brazing
4. **Fitting:** Familiarity with different types of tools used in fitting and do the following fitting exercises.

   a) V-fit b) Dovetail fit c) Semi-circular fit d) Bicycle tire puncture and change of two-wheeler tyre
5. **Electrical Wiring:** Familiarity with different types of basic electrical circuits and make the following connections.

   a) Parallel and series b) Two-way switch c) Godown lighting d) Tube light e) Three phase motor f) Soldering of wires
6. **Foundry Trade:** Demonstration and practice on Moulding tools and processes, Preparation of Green Sand Moulds for given Patterns.

7. **Welding Shop:** Demonstration and practice on Arc Welding and Gas welding. Preparation of Lap joint and Butt joint.
8. **Plumbing:** Demonstration and practice of Plumbing tools, Preparation of Pipe joints with coupling for same diameter and with reducer for different diameters.
9. **Basic repairs of Two-wheeler vehicle** – Demonstration of working of two-wheeler vehicle and its repairs.

Text Books:

1. Basic Workshop Technology: Manufacturing Process, Felix W.; Independently Published, 2019.
2. Workshop Processes, Practices and Materials; Bruce J. Black, Routledge publishers, 5^{th} Edn. 2015.
3. A Course in Workshop Technology Vol I. & II, B.S. Raghuwanshi, Dhanpath Rai & Co., 2015 & 2017.

Reference Books:

1. Wiring Estimating, Costing and Contracting; Soni P.M. & Upadhyay P.A.; Atul Prakashan, 2021-22.
2. Workshop Practice by H. S. Bawa, Tata-McGraw Hill, 2004.
3. Elements of Workshop Technology, Vol. I by S. K. Hajra Choudhury & Others, Media Promoters and Publishers, Mumbai. 2007, 14^{th} edition

Course Code	Course Name	Course Structure			
		L	T	P	C
P23CSL01	Data Structures Lab (Common to CSE, IT & allied branches)	0	0	3	1.5

Internal Marks: 15 External Marks: 35

Course Objectives:

The course aims to strengthen the ability of the students to identify and apply the suitable data structure for the given real-world problem. It enables them to gain knowledge in practical applications of data structures.

Course Outcomes: On Completion of the course, the student should be able to

CO1: Understand the role of linear data structures in organizing and accessing data efficiently in algorithms.

CO2: Design, implement, and apply linked lists for dynamic data storage, demonstrating understanding of memory allocation.

CO3: Develop programs using stacks to handle recursive algorithms, manage program states, and solve related problems.

CO4: Apply queue-based algorithms for efficient task scheduling and breadth-first traversal in graphs and distinguish between deques and priority queues and apply them appropriately to solve data management challenges.

CO5: Recognize scenarios where Trees, hashing is advantageous, and design hash-based solutions for specific problems.

List of Experiments:

Exercise 1: Array Manipulation

1. Write a program to reverse an array.
2. C Programs to implement the Searching Techniques – Linear & Binary Search
3. C Programs to implement Sorting Techniques – Bubble, Selection and Insertion Sort

Exercise 2: Linked List Implementation

1. Implement a singly linked list and perform insertion and deletion operations.
2. Develop a program to reverse a linked list iteratively and recursively.
3. Solve problems involving linked list traversal and manipulation.

Exercise 3: Linked List Applications

1. Create a program to detect and remove duplicates from a linked list.
2. Implement a linked list to represent polynomials and perform addition.
3. Implement a double-ended queue (deque) with essential operations.

Exercise 4: Double Linked List Implementation

1. Implement a doubly linked list and perform various operations to understand its properties and applications.
2. Implement a circular linked list and perform insertion, deletion, and traversal.

Exercise 5: Stack Operations

1. Implement a stack using arrays and linked lists.
2. Write a program to evaluate a postfix expression using a stack.
3. Implement a program to check for balanced parentheses using a stack.

Exercise 6: Queue Operations

1. Implement a queue using arrays and linked lists.
2. Develop a program to simulate a simple printer queue system.
3. Solve problems involving circular queues.

Exercise 7: Stack and Queue Applications

1. Use a stack to evaluate an infix expression and convert it to postfix.
2. Create a program to determine whether a given string is a palindrome or not.
3. Implement a stack or queue to perform comparison and check for symmetry.

Exercise 8: Binary Search Tree

1. Implementing a BST using Linked List.
2. Traversing of BST.

Exercise 9: Hashing

1. Implement a hash table with collision resolution techniques.
2. Write a program to implement a simple cache using hashing.

Textbooks:

1. Data Structures and algorithm analysis in C, Mark Allen Weiss, Pearson, 2^{nd} Edition.
2. Fundamentals of data structures in C, Ellis Horowitz, Sartaj Sahni, Susan Anderson- Freed, Silicon Press, 2008

Reference Books:

1. Algorithms and Data Structures: The Basic Toolbox by Kurt Mehlhorn and Peter Sanders
2. C Data Structures and Algorithms by Alfred V. Aho, Jeffrey D. Ullman, and John E. Hopcroft
3. Problem Solving with Algorithms and Data Structures" by Brad Miller and David Ranum
4. Introduction to Algorithms by Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein
5. Algorithms in C, Parts 1-5 (Bundle): Fundamentals, Data Structures, Sorting, Searching, and Graph Algorithms by Robert Sedgewick.

Course Code	Course Name	Course Structure			
		L	T	P	C
P23BST07	Health and Wellness, Yoga and Sports (Common to All branches of Engineering)	0	0	1	0.5

Course Objectives:

The main objective of introducing this course is to make the students maintain their mental and physical wellness by balancing emotions in their life. It mainly enhances the essential traits required for the development of the personality.

Course Outcomes: At the end of the course, the student will be able to

CO1: Understand the importance of yoga and sports for Physical fitness and sound health.

CO2: Demonstrate an understanding of health-related fitness components.

CO3: Compare and contrast various activities that help enhance their health.

CO4: Assess current personal fitness levels.

CO5: Develop Positive Personality

UNIT–I:

Concept of health and fitness, Nutrition and Balanced diet, basic concept of immunity Relationship between diet and fitness, Globalization and its impact on health, Body Mass Index (BMI) of all age groups.

Activities:

1. Organizing health awareness programmes in community
2. Preparation of health profile
3. Preparation of chart for balance diet for all age groups

UNIT–II:

Concept of yoga, need for and importance of yoga, origin and history of yoga in Indian context, classification of yoga, Physiological effects of Asanas- Pranayama and meditation, stress management and yoga, Mental health and yoga practice.

Activities:

Yoga practices – Asana, Kriya, Mudra, Bandha, Dhyana, Surya Namaskar

UNIT–III:

Concept of Sports and fitness, importance, fitness components, history of sports, Ancient and Modern Olympics, Asian games and Commonwealth games.

Activities:

1. Participation in one major game and one individual sport viz., Athletics, Volleyball, Basketball, Handball, Football, Badminton, Kabaddi, Kho-kho, Table tennis, Cricket etc.

   Practicing general and specific warm up, aerobics
2. Practicing cardiorespiratory fitness, treadmill, run test, 9 min walk, skipping and running.

Reference Books:

1. Gordon Edlin, Eric Golanty. Health and Wellness, 14^{th} Edn. Jones & Bartlett Learning, 2022
2. T.K.V.Desikachar. The Heart of Yoga: Developing a Personal Practice
3. Archie J.Bahm. Yoga Sutras of Patanjali, Jain Publishing Company, 1993
4. Wiseman, John Lofty, SAS Survival Handbook: The Ultimate Guide to Surviving Anywhere Third Edition, William Morrow Paperbacks, 2014
5. The Sports Rules Book/ Human Kinetics with Thomas Hanlon. – 3^{rd} ed. Human Kinetics, Inc.2014

General Guidelines:

1. Institutes must assign slots in the Timetable for the activities of Health/Sports/Yoga.
2. Institutes must provide field/facility and offer the minimum of five choices of as many as Games/Sports.
3. Institutes are required to provide sports instructor / yoga teacher to mentor the students.

Evaluation Guidelines:

1. Evaluated for a total of 100 marks.
2. A student can select 6 activities of his/her choice with a minimum of 01 activity per unit. Each activity shall be evaluated by the concerned teacher for 15 marks, totalling to 90 marks.
3. A student shall be evaluated by the concerned teacher for 10 marks by conducting viva voce on the subject.

Course Code	Course Name	Course Structure			
		L	T	P	C
P23EST09	DIGITAL LOGIC & COMPUTER ORGANIZATION	3	0	0	3

Internal Marks: 30 External Marks: 70

Course Objectives:

- Provide students with a comprehensive understanding of digital logic design principles and computer organization fundamentals.
- Describe memory hierarchy concepts.
- Explain input/output (I/O) systems and their interaction with the CPU, memory, and peripheral devices.

Course Outcomes:

1. Identify and explain fundamental concepts of data representation and basic digital logic functions. (L1)
2. Describe the operation of sequential circuits and understand the fundamental components and architecture of computer systems. (L2)
3. Apply principles of computer arithmetic operations and processor organization to design and analyze basic computational systems. (L3)
4. Explain memory organization concepts and analyze the performance of different memory types and management techniques. (L4)
5. Design basic I/O interfaces for managing device interactions and system performance. (L5)

UNIT – I

Data Representation: Binary Numbers, Fixed Point Representation. Floating Point Representation. Number base conversions, Octal and Hexadecimal Numbers, components, Signed binary numbers, Binary codes

Digital Logic Circuits-I: Basic Logic Functions, Logic gates, universal logic gates, Minimization of Logic expressions. K-Map Simplification, Combinational Circuits, Decoders, Multiplexers

UNIT – II

Digital Logic Circuits-II: Sequential Circuits, Flip-Flops, Binary counters, Registers, Shift Registers, Ripple counters

Basic Structure of Computers: Computer Types, Functional units, Basic operational concepts, Bus structures, Software, Performance, multiprocessors and multi computers, Computer Generations,Von-Neumann Architecture

UNIT – III

Computer Arithmetic: Addition and Subtraction of Signed Numbers, Design of Fast Adders, Multiplication of Positive Numbers, Signed-operand Multiplication, Fast Multiplication, Integer Division, Floating-Point Numbers and Operations

Processor Organization: Fundamental Concepts, Execution of a Complete Instruction, Multiple-Bus Organization, Hardwired Control and Multi programmed Control

UNIT – IV

The Memory Organization: Basic Concepts, Semiconductor RAM Memories, Read-Only Memories, Speed, Size and Cost, Cache Memories, Performance Considerations, Virtual Memories, Memory Management Requirements, Secondary Storage

UNIT – V

Input/Output Organization: Accessing I/O Devices, Interrupts, Processor Examples, Direct Memory Access, Buses, Interface Circuits, Standard I/O Interfaces

Textbooks:

1. Computer Organization, Carl Hamacher, Zvonko Vranesic, Safwat Zaky, 6th edition, McGraw Hill
2. Digital Design, 6th Edition, M. Morris Mano, Pearson Education
3. Computer Organization and Architecture, William Stallings, 11th Edition, Pearson

Reference Books:

1. Computer Systems Architecture, M. Moris Mano, 3rd Edition, Pearson
2. Computer Organization and Design, David A. Paterson, John L. Hennessy, Elsevier
3. Fundamentals of Logic Design, Roth, 5th Edition, Thomson

Online Learning Resources:

1. https://nptel.ac.in/courses/106/103/106103068/

Course Code	Course Name	Course Structure			
		L	T	P	C
P23BST10	DISCRETE MATHEMATICS AND GRAPH THEORY	3	0	0	3

Internal Marks: 30 External Marks: 70

Course Objectives:

1. To introduce the students to the topics and techniques of discrete methods and combinatorial reasoning.
2. To introduce a wide variety of applications. The algorithmic approach to the solution of problems is fundamental in discrete mathematics, and this approach reinforces the close ties between this discipline and the area of computer science.

Course Outcomes: At the end of the course, the student will be able to

1. Understand and apply mathematical logic statements and express logical sentences in terms of logical connectives. (L2)
2. Understand sets, relations, functions. (L2)
3. Able to formulate problems and solve recurrence relations. (L3)
4. Analyze the various types of graphs in different geometries related to edges. (L3)
5. Able to model and solve real-world problems using graphs and trees. (L3)

UNIT-I (10 Lectures)

Mathematical Logic: Propositional Calculus: Statements and Notations, Connectives, Well Formed Formulas, Truth Tables, Tautologies, Equivalence of Formulas, Duality Law, Tautological Implications, Normal Forms, Theory of Inference for Statement Calculus, Consistency of Premises, Indirect Method of Proof, Predicate Calculus: Predicates, Predicative Logic, Statement Functions, Variables and Quantifiers, Free and Bound Variables, Inference Theory for Predicate Calculus.

UNIT-II (10 Lectures)

Set Theory: Sets: Operations on Sets, Principle of Inclusion-Exclusion, Relations: Properties, Operations, Partition and Covering, Transitive Closure, Equivalence, Compatibility and Partial Ordering, Hasse Diagrams, Functions: Bijective, Composition, Inverse, Permutation, and Recursive Functions, Lattice and its Properties.

UNIT-III (10 Lectures)

Combinatorics and Recurrence Relations: Basis of Counting, Permutations, Permutations with Repetitions, Circular and Restricted Permutations, Combinations, Restricted Combinations, Binomial and Multinomial Coefficients and Theorems.

Recurrence Relations: Generating Functions, Function of Sequences, Partial Fractions, Calculating Coefficient of Generating Functions, Recurrence Relations,

Formulation as Recurrence Relations, Solving Recurrence Relations by Substitution and Generating Functions, Method of Characteristic Roots, Solving Inhomogeneous Recurrence Relations.

UNIT-IV (8 Lectures)

Graph Theory: Basic Concepts, Graph Theory and its Applications, Subgraphs, Graph Representations: Adjacency and Incidence Matrices, Isomorphic Graphs, Paths and Circuits, Eulerian and Hamiltonian Graphs.

UNIT-V (8 Lectures)

Multi Graphs: Multi graphs, Bipartite and Planar Graphs, Euler's Theorem, Graph Colouring and Covering, Chromatic Number, Spanning Trees, Prim's and Kruskal's Algorithms, BFS and DFS Spanning Trees.

Textbooks:

1. Discrete Mathematical Structures with Applications to Computer Science, J.P. Tremblay and P. Manohar, Tata McGraw Hill.
2. Elements of Discrete Mathematics-A Computer Oriented Approach, C. L. Liu and D. P. Mohapatra, 3rd Edition, Tata McGraw Hill.
3. Theory and Problems of Discrete Mathematics, Schaum's Outline Series, Seymour Lipschutz and Marc Lars Lipson, 3rd Edition, McGraw Hill.

Reference Books:

1. Discrete Mathematics for Computer Scientists and Mathematicians, J. L. Mott, A. Kandel and T. P. Baker, 2nd Edition, Prentice Hall of India.
2. Discrete Mathematical Structures, Bernand Kolman, Robert C. Busby and Sharon Cutler Ross, PHI.
3. Discrete Mathematics, S. K. Chakraborthy and B.K.Sarkar, Oxford, 2011.
4. Discrete Mathematics and its Applications with Combinatorics and Graph Theory, K. H.Rosen, 7th Edition, Tata McGraw Hill.

Web Resources:

1. http://tutorial.math.lamar.edu/Classes/DE/DE.aspx
2. http://mathworld.wolfram.com/topics
3. http://www.nptel.ac.in/course.php

Course Code	Course Name	Course Structure			
		L	T	P	C
P23ACT01	Environmental Studies	2	0	0	-

Internal Marks: 30 External Marks: 70

Course Objectives: At the end of the course the student can be able

1. To make the students aware of the environment.
2. To understand the importance of protecting natural resources, ecosystems for future generations and pollution causes due to day-to-day activities of human life.
3. To save earth from the adverse effects caused by inventions and engineering.

Course Outcomes: At the end of the course, the student will be able to

CO1: Understand the multidisciplinary nature, scope and importance of environmental studies.

CO2: Analyze the use and conservation of natural resources and associated environmental problems.

CO3: Describe the structure and function of ecosystems and approaches to biodiversity conservation.

CO4: Identify causes, effects and control measures of various types of environmental pollution and solid waste management.

CO5: Understand social issues related to environment, environmental legislation and human population growth impacts.

UNIT–I: Multidisciplinary Nature of Environmental Studies

Definition, Scope and Importance, Need for Public Awareness.

Natural Resources: Renewable and non-renewable resources – Natural resources and associated problems.

Forest resources: Use and over-exploitation, deforestation, case studies, timber extraction, mining, dams and their effects on forest and tribal people.

Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams – benefits and problems.

Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies.

Food resources: World food problems, changes caused by agriculture and over-grazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies.

Energy resources: [Details as applicable]

UNIT–II: Ecosystems and Biodiversity Conservation

Ecosystems: Concept, structure and function, producers, consumers and decomposers. Energy flow in the ecosystem, ecological succession, food chains, food

webs and ecological pyramids.

Types of ecosystems: Forest, grassland, desert, aquatic (ponds, streams, lakes, rivers, oceans, estuaries).

Biodiversity and Its Conservation: Genetic, species and ecosystem diversity; Biogeographical classification of India.

Value of biodiversity: Consumptive use, productive use, social, ethical, aesthetic and option values.

Biodiversity at global, national and local levels; India as a mega-diversity nation; Hot-spots of biodiversity; Threats to biodiversity: habitat loss, poaching, man-wildlife conflicts.

Endangered and endemic species of India.

Conservation of biodiversity: In-situ and Ex-situ conservation.

UNIT–III: Environmental Pollution and Solid Waste Management

Definition, causes, effects and control measures of:

a. Air pollution
b. Water pollution
c. Soil pollution
d. Marine pollution
e. Noise pollution
f. Thermal pollution
g. Nuclear hazards

Solid Waste Management: Causes, effects and control measures of urban and industrial wastes.

Role of an individual in prevention of pollution.

Pollution case studies.

Disaster management: floods, earthquake, cyclone and landslides.

UNIT–IV: Social Issues and the Environment

From Unsustainable to Sustainable development.

Urban problems related to energy.

Water conservation, rain water harvesting, watershed management.

Resettlement and rehabilitation of people; its problems and concerns (case studies).

Environmental ethics: Issues and possible solutions.

Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust (case studies).

Wasteland reclamation.

Consumerism and waste products.

Environmental Protection Act; Air (Prevention and Control of Pollution) Act; Water (Prevention and Control of Pollution) Act; Wildlife Protection Act; Forest Conservation Act.

Issues involved in enforcement of environmental legislation.

Public awareness.

UNIT–V: Human Population and the Environment

Population growth, variation among nations; population explosion.
Family Welfare Programmes.
Environment and human health.
Human Rights; Value Education; HIV/AIDS; Women and Child Welfare.
Role of information technology in Environment and human health.
Case studies.
Field Work: Visit to a local area to document environmental assets such as river, forest, grassland, hill/mountain. Visit to a local polluted site (urban/rural/industrial/agricultural Study of common plants, insects, and birds in the area.

Text Books:

1. Erach Bharucha, *Textbook of Environmental Studies for Undergraduate Courses*, Universities Press (India) Pvt Ltd, 2019.
2. Palaniswamy, *Environmental Studies*, 2nd Edition, Pearson Education, 2014.
3. S. Azeem Unnisa, *Environmental Studies*, Academic Publishing Company, 2021.
4. K. Raghavan Nambiar, *Textbook of Environmental Studies for Undergraduate Courses as per UGC model syllabus*, SciTech Publications (India), 2010.

Reference Books:

1. Deeksha Dave and E. Sai Baba Reddy, *Textbook of Environmental Science*, 2nd Edition, Cengage Publications, 2012.
2. M. Anji Reddy, *Textbook of Environmental Sciences and Technology*, BS Publications, 2014.
3. J. P. Sharma, *Comprehensive Environmental Studies*, Laxmi Publications, 2006.
4. J. Glynn Henry and Gary W. Heinke, *Environmental Sciences and Engineering*, Prentice Hall of India Pvt Ltd, 1988.
5. G. R. Chatwal, *A Text Book of Environmental Studies*, Himalaya Publishing House, 2018.
6. Gilbert M. Masters and Wendell P. Ela, *Introduction to Environmental Engineering and Science*, 1st Edition, Prentice Hall of India Pvt Ltd, 1991.

Online Learning Resources:

1. https://onlinecourses.nptel.ac.in/noc23_hs155/preview
2. https://www.edx.org/learn/environmental-science/rice-university-ap-environmental-science-part-3-pollution-andresources
3. http://ecoursesonline.iasri.res.in/Courses/Environmental%20Science-I/Data%20Files/pdf/lec07.pdf
4. https://www.youtube.com/watch?v=5QxxaVfgQ3k

Course Code	Course Name	Course Structure			
		L	T	P	C
P23CST03	OBJECT ORIENTED PROGRAMMING THROUGH JAVA	3	0	0	3

Internal Marks: 30 External Marks: 70

Course Objectives: The learning objectives of this course are to:

1. Identify Java language components and how they work together in applications.
2. Learn the fundamentals of object-oriented programming in Java, including defining classes, invoking methods, using class libraries.
3. Learn how to extend Java classes with inheritance and dynamic binding and how to use exception handling in Java applications.
4. Understand how to design applications with threads in Java.
5. Understand how to use Java APIs for program development.

Course Outcomes: At the end of this course, the students will be able to

CO1: Understand the OOPS concepts in Java programs. (L2)

CO2: Describe the concepts of classes with inheritance and dynamic binding to design applications. (L3)

CO3: Apply the concepts of inheritance and interfaces to build Java programs. (L3)

CO4: Apply the concepts of exceptions, I/O streams and multithreading to develop Java applications. (L3)

CO5: Develop Java applications using API. (L6)

UNIT–I: Object Oriented Programming and Basics (9 Lectures)

Basic concepts and principles.

Program Structure in Java: Introduction, Writing Simple Java Programs, Tokens in Java Programs, Java Statements, Command Line Arguments, User Input to Programs, Escape Sequences, Comments.

Data Types, Variables, and Operators: Data Types in Java, Declaration of Variables, Type Casting, Scope of Variable Identifier, Constants, Formatted Output with `printf()` Method, Static Variables and Methods, `final` Attribute.

Introduction to Operators: Types of operators, Precedence and Associativity of Operators.

Control Statements: Conditional Statements, Iteration Statements, Break, Continue Statements.

UNIT–II: Classes and Objects (8 Lectures)

Class Declaration and Modifiers, Class Members, Declaration of Class Objects, Assigning One Object to Another.

Access Control for Class Members.

Constructor Methods for Class, Overloaded Constructor Methods.

Nested Classes, `final` Class and Methods.
Passing Arguments by Value and by Reference, Keyword `this`.
Methods: Defining, Overloaded Methods, Overloaded Constructor Methods.
Class Objects as Parameters in Methods, Access Control, Recursive Methods, Nesting of Methods, Overriding Methods.
Attributes `final` and `static`.

UNIT–III: Arrays, Inheritance and Interfaces (9 Lectures)

Arrays: Introduction, Assigning Array to Another Array, Dynamic Change of Array Size, Sorting of Arrays, Search for Values in Arrays, Two-dimensional and Three-dimensional Arrays.
Inheritance: Process of Inheritance, Types of Inheritances, Object Class, Inhibiting Inheritance Using `final`, `super` Keyword, Method Overriding, Dynamic Method Dispatch, Abstract Classes.
Interfaces: Introduction, Multiple Interfaces, Nested Interfaces, Inheritance of Interfaces, Default Methods in Interfaces, Static Methods in Interface, Functional Interfaces.

UNIT–IV: Packages, Exception Handling and Java I/O (10 Lectures)

Packages and Java Library: Defining Package, Importing Packages and Classes, Path and Class Path, Access Control.
Packages in Java SE: `java.lang` package and its Classes, `Object` class, `Math` class.
Wrapper Classes, Auto-boxing and Auto-unboxing.
`java.util` package: Formatter Class, Random Class.
Time Package, Class `Instant` (`java.time.Instant`), Formatting for Date/Time in Java.
Exception Handling: Hierarchy of Standard Exception Classes, Keywords `throws` and `throw`, `try`, `catch`, and `finally` Blocks, Multiple Catch Clauses, Class `Throwable`, unchecked and checked exceptions.
Java I/O and File: Java I/O API, standard I/O streams, Byte streams, Character streams, Scanner class, File handling in Java (based on Text Book 2).

UNIT–V: Strings, Multithreading and GUI (9 Lectures)

String Handling: Interface `CharSequence`, Class `String`, String Methods, Class `StringBuffer`.
Multithreaded Programming: Need for Multiple Threads, `Thread` Class, Main Thread, Creation of New Threads, Thread States, Thread Priority, Synchronization, Deadlock and Race Conditions, Inter-thread Communication, Suspending, Resuming and Stopping Threads.
Java FX GUI: Java FX Scene Builder, Java FX App Window Structure, Displaying Text and Images, Event Handling, Layout of Nodes in Scene Graph, Mouse Events (based on Text Book 3).

Text Books:

1. JAVA one step ahead, Anitha Seth, B.L. Juneja, Oxford.
2. Joy with JAVA, Fundamentals of Object Oriented Programming, Debasis Samanta,

Monalisa Sarma, Cambridge, 2023.
3. JAVA 9 for Programmers, Paul Deitel, Harvey Deitel, 4th Edition, Pearson.

Reference Books:

1. The Complete Reference Java, 11th edition, Herbert Schildt, TMH.
2. Introduction to Java Programming, 7th Edition, Y. Daniel Liang, Pearson.

Online Resources:

1. https://nptel.ac.in/courses/106/105/106105191/
2. https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_012880464547618816347_shared/overview

Course Code	Course Name	Course Structure			
		L	T	P	C
P23CST04	OPERATING SYSTEMS	3	0	0	3

Internal Marks: 30 External Marks: 70

Course Objectives: At the end of the course the student will be able to

1. Provide basic knowledge of computer operating system structure and functioning.
2. Understand how Operating Systems evolved with advent of computer architecture.
3. Comprehend different CPU scheduling algorithms, page replacement algorithms and disk scheduling and identify the best ones.

Course Outcomes: At the end of the course, the student will be able to

CO1: Describe the underlying principles and techniques of operating systems. (L2)
CO2: Illustrate scheduling and communication methods of processes handled by operating systems. (L4)
CO3: Distinguish process synchronization methods and deadlock handling approaches employed in operating systems. (L3)
CO4: Classify memory management techniques and virtual memory mechanisms. (L4)
CO5: Analyze strategies of disk scheduling algorithms and file system architecture. (L4)

UNIT–I: Operating System Structures

Operating-System Services, User Operating-System Interface, System Calls, Types of System Calls, System Programs, Operating-System Design and Implementation, Operating-System Structure, Virtual Machines, Operating-System Generation, System Boot.

UNIT–II: Processes and Scheduling

Process Concept, Inter-process Communication, Communication in Client-Server Systems.

Threads: Overview, Multithreading Models.

Process Scheduling: Basic Concepts, Scheduling Criteria, Scheduling Algorithms.

UNIT–III: Synchronization and Deadlocks

The Critical-Section Problem, Peterson's Solution, Synchronization Hardware, Semaphores, Classic Problems of Synchronization, Monitors.

Deadlocks: System Model, Deadlock Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock.

UNIT–IV: Memory Management

Memory Management Strategies: Background, Swapping, Contiguous Memory Allocation, Segmentation, Paging, Structure of Page Table.

Virtual Memory Management: Background, Demand Paging, Page Replacement, Allocation of Frames, Thrashing.

UNIT–V: File Systems and Disk Management

File System Interface: The Concept of a File, Access Methods, Directory Structure, File System Mounting, File Sharing, Protection.

File System Implementation: File System Structure, Allocation Methods, Free Space Management.

Mass Storage Structure: Overview of Mass-storage Structure, Disk Scheduling.

Text Books:

1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, *Operating System Concepts*, 9th Edition, John Wiley and Sons Inc., 2012.
2. William Stallings, *Operating Systems – Internals and Design Principles*, 7th Edition, Prentice Hall, 2011.

Reference Books:

1. Andrew S. Tanenbaum, *Modern Operating Systems*, 2nd Edition, Addison Wesley, 2001.
2. Charles Crowley, *Operating Systems: A Design-Oriented Approach*, Tata McGraw Hill Education, 1996.
3. D M Dhamdhere, *Operating Systems: A Concept-Based Approach*, 2nd Edition, Tata McGraw-Hill Education, 2007.

Web References:

- `https://nptel.ac.in/courses/106/106/106106144/`
- `https://www.tutorialspoint.com/operating_system`

Course Code	Course Name	Course Structure			
		L	T	P	C
P23BST12	UNIVERSAL HUMAN VALUES – UNDERSTANDING HARMONY AND ETHICAL HUMAN CONDUCT	2	1	0	3

Internal Marks: 30 External Marks: 70

Course Objectives: At the end of the course, the student can be able

1. Help the students appreciate the essential complementary between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity which are the core aspirations of all human beings.
2. Facilitate the development of a Holistic perspective among students towards life and profession as well as towards happiness and prosperity based on a correct understanding of the Human reality and the rest of existence. Such holistic perspective forms the basis of Universal Human Values and movement towards value-based living in a natural way.
3. Highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually fulfilling human behaviour and mutually enriching interaction with Nature.

Course Outcomes: At the end of the course, the student will be able to

CO1: Define the terms like Natural Acceptance, Happiness and Prosperity (L1, L2)
CO2: Identify one's self, and one's surroundings (family, society nature) (L1, L2)
CO3: Apply what they have learnt to their own self in different day-to-day settings in real life (L3)
CO4: Relate human values with human relationship and human society. (L4)
CO5: Justify the need for universal human values and harmonious existence (L5) · Develop as socially and ecologically responsible engineers (L3, L6)

UNIT–I: Introduction to Value Education (6 Lectures, 3 Tutorials)

Lecture 1: Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of Education). Lecture 2: Understanding Value Education.
Tutorial 1: Practice Session PS1 Sharing about Oneself.
Lecture 3: Self-exploration as the Process for Value Education. Lecture 4: Continuous Happiness and Prosperity – the Basic Human Aspirations.
Tutorial 2: Practice Session PS2 Exploring Human Consciousness.
Lecture 5: Happiness and Prosperity – Current Scenario. Lecture 6: Method to Fulfill the Basic Human Aspirations.
Tutorial 3: Practice Session PS3 Exploring Natural Acceptance.

UNIT–II: Harmony in the Human Being (6 Lectures, 3 Tutorials)

Lecture 7: Understanding Human being as the Co-existence of the self and the body. Lecture 8: Distinguishing between the Needs of the self and the body.
Tutorial 4: Practice Session PS4 Exploring the difference of Needs of self and body.

Lecture 9: The body as an Instrument of the self. Lecture 10: Understanding Harmony in the self.
Tutorial 5: Practice Session PS5 Exploring Sources of Imagination in the self.
Lecture 11: Harmony of the self with the body. Lecture 12: Programme to ensure self-regulation and Health.
Tutorial 6: Practice Session PS6 Exploring Harmony of self with the body.

UNIT–III: Harmony in the Family and Society (6 Lectures, 3 Tutorials)

Lecture 13: Harmony in the Family – the Basic Unit of Human Interaction. Lecture 14: 'Trust' – the Foundational Value in Relationship.
Tutorial 7: Practice Session PS7 Exploring the Feeling of Trust.
Lecture 15: 'Respect' – as the Right Evaluation.
Tutorial 8: Practice Session PS8 Exploring the Feeling of Respect.
Lecture 16: Other Feelings, Justice in Human-to-Human Relationship. Lecture 17: Understanding Harmony in the Society. Lecture 18: Vision for the Universal Human Order.
Tutorial 9: Practice Session PS9 Exploring Systems to fulfil Human Goal.

UNIT–IV: Harmony in the Nature/Existence (4 Lectures, 2 Tutorials)

Lecture 19: Understanding Harmony in Nature. Lecture 20: Interconnectedness, self-regulation and Mutual Fulfilment among the Four Orders of Nature.
Tutorial 10: Practice Session PS10 Exploring the Four Orders of Nature.
Lecture 21: Realizing Existence as Co-existence at All Levels. Lecture 22: The Holistic Perception of Harmony in Existence.
Tutorial 11: Practice Session PS11 Exploring Co-existence in Existence.

UNIT–V: Implications of the Holistic Understanding – a Look at Professional Ethics (6 Lectures, 3 Tutorials)

Lecture 23: Natural Acceptance of Human Values. Lecture 24: Definitiveness of (Ethical) Human Conduct.
Tutorial 12: Practice Session PS12 Exploring Ethical Human Conduct.
Lecture 25: A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order. Lecture 26: Competence in Professional Ethics.
Tutorial 13: Practice Session PS13 Exploring Humanistic Models in Education.
Lecture 27: Holistic Technologies, Production Systems and Management Models – Typical Case Studies. Lecture 28: Strategies for Transition towards Value-based Life and Profession.
Tutorial 14: Practice Session PS14 Exploring Steps of Transition towards Universal Human Order.

Practice Sessions:

- **UNIT I**: PS1 Sharing about Oneself, PS2 Exploring Human Consciousness, PS3 Exploring Natural Acceptance
- **UNIT II**: PS4 Exploring the difference of Needs of self and body, PS5 Exploring Sources of Imagination in the self, PS6 Exploring Harmony of self with the body

- **UNIT III**: PS7 Exploring the Feeling of Trust, PS8 Exploring the Feeling of Respect, PS9 Exploring Systems to fulfil Human Goal
- **UNIT IV**: PS10 Exploring the Four Orders of Nature, PS11 Exploring Co-existence in Existence
- **UNIT V**: PS12 Exploring Ethical Human Conduct, PS13 Exploring Humanistic Models in Education, PS14 Exploring Steps of Transition towards Universal Human Order

Textbook and Teachers Manual:

1. **The Textbook:**
   R R Gaur, R Asthana, G P Bagaria, *A Foundation Course in Human Values and Professional Ethics*, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-47-1

2. **The Teacher's Manual:**
   R R Gaur, R Asthana, G P Bagaria, *Teachers' Manual for A Foundation Course in Human Values and Professional Ethics*, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-53-2

Reference Books:

1. JeevanVidya: EkParichaya, A Nagaraj, JeevanVidyaPrakashan, Amarkantak, 1999.
2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3. The Story of Stuff (Book).
4. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi
5. Small is Beautiful - E. F Schumacher.
6. Slow is Beautiful - Cecile Andrews
7. Economy of Permanence - J C Kumarappa
8. Bharat Mein Angreji Raj – Pandit Sunderlal
9. Rediscovering India - by Dharampal
10. Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi
11. India Wins Freedom - Maulana Abdul Kalam Azad
12. Vivekananda - Romain Rolland (English)
13. Gandhi - Romain Rolland (English)

Online Resources:

1. https://fdp-si.aicte-india.org/UHV-II%20Class%20Notes%20&%20Handouts/UHV%20Handout%201Introduction%20to%20Value%20Education.pdf
2. https://fdp-si.aicte-india.org/UHV-II%20Class%20Notes%20&%20Handouts/UHV%20Handout%202-Harmony%20in%20the%20Human%20Being.pdf
3. https://fdp-si.aicte-india.org/UHV-II%20Class%20Notes%20&%20Handouts/UHV%20Handout%203-Harmony%20in%20the%20Family.pdf
4. https://fdp-si.aicte-india.org/UHV%201%20Teaching%20Material/D3S2%20Respect%20July%2023.pdf
5. https://fdp-si.aicte-india.org/UHV-II%20Class%20Notes%20&%20Handouts/UHV%20Handout%205-Harmony%20in%20the%20Nature%20and%20Existence.pdf
6. https://fdp-si.aicte-india.org/download/FDPTeachingMaterial/3-days%20FDP-SI%20UHV%20Teaching%20Material/Day%203%20Handouts/UHV%203D%20D3-S2A%20Und%20Nature-Existence.pdf
7. https://fdp-si.aicte-india.org/UHV%20II%20Teaching%20Material/UHV%20II%20Lecture%202325%20Ethics%20v1.pdf
8. https://www.studocu.com/in/document/kiet-group-of-institutions/universal-humanvalues/chapter-5-holistic-understanding-of-harmony-on-professional-ethics/62490385
9. https://onlinecourses.swayam2.ac.in/aic22_ge23/preview

Course Code	Course Name	Course Structure			
		L	T	P	C
P23CSL03	OBJECT ORIENTED PROGRAMMING THROUGH JAVA LAB	3	0	0	3

Internal Marks: 30 External Marks: 70

Course Objectives:

- Practice object-oriented programming in the Java programming language.
- Implement Classes, Objects, Methods, Inheritance, Exception Handling, Runtime Polymorphism, User-defined Exception handling mechanism.
- Illustrate inheritance, Exception handling mechanism, JDBC connectivity.
- Construct Threads, Event Handling, implement packages, Java FX GUI.

Experiments covering the Topics:

- Object Oriented Programming fundamentals - data types, control structures.
- Classes, methods, objects, Inheritance, polymorphism.
- Exception handling, Threads, Packages, Interfaces.
- Files, I/O streams.

Sample Experiments:

Exercise – 1:

1. Write a JAVA program to display default value of all primitive data types of JAVA.
2. Write a JAVA program to display the roots of a quadratic equation $ax^2 + bx = 0$. Calculate the discriminant and based on its value, describe the nature of the roots.

Exercise – 2:

1. Write a JAVA program to search for an element in a given list of elements using binary search.
2. Write a JAVA program to sort elements in a list using bubble sort.
3. Write a JAVA program using StringBuffer to delete and remove characters.

Exercise – 3:

1. Write a JAVA program to implement class mechanism. Create a class, methods and invoke them inside main method.

2. Write a JAVA program to implement method overloading.
3. Write a JAVA program to implement a constructor.
4. Write a JAVA program to implement constructor overloading.

Exercise – 4:

1. Write a JAVA program to implement Single Inheritance.
2. Write a JAVA program to implement Multi-level Inheritance.
3. Write a JAVA program for abstract class to find areas of different shapes.

Exercise – 5:

1. Write a JAVA program giving example for the "super" keyword.
2. Write a JAVA program to implement Interface. What kind of Inheritance can be achieved?
3. Write a JAVA program that implements Runtime polymorphism.

Exercise – 6:

1. Write a JAVA program that describes exception handling mechanism.
2. Write a JAVA program illustrating Multiple catch clauses.
3. Write a JAVA program for creation of Java Built-in Exceptions.
4. Write a JAVA program for creation of User Defined Exception.

Exercise – 7:

1. Write a JAVA program that creates threads by extending Thread class:
   - Thread 1 displays "Good Morning" every 1 second.
   - Thread 2 displays "Hello" every 2 seconds.
   - Thread 3 displays "Welcome" every 3 seconds.

   Repeat the same by implementing Runnable interface.
2. Write a program illustrating isAlive() and join().
3. Write a program illustrating daemon threads.
4. Write a JAVA program solving the Producer-Consumer problem.

Exercise – 8:

- Write a JAVA program that imports and uses user-defined packages.

Course Code	Course Name	Course Structure			
		L	T	P	C
P23CSL04	OPERATING SYSTEM LAB	0	0	3	1.5

Internal Marks: 50 External Marks: 50

Course Objectives: The main objectives of the course are to:

- Provide insights into system calls, file systems, semaphores.
- Develop and debug CPU scheduling algorithms, page replacement algorithms, and thread implementation.
- Implement Banker's Algorithm to avoid deadlocks.
- Acquire generic software development skills through software life cycle stages.
- Generate test cases for software testing.

Experiments covering the Topics:

- UNIX fundamentals, commands & system calls.
- CPU Scheduling algorithms, thread processing.
- IPC, semaphores, monitors, deadlocks.
- Page replacement algorithms, file allocation strategies.
- Memory allocation strategies.
- Software Requirement Specification, DFD, CFD.
- Software estimation, UML diagrams, test case design.

Sample Experiments:

1. Practicing basic UNIX commands.
2. Write programs using UNIX system calls: fork, exec, getpid, exit, wait, close, stat, opendir, and readdir.
3. Simulate UNIX commands such as cp, ls, grep, etc.
4. Simulate CPU scheduling algorithms:
   a) FCFS
   b) SJF
   c) Priority
   d) Round Robin
5. Control number of OS ports opened using:
   a) Semaphore
   b) Monitors
6. Illustrate concurrent execution of threads using pthreads library.
7. Solve producer-consumer problem using semaphores.
8. Implement fixed partition memory allocation:
   a) First fit

b) Worst fit

c) Best fit

9. Simulate page replacement algorithms:

Course Code	Course Name	Course Structure			
		L	T	P	C
P23CBS01	PYTHON PROGRAMMING (SKILL ENHANCEMENT COURSE)	3	0	0	3

Internal Marks: 50 External Marks: 50

Course Objectives: The main objectives of the course are to:

- Introduce core programming concepts of Python programming language.
- Demonstrate Python data structures like Lists, Tuples, Sets, and Dictionaries.
- Implement Functions, Modules, and Regular Expressions in Python programming and create practical and contemporary applications using these.

Syllabus:

Unit-I: Introduction

History of Python Programming Language, Thrust Areas of Python, Installing Anaconda Python Distribution, Installing and Using Jupyter Notebook.
Parts of Python Programming Language: Identifiers, Keywords, Statements and Expressions, Variables, Operators, Precedence and Associativity, Data Types, Indentation, Comments, Reading Input, Print Output, Type Conversions, the `type()` Function and `is` Operator, Dynamic and Strongly Typed Language.
Control Flow Statements: if statement, if-else statement, if...elif...else, Nested if statement, while Loop, for Loop, continue and break Statements, Catching Exceptions Using `try` and `except` Statement.

Sample Experiments:

1. Write a program to find the largest element among three numbers.
2. Write a program to display all prime numbers within an interval.
3. Write a program to swap two numbers without using a temporary variable.
4. Demonstrate the following operators in Python with suitable examples:
    - Arithmetic Operators
    - Relational Operators
    - Assignment Operators
    - Logical Operators
    - Bitwise Operators
    - Ternary Operator
    - Membership Operators

- Identity Operators

5. Write a program to add and multiply complex numbers.
6. Write a program to print the multiplication table of a given number.

Unit-II: Functions, Strings, and Lists

Functions: Built-In Functions, Commonly Used Modules, Function Definition and Calling, `return` Statement and Void Function, Scope and Lifetime of Variables, Default Parameters, Keyword Arguments, `*args` and `**kwargs`, Command Line Arguments.

Strings: Creating and Storing Strings, Basic String Operations, Accessing Characters in Strings by Index Number, String Slicing and Joining, String Methods, Formatting Strings.

Lists: Creating Lists, Basic List Operations, Indexing and Slicing in Lists, Built-In Functions Used on Lists, List Methods, `del` Statement.

Sample Experiments:

1. Write a program to define a function with multiple return values.
2. Write a program to define a function using default arguments.
3. Write a program to find the length of a string without using any library functions.
4. Write a program to check if a substring is present in a given string or not.
5. Write a program to perform the given operations on a list:
   - Addition
   - Insertion
   - Slicing
6. Write a program to perform any five built-in functions by taking any list.

Unit-III: Dictionaries, Tuples, and Sets

Dictionaries: Creating Dictionary, Accessing and Modifying key:value Pairs in Dictionaries, Built-In Functions Used on Dictionaries, Dictionary Methods, `del` Statement.

Tuples and Sets: Creating Tuples, Basic Tuple Operations, `tuple()` Function, Indexing and Slicing in Tuples, Built-In Functions Used on Tuples, Relation between Tuples and Lists, Relation between Tuples and Dictionaries, Using `zip()` Function, Sets, Set Methods, Frozenset.

Sample Experiments:

1. Write a program to create tuples (name, age, address, college) for at least two members, concatenate the tuples, and print the concatenated tuple.
2. Write a program to count the number of vowels in a string (no control flow allowed).

3. Write a program to check if a given key exists in a dictionary or not.
4. Write a program to add a new key-value pair to an existing dictionary.
5. Write a program to sum all the items in a given dictionary.

Unit-IV: Files and Object-Oriented Programming

Files: Types of Files, Creating and Reading Text Data, File Methods to Read and Write Data, Reading and Writing Binary Files, Pickle Module, Reading and Writing CSV Files, Python `os` and `os.path` Modules.

Object-Oriented Programming: Classes and Objects, Creating Classes in Python, Creating Objects in Python, Constructor Method, Classes with Multiple Objects, Class Attributes vs Data Attributes, Encapsulation, Inheritance, Polymorphism.

Sample Experiments:

1. Write a program to sort words in a file and put them in another file. The output file should have only lower-case words; any upper-case words from source must be converted to lower case.
2. Python program to print each line of a file in reverse order.
3. Python program to compute the number of characters, words, and lines in a file.
4. Write a program to create, display, append, insert and reverse the order of items in an array.
5. Write a program to add, transpose, and multiply two matrices.
6. Write a Python program to create a class that represents a shape. Include methods to calculate its area and perimeter. Implement subclasses for different shapes like circle, triangle, and square.

Unit-V: Introduction to Data Science

Functional Programming, JSON and XML in Python, NumPy with Python, Pandas.

Sample Experiments:

1. Python program to check whether a JSON string contains a complex object or not.
2. Python program to demonstrate NumPy arrays creation using `array()` function.
3. Python program to demonstrate use of `ndim`, `shape`, `size`, `dtype`.
4. Python program to demonstrate basic slicing, integer, and Boolean indexing.
5. Python program to find min, max, sum, cumulative sum of an array.
6. Create a dictionary with at least five keys where each key maps to a list containing at least ten values. Convert this dictionary to a pandas DataFrame and explore the data as follows:

- Apply `head()` function to the DataFrame.
- Perform various data selection operations on the DataFrame.

7. Select any two columns from the above DataFrame, and observe the change in one attribute with respect to another using scatter and plot operations in matplotlib.

Reference Books:

1. Gowrishankar S, Veena A., *Introduction to Python Programming*, CRC Press.
2. S. Sridhar, J. Indumathi, V. M. Hariharan, *Python Programming*, 2nd Edition, Pearson, 2024.
3. Y. Daniel Liang, *Introduction to Programming Using Python*, Pearson.

Online Learning Resources / Virtual Labs:

1. `https://www.coursera.org/learn/python-for-applied-data-science-ai`
2. `https://www.coursera.org/learn/python?specialization=python#syllabus`

Course Code	Course Name	Course Structure			
		L	T	P	C
P23CST02	ADVANCED DATA STRUCTURES & ALGORITHMS ANALYSIS	3	0	0	3

Internal Marks: 30 External Marks: 70

Course Objectives:

1. Provide knowledge on advanced data structures frequently used in computer science domain.
2. Develop skills in algorithm design techniques popularly used.
3. Understand the use of various data structures in algorithm design.

Course Outcomes:

CO1: Identify various Time and Space complexities of various algorithms. Apply the concepts of advanced Trees for solving problems effectively.
CO2: Understand Graph Traversal methods and Divide and Conquer Algorithms.
CO3: Apply Greedy and Dynamic Programming concept to solve various problems.
CO4: Apply Backtracking, Branch and Bound concept to solve various problems.
CO5: Implement different performance analysis methods for non-deterministic algorithms.

UNIT–I: Introduction (9 Lectures)

Introduction to Algorithm Analysis, Space and Time Complexity Analysis, Asymptotic Notations.

AVL Trees: Creation, Insertion, Deletion operations and Applications.

B-Trees: Creation, Insertion, Deletion operations and Applications.

UNIT–II: Graphs and Divide & Conquer (9 Lectures)

Graphs – Terminology, Representations, Basic Search and Traversals, Connected Components and Biconnected Components.

Divide and Conquer: The General Method, Binary Search, Quick Sort, Merge Sort, Strassen's Matrix Multiplication.

UNIT–III: Greedy and Dynamic Programming (10 Lectures)

Greedy Method: The General Method, Job Sequencing with deadlines, Knapsack Problem, Minimum Cost Spanning Trees, Single Source Shortest Paths.

Dynamic Programming: The General Method, All pairs shortest paths, 0/1 Knapsack, String Editing, Travelling Sales Person Problem.

UNIT–IV: Backtracking and Branch & Bound (9 Lectures)

Backtracking: The General Method, 8–Queens Problem, Sum of Subsets Problem, Graph Coloring, Hamiltonian Cycles.

Branch and Bound: The General Method, 15–Puzzle Problem, Travelling Salesperson Problem.

UNIT–V: NP Hard and NP Complete Problems (8 Lectures)

Basic Concepts, Cook's Theorem. **NP Hard Graph Problems**: Click Decision Problem (CDP), Chromatic Number Decision Problem (CNDP).
NP Hard Scheduling Problems: Scheduling Identical Processors, Job Shop Scheduling.

Text Books:

1. Fundamentals of Data Structures in C++, Horowitz, Ellis; Sahni, Sartaj: Mehta, Dinesh, 2nd Edition Universities Press.
2. Computer Algorithms in C++, Ellis Horowitz, Sartaj Sahni, Sangu Thevar Rajasekaran, 2nd Edition University Press.

Reference Books:

1. Data Structures and program design in C, Robert Kruse, Pearson Education Asia.
2. An introduction to Data Structures with applications, Trembley& Sorenson, McGraw Hill.
3. The Art of Computer Programming, Vol.1: Fundamental Algorithms, Donald E Knuth, Addison-Wesley, 1997.
4. Data Structures using C & C++: Langsam, Augenstein& Tanenbaum, Pearson, 1995.
5. Algorithms+ Data Structures & Programs, N. Wirth, PHI.
6. Fundamentals of Data Structures in C++: Horowitz Sahni& Mehta, Galgottia Pub.
7. Data structures in Java: Thomas Standish, Pearson Education Asia.

Online Learning Resources:

1. `https://www.tutorialspoint.com/advanced_data_structures/index.asp`
2. `http://peterindia.net/Algorithms.html`
3. Abdul Bari, Introduction to Algorithms (youtube.com)

Course Code	Course Name	Course Structure			
		L	T	P	C
P23CBT01	COMPUTER NETWORKS	3	0	0	3

Internal Marks: 30 External Marks: 70

Course Objectives: The main objectives of the course is to

1. To understand the different types of networks.
2. To discuss the software and hardware components of a network.
3. To develop an understanding the principles of computer networks.
4. To familiarize with OSI model and the functions of layered structure.
5. To explain networking protocols, algorithms and design perspectives.

Course Outcomes:

CO1: Compare protocol models (OSI, TCP/IP) and select suitable protocol for network design. (L2)

CO2: Apply flow control, error control techniques and protocols to verify the correctness of data in the communicated network. (L3)

CO3: Apply routing and congestion control algorithms to deliver data packets across the networks. (L3)

CO4: Use communication protocols like IP, TCP, UDP. (L3)

CO5: Use communication protocols like HTTP, FTP across the Internet. (L3)

UNIT–I: Introduction (8 Lectures)

Types of computer networks, Mobile and Wireless Access Networks, Broadband Access Networks, Uses of Computer Networks, Protocol layering, InterNetworks, Network protocols, Design Goals, Network software, Reference Models, The OSI Reference model, The TCP/IP Reference model, A Critique of OSI model and protocols, A Critique of TCP/IP model and protocols.

UNIT–II: The Data Link Layer (9 Lectures)

Guided Transmission media, Data Link Layer Design Issues, Framing Error Control, Flow Control, Error Detection and Correction, Error Detection codes, Error Correction codes, Elementary Data Link Protocols, Sliding window Protocols, The Channel Allocation Problem, Multiple Access Protocols, Collision-Free Protocols, Limited-Contention Protocols, Wireless LAN Protocols, Ethernet, Classic Ethernet Physical Layer, Classic Ethernet Mac Sub layer Protocol, Ethernet Performance, Switched Ethernet, Fast Ethernet, Gigabit Ethernet, 10-Gigabit Ethernet, 40-And 100-Gigabit Ethernet, Retrospective On Ethernet.

UNIT–III: The Network Layer (10 Lectures)

Network Layer Design Issues, Routing Algorithms In A Single Network, Traffic Management at The Network Layer, Congestion Control Algorithms, Internetworking: An Overview, How Networks differ, Connecting Heterogeneous Networks, Connecting Endpoints Across Heterogeneous Networks, Internet work Routing, Packet

Fragmentation, The Network Layer In The Internet: The IP Version4 Protocol, IP Addresses, IP Version6, Internet Control Protocols, Label Switching and MPLS, OSPF—An Interior Gateway Routing Protocol, BGP—The Exterior Gateway Routing Protocol, Internet Multicasting.

UNIT–IV: The Transport Layer **(9 Lectures)**

The Transport Service, Elements Of Transport Protocols, Addressing, Connection Establishment, Connection Release, Error Control And Flow Control, Multiplexing, Crash Recovery, Congestion Control, The Internet Transport Protocols: UDP, Introduction To UDP, Remote Procedure Call, Real-Time Transport Protocols, The Internet Transport Protocols: TCP, Introduction To TCP, The TCP Service Model, The TCP Protocol, The TCP Segment Header, TCP Connection Establishment, TCP Connection Release.

UNIT–V: The Application Layer **(9 Lectures)**

Electronic Mail, Architecture and Services, The User Agent, Message Formats, Message Transfer, Final Delivery, The World Wide Web, Architectural Overview, Static Web Objects, Dynamic Web Pages and Web Applications, HTTP and HTTPS, Web Privacy, Content Delivery, Content and Internet Traffic, Server Farms and Web Proxies, Content Delivery Networks, Peer-To-Peer Networks, Evolution of The Internet.

Text Books:

1. Andrew Tanenbaum, Feamster Wetherall, Computer Networks, 6th Edition, Global Edition.

Reference Books:

1. Behrouz A. Forouzan, Data Communications and Networking, 5th Edition, McGraw Hill Publication, 2017.
2. James F. Kurose, Keith W.Ross, “Computer Networking: A Top-Down Approach”, 6th edition, Pearson, 2019.
3. Youlu Zheng, Shakil Akthar, “Networks for Computer Scientists and Engineers”, Oxford Publishers, 2016.

Web-Resources:

1. https://nptel.ac.in/courses/106105183/25
2. http://www.nptelvideos.in/2012/11/computer
3. https://nptel.ac.in/courses/106105183/3

Course Code	Course Name	Course Structure			
		L	T	P	C
P23CST05	DATABASE MANAGEMENT SYSTEMS	3	0	0	3

Internal Marks: 30 External Marks: 70

Course Objectives:

1. To introduce database management systems.
2. To give a good formal foundation on the relational model.
3. To introduce basic SQL as a universal database language.
4. To demonstrate principles behind systematic database design covering conceptual design, logical design, and normalization.
5. To provide an overview of physical design, including database indexing and storage techniques.
6. To explain transaction management techniques.

Course Outcomes:

CO1: Describe fundamental concepts of a relational database. (L1)
CO2: Create, maintain and manipulate a relational database using SQL. (L3)
CO3: Apply conceptual and logical database design. (L3)
CO4: Apply normalization for database design. (L3)
CO5: Illustrate storage management and transaction management techniques. (L3)

UNIT–I: Introduction (8 Lectures)

Database system, characteristics (Database Vs File System), database users (actors on scene, workers behind the scene), advantages of database systems, database applications.

Brief introduction of different data models; concepts of schema, instance and data independence; three-tier schema architecture for data independence; database system structure, environment, centralized and client-server architecture for the database.

UNIT–II: Relational Model and Basic SQL (10 Lectures)

Relational model: concepts of domain, attribute, tuple, relation, importance of null values, constraints (Domain, Key constraints, integrity constraints) and their importance.

BASIC SQL: Simple database schema, data types, table definitions (CREATE, ALTER), DML operations (INSERT, DELETE, UPDATE), basic SQL querying (SELECT, PROJECT) using WHERE clause, arithmetic and logical operations, SQL functions (date and time, numeric, string conversion).

UNIT–III: Entity Relationship Model and Advanced SQL (9 Lectures)

Entity Relationship model: basic features, representation of entities, attributes, entity set, relationship, relationship set, constraints, ER diagrams, generalization/specialization and aggregation.

SQL: creating tables with relationships, implementation of key and integrity constraints, nested queries, subqueries, grouping, aggregation, ordering, different types of joins, views (updatable and non-updatable), relational set operations.

UNIT–IV: Schema Refinement (Normalization) (8 Lectures)

Purpose of normalization or schema refinement, concept of functional dependency, closure of functional dependency and attribute closure.

Normal forms based on functional dependency: 1NF, 2NF, 3NF; concept of surrogate key; Boyce-Codd normal form (BCNF), lossless join and dependency preserving decomposition, fourth normal form (4NF), fifth normal form (5NF).

UNIT–V: Transaction Concept and Indexing Techniques (10 Lectures)

Transaction concept: transaction state, implementation of atomicity and durability, schedules, serializability, recoverability, implementation of isolation levels, 2PL and timestamp ordering protocols, failure classification, recovery and atomicity, ARIES recovery algorithm.

Indexing techniques: indexing, cluster indexes, primary and secondary indexes, index data structures, hash-based indexing, B+ trees: searching, insertion, deletion.

Text Books:

1. Abraham Silberschatz, Henry F. Korth, S. Sudarshan, *Database System Concepts*, 7th Edition, McGraw-Hill Education, 2019.
2. Raghu Ramakrishnan, Johannes Gehrke, *Database Management Systems*, 3rd Edition, McGraw-Hill Education (India), 2014.

Reference Books:

1. Steven Morris, Keeley Crockett, Carlos Coronel, Craig Blewett, *Database Principles: Fundamentals of Design, Implementation, and Management*, Cengage, 2020.
2. Ramez Elmasri, Shamkant B. Navathe, *Fundamentals of Database Systems*, 7th Edition, Pearson Education India, 2015.
3. C. J. Date, *Introduction to Database Systems*, 8th Edition, Pearson Education, 2009.

Web References:

1. `https://nptel.ac.in/courses/106/105/106105175/`
2. `https://www.geeksforgeeks.org/sql-tutorial/?ref=shm`
3. `https://www.tutorialspoint.com/dbms/index.htm`

Course Code	Course Name	Course Structure			
		L	T	P	C
P23MBT01	MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS	2	0	0	2

Internal Marks: 30 External Marks: 70

Course Objectives

1. To inculcate the basic knowledge of micro economics and financial accounting.
2. To make students learn demand estimation for different products, input-output relationships for optimizing production and cost.
3. To understand various types of market structures and pricing methods and strategies.
4. To give an overview of investment appraisal methods to guide students in planning long-term investments.
5. To provide fundamental skills in accounting and explain the process of preparing financial statements.

Course Outcomes

CO1 Define concepts related to Managerial Economics, financial accounting and management. (L2)

CO2 Understand fundamentals of economics such as demand, production, cost, revenue, and markets. (L2)

CO3 Apply concepts of production cost and revenues for effective business decisions. (L3)

CO4 Analyze investment options to maximize returns. (L4)

CO5 Develop accounting statements and evaluate financial performance of business entities. (L5)

Syllabus

UNIT-I (9 Lectures)

Managerial Economics Introduction: Nature, meaning, significance, and functions. Demand: Concept, Function, Law of Demand, Elasticity of Demand (types and measurement). Demand Forecasting: Factors governing forecasting, methods. Managerial Economics and Financial Accounting and Management.

UNIT-II (9 Lectures)

Production and Cost Analysis Introduction: Nature and significance. Production Function – Least-cost combination – Short run and Long run Production Function – Isoquants and Isocosts. Cost Concepts and Break-Even Analysis (BEA): Determination of Break-Even Point (simple problems).

UNIT-III (9 Lectures)

Business Organizations and Markets: Forms of Business Organizations (Sole Proprietorship, Partnership, Joint Stock Companies, Public Sector Enterprises). Types of Markets: Perfect competition, Monopoly, Monopolistic Competition, Oligopoly. Pricing and Output Decisions: Pricing Methods and Strategies.

UNIT-IV (9 Lectures)
Capital Budgeting: Nature, significance. Components of working capital, sources of short-term and long-term capital. Capital budgeting methods and evaluation: Payback Period, Accounting Rate of Return (ARR), Net Present Value (NPV), Internal Rate of Return (IRR) (sample problems).

UNIT-V (9 Lectures)
Financial Accounting Introduction: Concepts and conventions, Double-entry bookkeeping, Journal, Ledger, Trial Balance, Final Accounts (Trading, Profit and Loss Account, Balance Sheet). Financial Statement Analysis: Liquidity ratios, Activity ratios, Capital structure ratios, Profitability ratios.

Text Books

1. Varshney, R.L., Maheswari: Managerial Economics, Sultan Chand.
2. Arya Sri: Business Economics and Financial Analysis, 4th Edition, McGraw Hill.

Reference Books

1. Ahuja, H.L.: Managerial Economics, S. Chand.
2. Siddiqui, S.A., Siddiqui, A.S.: Managerial Economics and Financial Analysis, New Age International.
3. Nellis, J., Parker, D.: Principles of Business Economics, Pearson, 2nd Edition.
4. Salvatore, D.: Managerial Economics in a Global Economy, Cengage.

Online Learning Resources

1. https://www.slideshare.net/123ps/managerial-economics-ppt
2. https://www.slideshare.net/rossanz/production-and-cost-45827016
3. https://www.slideshare.net/darkyla/business-organizations-19917607
4. https://www.slideshare.net/balarajbl/market-and-classification-of-market
5. https://www.slideshare.net/ruchi101/capital-budgeting-ppt-59565396
6. https://www.slideshare.net/ashu1983/financial-accounting

Course Code	Course Name	Course Structure			
		L	T	P	C
P23BST15	NUMBER THEORY AND ITS APPLICATIONS	3	0	0	3

Internal Marks: 30 External Marks: 70

Course Objectives:

1. This course enables the students to learn the concepts of number theory and its applications to information security.

Course Outcomes:

CO1: Explain the knowledge of GCD and Prime Factorization. (L2)
CO2: Understand principles on congruence. (L2)
CO3: Apply the knowledge of congruence applications. (L3)
CO4: Solve the finite fields and primality. (L3)
CO5: Analyze various encryption methods and its applications. (L4)

UNIT–I: Integers, Greatest Common Divisors and Prime Factorization (10 Lectures)
The well ordering property, divisibility, representation of integers, computer operations with integers, prime numbers, greatest common divisors, the Euclidean algorithm, the fundamental theorem of arithmetic, factorization of integers and the Fermat numbers, linear Diophantine equations.

UNIT–II: Congruence (8 Lectures)
Introduction to congruence, linear congruence, the Chinese remainder theorem, systems of linear congruence.

UNIT–III: Applications of Congruence (10 Lectures)
Divisibility tests, the perpetual calendar, round-robin tournaments, computer file storage and hashing functions, Wilson's theorem and Fermat's little theorem, pseudo primes, Euler's theorem, Euler's phi-function, the sum and number of divisors, perfect numbers and Mersenne primes.

UNIT–IV: Finite Fields & Primality, Factoring (8 Lectures)
Finite fields, quadratic residues and reciprocity, pseudo primes, rho method, Fermat factorization and factor bases.

UNIT–V: Cryptology (10 Lectures)
Basic terminology, complexity theorem, character ciphers, block ciphers, exponentiation ciphers, public key cryptography, discrete logarithm, knapsack ciphers, RSA algorithm.

Text Books:

1. Kenneth H. Rosen, *Elementary Number Theory and Its Applications*, AT&T Information Systems & Bell Laboratories.
2. Neal Koblitz, *A Course in Number Theory & Cryptography*, Springer.

Reference Books:

1. Herbert S. Zuckerman, Hugh L. Montgomery, Ivan Niven, *An Introduction to the Theory of Numbers*, Wiley Publishers.
2. Tom M. Apostol, *Introduction to Analytic Number Theory*, Springer.
3. VK Krishnan, *Elementary Number Theory*, Universities Press.

Web Resources:

1. `http://tutorial.math.lamar.edu/Classes/DE/DE.aspx`
2. `http://mathworld.wolfram.com/topics`
3. `http://www.nptel.ac.in/course.php`

Course Code	Course Name	Course Structure			
		L	T	P	C
P23CBL01	COMPUTER NETWORKS LAB	0	0	3	1.5

Internal Marks: 50 External Marks: 50

Course Objectives:

1. To understand the different types of networks.
2. To discuss the software and hardware components of a network.
3. To enlighten the working of networking commands supported by operating system.
4. To familiarize the use of networking functionality supported by JAVA.
5. To familiarize with computer networking tools.

Course Outcomes:

CO1: Analyze the data traffic using network tools. (L4)
CO2: Understand network commands. (L2)
CO3: Trace different CPU Scheduling algorithms. (L2)
CO4: Implement Bankers Algorithms to Avoid Deadlocks. (L3)
CO5: Evaluate CPU scheduling and Page replacement algorithms. (L5)

List of Activities / Experiments (Computer Networks):

1. Study different types of Network cables (Copper and Fiber) and prepare cables (Straight and Cross) to connect two or more systems. Use crimping tool to connect jacks and LAN tester to verify the cables.
    i. Install and configure Network Devices: HUB, Switch and Routers. Consider both manageable and non-manageable switches. Perform logical configuration of the system. Set bandwidth of different ports.
    ii. Install and Configure Wired and Wireless NIC and transfer files between systems in Wired LAN and Wireless LAN. Consider both ad-hoc and infrastructure mode of operation.
2. Work with networking commands: `ping`, `tracert`, `ipconfig`, `pathping`, `telnet`, `ftp`, `getmac`, `arp`, `hostname`, `nbtstat`, `netdiag`, and `nslookup`.
3. Use Packet Tracer software to build network topology and configure using Distance Vector Routing Protocol.
4. Use Packet Tracer software to build network topology and configure using Link State Routing Protocol.
5. Using JAVA RMI, write a program to implement a Basic Calculator.

6. Implement a Chatting application using JAVA TCP and UDP sockets.
7. Implement Hello and Echo commands using JAVA.
    - Hello command checks machine availability at the other end.
    - Echo command measures round-trip time to the neighbor.
8. Using Wireshark perform the following operations:
    - Inspect HTTP Traffic.
    - Inspect HTTP Traffic from a given IP Address.
    - Inspect HTTP Traffic to a given IP Address.
    - Reject packets to a given IP Address.
    - Monitor Apache and MySQL Network Traffic.

Text Books:

1. Shivendra S. Panwar, Shiwen Mao, Jeong-dong Ryoo, and Yihan Li, *TCP/IP Essentials: A Lab-Based Approach*, Cambridge University Press, 2004.

Reference Books:

1. Cisco Networking Academy, *CCNA1 and CCNA2 Companion Guide*, Cisco Networking Academy Program, 3rd edition, 2003.
2. Elliotte Rusty Harold, *Java Network Programming*, 3rd edition, O'REILLY, 2011.
3. Andrew Tanenbaum, Feamster Wetherall, *Computer Networks*, 6th Edition, Global Edition.

Online Learning Resources:

1. `https://www.netacad.com/courses/packet-tracer-CiscoPacketTracer`
2. Ns Manual, Available at: `https://www.isi.edu/nsnam/ns/ns-documentation.html`, 2011.
3. `https://www.wireshark.org/docs/wsug_html_chunked/`
4. `https://nptel.ac.in/courses/106105183/25`
5. `http://www.nptelvideos.in/2012/11/computer-networks.html`
6. `https://nptel.ac.in/courses/106105183/3`
7. `http://vlabs.iitb.ac.in/vlabs-dev/labs_local/computer-networks/labs/explist.php`
8. `https://www.cse.iitb.ac.in/~mythili/os/`

Course Code	Course Name	Course Structure			
		L	T	P	C
P23CBL05	DATABASE MANAGEMENT SYSTEMS LAB	0	0	3	1.5

Internal Marks: 50 External Marks: 50

Course Objectives:

1. To populate and query a database using SQL DDL/DML commands.
2. Declare and enforce integrity constraints on a database.
3. Write queries using advanced concepts of SQL.
4. Program PL/SQL including procedures, functions, cursors and triggers.
5. Implement database connectivity using ODBC/JDBC.

Experiments covering the topics:

- DDL, DML, DCL commands.
- Queries, nested queries, built-in functions.
- PL/SQL programming - control structures.
- Procedures, functions, cursors, triggers.
- Database connectivity - ODBC/JDBC.

Sample Experiments:

1. Creation, altering and dropping of tables and inserting rows into a table (use constraints while creating tables). Examples using SELECT command.
2. Queries (including subqueries) using ANY, ALL, IN, EXISTS, NOT EXISTS, UNION, INTERSECT, constraints. Example: Select the roll number and name of the student who secured fourth rank in the class.
3. Queries using aggregate functions (COUNT, SUM, AVG, MAX, MIN), GROUP BY, HAVING and creation and dropping of Views.
4. Queries using conversion functions (to_char, to_number, to_date), string functions (concatenation, lpad, rpad, ltrim, rtrim, lower, upper, initcap, length, substr, instr), date functions (sysdate, next_day, add_months, last_day, months_between, least, greatest, trunc, round, to_char, to_date).
   (a) Create a simple PL/SQL program which includes declaration section, executable section and exception handling section (example: print student marks who secured first class; raise exception if no records found).
   (b) Insert data into student table and use COMMIT, ROLLBACK and SAVEPOINT in PL/SQL block.

(c) Develop a program that includes features NESTED IF, CASE and CASE expression. Extend the program using NULLIF and COALESCE functions.

   i. Program development using `WHILE` loops, numeric `FOR` loops, nested loops, error handling, built-in exceptions, user-defined exceptions, and `RAISE_APPLICATION_ERROR`.
   ii. Procedure creation with parameters passed as IN and OUT.
   iii. Creation and invocation of stored functions in SQL statements; writing complex functions.

(d) Programs using cursors with parameters, FOR UPDATE cursor, WHERE CURRENT OF clause, and cursor variables.

(e) Programs using BEFORE and AFTER triggers, row and statement triggers, INSTEAD OF triggers.

(f) Create a table and perform search operations using indexing and non-indexing techniques.

(g) Write Java programs to connect to a database using JDBC and perform insert and delete operations.

Text Books / Suggested Reading:

(a) Oracle: The Complete Reference, Oracle Press.
(b) Nilesh Shah, *Database Systems Using Oracle*, PHI, 2007.
(c) Rick F. Vander Lans, *Introduction to SQL*, 4th Edition, Pearson Education, 2007.

Course Code	Course Name	Course Structure			
		L	T	P	C
P23CBS02	FULL STACK DEVELOPMENT	1	0	2	2

Internal Marks: 30 External Marks: 70

Course Objectives:

(a) Make use of HTML elements and their attributes for designing static web pages.
(b) Build web pages by applying appropriate CSS styles to HTML elements.
(c) Experiment with JavaScript to develop dynamic web pages and validate forms.

Experiments covering the Topics:

- Lists, Links and Images
- HTML Tables, Forms and Frames
- HTML5 and Cascading Style Sheets (CSS)
- Selector Forms
- CSS with Color, Background, Font, Text and CSS Box Model
- Applying JavaScript – internal and external, Input/Output, Type Conversion
- JavaScript Conditional Statements and Loops, Pre-defined and User-defined Objects
- JavaScript Functions and Events
- Node.js

Sample Experiments:

1. Lists, Links and Images

(a) Write an HTML program demonstrating ordered lists, unordered lists, nested lists, and definition lists.
(b) Write an HTML program demonstrating hyperlinks with `<a>` tag using `href` and `target` attributes.
(c) Create an HTML document displaying your image and your friend's image with specified height and width; clicking navigates to respective profiles.
(d) Create an image gallery using thumbnails (100×100 pixels), where each thumbnail links to corresponding full-sized image.

2. HTML Tables, Forms and Frames

(a) Write an HTML program demonstrating tables using `<table>`, `<tr>`, `<th>`, `<td>` tags and attributes `border`, `rowspan`, `colspan`.

(b) Create a timetable using tables with caption, cell spacing, cell padding, border, rowspan, and colspan.

(c) Design a registration form with text, password, number, date fields, checkboxes, radio buttons, list boxes (`<select>`, `<option>`), textarea, submit and reset buttons; use tables for better layout.

(d) Create a frameset dividing the page into three parts: one with an image, second with a paragraph, third with a hyperlink; include `noframes` attribute.

3. HTML5 and Cascading Style Sheets, Types of CSS

(a) Use HTML5 semantic elements such as `<article>`, `<aside>`, `<figure>`, `<figcaption>`, `<footer>`, `<header>`, `<main>`, `<nav>`, `<section>`, `<div>`, and `<span>`.

(b) Embed audio and video elements in an HTML page.

(c) Apply inline, internal, and external CSS styles; demonstrate selectors, properties and values.

4. Selector Forms

(a) Demonstrate various CSS selector forms:

- Simple selectors: element, id, class, group, universal
- Combinator selectors: descendant, child, adjacent sibling, general sibling
- Pseudo-class selectors
- Pseudo-element selectors
- Attribute selectors

5. CSS with Color, Background, Font, Text and CSS Box Model

(a) Demonstrate referencing colors in CSS by various methods.

(b) Write a CSS rule to place a background image halfway down the page, horizontally titling it; image remains fixed during scrolling.

(c) Demonstrate CSS font and text properties: font-size, font-weight, font-style, text-decoration, text-transform, and text-align.

(d) Explain the CSS Box Model by demonstrating content, border, margin, and padding.

6. Applying JavaScript – Internal and External, I/O, Type Conversion

(a) Embed internal and external JavaScript in a webpage.

(b) Demonstrate different methods of displaying output.

(c) Demonstrate different methods of input.

(d) Create a webpage that prompts for voter's name and age; display in a table along with eligibility to vote.

7. JavaScript Predefined and User-defined Objects

(a) Write programs demonstrating the use of:

- Document object properties and methods
- Window object properties and methods
- Array object properties and methods
- Math object properties and methods
- String object properties and methods
- Regex object properties and methods
- Date object properties and methods
- User-defined objects with properties, methods, accessors, constructors

8. JavaScript Conditional Statements and Loops

(a) Write programs for:

- Comparing three integers and displaying the largest or "EQUAL NUMBERS"
- Display week days using switch case
- Print numbers 1 to 10 using for, while and do-while loops
- Iterate over object properties using for-in, for-each, and for-of loops
- Check if a number is Armstrong number (e.g., 153)
- Display denomination of a bank deposit amount in terms of notes (100s, 50s, etc.)

9. JavaScript Functions and Events

(a) Design functions to display:

- Factorial of a number
- Fibonacci series up to a number
- Prime numbers up to a number
- Check palindrome

(b) Design an HTML page with a text box and buttons for Factorial, Fibonacci, Prime, and Palindrome that call respective functions.

(c) Write form validation for registration page fields: name, mobile, email.

10. Node.js

(a) Create a web server using Node.js that executes JavaScript code.

(b) Transfer data over HTTP protocol using Node.js HTTP module.

(c) Create a text file 'src.txt' with sample contents (HTML, CSS, JavaScript, Typescript, MongoDB, Express.js, React.js, Node.js).

(d) Parse a URL using Node.js URL module.

(e) Create a user-defined module and demonstrate modularization in Node.js.

Text Books:

(a) Robert W. Sebesta, *Programming the World Wide Web*, 7th Edition, Pearson, 2013.

(b) Vasan Subramanian, *Pro MERN Stack: Full Stack Web App Development with Mongo, Express, React and Node*, 2nd edition, APress, O'Reilly.

Web Links:

(a) `https://www.w3schools.com/html`

(b) `https://www.w3schools.com/css`

(c) `https://www.w3schools.com/js/`

(d) `https://www.w3schools.com/nodejs`

(e) `https://www.w3schools.com/typescript`

Course Code	Course Name	Course Structure			
		L	T	P	C
P23BST17	DESIGN THINKING & INNOVATION	1	0	2	2

Internal Marks: 30 External Marks: 70

Course Objectives:

(a) Bring awareness on innovative design and new product development.
(b) Explain the basics of design thinking.
(c) Familiarize the role of reverse engineering in product development.
(d) Train how to identify needs of society and convert into demand.
(e) Introduce product planning and product development process.

Course Outcomes:

CO1: Define the concepts related to design thinking. (L1)
CO2: Explain the fundamentals of Design Thinking and innovation. (L2)
CO3: Apply the design thinking techniques for solving problems in various sectors. (L3)
CO4: Analyse to work in a multidisciplinary environment. (L4)
CO5: Evaluate the value of creativity. (L5)

UNIT–I: Introduction to Design Thinking (9 Lectures)

Introduction to elements and principles of Design, basics of design—dot, line, shape, form as fundamental design components. Principles of design. Introduction to design thinking, history of Design Thinking, new materials in industry.

UNIT–II: Design Thinking Process (10 Lectures)

Design thinking process (empathize, analyze, idea & prototype), implementing the process in driving inventions, design thinking in social innovations. Tools of design thinking—person, customer, journey map, brainstorming, product development.

Activity: Every student presents their idea in three minutes. Every student can present design process in the form of flow diagram or flow chart etc. Every student should explain about product development.

UNIT–III: Innovation (9 Lectures)

Art of innovation; difference between innovation and creativity; role of creativity and innovation in organizations. Creativity to Innovation. Teams for innovation, measuring the impact and value of creativity.

Activity: Debate on innovation and creativity, planning from idea to innovation, debate on value-based innovation.

UNIT–IV: Product Design (9 Lectures)

Problem formation, introduction to product design, product strategies, product value, product planning, product specifications. Innovation towards product design—case studies.

Activity: Importance of modeling, how to set specifications, explaining their own product design.

UNIT–V: Design Thinking in Business Processes (9 Lectures)

Design Thinking applied in Business & Strategic Innovation, Design Thinking principles that redefine business—business challenges: growth, predictability, change, maintaining relevance, extreme competition, standardization. Design thinking to meet corporate needs, design thinking for startups. Defining and testing business models and business cases. Developing & testing prototypes.

Activity: How to market our own product, maintenance, reliability and plan for startup.

Text Books:

(a) Tim Brown, *Change by Design*, 1st Edition, Harper Collins, 2009.
(b) Idris Mootee, *Design Thinking for Strategic Innovation*, 1st Edition, Adams Media, 2014.

Reference Books:

(a) David Lee, *Design Thinking in the Classroom*, Ulysses Press, 2018.
(b) Shrrutin N Shetty, *Design the Future*, 1st Edition, Norton Press, 2018.
(c) William Lidwell, Kritina Holden & Jill Butler, *Universal Principles of Design*, 2nd Edition, Rockport Publishers, 2010.
(d) Chesbrough.H, *The Era of Open Innovation*, 2003.

Online Learning Resources:

(a) https://nptel.ac.in/courses/110/106/110106124/
(b) https://nptel.ac.in/courses/109/104/109104109/
(c) https://swayam.gov.in/nd1_noc19_mg60/preview
(d) https://onlinecourses.nptel.ac.in/noc22_de16/preview

Course Code	Course Name	Course Structure			
		L	T	P	C
P23CST01	DESIGNING THE IOT (PROFESSIONAL CORE)	3	0	0	3

Internal Marks: 30 External Marks: 70

Prerequisite: Embedded hardware design.

Course Objectives:

(a) To understand the architectural overview of the Internet of Things (IoT).
(b) To acquire skills on data acquisition and communication in IoT.
(c) To understand the threats of IoT.

Course Outcomes:

(a) Understand how the IoT is different from traditional systems. (L2)
(b) Demonstrate the revolution of internet in mobile and cloud. (L2)
(c) Examine the architecture and operation of IoT. (L3)
(d) Explore various tools and programming paradigms for IoT applications. (L4)
(e) Develop an IoT prototype for real-time scenario. (L6)

UNIT–I

Design Principles of IoT: Design principles of connected devices, data acquiring organizing and analytics in IoT, system architecture of IoT.

UNIT–II

Prototyping the Embedded Devices for IoT: System hardware and prototyping, sensors and actuators for IoT, Radio module and wireless sensor network, gateways internet and web, software components.

UNIT–III

Embedded Programming for IoT: Programming connected devices, C and Python for IoT, Case study: Temperature controller, Smart irrigation system.

UNIT–IV

Embedded RTOS: Program structure and real time, multitasking and scheduling, RTOS services, signals, semaphores, NucleusSE, application timers, interrupts in NucleusES, NucleusES initialization and startup.

UNIT–V

Tools for IoT: Introduction, chef, puppet, NETCONF-YANG case studies. IoT Physical Devices: Basic building blocks of an IoT device and endpoints, family of pIoT devices, pcDuino, Beagle Bone Black, cubie board, domain specific IoTs.

Text Books:

(a) RajKamal, *Internet of Things, Architecture and Design Principles*, McGraw Hill Education, 1st Edition, May 2017.
(b) Arsheep Baga and Vijay Madisetti, *Internet of Things: A Hands-On Approach*, Universities Press, 1st Edition, 2015.

Reference Books:

(a) David Etter, *IoT (Internet of Things Programming: A simple and fast way of Learning IoT*, Kindle Edition, 2016.
(b) Fei HU, *Security and Privacy in Internet of Things (IoTs): Models, Algorithms, and Implementations*, CRC Press, 1st Edition, 2016.
(c) Colin Walls, *Embedded RTOS Design Insights and Implementation*, Elsevier, 1st Edition, December 2020.

Course Code	Course Name	Course Structure			
		L	T	P	C
P23CBT03	WIRELESS SENSOR NETWORKS (PROFESSIONAL CORE)	3	0	0	3

Internal Marks: 30 External Marks: 70

Course Objectives:

(a) To acquire the knowledge about various architectures and applications of Sensor Networks.
(b) To understand issues, challenges, and emerging technologies for wireless sensor networks.
(c) To learn about various routing protocols and MAC Protocols.
(d) To understand various data gathering and data dissemination methods.
(e) To study about design principles, node architectures, hardware, and software required for implementation of wireless sensor networks.

Course Outcomes: Upon completion of the course, the student will be able to:

(a) Understand the basics of Sensor Networks. (L2)
(b) Analyze and compare various architectures of Wireless Sensor Networks. (L4)
(c) Understand design issues and challenges in wireless sensor networks. (L2)
(d) Analyze and compare various data gathering and data dissemination methods. (L4)
(e) Design, simulate, and compare the performance of various routing and MAC protocols. (L6)

UNIT–I

Introduction to Sensor Networks, unique constraints and challenges, Advantage of Sensor Networks, Applications of Sensor Networks, Types of wireless sensor networks.

UNIT–II

Mobile Ad-hoc Networks (MANETs) and Wireless Sensor Networks, Enabling technologies for Wireless Sensor Networks. Issues and challenges in wireless sensor networks.

UNIT–III

Routing protocols, MAC protocols: Classification of MAC Protocols, S-MAC Protocol, B-MAC protocol, IEEE 802.15.4 standard and ZigBee.

UNIT–IV

Dissemination protocol for large sensor network. Data dissemination, data gathering, and data fusion; Quality of a sensor network; Real-time traffic support and security protocols.

UNIT–V

Design Principles for WSNs, Gateway Concepts, Need for gateway, WSN to Internet Communication, and Internet to WSN Communication. Single-node architecture, Hardware components & design constraints, Operating systems and execution environments, introduction to TinyOS and nesC.

Text Books:

(a) C. Siva Ram Murthy, B.S. Manoj, *Ad-Hoc Wireless Sensor Networks*, Pearson, 2004.
(b) Kaveh Pahlavan and P. Krishna Murthy, *Principles of Wireless Networks*, PE, 2002.

Reference Books:

(a) Kamilo Feher, *Wireless Digital Communications*, PHI, 1999.
(b) Andrea Goldsmith, *Wireless Communications*, Cambridge University Press, 2005.
(c) Gottapu Sasibhushana Rao, *Mobile Cellular Communication*, Pearson Education, 2012.
(d) William Stallings, *Wireless Communication and Networking*, PHI, 2003.

Course Code	Course Name	Course Structure			
		L	T	P	C
P23CBT04	CRYPTOGRAPHY & NETWORK SECURITY (PROFESSIONAL CORE)	3	0	0	3

Internal Marks: 30 External Marks: 70

Course Objectives:

(a) Explain the objectives of information security.
(b) Explain the importance and application of each of confidentiality, integrity, authentication and availability.
(c) Understand the basic categories of threats to computers and networks.
(d) Discuss the Mathematics of Cryptography.
(e) Discuss the fundamental ideas of Symmetric and Asymmetric cryptographic Algorithms.
(f) Discuss the Network layer, Transport Layer and Application layer Protocols Enhanced security mechanisms.

Course Outcomes:

CO1: To understand security issues related to computer networks and learn different symmetric key techniques. (L2)
CO2: To learn mathematics of cryptography for symmetric and Asymmetric algorithms and apply this knowledge to understand the Cryptographic algorithms. (L3)
CO3: To learn different types of symmetric and Asymmetric algorithms. (L2)
CO4: To learn different algorithms of Hash functions, message authentication and digital signature and their importance to security. (L2)
CO5: To learn different Enhanced security protocols of Application Layer, Transport Layer and Network layer. (L2)

UNIT–I

Security Concepts: Introduction, The need for security, Security approaches, Principles of security, Types of Security attacks, Security services, Security Mechanisms, A model for Network Security Cryptography. Classical Encryption Techniques - symmetric cipher model, Substitution techniques, Transposition techniques, Rotor Machines, Steganography.

UNIT–II

Introduction to Symmetric Cryptography: Algebraic Structures - Groups, Rings, Fields, GF() fields, Polynomials. Mathematics of Asymmetric cryptography: Primes, Checking for Primality, Euler's phi-functions, Fermat's Little Theorem, Euler's Theorem, Generating Primes, Primality Testing, Factorization, Chinese Remainder Theorem, Quadratic Congruence, Exponentiation and Logarithm.

UNIT–III

Symmetric key Ciphers: Block Cipher principles, DES, AES, Blowfish, IDEA, Block cipher operation. Stream ciphers: RC4, RC5. Asymmetric key Ciphers: Principles of public key cryptosystems, RSA algorithm, Diffie-Hellman Key Exchange, Elgamal Cryptographic system, Elliptic Curve Arithmetic, Elliptic Curve Cryptography.

UNIT–IV

Cryptographic Hash Functions: Applications of Cryptographic Hash Functions, Two Simple Hash Functions, Requirements and Security, Hash Functions Based on Cipher Block Chaining, Secure Hash Algorithms (SHA). Message Authentication Codes: Message Authentication Requirements, Message Authentication Functions, Requirements for Message Authentication Codes, Security of MACs, MACs Based on Hash Functions: HMAC, MACs Based on Block Ciphers: DAA And CMAC. Digital Signatures: Digital Signatures, Elgamal Digital Signature Scheme, Elliptic Curve Digital Signature Algorithm, RSA-PSS Digital Signature Algorithm.

UNIT–V

Network and Internet Security: Transport-Level Security: Web Security Considerations, Transport Level Security, HTTPS, SSH. IP Security: IP Security Overview, IP Security Policy, Encapsulating Security Payload, Authentication Header Protocol. Electronic-Mail Security: Internet-mail Security, Email Format, Email Threats and Comprehensive Email Security, S/MIME, PGP.

Text Books:

(a) William Stallings, *Cryptography and Network Security - Principles and Practice*, Pearson Education, 7th Edition, 2017.
(b) Behrouz A. Forouzan, Debdeep Mukhopadhyay, *Cryptography and Network Security*, McGraw Hill, 3rd Edition, 2015.

Reference Books:

(a) Atul Kahate, *Cryptography and Network Security*, McGraw Hill, 3rd Edition, 2017.
(b) Wade Trappe, Lawrence C. Washington, *Introduction to Cryptography with Coding Theory*, Pearson Education, 3rd Edition, 2020.
(c) Wenbo Mao, *Modern Cryptography: Theory and Practice*, Pearson Education, 1st Edition, 2004.

Course Code	Course Name	Course Structure			
		L	T	P	C
P23CBE01	SOFTWARE ENGINEERING(PROFESSIONAL ELECTIVE-1)	3	0	0	3

Internal Marks: 30 External Marks: 70

Course Objectives:

The objectives of this course are to introduce

(a) Software life cycle models
(b) Software requirements and SRS document.
(c) How to plan a project.
(d) The quality control and how to ensure good quality software.
(e) Testing methods of software, use of CASE tools
(f) Implementation issues, validation and verification procedures.

Course Outcomes:

(a) Compare and analyze various process models. (L2)
(b) Develop SRS documents and estimate the modularity of the project. (L6)
(c) Develop data flow diagrams and compare the user interface design. (L6)
(d) Compare testing strategies and analyze the software quality. (L2)
(e) Apply Computer Aided Software Engineering tools and analyze the components of software maintenance and reuse. (L3)

UNIT–I **(Lectures)**

Introduction: Evolution, Software development projects, Exploratory style of software developments, Emergence of software engineering, Notable changes in software development practices, Computer system engineering.

Software Life Cycle Models: Basic concepts, Waterfall model and its extensions, Rapid application development, Agile development model and Spiral model.

UNIT–II

Software Project Management: Software project management complexities, Responsibilities of a software project manager, Metrics for project size estimation, Project estimation techniques, Empirical Estimation techniques, COCOMO, Halstead's software science, and risk management.

Requirements Analysis and Specification: Requirements gathering and analysis, Software Requirements Specification (SRS), Formal system specification, Axiomatic specification, Algebraic specification, Executable specification and 4GL.

UNIT–III

Software Design: Overview of the design process, How to characterize a good software design? Layered arrangement of modules, Cohesion and Coupling. Approaches to software design.

Function-Oriented Software Design: Overview of SA/SD methodology, Structured analysis, Developing the DFD model of a system, Structured design, Detailed design, and Design Review.

User Interface Design: Characteristics of a good user interface, Basic concepts, Types of user interfaces, Fundamentals of component-based GUI development, and user interface design methodology.

UNIT–IV

Coding And Testing: Coding, Code review, Software documentation, Testing, Black-box testing, White-Box testing, Debugging, Program analysis tools, Integration testing, testing object-oriented programs, Smoke testing, and some general issues associated with testing.

Software Reliability and Quality Management: Software Reliability. Statistical testing, Software quality, Software quality management system, ISO 9000.SEI Capability maturity model. Few other important quality standards, and Six Sigma.

UNIT–V

Computer-Aided Software Engineering (CASE): CASE and its scope, CASE environment, CASE support in the software life cycle, other characteristics of CASE tools, Towards second generation CASE Tool, and Architecture of a CASE Environment.

Software Maintenance: Characteristics of software maintenance, Software reverse engineering, Software maintenance process models and Estimation of maintenance cost.

Text Books:

(a) Rajib Mall, *Fundamentals of Software Engineering*, PHI, 5th Edition.

Reference Books:

(a) Roger S.Pressman, *Software Engineering A Practitioner's Approach*, McGraw Hill International Edition, 9th Edition.
(b) Ian Sommerville, *Software Engineering*, Pearson Education, 10th Edition.
(c) Deepak Jain, *Software Engineering, Principles and Practices*, Oxford University Press.

E-Resources:

(a) https://nptel.ac.in/courses/106/105/106105182/
(b) https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_01260589506387148827_shared/overview

(c) https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_013382690411003904735_shared/overview

Course Code	Course Name	Course Structure			
		L	T	P	C
P23CBE02	OBJECT ORIENTED ANALYSIS AND DESIGN (PROFESSIONAL ELECTIVE -1)	3	0	0	3

Internal Marks: 30 External Marks: 70

Course Objectives:

The main objective of the course is to

(a) Understand and design complex systems using structured methods; analyze satellite-based navigation architecture.
(b) Apply UML basics to model the structure of object-oriented systems like traffic management.
(c) Create detailed class and object diagrams for advanced systems such as AI-based cryptanalysis.
(d) Model user behavior with UML diagrams for a vacation tracking web application.
(e) Design behavioral and architectural models for a weather forecasting system.

Course Outcomes:

At the end of the course the student will be able to

(a) Understand complex systems and apply design principles. (L2)
(b) Use UML to create basic structural models. (L3)
(c) Design advanced structural models with UML diagrams. (L6)
(d) Develop behavioral models to represent system behavior. (L6)
(e) Combine modeling techniques for full system architecture. (L2)

UNIT–I

Introduction: The Structure of Complex systems, The Inherent Complexity of Software, Attributes of Complex System, Organized and Disorganized Complexity, Bringing Order to Chaos, Designing Complex Systems. Case Study: System Architecture: Satellite-Based Navigation

UNIT–II

Introduction to UML: Importance of modeling, principles of modeling, object-oriented modeling, conceptual model of the UML, Architecture, and Software Development Life Cycle. Basic Structural Modeling: Classes, Relationships, common Mechanisms, and diagrams. Case Study: Control System: Traffic Management.

UNIT–III

Class & Object Diagrams: Terms, concepts, modeling techniques for Class & Object Diagrams. Advanced Structural Modeling: Advanced classes, advanced relationships, Interfaces, Types and Roles, Packages. Case Study: AI: Cryptanalysis.

UNIT–IV

Basic Behavioral Modeling-I: Interactions, Interaction diagrams, Use cases, Use case Diagrams, Activity Diagrams. Case Study: Web Application: Vacation Tracking System

UNIT–V

Advanced Behavioral Modeling: Events and signals, state machines, processes and Threads, time and space, state chart diagrams. Architectural Modeling: Component, Deployment, Component diagrams and Deployment diagrams. Case Study: Weather Forecasting

Text Books:

(a) Grady BOOCH, Robert A. Maksimchuk, Michael W. ENGLE, Bobbi J. Young, Jim Conallen, Kellia Houston, *Object-Oriented Analysis and Design with Applications*, Pearson, 3rd edition, 2013.

(b) Grady Booch, James Rumbaugh, Ivar Jacobson, *The Unified Modeling Language User Guide*, Pearson Education, 1st Edition, 2002.

Reference Books:

(a) Meilir Page-Jones, *Fundamentals of Object-Oriented Design in UML*, Pearson Education, 1st Edition, 2002.

(b) Pascal Roques, *Modeling Software Systems Using UML2*, Wiley India Private Limited, 2004.

(c) Atul Kahate, *Object Oriented Analysis & Design*, The McGraw-Hill Companies, 2004.

(d) Craig Larman, *Applying UML and Patterns: An introduction to Object – Oriented Analysis and Design and Iterative Development*, PHI, 3rd Edition, 2004.

Course Code	Course Name	Course Structure			
		L	T	P	C
P23CBE03	ARTIFICAL INTELLIGENCE (PROFESSIONAL ELECTIVE-I)	3	0	0	3

Internal Marks: 30 External Marks: 70

Course Objectives:

(a) Understand intelligent agents and basic AI problem-solving.
(b) Learn search strategies for solving AI problems.
(c) Apply CSPs and game-playing algorithms like Minimax.
(d) Represent knowledge and reason using logic.
(e) Handle uncertainty and understand expert systems.

Course Outcomes:

CO1: Enumerate the history and foundations of Artificial Intelligence. (L1)
CO2: Apply the basic principles of AI in problem solving. (L3)
CO3: Classify the appropriate representation of Knowledge. (L2)
CO4: Enumerate the Perspectives and Issues in Machine Learning. (L1)
CO5: Identify issues in Decision Tree Learning. (L1)

UNIT–I **(Lectures)**

Introduction, Overview of Artificial Intelligence: Problems of AI, AI techniques, Tic - Tac - Toe problem. Intelligent Agents: Agents and environment, nature of environment, structure of agents, goal-based agents, utility-based agents, learning agents. Problem Solving: Problems, Problem Space & Search: Defining the problem as state space search, production system, problem characteristics, issues in the design of search programs.

UNIT–II

Search Techniques: Problem solving agents, searching for solutions; uniform search strategies: breadth first search, depth first search, depth limited search, bidirectional search, comparing uniform search strategies. Heuristic search strategies: Greedy best-first search, A* search, AO* search, memory bounded heuristic search. Local search algorithms and optimization problems: Hill climbing search, simulated annealing search, local beam search.

UNIT–III

Constraint Satisfaction Problems: Local search for constraint satisfaction problems. Adversarial search, Games, optimal decisions & strategies in games, the minimax search procedure, alpha-beta pruning, additional refinements, iterative deepening.

UNIT–IV

Knowledge and Reasoning: Knowledge representation issues, representation and mapping, approaches to knowledge representation. Using predicate logic,

representing simple facts in logic, representing instance and ISA relationships, computable functions and predicates, resolution, natural deduction. Representing knowledge using rules, procedural versus declarative knowledge, logic programming, forward versus backward reasoning, matching, control knowledge.

UNIT–V

Probabilistic Reasoning: Representing knowledge in an uncertain domain, the semantics of Bayesian networks, Dempster-Shafer theory. Planning Overview: components of a planning system, goal stack planning, hierarchical planning, other planning techniques. Expert Systems: Representing and using domain knowledge, expert system shells, and knowledge acquisition.

Text Books:

(a) Stuart Russell and Peter Norvig, *Artificial Intelligence: A Modern Approach*, Prentice Hall Series, 4th Edition, 2021.

Reference Books:

(a) Elaine Rich and Kevin Knight, *Artificial Intelligence*, Tata McGraw Hill, 2010.
(b) Saroj Kaushik, *Artificial Intelligence*, Cengage Learning India, 2011.
(c) Dan W Peterson, *Introduction to Artificial Intelligence & Expert Systems*, PHI, 1st Edition, 2015.
(d) Giarranto, *Expert Systems: Principles and Programming*, VIKAS, 2004.

Course Code	Course Name	Course Structure			
		L	T	P	C
P23CBE04	MICROPROCESSORS & MICROCONTROLLERS (PROFESSIONAL ELECTIVE-I)	3	0	0	3

Internal Marks: 30 External Marks: 70

Course Objectives:

(a) To introduce fundamental architectural concepts of microprocessors and microcontrollers.
(b) To impart knowledge on addressing modes and instruction set of 8086 and 8051.
(c) To introduce assembly language programming concepts.
(d) To explain memory and I/O interfacing with 8086 and 8051.
(e) To introduce 16-bit and 32-bit microcontrollers.

Course Outcomes: At the end of the course the student will be able to

(a) Explain the architecture, features, and modes of the 8086 microprocessors. (L2)
(b) Write and debug basic assembly programs using 8086 instructions and directives. (L3)
(c) Interface 8086 with memory and I/O devices using appropriate controllers. (L3)
(d) Describe the architecture and programming of the 8051 microcontrollers. (L2)
(e) Develop interfacing applications using 8051 and compare them with other controllers. (L6)

UNIT–I

8086 Architecture: Main features, pin diagram/description, 8086 microprocessor family, internal architecture, bus interfacing unit, execution unit, interrupts and interrupt response, 8086 system timing, minimum mode and maximum mode configuration.

UNIT–II

8086 Programming: Program development steps, instructions, addressing modes, assembler directives, writing simple programs with an assembler, assembly language program development tools.

UNIT–III

8086 Interfacing: Semiconductor memories interfacing (RAM, ROM), Intel 8255 programmable peripheral interface, Interfacing switches and LEDS, Interfacing seven segment displays, software and hardware interrupt applications, Intel 8251 USART architecture and interfacing, Intel 8237a DMA con-

troller, stepper motor, A/D and D/A converters, Need for 8259 programmable interrupt controllers.

UNIT–IV

Microcontroller, Architecture of 8051, Special Function Registers (SFRs), I/O Pins Ports and Circuits, Instruction set, Addressing modes, Assembly language programming.

UNIT–V

Interfacing Microcontroller, Programming 8051 Timers, Serial Port Programming, Interrupts Programming, LCD & Keyboard Interfacing, ADC, DAC & Sensor Interfacing, External Memory Interface, Stepper Motor and Waveform generation, Comparison of Microprocessor, Microcontroller, PIC and ARM processors.

Text Books:

(a) Douglas V Hall, SSSP Rao, *Microprocessors and Interfacing – Programming and Hardware*, Tata McGraw Hill Education Private Limited, 3rd Edition, 1994.
(b) K M Bhurchandi, A K Ray, *Advanced Microprocessors and Peripherals*, McGraw Hill Education, 3rd edition, 2017.
(c) Raj Kamal, *Microcontrollers: Architecture, Programming, Interfacing and System Design*, Pearson, 2nd edition, 2012.

Reference Books:

(a) Ramesh S Gaonkar, *Microprocessor Architecture Programming and Applications with the 8085*, Penram International Publishing, 6th edition, 2013.
(b) Kenneth J. Ayala, *The 8051 Microcontroller*, Cengage Learning, 3rd edition, 2004.

Course Code	Course Name	Course Structure			
		L	T	P	C
P23EOE01	ELECTRONIC DEVICES AND CIRCUITS (OPEN ELECTIVE-1)	3	0	0	3

Internal Marks: 30 External Marks: 70

Course Outcomes:

CO1: Apply basic concepts of semiconductor physics to explain device behaviour.

CO2: Understand the formation of p-n junctions and their operation as diodes in various modes.

CO3: Describe the construction and operation of rectifiers with and without filters, including relevant expressions and comparisons.

CO4: Understand the construction, working principles, and V-I characteristics of BJTs and FETs in different configurations.

CO5: Analyze the necessity of transistor biasing, different biasing techniques for BJTs and FETs, and stabilization concepts with relevant expressions.

UNIT–I:

Review of Semiconductor Physics: Hall effect, continuity equation, law of junction, Fermi Dirac function, Fermi level in intrinsic and extrinsic Semiconductors.

Junction Diode Characteristics: Energy band diagram of PN junction Diode, Open circuited p-n junction, Biased p-n junction, p-n junction diode, current components in PN junction Diode, diode equation, V-I Characteristics, temperature dependence on V-I characteristics, Diode resistance, Diode capacitance.

UNIT–II:

Special Semiconductor Devices: Zener Diode, Breakdown mechanisms, Zener diode applications, LED, Varactor Diode, Photodiode, Tunnel Diode, UJT, PNPN Diode, SCR. Construction, operation and V-I characteristics. Rectifiers and Filters: Basic Rectifier setup, half wave rectifier, full wave rectifier, bridge rectifier, derivations of characteristics of rectifiers, rectifier circuits-operation, input and output waveforms; Filters, Inductor filter (Series inductor), Capacitor filter (Shunt inductor), π-Filter; comparison of various filter circuits in terms of ripple factors.

UNIT–III:

Transistor Characteristics:

BJT: Junction transistor, transistor current components, transistor equation, transistor configurations, transistor as an amplifier, characteristics of transistor in Common Base, Common Emitter and Common Collector configurations, Ebers-Moll model of a transistor, punch through/reach through,

Photo transistor, typical transistor junction voltage values.
FET: FET types, construction, operation, characteristics μ, g_m, r_d parameters, MOSFET-types, construction, operation, characteristics, comparison between JFET and MOSFET.

UNIT–IV:
Transistor Biasing and Thermal Stabilization: Need for biasing, operating point, load line analysis; BJT biasing methods; basic stability concepts: fixed bias, collector to base bias, self-bias; Stabilization against variations in V_{BE}, I_C, and β; Stability factors (S, S', S''); Bias compensation; Thermal runaway; Thermal stability biasing methods and stabilization.

UNIT–V:
Small Signal Low Frequency Transistor Amplifier Models:
BJT: Two port network, Transistor hybrid model, determination of h-parameters, conversion of h-parameters, generalized analysis of transistor amplifier model using h-parameters, Analysis of CB, CE and CC amplifiers using exact and approximate analysis, Comparison of transistor amplifiers.
FET: Generalized analysis of small signal model, Analysis of CG, CS and CD amplifiers, comparison of FET amplifiers.

Text Books:

(a) J. Millman, C. Halkias, "Electronic Devices and Circuits", Tata Mc-Graw Hill, 2nd Edition, 2007.

(b) David A. Bell, "Electronic Devices and Circuits", Oxford University Press.

(c) Robert L. Boylestad and Louis Nashelsky, "Electronics Devices and Circuit Theory", Pearson/Prentice Hall, 10th edition, 2009.

Reference Books:

(a) J. Millman, C. Halkias, "Integrated Electronics", Tata Mc-Graw Hill, 2nd Edition, 2009.

(b) K. Lal Kishore, "Electronic Devices and Circuits", BS Publications, 4th Edition, 2016.

Web References:

- Electronic Devices and Circuits - Amrita Vishwa Vidyapeetham
- https://www.udemy.com/course/electronics-devices-and-circuits-foundation-of-electronics/

Course Code	Course Name	Course Structure			
		L	T	P	C
P23EOE05	INTRODUCTION TO SIMULATION SOFTWARE (OPEN ELECTIVE-1)	3	0	0	3

Internal Marks: 30 External Marks: 70

Course Outcomes:

CO1: Understand the MATLAB environment, interface, and basic syntax for effective usage.

CO2: Apply MATLAB functions to perform numerical computations and data analysis.

CO3: Implement basic programming constructs such as loops and conditional statements in MATLAB.

CO4: Solve mathematical and engineering problems using built-in and user-defined MATLAB functions.

CO5: Demonstrate professionalism in presenting MATLAB-based solutions and industrial applications.

Unit-I:

MATLAB Basics: Historical Background, Scope of MATLAB, Importance of MATLAB for Engineers, Features, Applications, MATLAB Windows (Editor, Work Space, Command History, Command Window). Arithmetic Operations with Scalars, Display Formats, Clearing Operations, Commands, Data types, Operators.

Unit-II:

Data And Data Flow In MATLAB: Vectors, Matrix Operations & Operators, Reshaping Matrices, Arrays, Colon Notations, Numbers, Strings, Functions, File Input-Output, Importing and Exporting of data, Worked out Examples.

Unit-III:

MATLAB Programming: Relational and Logical Operators, Conditional Statements, Switch-Case Statements, Loops, Nested Statements, Script Files - Creating, Saving and Running script file, Current folder, Examples of MATLAB Applications.

Unit-IV:

MATLAB Plotting and Visualization: Plotting, Creating Plot & Editing Plot - 2D plots (plot, xlabel, ylabel, title, legend), Multiple plots in one figure, Subplots, 3D plots (mesh, surf, plot3), Customizing plots, MATLAB - Algebra, Calculus, Differential, Integration, Polynomials, solving a system of linear equations.

Unit-V:

GUI and Simulink: Creating and Displaying a Graphical User Interface, Graphical User Interface Components, Additional Containers: Panels and Button Groups, Dialog Boxes, Menus, Tips for Creating Efficient GUIs. Introduction

to Simulink, Importance, Model Based Design, Tools, Mathematical Modeling, Converting Mathematical Model into Simulink Model, Importing Exporting Data, Solver Configuration, Masking Block/Model.

Text Books:

(a) Rudra Pratap, *Getting Started With MATLAB: A Quick Introduction For Scientists And Engineers*, Oxford University Press.

(b) Y. Kirani Singh, B.B. Chaudhuri, *MATLAB Programming*, PHI Publication.

(c) Amos Gilat, *MATLAB: An Introduction with Applications*.

Reference Books:

(a) Stephen J. Chapman, *MATLAB® Programming For Engineers*, Fourth edition.

(b) Won Y. Yang, Wenwu Cao, Tae-Sang Chung, John Morris, *Applied Numerical Methods Using MATLAB*, 1st Edition.

(c) David Houcque, *Introduction To MATLAB For Engineering Students*, Northwestern University.

Web References:

- `https://www.mathworks.com/help/matlab/`
- `https://matlabacademy.mathworks.com/details/matlab-onramp/getting-started`
- `https://www.coursera.org/learn/matlab`

Course Code	Course Name	Course Structure			
		L	T	P	C
P23ADO04	INTRODUCTION TO DATA SCIENCE	3	0	0	3

Internal Marks: 30 External Marks: 70

Course Prerequisite: Basic knowledge of programming (Python), mathematics, and statistics.

Course Objectives:

(a) To introduce the fundamental concepts, workflow, and scope of Data Science.
(b) To understand data collection, preprocessing, and visualization techniques.
(c) To apply statistical methods for data analysis.
(d) To use Python libraries for data science applications.
(e) To solve basic real-world problems using data science methods.

Course Outcomes: At the end of this course, the students will be able to:

(a) Understand the data science life cycle and key roles.
(b) Explore and preprocess real-world datasets.
(c) Apply descriptive statistics and inferential techniques.
(d) Visualize data using standard Python tools.
(e) Implement data science solutions using Python.

UNIT–I:

Introduction to Data Science: What is Data Science? History and Evolution, Data Science vs Data Analytics vs Business Intelligence, Data Science Life Cycle: Business Understanding, Data Collection, Data Cleaning, Modeling, Evaluation, Deployment, Roles in Data Science: Data Scientist, Data Analyst, Data Engineer.

UNIT–II:

Data Collection and Preprocessing: Types of Data: Structured, Unstructured, Semi-Structured; Data Acquisition Techniques – APIs, Web Scraping, Databases; Data Cleaning: Handling Missing Data, Duplicates, Outliers, Normalization and Standardization, Encoding Categorical Variables.

UNIT–III:

Exploratory Data Analysis (EDA): Introduction to EDA, Summary Statistics, Distributions, Correlation; Data Visualization: Histograms, Boxplots, Scatterplots, Heatmaps, Pair Plots; EDA Tools: Pandas Profiling, Seaborn, Matplotlib.

UNIT–IV:

Statistical Methods for Data Science: Descriptive Statistics: Mean, Median, Mode, Variance, Standard Deviation; Probability Distributions: Bino-

mial, Normal, Poisson; Inferential Statistics: Sampling, Central Limit Theorem, Confidence Intervals, Hypothesis Testing, p-values, t-test, Chi-square test.

UNIT–V:

Introduction to Data Science with Python: Working with Pandas: DataFrames, Series, Indexing, GroupBy; NumPy for Numerical Computation; Introduction to Scikit-learn: Data Splitting, Simple Linear Regression, Classification Overview; Case Studies: Real-world mini projects in Healthcare, Retail, or Social Media.

Text Books:

(a) Joel Grus, *Data Science from Scratch: First Principles with Python*, 2nd Edition, O'Reilly Media, 2019.

(b) Vasant Dhar, *Data Science and Prediction: Data, Algorithms and Models*, Oxford University Press, 2020.

Reference Books:

(a) Cathy O'Neil and Rachel Schutt, *Doing Data Science*, O'Reilly Media, 2013.

(b) Jake VanderPlas, *Python Data Science Handbook*, O'Reilly Media, 2016.

(c) Wes McKinney, *Python for Data Analysis*, O'Reilly Media, 2nd Edition, 2017.

(d) Andreas C. Müller and Sarah Guido, *Introduction to Machine Learning with Python*, O'Reilly, 2016.

Web References:

- https://www.kaggle.com/learn/data-science
- https://www.datacamp.com/tracks/data-scientist-with-python
- https://towardsdatascience.com/
- https://pandas.pydata.org/docs/
- https://numpy.org/doc/
- https://seaborn.pydata.org/

Course Code	Course Name	Course Structure			
		L	T	P	C
P23MBO01	ENTREPRENEURSHIP DEVELOPMENT VENTURE CREATION Venture Creation	2	0	2	2

Internal Marks: 30 External Marks: 70

Course Objectives:

(a) To introduce the concept, process and importance of entrepreneurship development.
(b) To acquaint students with the knowledge and skills for identifying business opportunities, project appraisal and management.
(c) To familiarize learners with institutional support and legal requirements for entrepreneurship.
(d) To develop an understanding of the issues and challenges of small-scale industries and entrepreneurial environment in India.

UNIT–I:

Entrepreneur and Entrepreneurship: Definition, evolution and concept of entrepreneur, functions and types of entrepreneurs, characteristics and traits of successful entrepreneurs, entrepreneurship and entrepreneurial culture, women entrepreneur: meaning, growth, problems, remedies. Theories of entrepreneurship, motivation theories (Maslow, McClelland, Alderfer).

UNIT–II:

Entrepreneurial Development: Environmental factors, socio-economic environment in the emergence of entrepreneurship. Entrepreneurial Development Programmes (EDPs): meaning, objectives, need, organizing EDPs, evaluation and problems, methods, achievements, and role of EDPs in India. Institutional support for entrepreneurship (NSIC, SIDBI, SISI, DIC, etc.).

UNIT–III:

Project Appraisal and Management: Identification and search for business ideas, project classification and formulation, project appraisal and report, feasibility and profitability analysis, sources of finance, profitability and risk analysis, risk assessment and techniques.

UNIT–IV:

Legal and Statutory Environment for Small Industry: Legal formalities for setting up small scale industrial undertakings (SSI), government setup in promoting small industries, various incentives and subsidies, financial

institutions, registration procedures, social responsibilities of business, steps in starting a small industry, problems and remedies for industrial sickness.

UNIT–V:

Small Scale Industrial Undertakings: Definition and characteristics of SSI, role in economic development, government policy towards SSI, incentives and subsidies, challenges and problems for SSI, steps to overcome sickness, case studies in entrepreneurship.

Text Books:

(a) Vasant Desai, "Dynamics of Entrepreneurial Development and Management", Himalaya Publishing House.

(b) S.S. Khanka, "Entrepreneurial Development", S. Chand & Company Ltd.

Reference Books:

(a) C.B. Gupta and N.P. Srinivasan, "Entrepreneurship Development in India", Sultan Chand & Sons.

(b) P. Saravanavel, "Entrepreneurship Development", Ess Pee Kay Publishing House.

(c) E. Gordon, K. Natarajan, "Entrepreneurship Development", Himalaya Publishing House.

Web Resources:

(a) https://www.niesbud.nic.in/

(b) https://msme.gov.in/

(c) https://en.wikipedia.org/wiki/Entrepreneurship

Course Code	Course Name	Course Structure			
		L	T	P	C
P23CBL02	INTERNET OF THINGS LAB (PROFESSIONAL CORE)	0	0	3	1.5

Internal Marks: 30 External Marks: 70

Course Objectives:

This Course focuses on hands-on IoT concepts such as sensing, actuation and communication. This Course focuses on Internet of Things (IoT) prototypes, including devices for the Course focuses on real world applications of IoT.

Course Outcomes:

Upon successful completion of the course/Lab the students will be able to:

(a) Design some IoT based prototypes. (L6)
(b) To learn about embedded OS used for IoT application. (L2)
(c) To learn about communication protocol of IoT. (L2)
(d) Develop knowledge of IoT hardware and software. (L6)
(e) Develop knowledge of sensors and actuators. (L6)
(f) Study of some real world IoT applications. (L2)

List of Experiments:

(a) Write a program to install Python on different operating systems.
(b) Write a program to display light on LED using Arduino.
(c) Write a program to turn on the LED, based on the state of the push button using Arduino.
(d) Write a program to read Analog Inputs using Arduino.
(e) Write a program to change the frequency of the blinking LED.
(f) Write a program for adding Sensor to Trigger a Notification using Arduino.
(g) Write a program to use the push button to send an email when pressed.
(h) Write a program to display a colour on the Sense HAT using Raspberry Pi3.
(i) Write a program to detect temperature with the Sense HAT.
(j) Write a program to detect humidity with the Sense HAT.
(k) Write a program to detect pitch, roll, and yaw with the Sense HAT.
(l) Write a program to Control the LED with the Android App.

Course Code	Course Name	Course Structure			
		L	T	P	C
P23CBL03	CYBER SECURITY LAB (PROFESSIONAL CORE)	0	0	3	1.5

Internal Marks: 50 External Marks: 50

Course Objective:

- To get practical exposure to Cybersecurity threats and Forensics tools.

Course Outcomes:

(a) Get the skill to identify cyber threats/attacks. (L2)
(b) Get the knowledge to solve security issues in day-to-day life. (L6)
(c) Able to use Autopsy tools. (L3)
(d) Perform Memory capture and analysis. (L3)
(e) Demonstrate Network analysis using Network miner tools. (L3)

List of Experiments:

(a) Perform an Experiment for port scanning with nmap.
(b) Set up a honeypot and monitor the honeypot on the network.
(c) Install Jscript/Cryptool tool (or any other equivalent) and demonstrate Asymmetric, Symmetric crypto algorithm, Hash and Digital/PKI signatures.
(d) Generate minimum 10 passwords of length 12 characters using openSSL command.
(e) Perform practical approach to implement Footprinting - Gathering target information using Dmitry-Dmagic, UA tester.
(f) Work with sniffers for monitoring network communication (Wireshark).
(g) Using Snort, perform real-time traffic analysis and packet logging.
(h) Perform email analysis using the Autopsy tool.
(i) Perform Registry analysis and get boot time logging using process monitor tool.
(j) Perform File type detection using Autopsy tool.
(k) Perform Memory capture and analysis using FTK imager tool.
(l) Perform Network analysis using the Network Miner tool.

Text Books:

(a) E.P. Dorothy, *Real Digital Forensics for Handheld Devices*, Auerbach Publications, 2013.

(b) J. Sammons, *The Basics of Digital Forensics: The Primer for Getting Started in Digital Forensics*, Syngress Publishing, 2012.

Reference Books:

(a) E. Casey, *Handbook of Digital Forensics and Investigation*, Academic Press, 2010.
(b) C.H. Malin, E. Casey and J.M. Aquilina, *Malware Forensics Field Guide for Windows Systems: Digital Forensics Field Guides*, Syngress, 2012.
(c) J. Wiles and A. Reyes, *The Best Damn Cybercrime and Digital Forensics Book Period*, Syngress, 2007.

Course Code	Course Name	Course Structure			
		L	T	P	C
P23CBS03	FULL STACK DEVELOPMENT-2 (Skill Enhancement Course)	0	1	2	2

Internal Marks: 30 External Marks: 70

Course Objectives:

(a) Learn the basics of Node.js.
(b) Build web apps using Express.js.
(c) Understand and use TypeScript.
(d) Create RESTful APIs with Node and Express.
(e) Apply best practices in backend development.

Course Outcomes:

CO1: Make use of router, template engine and authentication using sessions to develop application in Express JS. (L3)
CO2: Build a single page application using RESTful APIs in Express JS. (L6)
CO3: Make use of components, props, states and render data in ReactJS. (L3)
CO4: Apply router and hooks in designing ReactJS application. (L3)
CO5: Make use of MongoDB queries to perform CRUD operations on document database. (L3)

List of Experiments:

Experiment 1: ExpressJS – Routing, HTTP Methods, Middleware

a. Write a program to define a route, Handling Routes, Route Parameters, Query Parameters and URL building.
b. Write a program to accept data, retrieve data and delete a specified resource using http methods.
c. Write a program to show the working of middleware.

Experiment 2: ExpressJS – Templating, Form Data

a. Write a program using templating engine.
b. Write a program to work with form data.

Experiment 3: ExpressJS – Cookies, Sessions, Authentication

a. Write a program for session management using cookies and sessions.
b. Write a program for user authentication.

Experiment 4: ExpressJS – Database, RESTful APIs

a. Write a program to connect MongoDB database using Mangoose and perform CRUD operations.
b. Write a program to develop a single page application using RESTful APIs.

Experiment 5: ReactJS – Render HTML, JSX, Components – function & Class

a. Write a program to render HTML to a web page.
b. Write a program for writing markup with JSX.
c. Write a program for creating and nesting components (function and class).

Experiment 6: ReactJS – Props and States, Styles, Respond to Events

a. Write a program to work with props and states.
b. Write a program to add styles (CSS & Sass Styling) and display data.
c. Write a program for responding to events.

Experiment 7: ReactJS – Conditional Rendering, Rendering Lists, React Forms

a. Write a program for conditional rendering.
b. Write a program for rendering lists.
c. Write a program for working with different form fields using react forms.

Experiment 8: ReactJS – React Router, Updating the Screen

a. Write a program for routing to different pages using react router.
b. Write a program for updating the screen.

Experiment 9: ReactJS – Hooks, Sharing data between Components

a. Write a program to understand the importance of using hooks.
b. Write a program for sharing data between components.

Experiment 10: MongoDB – Installation, Configuration, CRUD operations

a. Install MongoDB and configure ATLAS.
b. Write MongoDB queries to perform CRUD operations on document using insert(), find(), update(), remove().

Experiment 11: MongoDB – Databases, Collections and Records

a. Write MongoDB queries to Create and drop databases and collections.
b. Write MongoDB queries to work with records using find(), limit(), sort(), createIndex(), aggregate().

Experiment 12: Augmented Programs: (**Any 2 must be completed**)

a. Design a to-do list application using NodeJS and ExpressJS.
b. Design a Quiz app using ReactJS.
c. Complete the MongoDB certification from MongoDB University website.

Text Books:

(a) Robet W Sebesta, *Programming the World Wide Web*, Pearson, 7th Edition, 2013.
(b) Vasan Subramanian, *Pro MERN Stack: Full Stack Web App Development with Mongo, Express, React, and Node*, A Press, O'Reilly, 2nd edition.
(c) *Node.Js in Action*, Mike Cantelon, Mark Harter, T.J. Holowaychuk, Nathan Rajlich, Manning Publications. (Chapters 1-11)
(d) Azat Mardan, *React Quickly*, Manning Publications (Chapters 1-8,12-14)

Web Links:

(a) ExpressJS - `https://www.tutorialspoint.com/expressjs`
(b) ReactJS - `https://www.w3schools.com/REACT` (and) `https://react.dev/learn#`
(c) MongoDB - `https://learn.mongodb.com/learning-paths/introduction-to-mongodb`

Course Code	Course Name	Course Structure			
		L	T	P	C
P21CSTXX	AGILE METHODOLOGIES	3	0	0	3

Internal Marks: 30 **External Marks:** 70

Course Objectives:

(a) To provide students with a theoretical as well as practical understanding of agile software development practices and how small teams can apply them to create high-quality software.
(b) To provide a good understanding of software design and a set of software technologies and APIs.
(c) To do a detailed examination and demonstration of Agile development and testing techniques.
(d) To understand the benefits and pitfalls of working in an Agile team.
(e) To understand Agile development and testing.

Course Outcomes: Upon completion of the course, the students will be able to:

(a) Realize the importance of interacting with business stakeholders in determining the requirements for a software system.
(b) Perform iterative software development processes: how to plan them, how to execute them.
(c) Point out the impact of social aspects on software development success.
(d) Develop techniques and tools for improving team collaboration and software quality.
(e) Perform software process improvement as an ongoing task for development teams.
(f) Show how agile approaches can be scaled up to the enterprise level.

UNIT I: Agile Methodology

Theories for Agile Management – Agile Software Development – Traditional Model vs. Agile Model – Classification of Agile Methods – Agile Manifesto and Principles – Agile Project Management – Agile Team Interactions – Ethics in Agile Teams – Agility in Design, Testing – Agile Documentation – Agile Drivers, Capabilities and Values.

UNIT II: Agile Processes

Lean Production – SCRUM, Crystal, Feature Driven Development – Adaptive Software Development – Extreme Programming: Method Overview – Lifecycle – Work Products, Roles and Practices.

UNIT III: Agility and Knowledge Management

Agile Information Systems – Agile Decision Making – Earl's Schools of KM – Institutional Knowledge Evolution Cycle – Development, Acquisition, Refinement, Distribution, Deployment, Leveraging – KM in Software Engineering – Managing Software Knowledge – Challenges of Migrating to Agile Methodologies – Agile Knowledge Sharing – Role of Story-Cards – Story-Card Maturity Model (SMM).

UNIT IV: Agility and Requirements Engineering

Impact of Agile Processes in RE – Current Agile Practices – Variance – Overview of RE Using Agile – Managing Unstable Requirements – Requirements Elicitation – Agile Requirements Abstraction Model – Requirements Management in Agile Environment, Agile Requirements Prioritization – Agile Requirements Modeling and Generation – Concurrency in Agile Requirements Generation.

UNIT V: Agility and Quality Assurance

Agile Product Development – Agile Metrics – Feature Driven Development (FDD) – Financial and Production Metrics in FDD – Agile Approach to Quality Assurance – Test Driven Development – Agile Approach in Global Software Development.

Text Books:

(a) David J. Anderson and Eli Schragenheim, *Agile Management for Software Engineering: Applying the Theory of Constraints for Business Results*, Prentice Hall, 2003.
(b) Hazza and Dubinsky, *Agile Software Engineering*, Series: Undergraduate Topics in Computer Science, Springer, 2009.

Reference Books:

(a) Craig Larman, *Agile and Iterative Development: A Manager's Guide*, Addison-Wesley, 2004.
(b) Kevin C. Desouza, *Agile Information Systems: Conceptualization, Construction, and Management*, Butterworth-Heinemann, 2007.

Web References:

(a) `https://www.scrumalliance.org`
(b) `https://www.agilealliance.org`
(c) `https://www.tutorialspoint.com/agile/index.htm`

Course Code	Course Name	Course Structure			
		L	T	P	C
P23XXXXX	CLOUD COMPUTING (PROFESSIONAL CORE)	3	0	0	3

Internal Marks: 30 External Marks: 70

Course Objectives:

(a) To explain the evolving utility computing model called cloud computing.
(b) To introduce the various levels of services offered by cloud.
(c) To discuss the fundamentals of cloud enabling technologies such as distributed computing, service-oriented architecture and virtualization.
(d) To emphasize the security and other challenges in cloud computing.
(e) To introduce the advanced concepts such as containers, serverless computing and cloud-centric Internet of Things.

Course Outcomes: At the end of the course the student will able to

(a) Describe cloud computing models, services, and providers. (L2)
(b) Explain enabling technologies like distributed computing and virtualization. (L2)
(c) Understand virtualization, containers, and orchestration tools. (L2)
(d) Analyze key challenges and security issues in cloud computing. (L4)
(e) Demonstrate the advanced topics like serverless computing, IoT, and DevOps. (L3)

UNIT-I: (9 Lectures)

Introduction to Cloud Computing Fundamentals: Cloud computing at a glance, defining a cloud, cloud computing reference model, types of services (IaaS, PaaS, SaaS), cloud deployment models (public, private, hybrid), utility computing, cloud computing characteristics and benefits, cloud service providers (Amazon Web Services, Microsoft Azure, Google AppEngine).

UNIT-II: (9 Lectures)

Cloud Enabling Technologies: Ubiquitous Internet, parallel and distributed computing, elements of parallel computing, hardware architectures for parallel computing (SISD, SIMD, MISD, MIMD), elements of distributed computing, Inter-process communication, technologies for distributed computing, remote procedure calls (RPC), service-oriented architecture (SOA), Web services, and virtualization.

UNIT-III: (9 Lectures)

Virtualization and Containers: Characteristics of virtualized environments, taxonomy of virtualization techniques, virtualization and cloud Computing, pros and cons of virtualization, technology examples (XEN, VMware), building blocks of containers, container platforms (LXC, Docker), container orchestration, Docker Swarm and Kubernetes, public cloud VM (e.g. Amazon EC2) and container (e.g. Amazon Elastic Container Service) offerings.

UNIT-IV: (9 Lectures)

Cloud computing challenges: Economics of the cloud, cloud interoperability and standards, scalability and fault tolerance, energy efficiency in clouds, federated clouds, cloud computing security, fundamentals of computer security, cloud security architecture, cloud shared responsibility model, security in cloud deployment models.

UNIT-V: (9 Lectures)

Advanced concepts in cloud computing: Serverless computing, Function-as-a-Service, serverless computing architecture, public cloud (e.g. AWS Lambda) and open-source (e.g. OpenFaaS) serverless platforms, Internet of Things (IoT), applications, cloud-centric IoT and layers, edge and fog computing, DevOps, infrastructure-as-code, quantum cloud computing.

Text Books:

(a) Rajkumar Buyya, Christian Vecchiola, ThamaraiSelvi, Shivananda Poojara, Satish N. Srirama, "Mastering Cloud Computing", McGraw Hill, 2nd edition, 2024.
(b) Kai Hwang, Geoffery C. Fox, Jack J. Dongarra, "Distributed and Cloud Computing", Elsevier, 2012.

Reference Books:

(a) Dan C Marinescu, "Cloud Computing, Theory and Practice", MK Elsevier, 2nd edition, 2018.
(b) K. Chandrasekhran, "Essentials of cloud Computing", CRC press, Taylor & Francis Group, 2014.
(c) Online documentation and tutorials from cloud service providers (e.g., AWS, Azure, GCP)

Course Code	Course Name	Course Structure			
		L	T	P	C
P23XXXXX	BLOCKCHAIN TECHNOLOGY (PROFESSIONAL CORE)	3	0	0	3

Internal Marks: 30 External Marks: 70

Course Objectives:

(a) Understand blockchain basics, types, consensus, and cryptocurrencies.
(b) Explore public blockchains and smart contracts.
(c) Learn about private/consortium blockchains and ICOs.
(d) Study blockchain security and its real-world applications.
(e) Analyze case studies and build blockchain apps using Python and Hyperledger.

Course Outcomes: At the end of the course the student will be able to

(a) Describe blockchain fundamentals and cryptocurrency concepts. (L2)
(b) Explain public blockchain systems and smart contract functionality. (L2)
(c) Differentiate blockchain types and outline the ICO process. (L2)
(d) Evaluate blockchain security and sector-wise applications. (L4)
(e) Apply blockchain concepts through case studies and development tools. (L3)

UNIT–I:

Fundamentals of Blockchain: Introduction, Origin of Blockchain, Blockchain Solution, Components of Blockchain, Block in a Blockchain, The Technology and the Future.

Blockchain Types and Consensus Mechanism: Introduction, Decentralization and Distribution, Types of Blockchain, Consensus Protocol.

Cryptocurrency: Bitcoin, Altcoin and Token: Introduction, Bitcoin and the Cryptocurrency, Cryptocurrency Basics, Types of Cryptocurrencies, Cryptocurrency Usage.

UNIT–II:

Public Blockchain System: Introduction, Public Blockchain, Popular Public Blockchains, The Bitcoin Blockchain, Ethereum Blockchain.

Smart Contracts: Introduction, Smart Contract, Characteristics of a Smart Contract, Types of Smart Contracts, Types of Oracles, Smart Contracts in Ethereum, Smart Contracts in Industry.

UNIT–III:

Private Blockchain System: Introduction, Key Characteristics of Private Blockchain, Private Blockchain, Private Blockchain Examples, Private Blockchain

and Open Source, E-commerce Site Example, Various Commands (Instructions) in E-commerce Blockchain, Smart Contract in Private Environment, State Machine, Different Algorithms of Permissioned Blockchain, Byzantine Fault, Multichain.

Consortium Blockchain: Introduction, Key Characteristics of Consortium Blockchain, Need of Consortium Blockchain, Hyperledger Platform, Overview of Ripple, Overview of Corda.

Initial Coin Offering: Introduction, Blockchain Fundraising Methods, Launching an ICO, Investing in an ICO, Pros and Cons of Initial Coin Offering, Successful Initial Coin Offerings, Evolution of ICO, ICO Platforms.

UNIT–IV:

Security in Blockchain: Introduction, Security Aspects in Bitcoin, Security and Privacy Challenges of Blockchain in General, Performance and Scalability, Identity Management and Authentication, Regulatory Compliance and Assurance, Safeguarding Blockchain Smart Contract (DApp), Security Aspects in Hyperledger Fabric.

Applications of Blockchain: Introduction, Blockchain in Banking and Finance, Blockchain in Education, Blockchain in Energy, Blockchain in Healthcare, Blockchain in Real-estate, Blockchain in Supply Chain, The Blockchain and IoT. Limitations and Challenges of Blockchain.

UNIT–V:

Blockchain Case Studies: Case Study 1 – Retail, Case Study 2 – Banking and Financial Services, Case Study 3 – Healthcare, Case Study 4 – Energy and Utilities.

Blockchain Platform using Python: Introduction, Learn How to Use Python Online Editor, Basic Programming Using Python, Python Packages for Blockchain.

Blockchain Platform using Hyperledger Fabric: Introduction, Components of Hyperledger Fabric Network, Chain codes from Developer.ibm.com, Blockchain Application Using Fabric Java SDK.

Text Books:

(a) Chandramouli Subramanian, Asha A.George, Abhilasj K A and Meena Karthikeyan, “Block chain Technology”, Universities Press, 2020.

Reference Books:

(a) Melanie Swan, “Blockchain Blue print for Economy”, O’Reilly Media, 2015.
(b) Jai Singh Arun, Jerry Cuomo, Nitin Gauar, “Blockchain for Business”, Pearson Education, First Edition, 2019.

Course Code	Course Name	Course Structure			
		L	T	P	C
P23XXXXX	PRIVACY AND SECURITY IN IOT (PROFESSIONAL ELECTIVE - II)	3	0	0	3

Internal Marks: 30M External Marks: 70M

Course Objectives:

(a) Ability to understand the Security requirements in IoT.
(b) Understand the cryptographic fundamentals for IoT.
(c) Ability to understand the authentication credentials and access control.
(d) Understand the various types Trust models and Cloud Security.

Course Outcomes: At the end of the course, the student shall be able to:

(a) Apply Security and privacy concepts in IoT devices. (L3)
(b) Gain knowledge on types of Vulnerabilities. (L1)
(c) Familiar with Encryption & Decryption algorithms. (L2)

UNIT-I:

Introduction: Securing The Internet Of Things: Security Requirements in IoT Architecture - Security in Enabling Technologies - Security Concerns in IoT Applications. Security Architecture in the Internet of Things - Security Requirements in IoT - 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 – Attack & Fault trees.

UNIT-II:

Cryptographic Fundamentals For IOT: Cryptographic primitives and its role in IoT – Encryption and Decryption – Hashes – Digital Signatures – Random number generation – Cipher suites – key management fundamentals – cryptographic controls built into IoT messaging and communication protocols – IoT Node Authentication.

UNIT-III:

Identity & Access Management Solutions For IOT: Identity lifecycle – authentication credentials – IoT IAM infrastructure – Authorization with Publish / Subscribe schemes – access control.

UNIT-IV:

Privacy Preservation And Trust Models For IOT: Concerns in data dissemination – Lightweight and robust schemes for Privacy protection – Trust and Trust models for IoT – self-organizing Things - Preventing unauthorized access.

UNIT-V:

Cloud Security for IoT: Cloud services and IoT – offerings related to IoT from cloud service providers – Cloud IoT security controls – An enterprise IoT cloud security architecture – New directions in cloud enabled IoT computing.

Text Books:

(a) Brian Russell, Drew Van Duren, "Practical Internet of Things Security", Packt Publications, Kindle Edition, 2016.
(b) Shancang Li, Li Da Xu, "Securing the Internet of Things", Elsevier, 1st Edition, 2017.
(c) Fei Hu, "Security and Privacy in Internet of Things (IoTs): Models, Algorithms, and Implementations", CRC Press LLC, 1st Edition, 2016.

Course Code	Course Name	Course Structure			
		L	T	P	C
P23XXXXX	DEVEOPS (PROFESSIONAL ELECTIVE-II)	3	0	0	3

Internal Marks: 30 External Marks: 70

Course Objectives:

(a) Understand DevOps principles and lifecycle for agile software delivery.
(b) Manage source code and ensure code quality using Git and testing tools.
(c) Automate builds and continuous integration using Jenkins.
(d) Implement continuous delivery and containerization with Docker and Selenium.
(e) Automate configuration management and orchestration using Ansible and Kubernetes.

Course Outcomes: End of the course, the student will be able to

(a) Explain DevOps concepts and workflows. (L2)
(b) Demonstrate proficiency in Git and perform Unit testing with code quality tools. (L3)
(c) Configure Jenkins pipelines for continuous integration. (L2)
(d) Deploy applications using Docker and apply automated testing. (L3)
(e) Use Ansible and Kubernetes for configuration management and container orchestration. (L3)

UNIT-I

Introduction to DevOps: Introduction to SDLC, Agile Model. Introduction to Devops. DevOps Features, DevOps Architecture, DevOps Lifecycle, Understanding Workflow and principles, Introduction to DevOps tools, Build Automation, Delivery Automation, Understanding Code Quality, Automation of CI/CD. Release management, Scrum, Kanban, delivery pipeline, bottlenecks, examples.

UNIT-II

Source Code Management (GIT): The need for source code control, The history of source code management, Roles and code, source code management system and migrations. What is Version Control and GIT, GIT Installation, GIT features, GIT workflow, working with remote repository, GIT commands, GIT branching, GIT staging and collaboration.

UNIT TESTING - CODE COVERAGE: Junit, nUnit & Code Coverage with Sonar Qube, SonarQube - Code Quality Analysis.

UNIT-III

Build Automation - Continuous Integration (CI): Build Automation, What is CI Why CI is Required, CI tools, Introduction to Jenkins (With Architecture), Jenkins workflow, Jenkins master slave architecture, Jenkins Pipelines, PIPELINE

BASICS - Jenkins Master, Node, Agent, and Executor Freestyle Projects & Pipelines, Jenkins for Continuous Integration, Create and Manage Builds, User Management in Jenkins Schedule Builds, Launch Builds on Slave Nodes.

UNIT-IV

Continuous Delivery (CD): Importance of Continuous Delivery, CONTINUOUS DEPLOYMENT CD Flow.

Containerization with Docker: Introduction to Docker, Docker installation, Docker commands, Images & Containers, DockerFile, Running containers, Working with containers and publish to Docker Hub.

Testing Tools: Introduction to Selenium and its features, JavaScript testing.

UNIT-V

Configuration Management - ANSIBLE: Introduction to Ansible, Ansible tasks, Roles, Jinja templating, Vaults, Deployments using Ansible.

CONTAINERIZATION USING KUBERNETES (OPENSHIFT): Introduction to Kubernetes Namespace & Resources, CI/CD - On OCP, BC, DC &ConfigMaps, Deploying Apps on Openshift Container Pods. Introduction to Puppet master and Chef.

Text Books:

(a) Joyner, Joseph., "DevOps for Beginners: DevOps Software Development Method Guide for Software Developers and IT Professionals", Mihails Konoplows, 1st Edition, 2015.
(b) Alisson Machado de Menezes, "Hands-on DevOps with Linux", BPB Publications, 1st Edition, India, 2021.

Reference Books:

(a) Len Bass, Ingo Weber, Liming Zhu, "DevOps: A Software Architect's Perspective", Addison Wesley.
(b) Gene Kim, Jez Humble, Patrick Debois, John Willis, "The DevOps Handbook", IT Revolution Press, 1st Edition, 2016.
(c) Verona, Joakim, "Practical DevOps", Packt Publishing, 1st Edition, 2016.
(d) Joakim Verona, "Practical DevOps, Ingram short title", 2nd edition (2018). ISBN10: 1788392574.
(e) Deepak Gaikwad, Viral Thakkar, "DevOps Tools from Practitioner's Viewpoint", Wiley publications. ISBN: 9788126579952.

Course Code	Course Name	Course Structure			
		L	T	P	C
P23XXXXX	MACHINE LEARNING (PROFESSIONAL ELECTIVE-II)	3	0	0	3

Internal Marks: 30 External Marks: 70

Course Objectives: The objectives of the course is to

(a) Understand basic ML concepts, learning types, and the machine learning workflow.
(b) Apply distance-based models like KNN for classification and regression.
(c) Learn decision tree and Bayesian methods for classification and regression.
(d) Understand linear models, SVMs, and neural networks for supervised learning.
(e) Explore clustering techniques for unsupervised pattern discovery.

Course Outcomes: At the end of the course, student will be able to

(a) Enumerate the Fundamentals of Machine Learning. (L1)
(b) Build Nearest neighbour based models. (L6)
(c) Apply Models based on decision trees and Bayes rule. (L3)
(d) Make use of Linear discriminants for machine Learning. (L3)
(e) Choose appropriate clustering technique. (L1)

UNIT-I

Introduction to Machine Learning: Evolution of Machine Learning, Paradigms for ML, Learning by Rote, Learning by Induction, Reinforcement Learning, Types of Data, Matching, Stages in Machine Learning, Data Acquisition, Feature Engineering, Data Representation, Model Selection, Model Learning, Model Evaluation, Model Prediction, Search and Learning, Data Sets.

UNIT-II

Nearest Neighbor-Based Models: Introduction to Proximity Measures, Distance Measures, Non-Metric Similarity Functions, Proximity Between Binary Patterns, Different Classification Algorithms Based on the Distance Measures, K-Nearest Neighbor Classifier, Radius Distance Nearest Neighbor Algorithm, KNN Regression, Performance of Classifiers, Performance of Regression Algorithms.

UNIT-III

Models Based on Decision Trees: Decision Trees for Classification, Impurity Measures, Properties, Regression Based on Decision Trees, Bias–Variance Trade-off, Random Forests for Classification and Regression.

The Bayes Classifier: Introduction to the Bayes Classifier, Bayes' Rule and Inference, The Bayes Classifier and its Optimality, Multi-Class Classification, Class Conditional Independence and Naive Bayes Classifier (NBC).

UNIT-IV

Linear Discriminants for Machine Learning: Introduction to Linear Discriminants, Linear Discriminants for Classification, Perceptron Classifier, Perceptron Learning Algorithm, Support Vector Machines, Linearly Non-Separable Case, Non-linear SVM, Kernel Trick, Logistic Regression, Linear Regression, Multi-Layer Perceptrons (MLPs), Backpropagation for Training an MLP.

UNIT-V

Clustering: Introduction to Clustering, Partitioning of Data, Matrix Factorization, Clustering of Patterns, Divisive Clustering, Agglomerative Clustering, Partitional Clustering, K-Means Clustering, Soft Partitioning, Soft Clustering, Fuzzy C-Means Clustering, Rough Clustering, Rough K-Means Clustering Algorithm, Expectation Maximization-Based Clustering, Spectral Clustering.

Text Books:

(a) M N Murthy, V S Ananthanarayana, "Machine Learning Theory and Practice", Universities Press (India), 2024

Reference Books:

(a) Tom M. Mitchell, "Machine Learning", McGraw-Hill Publication, 2017.
(b) Peter Harrington, "Machine Learning in Action", DreamTech, 2012.
(c) Pang-Ning Tan, Michel Stenbach, Vipin Kumar, "Introduction to Data Mining", 7th Edition, 2019.

Course Code	Course Name	Course Structure			
		L	T	P	C
P23XXXXX	LIGHT WEIGHT CRYPTOGRAPHY (PROFESSIONAL ELECETIVE-II)	3	0	0	3

Internal Marks: 30 External Marks: 70

Course Objectives:

(a) Learn RFID use in anti-counterfeiting.
(b) Understand RFID security and privacy issues.
(c) Explore RFID/NFC in secure supply chains.
(d) Study cryptographic protection for RFID.
(e) Learn lightweight crypto for RFID tags.

Course Outcomes: At the end of the course, students will be able to

(a) To learn Cryptographic based solutions, attacks and intrusions. (L1)
(b) Understand security and privacy issues in radio frequency identification (RFID) systems. (L2)
(c) Apply network-based NIC solutions for enhancing supply chain safety. (L3)
(d) Understanding multiple ways to attack and defend industrial systems. (L2)
(e) Demonstrate knowledge of lightweight cryptographic methods for low-cost RFID tags. (L3)

UNIT-I

Anti-counter feiting and RFID: Anti-Counter feiting and Supply Chain Security, Networked RFID Systems, PC Network Architecture, A Security Primer.

UNIT-II

Security and Privacy Current Status: Addressing Insecurities and Violations of Privacy, RFID Tag Vulnerabilities in RFID Systems, From Identification to Authentication – A Review of RFID Product Authentication Techniques.

UNIT-III

Network-Based Solutions: EPC System for a Safe & Secure Supply Chain and How it is Applied, The Potential of RFID and NFC in Anti-Counterfeiting, Improving the Safety and Security of the Pharmaceutical Supply Chain.

UNIT-IV

Cryptographic Solutions: Product Specific Security Based on RFID Technology, Strengthening the Security of Machine-Readable Documents, Enhancing Security of Class I Generation 2 RFID against Traceability and Cloning.

UNIT-V

Low-cost Cryptographic Solutions: A Random Number Generator for Application in RFID Tags, A Low-Cost Solution to Cloning and Authentication Based on a Lightweight Primitive, Lightweight Cryptography for Low-Cost RFID.

Text Books:

(a) Peter H.Cole, Damith C. Ranasinghe, "Networked RFID Systems and Light weight Cryptography", Springer publication, 1st Edition, 2008.

Reference Books:

(a) Ying jiu Li, Robert H.Deng, "RFID Security and Privacy", Morgan and Claypool Publications, 1st Edition, 2014.
(b) Klaus Finken zeller, "RFID HANDBOOK", Wiley Publications, 3rd Edition.

Course Code	Course Name	Course Structure			
		L	T	P	C
P23XXXXX	SOFTWARE PROJECT MANAGEMENT (PROFESSIONAL ELECTIVE-III)	3	0	0	3

Internal Marks: 30 External Marks: 70

Course Objectives:

(a) Learn traditional vs. modern software management and software economics.
(b) Understand software lifecycle phases and key project artifacts.
(c) Explore software architectures, workflows, and iterative planning.
(d) Study project roles, automation, and software metrics.
(e) Learn Agile, Scrum, and DevOps practices in software development.

Course Outcomes: At the end of the course, the student shall be able to:

(a) Distinguish between conventional and modern software management approaches.
(b) Identify software lifecycle phases and describe key development artifacts.
(c) Apply iterative planning and understand process workflows in software projects.
(d) Analyze project organization, automation tools, and software metrics.
(e) Implement Agile and DevOps practices in real-world software development.

UNIT-I

Conventional Software Management: The waterfall model, conventional software Management performance.

Evolution of Software Economics: Software Economics, pragmatic software cost estimation.

Improving Software Economics: Reducing Software product size, improving software processes, improving team effectiveness, improving automation, Achieving required quality, peer inspections.

The old way and the new: The principles of conventional software Engineering, principles of modern software management, transitioning to an iterative process.

UNIT-II

Life cycle phases: Engineering and production stages, inception, Elaboration, construction, transition phases.

Artifacts of the process: The artifact sets, Management artifacts, Engineering artifacts, programmatic artifacts.

UNIT-III

Model-based software architectures: A Management perspective and technical perspective.

Workflows of the process: Software process workflows, Iteration workflows.

Checkpoints of the process: Major milestones, Minor Milestones, Periodic status assessments.

Iterative Process Planning: Work breakdown structures, planning guidelines, cost and schedule estimating, Iteration planning process, Pragmatic planning.

UNIT-IV

Project Organizations and Responsibilities: Line-of-Business Organizations, Project Organizations, evolution of Organizations.

Process Automation: Building blocks, The Project Environment.

Project Control and Process instrumentation: The seven core Metrics, Management indicators, quality indicators, life cycle expectations, pragmatic Software Metrics, Metrics automation.

UNIT-V

Agile Methodology: ADAPTing to Scrum, Patterns for Adopting Scrum, Iterating towards Agility.

Fundamentals of DevOps: Architecture, Deployments, Orchestration, Need, Instance of applications, DevOps delivery pipeline, DevOps eco system.

DevOps adoption in projects: Technology aspects, Agiling capabilities, Tool stack implementation, People aspect, processes

Text Books:

(a) Walker Royce, “Software Project Management”, PEA, 2005.
(b) Mike Cohn, “Succeeding with Agile: Software Development Using Scrum”, Addison Wesley.
(c) Gene Kim, John Willis, Patrick Debois, Jez Humble, “The DevOps Handbook: How to Create World-Class Agility, Reliability, and Security in Technology Organizations”, 1st Edition, O’Reilly publications, 2016.

Reference Books:

(a) Bob Hughes, Mike Cotterell, “Software Project Management”, TMH, 3rd edition.
(b) Joel Henry, “Software Project Management”, PEA, 2003.
(c) Pankaj Jalote, “Software Project Management in practice”, PEA, 2005.
(d) Robert K.Wysocki, “Effective Software Project Management”, Wiley, 2006.
(e) Kathy Schwalbe, “Project Management in IT”, Cengage.

Course Code	Course Name	Course Structure			
		L	T	P	C
P23XXXXX	CYBER SECURITY AND DIGITAL FORENSICS (PROFESSIONAL ELECTIVE-III)	3	0	0	3

Internal Marks: 30 External Marks: 70

Course Objectives:

(a) To understand the basics, scope, types, and categories of cyber crime.
(b) To explore key cyber crime issues and legal enforcement responses.
(c) To learn investigation techniques and tools for cyber crime analysis.
(d) To gain knowledge of digital forensic methods and technologies.
(e) To understand cyber laws, evidence handling, and legal frameworks.

Course Outcomes: At the end of the course, the student will able to

(a) Identify types and categories of cyber crime. (L2)
(b) Analyze cyber crime issues and legal responses. (L4)
(c) Apply investigation techniques and tools. (L3)
(d) Use digital forensic methods and tools. (L3)
(e) Understand cyber laws and evidence handling. (L2)

UNIT-I

Introduction: Introduction and Overview of Cyber Crime, Nature and Scope of Cyber Crime, Types of Cyber Crime: Social Engineering, Categories of Cyber Crime, Property Cyber Crime.

UNIT-II

Cyber Crime Issues: Unauthorized Access to Computers, Computer Intrusions, White collar Crimes, Viruses and Malicious Code, Internet Hacking and Cracking, Virus Attacks, Pornography, Software Piracy, Intellectual Property, Mail Bombs, Exploitation, Stalking and Obscenity in Internet, Digital laws and legislation, Law Enforcement Roles and Responses.

UNIT-III

Investigation: Introduction to Cyber Crime Investigation, Investigation Tools, eDiscovery, Digital Evidence Collection, Evidence Preservation, E-Mail Investigation, E-Mail Tracking, IP Tracking, E-Mail Recovery, Hands-on Case Studies. Encryption and Decryption Methods, Search and Seizure of Computers, Recovering Deleted Evidences, Password Cracking.

UNIT-IV

Digital Forensics: Introduction to Digital Forensics, Forensic Software and Hardware, Analysis and Advanced Tools, Forensic Technology and Practices, Forensic Ballistics and Photography, Face, Iris and Fingerprint Recognition, Audio Video Analysis, Windows System Forensics, Linux System Forensics, Network Forensics.

UNIT-V

Laws and Acts: Laws and Ethics, Digital Evidence Controls, Evidence Handling Procedures, Basics of Indian Evidence ACT, IPC and CrPC, Electronic Communication Privacy ACT, Legal Policies.

Text Books:

(a) Nelson Phillips and Enfinger Steuart, "Computer Forensics and Investigations", Cengage Learning, New Delhi, 2009.
(b) Kevin Mandia, Chris Prosise, Matt Pepe, "Incident Response and Computer Forensics", Tata McGraw-Hill, New Delhi, 2006.

Reference Books:

(a) Robert M Slade, "Software Forensics", Tata McGraw-Hill, New Delhi, 2005.
(b) Bernadette H Schell, Clemens Martin, "Cybercrime", ABC–CLIO Inc, California, 2004.
(c) "Understanding Forensics in IT", NIIT Ltd, Prentice Hall India Learning Private Limited, 2005.

Course Code	Course Name	Course Structure			
		L	T	P	C
P23XXXXX	MOBILE ADHOC NETWORKS (PROFESSIONAL ELECTIVE-III)	3	0	0	3

Internal Marks: 30 External Marks: 70

Course Objectives:

(a) Understand MANET characteristics, applications, and MAC protocol design.
(b) Explain routing and transport protocols for Ad Hoc networks.
(c) Identify security challenges and solutions in MANETs.
(d) Describe design and communication in Wireless Sensor Networks.
(e) Summarize security and operating systems for Wireless Sensor Networks.

Course Outcomes: At the end of the course, the student shall be able to:

(a) Explain the fundamentals and challenges of MANETs and MAC protocols. (L2)
(b) Analyze routing and transport layer protocols for Ad Hoc networks. (L4)
(c) Assess security issues and solutions in Mobile Ad Hoc Networks. (L2)
(d) Understand design principles and communication in Wireless Sensor Networks. (L2)
(e) Apply knowledge of security mechanisms and operating systems in Wireless Sensor Networks. (L3)

UNIT-I

Introduction to Ad Hoc Wireless Networks: Cellular and Ad Hoc Wireless Networks, Characteristics of MANETs, Applications of MANETs, Issues and Challenges of MANETs, Ad Hoc Wireless Internet, MAC protocols for Ad hoc Wireless Networks-Issues, Design Goals and Classifications of the MAC Protocols.

UNIT-II

Routing Protocols for Ad Hoc Wireless Networks: Issues in Designing a Routing Protocol, Classifications of Routing Protocols, Topology-based versus Position-based Approaches, Issues and design goals of a Transport layer protocol, Classification of Transport layer solutions, TCP over Ad hoc Wireless Networks, Solutions for TCP over Ad Hoc Wireless Networks, Other Transport layer protocols.

UNIT-III

Security protocols for Ad hoc Wireless Networks: Security in Ad hoc Wireless Networks, Network Security Requirements, Issues and Challenges in Security Provisioning, Network Security Attacks, Key Management, Secure

Routing in Ad hoc Wireless Networks, Cooperation in MANETs, Intrusion Detection Systems.

UNIT-IV

Basics of Wireless Sensors and Applications: The Mica Mote, Sensing and Communication Range, Design Issues, Energy Consumption, Clustering of Sensors, Applications, Data Retrieval in Sensor Networks-Classification of WSNs, MAC layer, Routing layer, Transport layer, High-level application layer support, Adapting to the inherent dynamic nature of WSNs.

UNIT-V

Security in WSNs: Security in WSNs, Key Management in WSNs, Secure Data Aggregation in WSNs, Sensor Network Hardware-Components of Sensor Mote, Sensor Network Operating Systems–TinyOS, LA-TinyOS, SOS, RETOS, Imperative Language-nesC, Dataflow Style Language-TinyGALS, Node-Level Simulators, NS-2 and its sensor network extension, TOSSIM.

Text Books:

(a) C. Siva Ram Murthy, B. S. Murthy, "Ad Hoc Wireless Networks – Architectures and Protocols", Pearson Education, 1st edition, 2004.
(b) Carlos Corderio Dharma P.Aggarwal, "Ad Hoc and Sensor Networks – Theory and Applications", World Scientific Publications / Cambridge University Press, 2nd edition March 2006.

Reference Books:

(a) Feng Zhao, Leonidas Guibas, "Wireless Sensor Networks: An Information Processing Approach", Elsevier Science imprint, Morgan Kauffman Publishers, 1st edition, 2005, rp2009.
(b) Subir Kumar Sarkar, et al., "Wireless Ad hoc Mobile Wireless Networks – Principles, Protocols and Applications", Auerbach Publications, Taylor & Francis Group, 1st edition, 2008.
(c) Charles E.Perkins, "Ad hoc Networking", Pearson Education, 1st edition, 2001.
(d) Shih-Lin Wu, Yu-Chee Tseng, "Wireless Ad hoc Networking", Auerbach Publications, Taylor & Francis Group, 1st edition, 2007.
(e) Fei Hu, Xiaojun Cao, "Wireless Sensor Networks – Principles and Practice", An Auerbach book, CRC Press, Taylor & Francis Group, 1st edition, 2010.

Course Code	Course Name	Course Structure			
		L	T	P	C
P23XXXXX	NATURAL LANGUAGE PROCESSING (PROFESSIONAL ELECTIVE-III)	3	0	0	3

Internal Marks: 30 External Marks: 70

Course Objectives:

(a) Understand the fundamentals of language modeling, morphology, and tokenization techniques in NLP.
(b) Explain word-level analysis techniques including N-grams and part-of-speech tagging methods.
(c) Analyze syntactic structures using context-free grammars and parsing algorithms in NLP.
(d) Describe semantic representation, word sense disambiguation, and thematic role assignment.
(e) Apply discourse analysis techniques and utilize lexical resources in natural language processing.

Course Outcomes: At the end of the course, the student shall be able to:

(a) Describe core concepts of language modeling, morphology, and tokenization in NLP. (L2)
(b) Apply word-level analysis and part-of-speech tagging techniques effectively. (L3)
(c) Construct and analyze syntactic structures using grammar and parsing methods. (L6)
(d) Interpret semantic representations and perform word sense disambiguation. (L4)
(e) Utilize discourse analysis methods and lexical resources for NLP tasks. (L3)

UNIT-I

Introduction: Origins and challenges of NLP – Language Modeling: Grammar-based LM, Statistical LM – Regular Expressions, Finite-State Automata – English Morphology, Transducers for lexicon and rules, Tokenization, Detecting and Correcting Spelling Errors, Minimum Edit Distance.

UNIT-II

Word Level Analysis: Unsmoothed N-grams, Evaluating N-grams, Smoothing, Interpolation and Backoff – Word Classes, Part- of-Speech Tagging, Rule-based, Stochastic and Transformation-based tagging, Issues in PoS tagging – Hidden Markov and Maximum Entropy models.

UNIT-III

Syntactic Analysis: Context-Free Grammars, Grammar rules for English, Treebanks, Normal Forms for grammar – Dependency Grammar – Syntactic Parsing, Ambiguity, Dynamic Programming parsing – Shallow parsing Probabilistic CFG, Probabilistic CYK, Probabilistic Lexicalized CFGs – Feature structures, Unification of feature structures

UNIT-IV

Semantics And Pragmatics: Requirements for representation, First-Order Logic, Description Logics – Syntax-Driven Semantic analysis, Semantic attachments – Word Senses, Relations between Senses, Thematic Roles, selectional restrictions – Word Sense Disambiguation, WSD using Supervised, Dictionary & Thesaurus, Bootstrapping methods – Word Similarity using Thesaurus and Distributional methods.

UNIT-V

Discourse Analysis And Lexical Resources: Discourse segmentation, Coherence – Reference Phenomena, Anaphora Resolution using Hobbs and Centering Algorithm – Coreference Resolution – Resources: Porter Stemmer, Lemmatizer, Penn Treebank, Brill's Tagger, WordNet, PropBank, FrameNet, Brown Corpus, British National Corpus (BNC).

Text Books:

(a) Daniel Jurafsky, James H. Martin, "Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech", Pearson Publication, 2nd Edition, 2014.
(b) Steven Bird, Ewan Klein and Edward Loper, "Natural Language Processing with Python", OReilly Media, First Edition, 2009.

Reference Books:

(a) Breck Baldwin, "Language Processing with Java and Ling Pipe Cookbook", Atlantic Publisher, 1st Edition, 2015.
(b) Richard M Reese, "Natural Language Processing with Java", OReilly Media, 2nd Edition, 2015.
(c) Nitin Indurkhya and Fred J. Damerau, "Handbook of Natural Language Processing", Chapman and Hall/CRC Press, Second Edition, 2010.
(d) Tanveer Siddiqui, U.S. Tiwary, "Natural Language Processing and Information Retrieval", 3rd Edition, Oxford University Press, 2008.

Course Code	Course Name	Course Structure			
		L	T	P	C
P23EOE07	PRINCIPLES OF COMMUNICATION (OPEN ELECTIVE-II)	3	0	0	3

Internal Marks: 30 External Marks: 70

Course Outcomes:

(a) Analyze analog modulation schemes and angle modulated signals in time and frequency domains.
(b) Understand the behaviour of analog signals as random processes and noise.
(c) Apply knowledge of channel characteristics to assess effects on modulated signals.
(d) Evaluate the performance of analog communication systems using SNR metrics.
(e) Analyze pulse modulation techniques such as PAM, PPM, PCM, and TDM.

UNIT–I:

Basic tools for communication: Fourier Series/Transform, Properties, Autocorrelation, Energy Spectral Density, Parseval's Relation, Amplitude Modulation (AM), Spectrum of AM, Envelope Detection, Power Efficiency, Modulation Index.

UNIT–II:

Double Sideband Suppressed Carrier (DSB-SC) Modulation: Demodulation, Costas Receiver, Single Sideband Modulation (SSB), Hilbert Transform, Complex Pre-envelope/Envelope, Demodulation of SSB, Vestigial Sideband Modulation (VSB)

UNIT–III:

Angle Modulation: Frequency Modulation (FM), Phase Modulation (PM), Modulation Index, Instantaneous Frequency, Spectrum of FM Signals, Carsons Rule for FM Bandwidth, Narrowband FM Generation, Wideband FM Generation via Indirect Method, FM Demodulation

UNIT–IV:

Introduction to Sampling: Spectrum of Sampled Signal, Aliasing, Nyquist Criterion, Signal Reconstruction from Sampled Signal, Pulse Amplitude Modulation, Quantization, Uniform Quantizers – Midrise and Midtread, Quantization noise, Non-uniform Quantizers, Delta Modulation, Differential Pulse Code Modulation (DPCM)

UNIT–V:

Basics of Probability: Conditional Probability, MAP Principle, Random Variables, Probability Density Functions, Applications in Wireless Channels, Basics of Random Processes, Gaussian Random Process, Noise.

Text Books:

(a) Simon Haykin "Communications Systems", John Wiley and Sons, Inc, 4th Edition, 2006.

(b) David Tse "Fundamentals of Wireless Communication", Cambridge University Press, 2005.

Web References:

(a) Signals and Systems from Massachusetts Institute of Technology — Class Central

(b) Coursera Plus — Unlimited Access to 10,000+ Online Courses

Course Code	Course Name	Course Structure			
		L	T	P	C
P21MBO05	MANAGEMENT SCIENCE(OPEN ELECTIVE -II)	2	0	2	2

Internal Marks: 30 External Marks: 70

Course Objectives:

(a) To understand the application of management science in decision making process and its importance, evaluation of management thought, how organisation structure is designed along with its principles and types.
(b) To understand types of management related to work study, quality control, control charts and inventory control and their types.
(c) To learn the main functional areas of organisation such as Financial Management, Production Management, Marketing Management, Human Resource Management, Product life cycles and Channels of Distribution.
(d) To understand the development of network and identifying critical path.
(e) To understand the concept of strategic management and basic concepts of MIS, MRP, JIT, TQM, Six Sigma, CMM, Supply Chain Management, ERP, Business Process Outsourcing, Benchmarking and Business Process Re-engineering.

Course Outcomes:

(a) Able to apply the concepts and principles of management in real life and design and develop organizational structures.
(b) Able to apply PPC techniques, Quality Control, and Work-study principles in industry.
(c) Able to identify and apply Marketing, HRM, and Production strategies effectively.
(d) Able to develop PERT/CPM charts for projects and estimate time and cost.
(e) Able to develop Mission, Objectives, Goals and strategies using modern management techniques like MIS, ERP, TQM, SCM, BPR, and Benchmarking.

UNIT–I:

Introduction to management: Concept, nature and importance of Management – Generic Functions of Management – Evaluation of Management thought – Theories of Motivation – Decision making process – Designing organization structure – Principles of organization – Organizational typology – International Management: Global Leadership and Organizational behavior Effectiveness (GLOBE) structure.

UNIT–II:

Operations Management: Principles and types of management – Work study – Statistical Quality Control – Control charts (P-chart, R-chart, and C-chart) with simple problems – Material Management: Need for Inventory control – EOQ, ABC analysis (simple problems) and Types of ABC analysis (HML, SDE, VED, and FSN analysis).

UNIT–III:

Functional Management: Concept of HRM, HRD and PMIR – Functions of HR Manager – Wage payment plans (Simple Problems) – Job Evaluation and Merit Rating – Marketing Management – Functions of Marketing – Marketing strategies based on product Life Cycle, Channels of distributions – Operationalising change through performance management.

UNIT–IV:

Project Management (PERT/CPM): Development of Network – Difference between PERT and CPM – Identifying Critical Path – Probability – Project Crashing (Simple Problems).

UNIT–V:

Strategic Management: Vision, Mission, Goals, Strategy – Elements of Corporate Planning Process – SWOT analysis – Steps in Strategy Formulation and Implementation – Generic Strategy Alternatives – Global strategies.

Contemporary Management Practices: Basic concepts of MIS, Total Quality Management (TQM), Six Sigma, Supply Chain Management, Enterprise Resource Planning (ERP), Business Process Re-engineering and Benchmarking.

Text Books:

(a) Dr. P. Vijaya Kumar & Dr. N. Appa Rao, 'Management Science', Cengage, Delhi, 2012.

(b) Dr. A. R. Aryasri, 'Management Science', TMH, 2011.

Reference Books:

(a) Philip Kotler & Armstrong: Principles of Marketing, Pearson Publications.

(b) Biswajit Patnaik: Human Resource Management, PHI, 2011.

(c) Hitt and Vijaya Kumar: Strategic Management, Cengage Learning.

(d) Seth & Rastogi: Global Management Systems, Cengage Learning, Delhi, 2011.

Web References:

- https://mrcet.com/downloads/digital_notes/ECE/II%20Year/Management%20Science.pdf

- https://books.askvenkat.org/management-science-textbook-aryasri-pdf/
- https://nptel.ac.in/courses/122/102/122102007/
- https://nptel.ac.in/courses/122/108/122108038/
- http://www.universityofcalicut.info/SDE/Management_science_corrected_on13April2016.pdf

Course Code	Course Name	Course Structure			
		L	T	P	C
P23EOE08	PRINCIPLES OF SIGNAL PROCESSING (OPEN ELECTIVE-II)	3	0	0	3

Internal Marks: 30 External Marks: 70

Course Outcomes:

(a) Acquire fundamental knowledge of signals and systems.
(b) Interpret and apply various transforms for analyzing continuous-time signals.
(c) Explain sampling theorem and apply z-transform to discrete systems.
(d) Analyze discrete-time signals using appropriate transforms.
(e) Design and analyze digital filters for signal processing applications.

UNIT–I:

Introduction: Definition of Signals and Systems, Classification of Signals, Classification of Systems, Operations on signals: time-shifting, time-scaling, amplitude-shifting, Amplitude-scaling. Problems on classification and characteristics of Signals and Systems. Complex exponential and sinusoidal signals, impulse function, step function, signum function and ramp function. Introduction, Linear system, impulse response, Linear time invariant (LTI) system, Linear time invariant (LTV) system, Concept of convolution in time domain and frequency domain, Graphical representation of convolution, Transfer function of a LTI system, Related problems.

UNIT–II:

Analysis of Continuous Time Signals: Fourier Series and Fourier Transform: Fourier series representation of continuous time periodic signals, Dirichlet's conditions, Trigonometric Fourier series and Exponential Fourier series, Deriving Fourier transform from Fourier series, Fourier transform of standard signals, properties of Fourier transforms, Related problems.

Laplace Transforms: Introduction, Concept of region of convergence (ROC) for Laplace transforms, Properties of L.T's, Inverse Laplace transform, Relation between Laplace Transform and Fourier Transform of a signal.

UNIT–III:

Sampling and Z–Transforms: Sampling Theorem: Graphical and analytical proof for Band Limited Signals, impulse sampling, Reconstruction of signal from its samples, Aliasing.

Z–Transforms: Concept of Z-Transform of a discrete sequence. Region of convergence in Z-Transform, Inverse Z-transform, properties of Z-transforms.

UNIT–IV:

Fourier Analysis of Discrete Signals: Fourier Transform of Discrete Signal, Properties, and Inverse Fourier Transforms, related problems. Discrete Fourier Transforms: Definition, Properties, Inverse DFT, related problems. Fast Fourier Transform: Decimation in Time domain and Decimation in Frequency Algorithms.

UNIT–V:

Digital Filters: Structures of IIR filters and FIR filters: Direct form–1 and Direct form 2; cascade form; parallel form. Analog filter design: LPF, BPF, HPF and BEF filter design using Butterworth. Frequency Transformations: Analog to Analog; Digital and Digital. IIR Filter Design: IIR filter from analog filter – IIR filter design by Impulse Invariance, Bilinear transformation. FIR Filter Design: Filter design using windowing techniques. Rectangular Window, Hamming Window, Hanning Window.

Text Books:

(a) B. P. Lathi, "Signals, Systems and Communications", BS Publications, 2003.

(b) P. Ramesh Babu, "Digital Signal Processing" , SCITECH Publishers, 5th Edition, 2003.

Reference Books:

(a) Simon Haykin and Van Veen, "Signals and Systems", Wiley, 2nd Edition, 2007.

(b) A.V. Oppenheim, A.S. Willsky and S.H. Nawab, "Signals and Systems", PHI, 2nd Edition, 1997.

(c) A.V. Oppenheim and R.W. Schaffer, "Discrete Time Signal Processing", 3rd Edition, Pearson, 2014.

Web References:

(a) Digital Signal Processing 1: Basic Concepts and Algorithms — Coursera

(b) Digital Signal Processing (online) — Oxford University Department for Continuing Education

Course Code	Course Name	Course Structure			
		L	T	P	C
P23XXXX	DIGITAL MARKETING (Open Elective -II)	3	0	0	3

Internal Marks: 30 External Marks: 70

Course Objectives:

(a) To impart knowledge of digital marketing concepts, channels, and analytics.
(b) To distinguish traditional marketing from digital, and teach integrated strategies.
(c) To familiarize students with SEO, SEM, Email, Content and Social Media Marketing.
(d) To develop the ability to create, monitor and analyze digital marketing campaigns.
(e) To provide practical knowledge in key digital tools and platforms for business growth.

Course Outcomes:

(a) Understand the concepts, evolution, and significance of digital marketing.
(b) Apply digital marketing strategies including SEO, SEM, Content, Email, and Social Media.
(c) Design and optimize digital campaigns; use analytics for performance tracking.
(d) Analyze and compare different digital media platforms and their suitability for various business objectives.
(e) Demonstrate proficiency in digital tools, campaign planning, and measuring digital ROI.

UNIT–I:

Introduction to Digital Marketing: Fundamentals of Digital Marketing, Significance and Evolution, Traditional Marketing vs Digital Marketing, Digital Marketing Landscape, Key Drivers. Digital Consumer & Communities, Generation Y, Netizens' expectations and influence in Digital Marketing[**?**].

UNIT–II:

Digital Users and Strategy: Overview of digital users in India and worldwide, Digital Marketing Strategy: Consumer Decision Journey, POEM Framework (Paid, Owned, Earned Media), Segmenting and Customizing Messages, Digital Advertising Market, Digital Skills, Digital Marketing Plan[**?**].

UNIT–III:

SEO, SEM & Social Media: Terminology in Digital Marketing, Search Engine Optimization (SEO), Pay-Per-Click (PPC), Social Media Marketing (SMM), Social Media Platforms (Facebook, LinkedIn, Twitter, Instagram, YouTube): Content strategy, Targeting, Ad Campaigns. Overview of Google Analytics, Affiliate Marketing, Email Marketing, Mobile Marketing[**?**][**?**].

UNIT–IV:

Digital Advertising and Display Ads: Types of Digital Ads (Search, Display, Video, Native), Display Advertising – Concepts, Buying Models (CPC, CPM, CPL, CPA), Ad Formats, Ad Placement Techniques. Programmatic Advertising, AdWords, AdSense. Display metrics and ROI measurement techniques[**?**][**?**].

UNIT–V:

Content, Email and Analytics: Content Marketing strategy: Creation, Distribution, Blogging, Multimedia (video, podcasting, images). Email Marketing: Campaign setup, email list generation, A/B testing. Introduction to Web Analytics: Google Analytics, Traffic reports, Conversion evaluation. Mobile Marketing overview, basic legal/ethical issues[**?**][**?**].

Text Books:

(a) Kamat and Kamat, *Digital Marketing*, Himalaya Publishing.

(b) Damien Ryan, *Marketing Strategies for Engaging the Digital Generation*.

(c) V. Ahuja, *Digital Marketing*, Oxford University Press.

(d) S. Gupta, *Digital Marketing*, McGraw-Hill.

(e) H. Annmarie, A. Joanna, *Quick win Digital Marketing*.

Reference Books:

(a) Dodson, Ian, *The Art of Digital Marketing*, Wiley.

(b) Owen Richards, *Digital Marketing Analytics*.

(c) Pradeep Chopra, *Digital Marketing for Dummies*.

Web Resources:

- `https://onlinecourses.swayam2.ac.in/cec21_mg09/preview`
- `https://www.hubspot.com/resources/courses`
- `https://learndigital.withgoogle.com/digitalgarage`

Course Code	Course Name	Course Structure			
		L	T	P	C
P23XXXXX	CLOUD COMPUTING lAB(PROFESSIONAL CORE)	0	0	3	1.5

Internal Marks: 50 External Marks: 50

Course Objectives:

(a) To introduce the various levels of services offered by cloud.
(b) To give practical knowledge about working with virtualization and containers.
(c) To introduce the advanced concepts such as serverless computing and cloud simulation.

Course Outcomes: At the end of the course, the student should be able to

(a) Demonstrate various service types, delivery models and technologies of a cloud computing environment.
(b) Distinguish the services based on virtual machines and containers in the cloud offerings.
(c) Assess the challenges associated with a cloud-based application.
(d) Discuss advanced cloud concepts such as serverless computing and cloud simulation.
(e) Examine various programming paradigms suitable to solve real world and scientific problems using cloud services.

List of Experiments:

(a) Lab on web services
(b) Lab on IPC, messaging, publish/subscribe
(c) Install VirtualBox/VMware Workstation with different flavours of Linux or Windows OS on top of Windows8 or above.
(d) Install a C compiler in the virtual machine created using VirtualBox and execute Simple Programs.
(e) Create an Amazon EC2 instance and set up a web-server on the instance and associate an IP address with the instance. In the process, create a security group allowing access to port 80 on the instance.
OR
(f) Do the same with OpenStack
(g) Install Google App Engine. Create a hello world app and other simple web applications using python/java.
(h) Start a Docker container and set up a webserver (e.g. apache2 or Python based Flask micro web framework) on the instance. Map the host directory as a data volume for the container.
(i) Find a procedure to transfer the files from one virtual machine to another virtual machine. Similarly, from one container to another container.

(j) Find a procedure to launch virtual machine using try stack (Online OpenStack Demo Version)
(k) Install Hadoop single node cluster and run simple applications like word count.
(l) Utilize OpenVAS – Serverless computing framework and demonstrate basic event driven function invocation.
(m) Simulate a cloud scenario using CloudSim and run a scheduling algorithm that is not present in CloudSim.

Text Books:

(a) Rajkumar Buyya, Christian Vecchiola, Thamarai Selvi, ShivanandaPoojara, Satish N. Srirama, "Mastering Cloud Computing", 2nd edition, McGraw Hill, 2024.
(b) Kai Hwang, Geoffery C. Fox, Jack J. Dongarra, "Distributed and Cloud Computing", Elsevier, 2012.

Reference Books:

(a) Dan C Marinescu, "Cloud Computing, Theory and Practice", MK Elsevier, 2nd edition, 2018.
(b) Rajkumar Buyya, James Broberg and Andrzej M. Goscinski, "Cloud Computing: Principles and Paradigms", Wiley, 2011.
(c) Online documentation and tutorials from cloud service providers (e.g. AWS, Google App Engine)
(d) Docker, Reference documentation, docs.docker.com/reference/
(e) OpenFaaS, Serverless Functions Made Simple, docs.openfaas.com/

Course Code	Course Name	Course Structure			
		L	T	P	C
P23XXXXX	BLOCKCHAIN TECHNOLOGY LAB (PROFESSIONAL CORE)	0	0	3	1.5

Internal Marks: 50 External Marks: 50

Course Objectives: This course will enable the students:

(a) Understanding Block chain Fundamentals and creating basic blocks.
(b) Able to Develop Block chain Applications in a structured manner.
(c) Ability to create own crypto currency and get familiarity with future currencies.
(d) Able to Evaluate and Analyze Block chain Systems.

Course Outcomes:

(a) Knowledge of Block chain Concepts and creating basic blocks.
(b) Proficiency in Block chain Development.
(c) Ability to Design and Implement Block chain Applications.
(d) Evaluation and Analysis of Block chain Systems.
(e) Knowledge of crypto currency and creating a basic form of it.

List of Experiments:

(a) Creating Merkle tree
(b) Creation of Block
(c) Block chain Implementation Programming code
(d) Creating ERC20 token
(e) Java code to implement block chain in Merkle Trees
(f) Java Code to implement Mining using block chain
(g) Java Code to implement peer-to-peer using block chain
(h) Creating a Crypto-currency Wallet

Course Code	Course Name	Course Structure			
		L	T	P	C
P23XXXXX	SOFT SKILLS (SKILL ENHANCEMENT COURSE)	0	0	3	1.5

Internal Marks: 30 External Marks: 70

Course Objectives:

(a) To equip the students with the skills to effectively communicate in English.
(b) To train the students in interview skills, group discussions and presentation skills.
(c) To motivate the students to develop confidence.
(d) To enhance the students' interpersonal skills.
(e) To improve the students' writing skills.

Course Outcomes: At the end of the course, the student should be able to

(a) Enhance analytical thinking and communication skills. (L2)
(b) Develop self-management and etiquette skills. (L6)
(c) Master grammar and business writing. (L2)
(d) Improve job readiness and interview skills. (L2)
(e) Strengthen interpersonal relationship skills. (L2)

UNIT – I

Analytical Thinking & Listening Skills: Self-Introduction, Shaping Young Minds - A Talk by Azim Premji (Listening Activity), Self – Analysis, Developing Positive Attitude, Perception.
Communication Skills: Verbal Communication; Non-Verbal Communication (Body Language)

UNIT – II

Self-Management Skills: Anger Management, Stress Management, Time Management, Six Thinking Hats, Team Building, Leadership Qualities
Etiquette: Social Etiquette, Business Etiquette, Telephone Etiquette, Dining Etiquette

UNIT – III

Standard Operation Methods: Basic Grammars, Tenses, Prepositions, Pronunciation, Letter Writing; Note Making, Note Taking, Minutes Preparation, Email & Letter Writing

UNIT-IV

Job-Oriented Skills: Group Discussion, Mock Group Discussions, Resume Preparation, Interview Skills, Mock Interviews

UNIT-V

Interpersonal Relationships: Introduction, Importance, Types, Uses, Factors affecting interpersonal relationships, Accommodating different styles, Consequences of interpersonal relationships

Text Books:

(a) Barun K. Mitra, "Personality Development and Soft Skills", Oxford University Press, 2011.
(b) S.P. Dhanavel, "English and Soft Skills", Orient Blackswan, 2010.

Reference Books:

(a) R.S.Aggarwal, "A Modern Approach to Verbal & Non-Verbal Reasoning", S.Chand & Company Ltd., 2018.
(b) Raman, Meenakshi & Sharma, Sangeeta, "Technical Communication Principles and Practice", Oxford University Press, 2011.

E-resources:

(a) https://swayam-plus.swayam2.ac.in/courses/course-details?id=P_CAMBR_01

Course Code	Course Name	Course Structure			
		L	T	P	C
P23XXXXX	TECHNICAL PAPER WRITING & IPR (AUDIT COURSE)	2	0	0	0

Internal Marks: – External Marks: –

Course Objectives:

(a) Plan and write clear technical reports using correct tense and transitions.
(b) Draft reports with illustrations and edit for grammar and clarity.
(c) Proofread, summarize, and present technical documents effectively.
(d) Use advanced word processor tools to prepare technical reports.
(e) Understand intellectual property types and the patenting process.

Course Outcomes: At the end of the course, the student should be able to

(a) Write well-structured technical reports with appropriate language and format.
(b) Prepare drafts using visuals and improve documents through effective editing.
(c) Proofread, summarize, and confidently present technical information.
(d) Utilize advanced word processing features for professional report preparation.
(e) Explain intellectual property concepts and the patenting process in technology.

UNIT-I

Introduction: An introduction to writing technical reports, technical sentences formation, using transitions to join sentences, Using tenses for technical writing.

Planning and Structuring: Planning the report, identifying reader(s), Voice, Formatting and structuring the report, Sections of a technical report, Minutes of meeting writing.

UNIT-II

Drafting report and design issues: The use of drafts, Illustrations and graphics.

Final edits: Grammar, spelling, readability and writing in plain English: Writing in plain English, Jargon and final layout issues, Spelling, punctuation and Grammar, Padding, Paragraphs, Ambiguity.

UNIT-III

Proofreading and summaries: Proofreading, summaries, Activities on summaries.

Presenting final reports: Printed presentation, Verbal presentation skills, Introduction to proposals and practice.

UNIT-IV

Using word processor: Adding a Table of Contents, Updating the Table of Contents, Deleting the Table of Contents, Adding an Index, Creating an Outline, Adding Comments, Tracking Changes, Viewing Changes, Additions, and Comments, Accepting and Rejecting Changes, Working with Footnotes and Endnotes, Inserting citations and Bibliography, Comparing Documents, Combining Documents, Mark documents final and make them read only, Password protecting Microsoft Word documents, Using Macros.

UNIT-V

Nature of Intellectual Property: Patents, Designs, Trade and Copyright.
Process of Patenting and Development: Technological research, innovation, patenting, development.
International Scenario: International cooperation on Intellectual Property

Text Books:

(a) Kompal Bansal & Parshit Bansal, "Fundamentals of IPR for Beginner's", BS Publications, 1st Edition, 2016.
(b) William S. Pfeiffer and Kaye A. Adkins, "Technical Communication: A Practical Approach", Pearson.
(c) Ramappa, T., "Intellectual Property Rights Under WTO", S Chand, 2nd Edition, 2015.

Reference Books:

(a) Adrian Wallwork, "English for Writing Research Papers", Springer, 2011.
(b) Day R, "How to Write and Publish a Scientific Paper", Cambridge University Press, 2006.

E-resources:

(a) https://www.udemy.com/course/reportwriting/
(b) https://www.udemy.com/course/professional-business-english-and-technical-report-writing/
(c) https://www.udemy.com/course/betterbusinesswriting/