ACADEMIC REGULATIONS (R18)

COURSE STRUCTURE AND DETAILED SYLLABUS

(CHOICE BASED CREDIT SYSTEM (CBCS))

COMPUTER SCIENCE & ENGINEERING

For

B. Tech. - Regular Four Year Degree Course

(Applicable for the batches admitted from 2018 - 2019)

&

B. Tech. - Lateral Entry Scheme

(Applicable for the batches admitted from 2019 - 2020)

CMR INSTITUTE OF TECHNOLOGY

(UGC - Autonomous)

Approved by AICTE, Permanently Affiliated to JNTUH, Accredited by NAAC with A Grade and NBA

Kandlakoya(V), Medchal District, Hyderabad-501 401, Telangana State

Landline: 08418-200720; Fax: 08418-200240

E-mail: principal@cmritonline.ac.in Web: www.cmritonline.ac.in

FOREWORD

CMR Institute of Technology, established in the year 2005, Approved by AICTE, New Delhi, Permanently Affiliated to JNTUH, twice Accredited by NBA, Achieved UGC Autonomous Status and has been bestowed with NAAC 'A' Grade in July 2018 for its remarkable academic accomplishments accompanied by its unflinching spirit and dedication to impart quality technical education to the deserving aspirants. The institution has commenced functioning independently within the set norms prescribed by UGC and AICTE. The performance of the institution manifests the confidence that the prestigious monitoring body, the UGC has on it, in terms of upholding its spirit and sustenance of the expected standards of functioning on its own consequently facilitating the award of degrees for its students. Thus, an autonomous institution is provided with the necessary freedom to have its own **curriculum, examination system and monitoring mechanism**, independent of the affiliating University but under its observance.

CMR Institute of Technology takes pride for having won the confidence of such distinguished academic bodies meant for monitoring the quality in technology education. Besides, the institution is delighted to sustain the same spirit of discharging the responsibilities that it has been conveying since a decade to attain the current academic excellence, if not improving upon the standards and ethics. Consequently, statutory bodies such as the Academic Council and the Boards of Studies have been constituted under the supervision of the Governing Body of the College and with the recommendations of the JNTU Hyderabad, to frame the regulations, course structure and syllabi for autonomous status.

The autonomous regulations, course structure and syllabi have been framed in accordance with the vision and mission of the institution along with certain valuable suggestions from professionals of various ancillary fields such as the academics, the industry and the research, all with a noble vision to impart quality technical education and contribute in catering full-fledged engineering and management graduates to the society.

All the faculty members, the parents and the students are requested to study all the rules and regulations carefully and approach the Principal to seek any clarifications, if needed, without presumptions, to avoid unwanted subsequent inconveniences and embarrassments. The cooperation of all the stake holders is sought for the successful implementation of the autonomous system in the larger interests of the institution and for brightening the career prospects of engineering and management graduates.

CMR INSTITUTE OF TECHNOLOGY

Vision: To create world class technocrats for societal needs.

Mission: Impart global quality technical education for a better future by providing appropriate learning environment through continuous improvement and customization.

Quality Policy: Strive for global excellence in academics & research to the satisfaction of students and stakeholders.

Department of Computer Science & Engineering (CSE)

Vision: To be a model for academic excellence and research in the field of computer science and engineering that prepares competent professionals with innovative skills, moral values and societal concern.

Mission: Impart quality education through state-of-art curriculum, conducive learning environment and research with scope for continuous improvement leading to overall professional success.

I. PROGRAMME EDUCATIONAL OBJECTIVES (PEO's)

PEO1: Graduate will be capable of practicing principles of computer science & engineering, mathematics and scientific investigation to solve the problems that are appropriate to the discipline.

PEO2: Graduate will be an efficient software engineer in diverse fields and will be a successful professional and/or pursue higher education and research.

PEO3: Graduate exhibits professional ethics, communication skills, teamwork and adapts to changing environments of engineering and technology by engaging in lifelong learning.

II. PROGRAMME OUTCOMES (PO's)

1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6. **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

13 **PSO1:** Design and Develop computer based systems across various domains related to Algorithms, Software Development, Networking, Security, Blockchain, Gaming, Full Stack Web Development, Cloud Computing, Artificial Intelligence, Machine Learning, Data Science, Cyber Security and IoT.

14 **PSO2:** Apply technical and research based skills learnt through professional society activities, internships and projects to provide solutions to real world problems in environment and society.

Academic Regulations (R18)
B.Tech. - Regular Four Year Degree Programme
(For batches admitted from the academic year 2018 - 19)
&
B.Tech. - Lateral Entry Scheme
(For batches admitted from the academic year 2019 - 20)

PREAMBLE

For pursuing four year under graduate Bachelor Degree Programme in Engineering (B.Tech.) offered by **CMR Institute of Technology** under Autonomous status will herein be referred to as CMRIT (Autonomous).

All the specified rules are herein approved by the Academic Council. These rules will be in force and are applicable to students admitted from the Academic Year 2018-19 onwards. Any reference to "Institute" or "College" in these rules and regulations stand for CMRIT (Autonomous).

Choice Based Credit System (CBCS) has been adopted since 2017-18 under Autonomous status.

All the rules and regulations specified shall hereafter be read as a whole for the purpose of interpretation, as and when a doubt arises, the interpretation of the Chairman, Academic Council is final. As per the requirements of statutory bodies, the Principal, CMRIT (Autonomous) shall be The Chairman, Academic Council.

1. UNDER GRADUATE PROGRAMS OFFERED (E&T)

CMRIT (Autonomous), affiliated to JNTUH, offers 4 Year (8 Semesters) **B.Tech.** Degree Programme in the following Branches of Engineering:

1) B.Tech. - Civil Engineering
2) B.Tech. - Mechanical Engineering
3) B.Tech. - Electronics and Communication Engineering
4) B.Tech. - Computer Science and Engineering

2. ADMISSION CRITERIA AND MEDIUM OF INSTRUCTION

2.1. Admission into first year of four year B.Tech. (Regular) Degree Programme:

2.1.1. Eligibility: A candidate seeking admission into the first year of four year B. Tech. Degree Programme should have:

(i) Passed either Intermediate Public Examination (IPE) conducted by the Board of Intermediate Education, Telangana, with Mathematics, Physics and Chemistry as optional subjects or any equivalent examination recognized by Board of Intermediate Education, Telangana or a Diploma in Engineering conducted by the Board of Technical Education, Telangana or equivalent Diploma recognized by Board of Technical Education for admission as per guidelines defined by the Regulatory bodies of Telangana State Council for Higher Education (TSCHE) and AICTE.

(ii) Secured a rank in the TSEAMCET examination conducted by TSCHE for allotment of a seat by the Convenor, TSEAMCET.

2.1.2. Admission Procedure: Admissions are made into the first year of four year B.Tech. Degree Programme as per the stipulations of the TSCHE.

(a) Category A: 70% of the seats are filled through TSEAMCET counseling.

(b) Category B: 30% of the seats are filled by the Management.

2.2. Admission into the second year of four year B. Tech. (Regular) Degree Programme Under Lateral Entry Scheme.

2.2.1 Eligibility: A candidate seeking admission into the II year I Semester B. Tech. Regular Degree Programme under Lateral Entry Scheme (LES) should have passed the qualifying examination (B.Sc. Mathematics or Diploma in concerned course) and have secured a rank at Engineering Common Entrance Test TSECET (FDH). Admissions are made in accordance with the instructions received from the Convenor, TSECET and Government of Telangana State.

2.2.2 Admission Procedure: Admissions are made into the II year of four year B.Tech. (Regular) Degree Programme through Convenor, TSECET (FDH) against the sanctioned intake in each Programme of study as lateral entry student.

2.3. Branch Transfers: There shall be no Branch transfers after the completion of Admission Process.

2.4. Medium of Instruction: The Medium of Instruction and Examinations for the entire B.Tech. programme will be in **English** only.

3. B.Tech. PROGRAMME STRUCTURE

3.1 Admitted under Four year B. Tech. (Regular) degree Programme:

3.1.1 A student after securing admission shall pursue the under graduate programme in B.Tech. for a minimum period of **four** academic years (8 semesters), and a maximum period of **eight** academic years (16 semesters) starting from the date of commencement of first year first semester, failing which, students shall forfeit their seat in B.Tech course.

3.1.2 As per AICTE guidelines, a 3-week 'Mandatory **Induction Programme'** shall be offered to I-B.Tech. students to acquaint the newly admitted students with the professional environment and prepare them for the academic schedules ahead.

3.1.3 The entire B.Tech. programme is structured for a total of 160 credits. Distribution of credits Semester-wise is available in the respective course structure.

3.1.4 Each student shall register and secure 160 credits (with CGPA ≥ 5) for the completion of the under graduate programme and award of the B.Tech. degree.

3.2 Admitted under Lateral Entry Scheme (LES) into B. Tech. degree Programme:

3.2.1 After securing admission into II year B.Tech. I Semester, the LES students shall pursue a course of study for not less than three academic years (6 Semesters) and not more than six academic years (12 Semesters), failing which students shall forfeit their seat in B.Tech. programme.

3.2.2 The student shall register and secure 122 credits (with CGPA ≥ 5) from II year to IV year B.Tech. programme (LES) for the award of B.Tech. degree.

3.3 The Course Structure is designed based on the AICTE Model Curriculum (Jan-2018) for Under-Graduate Degree Courses in Engineering & Technology. **UGC / AICTE** specified definitions / descriptions are adopted appropriately for various terms and abbreviations used in these Academic Regulations / Norms, which are listed below:

3.3.1 Semester Scheme: Each B.Tech. (Regular) Programme is of 4 Academic Years (8 Semesters) and B.Tech. (LES) Programme is of 3 Academic Years (6 Semesters)), with the academic year being divided into two semesters of 22 weeks (≥ 90 Instructional days per semester) each, each Semester having - 'Continuous Internal Evaluation (CIE)' and 'Semester End Examination (SEE)', Choice Based Credit System (CBCS) and Credit Based

Semester System (CBSS) as indicated by UGC and Curriculum / Course Structure as suggested by AICTE are followed.

3.3.2 Credit Courses:

a) All Subjects / Courses are to be registered by a student in a Semester to earn Credits. Credits shall be assigned to each Subject / Course in a L: T: P: C (Lecture Periods: Tutorial Periods: Practical Periods : Credits) Structure based on the following general pattern:

Theory		Practical	
1 Hr. Lecture (L) per week	1 credit	1 Hr. Practical (P) per week	0.5 credit
1 Hr. Tutorial (T) per week	1 credit	2 Hrs Practical (Lab) per week	1.0 credit

All Mandatory Courses, Study Tour, Guest Lecture, etc., will not carry any Credits.

b) **Contact Hours:** Weekly contact hours – maximum of 30 hours per week (i.e. 1 hour = 60 Minutes) including credit and non-credit courses.

3.3.3 Subject / Course Classification and Nomenclature:

CMRIT has followed the guidelines specified by AICTE / UGC / JNTUH. The subjects / courses offered in B.Tech. programme are broadly classified as mentioned below.

S. No.	Category	Breakup of Credits (AICTE)	Breakup of Credits (CMRIT)
1	Humanities and Social Sciences including Management courses (HSMC)	12*	09.0
2	Basic Science Courses (BSC)	25*	22.0
3	Engineering Science courses including workshop, drawing, basics of Electrical / Mechanical / Computer etc. (ESC)	24*	25.5
4	Professional core courses (PCC)	48*	65.5
5	Professional Elective courses relevant to chosen specialization / branch (PEC)	18*	15.0
6	Open subjects – Electives from other technical and /or emerging subjects (OEC)	18*	09.0
7	Project work, seminar and internship in industry or appropriate work place / academic and research institutions in India / abroad (PRJ)	15*	14.0
8	Mandatory Courses (Environmental Sciences, Induction program, Indian Constitution, Essence of Indian Traditional Knowledge, etc) (MC)	(non-credit)	(non-credit)
Total Credits		**160***	**160**

**Minor variation is allowed as per need of the respective disciplines.*

4. COURSE REGISTRATION

4.1 A '**faculty advisor or counselor**' shall be assigned to each student to advise the student about the B.Tech. programme, course structure and curriculum, choice / option for subjects / courses, based on his/her competence, progress, pre-requisites and interest.

4.2 The academic section of the college invites 'registration forms' from students before the beginning of the semester through online submission, ensuring '**date** and **time stamping**'. The online registration requests for any 'current semester' shall be completed **before the commencement of SEEs (Semester End Examinations) of the 'preceding semester'**.

4.3 A student can apply for **online** registration, **only after** obtaining the '**written approval**' from his faculty advisor or counselor, which should be submitted to the college academic

section through the Head of the Department. A copy of it shall be retained with Head of the Department, faculty advisor and the student.

4.4 A student has to register for all subjects/courses in a semester as specified in the course structure and may be permitted to register one additional theory subject / course limited to 3 credits, based on the student's **progress** and SGPA / CGPA, and completion of the '**pre-requisites'** as indicated for various subjects/courses, in the department course structure and syllabus contents.

4.5 If the student submits ambiguous choices or multiple options or erroneous (incorrect) entries during **online** registration for the subject(s) / course(s) under a given / specified course group / category as listed in the course structure, only the first mentioned subject / course in that category will be taken into consideration.

4.6 Subject / course options exercised through **online** registration are final and **cannot** be changed or inter- changed; further, alternate choices will not be considered. However, if the subject / course that has already been listed for registration by Head of the Department in a semester could not be offered due to any unforeseen or unexpected reasons, then the student shall be allowed to have alternate choice - either for a new subject (subject to offering of such a subject), or for another existing subject (subject to availability of seats), which may be considered. Such alternate arrangements will be made by Head of the Department, with due notification and time-framed schedule, within the **first week** from the commencement of class-work for that semester.

4.7 Dropping of additional registered subject / course (refer 4.4) may be permitted only after obtaining prior approval from the faculty advisor / counselor, '**within a period of 15 days**' from the commencement of that semester.

4.8 **Open electives**: Students have to choose one open elective wherever offered from the list of open electives given for their stream. Students should opt for open electives offered by other departments / branches only.

4.9 **Professional electives**: Students have to choose professional elective wherever offered from the list of professional electives given. However, students may opt for professional elective subjects offered in the related area.

4.10 **Mandatory Courses (Non-Credit):** All mandatory courses wherever offered require prior registration.

5. SUBJECTS / COURSES TO BE OFFERED

5.1 A typical Section (or Class) Strength for each Semester shall be 60. A subject / course may be offered to the students, **if only** a minimum 1/3 of students register to the course. The Maximum Strength of a Section is limited to 80 (60 + 1/3 of the Section Strength).

i) More than **one faculty member** may offer the **same subject** (lab / practical's may be included with the corresponding theory subject in the same semester) in any semester. However, selection choice for students will be based on '**first come first serve** basis and CGPA criterion' (i.e. the first focus shall be on early **on-line entry** from the student for registration in that semester, and the second focus, if needed, will be on CGPA of the student).

ii) If more entries for registration of a subject come into picture, then the concerned Head of the Department shall take necessary decision, whether or not to offer such a subject / course for **two (or multiple) sections**.

6. ATTENDANCE REQUIREMENTS

6.1 A student shall be eligible to appear for the semester end examinations, if the student acquires a minimum 75% of attendance in aggregate (excluding the days of midterm

examinations) for all the subjects / courses, excluding attendance in mandatory courses in that semester.

6.2 Condoning 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 on genuine and valid grounds, based on the student's representation with supporting evidence.

6.3 A stipulated fee shall be payable towards condoning of shortage of attendance.

6.4 Shortage of attendance below 65% in aggregate shall in **no** case be condoned.

6.5 **Students whose shortage of attendance is not condoned in any semester are not eligible to take their end examinations of that semester. They get detained and their registration for that semester shall stand cancelled. They will not be promoted to the next semester.** They may seek re-registration for all those subjects registered in that semester in which student was detained, by seeking re-admission into that semester as and when offered; in case if there are any professional electives and / or open electives, the same may also be re-registered, if offered. However, if those electives are not offered in later semesters, then alternate electives may be chosen from the **same** set of elective subjects offered under that category.

6.6 A student fulfilling the attendance requirement in the present semester shall not be eligible for readmission into the same class.

7. ACADEMIC REQUIREMENTS

The following academic requirements have to be satisfied, in addition to the attendance requirements mentioned in item no. 6.

7.1 A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/course, if student secures not less than 35% marks (25 out of 70 marks) in the semester end examination (SEE), and a minimum of 40% of marks in the sum total of the Continuous Internal Evaluation (CIE) and Semester End Examination (SEE) taken together; in terms of letter grades, this implies securing **C** grade or above in that subject / course.

7.2 A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to summer internship and project courses, if student secures not less than 40% of the total marks in each of them. The student would be treated as failed, if student does not submit a report on his project(s), or does not make a presentation of the same before the evaluation committee as per the schedule. Student may reappear once for each of the above evaluations, when they are scheduled again; if he fails in such 'one re-appearance' evaluation also, student has to reappear for the same in the next subsequent semester, as and when it is scheduled.

7.3 Promotion Rules

7.3.1 Four year B.Tech. (Regular):

S. No.	Promotion	Conditions to be fulfilled
1	First year first semester to first year second semester	Regular course of study of first year first semester.
2	First year second semester to second year first semester	**(i)** Regular course of study of first year second semester. **(ii)** Must have secured at least 19 credits out of 38 credits i.e., 50% credits up to first year second semester from all the relevant regular and supplementary examinations whether the student takes those examinations or not.
3	Second year first semester to second year second semester	Regular course of study of second year first semester.

4	Second year second semester to third year first semester	**(i)** Regular course of study of second year second semester. **(ii)** Must have secured at least 48 credits out of 80 credits i.e., 60% credits up to second year second semester from all the relevant regular and supplementary examinations, whether the student takes those examinations or not.
5	Third year first semester to third year second semester	Regular course of study of third year first semester.
6	Third year second semester to fourth year first semester	**(i)** Regular course of study of third year second semester. **(ii)** Must have secured at least 72 credits out of 120 credits i.e., 60% credits up to third year second semester from all the relevant regular and supplementary examinations, whether the student takes those examinations or not.
7	Fourth year first semester to fourth year second semester	Regular course of study of fourth year first semester.

7.3.2 Four year B.Tech. (LES):

S. No.	Promotion	Conditions to be fulfilled
1	Second year first semester to second year second semester	Regular course of study of second year first semester.
2	Second year second semester to third year first semester	**(i)** Regular course of study of second year second semester. **(ii)** Must have secured at least 21 credits out of 42 credits i.e., 50% credits up to second year second semester from all the relevant regular and supplementary examinations, whether the student takes those examinations or not.
3	Third year first semester to third year second semester	Regular course of study of third year first semester.
4	Third year second semester to fourth year first semester	**(i)** Regular course of study of third year second semester. **(ii)** Must have secured at least 49 credits out of 82 credits i.e., 60% credits up to third year second semester from all the relevant regular and supplementary examinations, whether the student takes those examinations or not.
5	Fourth year first semester to fourth year second semester	Regular course of study of fourth year first semester.

7.4 A student has to register for all subjects covering 160 credits (122 credits in case of LES) as specified and listed (with the relevant course / subject classifications as mentioned) in the course structure, fulfill all the attendance and academic requirements for 160 credits (122 credits in case of LES) securing a minimum of **'C'** grade or above in each subject, and 'earn all 160 credits (122 credits in case of LES) securing SGPA ≥ 5.0 (in each semester), and CGPA (at the end of each successive semester) ≥ 5.0, to successfully complete the under graduate programme.

7.5 If a student registers for '**additional subjects'** (in the parent department or other departments / branches of engineering) other than those listed subjects totaling to 160 credits (122 credits in case of LES) as specified in the course structure of parent department, the performances in those '**additional subjects**' (although evaluated and graded using the same procedure as that of the required 160 credits (122 credits in case of LES)) will not be taken into account while calculating the SGPA and CGPA. For such '**additional subjects'** registered, % of marks and letter grade alone will be indicated in

the grade card as a performance measure, subject to completion of the attendance and academic requirements as stated in regulations 6 and 7.1 to 7.4 above.

7.6 A student eligible to appear in the semester end examination for any subject / course, but absent from it or failed (thereby failing to secure **'C'** grade or above) may reappear for that subject / course in the supplementary examination as and when conducted. In such cases, internal marks (CIE) assessed earlier for that subject / course will be carried over, and added to the marks to be obtained in the SEE supplementary examination for evaluating performance in that subject.

7.7 A student **detained in a semester due to shortage of attendance may be re-admitted when the same semester is offered in the next academic year for fulfillment of academic requirements**. The academic regulations under which student has been readmitted shall be applicable. However, no grade allotments or SGPA / CGPA calculations will be done for the entire semester in which student has been detained.

7.8 A student detained **due to lack of credits, shall be promoted to the next academic year only after acquiring the required academic credits.** The academic regulations under which student has been readmitted shall be applicable.

8. EVALUATION - DISTRIBUTION AND WEIGHTAGE OF MARKS

8.1 The performance of a student in each semester shall be evaluated subject-wise / course-wise (irrespective of credits assigned) with a maximum of 100 marks. These evaluations shall be based on 30 marks allotted for CIE (Continuous Internal Evaluation) and 70 marks for SEE (Semester End Examination), and a letter grade corresponding to the percentage of marks obtained shall be given.

8.2 Evaluation of Theory Subjects / Courses

A) Continuous Internal Evaluation: For each theory subject, during the semester, there shall be 2 mid-term examinations of 30 marks each. Each mid-term examination consists of subjective paper for 25 marks & assignment for 5 marks and the final CIE marks (for total of 30) are calculated by taking 80% weightage from best of the two mid examinations and 20% weightage from the least scored mid examination marks in each subject.

- The first mid-term examination shall be conducted for the first 50% of the syllabus, and the second mid-term examination shall be conducted for the remaining 50% of the syllabus.
- The subjective paper shall be conducted for duration of 90 minutes. Each subjective paper shall contain 2 parts (Part-A and Part-B). Part-A consists of one compulsory question with five sub questions carrying two marks each. Part-B consists of 3 essay questions carrying five marks each with internal choice; the student has to answer all 3 questions.
- First assignment should be submitted before the commencement of the first mid-term examinations, and the second assignment should be submitted before the commencement of the second mid-term examinations. The assignments shall be specified / given by the concerned subject teacher.

B) Semester End Examinations: The duration of SEE is 3 hours. The details of the question paper pattern are as follows:

- The end semester examinations will be conducted for 70 marks consisting of two parts viz. i) **Part- A** for 20 marks, ii) **Part - B** for 50 marks.
- Part-A is compulsory, which consists of ten questions (two from each unit) carrying 2 marks each.

- Part-B consists of five questions (numbered from 11 to 15) carrying 10 marks each. One question from each unit (may contain sub-questions) with internal choice.

8.3 Evaluation of Practical / Design / Drawing Subjects /Courses: In any semester, a student has to complete a minimum of 10 experiments / exercises in each laboratory course and get the record certified by the concerned Head of the Department to be eligible for Semester End Examination.

For practical subjects, there shall be a Continuous Internal Evaluation (CIE) during the Semester for 30 internal marks and 70 marks for Semester End Examination (SEE).

A) Continuous Internal Evaluation (CIE): For each practical subject, during the semester, there shall be 2 mid-term examinations of 30 marks each. Each mid-term examination consists of day-to-day work evaluation for 20 marks and internal test for 10 marks conducted by the concerned laboratory teacher for duration of 90 minutes. The first mid-term examination shall be conducted for the first 50% of the syllabus, and the second mid-term examination shall be conducted for the remaining 50% of the syllabus. The final CIE marks (for total of 30) are calculated by taking 80% weightage from best of the two mid examinations and 20% weightage from the least scored mid examination marks in each practical subject.

B) Semester End Examination (SEE): The SEE for practical subject / course shall be conducted at the end of the semester with duration of 3 hours by one internal and one external examiner appointed by the Head of the Institution as per the recommendation of the concerned Head of the Department.

8.4 Evaluation of Summer Internship: The Summer internship I & II (4 - 6 weeks each) registered by the students in consultation with course coordinator and carried out in Industries and/or R&D Organizations immediately after their IV and VI semester course work respectively, the completion report will be assessed in subsequent semester(s) as 'Satisfactory' or 'Unsatisfactory' by a committee consisting of Head of the Department, supervisor and a senior faculty member of the department.

8.5 Evaluation of Project work: Student(s) shall start the Project Work during the VII Semester as per the instructions of the Project Guide / Supervisor assigned by the Head of the Department. The topics for Summer Internship and Project Stage – I shall be different from one another.

a) The Project Work shall be carried out in two stages: Project-I (Stage – I) during VII Semester and Project-II (Stage – II) during VIII Semester. The student has to prepare two independent Project Work Reports – *one each during each stage*. First Report shall include the Project Work carried out under Stage – I, and the Second Report (Final Report) shall include the Project Work carried out under Stage – I and Stage – II put together. Stage – I and Stage – II of the Project Work shall be evaluated for 100 marks each.

b) Out of the total 100 marks allotted for each stage of the Project Work, 30 marks shall be for the Continuous Internal Evaluation(CIE), and 70 marks shall be for the End Semester Viva-voce Examination (SEE). The marks earned under CIE for both the stages of the Project shall be awarded by the Project Guide / Supervisor (based on the continuous evaluation of student's performance during the two Project Work stages); and the marks earned under SEE shall be awarded by the Project Viva-voce Committee (based on the work carried out, report prepared and the presentation made by the student at the time of Viva-voce Examination).

c) For the Project Stage - I, the Viva-voce shall be conducted at the end of the VII Semester by the Department Evaluation Committee comprising of the Head of the Department , One Senior Faculty member and Supervisor. The Project Stage – II

Viva-voce shall be conducted by the Committee comprising of an External Examiner appointed by the Head of the Institution, Head of the Department and Project Supervisor at the end of the VIII Semester.

d) If a student does not appear (or fails) for any of the two Viva-voce examinations at the scheduled times as specified above, he may be permitted to reappear for Project Stage - I and/or Project Stage - II Viva-voce examinations, as and when they are scheduled again in that semester; if he fails in such 'one reappearance' evaluation also, he has to reappear for the same in the next subsequent semester(s), as and when they are scheduled, as supplementary candidate.

8.6 **Evaluation of Mandatory Non-Credit Courses:** There shall be only CIE for all mandatory (non credit) courses, instead of marks or letter grade '**Satisfactory'** or "**Unsatisfactory'** shall be indicated and this will not be counted for the computation of SGPA / CGPA. The student has to maintain a minimum of 65% attendance and secure not less than 40% in the CIE and then only the student is declared as **pass** and will be qualified for the award of the degree.

9. GRADING PROCEDURE

9.1 Marks will be awarded to indicate the performance of the student in each theory subject, lab / practical's/design/drawing practice, Summer Internship – I & Summer Internship – II and Project-I & Project-II based on the percentage of marks obtained in Continuous Internal Evaluation plus Semester End Examination, both taken together, as specified in item 8 above, a corresponding letter grade shall be given.

9.2 As a measure of the student's performance, a 10-point Absolute Grading System using the following letter grades (UGC Guidelines) and corresponding percentage of marks shall be followed...

% of Marks Secured (Class Intervals)	Letter Grade (UGC Guidelines)	Grade Points
90% and above (≥ 90% , ≤ 100%)	O (Outstanding)	10
Below 90% but not less than 80% (≥ 80% , < 90%)	A^+ (Excellent)	9
Below 80% but not less than 70% (≥ 70% , < 80%)	A (Very Good)	8
Below 70% but not less than 60% (≥ 60% , < 70%)	B^+ (Good)	7
Below 60% but not less than 50% (≥ 50% , < 60%)	B (above Average)	6
Below 50% but not less than 40% (≥ 40% , < 50%)	C (Average)	5
Below 40% (< 40%)	F (Fail)	0
Absent	Ab	0

9.3 A student obtaining '**F'** grade in any subject shall be considered **'failed**' and will be required to reappear as '**Supplementary Student**' in the Semester End Examination (SEE), as and when offered. In such cases, Continuous Internal Examination (CIE) in those subject(s) will remain same as those obtained earlier.

9.4 A letter grade does not imply any specific % of marks.

9.5 In general, a student shall not be permitted to repeat any subject/course (s) only for the sake of '**grade improvement**' or 'SGPA / CGPA improvement'. However, student has to repeat all the subjects / courses pertaining to that semester, if detained.

9.6 A student earns grade point (GP) in each subject / course, on the basis of the letter grade obtained in that subject/course (excluding mandatory non-credit courses). Then the corresponding '**credit points**' (CP) are computed by multiplying the grade point with credits for that particular subject/course.

Credit Points (CP) = Grade Point (GP) x Credits

9.7 The student passes the subject / course only when GP ≥ 5 (C grade or above).

9.8 The Semester Grade Point Average (SGPA) is calculated by dividing the sum of credit points (ΣCP) secured from all subjects / courses registered in a semester, by the total number of credits registered during that semester. SGPA is rounded off to **two** decimal places. SGPA is thus computed as

$$\mathbf{SGPA\ (S_i) = \sum (C_i\ X\ G_i) / \sum C_i}$$

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

9.9 The Cumulative Grade Point Average (CGPA) is a measure of the overall cumulative performance of a student in all semesters considered for registration. The CGPA is the ratio of the total credit points secured by a student in **all** registered courses in **all** Semesters, and the total number of credits registered in **all** the semesters. CGPA is rounded off to **two** decimal places. CGPA is thus computed from the I year second semester onwards, at the end of each semester, as per the formula:

$$\mathbf{CGPA = \sum (C_i\ X\ S_i) / \sum C_i}$$

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

Illustration of calculation of SGPA					Illustration of calculation of CGPA			
Course /Subject	Credits	Letter Grade	Grade Points	Credit Points	Sem.	Credits	SGPA	Credits x SGPA
Course 1	4	A	8	4 x 8 = 32	Sem I	19	7	19 x 7= 133
Course 2	3	O	10	3 x 10 = 30	Sem II	19	6	19 x 6= 114
Course 3	3	C	5	3 x 5 = 15	Sem III	21	6.5	21 x 6.5 =136.5
Course 4	3	B	6	3 x 6 = 18	Sem IV	21	6	21 x 6 = 126
Course 5	1.5	A^+	9	1.5x9 = 13.5	Sem V	20	7.5	20 x 7.5 =150
Course 6	1.5	A	8	1.5x8 = 12	Sem VI	20	8	20 x 8 = 160
Course 7	1.5	B^+	7	1.5x7 = 10.5	Sem VII	20	8.5	20 x 8.5 =170
Course 8	1.5	A^+	9	1.5x9 = 13.5	Sem VIII	20	8	20 x 8 = 160
Total	19		62	144.5	Total	160		1149.5
SGPA = 144.5/19 = 7.60					CGPA = 1149.5/160 = 7.18			

9.10 For merit ranking or comparison purposes or any other listing, **only** the '**rounded off**' values of the CGPAs will be used.

9.11 For calculations listed in Item 9.6–9.10, performance in failed subjects/courses (securing **F** grade) will also be taken into account, and the credits of such subjects/courses will also be included in the multiplications and summations. However, mandatory courses will not be taken into consideration.

10 PASSING STANDARDS

10.1 A student shall be declared '**successful'** or '**passed**' in a semester, if student secures a GP ≥ 5 ('C' grade or above) in every subject/course in that semester (i.e. when student gets an SGPA ≥ 5.00 at the end of that particular semester); and a student shall be declared '**successful**' or '**passed**' in the entire under graduate programme, only when a student gets a CGPA ≥ 5.00 for the award of the degree as required.

10.2 After the completion of each semester, a grade card or grade sheet (or transcript) shall be issued to all the registered students of that semester, indicating the letter grades and credits earned. it will show the details of the courses registered (course code, title, no. of credits, grade earned etc.), credits earned, SGPA, and CGPA.

10 DECLARATION OF RESULTS

11.1 Computation of SGPA and CGPA are done using the procedure listed in 9.6 – 9.9.

11.2 The conversion formula from CGPA to percentage of Marks:

Percentage of Marks = (final CGPA – 0.5) x 10

12 AWARD OF DEGREE

12.1 After a student has satisfied the requirement prescribed for the completion of the program and is eligible for the award of B. Tech. degree the student shall be placed in one of the following four classes based on CGPA:

Class Awarded	Grade to be Secured	Remarks
First Class with Distinction	≥ 8 CGPA	From the aggregate marks secured from 160 Credits for Regular Students and 122 Credits for Lateral Entry Students.
First Class	≥ 6.5 to < 8 CGPA	
Second Class	≥ 5.5 to < 6.5 CGPA	
Pass Class	≥ 5.00 to < 5.5 CGPA	
FAIL	CGPA < 5	

12.2 First class with distinction will be awarded to those students who clear all the subjects in single attempt during their regular course of study by fulfilling the following conditions:

(i) Should have passed all the subjects/courses in '**first appearance'** within the first 4 academic years (or 8 sequential semesters) for B.Tech. (Regular) and first 3 academic years (or 6 sequential semesters) for B.Tech. (LES) from the date of commencement of first year first semester for B.Tech. (Regular) and II year I semester for B.Tech. (LES).

(ii) Should have secured a CGPA ≥ 8.00, at the end of each of the 8 sequential semesters (6 sequential semesters for LES), starting from I year I semester (starting from II year I semester for LES) onwards.

(iii) Should not have been detained or prevented from writing the end semester examinations in any semester due to shortage of attendance or any other reason, shall be placed in '**first class with distinction'**.

12.3 **Award of Medals:** Students fulfilling the conditions listed under item 12.2 alone will be eligible for award of '**College Ranks**' and '**Medals**'.

12.4 **Graduation Day:** The College shall have its own Annual Graduation Day for the award of Degrees issued by the University.

12.5 **Transcripts:** After successful completion of prerequisite credits for the award of degree a transcript containing performance of all academic years will be issued as a final record. Duplicate transcripts will also be issued if required after the payment of requisite fee and also as per norms in vogue.

13 WITH HOLDING OF RESULTS

If the student has not paid the fees to the Institute at any stage, or has dues pending due to any reason whatsoever, or if any case of indiscipline is pending, the result of the student may be withheld, and the student will not be allowed to go into the next higher semester. The award or issue of the degree may also be withheld in such cases.

14 SUPPLEMENTARY EXAMINATIONS

Supplementary examinations for odd semester subjects will be conducted along with even semester regular examinations and vice versa.

15. TRANSITORY REGULATIONS

a) A student who has discontinued for any reason, or has been detained for want of attendance or lack of required credits as specified, or who has failed after having undergone the degree programme, may be considered eligible for readmission to the same subjects / courses (or equivalent subjects/ courses, as the case may be), and same professional electives / open electives (or from set / category of electives or equivalents suggested, as the case may be) as and when they are offered (within the time-frame of 8 years from the date of commencement of student's first year first semester).

b) A student who has failed in any subject under any regulation has to pass those subjects in the respective regulations.

c) The maximum credits that a student acquires for the award of degree, shall be the sum of the total number of credits secured in all the regulations of his/her study including R18 Regulations. The performance evaluation of the student will be done as per the rules and regulations applicable at the time of admission(s) regarding award of grade and/or class as the case may be.

d) If a student readmitted to R18 Regulations, has any subject with 80% of syllabus common with his/her previous regulations, that particular subject in R18 Regulations will be substituted by another subject to be suggested by the CMRIT Academic Council.

e) **Promotion Rule:** Where the credits allotted to a semester/year under the regulations studied in are different from that under R18 regulations for the corresponding semester/year, the promotion rules of R18 vide section 7.3 shall be applied after normalization. Normalization is done by scaling down or up the number of credits of a semester/year under the previous regulations to equal the number of credits of the corresponding semester/year under R18 regulations and revising the secured credits also in the same proportion.

16 STUDENT TRANSFERS

There shall be no transfers from other colleges / streams.

17 RULES OF DISCIPLINE

17.1 Any attempt by any student to influence the teachers, examiners, faculty members and staff of Controller of Examination office for undue favours in the exams, and bribing them either for marks or attendance will be treated as malpractice case and the student can be debarred from the college.

17.2 When the performance of the student in any subject(s) is cancelled as a punishment for indiscipline, student is awarded zero marks in that subject(s).

17.3 When the student's answer book is confiscated for any kind of attempted or suspected malpractice the decision of the Malpractice Prevention Committee is final.

18. MALPRACTICE

18.1 **Malpractice Prevention Committee:** The committee shall examine the student's malpractice and indiscipline cases occurred, while conducting the examinations and recommend appropriate punishment to the Academic Council after taking explanation from the student and concerned invigilator as per the malpractice rules mentioned below. The committee consists of

a) Controller of Examinations - Chairman
b) Addl. Controller of Examinations.- Convener

c) Subject Expert - Member
d) Head of the Department of which the student belongs to - Member
e) The Invigilator concerned - Member

18.2 Malpractice Rules: Disciplinary Action for Improper Conduct in Examinations

S. No.	Nature of Malpractices / Improper Conduct	Punishment
1(a)	Possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, Cell phones, pager, palm computers or any other form of material concerned with or related to the subject of the examination (theory or practical) in which he is appearing but has not made use of (material shall include any marks on the body of the candidate which can be used as an aid in the subject of the examination)	Expulsion from the examination hall and cancellation of the performance in that subject only.
1(b)	Gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or communicates through cell phones with any candidate or persons in or outside the exam hall in respect of any matter.	Expulsion from the examination hall and cancellation of the performance in that subject only of all the candidates involved. In case of an outsider, he will be handed over to the police and a case is registered against him.
2	Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the subject of the examination (theory or practical) in which the candidate is appearing.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the subjects of that Semester/year. The Hall Ticket of the candidate is to be cancelled and sent to the Principal.
3	Impersonates any other candidate in connection with the examination.	The candidate who has impersonated shall be expelled from examination hall. The candidate is also debarred and forfeits the seat. The performance of the original candidate who has been impersonated, shall be cancelled in all the subjects of the examination (including practical's and project work) already appeared and shall not be allowed to appear for examinations of the remaining subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. If the imposter is an outsider, he will be handed over to the police

		and a case is registered against him.
4	Smuggles in the Answer book or additional sheet or takes out or arranges to send out the question paper during the examination or answer book or additional sheet, during or after the examination.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
5	Uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks.	Cancellation of the performance in that subject.
6	Refuses to obey the orders of the Addl. Controller of examinations / any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out, or threatens the addl. Controller of examinations or any person on duty in or outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the addl. Controller of examinations, or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction of property in the examination hall or any part of the College campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination.	In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that subject and all other subjects the candidate(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the subjects of that semester/year. The candidates also are debarred and forfeit their seats. In case of outsiders, they will be handed over to the police and a police case is registered against them.
7	Leaves the exam hall taking away answer script or intentionally tears of the script or any part thereof inside or outside the examination hall.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and

		all examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
8	Possess any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat.
9	If student of the college, who is not a candidate for the particular examination or any person not connected with the college indulges in any malpractice or improper conduct mentioned in clause 6 to 8.	Student of the colleges expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat. Person(s) who do not belong to the College will be handed over to police and, a police case will be registered against them.
10	Comes in a drunken condition to the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year.
11	Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny.	Cancellation of the performance in that subject and all other subjects the candidate has appeared including practical examinations and project work of that semester/year examinations.
12	If any malpractice is detected which is not covered in the above clauses 1 to 11 shall be reported to the principal for further action to award suitable punishment.	

19. SCOPE

i) The Academic Regulations should be read as a whole, for the purpose of any interpretation.

ii) The above mentioned rules and regulations are applicable in general to both B.Tech. (Regular) and B.Tech. (LES), unless and otherwise specific.

iii) In case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Chairman of the Academic Council is final.

20. REVISION AND AMENDMENTS TO REGULATIONS

The Academic Council may revise or amend the academic regulations, course structure or

syllabi at any time, and the changes or amendments made shall be applicable to all students with effect from the dates notified by the Academic Council.

———————

COURSE STRUCTURE

B.Tech. – R-18 COURSE STRUCTURE

(Applicable from the batch admitted during 2018-19 and onwards)

I – Semester (I – B.Tech. – I - Semester)							
S. No.	Subject Code	Subject	POs	Hours Per Week			Credits
				L	T	P	
1	BSC-101	Engineering Mathematics – I (Linear Algebra & Calculus)	1,2,12	3	1	-	4
2	BSC-103	Applied Physics	1,2,12	3	-	-	3
3	HSMC-101	English	10,12	2	-	-	2
4	ESC-103	Programming for Problem Solving	1,2,3,12	3	-	-	3
5	ESC-109	Engineering Graphics	1,5,10	1	-	4	3
6	BSC-104	Applied Physics Lab	4	-	-	3	1.5
7	HSMC-102	English Language and communication Skills Lab	5,10	-	-	2	1
8	ESC-104	Programming for Problem Solving Lab	4	-	-	3	1.5
TOTAL				**12**	**01**	**12**	**19**
Mandatory Course (Non-Credit)							
9	MC-101	Technology Exploration for Social Innovation Lab - I	1 to 14	-	-	2	-

II – Semester (I – B.Tech. – II - Semester)							
S. No.	Subject Code	Subject	POs	Hours Per Week			Credits
				L	T	P	
1	BSC-102	Engineering Mathematics – II (Advanced Calculus)	1,2,12	3	1	-	4
2	BSC-107	Engineering Chemistry	1,2,12	3	-	-	3
3	ESC-101	Basic Electrical & Electronics Engineering	1,2,3,12	3	-	-	3
4	ESC-105	Data Structures	1,2,3,12	3	-	-	3
5	BSC-108	Engineering Chemistry Lab	4	-	-	3	1.5
6	ESC-102	Basic Electrical & Electronics Engineering Lab	4	-	-	3	1.5
7	ESC-106	Data Structures Lab	4	-	-	3	1.5
8	ESC-110	IT & Engineering Workshop	1,5,9,10	-	-	3	1.5
TOTAL				**12**	**01**	**12**	**19**
Mandatory Course (Non-Credit)							
9	MC-102	Technology Exploration for Social Innovation Lab – II	1 to 14	-	-	2	-

Note: **Students need to carry out virtual lab experiments by registering on to the AICTE referred portal https://vlabs.ac.in**

III – Semester (II – B.Tech. – I - Semester)							
S. No.	Subject Code	Subject	POs	Hours Per Week			Credits
				L	T	P	
1	ESC-210	Discrete Mathematics	1,2,12	3	-	-	3
2	ESC-211	Digital Logic Design and Computer Organization	1,2,3,6,12	3	-	-	3
3	CS-PCC-211	Python Programming	1,2,3,12	3	-	-	3
4	CS-PCC-212	OOP through Java	1,2,3,12	3	1	-	4
5	CS-PCC-213	Database Management Systems	1,2,3,12	3	-	-	3
6	CS-PCC-214	Python Programming Lab	4,5	-	-	2	1
7	CS-PCC-215	OOP through Java Lab	4,5	-	-	3	1.5
8	CS-PCC-216	Database Management Systems Lab	4,5	-	-	2	1
9	ESC-212	Digital Logic Design and Computer Organization Lab	4,5	-	-	3	1.5
TOTAL				**15**	**01**	**10**	**21**
Mandatory Course (Non-Credit)							
10	MC-201	Gender Sensitization Lab	9,12	-	-	2	-

IV – Semester (II – B.Tech. – II - Semester)							
S. No.	Subject Code	Subject	POs	Hours Per Week			Credits
				L	T	P	
1	BSC-201	Numerical and Statistical Methods	1,2,12	3	1	-	4
2	CS-PCC-221	Formal Languages and Automata Theory	1,2,3,12	3	-	-	3
3	CS-PCC-222	Software Design and Engineering	2,3,8,11,12,13	3	-	-	3
4	CS-PCC-223	Operating Systems	1,2,12	3	-	-	3
5	CS-PCC-224	Computer Networks	1,2,12,13	3	-	-	3
6	CS-PCC-225	Operating Systems (Linux) Lab	3,5,14	-	-	2	1
7	CS-PCC-226	Computer Networks Lab	3,5,14	-	-	2	1
8	CS-PCC-227	Internet of Things Lab	1,2,3,4,5,6,7,14	1	-	2	2
9	BSC-203	Computational Mathematics Lab using Sci Lab	3,4,5,14	-	-	2	1
TOTAL				**16**	**01**	**8**	**21**
Mandatory Course (Non-Credit)							
10	MC-202	Environmental Sciences	1,6,7,12	2	-	-	-

Note: Summer Internship – I (Mandatory Course) carried out during Summer Vacation between IV semester & V semester and evaluated in V semester.

V – Semester (III – B.Tech. – I - Semester)							
S. No.	Subject Code	Subject	POs	Hours Per Week			Credits
				L	T	P	
1	CS-PCC-311	Design & Analysis of Algorithms	2,3,12,13	3	-	-	3
2	CS-PCC-312	Compiler Design	2,3,4,12,13	3	-	-	3
3	CS-PCC-313	Data Mining and Analytics	1,2,3,12,13	3	-	-	3
4	CS-PCC-314	Web Technologies	2,3,6,12,13	3	-	-	3
5	CS-PCC-315	Artificial Intelligence	1,2,3,6,12,13	3	-	-	3
6	CS-PCC-316	Data Mining and Analytics Lab	4,5,14	-	-	2	1
7	CS-PCC-317	Web Technologies Lab	4,5,14	-	-	2	1
8	CS-PCC-318	Artificial Intelligence Lab	4,5,14	-	-	2	1
9	HSMC-301	Advanced English Communication Skills Lab	5,10	1	-	2	2
TOTAL				**15**	**-**	**10**	**20**
Mandatory Course (Non-Credit)							
10	MC-311	Employability Skills - I	9,10	3	-	-	-
11	MC-312	Summer Internship - I	1 to 14	-	-	-	-

VI – Semester (III – B.Tech. – II - Semester)							
S. No.	Subject Code	Subject	POs	Hours Per Week			Credits
				L	T	P	
1	CS-PCC-321	Cloud Computing	1,2,3,12,13	3	-	-	3
2	CS-PCC-322	Machine Learning and Data Sciences	2,3,6,12,13	3	-	-	3
3	CS-PCC-323	Full Stack Web Development	2,3,6,12,13	3	-	-	3
4	**Professional Elective – I**			3	-	-	3
	CS-PEC-301	T: Advanced Algorithms	2,3,4,12,13				
	CS-PEC-302	S: Distributed Systems	3,4,12,13				
	CS-PEC-303	D: Digital marketing	2,3,5,6,8,12				
	CS-PEC-304	A: Blockchain Technology	2,3,5,6,12,13				
5	**Open Elective – I**			3	-	-	3
	OEC-301	CE: Disaster Management	2,7,8,12				
	OEC-302	ME: Fundamentals of Operations Research	1,2,12				
	OEC-303	ECE: Electronic Measurements and Instrumentation	1,2,12				
	OEC-304	CSE: Java Programming	1,2,3,5,12				
	OEC-305	HSMC: Indian Culture and Constitution	8,12				
6	CS-PCC-324	Cloud Computing Lab	4,5,14	-	-	2	1
7	CS-PCC-325	Machine Learning and Data Sciences Lab	4,5,14	-	-	2	1
8	CS-PCC-326	Full Stack Web Development Lab	4,5,14	-	-	2	1
9	CS-PCC-327	Mobile Application Development (Android) Lab	2,3,4,5,8,14	1	-	2	2
TOTAL				**16**	**-**	**8**	**20**
Mandatory Course (Non-Credit)							
10	MC-321	Employability Skills - II	9,10	3	-	-	-

Note: Summer Internship – II carried out during Summer Vacation between VI semester & VII semester and evaluated in VII semester.

VII – Semester (IV – B.Tech. – I - Semester)							
S. No.	Subject Code	Subject	POs	Hours Per Week			Credits
				L	T	P	
1	HSMC-401	Management, Economics and Accountancy	11,12	3	-	-	3
2	CS-PCC-411	Information Security	2,3,6,8,12,13	3	-	-	3
3	**Professional Elective – II**			3	-	-	3
	CS-PEC-401	T: Software Testing Methodologies	3,4,5,12,13				
	CS-PEC-405	S: Advanced Computer Architecture	3,4,12,13				
	CS-PEC-409	D: Natural Language Processing	2,3,5,6,12,13				
	CS-PEC-413	A: Virtual Reality	2,3,5,8,12,13				
4	**Professional Elective – III**			3	-	-	3
	CS-PEC-402	T: Quantum Computing	1,2,3,5,12,13				
	CS-PEC-406	S: Adhoc and Sensor Networks	2,3,4,12,13				
	CS-PEC-410	D: Information Retrieval Systems	2,3,4,12,13				
	CS-PEC-414	A: Ethical Hacking	2,4,5,6,8,12,13				
5	**Open Elective – II**			3	-	-	3
	OEC-401	CE: Environmental Impact Assessment	6,7,10,12				
	OEC-403	ME: Non-Conventional Energy Sources	6,7,12				
	OEC-405	ECE: Principles of Communication Systems	1,2,3,12				
	OEC-407	CSE: Database Management Systems	1,2,3,5,12				
	OEC-409	HSMC: Intellectual Property Rights	1,6,8,10,12				
6	HSMC-402	Technical Writing Skills Lab	10,12	-	-	2	1
7	CS-PCC-412	Information Security Lab	4,5,14	-	-	2	1
8	CS-PRJ-413	Project – I	1 to 14	-	-	6	2
TOTAL				**15**	**-**	**10**	**20**
Mandatory Course (Non-Credit)							
9	MC-411	Summer Internship - II	1 to 14	-	-	-	-

VIII – Semester (IV – B.Tech. – II - Semester)							
S. No.	Subject Code	Subject	POs	Hours Per Week			Credits
				L	T	P	
1	**Professional Elective –IV**			3	-	-	3
	CS-PEC-403	T: Software Project Management	3,4,5,11,12,13				
	CS-PEC-407	S: Computational Biology	1,2,5,6,12,13				
	CS-PEC-411	D: Cyber-Physical Systems	2,3,5,6,12,13				
	CS-PEC-415	A: Cognitive Computing	1,2,3,4,5,6,12,13				
2	**Professional Elective – V**			3	-	-	3
	CS-PEC-404	T: Computer Forensics	2,3,5,8,12,13				
	CS-PEC-408	S: Digital Image Processing	1,2,3,12,13				
	CS-PEC-412	D: Neural Networks and Deep Learning	2,3,5,6,12,13				
	CS-PEC-416	A: Cyber Security	2,4,5,6,8,12,13				
3	**Open Elective – III**			3	-	-	3
	OEC-402	CE: Green Building Technologies	1,2,7,12				
	OEC-404	ME: Fundamentals of Robotics	1,2,5,12				
	OEC-406	ECE: Fundamentals of Embedded Systems	1,2,3,12				
	OEC-408	CSE: Web Technologies	2,3,5,6,12				
	OEC-410	HSMC: Principles of Entrepreneurship	7,8,9,11,12				
4	CS-PRJ-421	Project-II	1 to 14	-	-	22	11
TOTAL				**9**	**-**	**22**	**20**

I-B.TECH.-I-SEMESTER SYLLABUS

ENGINEERING MATHEMATICS – I
(Linear Algebra and Calculus)

I-B.Tech-I-Sem. **L T P C**
Subject Code: BSC-101 **3 1 - 4**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO1	PO2	PO12
CO1	solve system of linear equations by using matrices	3	2	1
CO2	find Eigen values and Eigen vectors	3	2	1
CO3	analyze the nature of sequences and series	3	2	1
CO4	verify mean value theorems and evaluate improper integrals by using Beta and Gamma functions	3	2	1
CO5	find the extreme values of functions of two variables	3	2	1

Unit-I: Matrices **9 hours**

Matrices: Types of Matrices, Symmetric; Hermitian; Skew-symmetric; Skew-Hermitian; orthogonal matrices; Unitary Matrices; rank of a matrix by Echelon form and Normal form, Inverse of Non-singular matrices by Gauss-Jordan method; System of linear equations; solving system of Homogeneous and Non-Homogeneous equations. Gauss elimination method; Gauss Seidel Iteration Method.

Unit-II: Eigen values and Eigen vectors **11 hours**

Linear Transformation and Orthogonal Transformation: Eigen values and 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: Sequences &Series **(4 + 6) 10 hours**

Part A: Sequence: Definition of a Sequence, limit; Convergent, Divergent and Oscillatory sequences. Series: Convergent, Divergent and Oscillatory Series; Series of positive terms; Comparison test, p-test, D-Alembert's ratio test; Raabe's test.

Part B: Cauchy's Integral test; Cauchy's root test
Alternating series: Leibnitz test; Alternating Convergent series: Absolute and Conditionally Convergence.

Unit-IV: Calculus **9 hours**

Mean value theorems: Rolle's Theorem, Lagrange's Mean value theorem with their Geometrical Interpretation and applications, Cauchy's Mean value Theorem.
Definition of Improper Integral: Beta and Gamma functions and their applications.

Unit-V: Multivariable calculus (Partial Differentiation and applications) **9 hours**

Definitions of Limit and continuity, Partial Differentiation; Euler's Theorem; Total derivative; Jacobian; Functional dependence & independence, Maxima and minima of functions of two variables and three variables using method of Lagrange multipliers.

Textbooks:

1. Higher Engineering Mathematics by B.S. Grewal, Khanna Publishers, 36th Edition,2010
2. Advanced Engineering Mathematics by Erwin kreyszig, 9th Edition, John Wiley & Sons, 2006.
3. Calculus and Analytic Geometry by G.B.Thomas and R.L.Finney, 9thEdn, Pearson, Reprint, 2002.

References:

1. A text book of Engineering Mathematics, N.P. Bali and Manish Goyal, Laxmi Pub., Reprint, 2008.
2. Higher Engineering Mathematics, Ramana B.V., TMH, 11th Reprint.

APPLIED PHYSICS

I-B.Tech.-I-Sem. **L T P C**
Subject Code: BSC-103 **3 - - 3**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO1	PO2	PO12
CO1	explain the principles of Quantum Mechanics	3	2	1
CO2	analyze various electron theories of conduction in solids	3	2	1
CO3	classify semiconductors and relate functioning of semiconductor devices	3	2	1
CO4	illustrate principles and applications of lasers and optical fibers	3	2	1
CO5	outline dielectric and magnetic properties of materials	3	2	1

Unit-I: Principles of Quantum Mechanics **9 hours**

Waves and Particles, de Broglie Hypothesis, Matter Waves, Davisson and Germer's Experiment, Heisenberg's Uncertainty Principle, Physical Significance of the Wave Function , Schrödinger's Time Independent Wave Equation –Particle in 1- Dimensional potential box extended to 3-dimension.

Unit-II: Introduction to solids **9 hours**

Quantum free electron theory, Estimation of Fermi energy, Dependence of Fermi level on temperature, Density of states.
Bloch's theorem, Kronig – Penny model, E – K diagram, origin of energy bands, Classification of materials on the basis of energy bands, Effective mass of electron.

Unit-III: Semiconductor Physics and Devices **(6 + 5) 11 hours**

Part-A: Introduction, Calculation of carrier concentration in Intrinsic &, Extrinsic Semiconductors, Direct and Indirect band gaps, Fermi Level in Intrinsic and Extrinsic Semiconductors, Hall Effect.

Part-B: Formation of PN Junction, Open Circuit PN Junction, Energy Level Diagram of PN Diode, I-V Characteristics of PN Junction diode. Solar cell, LED.

Unit-IV: Lasers & Fiber Optics **9 hours**

Characteristics of Lasers, Absorption, Spontaneous and Stimulated Emission of Radiation, Einstein's Coefficients and Relation between them, Population Inversion, Lasing Action, Ruby Laser, Helium-Neon Laser, Semiconductor Diode Laser, Applications of Lasers.
Principle of Optical Fiber, Construction of Fiber, Acceptance Angle And Acceptance Cone, Numerical Aperture, Types of Optical Fibers: Step Index And Graded Index Fibers, Application of Optical Fiber in Communication Systems.

Unit-V: Dielectric & Magnetic Properties **10 hours**

Introduction Dielectric properties, Electronic, Ionic and Orientation Polarizations and Calculation of Polarizabilities: Ionic and Electronic – Internal Fields in Solids, Clausius – Mossotti Equation, Ferro-electricity and Piezo-electricity; Applications.
Introduction magnetic properties, Origin of Magnetic Moment, Bohr Magneton, Classification of Dia, Para and Ferro Magnetic Materials on the basis of Magnetic Moment, Domain Theory of Ferro Magnetism on the basis of Hysteresis Curve, Soft and Hard Magnetic Materials, Applications.

Textbooks:

1. Principles of physics by Halliday, Resnick, Walker, Wiley India Pvt. Ltd, 9th Edition.
2. Introduction to solid state physics by Charles Kittel, Wiley India Pvt. Ltd, 7thEdition.

References:

1. Applied Physics by P.K.Mittal, I K International Publishers.
2. Engineering Physics by P.K.Palanisamy, Scitech Publishers.

ENGLISH

I-B.Tech.-I-Sem. **L T P C**
Subject Code: HSMC-101 **2 - - 2**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO10	PO12
CO1	acquire proficiency in RAWLS skills	3	1
CO2	demonstrate the acquired language in written and spoken contexts	3	1
CO3	express, restate and respond appropriately by comprehending the given data	3	1
CO4	develop proficiency to succeed in academic activities, research and career	3	1
CO5	excel in professional and social etiquette	3	1

SYLLABUS

Reading Skills:

Objectives:

To develop an awareness in students about the significance of silent reading and comprehension.
To develop students' ability to guess meanings of words from the context and grasp the overall message of the text, draw inferences, etc., by way of:

- Skimming and Scanning the text
- Intensive and Extensive Reading
- Reading for Pleasure
- Identifying the topic sentence
- Inferring lexical and contextual meaning
- Recognizing Coherence/Sequencing of Sentences

NOTE: The students will be trained in reading skills using the prescribed texts for detailed study. They will be tested in reading comprehension of different 'unseen' passages which may be taken from authentic texts, such as magazines/newspaper articles.

Writing Skills:

Objectives:

1. To develop an awareness in the students about writing as an exact and formal skill
2. To create an awareness in students about the components of different forms of writing, beginning with the lower order ones through;
   - Writing of sentences
   - Use of appropriate vocabulary
   - Paragraph writing
   - Coherence and cohesiveness
   - Narration / description
   - Note Making
   - Formal and informal letter writing
   - Describing graphs using expressions of comparison

Unit –I **7 hours**

('The Raman Effect' from the prescribed textbook 'English for Engineers' published by Cambridge University Press.)

Vocabulary Building: The Concept of Word Formation --The Use of Prefixes and Suffixes.
Grammar: Identifying Common Errors in Writing with Reference to Articles and Prepositions.
Reading: Reading and Its Importance- Techniques for Effective Reading.
Basic Writing Skills: Sentence Structures - Use of Phrases and Clauses in Sentences-Importance of Proper Punctuation- Techniques for writing precisely – **Paragraph writing** – Types, Structures and Features of a Paragraph - Creating Coherence-Organizing Principles of Paragraphs in Documents.

Unit –II **6 hours**

('Ancient Architecture in India' from the prescribed textbook 'English for Engineers' published by Cambridge University Press.)

Vocabulary: Synonyms and Antonyms.
Grammar: Identifying Common Errors in Writing with Reference to Noun-pronoun Agreement and Subject-verb Agreement.
Reading: Improving Comprehension Skills – Techniques for Good Comprehension
Writing: Format of a Formal Letter-**Writing Formal Letters** E.g.., Letter of Complaint, Letter of Requisition, Job Application with Resume.

Unit –III **(3 + 3) 6 hours**

('Blue Jeans' from the prescribed textbook 'English for Engineers' published by Cambridge University Press.)

Part A: Vocabulary: Acquaintance with Prefixes and Suffixes from Foreign Languages in English to form Derivatives-Words from Foreign Languages and their Use in English.
Grammar: Identifying Common Errors in Writing with Reference to Misplaced Modifiers and Tenses.

Part B: Reading: Sub-skills of Reading- Skimming and Scanning
Writing: Nature and Style of Sensible Writing- **Defining- Describing** Objects, Places and Events – **Classifying**- Providing Examples or Evidence

Unit-IV **7 hours**

('What Should You Be Eating' from the prescribed textbook 'English for Engineers' published by Cambridge University Press.)

Vocabulary: Standard Abbreviations in English
Grammar: Redundancies and Clichés in Oral and Written Communication.
Reading: Comprehension- Intensive Reading and Extensive Reading
Writing: Writing Practices--Writing Introduction and Conclusion - Essay Writing-Précis Writing.

Unit-V **6 hours**

('How a Chinese Billionaire Built Her Fortune' from the prescribed textbook 'English for Engineers' published by Cambridge University Press.)

Vocabulary: Technical Vocabulary and their usage
Grammar : Common Errors in English
Reading : Reading Comprehension-Exercises for Practice
Writing : Technical Reports- Introduction – Characteristics of a Report – Categories of Reports; **Formats**- Structure of Reports (Manuscript Format) -Types of Reports - Writing a Report.

Textbook:

1. Sudarshana, N.P. and Savitha, C. (2018). English for Engineers. Cambridge University Press.

References:

1. Swan, M. (2016). Practical English Usage. Oxford University Press.
2. Kumar, S and Lata, P.(2018). Communication Skills. Oxford University Press.
3. Wood, F.T. (2007).Remedial English Grammar. Macmillan.
4. Zinsser, William. (2001). On Writing Well. Harper Resource Book.
5. Hamp-Lyons, L. (2006).Study Writing. Cambridge University Press.
6. Exercises in Spoken English. Parts I –III. CIEFL, Hyderabad. Oxford University Press.

PROGRAMMING FOR PROBLEM SOLVING

I-B.Tech.-I-Sem. **L T P C**
Subject Code: ESC-103 **3 - - 3**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO1	PO2	PO3	PO12
CO1	write simple programs using C language	3	3	2	2
CO2	design structured programs using functions	3	3	2	2
CO3	develop programs using arrays, strings and pointers	3	3	2	2
CO4	construct programs for heterogeneous data	3	3	2	2
CO5	implement various file operations in C programming	3	3	2	2

Unit-I: Introduction to Programming **11 hours**

Introduction to components of a computer system: primary and secondary memory, processor, Input/output devices, operating system, compilers, creating, compiling and executing a program. Introduction to Algorithms: Representation of Algorithm/Pseudo code, Flowchart, Structure chart with examples, Program development steps.

Introduction to C Programming Language: identifiers, data types, variables , constants, Operators, Expression evaluation, precedence, Preprocessor commands, Conditional Branching and Loops: Writing and evaluation of conditions and consequent branching with if, if-else, switch-case, ternary operator, goto, Iteration with for, while, do-while loops.

Unit-II: Arrays and Functions **8 hours**

Arrays: Concepts, using arrays in C, One dimensional, two dimensional arrays, multidimensional arrays, array applications- linear search, binary search and bubble sort, C program examples.

Functions: Designing Structured Programs, Functions, user defined functions, Standard functions, Parameter passing in functions, Storage classes-auto, register, static, extern, recursion- recursive functions, differences between recursion and iteration, Simple programs, such as Finding Factorial, GCD, Fibonacci series etc., Limitations of recursion, example C programs.

Unit-III: Pointers and Strings **(5 + 5) 10 hours**

Part A: Pointers: Defining pointers, pointers to pointers, Pointer Arithmetic, accessing arrays using pointers, void pointer, Null pointer, Dangling Pointer, dynamic memory allocation functions.

Part B: Strings: Introduction to strings, handling strings as array of characters, basic string functions available in C (strlen, strcat, strcpy, strcmp, strstr, etc.), arrays of strings.

Unit-IV: Structures and Unions **10 hours**

Structures - Defining structures, initializing structures, accessing structures, operations on structures, Nested structures, structures containing arrays, arrays of structures, structures and functions, self-referential structures, enum, typedef, bit fields; **Unions -** Defining unions, initializing unions, accessing unions, differences between Structures and unions, C programming examples.

Unit-V: File handling in C **9 hours**

Files - Concept of a file ,Text and Binary files, Differences between text and binary files, File opening modes , Opening and Closing files, file input / output functions, file status functions (error handling), Random access using fseek, ftell and rewind functions, C programming examples.

Textbooks:

1. Computer Science: A Structured Programming Approach Using C, B. A. Forouzan and R. F. Gilberg, 3rd Edition, Cengage Learning.
2. Programming in ANSI C, E. Balaguruswamy, TMH.

References:

1. The C Programming Language, B.W. Kernighan and Dennis M. Ritchie, 2nd Edition, Pearson.
2. C: The Complete Reference, Herbert Schildt, TMH, 4th Edition.

ENGINEERING GRAPHICS

I-B.Tech-I-Sem. **L T P C**
Subject Code: ESC-109 **1 - 4 3**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO1	PO5	PO10
CO1	apply engineering drawing concepts in technical graphic communication	3	3	2
CO2	construct conic sections using various methods	3	3	2
CO3	draw orthographic projections of points, lines, planes and solids	3	3	2
CO4	draw development of solid surfaces	3	3	2
CO5	draw the conversions of orthographic to isometric projections & vice versa	3	3	2

List of Experiments:

Week 1: Introduction to engineering drawing and AutoCAD software, Lettering, dimensioning practice and Geometrical Constructions.

Week 2: Conic sections: General method, Construction of Ellipse, Parabola.

Week 3: Construction of Hyperbola, Epicycloid.

Week 4: Construction of hypocycloid, involutes.

Week 5: Orthographic Projections: Principles of Orthographic projections, Projections of Points.

Week 6: Projections of lines simple position, inclined to one plane.

Week 7: Projections of Lines inclined to both the planes.

Week 8: Projections of planes inclined to one plane and both the planes.

Week 9: Projections of Solids simple position.

Week 10: Projections of Solids inclined to one plane.

Week 11: Projections of Solids inclined to both the planes.

Week 12: Development of surfaces: Development of Prisms and Cylinders, Pyramids and Cones.

Week 13: Isometric projections: isometric views of lines, planes and solid figures; Conversion of Isometric to Orthographic views (3D to 2D).

Week 14: Conversion of Orthographic to Isometric views (2D to 3D).

Textbooks:

1. Engineering Drawing N.D. Bhatt, Charotar.
2. A Text Book of Engineering Drawing, Basant Agarwal.

References:

1. A Text Book of Engineering Drawing, Dhawan R K, S. Chand.
2. Engineering Graphics with Auto CAD, James D Bethune, Pearson Education.

APPLIED PHYSICS LAB

I-B.Tech.-I-Sem. **L T P C**
Subject Code: BSC-104 **- - 3 1.5**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO4
CO1	demonstrate the electrical properties of a semiconductor	3
CO2	compare practical results with theoretical calculations in electrical circuits	3
CO3	demonstrate the properties of lasers and optical fibers	3
CO4	find the energy gap of a semiconductor and identify its band structure	3
CO5	examine electrical resonance in LCR circuits	3

List of Experiments: (Any 08 experiments compulsory)

1. Determination of Energy Gap of a Semiconductor.
2. Time constant of an R-C Circuit.
3. Stewart and Gee's method - Magnetic field along the axis of current carrying coil-
4. Bending Losses of Fibers & Evaluation of numerical aperture of given fiber.
5. Determination of Resonance frequency of an LCR circuit.
6. Verify the characteristics of a Solar Cell.
7. Diffraction Grating-Determination of wavelengths of a LASER source.
8. Verify the characteristics of a Light Emitting Diode.
9. Verify the characteristics of a Laser Diode.
10. Calculation of Hall Voltage across the sample material.

Micro-Projects: Student must submit a report on one of the following Micro–Projects before commencement of second internal examination.

1. Determine the Horizontal component of earth's magnetic field using Tangent law.
2. Determine refractive index of a liquid using Newton's rings.
3. Design a tank circuit for a given resonance frequency and verify resonance principle.
4. Determine the width of slit using single slit diffraction pattern.
5. Determine dispersive power of liquids by using spectrometer and hallow prism.
6. Convert mechanical energy to light energy using principle of energy conservation.
7. Design mobile phone detector.
8. Design a counter using Photo cell characteristics.
9. Determine Fermi energy of a given semiconductor material.
10. Design a circuit to detect breakage in a conducting wire.

Reference:

1. Applied Physics Lab Manual, FED, CMRIT, Hyd.

ENGLISH LANGUAGE AND COMMUNICATION SKILLS LAB

I-B.Tech-I-Sem. **L T P C**
Subject Code: HSMC-102 **- - 2 1**

The **Language Lab** focuses on the production and practice of sounds of language and familiarizes the students with the use of English in everyday situations and contexts.

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO5	PO10
CO1	identify the nuances of the language through multimedia experience	3	3
CO2	express clearly with right accent, intonation to overcome MTI	3	3
CO3	demonstrate formal and informal English in real life scenarios	3	3
CO4	develop speaking and listening skills	3	3
CO5	appraise communication and correspond effectively	3	3

COMPUTER ASSISTED LANGUAGE LEARNING (CALL) LAB

Exercise – I (Week 1 & 2): Introduction to Phonetics -Speech Sounds -Vowels and Consonants

Exercise – II (Week 5): Pronunciation I: Syllable Division, Accent & Stress

Exercise – III (Week 8): Pronunciation II: Intonation and Rhythm

Exercise – IV (Week 11): Errors in pronunciation – the Influence of Mother Tongue (MTI)

Exercise – V (Week 14): Listening Comprehension (Specific & General)

INTERACTIVE COMMUNICATION SKILLS (ICS) LAB

Exercise – I (Week 3 & 4): JAMs

Exercise – II (Week 6 & 7): Role Play: Situational Dialogues

Exercise – III (Week 9 & 10): Descriptions & Formal Presentations

Exercise – IV (Week 12 & 13): Communication at Workplace and Interviews Skills

Micro-Projects: Student must submit a report on one of the following Micro–Projects before commencement of second internal examination.

1. Common Errors in English
2. Listening Skills
3. Phonetics
4. Writing Skills
5. Reading Skills
6. Letter Writing
7. Report Writing
8. Vocabulary
9. Body Language
10. Functional English

Reference:

1. English Language and Communication Skills Lab Manual, FED, CMRIT, Hyd.

PROGRAMMING FOR PROBLEM SOLVING LAB

I- B.Tech-I-Sem. **L T P C**
Subject Code: ESC-104 **- - 3 1.5**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO4
CO1	execute simple programs using C compiler	3
CO2	apply control statements in designing programs	3
CO3	design programs using functions, arrays, strings and pointers	3
CO4	construct programs for heterogeneous data	3
CO5	implement various file operations in C programming	3

LIST OF EXPERIMENTS

Week 1: Familiarization with programming environment

1. Write a program to print sample strings like “hello world”, “Welcome to C Programming” with different formats using escape sequences.
2. Write a Program to print different data types in C and their ranges.
3. Write a Program to initialize, assign & print variables of different data types.

Week 2: Operators

1. Write a Program to demonstrate arithmetic operators. (+,-,*,/,%)
2. Write a Program to demonstrate relational operators.(<,>,<=,>=,==,!=)
3. Write a program to check equivalence of two numbers using conditional operator.
4. Write a Program to demonstrate pre increment and post increment. (++a, a++ where a is a value to be initialized)

Week 3: Simple C programs

1. Write a Program to read radius value from the keyboard and calculate the area of circle
2. Write a Program to calculate simple interest.
3. Write a Program to convert temperature. (Fahrenheit –Centigrade and vice-versa)
4. Write a program for computing the volume of sphere, cone and cylinder assume that dimensions are integers use type casting where ever necessary.

Week 4: Decision Statements

1. Write program that declares Class awarded for a given percentage of marks, where mark <40%= Failed, 40% to <60% = Second class, 60% to <70%=First class, >= 70% = distinction. Read percentage from standard input.
2. Write a Program to calculate roots of quadratic equation (using if-else).
3. Write a Program to perform arithmetic operations using switch case.
4. Write a Program to display colors using switch case (VIBGYOR).

Week 5: Loops

1. Write a program to calculate sum of individual digits of a given number.
2. Write a program to print prime numbers in the given range.
3. Write a program to read 2 numbers x and n then compute the sum of the Geometric Progression. $1+x+ x^2+x^3+ - - - - - - - +x^n$
4. Write a C program to construct a pyramid of numbers as follows:

.

```
1          *        1          1          *
1 2        * *      2 3        2 2        * *
1 2 3      * * *    4 5 6      3 3 3      * * *
                               4 4 4 4    * *
                                          *
```

Week 6: 1-D arrays

1. Write a program to store 10 elements in the 1-D array and print sum of the array.
2. Write a program to print minimum and maximum elements in the 1-D array.
3. Write a program to search the given element by using linear search and binary search.
4. Write a program to sort the given elements using bubble sort technique.

Week 7: 2-D arrays

1. Write a program to perform matrix addition.
2. Write a program to perform matrix multiplication.
3. Write a program to print the transpose of a matrix.

Week 8: Functions

1. Write a program to find product of two numbers using functions without arguments, without return type.
2. Write a program to find difference of two numbers using functions without arguments, with return type.
3. Write a program to find sum of two numbers using functions with arguments &without return type.
4. Write a program to find product of two numbers using functions with arguments, with return type.

Week 9: Functions and Recursion

1. Write a program to swap two numbers using
   a) Call by Value
   b) Call by Reference. (Using pointers)
2. Write a program to calculate factorial, GCD and Fibonacci series of n terms using recursion and non-recursion functions.
3. Write C program that reads two integers x and n and calls a recursive function to compute x^n
4. Write a C program that reads two integers and calls a recursive function to compute ${}^nC_r$

Week 10: Strings

1. Write a program to demonstrate various string manipulations using built-in functions.
2. Write a program to print the given strings in ascending order.
3. Write a program to verify the given string is palindrome or not (without using built-in functions and with using built-in functions).
4. Write a program to concatenate two strings using arrays without using strcat.

.

Week 11: Structures

1. Write a program to find total marks of individual student and average marks for 10 students using structures.
2. Write a program to illustrate passing an entire structure to a function.
3. Write a C Program to perform addition and multiplication of two complex numbers using structures.

Week 12: File operations

1. Write a C program to display the contents of a file to standard output device.
2. Write a C program which copies one file to another, replacing all lowercase characters with their uppercase equivalents.
3. Write a C program to merge two files into a third file (i.e., the contents of the first file followed by those of the second are put in the third file).
4. Write a C program to count the number of times a character occurs in a text file.

Micro-Projects: Student must submit a report on one of the following Micro–Projects before commencement of second internal examination.

1. Pay roll management system.
2. Fee collection system.
3. Employee's Management System.
4. Library management.
5. Department store system.
6. Personal Dairy Management System.
7. Telecom Billing Management System.
8. Bank Management System.
9. Contacts Management.
10. Medical Store Management System.

Reference:

1. Programming for Problem Solving Lab Manual, FED, CMRIT, Hyd.

TECHNOLOGY EXPLORATION FOR SOCIAL INNOVATION LAB - I
MANDATORY COURSE (NON-CREDIT)

I-B.Tech.-I-Sem. **L T P C**
Subject Code: MC-101 **- - 2 -**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO1 to PO14
CO1	identify the problems	3
CO2	illustrate social innovation	3
CO3	choose suitable processes	3
CO4	design suitable prototype	3
CO5	develop feasibility report	3

Week 1 & 2: Introduction to Engineering: what is engineering, difference between science, engineering and technology. Requirement of a scientist and engineer. Misconceptions about engineering, Expectation for the 21st century engineer.

Week 3 & 4: Introduction to Social Innovation: Core definitions, Core elements and common features of social innovation, a topology of social innovations, Fields for social innovation, History of social innovation

Week 5: social and economic change: The shape of the economy to come, Understanding social change-individuals, Movements and organizations.

Week 6: Process of Social Innovation: Prompts – identifying needs, Proposals – generating ideas, Prototyping – testing the idea in practice, Sustaining-developing a business model, Scaling and diffusion-growing social innovations

Week 7: Systematic change: Different sectors for social innovation and stages of social innovation.

Week 8: Engineering Design: Engineering Design Process, Multidisciplinary facet of design.

Week 9 & 10: Charts: Pair wise comparison chart, Introduction to Mechatronics system, generation of multiple solutions, Pugh Chart.

Week 11: PCB Design: Motor and battery sizing concepts, introduction to PCB design .

Week 12: Social Innovation: Designing the social innovations and Examples.

Week 13 & 14: Case Studies: Report writing and documentation, Presentation of the case studies with a focus on impact and vision on society.

Reference:

1. A Hand Book on Technology Exploration for Social Innovation - I, FED, CMRIT, Hyd.

I-B.TECH.-II-SEMESTER SYLLABUS

ENGINEERING MATHEMATICS – II
(Advanced Calculus)

I-B.Tech.-II-Sem. **L T P C**
Subject Code: BSC-102 **3 1 - 4**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO1	PO2	PO12
CO1	solve linear and non-linear ordinary differential equations	3	2	1
CO2	solve linear and non-linear partial differential equations	3	2	1
CO3	evaluate the line, surface and volume integrals and convert them from one to another by using multiple integrals	3	2	1
CO4	determine vector field, scalar field, gradient, divergence and curl by using vector differentiation	3	2	1
CO5	solve the line, surface and volume integrals by using vector integration	3	2	1

Unit-I: Differential Equations **11 hours**

Exact & Reducible to exact, Linear and Bernoulie's Differential Equations. Applications; Newton's law of cooling, law of natural growth and decay. Non-homogeneous linear differential equations of second and higher order with constant coefficients with RHS term of the type e^{ax}, Sin ax, cos ax, polynomials in x, $e^{ax}V(x)$, xV(x),method of Variation of parameters.

Unit-II: Partial Differential Equations **8 hours**

Formation of partial differential equations-by elimination of arbitrary constants and arbitrary functions–solutions of first order linear (Lagrange) equations and nonlinear equations (Four standard types) – Method of Separation of Variables.

Unit-III: Multiple Integration **(5 + 5) 10 hours**

Part A: Double integrals (Cartesian &polar), change of order of integration in double integrals, Change of variables (Cartesian to polar).

Part B: Applications: areas and volumes (Cartesian), Triple integrals (Cartesian).

Unit-IV: Vector Differentiation **9 hours**

Vector Differentiation: Vector point functions and scalar point functions. Gradient, Divergence and Curl. Directional derivatives, Scalar potential functions. Solenoidal and Irrational vectors, Vector Identities.

Unit-V: Vector Integration **10 hours**

Vector Integration: Line, Surface and Volume Integrals. Theorems of Green, Gauss and Stokes (without proofs) and related Problems.

Textbooks:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010
2. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons,2006
3. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edn., Pearson, Reprint, 2002.

References:

1. Paras Ram, Engineering Mathematics, 2nd Edition, CBS Publishes
2. S. L. Ross, Differential Equations, 3rd Edition, Wiley

ENGINEERING CHEMISTRY

I-B.Tech.-II-Sem. **L T P C**
Subject Code: BSC-107 **3 - - 3**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO1	PO2	PO12
CO1	determine the hardness of water and various treatment methods	3	2	1
CO2	apply the concepts of electrochemistry and corrosion control	3	2	1
CO3	explain the principles of spectroscopy and its applications	3	2	1
CO4	illustrate the various fuels, synthesis of polymers and drugs	3	2	1
CO5	analyze the properties of engineering materials	3	2	1

Unit-I: Water and its treatment **9 hours**

Introduction – hardness of water – causes of hardness – types of hardness: temporary and permanent – expression and units of hardness – Estimation of hardness of water by complexometric method. Numerical problems. Boiler troubles: Sludge's, scales and Caustic embrittlement. Internal treatment of Boiler feed water – Calgon conditioning – Phosphate conditioning – Colloidal conditioning – Softening of water by ion exchange processes. Potable water and its specifications- Steps involved in the treatment of potable water - Disinfection of potable water by chlorination and Ozonization Desalination of water – Reverse osmosis. Deflouridation - Nalgonda technique.

Unit-II: Electrochemistry and Corrosion **10 hours**

Electrochemistry: Introduction, conductance - specific, equivalent and molar conductance, Electrode-Types of electrodes – Construction and functioning of Standard hydrogen electrode, calomel electrode, Determination of p^H of a solution by using glass electrode. Nernst equation – electrochemical series and its applications. Electrochemical cells: Daniel cell – cell notation, cell reaction and cell EMF – Numerical problems Batteries: Primary (Lithium cell) and secondary batteries (Lead – acid storage battery and Lithium ion battery).
Corrosion: Causes and effects of corrosion – theories of chemical and electrochemical corrosion – mechanism of electrochemical corrosion, Types of corrosion: Galvanic, water-line and pitting corrosion. Factors affecting rate of corrosion, Corrosion control methods- Cathodic protection – Sacrificial anode and impressed current cathodic methods-protective coatings-metallic coatings-hot dipping and cementation.

Unit-III: Spectroscopic techniques and applications **(5 + 4) 9 hours**

Part A: Principles of spectroscopy and applications of electronic spectroscopy. Vibrational and rotational spectroscopy.

Part B: Basic concepts of nuclear magnetic resonance Spectroscopy- chemical shift. Introduction to Magnetic resonance imaging.

Unit-IV: Reaction Mechanism and synthesis of drug molecules **11 hours**

Substitution reactions: Nucleophilic substitution reactions: Mechanism of SN1, SN2 reactions. Electrophilic and nucleophilic addition reactions: Addition of HBr to propene. Markownikoff and anti Markownikoff's additions. Grignard additions on carbonyl compounds. Elimination reactions: Dehydrohalogenation of alkyl halides. Saytzeff rule. Oxidation reactions: Oxidation of alcohols using $KMnO_4$ and chromic acid. Reduction reactions: reduction of carbonyl compounds using $LiAlH_4$& $NaBH_4$. Hydroboration of olefins. Structure, synthesis and pharmaceutical applications of Paracetamol and Aspirin.

Unit-V: Engineering Materials **9 hours**

Cement: Portland cement, its composition, setting and hardening of Portland cement. Special cements-white cement, waterproof cement, high alumina cement, acid resistant cement.
Refractories: Classification and characteristics of refractories, properties and applications of Refractories.

Lubricants: Classification of lubricants with examples – characteristics of a good lubricants-mechanism of lubrication (thick film, thin film and extreme pressure) –properties of lubricants: viscosity, cloud point, pour point, flash point and fire point.
Nanomaterials: Introduction to nanomaterials, preparation of CNT'S by CVD method, properties and applications of CNT'S. General applications of nanomaterials.

Textbooks:

1. Engineering Chemistry by P.C Jain and M.Jain, Dhanpatrai Publishing Company, New Delhi 2010.
2. Engineering Chemistry by Rama Devi, Venkata Ramana Reddy and Rath, Cengage learning, New Delhi. 2016.
3. Fundamentals of Molecular Spectroscopy, by C.N. Banwell.
4. Organic Chemistry: Structure and Function by K.P.C. Volhardt and N.E. Schore, 5th Edition.

References:

1. Engineering Chemistry by Shikha Agarwal, Cambridge University Press, New Delhi 2015.
2. Engineering Chemistry by Shashi Chawla, Dhanpatrai and Company (P) Ltd., New Delhi 2011.

BASIC ELECTRICAL & ELECTRONICS ENGINEERING

I-B.Tech.-II-Sem. **L T P C**
Subject Code: ESC-101 **3 - - 3**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO1	PO2	PO3	PO12
CO1	solve electrical circuits using circuit laws	3	3	2	1
CO2	explain the concepts of single phase and three phase AC circuits	3	3	2	1
CO3	elaborate the working principles and construction of AC and DC machines	3	3	2	1
CO4	evaluate the functioning of electronic devices and their applications	3	3	2	1
CO5	illustrate the configurations and biasing techniques of BJT	3	3	2	1

Unit-I: Introduction to Electrical Circuits **11 hours**

Electrical circuit elements (R, L and C), Types of sources, Source Transformation, ohm's law Kirchhoff's Laws, Network reduction techniques – series, parallel, series-parallel, star-to-delta, delta-to-star transformation, Mesh and Nodal Analysis, Superposition ,Reciprocity, Thevenin's, Norton's and Maximum power transformer Theorems for dc excitation. Simple problems

Unit-II: Single phase & 3-phase AC circuits: **8 hours**

1-phase AC circuits: Introduction, Sinusoidal alternating quantities, RMS values, Average values, form factor and peak factor, AC through RL, RC & RLC circuits.
3-phase AC circuits: Introduction, line voltage, line current relations power equation in star and delta connections of power equation in star & delta connections of 3-phase systems, Advantages of 3-phase systems.

Unit-III: Electrical Machines & P-N Junction Diode **(5 + 5) 10 hours**

Part-A: Electrical Machines: Construction, Working principle and applications of electric dc generator & DC motor, single phase transformer & 3-ph induction motor.

Part-B: P-N Junction Diode: PN Junction diode- V-I Characteristics, Ideal versus Practical, Temperature dependence, Diode as a Switch.

Unit-IV: Rectifiers & Special Purpose Devices **9 hours**

Rectifiers: Diode as a Rectifier - Half Wave Rectifier, Full Wave rectifier with centre tapped transformer, Bridge Rectifier.
Special Purpose Devices: Breakdown Mechanisms in Semi-Conductor Diodes, Zener diode characteristics, Use of Zener diode as simple regulator, Principle of operation and Characteristics of SCR.

Unit-V: Bipolar Junction Transistor (BJT) **10 hours**

Construction, Principle of Operation, Symbol, Amplifying Action, CB, CE, CC configurations. DC & AC load line, stability factor, Need for biasing & biasing techniques.

Textbooks:

1. Circuit Theory (Analysis and synthesis) - A. Chakrabarti, Dhanpat Rai & co (Pvt) Ltd 7th Ed, 2015
2. Electronic Devices and Circuits – R.L. Boylestad and Louis Nashelsky, PEI/PHI, 9th Ed, 2006.
3. Electrical Technology- vol-II B L Theraja, S.Chand publications

References:

1. Introduction to Electronic Devices and Circuits-Rober T. Paynter, Pearson Education.
2. Network Theory by Sudhakar, Shyam Mohan Palli, TMH.
3. Electronic Devices and Circuits – 2nd Edition by Muhammad H.Rashid, Cengage Learning.

DATA STRUCTURES

I-B.Tech.-II-Sem. **L T P C**
Subject Code: ESC-105 **3 - - 3**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO1	PO2	PO3	PO12
CO1	classify different data structures to design efficient programs	3	3	2	2
CO2	identify appropriate sorting and searching techniques	3	2	2	2
CO3	illustrate operations and applications of linear data structures	3	3	2	2
CO4	explain various concepts of non-linear data structures	3	3	2	2
CO5	choose an appropriate hashing technique for a given problem	3	3	2	2

Unit-I: Introduction to Data Structures, Searching and Sorting **11 hours**

Basic concepts - Introduction to data structures, classification of data structures, operations on data structures, abstract data type, algorithms, different approaches to design an algorithm, recursive algorithms.
Searching and Sorting techniques - Linear search and binary search, Bubble sort, selection sort, insertion sort, quick sort, merge sort, and comparison of sorting algorithms.

Unit-II: Linear Data Structures **8 hours**

Stack - Primitive operations, implementation of stacks using Arrays, applications of stacks: arithmetic expression conversion and evaluation.
Queue - Primitive operations; Implementation of queues using Array, Types of Queue: Simple queue, circular queue and priority queue, applications of linear queue.

Unit-III: Linked Lists **(5 + 5) 10 hours**

Part A: Linked lists -Introduction, singly linked list, representation of a linked list in memory, operations on a single linked list: Traversing, searching, insertion, deletion. Applications of linked lists: Polynomial representation and sparse matrix manipulation.

Part B: Types of linked lists - Doubly linked lists, Circular linked lists, linked list representation and operations of Stack, linked list representation and operations of queue.

Unit-IV: Non Linear Data Structures **10 hours**

Trees - Basic Tree Terminologies, binary tree, binary tree representation, array and linked representations, binary tree traversal, application of trees;
Types of Trees – Binary Search Tree: properties and operations, Balanced search trees: AVL tree; M-Way search trees: B tree.

Unit-V: Graphs and Hashing **9 hours**

Graphs- Basic terminologies and representations, graph implementation, graph search and traversal algorithms, Application of graphs.
Hashing and Collision- Introduction, hash tables, hash functions, collisions, applications of hashing.

Textbooks:

1. Mark A. Weiss, “Data Structures and Algorithm Analysis in C”, Pearson, 2nd Edition, 1996.
2. Ellis Horowitz, SatrajSahni, Susan Anderson Freed, “Fundamentals of Data Structures in C”, Universities Press, 2nd Edition 2008.

References:

1. ReemaThareja, “Data Structures using C”, Oxford University Press, 2nd Edition, 2014.
2. S. Lipschutz, “Data Structures”, Tata McGraw Hill Education, 1st Edition, 2008.
3. Tanenbaum, Langsam, Augenstein, “Data Structures Using C”, Pearson, 1st Edition, 2003.

ENGINEERING CHEMISTRY LAB

I-B.Tech.-II-Sem. **L T P C**
Subject Code: BSC-108 **- - 3 1.5**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO4
CO1	determine the hardness in water samples to solve societal problems	3
CO2	estimate the strength of the given solutions	3
CO3	analyze adsorption and viscosity of various fluids	3
CO4	synthesize the various organic compounds used in medical industry	3
CO5	verify and understand the distribution coefficient	3

LIST OF EXPERIMENTS: (PERFORM ANY 10 EXPERIMENTS)

Volumetric Analysis:

1. Determination of total hardness of water by complexo metric method using EDTA.
2. Estimation of ferrous ion by dichrometry.

Instrumentation:

3. Estimation of HCl by Conductometric titrations.
4. Estimation of Acetic acid by Conductometric titrations.
5. Estimation of HCl by Potentiometric titrations.
6. Estimation of Fe^{2+} by Potentiometer using $KMnO_4$.
7. Estimation of copper by colorimetric method

Preparations:

8. Synthesis of Aspirin and paracetamol.

Physical properties:

9. Determination of viscosity of a liquid by using Ostwald's viscometer.
10. Determination of surface tension of a given liquid using stalagmometer.
11. Verification of Freundlich adsorption isotherm-adsorption of acetic acid on charcoal.
12. Determination of partition coefficient of acetic acid between n-butanol and water.

Micro-Projects: Student must submit a report on one of the following Micro–Projects before commencement of second internal examination.

1. Assessment of ground water quality of specified area.
2. Determination of Viscosity of castor oil and groundnut oil.
3. Preparation of petroleum jelly.
4. Preparation of soaps and liquid hand wash.
5. Recycling of waste water.
6. Drinking water purification.
7. Estimation of manganese in pyrolusite.
8. Determination of ferrous ion in cement.
9. Determination of P^H values of various soft drinks.
10. Studies on the effect of metal coupling on corrosion.

References:

1. Engineering Chemistry Lab manual - Department of FED - CMRIT, Hyd.

BASIC ELECTRICAL AND ELECTRONICS ENGINEERING LAB

I-B.Tech.-II-Sem. **L T P C**
Subject Code: ESC-102 **- - 3 1.5**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO4
CO1	design electrical circuits to verify circuit laws and network theorems	3
CO2	find the efficiency of AC and DC machines	3
CO3	verify the V-I characteristics of various electronic devices	3
CO4	determine the efficiency of various rectifiers	3
CO5	illustrate the configurations of Bi-polar junction transistor	3

LIST OF EXPERIMENTS

Note: Minimum of 6 experiments to be conducted from each part.

Part-A: Electrical lab

1. Verification of KVL & KCL.
2. Verification of Superposition theorem & reciprocity theorem.
3. Verification of maximum power transfer theorem. Verification on DC.
4. Experimental determination of Thevenin's Theorem equivalent circuits.
5. Experimental determination of Norton's Theorem equivalent circuits
6. Load Test on Single Phase Transformer (Calculate Efficiency and Regulation)
7. Brake Test on DC Shunt Motor. (To draw the performance curves).
8. Performance characteristics of a 3-phase induction motor.

Part-B: Electronics Lab

9. Forward and reverse bias characteristics of PN-Junction Diode.
10. Zener diode V-I characteristics and Zener diode as voltage regulator.
11. Efficiency of Half wave rectifier.
12. Efficiency of Full wave rectifier.
13. Input & output characteristics of Transistor in CB configuration.
14. Input & output characteristics of Transistor in CE configuration.
15. SCR Characteristics.
16. Design and verification of self-bias circuit.

Micro-Projects: Student must submit a report on one of the following Micro–Projects before commencement of second internal examination.

1. Design a regulated power supply.
2. Design a voltmeter.
3. Design a voltage doubler circuit.
4. Design a line follower using DC motor.
5. Design an automatic fan controller.
6. Design a burglar alarm.
7. Design an automatic irrigation system using soil moisture sensor.
8. Design a Water level indicator using transistor.
9. Design a brake failure indicator.
10. Design an IR transmitter and receiver.

Reference:

1. Basic Electrical & Electronics Engineering Lab manual, FED, CMRIT, Hyd.

DATA STRUCTURES LAB

I-B.Tech.-II-Sem. **L T P C**
Subject Code: ESC-106 **- - 3 1.5**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO4
CO1	implement various searching and sorting techniques	3
CO2	demonstrate basic operations of stack and queues using arrays and linked lists	3
CO3	apply stack data structure to solve various computing problems	3
CO4	demonstrate and apply different methods for traversing graphs	3
CO5	construct binary search tree	3

Week-1: Searching Techniques

Write C programs for implementing the following searching techniques.

a. Linear search. b. Binary search.

Week-2: **Sorting Techniques**

Write C programs for implementing the following sorting techniques to arrange a list of integers in ascending order.

a. Bubble sort. b. Insertion sort. c. Selection sort.

Week-3: **Sorting Techniques**

Write C programs for implementing the following sorting techniques to arrange a list of integers in ascending order.

a. Quick sort. b. Merge sort

Week-4: Implementation of Stack and Queue

a. Write C programs to design and implement Stack and its operations using Arrays.
b. Write C programs to design and implement Queue and its operations using Arrays.

Week-5: **Applications of Stack**

a. Write C program by using Stack operations to convert infix expression into postfix expression.
b. Write C program by using Stack operations for evaluating the postfix expression.

Week-6: **Implementation of Single Linked List**

Write a C program that uses functions to perform the following operations on single linked list.

(i) Creation (ii) insertion (iii) deletion (iv) traversal

Week-7: Implementation of Circular Single Linked List

Write a C program that uses functions to perform the following operations on Circular linked list.

(i) Creation (ii) insertion (iii) deletion (iv) traversal

Week-8: Implementation of Double Linked List

Write a C program that uses functions to perform the following operations on double linked list.

(i) Creation (ii) insertion (iii) deletion (iv) traversal in both ways.

Week-9: Implementation of Stack Using Linked List

Write a C program to implement stack using linked list.

Week-10: Implementation of Queue Using Linked List

Write a C program to implement queue using linked list.

Week-11: Graph Traversal Techniques

Write C programs to implement the following graph traversal algorithms:

a. Depth first search.
b. Breadth first search.

Week-12: Implementation of Binary Search Tree

Write a C program that uses functions to perform the following:

a. Create a binary search tree.
b. Traverse the above binary search tree recursively in pre-order, post-order and in-order.

Micro-Projects: Student must submit a report on one of the following Micro–Projects before commencement of second internal examination.

1. Write a program to create a one dimensional array at run time using a user defined function with user given number of elements into it. Also write separate functions that would allow you to insert and delete elements into/from this array at any arbitrary location.
2. WAP to add and subtract following polynomials $5x^2 – 3xy + y – 2x^2 – y^2+5xy – x + y$ using array.
3. Write a program to create one dimensional - two dimensional and three dimensional arrays in memory and then verify the various address calculation formulae for any arbitrary element of these arrays.
4. Write a program to implement a sparse matrix for the given matrix A.
5. Write a program to implement a queue using stack operations.
6. WAP to convert the following expression to its postfix equivalent using stack
   I. ((A+B)* D) ^ (E – F)
   II. A+ (B * C – (D / E ^ F) * G) * H Where ^: raise to the power
7. Implement a program to evaluate any given postfix expression. Test your program for the evaluation of the equivalent postfix form of the expression (- (A*B)/D) ↑ C+E – F * H * I for A = 1 - B = 2 - D = 3 - C = 14 - E = 110 - F = 220 - H = 16.78 - I = 364.621.
8. WAP to declare a priority queue using two-dimensional array - store elements and priority. Display the elements according to priority from higher to lower.
9. Let $X = (x_1 - x_2 - \dots x_n)$ -$Y = (y_1 - y_2 - \dots y_n)$ be two lists with a sorted sequence of elements. Write a program to merge the two lists together as a single list Z with m + n elements. Implement the lists using array and singly linked list.
10. Write a menu driven program which will maintain a list of mobile phone models - their price - name of the manufacturer – storage capacity etc. - as a doubly linked list. The menu should make provisions for inserting information pertaining to new mobile phone models - delete obsolete models - and update data such as price besides answering queries such as listing all mobile phone models within a price range specified by the user and listing all details given a mobile phone model.

Reference:

1. Data Structures Lab Manual, FED, CMRIT, Hyd.

IT & ENGINEERING WORKSHOP

I-B.Tech.-II-Sem. **L T P C**
Subject Code: ESC-110 **- - 3 1.5**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO1	PO5	PO9	PO10
CO1	install and make use of operating systems and MS office tools	3	3	2	2
CO2	configure fire walls and trouble shoot network connections	3	3	2	2
CO3	apply safety norms while handling the workshop equipment	3	1	3	2
CO4	prepare required models using various engineering trades	3	1	3	2
CO5	make use of various power tools	3	1	3	2

LIST OF EXPERIMENTS

PART-A: IT Workshop

Week-1: WINDOWS OPERATING SYSTEM & DRIVERS INSTALLATION

Windows 7, Windows 8 and Windows 10. LAN, graphics, audio, video and command prompt, commands.

Week-2: NETWORK CONNECTIONS & TROUBLESHOOTING

IP configurations, connecting devices in LAN through bridge, hub, switch; Wi-Fi, Li-Fi and Bluetooth settings; Crimping: Crossover, strait over. Hardware and software troubleshooting.

Week-3: Cyber Hygiene

Introduction to Virus, worms, threats. Threats on internet, Configure the Systems to be internet safe, Install antivirus, personal firewall, block pop-ups, block active x downloads

Week-4: MS Word

Prepare the project document and resume.

Week-5: MS Excel

Spreadsheet basics, modifying worksheets, formatting cells, formulas and functions, sorting and filtering, charts.

Week-6: MS Power Point

Power point screen, working with slides, add content, work with text, working with tables, graphics, slide animation, reordering slides, adding sound to a presentation.

PART-B: Engineering Workshop

Week-7: House Wiring

Power point, light fitting and switches.

Week-8 & 9: Carpentry

Study of tools and joints; Practice in planning, chiseling, marking and sawing; Joints: Cross joint, T joint, Dove tail joint.

Week-10 &11: Fitting

Study of tools, practice in filing, cutting, drilling and tapping; Male and female joints, stepped joints.

Week-12 & 13: Tin Smithy & Black Smithy

Tin smithy:-Preparation of Open scoop, Cylinder, square/rectangular tray, **Black Smithy**:-S-Hook, Square /Hexagonal headed bolt.

Week 14: Demonstration of Power Tools

Bench drilling machine, hand drilling machine, power hacksaw, grinding machine and wood cutting machine.

Micro-Projects: Student must submit a report on one of the following Micro–Projects before commencement of second internal examination.

1. Design monthly budget planner using Ms Excel.
2. Design a Photo album using Ms Power Point.
3. Design of various certificates / brochure using Ms Word.
4. Design a video presentation using open source tools.
5. Preparation of truncated prism.
6. Make Round tee pipe.
7. Design electrical wiring plan for a house.
8. Prepare decorative series lights / dim & bright lighting.
9. Preparation of door stoppers / hinges.
10. Preparation of tool handles.

Reference:

1. IT & Engineering Workshop Lab Manual, FED, CMRIT, Hyd.

TECHNOLOGY EXPLORATION FOR SOCIAL INNOVATION LAB - II
MANDATORY COURSE (NON-CREDIT)

I-B.Tech.-II-Sem. **L T P C**
Subject Code: MC-102 **- - 2 -**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO1 to PO14
CO1	deploy suitable mechanisms	3
CO2	develop platform based innovations	3
CO3	demonstrate data acquisition and analytical skills	3
CO4	execute projects using suitable management techniques	3
CO5	adapt ethics and code of conduct	3

Week 1: Mechanisms: Basic Components of a Mechanism, Degrees of Freedom or Mobility of a Mechanism.

Week 2 & 3: Mechanisms & Examples: 4 Bar Chain, Crank Rocker Mechanism, Slider Crank Mechanism. Example: Simple Robotic Arm building.

Week 4: Platform based development: Introduction to various platform based development (arduino) programming and its essentials.

Week 5 & 6: Introduction to Arduino: Introduction to sensors, transducers and actuators and its interfacing with arduino.

Week 7: Data Acquisition and Analysis: Types of Data, Descriptive Statistics techniques as applicable to different types of data.

Week 8 & 9: Analysis: Types of graphs as applicable to different types of data, Usage of Microsoft Excel tool for descriptive statistics, Data Acquisition(Temperature and humidity) using Sensors. Exporting acquired data to Microsoft Excel and analysis using visual representation.

Week 10: Project Management: Introduction to Agile practices, Significance of team work, Importance of communication in engineering profession.

Week 11: Tools: Checklist, Timeline, Gantt chart, Significance of documentation.

Week 12: Engineering Ethics: Identifying Engineering as a Profession, Significance of Professional Ethics, Code of Conduct for Engineers.

Week13 & 14: Ethical Dilemmas: Identifying Ethical Dilemmas in different tasks of engineering, Applying Moral Theories and codes of conduct for resolution of Ethical Dilemmas.

Reference:

1. A Hand Book on Technology Exploration for Social Innovation - II, FED, CMRIT, Hyd.

II-B.TECH.-I-SEMESTER SYLLABUS

DISCRETE MATHEMATICS

II-B.Tech.-I-Sem. **L T P C**
Subject Code: ESC-210 **3 - - 3**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO1	PO2	PO12
CO1	verify logical statements using connectives	3	3	2
CO2	validate arguments using predicate calculus	3	3	2
CO3	perform various operations with relational algebra	3	3	2
CO4	solve problems using combinatorics	3	3	2
CO5	simplify real-life situations using graph theory	3	3	3

Unit-I: Mathematical logic **10 hours**

Introduction, Statements and Notation, Connectives, Well-formed formulas, tautologies, equivalence of formulas, duality law, functionally complete set of connectives, other connectives.

Unit-II: Predicate Calculus **9 hours**

Normal Forms, Rules of Inference, Automatic theorem proving, Predicate Calculus, Mathematical induction.

Unit-III: Set theory, Relations and Functions **(5 + 5) 10 hours**

Part-A: Set theory: Basic Concepts, Representation of sets, operations on sets, Principles of inclusion and exclusion.

Part-B: Relations and Functions: Relations and ordering, properties of binary relation, functions, partial ordered set, lattice.

Unit-IV: Elementary Combinatory **10 hours**

Basics of Counting, Combinations and Permutations, Enumeration of Combinations and Permutations, Enumerating Combinations and Permutations with Repetitions, Pigeon hole principle

Unit-V: Graph Theory **9 hours**

Basic Concepts, Isomorphism and Sub-graphs, Planar Graphs, Euler's Formula, Multi-graphs and Euler Circuits, Hamiltonian Graphs, Chromatic Numbers, The Four-Color Problem.

Textbooks:

1. Discrete Mathematical Structures with Applications to Computer Science: J. P. Tremblay, R. Manohar, TMH, 1st Edition.
2. Discrete Mathematics for Computer Scientists & Mathematicians: Joe l. Mott, Abraham Kandel, Teodore P. Baker, PHI, 2nd Edition.

References:

1. Discrete and Combinatorial Mathematics - an applied introduction: Ralph. P. Grimald, Pearson education, 5th Edition.
2. Discrete Mathematical Structures: Thomas Kosy, TMH.

DIGITAL LOGIC DESIGN AND COMPUTER ORGANIZATION

II-B.Tech.-I Sem. **L T P C**
Subject Code: ESC-211 **3 - - 3**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO1	PO2	PO3	PO6	PO12
CO1	interpret number systems and logical functions using K-Maps	3	3	2	2	2
CO2	design various combinational and sequential circuits	3	3	2	2	3
CO3	illustrate computer components and function of 8086 processor	3	3	2	2	2
CO4	analyze arithmetic operations and I/O operations	3	3	2	2	3
CO5	distinguish various memories and pipelining operations	3	3	2	2	3

Unit-I **10 hours**

Binary Systems: Digital Systems, Binary Numbers, Number base conversions, Octal, Hexadecimal numbers, signed binary numbers, complements, floating point representation, binary codes.
Boolean algebra and logic gates: Basic Definitions, Basic theorems and properties of Boolean algebra, Boolean functions, canonical and standard forms, Digital Logic Gates, The K-Map Method, Three-Variable Map, Four-Variable Map, sum of products, product of sums simplification, Don't care conditions, NAND and NOR implementation.

Unit-II **10 hours**

Combinational Circuits: Design Procedure, Combinational circuit for different code converters, Binary Adder – Subtractor, Decoders, Encoders, Multiplexers and De-Multiplexers.
Sequential circuits: Synchronous sequential Circuits, Latches, Flip-flops, Registers, ripple counters, synchronous counters, ring counter, Johnson counter.

Unit-III **(4 + 5) 9 hours**

Part-A: Basic Computer Organization and Design: Instruction codes, computer registers, computer instructions, timing and control, instruction cycle, micro program example.

Part-B: Central Processing Unit: The 8086 processor architecture, register organization, physical memory organization, general bus operation, instruction formats, addressing modes, 8086 instruction set and assembler directives, Assembly Language Programming (ALP).

Unit-IV **10 hours**

Computer Arithmetic: Introduction, addition and subtraction, multiplication algorithms, division algorithms.
Input-Output Organization: Peripheral devices, input-output interface, asynchronous data transfer, modes of transfer, priority interrupt, direct memory access, input - output processor.

Unit-V **9 hours**

Memory: Memory hierarchy, RAM, ROM, associative memory, and cache memory.
Pipeline Processing: Parallel processing, pipelining, arithmetic pipeline, instruction pipeline.

Textbooks:

1. Digital Design, M. Morris Mano, M.D.Ciletti, 5th Edition, Pearson.
2. Computer System Architecture, M.Morris Mano, 3rd Edition, Pearson.
3. Advanced Microprocessors and Peripherals, K. M. Bhurchandi, A.K Ray, 3rd Edition, TMH.

References:

1. Fundamentals of Logic Design, C. H. Roth, L. L. Kinney, 7th Edition, Cengage Learning.
2. Microprocessors and Interfacing, D V Hall, SSSP Rao, 3rd Edition, TMH.
3. Carl Hamacher, Zvonko Vranesic, Safwat Zaky: Computer Organization, 5th Edition, TMH, 2002.

PYTHON PROGRAMMING

II-B.Tech.-I-Sem. **L T P C**
Subject Code: CS-PCC-211 **3 - - 3**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO1	PO2	PO3	PO12
CO1	perceive the fundamentals of python programming	3	3	2	2
CO2	develop programs using control statements	3	3	2	2
CO3	analyze the programming performances using functions	3	3	2	2
CO4	make use of collections in python programming	3	3	3	2
CO5	design classes and build error-free codes	3	3	3	3

Unit-I: Introduction **10 hours**

Introduction to Python, Installing Python. How a Program Works, Using Python, Program Development Cycle, Input and Output, Comments, Variables, Data types, Reading Input from the Keyboard, Displaying Output with the Print Function, Performing Calculations, Operators, Type conversions, Expressions.

Unit-II: Control Flow, Functions and Modules **10 hours**

Control Flow Statements: Decision Structures and Boolean Logic: if, if-else, if-elif-else Statements, Nested Decision Structures, Repetition Structures: Introduction, while loop, for loop, Input Validation Loops, Nested Loops, control statements-break, continue, pass.

Functions and Modules: Introduction, Defining and Calling a Void Function, Designing a Program to Use Functions, Local Variables, Passing Arguments to Functions, Global Variables and Global Constants, Value-Returning Functions-Generating Random Numbers, The math Module, Storing Functions in Modules.

Unit-III: Strings and Collections **(4 + 5) 9 hours**

Part-A: Strings: Accessing Characters and Substrings in a String, String Methods, Basic String Operations, String Slicing, Testing, Searching, Comparing and Manipulating Strings.

Part-B: Collections: Lists, Introduction to Lists, List slicing, Finding Items in Lists with the in Operator, List Methods and Useful Built-in Functions, Copying Lists, Processing Lists, Two-Dimensional Lists, Tuples, Tuple methods. Sets, Operations on Sets, Dictionaries and its methods.

Unit-IV: Classes and Exceptions **10 hours**

Design with Classes: Classes and Objects, Classes and Functions, Classes and Methods, Working with Instances, Inheritance and Polymorphism. Object-Oriented Programming: Procedural and Object-Oriented Programming, Classes, techniques for Designing Classes.

Exceptions: Difference between an error and Exception, Handling Exception, try except block, Raising Exceptions, User Defined Exceptions.

Unit-V: GUI Programming **9 hours**

Graphical User Interfaces: Behavior of terminal based programs and GUI-based programs, Coding simple GUI-based programs, other useful GUI resources. GUI Programming: Graphical User Interfaces, Using the Tkinter Module, Display text with Label Widgets, Organizing Widgets with Frames, Button Widgets and Info Dialog Boxes, Getting Input with Entry Widget, Using Labels as Output Fields, Radio Buttons, Check Buttons.

Textbooks:

1. Kenneth A. Lambert, The Fundamentals of Python: First Programs, 2011, Cengage Learning.
2. Think Python First Edition, by Allen B. Downey, Orielly publishing.

References:

1. Introduction to Computation and Programming Using Python. John V. Guttag, The MIT Press.
2. James Payne, Beginning Python using Python 2.6 and Python 3, Wrox publishing.

OOP THROUGH JAVA

II-B.Tech.-I-Sem. **L T P C**
Subject Code: CS-PCC-212 **3 1 - 4**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO1	PO2	PO3	PO12
CO1	write simple java programs using OOP concepts	3	3	2	2
CO2	interpret programs using the concepts of inheritance, polymorphism, packages and interfaces	3	3	2	2
CO3	build efficient and error free codes using the concepts of multithreading and exception handling	3	3	3	3
CO4	design GUI programs using the concepts of AWT and event handling	3	3	3	2
CO5	develop real-time applications using applets and swings	3	3	3	3

Unit - I: Java Basics **10 hours**

Java Basics: History of Java, Java buzzwords, data types, variables, scope and life time of variables, arrays, operators, expressions, control statements, type conversion and casting, simple java programs, concepts of classes, objects, constructors, methods, access control, this keyword, garbage collection, overloading methods, parameter passing, recursion, exploring String class.

Unit - II: Inheritance, Polymorphism, Packages and Interfaces **9 hours**

Inheritance and Polymorphism: Types of inheritance, member access rules, super uses, using final with inheritance, the object class and its methods, Method overriding, dynamic binding, abstract classes and methods.
Packages and Interfaces: Defining, Creating and Accessing a Package, understanding CLASSPATH, importing packages, Differences between classes and interfaces, defining an interface, implementing interface, applying interfaces, variables in interface and extending interfaces.

Unit - III: Exception handling and Multithreading **(5 + 5) 10 hours**

Part-A: Exception handling: Concepts of exception handling, benefits of exception handling, exception hierarchy, usage of try, catch, throw, throws and finally, built in exceptions, creating own exception sub classes.

Part-B: Multithreading: Differences between multi-threading and multitasking, thread life cycle, creating threads, thread priorities, synchronizing threads, inter thread communication.

Unit - IV: Event handling and AWT **9 hours**

Event Handling: Events, Event sources, Event classes, Event Listeners, Delegation event model, handling mouse and keyboard events, Adapter classes.
AWT: class hierarchy, user interface components- labels, buttons, scrollbars, text components, checkbox, checkbox groups, choices, lists panels – scroll pane, dialogs, menu bar, Layout Managers- Flow Layout, Border Layout, Grid Layout, Card Layout, Grid Bag Layout.

Unit - V: Applets and Swings **10 hours**

Applets: Concepts of Applets, differences between applets and applications, life cycle of an applet, types of applets, creating applets, passing parameters to applets.
Swings: Introduction, limitations of AWT, MVC architecture, components, containers, exploring swing- JApplet, JFrame and JComponent, ImageIcon, JLabel, JTextfield, JButton, JCheckbox, JList, JRadiobutton, JComboBox, JTabbedPane, JScrollPane.

Textbooks:

1. Java the complete reference, 8th Editon, Herbert Schildt, TMH.

References:

1. Java How to Program, H. M. Dietel and P. J. Dietel, 6th Edition, Pearson Education/PHI.
2. Introduction to Java programming, Y. Daniel Liang, Pearson Education.

DATABASE MANAGEMENT SYSTEMS

II-B.Tech.-I-Sem. **L T P C**
Subject Code: CS-PCC-213 **3 - - 3**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO1	PO2	PO3	PO12
CO1	design simple databases using basic concepts of database architectures	3	3	3	2
CO2	construct databases using ER Modelling	3	3	3	2
CO3	formulate SQL queries to interact with database	3	3	3	2
CO4	apply normalization on database to eliminate redundancy	3	3	3	2
CO5	illustrate the mechanisms of transaction management, concurrency control and recovery system	3	3	3	2

Unit – I: Introduction to Database Systems **11 hours**

Introduction: Introduction and applications of DBMS, Purpose of data base, History of database, Database architecture - Abstraction Levels, Data Independence, Database Languages, Database users and DBA.
Introduction to Database Design: Database Design Process, Data Models, ER Diagrams - Entities, Attributes, Relationships, Constraints, keys, Generalization, Specialization, Aggregation, Conceptual design with the E-R model for large Enterprise.

Unit – II: Relational Model, Algebra and Calculus **9 hours**

The Relational Model: Introduction to the relational model, Integrity constraints over relations, Enforcing integrity constraints, Querying relational data, Logical database design: E-R to relational, Introduction to views, Destroying/altering tables and views.
Relational Algebra and Calculus: Relational algebra operators, relational calculus - Tuple and domain relational calculus.

Unit – III: SQL **(5 + 4) 9 hours**

Part-A: Basics of SQL, DDL, DML, DCL, structure – creation, alteration, defining constraints – Primary key, foreign key, unique, not null, check, in operator, Functions - aggregate functions, Built-in functions – numeric, date, string functions, set operations.

Part-B: Sub-queries, correlated sub-queries, Use of group by, having, order by, join and its types, Exist, Any, All, view and its types. Transaction control commands – Commit, Rollback, save point, cursors, stored procedures, Triggers.

Unit – IV: Schema Refinement and Normal Forms **9 hours**

Schema Refinement and Normal Forms: Introduction to schema refinement, functional dependencies, reasoning about FDs. Normal forms: 1NF, 2NF, 3NF, BCNF, Multi valued dependency-forth normal form-Join dependency-fifth normal form, Properties of decomposition, dependency preservation, lossless design, normalization, schema refinement in database design.

Unit – V: Transactions Management, Concurrency Control and Recovery System **10 hours**

Transactions Management: Transaction concept, transaction state, implementation of atomicity and durability, concurrent executions, Serializability, testing for Serializability, recoverability, implementation of isolation.
Concurrency Control and Recovery System: Concurrency control, lock based protocols, time-stamp protocols, validation protocols, Crash Recovery, Remote backup system.
Overview of Storage and Indexing: Tree structured indexing - intuition for tree indexes, indexed sequential access method (ISAM), B+ Trees - a dynamic tree structure.

Textbooks:

1. Raghurama Krishnan, Johannes Gehrke, Database Management Systems, 3rd Edition, TMH.
2. Abraham Silberschatz, Henry F.Korth, S.Sudarshan, Database System Concepts, 5th Edn, TMH.

PYTHON PROGRAMMING LAB

II-B.Tech.-I-Sem. **L T P C**
Subject Code: CS-PCC-214 **- - 2 1**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO4	PO5
CO1	write simple programs using python	3	3
CO2	develop programs using control statements	3	3
CO3	implement functions in programming	3	3
CO4	make use of lists and tuples in python	3	3
CO5	demonstrate file I/O operations	3	3

LIST OF EXPERIMENTS

Week 1: a) Write a Python program to compute the GCD of two numbers.
b) Write a Python program to find the maximum among a list of numbers.
c) Write a Python program to display first "N" Fibonacci sequence.

Week 2: a) Write a Python program to display first "N" prime numbers.
b) Write a Python program to find the factorial value of a given number.
c) Write a Python program to check whether the given string is palindrome or not.

Week 3: a) Write a program to compute distance between two points taking input from the user (Pythagorean Theorem)
b) Write a program add.py that takes 2 numbers as command line arguments and prints its sum.
c) Write a Python program to read filename as command line argument and displays the character count, word count and line count.

Week 4: a) Using a for loop, write a program that prints out the decimal equivalents of 1/2, 1/3, 1/4, . . . , 1/10.
b) Write a Python program to simulate simple Calculator.
c) Write a Python program to copy contents from one file to another file.

Week 5: a) Write a program to count the numbers of characters in the string and store them in a dictionary data structure.
b) Write a program to use split and join methods in the string and trace a birthday with a dictionary data structure.

Week 6: a) Write a Python program to compute the matrix multiplication.
b) Write a Python program to find the most frequent words in a text read from a file.
c) Write a program to print each line of a file in reverse order.

Week 7: a) Write a Python program to perform Linear Search.
b) Write a Python program to perform Binary Search.

Week 8: a) Write a Python program to implement Insertion sort.
b) Write a Python program to implement Merge Sort.

Week 9: a) Write a function nearly equal to test whether two strings are nearly equal. Two strings a and b are nearly equal when a can be generated by a single mutation on b.
b) Find mean, median, mode for the given set of numbers in a list.
c) Write two functions **dups** to find all duplicates in the list and **unique** to find all the unique elements of a list.

Week 10: a) Write a Python function to compute "N"/0 and use try/except to catch the exceptions.
b) Write a Python program to define a custom exception class which takes a string message as attribute.

Week 11: a) Write a Python program which accepts a sequence of comma-separated numbers from user and generate a list and a tuple with those numbers.
b) Write a function cumulative product to compute cumulative product of a list of numbers.
c) Write a function reverse to reverse a list without using the reverse function.

Micro-Projects: Student must submit a report on one of the following Micro–Projects before commencement of second internal examination.

1. Install packages requests, flask and explore them using pip.
2. Write a python script to fetch the content(s) from the web pages. (Hint: use Wiki).
3. Write a python script that serves HTTP Response and HTML Page on request.
4. Create a class for ATM and implement its functions.
5. Create several modules and imports these modules in a new program.
6. Create a class for Library and implement its functions.
7. Write a python script for reading and writing data from local files. (.txt,.csv,.xls, .json, etc)
8. Write a python script for reading data from remote files.
9. Demonstrate the working of pandas data structures: Series and Data Frames.
10. Develop an application to access database with DB-API2.

Reference:

1. Python Programming Lab Manual, Department of CSE, CMRIT, Hyd.

OOP THROUGH JAVA LAB

II-B.Tech.-II-Sem. **L T P C**
Subject Code: CS-PCC-215 **- - 3 1.5**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO4	PO5
CO1	write, compile and execute simple java programs	3	3
CO2	develop programs using inheritance, polymorphism, packages and Interfaces	3	3
CO3	demonstrate multithreading and exception handling mechanisms	3	3
CO4	design GUI using the concepts of AWT and event handling	3	3
CO5	build real-time applications using applets and swings	3	3

Note: Use Eclipse or Netbeans platform and get acquainted with the various menus. Create a test project, add a test class and run it. See how you can use auto suggestions and auto fills. Try code formatter and code refactoring like renaming variables, methods and classes. Try debugging step by step with a small program of about 10 to 15 lines which contains at least one if else condition and a for loop.

Week 1:

a) Write a Java program that prints all real solutions to the quadratic equation $ax^2 + bx + c = 0$. Read in a, b, c and use the quadratic formula. If the discriminate b^2-4ac is negative, display a message stating that there are no real solutions.
b) Write a Java program that prompts the user for an integer and then prints out all prime numbers up to that integer. (use Scanner class to read input)

Week 2:

a) Write a Java program to create a Student class with following fields
   i. Hall ticket number
   ii. Student Name
   iii. Department
   Create 'n' number of Student objects where 'n' value is passed as input to constructor.
b) Write a Java program to demonstrate string comparison using == and equals method.

Week 3:

a) Write a Java program that checks whether a given string is a palindrome or not.
   Ex: MADAM is a palindrome.
b) Write a Java program for sorting list of names. Read input from command line.
c) Write a Java program to make frequency count of words in a given text.

Week 4:

a) Write a java program to demonstrate static member, static method and static block.
b) Write a java program todemonstrate method overloading and method overriding.
c) Write a java program to demonstrate finals, blank finals, final methods, and final classes
d) Write a java program to demonstrate synchronized keyword.

Week 5:

a) Write a java program to implement multiple inheritance.
b) Write a program to demonstrate packages.
c) Java program to demonstrate abstract usage
d) Write a Java program that creates a user interface to perform integer divisions.

Week 6:

a) Write a java program to crate user defined exception class and test this class.
b) Java program that implements a multi-thread application

Week 7:

Java program to demonstrate MouseListener, MouseMotionListener and KeyListener

Week 8:

a) Applet that displays a simple message
b) Applet to compute factorial value

Week 9:

a) Java program that simulates a traffic light
b) Java program to demonstrate Hashtable usage

Week 10:

a) Java program to display the table using Labels in Grid Layout
b) Java program that works as a simple calculator

Week 11:

Develop Swing application which uses JList, JTree, JTable, JTabbedPane and JScrollPane.

Micro-Projects: Student must submit a report on one of the following Micro–Projects before commencement of second internal examination.

1. Design job application form using swing / applet
2. Develop attendance management system
3. Implement social media System
4. Implement Library management System.
5. Design New Patient Registry Management System
6. Develop Scientific Calculator
7. Demonstrate login validation using rich GUI components
8. Create a package which has classes and methods to read Student Admission details.
9. Event handler to display cut/copy/paste events using swings
10. Demonstrate Graphics class

Reference:

1. OOP through JAVA Lab Manual, Department of CSE, CMRIT, Hyd.

DATABASE MANAGEMENT SYSTEMS LAB

II-B.Tech.-I-Sem. **L T P C**
Subject Code: CS-PCC-216 **- - 2 1**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO4	PO5
CO1	construct databases using SQL commands	3	3
CO2	apply normalization techniques to eliminate redundancy	3	3
CO3	design a database schema for a given domain	3	3
CO4	solve queries based on joins, nested queries and aggregate functions	3	3
CO5	execute PL / SQL programs for a given application	3	3

Note: Take any database application and follow up the following experiments and make expertise in different case studies.

LIST OF EXPERIMENTS

Week - 1:

Student should decide on a case study, analyze and then formulate the problem Statement by populating objects (entities) and their role.

Week - 2:

Conceptual Designing using ER Diagrams (Identifying entities, attributes, keys and relationships between entities, cardinalities, generalization, specialization etc.)

Note: Student is required to submit a document by drawing ER Diagram to the Lab teacher.

Week - 3:

Converting ER Model to Relational Model (Represent entities and relationships in Tabular form, Represent attributes as columns, identifying keys)

Note: Student is required to submit a document showing the database tables created from ER Model.

Week - 4:

Normalization -To remove the redundancies and anomalies in the above relational tables, Normalize up to Third Normal Form

Week - 5:

Creation of Tables using SQL- Overview of using SQL tool, Data types in SQL, **Practicing DDL Commands-**Creating Tables (along with Primary and Foreign keys), Altering Tables and Dropping Tables.

Week - 6:

Practicing DML commands - Insert, Select, Update, Delete of Tables.

Week - 7:

Practicing Queries using ANY, ALL, IN, EXISTS, NOT EXISTS, UNION, INTERSECT, EXCEPT, CONSTRAINTS etc.

Week - 8:

Practicing Sub queries (Nested, Correlated) and Joins (Inner, Outer and Equi).

Week - 9:

Practice Queries using Aggregate Operators - COUNT, SUM, AVG, MAX, MIN. GROUP BY, HAVING, VIEWS Creation and Dropping.

Week - 10:

Practicing on Triggers - creation of trigger, Insertion using trigger, Deletion using trigger, Updating using trigger

Week - 11:

Procedures- Creation of Stored Procedures, Execution of Procedure, and Modification of Procedure.

Week - 12:

Cursors - Declaring Cursor, Opening Cursor, Fetching the data, closing the cursor.

Micro-Projects: Student must submit a report on one of the following Micro–Projects before commencement of second internal examination.

1. Design and implement University Database for External examination schedule.
2. Construct an E-R diagram for a motor-vehicle sales company.
3. Design and implement relational database for University Registrar's office.
4. Take any schema and convert in to 1st Normal Form and 2nd Normal Form.
5. Design and implement a schema for Life Insurance Company.
6. Design an E-R diagram for the Library Management system.
7. Demonstrate various built-in functions of SQL with suitable examples.
8. Demonstrate various operators in SQL with suitable examples.
9. Perform sub-queries, nested Queries and join concepts in SQL with suitable examples.
10. Analyze tuple relational calculus and domain relational calculus for suitable queries.

Reference:

1. Database Management Systems Lab Manual, Department of CSE, CMRIT, Hyd.

DIGITAL LOGIC DESIGN AND COMPUTER ORGANIZATION LAB

II-B.Tech.-I-Sem. **L T P C**
Subject Code: ESC-212 **- - 3 1.5**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO4	PO5
CO1	design logic gates using NAND and NOR gates	3	3
CO2	construct the combinational and sequential logic circuits	3	3
CO3	solve simple problems using ALP	3	3
CO4	implement string handling operations using ALP	3	3
CO5	develop programs using procedures and macros	3	3

PART-1: Exercises in Digital Logic Design

1. Implement Logic gates using NAND and NOR gates
2. Design and implement Full adder using gates
3. Design and implement 4:1 MUX, 8:1MUX using gates/ICs.
4. Design and implement 3 to 8 decoder using gates
5. Design and implement 4 bit comparator using gates/IC
6. Design and implement 4bit shift register using Flip flops
7. Design and implement Decade counter

PART-2: Exercises in 8086 Assembly Language Programming (ALP)

Write an Assembly Language Programs (ALP) for the following using GNU Assembler / Microsoft Assembler.

1. Write an ALP to evaluate the expressions:

   i) a = b +c– d*e
   ii) z= x * y+ w – v + u / k

2. Write an ALP to take N numbers as input. And do the following operations on them.

   a. Arrange in ascending order
   b. Arrange in descending order

3. Write an ALP to take N numbers as input and find maximum, minimum and average.

4. Write an ALP to take a string of as input and do the following operations on it.

   a. Find the length
   b. Check is it Palindrome or not

5. Write an ALP to take a string as input and do the following Operations on it

   a. Find the Armstrong number
   b. Find the Fibonacci series for n numbers

6. Write an ALP to implement the following operations as procedures and call from the Main Procedure.

   a. Find the Armstrong number
   b. Find the Fibonacci series for n numbers

7. Write an ALP to find the factorial of a given number as a Procedure and call from the main program which display the result.

Micro-Projects: Student must submit a report on one of the following Micro–Projects before commencement of second internal examination.

1. Implement 4 x 1 multiplexer using PLA.
2. Implement full Subtractor (hint: use half Subtractor).
3. Design a logic circuit that has three inputs A, B and C whose output will be HIGH only when a majority of the inputs are HIGH.
4. Design a circuit for detecting equality of two bit binary numbers.
5. Write an ALP to evaluate the following expressions:
   i) a = b * c / d - e ii) z= x / y + w * u - v
   a. Considering 8-bit and 16 bit binary numbers.
   b. Considering 2 digit and 4 digit BCD numbers.
6. Write an ALP to convert given lower case letter to upper case letter (using AND Logic instruction).
7. Write an ALP to create a table consisting of roll number, name. Input a roll number through keyboard and then display the corresponding name by searching from the table. Display appropriate message, if roll number does not exists.
8. Write an ALP to compare two strings. (Use subroutine)
9. Write an ALP to read today's date and time through keyboard and then display the corresponding day and month.
10. Write an ALP to count the number of 1's and 0's in given binary number.

Reference:

1. Digital Logic Design and Computer Organization Lab Manual, Department of CSE, CMRIT, Hyd.

GENDER SENSITIZATION LAB
(MANDATORY COURSE- NON- CREDIT)

II-B.Tech.-I-Sem. **L T P C**
Subject Code: MC-201 **- - 2 -**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO9	PO12
CO1	identify gender issues in contemporary India	2	3
CO2	explain gender roles, spectrum, relationships etc	3	2
CO3	analyze gender issues related to sexual harassment and violence	3	3
CO4	assess gender and human rights	3	3
CO5	adapt to the societal need to end prejudices and achieve gender equality	2	3

Unit-I: Understanding Gender **6 hours**

Introduction: Definition of Gender-Basic Gender Concepts and Terminology-Exploring Attitudes towards Gender-Construction of Gender-Socialization: Making Women, Making Men - Preparing for Womanhood. Growing up Male. First lessons in Caste.

Unit-II: Gender Roles and Relations **6 hours**

Two or Many? -Struggles with Discrimination-Gender Roles and Relations-Types of Gender Roles-Gender Roles and Relationships Matrix-Missing Women-Sex Selection and Its Consequences-Declining Sex Ratio. Demographic Consequences-Gender Spectrum: Beyond the Binary.

Unit-III: Gender and Labour **(4 + 4) 8 hours**

Part-A: Division and Valuation of Labour-Housework: The Invisible Labor- "My Mother doesn't Work." "Share the Load."-Work: Its Politics and Economics.
Part-B: Fact and Fiction. Unrecognized and Unaccounted work. Gender Development Issues-Gender, Governance and Sustainable Development-Gender and Human Rights-Gender and Mainstreaming.

Unit-IV: Gender - Based Violence **6 hours**

The Concept of Violence- Types of Gender-based Violence-Gender-based Violence from a Human Rights Perspective-Sexual Harassment: Say No! -Sexual Harassment, not Eve-teasing- Coping with Everyday Harassment- Further Reading: "*Chupulu".*
Domestic Violence: Speaking OutIs Home a Safe Place? -When Women Unite [Film]. Rebuilding Lives. Thinking about Sexual Violence Blaming the Victim-"I Fought for my Life".

Unit-V: Gender and Culture **6 hours**

Gender and Film-Gender and Electronic Media-Gender and Advertisement-Gender and Popular Literature- Gender Development Issues-Gender Issues - Gender Sensitive Language-Gender and Popular Literature - Just Relationships: Being Together as Equals.
Mary Kom and Onler. Love and Acid just do not Mix. Love Letters. Mothers and Fathers. Rosa Parks - The Brave Heart.

Text Book:

1. Towards a world of equals, A bilingual textbook on gender, Telugu Akademi, Hyderabad.

Note: Classes will consist of a combination of activities: dialogue-based lectures, discussions, collaborative learning activities, group work and in-class assignments. Apart from the above prescribed book, Teachers can make use of any authentic materials related to the topics given in the syllabus on "Gender".

ASSESSMENT AND GRADING: (1) Discussion & Classroom Participation: 20%
(2) Project/Assignment: 30% (3) End Term Exam: 50%

II-B.TECH.-II-SEMESTER SYLLABUS

NUMERICAL AND STATISTICAL METHODS

II-B.Tech.-II-Sem. **L T P C**
Subject Code: BSC-201 **3 1 - 4**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO1	PO2	PO12
CO1	solve transcendental, linear and non-linear system of equations using numerical methods	3	2	1
CO2	find the numerical solutions for first order initial value problems and integrals	3	2	1
CO3	differentiate among random variables involved in the probability models	3	2	1
CO4	test hypothesis for small and large samples	3	2	1
CO5	identify the correlation coefficients, strength, direction and significance level	3	2	1

Unit-I: Algebraic and transcendental Equations and Curve Fitting **9 hours**

Algebraic and transcendental Equations: Introduction, Bisection Method, Method of False position, Iteration method and Newton Raphson method.
Curve Fitting: Fitting a linear, second degree, exponential and power curve by method of least squares.

Unit-II: Numerical Integration and Solution of Ordinary Differential Equations **9 hours**

Numerical Integration: Trapezoidal rule, Simpson's $1/3^{rd}$ and $3/8^{th}$ rule.
Solution of Ordinary Differential equations: Taylor's series, Picard's method of successive approximations, Euler's method, Runge - Kutta method (second and fourth order)

Unit- III: Probability, Random variables and Distributions **(6 + 4) 10 hours**

Part A: Probability & Random variables: Random variables, discrete and continuous random variables, probability distribution function, probability density function and mathematical expectations.
Part B: Distributions: Binomial, Poisson and Normal distributions.

Unit – IV: Sampling Theory and Test of Hypothesis for Large Samples **12 hours**

Sampling Theory: Introduction, Population and samples, Sampling distribution of means and variances
Test of Hypothesis For Large Samples : Introduction, Hypothesis, Null and Alternative Hypothesis, Type I and Type II errors, Level of significance, One tail and two-tail tests, Tests concerning one mean and proportion, two means-proportions and their differences. Point estimation, Maximum error of estimate and Interval estimation.

Unit – V: Test of Hypothesis for Small Samples **8 hours**

Test of Hypothesis for Small Samples: t - Test, F-Test and χ^2- Test for goodness of fit and independence of attribute. Point estimation, maximum error of estimate and Interval estimation. Correlation and regression-Rank Correlation.

Textbooks:

1. Introductory Methods of Numerical Analysis by S. S. Sastry, PHI Learning Pvt. Ltd.
2. Fundamentals of Mathematical Statistics by S. C. Gupta & V. K. Kapoor, S. Chand Publishers.

References:

1. Numerical Methods for Scientific and Engineering Computation by M.K.Jain, S.R.K.Iyengar and R.K.Jain, New Age International Publishers.
2. Probability and Statistics for Engineers and Sciences by Jay L. Devore, Cengage Learning.
3. Mathematics for engineers and scientists by Alan Jeffrey, 6^{th} Edition, CRC press.

FORMAL LANGUAGES AND AUTOMATA THEORY

II-B.Tech.-II-Sem. **L T P C**
Subject Code: CS-PCC-221 **3 - - 3**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO1	PO2	PO3	PO12
CO1	explain the concepts of formal languages and finite automata techniques	3	3	3	2
CO2	design various finite automata and its conversion	3	3	3	2
CO3	build finite automata for different regular expressions and languages	3	3	3	2
CO4	summarize context free grammar and construction of PDA	3	3	3	2
CO5	construct turing machines and analyze undecidability	3	3	3	2

Unit-I **11 hours**

Formal Language Theory: Symbols, Alphabets and Strings, Operations on Strings, Formal Languages, Operations on Languages, Grammar Hierarchy: Chomsky Hierarchy of languages.
Fundamentals of Automata: Finite State Machine, Components of Finite State Automata, Elements of Finite State System.

Unit-II **9 hours**

Finite Automata: Introduction, Deterministic Finite Automata (DFA), Design of DFAs, Non Deterministic Finite Automata (NFA), Non-Deterministic Automata with Є-moves, Design of NFA-Є's, NFA Versus DFA.
Equivalent Automata: Equivalent Finite-State Automata, Equivalence of NFA/NFA- ε and DFA, Equivalence of NFA, with Є moves to NFA, without Є – moves, Minimization of Finite Automata

Unit-III **(5 + 5) 10 hours**

Part-A: Regular Expressions and Languages: Regular languages, Regular expressions, Components of Regular Expression, Properties of Regular Expressions.

Part-B: Finite Automata and Regular Expressions: Properties of Regular Sets and Regular Languages, Arden's Theorem, Equivalence of Finite Automata and Regular Expressions, Equivalence of DFA and Regular Expression.

Unit-IV **10 hours**

Context-Free Grammars and Context-Free Languages: Ambiguous and Unambiguous Grammars, Simplification of Context-Free Grammars, Normal Forms for Context Free Grammars, Chomsky Vs. Greibach Normal Form, Application of Context- Free Grammars.
Push down Automata: Push down automata, definition, model, acceptance of CFL, Acceptance by final state and acceptance by empty state and its equivalence. Equivalence of CFL and PDA, interconversions.

Unit-V **9 hours**

Turing Machine: Introduction, Components of Turing Machine, Elements of TM, Moves of a TM, Language accepted by a TM , Design of TM's, Types of Turing machines (proofs not required), Chomsky hierarchy of Languages, undecidable Problems, NP and P Problems.

Text Books:

1. Introduction to Automata Theory Languages and Computation, Hopcroft H.E. and Ullman J. D. Pearson Education.
2. Theory of Computer Science automata, languages and computations, K.L.P.Mishra, N.Chandrashekaran, PHI Publications.

References:

1. Introduction to Theory of Computation – Sipser 2nd Edition Thomson.
2. A Text Book on Automata Theory, Nasir S.F.B, P.K. Srimani, Cambridge university Press.

SOFTWARE DESIGN AND ENGINEERING

II-B.Tech.-II-Sem. **L T P C**
Subject Code: CS-PCC-222 **3 - - 3**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO2	PO3	PO8	PO11	PO12	PO13
CO1	identify & analyze software requirements and prepare SRS	3	3	3	3	3	3
CO2	design a system, component or process to meet the needs	3	3	3	3	3	3
CO3	make use of UML diagrams in software design	3	3	3	3	3	3
CO4	analyze various testing techniques by using various metrics	3	3	3	3	3	3
CO5	adapt risk management strategies to assure software quality	3	2	3	3	3	3

Unit-I **10 hours**

Introduction to Software Engineering: Evolving role of Software, Software engineering-A layered technology, The Capability Maturity Model Integration (CMMI), Process Assessment.
Process Models: The water fall model, incremental process models, evolutionary process models, specialized process models, the unified process.
Software Requirements: Functional and Non functional requirements, User requirements, System requirements, the software requirements document. **Requirements Engineering Process:** Feasibility studies, requirements elicitation and analysis, requirements validation, requirements management.

Unit-II **9 hours**

Design engineering: Design process and design quality, design concepts, the design model, Creating an Architectural Design: Software architecture, data design, architectural styles and patterns, architectural design.
Modeling component-level design & performing user interface design: Designing Class based components, conducting component level design, Golden rules, user interface analysis and design.

Unit-III **(5 + 5) 10 hours**

Part-A: Introduction to UML: Principles of modelling, conceptual model of the UML, **Class and Object Diagrams**: terms, concepts, modeling techniques.
Part-B: Behavioral Modeling: Interaction diagrams, use case diagrams, activity diagrams**,** state chart diagram, component and deployment diagrams.

Unit-IV **10 hours**

Testing Strategies: A strategic approach to software testing, strategies for conventional software, Black-Box and White-Box testing, Validation Testing, System Testing, the art of Debugging.
Product Metrics: Software Quality, Metrics for analysis model, Metrics for design model, Metrics for source code, Metrics for testing, Metrics for maintenance.
Process and products Metrics: Software measurement, Metrics for software quality.

Unit-V **9 hours**

Risk Analysis and Management: Risk Management, Reactive vs Proactive risk strategies, Software risks, Risk identification, Risk projection Risk refinement, RMMM, RMMM plan.
Software Quality Assurance: Quality Management, Quality concepts, Software quality assurance, Software reviews, Formal technical reviews, Statistical Software Quality Assurance, Software reliability, ISO 9000Quality standards.

Text Books:

1. Roger S. Pressman, Software engineering- A practitioner's Approach, TMH (I), 7th Edition, 2019.
2. Ian Sommerville, Software Engineering, Pearson education Asia, 10th Edition, 2015.
3. Grady Booch, James Rumbaugh, Ivar Jacobson: The Unified Modelling Language User Guide, Pearson Education.

OPERATING SYSTEMS

II-B.Tech.-II-Sem. **L T P C**
Subject Code: CS-PCC-223 **3 - - 3**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO1	PO2	PO12
CO1	outline various concepts operating systems and Linux utilities	3	3	2
CO2	solve synchronization problems by using process management and API s	3	3	2
CO3	adapt various deadlock handling and memory management mechanism	3	3	2
CO4	analyze various file management system	3	3	2
CO5	make use of I/O Management and security mechanisms	3	3	2

Unit-I **9 hours**

Operating Systems Overview: Introduction, Operating System Objectives and functions, Evolution of operating System, Example Systems.
Operating Systems Structures: Operating system services and systems calls, system programs, operating system structure.

Unit-II **10 hours**

Process Management: Process concepts, process state, process control block, scheduling queues, process scheduling, Threads Overview, Threading issues.
Concurrency and Synchronization: Cooperating Processes, Inter-process Communication, Principles of Concurrency, Mutual Exclusion, Software and hardware approaches, Semaphores, Monitors, Message Passing, and Classic problems of synchronization.

Unit-III **(5 + 5) 10 hours**

Part-A: Deadlocks: System model, deadlock characterization, deadlock prevention, detection and avoidance, recovery from deadlock banker‘s algorithm.

Part-B: Memory Management: Basic concepts, swapping, contiguous memory allocation, paging, structure of the page table, segmentation, virtual memory, demand paging, page-replacement algorithms, thrashing.

Unit-IV **10 hours**

File Management System: Concept of a file, access methods, directory structure, file system mounting, file sharing, protection. File system implementation: file system structure, file system implementation, directory implementation, allocation methods, free-space management, efficiency and performance.

Unit-V **9 hours**

I/O Management System: Mass storage structure - overview of mass storage structure, disk structure, disk attachment, disk scheduling algorithms, swap space management, stable storage implementation, tertiary storage structure.
Protection & Security: Protection mechanisms, OS Security issues, threats, Intruders, Viruses.

Text Books:

1. Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, Operating System Principles, 10th Edition, 2018, Wiley India Private Limited, New Delhi.
2. Internal and Design Principles, Stallings, 5th Edition, 2005, Pearson education, PHI.

References:

1. Andrew S. Tanenbaum, Modern Operating Systems, 2nd Edition, 2007, PHI, India.
2. Operating System a Design Approach-Crowley, TMH.
3. Operating Systems – A concept based approach – DM Dhamdhere, 2nd Edition, TMH.

COMPUTER NETWORKS

II-B.Tech.-II-Sem. **L T P C**
Subject Code: CS-PCC-224 **3 - - 3**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO1	PO2	PO12	PO13
CO1	outline the basics of computer networks and various layers	3	3	2	3
CO2	demonstrate multiple access protocols	3	3	2	3
CO3	interpret network layer and routing algorithms	3	3	3	3
CO4	illustrate internetworking and various transport protocols	3	3	3	3
CO5	make use of various protocols of application layer	3	3	2	3

Unit-I **10 hours**

Overview of the Internet: Protocols and standards, Layering scenario, TCP/IP Protocol Suite, The OSI model, Internet history and administration, Comparison of the OSI and TCP/IP reference model.
Physical layer: Transmission Media, Guided Media, wireless transmission Media.
Data link layer: Design issues, CRC Codes, Elementary Data Link layer Protocols, sliding Window Protocol.

Unit-II **9 hours**

Multiple Access protocols-Aloha, CSMA, Collision free protocols, Ethernet –Physical layer, Ethernet Mac sub layer, Data link layer switching and use of bridges, learning bridges ,Spanning tree bridges, repeaters, hubs, bridges, switches ,routers and gateways.

Unit – III **(5 + 5) 10 hours**

Part-A: Network layer: Network layer Design issues, store and forward packet switching connection less and connection oriented networks.
Part-B: Routing Algorithms: Optimality principle, shortest path, flooding, distance vector routing, count to infinity problem, hierarchical routing, congestion control algorithms and admission control.

Unit – IV **9 hours**

Internetworking: Tunneling, internetwork Routing, Packet fragmentation, IPV4, IPV6 Protocol, IP addresses, CIDR, ICMP, ARP, RARP, DHCP.
Transport Layer: Services provided to the upper layers elements of transport protocol-addressing connection establishment, connection release.

Unit-V **10 hours**

The internet Transport protocols UD-RPC, Real time Transport protocols, The internet Transport protocols-Introduction to TCP, The TCP services model ,The TCP segment Header, The connection Establishment, The TCP Connection release, The TCP Connection management modeling, The TCP Sliding Window, The TCP Congestion Control.
Application Layer: Introduction, Providing services, Applications layer paradigms, HTTP, FTP, electronic mail, DNS, SSH.

Text Books:

1. Data Communications and Networking – Behrouz A Forouzan, Fourth Edition, TMH.
2. Computer Networks - Andrew S Tanenbaum, 4th Edition. Pearson Education/PHI

References:

1. Introduction to Data communication and Networking, Tamasi, Pearson Education
2. Computer Networking: A Top-Down Approach Featuring the Internet, James F. Kurose, Keith W. Ross, 3rd Edition, Pearson.

OPERATING SYSTEMS (Linux) LAB

II-B.Tech.-II-Sem. **L T P C**
Subject Code: CS-PCC-225 **- - 2 1**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO3	PO5	PO14
CO1	interpret various CPU scheduling algorithms and file allocation methods	3	3	3
CO2	experiment with File organization and memory management	3	3	3
CO3	distinguish Deadlock Avoidance and Deadlock Prevention	3	3	3
CO4	compare different page replacement and disk scheduling techniques	3	3	3
CO5	design and develop solutions for using system calls and implementing IPCs	3	3	3

LIST OF EXPERIMENTS

Week 1:

Write C programs to simulate the following CPU Scheduling algorithms:
a) FCFS b) priority

Week 2:

Write C programs to simulate the following CPU Scheduling algorithms:
a) SJF b) Round Robin

Week 3:

Write a C program to simulate Bankers Algorithm for Deadlock Avoidance

Week 4:

Write a C program to simulate Bankers Algorithm for Deadlock Prevention

Week 5:

Write C programs to simulate the following memory management techniques:
a) Fixed Memory Technique (MFT) b) Variable Memory Technique (MVT)

Week 6:

Write C program to simulate the following contiguous memory allocation techniques
a) First-fit b) Best-fit c) Worst-fit

Week 7:

Write C programs to simulate the following memory management techniques:
a) Paging b) Segmentation

Week 8:

Write C programs to simulate the following Page Replacement Techniques:
a) FIFO b) LRU c) Optimal

Week 9:

Write C programs to simulate the following file allocation strategies:
a) Sequential b) Linked c) Indexed

Week 10:

Write C programs to simulate the following file organization Techniques:
a) Single level b) Two level c) Hierarchical

Week 11:

Write C program to simulate the following Disk Scheduling algorithms:
a) FCFS b) SSTF c) SCAN

Weeks 12:

Write C programs to simulate the following Disk scheduling algorithms:
a) C-SCAN b) LOOK c) C-LOOK

Micro-Projects: Student must submit a report on one of the following Micro–Projects before commencement of second internal examination.

1. Multi-level queue CPU scheduling algorithm
2. Producer-consumer problem using semaphore
3. Dining- Philosopher problem using semaphore
4. Multithreading using pthread library
5. Process / Thread synchronization
6. DAG (Directed Acyclic Graph) file organization technique
7. A slower file system mechanism
8. Demand Paging technique of memory management
9. Threaded Matrix Multiply
10. Virtual Memory Simulation

References:

1. Operating Systems (Linux) Lab Manual, Department of CSE, CMRIT, Hyd.

COMPUTER NETWORKS LAB

II-B.Tech.-II-Sem. **L T P C**
Subject Code: CS-PCC-226 **- - 2 1**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO4	PO5	PO14
CO1	make use of NS2/NS3 tools in computer networks	3	3	3
CO2	outline the concepts of network models and components	3	3	3
CO3	Adapt various data link layer algorithms and protocols	3	3	3
CO4	illustrate various network layer algorithms and protocols	3	3	3
CO5	demonstrate various transport layer algorithms and protocols	3	3	3

LIST OF EXPERIMENTS

1. Familiarization with Networking Components and devices (LAN Adapters, Hubs, Switches, Routers, Co-axial cable, Crimping Tool, Connectors etc.)
2. Implement the data link layer framing method using character stuffing and bit stuffing.
3. Implement CRC on a data set of characters using CRC-12 / CRC-16 polynomial.
4. Implement Stop and Wait Protocol
5. Implement Sliding Window Protocol.
6. Implement Dijkstra's shortest path algorithm through a graph.
7. Obtain Routing table at each node using distance vector routing algorithm for a given subnet graph with weights indicating delay between nodes.
8. Implement a Hierarchical routing algorithm.
9. Obtain broadcast tree for given subnet of hosts.
10. Implement collision free protocol.
11. Simulate ARP / RARP protocols using NS2/NS3 tools.
12. Implement the token bucket congestion control algorithm.

Micro-Projects: Student must submit a report on one of the following Micro–Projects before commencement of second internal examination.

1. Peer to Peer File Sharing Technology over LANs.
2. Packet Loss Testing.
3. Network Design Proposal for an Institution.
4. Implementation of Client Server Protocol.
5. Congestion Control using Network Based Protocol.
6. Network Administrator Tool Project.
7. Domain Name Service with Secured Manager.
8. Implementation of File Transfer Protocol.
9. Client-Server based Instant Messenger.
10. Remote System Access by using Virtual Network Computing.

Reference:

1. Computer Networks Lab Manual, Department of CSE, CMRIT, Hyd.

INTERNET OF THINGS LAB

II-B.Tech.-II-Sem. **L T P C**
Subject Code: CS-PCC-227 **1 - 2 2**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO14
CO1	improve working on basic IoT devices	3	3	3	3	3	3	3	3
CO2	determine learning and utilization of IoT devices	3	3	3	3	3	3	3	3
CO3	develop automation work-flow in IoT enabled environment	3	3	3	3	3	3	3	3
CO4	recommend working on advance IoT Systems	3	3	3	3	3	3	3	3
CO5	take part in practicing and monitoring remotely	3	3	3	3	3	3	3	3

List of Experiments (Minimum **10** experiments to be conducted**)**

1. Familiarization with Arduino/Raspberry Pi and perform necessary software installation.
2. To interface LED/Buzzer with Arduino/Raspberry Pi and write a program to turn ON LED for 1 sec after every 2 seconds.
3. To interface Push button/Digital sensor (IR/LDR) with Arduino/Raspberry Pi and write a program to turn ON LED when push button is pressed or at sensor detection.
4. To interface DHT11 sensor with Arduino/Raspberry Pi and write a program to print temperature and humidity readings.
5. To interface Bluetooth with Arduino/Raspberry Pi and write a program to send sensor data to smart phone using Bluetooth.
6. To interface Bluetooth with Arduino/Raspberry Pi and write a program to turn LED ON/OFF when '1'/'0' is received from smart phone using Bluetooth.
7. Write a program on Arduino/Raspberry Pi to upload temperature and humidity data to cloud.
8. Write a program on Arduino/Raspberry Pi to retrieve temperature and humidity data from cloud.
9. Write a program on Arduino/Raspberry Pi to publish temperature data to MQTT broker.
10. Write a program on Arduino/Raspberry Pi to subscribe to MQTT broker for temperature data and print it.
11. Write a program to create TCP server on Arduino/Raspberry Pi and respond with humidity data to TCP client when requested.
12. Write a program to create UDP server on Arduino/Raspberry Pi and respond with humidity data to UDP client when requested.

Micro-Projects: Student must submit a report on one of the following Micro–Projects before commencement of second internal examination.

1. Air Pollution Meter
2. Smart Garbage Collector
3. SMART Garage Door
4. Humidity & Temperature Monitoring
5. Baggage Tracker
6. Smart Trash Collector
7. Liquid Level Monitor
8. Circuit Breakage Detection
9. Human Safety Night Patrolling IOT Project
10. Anti-Theft Flooring System

Reference:

1. Internet of Things Lab Manual, Department of CSE, CMRIT, Hyd.

COMPUTATIONAL MATHEMATICS LAB USING Sci LAB

II-B.Tech.-II-Sem. **L T P C**
Subject Code: BSC-203 **- - 2 1**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO3	PO4	PO5	PO14
CO1	solve problems on Linear Algebra and plotting of Graphs	3	3	3	3
CO2	find roots of an equation using various Methods	3	3	3	3
CO3	fit a curve for straight line, parabola, exponential and power curves	3	3	3	3
CO4	solve ordinary differential equations using Numerical techniques	3	3	3	3
CO5	solve ordinary integral equations using Numerical techniques	3	3	3	3

LIST OF EXPERIMENTS

Week-01: Introduction to Sci Lab, History, Features and Local Environment.
Week-02: Basic operations on Matrices (Characteristic Equations, Eigen values and Eigen vectors).
Week-03: Plotting of Graphs and finding Roots of Polynomials.
Week-04: Find the root of equation by Bisection and Regula-Falsi Methods.
Week-05: Find the root of equation by Iteration and Newton Raphson Methods
Week-06: Fit a straight line and second degree polynomial curves using method of least square.
Week-07: Fit a power curve using method of least square.
Week-08: Fit a exponential curve using method of least square.
Week-09: Basic operations on Differential Equations / Integrations and find the area by using Trapezoidal rule.
Week-10: Find the area by using Simpsons 1/3rd rule and 3/8th rule.
Week-11: Find the solution of a given Differential Equation by using Euler's method.
Week-12: Find the solution of a given Differential Equation by using Runge-Kutta method (2^{nd} and 4^{th} Order).

Micro-Projects: Student must submit a report on one of the following Micro–Projects before commencement of second internal examination.

1. Demonstrate the battery discharge function graphically by adopting a mathematical model.
2. Apply inverse Laplace transforms in image processing for getting the better image.
3. Evaluate the trigonometric functions using Laplace transforms.
4. Illustrate the laminar flow of heat through partial differential equations.
5. Design a mathematical model to explain the functioning of Global positioning system (GPS)
6. Design a mathematical model for the construction of flyover
7. Model any art craft using mathematical calculations (electrical / non-electrical)
8. Prepare a detailed report on usage of mathematical concepts in overcoming "risk vs reward" situations in day to day life.
9. 2-D plotting using SCI-lab.
10. 3-D plotting using SCI-lab.

Reference:

1. Computational Mathematics Lab using Sci Lab Manual, FED, CMRIT, Hyd.

ENVIRONMENTAL SCIENCES
MANDATORY COURSE (NON-CREDIT)

II-B.Tech.-II-Sem. **L T P C**
Subject Code: MC-202 **2 - - -**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO1	PO6	PO7	PO12
CO1	identify the role of ecosystem for livelihood	3	3	3	2
CO2	interpret methods to sustain environmental resources	3	3	3	2
CO3	outline bio-diversity and its relevance to ecological balance	3	3	3	2
CO4	explain laws and legislations on environmental protection	3	3	3	3
CO5	evaluate technologies for achieving sustainable development	3	3	3	2

Unit I: Ecosystem **6 hours**

Introduction to ecosystem: Definition, Scope and Importance; Classification of ecosystem; Structure and functions of ecosystem food chain food web, ecological energetic, eco-pyramids, carrying capacity; Biogeochemical cycles (Carbon and Nitrogen Cycles), flow of energy.

Unit II: Natural Resources **7 hours**

Renewable and Non–renewable resources–Importance, uses, classification of natural resources (i) forest: deforestation, timber extraction & conservation (ii) water: conflicts over water, dams – benefits &effects; use and over exploitation of water resources, (iii) mineral :use and exploitation, effects on mining, (iv) energy resources: growing needs, renewable and non renewable energy sources, use of alternative energy (v) land resources: land degradation, landslides, soil erosion and desertification; role of an individual in conservation of natural resources and equitable use.

Unit III: Biodiversity **(3 + 2) 5 hours**

Part A: Definition and levels of biodiversity, Values of biodiversity Bio– geographical classification of India; hot spots of biodiversity; India as a mega diversity nation; Threats to biodiversity; Endangered and endemic species of India.

Part B: Conservation of biodiversity: In–situ and Ex–situ conservation; Case studies.

Unit IV: Environmental Pollution & Control Technologies **8 hours**

Types of environmental pollution; **Air pollution**: major air pollutants, sources, effects, control measures, National Air Quality Standards. Water pollution: sources, impacts & control technologies-ETP, watershed management, rain water harvesting, Water Quality standards. Soil pollution: sources, causes & impacts on modern agriculture. Noise pollution. Solid waste Management- causes, effects and control measures; E-waste. **Global Environmental Issues and Treaties**: Global warming, ozone layer depletion. International protocol, Kyoto and Montreal protocol. Population Explosion.

Unit V: Environmental Acts, EIA & Sustainable Development **6 hours**

Environment Protection Acts: Air (Prevention and Control of Pollution) Act, Water (Prevention and control of Pollution) Act, Wildlife Protection Act and Forest Conservation Act, Environment (Protection) Act, 1986. EIA: conceptual facts, base line data acquisition, EIS, EMP. **Sustainable development**-causes & threats, strategies for achieving sustainable development; CDM and concept of green building, life cycle assessment(LCA); Ecological foot print. **Role of Information Technology** in Environment - Remote Sensing, GIS.

Textbooks:

1. Environmental Science by Y. Anjaneyulu, B S Publications (2004).
2. Environmental studies by Rajagopalan R (2009), Oxford University Press, New Delhi.

References:

1. Environmental Science and Technology by M. Anji Reddy (2007), B.S Publications.
2. Environmental Studies by Anubha Kaushik (2006), 4th edition, New age International Publications

III-B.TECH.-I-SEMESTER SYLLABUS

DESIGN & ANALYSIS OF ALGORITHMS

III-B.Tech.-I-Sem. **L T P C**
Subject Code: CS-PCC-311 **3 - - 3**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO2	PO3	PO12	PO13
CO1	measure time and space complexity of algorithms	3	3	3	3
CO2	solve problems using disjoint sets and divide-and-conquer techniques	3	3	2	2
CO3	apply greedy method and dynamic programming paradigm to solve the problems	3	3	2	2
CO4	adapt back-tracking and branch-bound methods to solve problems	3	3	2	2
CO5	interpret NP-hard and NP-complete problems	3	3	2	2

Unit-I **8 Hours**

Introduction: Algorithm, pseudo code for expressing algorithms, performance analysis-space complexity, time complexity, asymptotic Notation: big-oh notation, omega notation, theta notation and little oh notation.

Unit-II **12 Hours**

Disjoint Sets: Disjoint set operations, UNION and FIND algorithms, spanning trees, connected components and biconnected components.
Divide and Conquer: General method, applications-Binary search, Quick sort, Merge sort, Strassen's matrix multiplication.

Unit-III **(4 + 6) 10 Hours**

Part-A: Greedy method: General method, applications-Job sequencing with deadlines, knapsack problem, Minimum cost spanning trees, Single source shortest path problem.

Part-B: Dynamic Programming: General method, applications- Optimal binary search trees, 0/1 knapsack problem, All pairs shortest path problem, Travelling sales person problem, Reliability design.

Unit-IV **10 Hours**

Backtracking: General method, applications-n-queen problem, sum of subsets problem, graph coloring, Hamiltonian cycles.
Branch and Bound: General method, applications - Travelling sales person problem, 0/1 knapsack problem, LC Branch and Bound solution, FIFO Branch and Bound solution.

Unit-V **8 Hours**

NP-Hard and NP-Complete problems: Basic concepts, non-deterministic algorithms, NP - Hard and NP Complete classes, Cook's theorem statement.

Textbooks:

1. Fundamentals of Computer Algorithms, Ellis Horowitz, Satraj Sahni and Rajasekharam, Galgotia Publications pvt. Ltd.
2. Design and Analysis Algorithms - Parag Himanshu Dave, Himanshu Bhalchandra Dave Publisher: Pearson.

References:

1. Introduction to Algorithms, second edition, T.H.Cormen, C.E.Leiserson, R.L.Rivest,and C.Stein, PHI Pvt. Ltd./ Pearson Education
2. Data structures and Algorithm Analysis in C++, Allen Weiss, Second edition, Pearson education. Design and Analysis of algorithms, Aho, Ullman and Hopcroft, Pearson education.
3. Algorithm Design: Foundations, Analysis and Internet examples, M.T.Goodrich and R.Tomassia, John Wiley and Sons.

COMPILER DESIGN

III-B.Tech.-I-Sem. **L T P C**
Subject Code: CS-PCC-312 **3 - - 3**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO2	PO3	PO4	PO12	PO13
CO1	illustrate the various phases of compiler	3	3	3	2	2
CO2	construct top down and bottom up parsers	3	3	3	2	2
CO3	adapt intermediate Code Generation techniques and run-time storage allocation strategies	3	3	3	2	2
CO4	simplify the code using code optimization techniques	3	3	3	2	2
CO5	apply generic code generation algorithm to generate target code	3	3	3	2	2

Unit-I **10 Hours**

Overview of Compilation: Phases of Compilation – Lexical Analysis, Regular Grammar and Regular Expression for common programming language features, Pass and Phases of translation, interpretation, bootstrapping, data structures in compilation, LEX-lexical analyzer generator.

Unit-II **10 Hours**

Top down Parsing: Context-free grammars, Top down parsing – Backtracking, LL (1), recursive descent parsing, Predictive parsing.
Bottom up parsing: Shift-Reduce parsing, LR parsing, handling ambiguous grammar, YACC – automatic parser generator.

Unit-III **(4 + 6) 10 Hours**

Part-A: Intermediate Code Generation: Intermediate forms of source Programs - abstract syntax tree, polish notation and three address codes. Attributed grammars, Syntax directed translation.

Part-B: Symbol Tables: Symbol table format, organization for block structures languages, hashing and tree structures, representation of scope information. Block structures and non-block structure storage allocation: static, Runtime stack and heap storage allocation.

Unit-IV **11 Hours**

Code optimization: Consideration for Optimization, Scope of Optimization, local optimization, loop optimization, frequency reduction, constant folding, DAG representation. Data flow analysis: Flow graph, data flow equations, global optimization, redundant sub expression elimination, Induction variable elements, Live variable analysis, Copy propagation.

Unit-V **7 Hours**

Object code generation: Object code forms, machine dependent code optimization, register allocation and assignment generic code generation algorithms, DAG for register allocation.

Textbooks:

1. Compilers: Principles, Techniques and Tools, 2nd Edition, Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffry D. Ullman, Pearson.
2. Systems programming and operating systems – D.M Dhamdhere, 2nd Edition, TMH.

References:

1. Lex & Yacc – John R. Levine, Tony Mason, Doug Brown, O'reilly.
2. Modern Compiler Design- Dick Grune, Henry E. Bal, Cariel T. H. Jacobs, Wiley dreamtech.
3. Randy Allen, Ken Kennedy, Optimizing Compilers for Modern Architectures, Morgan.

DATA MINING AND ANALYTICS

III-B.Tech.-I-Sem. **L T P C**
Subject Code: **CS-PCC-313** **3 - - 3**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO1	PO2	PO3	PO12	PO13
CO1	summarize fundamentals of data mining	3	2	2	2	2
CO2	illustrate various mining association rules	3	3	2	2	3
CO3	make use of classification and clustering techniques	3	3	3	2	3
CO4	outline various data analytics techniques	3	2	2	2	3
CO5	solve statistical problems using R programming	3	3	3	3	3

Unit-I **8 hours**

Introduction to Data Mining: Kinds of Data, Data mining Functionalities – Interesting Patterns Task Primitives, Issues in Data Mining, Data Preprocessing.

Unit-II **10 hours**

Mining Frequent, Associations and Correlations: Basic Concepts, Frequent Itemset Mining Methods:, Apriori Algorithm: Finding Frequent Itemsets by Confined Candidate Generation, Generating Association Rules from Frequent Itemsets, Improving the Efficiency of Apriori, From Association Analysis to Correlation Analysis.

Unit-III **(6 + 6) 12 hours**

Part-A: Classification: Basic Concepts, Algorithm for Decision Tree Induction, Attribute Selection Measures. Bayes Classification Methods, Bayesian Belief Networks, a Multilayer Feed-Forward Neural Network, k-Nearest-Neighbor Classifiers.

Part-B: Clustering: Cluster Analysis, Partitioning Methods: k-Means and k-Medoids, Hierarchical Methods: Agglomerative versus Divisive Hierarchical Clustering.

Unit-IV **9 hours**

Data Definitions and Analysis Techniques: Introduction to statistical learning and R-Programming, Elements, Variables, and Data categorization, Levels of Measurement, Data management and indexing.

Unit-V **9 hours**

Basic Analysis Techniques: Statistical hypothesis generation and testing, Chi-Square test, t-Test, Analysis of variance, Maximum likelihood test, regression, Practice and analysis with R.

Textbooks:

1. Data Mining- Concepts and Techniques- Jiawei Han, Micheline Kamber, Morgan Kaufmann Publishers, Elsevier, 2 Edition, 2006.
2. Introduction to Data Mining, Pang-Ning Tan, Vipin Kumar, Michael Steinbanch, Pearson Education.
3. An Introduction to Statistical Learning: with Applications in R, G James, D. Witten, T Hastie, and R. Tibshirani, Springer, 2013

References:

1. Data mining Techniques and Applications, Hongbo Du Cengage India Publishing
2. Data Mining Techniques, Arun K Pujari, 3rd Edition, Universities Press.
3. Software for Data Analysis: Programming with R (Statistics and Computing), John M. Chambers, Springer.

WEB TECHNOLOGIES

III–B.Tech.-I-Sem. **L T P C**
Subject Code: CS-PCC-314 **3 - - 3**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO2	PO3	PO6	PO12	PO13
CO1	apply the design principles of HTML and Java Script to create static and dynamic web pages	3	2	2	3	3
CO2	develop server side scripting with PHP language	3	2	2	3	3
CO3	illustrate server side programming with java Servlets	3	3	3	3	3
CO4	demonstrate server side programming with java JSP	3	3	3	3	3
CO5	design web application using MVC	3	3	3	3	3

Unit-I **9 Hours**

Introduction HTML: History of HTML, HTML Basics: Elements, Attributes; Tags: images, list, Tables, Forms, Frames, div and span.
CSS: Introduction to cascading style sheet, Types of style sheets, selectors.
Java Script: Introduction to scripting, control structures, conditional statements, Arrays, Functions, objects.

Unit-II **9 Hours**

Introduction to PHP: Declaring variables, data types, arrays, strings, operators, expressions, control structures, functions, Reading data from web form controls like text boxes, radio buttons etc., Handling File Uploads, results, sessions and cookies; Connecting to database (MySQL as reference), executing simple queries.
File Handling in PHP: File operations like opening, closing, reading, writing, deleting etc.

Unit-III **(6 + 4) 10 Hours**

Part-A: XML: Basics of XML, Elements, Attributes, Name space; Introduction to DTD: internal and external DTD, Elements of DTD, DTD Limitations, XML Schema, Schema structure.
Part-B: XHTML, DOM and SAX Parsers.

Unit-IV **10 Hours**

Servlets: Introduction, Lifecycle, Generic and HTTP servlet, passing parameters to servlet, HTTP servlet Request & Response interfaces, Deploying web Applications.
Session Tracking: Hidden form fields, cookies, URL- Rewriting, session.

Unit-V **10 Hours**

JSP: Introduction, Difference Between servlets & JSP, Anatomy of JSP page, JSP elements: Directives, comments, Expressions, scriptlets, declaration, Implicit JSP objects, using Action elements.
JDBC: Introduction, JDBC Drivers, Loading Driver, establishing connection, Executing SQL statement in JSP pages, MVC architecture

Textbooks:

1. Web Technologies, Uttam K Roy, Oxford University Press
2. The Complete Reference PHP- Steven Hozner, Tata McGraw-Hill

References:

1. Java Server Pages-Hans Bergsten, SPD O'Reilly
2. JavaScript, D. Flanagan O'Reilly, SPD.
3. Beginning Web Programming-Jon Dckett WROX.

ARTIFICIAL INTELLIGENCE

III–B.Tech.-I-Sem. **L T P C**
Subject Code: CS-PCC-315 **3 - - 3**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO1	PO2	PO3	PO6	PO12	PO13
CO1	explain the concepts of artificial intelligence	3	3	3	3	2	3
CO2	illustrate various search algorithms	3	3	3	3	2	3
CO3	adapt various probabilistic reasoning approaches	3	3	2	3	3	3
CO4	elaborate Markov decision process	3	3	2	3	2	3
CO5	perceive various reinforcement learning approaches	3	3	2	3	3	3

Unit-I: Introduction **8 Hours**

Concept of AI, history, current status, scope, agents, environments, Problem Formulations, Review of tree and graph structures, State space representation, Search graph and Search tree.

Unit-II: Search Algorithms **10 Hours**

Random search, Search with closed and open list, Depth first and Breadth first search, Heuristic search, Best first search, A* algorithm, Game Search.

Unit-III: Probabilistic Reasoning **(6 + 4) 10 Hours**

Part-A: Probability, conditional probability, Bayes Rule, Bayesian Networks- representation, construction and inference.

Part-B: Temporal Model, Hidden Markov Model.

Unit-IV: Markov Decision Process **10 Hours**

MDP formulation, utility theory, utility functions, value iteration, policy iteration and partially observable MDPs.

Unit-V: Reinforcement Learning **10 Hours**

Passive reinforcement learning, direct utility estimation, adaptive dynamic programming, temporal difference learning, active reinforcement learning- Q learning.

Textbooks:

1. Elaine Rich & Kevin Knight, ‘Artificial Intelligence’, 3rd Edition, TMH, 2008.
2. Russel and Norvig, ‘Artificial Intelligence’, Pearson Education, PHI, 2003.

References:

1. Trivedi, M.C., “A Classical Approach to Artifical Intelligence”, Khanna Publishing House, Delhi.
2. Saroj Kaushik, “Artificial Intelligence”, Cengage Learning India, 2011.
3. David Poole and Alan Mackworth, “Artificial Intelligence: Foundations for Computational Agents”, Cambridge University Press 2010.

DATA MINING AND ANALYTICS LAB

III-B.Tech.-I-Sem. **L T P C**
Subject Code: **CS-PCC-316** **- - 2 1**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO4	PO5	PO14
CO1	make use of open source data mining and analytic tools	3	3	3
CO2	examine the interesting insights of Apriori algorithm using WEKA	3	3	3
CO3	demonstrate the classification and clustering techniques	3	3	3
CO4	analyze the concepts of data analytics and statistical testing methods	3	3	3
CO5	compare various kinds of regression techniques	3	3	3

LIST OF EXPERIMENTS

Part-A: Data Mining

1. Demonstration of preprocessing on dataset student.arff
2. Demonstration of Association rule process on dataset contactlenses.arff using apriori algorithm.
3. Demonstration of classification rule process on dataset employee.arff using j48 algorithm.
4. Demonstration of classification rule process on dataset employee.arff using id3 algorithm.
5. Demonstration of classification rule process on dataset employee.arff using naïve bayes algorithm.
6. Demonstration of clustering rule process on dataset iris.arff using simple k-means.
7. Demonstration of clustering rule process on dataset student.arff using hierarchical clustering.

Part-B: Data Analytics

1. a) Write R program to find R-Mean, Median & Mode with the sample data.
   b) Write R program to find Analysis and Covariance with the sample data and visualize the regression graphically.

2. Write R program to find the following Regressions with the sample data and visualize the regressions graphically.
   a) Linear Regression
   b) Multiple Regression
   c) Logistic Regression
   d) Poisson Regression.

3. a) Write R program to find Time Series Analysis with the sample data and visualize the regression graphically.
   b) Write R program to find Non Linear Least Square with the sample data and visualize the regression graphically.
   c) Write R program to find Decision Tree with the sample data and visualize the regression graphically.

4. Write R program to find the following Distribution with the sample data and visualize the linear regression graphically.
   a) Normal Distribution
   b) Binomial Distribution

5. Write R program to do the following tests with the sample data and visualize the results graphically.
   a) χ^2-test
   b) t-test
   c) F-test

Micro-Projects: Student must submit a report on one of the following Micro–Projects before commencement of second internal examination.

1. Data Mining Techniques in Healthcare System using WEKA.
2. Credit Scoring Analysis using WEKA.
3. Crime Rate Prediction using K Means.
4. Weather Forecasting using Data Mining.
5. Smart Health Prediction using Data Mining.
6. Movie Success Prediction using Data Mining.
7. Google data analysis using R.
8. IRCTC Reservation system data analysis using R.
9. Facebook data analysis using R.
10. Banking system data analysis using R.

Reference:

1. Data Mining and Analytics Lab Manual, Department of CSE, CMRIT, Hyd.

WEB TECHNOLOGIES LAB

III-B.Tech.-I-Sem. **L T P C**
Subject Code: CS-PCC-317 **- - 2 1**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO4	PO5	PO14
CO1	design web pages using HTML, CSS and JavaScript	3	3	3
CO2	build web application using PHP and MySQL	3	3	3
CO3	create web application using PHP and XML	3	3	3
CO4	develop web application using servlets and JDBC	3	3	3
CO5	construct web application using JSP and JDBC	3	3	3

LIST OF EXPERIMENTS

HTML & Java Script

1. Develop static pages (using Only HTML) of an online Book store. The pages should resemble: www.amazon.com the website should consist the following pages. Home page, Registration and user Login User Profile Page, Books catalog Shopping Cart, Payment By credit card Order Conformation
2. Validate the Registration, user login, user profile and payment by credit card pages using JavaScript.
3. Write an HTML page including any required Javascript that takes a number from one text field in the range of 0 to 999 and shows it in another text field in words. If the number is out of range, it should show “out of range” and if it is not a number, it should show “not a number” message in the result box

PHP & XML

4. A web application that takes name and age from an HTML page.If the age is less than 18, it should send a page with “Hello <name>, you are not authorized to visit this site” message, where <name> should be replaced with the entered name. Otherwise it should send “Welcome <name> to this site” message.
5. A web application that lists all cookies stored in the browser on clicking “List Cookies” button. Add cookies if necessary.
6. A web application takes a name as input and on submit it shows a hello <name>page where <name>is taken from the request. It shows the start time at the right top corner of the page and provides a logout button. On clicking this button, it should show a logout page with Thank You<name> Message with the duration of usage (hint: Use session to store name and time).
7. Modify the above program to use an xml file instead of database

Servlet

8. A web application that takes name and age from an HTML page. If the age is less than 18, it should send a page with “Hello <name>, you are not authorized to visit this site” message, where <name> should be replaced with the entered name. Otherwise it should send “Welcome <name> to this site” message.
9. A web application that lists all cookies stored in the browser on clicking “List Cookies” button. Add cookies if necessary.
10. A web application takes a name as input and on submit it shows a hello <name>page where <name>is taken from the request. It shows the start time at the right top corner of the page and provides a logout button. On clicking this button, it should show a logout page with Thank You<name> Message with the duration of usage (hint: Use session to store name and time).

JSP

11. A web application that takes name and age from an HTML page. If the age is less than 18, it should send a page with "Hello <name>, you are not authorized to visit this site" message, where <name> should be replaced with the entered name. Otherwise it should send "Welcome <name> to this site" message.
12. A web application that lists all cookies stored in the browser on clicking "List Cookies" button. Add cookies if necessary.
13. A web application takes a name as input and on submit it shows a hello <name>page where <name>is taken from the request. It shows the start time at the right top corner of the page and provides a logout button. On clicking this button, it should show a logout page with Thank You<name> Message with the duration of usage (hint: Use session to store name and time).

Micro-Projects: Student must submit a report on one of the following Micro–Projects before commencement of second internal examination.

1. Develop dynamic pages (using PHP) of an online Bookstore. The pages should resemble: the website should consist the following pages. Home page, Registration and user Login User Profile Page, Books catalog Shopping Cart, Payment By credit card Order Conformation.
2. Develop dynamic pages (using JSP) of an online Bookstore. The pages should resemble: the website should consist the following pages. Home page, Registration and user Login User Profile Page, Books catalog Shopping Cart, Payment By credit card Order Conformation.
3. Develop dynamic pages (using PHP) of an online Banking system. The pages should resemble: the website should consist the following pages. Home page, Registration and user Login User Profile Page, Statement info, Fund Transfer info,Request (checkbook, credit card…..etc).
4. Develop dynamic pages (using JSP) of an online Banking system. The pages should resemble: the website should consist the following pages. Home page, Registration and user Login User Profile Page, Statement info, Fund Transfer info,Request (checkbook, credit card…..etc).
5. Develop dynamic pages (using PHP) of an online Bus reservation system. The pages should resemble: the website should consist the following pages. Home page, Registration and user Login User Profile Page, buses route info, booking info, Payment By credit card Order Conformation.
6. Develop dynamic pages (using jsp) of an online Bus reservation system. The pages should resemble: the website should consist the following pages. Home page, Registration and user Login User Profile Page, buses route info, booking info, Payment By credit card Order Conformation.
7. Develop dynamic pages (using PHP) of an online library management system. The pages should resemble: the website should consist the following pages. Home page, Registration and user Login User Profile Page, Statement info, Fund Transfer info,Request (checkbook, credit card…..etc).
8. Develop dynamic pages (usingJSP) of an online library management system. The pages should resemble: the website should consist the following pages. Home page, Registration and user Login User Profile Page, Statement info, Fund Transfer info,Request (checkbook, credit card…..etc).
9. Develop dynamic pages (using php) of an E-commernce. The pages should resemble: the website should consist the following pages. Home page, Registration and user Login User Profile Page, List of items, Shopping Cart, Payment By credit card Order Conformation, track Order.
10. Develop dynamic pages (using JSP) of an E-commernce. The pages should resemble: the website should consist the following pages. Home page, Registration and user Login User Profile Page, List of items, Shopping Cart, Payment By credit card Order Conformation, track Order.

Reference:

1. Web Technologies Lab Manual, Department of CSE, CMRIT, Hyd.

ARTIFICIAL INTELLIGENCE LAB

III-B.Tech.-I-Sem. **L T P C**
Subject Code: CS-PCC-318 **- - 2 1**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO4	PO5	PO14
CO1	illustrate various search techniques	3	3	3
CO2	solve real-time problems using graph theory	3	3	3
CO3	develop various games using AI techniques	3	3	3
CO4	adapt Bayesian probability model	3	3	3
CO5	design programs based on Markov decision process	3	3	3

List of Experiments (Using Python)

1. Write a program to implement BFS Traversal.
2. Write a program to implement DFS Traversal.
3. Write a program to implement A* Search.
4. Write a program to implement Travelling Salesman Problem.
5. Write a program to implement Graph Coloring Problem.
6. Write a program to implement Missionaries and Cannibals Problem.
7. Write a program to implement Water Jug Problem.
8. Write a program to implement Hangman game.
9. Write a program to implement Tic-Tac-Toe game.
10. Write a program to implement 8 Queens Problem
11. Write a program to implement Bayesian Network.
12. Write a program to implement Hidden Markov Model.

Micro-Projects: Student must submit a report on one of the following Micro–Projects before commencement of second internal examination.

1. Intelligent vehicles using Artificial Intelligence.
2. Smart ICU Predictive detection of deterioration of seriously ill patients using Artificial Intelligence.
3. Artificial Intelligence Innovation.
4. Prevention against Cyber security Threats using Artificial Intelligence.
5. Efficient, Scalable Processing of Patient Data using Artificial Intelligence.
6. Smart Bike Share Programs using Artificial Intelligence.
7. Automatic Document Classification using Bayesian theorem.
8. Automated Geophysical Feature Detection using Artificial Intelligence.
9. Artificial Intelligence for Records Management.
10. Artificial Intelligence in e-Commerce.

Reference:

1. Artificial Intelligence Lab Manual, Department of CSE, CMRIT, Hyd.

ADVANCED ENGLISH COMMUNICATION SKILLS LAB

III-B.Tech.-I-Sem. **L T P C**
Subject Code: HSMC-301 **1 - 2 2**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO5	PO10
CO1	assess and utilize vocabulary in an effective way	3	3
CO2	interpret interpersonal relationships	3	3
CO3	elaborate academic reading and writing skills	3	3
CO4	formulate appropriate communication techniques in various contexts	3	3
CO5	adapt to different work-place and socio-cultural scenarios	3	3

List of Experiments:

Week 1 & 2: Importance of Non-Verbal Communication – Synonyms and Antonyms, One-word substitutes, Prefixes and Suffixes, Idioms, Phrases and Collocations.

Week 3: Conversations, Self introduction, Role Play.

Week 4: General Vs Local Comprehension, Reading for Facts, Guessing Meaning from context, Skimming, Scanning, Inferring Meaning.

Week 5: Unseen Passages on various topics.

Week 6 & 7: Structure and Presentation of different types of Writing – e-correspondence / Technical Report Writing.

Week 8: Letter Writing, Resume Writing, CV, E-mail Writing, Memo Writing.

Week 9 & 10: Oral Presentations (individual or group) and Written Presentation through Posters/ Projects / Reports / e-mails / Assignments, etc.

Week 11: JAMs, Seminars, PPTs, Debate Sessions

Week 12 & 13: Dynamics of Group Discussion, Organization of Ideas and Rubrics of Evaluation – Concept and Process, Interview Preparation Techniques.

Week 14: Group Discussion and Mock Interviews.

Micro-Projects: Student must submit a report on one of the following Micro–Projects before commencement of second internal examination.

1. Role Play / Debate
2. Office Communication
3. Presentation Skills
4. Public Speaking
5. Interview Skills
6. Telephone Skills
7. Article Writing
8. Workplace etiquette
9. Video Resume / resume writing
10. Group Discussion

Reference:

1. Advanced English Communication Skills Lab Manual, FED, CMRIT, Hyd.

EMPLOYABILITY SKILLS – I
MANDATORY COURSE (NON-CREDIT)

III-B.Tech.-I-Sem. **L T P C**
Subject Code: MC-311 **3 - - -**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO9	PO10
CO1	demonstrate verbal and written skills effectively	3	3
CO2	develop professional correspondence skills	3	3
CO3	build proficiency in quantitative reasoning	3	3
CO4	improve critical thinking skills	3	3
CO5	exhibit confidence in facing the interview process	3	3

Unit–I **10 Hours**

Verbal Ability: Fundamentals of Grammar - Sentence Structure - Parts of Speech.
Analytical Skills: Averages - Basic Concepts, combined mean, average principles, wrong values taken, number added or deleted, average speed.
Percentages - Basic Concepts, conversions, finding percentages from given numbers, quantity increases or decreases by given percentage, population increase by given percentage, comparisons, consumption when a commodity price increase or decrease and applications.
Data Interpretation - Introduction to Data Interpretation, quantitative and qualitative data, Tabular Data, Line Graphs, Bar Chart, Pie Charts, X-Y Charts.

Unit–II **10 Hours**

Synonyms and Antonyms, Homonyms and Homophones, Word Formation, Idioms and Phrases, Analogy, One-word Substitutes.
Analytical Skills: Reasoning - Number Series, Letter Series, Series completion and correction, Coding and Decoding.

Unit–III **(4 + 4) 8 Hours**

Part-A: Verbal Ability: Exercises on Common Errors in Grammar.
Analytical Skills: Word analogy-Applied analogy.

Part-B: Verbal Ability: Vocabulary Enhancement, Study skills and using a Dictionary.
Analytical Skills: Classifications, verbal classification.

Unit–IV **10 Hours**

Verbal Ability: Paragraph writing, Picture description, Text Completion, Essay writing.
Analytical Skills: Reasoning Logical Diagrams - Simple diagrammatic relationship, Multi diagrammatic relationship, Venn-diagrams, Analytical reasoning.

Unit–V **10 Hours**

Verbal Ability: Sentence Equivalence, Comparison and Parallelism, Letter writing and e-mail writing.
Analytical Skills: Reasoning Ability - Blood Relations, Seating arrangements, Directions, Decision making.

Activities List:

1. Regular cumulative practice tests.
2. Quiz, Crossword, Word-search and related activities.
3. Picture Description including Description of Photos/Images/Posters/Advertisement Analysis etc.,

Reference:

1. Employability Skills – I Manual, FED, CMRIT, Hyd.

SUMMER INTERNSHIP - I
MANDATORY COURSE (NON-CREDIT)

III-B.Tech.-I-Sem. **L T P C**
Subject Code: MC-312 - - - -

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO1 to PO14
CO1	utilize the domain knowledge with modern tools to solve real world problems	3
CO2	analyze the industrial processes that results in the end product / service	3
CO3	extend global needs for professional ethics, responsibility and communication	3
CO4	function well as an individual, member or leader in diverse teams	3
CO5	make use of engineering knowledge for societal sustenance	3

Guidelines:

1. The student has to complete the internship for a period of 4 to 6 weeks during summer vacation between IV Semester & V Semester.
2. The internship can be carried out in any industry / R&D Organization / Research Institute / Premier Educational Institutes like IITs, NITs and IIITs etc.
3. The registration process of internship should be completed before the commencement of IV-semester end examinations.
4. The registration process for internship involves:
   a) Students have to approach respective course coordinator with name of proposed company / organization in which they wish to carry out internship.
   b) The Department shall nominate guide to supervise the interns.
   c) Student has to obtain a no objection certificate (NOC) in the prescribed format from the department and submit the same to the respective organization.
   d) Student has to submit acceptance letter issued by the respective organization to the course coordinator.
5. The internal guide has to visit place of internship at least once during student's internship.
6. The students shall report the progress of the internship to the guide in regular intervals and seek advice.
7. After the completion of Internship, students shall submit a final report along with internship and attendance certificates to the course coordinator with the approval of internal guide.
8. The evaluation of internship shall be done during V-Semester.
9. The student has to give a PPT presentation for duration of 10 to 15 minutes in the presence of departmental evaluation committee consists of Head of the Department, Internal Guide and Two Senior Faculty from the respective departments.
10. After the successful presentation by the student, the evaluation committee recommends the result as satisfactory for the internship. In case of students who have not registered for internship / not submitted the internship certificate and report, the V-Semester result will not be declared till completion.

III-B.TECH.-II-SEMESTER SYLLABUS

CLOUD COMPUTING

III-B.Tech.-II-Sem. **L T P C**
Subject Code: CS-PCC-321 **3 - - 3**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO1	PO2	PO3	PO12	PO13
CO1	explain various computing paradigms	3	2	3	2	2
CO2	illustrate fundamentals of cloud computing	3	2	3	2	2
CO3	elaborate cloud computing architecture and management	3	3	3	2	2
CO4	perceive various cloud service models	3	3	3	2	2
CO5	select various cloud service providers	3	2	3	2	2

Unit-I **10 Hours**

Cloud computing Fundamentals: Physical Servers introduction, Virtual Servers(Vmware and Virtual Box) introduction, cloud Servers introduction, Phyical Vs Virtual Vs cloud, Motivation of cloud servers, need of cloud computing, cloud computing providers and history, Principles of cloud computing, Software as a service (saas), Platform as a service (paas), Infrastructure as a service (iaas).

Unit–II **10 Hours**

Cloud Compute: Account creation, Regisons, availability zones, Global infrastructure of AWS, Replication, Elastic Cloud Compute(Ec2), AMI, instance, security groups, keypairs, instance types (nano, micro,small..) tags, volumes, elastic ip, snapshots in volume, snapshots in instance, load balancing, Auto scaling.
IAM: Identity access management introduction, creating users, creating groups, providing permissions, MFA (Multi factor authentication).

Unit-III **(4 + 5) 9 Hours**

Part-A: VPC (Virtual Private Cloud): Router, switch, LAN, MAN, WAN, VPN, MPLS, Adapters, NAT, Bridged, Hostname, IP (4parts), Branch wise configuring IP, Private IP, Public IP, Security (ACL, Firewall), VPC, Subnet, Routing tables, Internet Gate way, Separate zones per each business in cloud.

Part-B: Domain Management: Route53 - Domain name, Hostname, DNS Name, FQDN, Sub domains, WWW, A record, CNAME Record, DNS zones, Domain name service providers, Name servers.

Unit-IV **9 Hours**

Cloud Database: RDBMS Introduction (Data, Database, DBMS, RDBMS), Oracle/SQL Server database creation, backups, snapshots, retention period, accessibility, Database clients, Client Server architecture, Database connectivity with Application.
S3: Bucket, Storage types, glacier, static website hosting, versioning, Server access logging, Object-level-logging, Encryption, Object Locks, Providing access to files/directories, transfer acceleration, Requester pays

Unit-V **10 Hours**

SNS: SNS introduction, configuring mail id, topics.
Lamda: Lamda Functionality, Programming Languages in lambda, Usage of Lambda, Importance of Lambda.
Cloud watch: What is Amazon Cloud watch, Cloud Watch Concepts, Why Cloud watch, Amazon cloud watch workflow, Cloud watch Events, AWS dynamic domain name, Cloud watch logs, Scheduler syntax, Scheduler types.

Textbook:

1. Cloud Computing: Principles and Paradigms by Rajkumar Buyya, James Broberg and Andrzej M. Goscinski, Wiley, 2011.

References:

1. Essentials of cloud Computing: K. Chandrasekhran, CRC press, 2014.

MACHINE LEARNING AND DATA SCIENCES

III-B.Tech.-II-Sem. **L T P C**
Subject Code: CS-PCC-322 **3 - - 3**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO2	PO3	PO6	PO12	PO13
CO1	demonstrate the required mathematical foundations for ML& DS	3	3	3	3	3
CO2	outline the functionalities of machine learning	3	3	3	3	3
CO3	illustrate learning algorithms & data science basics	3	3	2	2	3
CO4	build data science applications using Python based toolkits	3	3	3	3	3
CO5	use recommender systems and sentiment analysis in real time applications	3	3	3	3	3

Unit-I: Mathematical Foundations **10 hours**

Linear Algebra: Vectors, Matrices, Statistics: Describing a Single Set of Data, Correlation, Simpson's Paradox, Correlation and Causation, Probability: Dependence and Independence, Conditional Probability, Bayes's Theorem, Random Variables, Continuous Distributions, The Normal Distribution, The Central Limit Theorem, Hypothesis and Inference: Statistical Hypothesis Testing, Confidence Intervals, Phacking, Bayesian Inference.

Unit-II: Machine Learning **10 hours**

Overview of Machine learning concepts – Over fitting and train/test splits, Types of Machine learning – Supervised, Unsupervised, Reinforced learning, Introduction to Bayes Theorem, Linear Regression-model assumptions, regularization (lasso, ridge, elastic net), Classification and Regression algorithms- Naïve Bayes, K-Nearest Neighbors, logistic regression, support vector machines (SVM), decision trees, and random forest, Classification Errors.

Unit-III: Advanced Machine Learning and Introduction to Data Sciences **(4 + 5) 10 hours**

Part-A: Find-S: finding a maximally specific hypothesis, Analysis of Time Series- Linear Systems Analysis, Nonlinear Dynamics, Rule Induction, Neural Networks - Learning and Generalization, Overview of Deep Learning.

Part-B: Introduction to Data Science: Concept of Data Science, Traits of Big data, Web Scraping, Analysis vs reporting, Data Science in business.

Unit-IV: Programming Tools for Data Science **9 hours**

Toolkits using Python: Matplotlib, NumPy, Scikit-learn, NLTK, Visualizing Data: Bar Charts, Line Charts, Scatterplots, Working with data: Reading Files, Scraping the Web, Using APIs (Example: Using the Twitter APIs), Cleaning and Munging, Manipulating Data, Rescaling, Dimensionality Reduction.

Unit-V: Recommender Systems and Sentiment Analysis **10 hours**

Recommender Systems: Introduction, Content-Based Filtering, Collaborative Filtering, Hybrid Recommenders.
Sentiment Analysis: Introduction, Data Cleaning, Text Representation.

Textbooks:

1. Joel Grus, "Data Science from Scratch: First Principles with Python", O'Reilly Media(unit-1)
2. Jeeva Jose, "Machine Learning", Khanna Publishing House, Delhi. (unit-2&3)
3. Chopra Rajiv, "Machine Learning", Khanna Publishing House, Delhi. (unit2&4)
4. Introduction to data science by Igual, Laura & Seguí, Santi, Springer. (unit-5)

References:

1. Machine Learning – Tom M. Mitchell, TMH.
2. Jain V.K., "Data Sciences", Khanna Publishing House, Delhi.

FULL STACK WEB DEVELOPMENT

III-B.Tech.-II-Sem. **L T P C**
Subject Code: CS-PCC-323 **3 - - 3**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO2	PO3	PO6	PO12	PO13
CO1	explain the concepts of full stack web development	3	2	2	3	3
CO2	illustrate High level programming and jQuery concepts	3	2	2	3	3
CO3	make use of Node.js and MongoDB Driver for web development	3	3	3	3	3
CO4	develop app using angularJS concepts	3	3	3	3	3
CO5	establish version control in GitHub	3	2	3	3	3

Unit-I **9 Hours**

Introduction: Getting Started With HTML - HTML5, Video & Audio, Canvas, SVG, Web Storage, Drag & Drop, Geo Location. Basic Styling using CSS 5 – Basic Styling, Positioning & Background Images. Bootstrap – Setup, Templates, Navbar, Typography, Forms & Tables.

Unit-II **10 Hours**

High level programming: Variables, Arrays, Objects, Loops, Conditionals, Switches, Functions, Events, Form validating, Ajax.
jQuery: Selectors & Mouse events, Form events, DOM Manipulation, Effects & Animation, Traversing & Filtering.

Unit-III **(5 + 6) 11 hours**

Part-A: Node.js: Getting Started With Node, Installation and Simple Server - Project using Simple Node Server, Express Setup and Routing, Template Engines - Project using template Engine.

Part-B: Node MongoDB Driver - Setup, Middleware & Routes - Starting the Project, Creating the UI, Form Validation and User Register, Password Encryption, Login Functionality, Access Control & Logout.

Unit-IV: App Development using Angular **8 hours**

Getting Started With Angular, Angular 2 App From Scratch, Angular 2 App From The Quickstart, Components & Properties, Events & Binding with ngModel, Fetch Data From A Service , Submit Data To Service, Http Module & Observables, Routing.

Unit-V: Git & Version Control **10 hours**

Getting Started with Git, Working with A Local Repository, Branches and Merging, Working with A Remote Repository, Test project with all test cases, finding bugs, check previous versions, deploying procedures, documentation.

Textbooks:

1. Northwood, Chris. The Full Stack Developer: Your Essential Guide to the Everyday Skills Expected of a Modern Full Stack Web Developer. Apress, 2018.
2. Mulder P. Full Stack Web Development with Backbone.js: Scalable Application Design with 100% JavaScript. "O'Reilly Media, Inc."; 2014 Jun 10.

References:

1. Ihrig CJ, Bretz A. Full stack Javascript development with MEAN. SitePoint; 2014 Dec 24.

ADVANCED ALGORITHMS
(Professional Elective - I)

III-B.Tech.-II-Sem. **L T P C**
Subject Code: CS-PEC-301 **3 - - 3**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO2	PO3	PO4	PO12	PO13
CO1	outline various analysis techniques for algorithms	3	3	2	2	3
CO2	develop applications using graph algorithms	3	3	3	3	3
CO3	analyze different number-theoretic algorithms	3	3	3	3	3
CO4	illustrate string-matching, probabilistic & randomized algorithms	3	3	3	3	3
CO5	solve problems using NP-Completeness & Approximate algorithms	3	3	3	3	3

Unit-I **9 hours**

Review of Analysis Techniques: Growth of Functions- Asymptotic notations; Standard notations and common functions; Recurrences -The substitution method, recursion-tree method, the master method.
Amortized Analysis: Aggregate, Accounting and Potential Methods.

Unit-II **10 hours**

Graph Algorithms: Introduction to Single – Source shortest paths: Variants, negative weight edges, Cycles, Representing Shortest paths, Relaxation, Johnson's algorithm.
Maximum Flow: Flow networks and Ford-Fulkerson method; Maximum bipartite matching.

Unit-III **(5 + 5) 10 hours**

Part-A: Number -Theoretic Algorithms: Elementary notions; GCD; Modular Arithmetic; solving modular linear equations.

Part-B: The Chinese remainder theorem; Powers of an element; Primality testing; Integer factorization.

Unit-IV **10 hours**

String-Matching Algorithms: Naïve string Matching; Rabin - Karp algorithm; String matching with finite automata.
Probabilistic and Randomized Algorithms: Probabilistic algorithms; Randomizing deterministic algorithms, Monte Carlo and Las Vegas algorithms; Probabilistic numeric algorithms.

Unit-V **9 hours**

NP-Completeness & Approximate Algorithms: Polynomial time, Polynomial-time verification, NP-completeness and reducibility, set-cover problem, vertex-cover problem, Max-K-SAT problem.

Textbooks:

1. T. H. Cormen, C E Leiserson, R L Rivest and C Stein: Introduction to Algorithms, 3rd Edition, Prentice-Hall of India, 2010.
2. Kenneth A. Berman, Jerome L. Paul: Algorithms, Cengage Learning, 2002.

References:

1. Ellis Horowitz, Sartaj Sahni, S.Rajasekharan: Fundamentals of Computer Algorithms, 2nd Edition, Universities press, 2007.

DISTRIBUTED SYSTEMS
(Professional Elective - I)

III-B.Tech.-II-Sem. **L T P C**
Subject Code: CS-PEC-302 **3 - - 3**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO3	PO4	PO12	PO13
CO1	perceive various architectures used to design distributed systems	3	2	2	2
CO2	build distributed systems using various inter process communication techniques	3	3	2	2
CO3	evaluate distributed algorithms for clock synchronization	3	3	2	2
CO4	analyze the role of middleware using RPC,RMI and design a name server	3	2	2	2
CO5	apply fault tolerant techniques to improve concurrency	3	3	3	2

Unit-I **9 Hours**

Characterization of Distributed Systems: Introduction, Examples of Distributed systems, Resource sharing and the web, Challenges.
System models: Introduction, Architectural and Fundamental Models.

Unit-II **10 Hours**

Time and Global States: Introduction, Clocks, Events and Process states, Synchronizing Physical Clocks, Logical Time and Logical Clocks, Global States.
Coordination and Agreement: Introduction, Distributed Mutual Exclusion, Elections, Multicast Communication, Consensus and Related Problems.

Unit-III **(5 + 5) 10 Hours**

Part-A: Inter process Communication: Introduction, The API for the Internet Protocols, External Data Representation and Marshalling, Client-Server Communication, Group Communication.

Part-B: Distributed objects and Remote Invocation: Introduction, Communication between Distributed Objects, RPC, Events and Notifications.

Unit-IV **11 Hours**

Distributed File Systems: Introduction, File Service Architecture, SUN Network File System, The Andrew File System.
Name Services: Introduction, Name Services and the Domain Name System, Global Name Services.
Distributed Shared Memory: Introduction, Design and Implementation Issues, Sequential Consistency and IVY, Release consistency and Munin.

Unit-V **8 Hours**

Transactions and Concurrency Control: Introduction, Transactions, Nested Transactions, Locks, Optimistic concurrency control, Timestamp ordering.
Distributed Transactions: Introduction, Flat and Nested Distributed Transactions, Atomic commit protocols, Concurrency control in distributed transactions, Distributed deadlocks, Transaction recovery.

Textbooks:

1. Distributed Systems Concepts and Design, G Coulouris, J Dollimore and Tim Kindberg, Pearson Education, 4th Edition, 2009.

References:

1. Distributed Systems: Principles and Paradigms, Andrew S. Tanenbaum and Maarten Van. Steen, 2nd Edition, PHI.
2. Distributed Systems, An Algorithm Approach, Sukumar Ghosh, Chapman and Hall, CRC, Taylor & Francis Group, 2007.

DIGITAL MARKETING
(Professional Elective - I)

III-B.Tech.-II-Sem. **L T P C**
Subject Code: CS-PEC-303 **3 - - 3**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO2	PO3	PO5	PO6	PO8	PO12
CO1	outline the importance of digital marketing	2	1	2	3	3	3
CO2	use search engine optimization to achieve business goals	3	2	3	3	3	3
CO3	adapt social media for business promotion	3	3	3	3	3	3
CO4	identify link building techniques for content consideration	3	2	3	3	3	3
CO5	apply digital marketing techniques in real time applications	3	3	3	3	3	3

Unit-I: Introduction **9 hours**

Introduction: digital marketing, Digital vs. Real Marketing, Digital Marketing Channels, Creating initial digital marketing plan, Content management, SWOT analysis, Target group analysis, Web design, Optimization of Web sites.

Unit-II: Search Engine Optimization (SEO) **11 hours**

Introduction, writing the SEO content – title, meta tags, image tags, html tags, content writing essentials, Google adwords, Google adsense, Google webmaster tools, on and off page optimization, web crawlers, keyword strategy; SEO friendly website design, hosting & integration.

Unit-III: Social media in business **(4 + 5) 9 hours**

Part-A: Wikipedia, Facebook, Instagram, LinkedIn, Google – advertising, analytics, ads visibility, bulk emailing essentials, integration of social media buttons into business website.

Part-B: campaign budgeting, cost control, resource planning, strengthen your brand, Generate leads, Get more visibility online, Connect with your audience, link exchange, registering with directories, data visualization.

Unit-IV: Link building and content consideration **10 hours**

Precursors to link building, elements of link building, finding your competition, analyzing your competition, competitor tracking, becoming a resource, content duplication, content verticals, sitemaps.

Unit-V: Applications **9 hours**

Travel portal - Makemytrip, Yatra, IRCTC; E-commerce – Amazon, flipkart; Song portals – Wynk.

Textbooks:

1. Jerkovic, John I. SEO warrior: essential techniques for increasing web visibility. "O'Reilly Media, Inc.", 2009.
2. The Art of SEO: Mastering Search Engine Optimization Eric Enge, Stephan Spencer, Rand Fishkin, Jessie C Stricchiola; O'Reilly Media

Reference:

1. SEO: Search Engine Optimization Bible Jerri L. Ledford; Wiley India; 2nd Edition

BLOCKCHAIN TECHNOLOGY
(Professional Elective - I)

III-B.Tech.-II-Sem. **L T P C**
Subject Code: CS-PEC-304 **3 - - 3**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO2	PO3	PO5	PO6	PO12	PO13
CO1	explain the fundamentals of Blockchain techniques	3	2	2	3	3	3
CO2	analyze various consensus problems	3	3	3	3	2	3
CO3	adapt Blockchain technology to improve business	3	3	3	3	2	3
CO4	make use of Ethereum frameworks to write smart contract	3	3	3	3	2	3
CO5	interpret Blockchain technology in real time applications	3	3	3	3	2	3

Unit-I **10 hours**

Introduction: What is Blockchain, the business backdrop, the problem area, Relation to bitcoin, Requirements for Blockchain in a business environment, Requirements deep dive, Leverage Blockchain benefits, why Blockchain is relevant for business.
Consensus: shared reference data example, Provenance: supply chain example, Immutability: audit and compliance example, Finality: letter of credit example, Industry use cases, Customer adoption.

Unit-II **10 hours**

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

Unit-III **(4 + 6) 10 hours**

Part-A: Transform your Business with Blockchain: IBM and Hyperledger relationship: Blockchain for business, Hyperledger Composer, Public references, IBM engagement model, Set up the Hyperledger Composer Playground, Transfer assets in a Blockchain network, Explore editor views archive data.

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

Unit-IV **8 hours**

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

Unit-V **10 hours**

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

Textbook:

1. Narayanan, Arvind, et al. Bitcoin and cryptocurrency technologies: A comprehensive introduction. Princeton University Press, 2016.

References:

1. Vigna, Paul, and Michael J. Casey. The Truth Machine: The Blockchain and the Future of Everything. Picador, 2019.
2. Gerard, David. Attack of the 50 foot blockchain: Bitcoin, blockchain, Ethereum & smart contracts. David Gerard, 2017.
3. De Filippi, Primavera De Filippi. Blockchain and the law: The rule of code. Harvard University Press, 2018.

DISASTER MANAGEMENT
(Open Elective - I)

III-B.Tech.-II-Sem. **L T P C**
Subject Code: OEC-301 **3 - - 3**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO2	PO7	PO8	PO12
CO1	analyze impact of disasters	3	2	3	3
CO2	choose suitable disaster management mechanism	3	3	3	3
CO3	make use of appropriate measures for capacity building to reduce risks	2	2	3	2
CO4	develop strategies to cope up with disasters	3	3	3	3
CO5	build disaster management plan	2	3	3	3

Unit-I **10 hours**

Understanding Disaster: Concept of Disaster - Different approaches- Concept of Risk - Levels of Disasters - Disaster Phenomena and Events (Global, national and regional)
Hazards and Vulnerabilities: Natural and man-made hazards; response time, frequency and forewarning levels of different hazards - Characteristics and damage potential or natural hazards; hazard assessment - Dimensions of vulnerability factors; vulnerability assessment - Vulnerability and disaster risk - Vulnerabilities to flood and earthquake hazards

Unit–II **9 hours**

Disaster Management Mechanism: Concepts of risk management and crisis managements - Disaster Management Cycle - Response and Recovery - Development, Prevention, Mitigation and Preparedness - Planning for Relief

Unit-III **(5 + 5)10 hours**

Capacity Building: Capacity Building: Concept - Structural and Nonstructural Measures Capacity Assessment; Strengthening Capacity for Reducing Risk - Counter-Disaster Resources and their utility in Disaster Management - Legislative Support at the state and national levels

Unit- IV **9 hours**

Coping with Disaster: Coping Strategies; alternative adjustment processes – Changing Concepts of disaster management - Industrial Safety Plan; Safety norms and survival kits - Mass media and disaster management.

Unit-V **10 hours**

Planning for disaster management: Strategies for disaster management planning - Steps for formulating a disaster risk reduction plan - Disaster management Act and Policy in India Organizational structure for disaster management in India - Preparation of state and district, Disaster management plans.

Textbooks:

1. Manual on Disaster Management, National Disaster Management, Agency Govt of India.
2. Disaster Management by Mrinalini Pandey Wiley 2014.
3. Disaster Science and Management by T. Bhattacharya, TMH, 2015

References:

2. Earth and Atmospheric Disasters Management, N. Pandharinath, CK Rajan, BSP 2009.
3. National Disaster Management Plan, Ministry of Home affairs, Government of India (http://www.ndma.gov.in/images/policyplan/dmplan/draftndmp.pdf)

FUNDAMENTALS OF OPERATIONS RESEARCH
(Open Elective-I)

III-B.Tech.-II-Sem. **L T P C**
Subject Code: OEC-302 **3 - - 3**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO1	PO2	PO12
CO1	formulate and solve linear programming problem using various methods	3	2	3
CO2	solve transportation and assignment problems	3	3	3
CO3	compute sequencing and inventory model problems	2	2	3
CO4	analyze waiting lines and game theory problems	3	3	3
CO5	evaluate replacement and dynamic programming problems	2	3	3

Unit-I **10 hours**

Introduction to Operations Research: Basics definition, scope, objectives, phases, models, applications and limitations of Operations Research.
Linear Programming Problem Formulation, Graphical solution, Simplex method, Artificial variables techniques: Two-phase method, Big M method.

Unit-II **9 hours**

Transportation Problem: Formulation, solution, unbalanced Transportation problem. Finding basic feasible solutions – Northwest corner rule, least cost method and Vogel's approximation method. Optimality test: MODI method.
Assignment model: Formulation. Hungarian method for optimal solution. Solving unbalanced problem. Traveling salesman problem and assignment problem.

Unit-III **(5 + 5) 10 hours**

Part-A: Sequencing: Introduction, Flow-Shop sequencing, n jobs through two machines, n jobs through three machines, Job shop sequencing, two jobs through m machines.

Part-B: Inventory: Introduction, Single item, Deterministic models - Purchase inventory models with one price break and multiple price breaks -Stochastic models - demand may be discrete variable or continuous variable - Single Period model and no setup cost.

Unit-IV **10 hours**

Theory of Games: Introduction, Terminology- Solution of games with saddle points and without saddle points- 2 x 2 games, dominance principle, m x 2 & 2 x n games -graphical method.
Waiting Lines: Introduction, Terminology-Single Channel-Poisson arrivals and Exponential Service times-with infinite population and finite population models-Multichannel-Poisson arrivals and exponential service times with infinite population.

Unit-V **9 hours**

Dynamic Programming: Introduction, Terminology - Bellman's Principle of Optimality - Applications of dynamic programming- Project network - CPM and PERT networks - Critical path scheduling.

Text Books:

1. Operations Research, J.K.Sharma 4th Edition, Mac Milan.
2. Introduction to O. RIHilIier & Libermannf, TMH.

References:

1. Introduction to O.R, Hamdy A. Taha, PHl.
2. Operations Research, A.M.Natarajan, P. Balasubramaniam, A.Tamilarasi, Pearson Education.
3. Operations Research I Wagner, PHI Publications.

ELECTRONIC MEASUREMENTS AND INSTRUMENTATION
(Open Elective-I)

III-B.Tech.-II-Sem. **L T P C**
Subject Code: OEC-303 **3 - - 3**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO1	PO2	PO12
CO1	apply the fundamental concepts of measuring instruments	3	2	2
CO2	distinguish signal generators and signal analyzers	3	3	2
CO3	make use of oscilloscopes	3	2	2
CO4	identify various transducers	3	3	2
CO5	develop bridges for various measuring parameters	3	2	2

Unit-I **10 hours**

Block Schematics of Measurement: Performance characteristics-static characteristics, dynamic characteristics; measuring instruments: DC Voltmeters, D' Arsonval Movement, DC Current Meters, AC voltmeters and Current Meters, Ohmmeters, Multi-meters; meter protection; Extension of Range; True RMS Responding voltmeters; specifications of instruments.

Unit-II **9 hours**

Signal Analyzers: AF, HF Wave Analyzers, Heterodyne wave Analyzers, Power Analyzers; capacitance-voltage Meters; oscillators; signal generators-sweep frequency generators: AF, RF, pulse and square wave, arbitrary waveform & function generators and Specifications.

Unit-III **(5 + 5) 10 hours**

Part-A: Oscilloscopes: CRT, Block Schematic of CRO, Time Base Circuits, CRO Probes. Applications-measurement of Time period and frequency specifications.

Part-B: Special Purpose Oscilloscopes: introduction to dual trace, dual beam CROs, sampling oscilloscopes, storage oscilloscopes, digital storage CROs.

Unit-IV **10 hours**

Transducers: Classification of transducers; force and displacement transducers; resistance thermometers; hotwire anemometers; LVDT; thermocouples, Synchros, special resistance thermometers; digital temperature sensing system; Piezoelectric; variable capacitance transducers; magneto strictive transducers.

Unit-V **9 hours**

Bridges: Wheat Stone Bridge, Kelvin Bridge, and Maxwell Bridge; measurement of physical parameters-flow, displacement, level, humidity, moisture, force, pressure, vacuum level, temperature measurements; data acquisition systems.

Textbooks:

1. Electronic Instrumentation: H.S.Kalsi-TMH 2nd Edition 2004.
2. Modern Electronic Instrumentation and Measurement Techniques: A.D. Helbincs, W.D.Cooper: PHI 5th Edition, 2003.

References:

1. Electronic Instrumentation and Measurements- David A. Bell, Oxford Univ. Press, 1997.
2. Electronic Measurements and Instrumentation K. Lal Kishore, Pearson Education 2010.

JAVA PROGRAMMING
(Open Elective-I)

III-B.Tech.-II-Sem. **L T P C**
Subject Code: OEC-304 **3 - - 3**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO1	PO2	PO3	PO5	PO12
CO1	write simple java programs using OOP concepts	3	2	2	3	2
CO2	develop programs using inheritance and polymorphism	3	2	3	3	2
CO3	create packages and interfaces	3	2	3	3	2
CO4	build efficient code using multithreading and exception handling	3	2	3	3	2
CO5	design real-time applications using applets	3	2	3	3	2

Unit-I **10 hours**

Java Basics: History of Java, Java buzzwords, data types, variables, scope and life time of variables, arrays, operators, expressions, control statements, type conversion and casting, OOP concepts, concepts of classes, objects, constructors, methods, access control, this keyword, garbage collection, parameter passing, recursion, exploring String class.

Unit-II **9 hours**

Inheritance and Polymorphism: Types of inheritance, member access rules, super uses, using final with inheritance, the object class and its methods, method overloading and overriding, dynamic binding, abstract classes and methods.

Unit-III **(5 + 5) 10 hours**

Part-A: Packages and Inner classes: Defining, creating and accessing a package, CLASSPATH, importing packages, inner classes – local, anonymous and static.

Part-B: Interfaces: Defining an interface, implementing interface, applying interfaces, variables in interface and extending interfaces, differences between classes and interfaces.

Unit-IV **9 hours**

Exception handling: Concepts of exception handling, benefits of exception handling, exception hierarchy, usage of try, catch, throw, throws and finally, built in exceptions, creating own exception sub classes.
Multithreading: Differences between multi-threading and multitasking, thread life cycle, creating threads, thread priorities, synchronizing threads, inter thread communication.

Unit-V **10 hours**

Applets: Concepts of Applets, differences between applets and applications, life cycle of an applet, types of applets, creating applets, passing parameters to applets.

Textbooks:

1. Java the complete reference, 8th Edition, Herbert Schildt, TMH.

References:

1. Java How to Program, H. M. Dietel and P. J. Dietel, Sixth Edition, Pearson Education, PHI.
2. Introduction to Java programming, Y. Daniel Liang, Pearson Education.

INDIAN CULTURE AND CONSTITUTION
(Open Elective-I)

III-B.Tech.-II-Sem. **L T P C**
Subject Code: OEC-305 **3 - - 3**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO8	PO12
CO1	identify paradigm shift in indian culture	3	1
CO2	explain features of languages, religions and holy books	3	2
CO3	illustrate provisions of Indian constitution	3	3
CO4	appreciate the structure of Indian administration system	3	3
CO5	appraise the role of Election Commission of India	3	2

Unit-I **10 hours**

Indian Culture: Characteristics of Indian culture, significance of geography on Indian culture, society in India through ages, religions in ancient period, caste system, communalism and modes of cultural exchange.

Unit-II **9 hours**

Indian Languages, Religions and Literature: Evolution of script and languages in India, the Vedas and holy books of various religions. religion and philosophy in India; ancient period – Prevedic, Vedic religion, Buddhism and Jainism.

Unit-III **(5 + 5) 10 hours**

Part A: Indian Constitution: Constitution' meaning of the term, Indian Constitution: Sources and constitutional history, Features: Citizenship, Fundamental Rights and Duties.

Part B: Union Administration: Structure of the Indian Union: Federalism, Centre- State relationship, President: Role, power and position, PM and Council of ministers, Cabinet and Central Secretariat, Lok Sabha, Rajya Sabha.

Unit-IV **10 hours**

State Administration: Governor: Role and Position, CM and Council of ministers, State Secretariat: Structure and functions Election Commission: Role and Functioning.
District's Administration: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation.

Unit-V **9 hours**

Local Administration: Introduction to local self government, Organizational Hierarchy (Different departments), ZP administration, Mandal level and Village level administration.
Election Commission: Role, structure and Functions of Election Commission of India. Introduction to different welfare boards.

Reference:

1. A Hand Book on Indian Culture and Constitution, FED, CMRIT, Hyderabad.

CLOUD COMPUTING LAB

III-B.Tech.-II-Sem. **L T P C**
Subject Code: CS-PCC-324 **- - 2 1**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO4	PO5	PO14
CO1	analyze the use of Cloud Applications	3	3	3
CO2	create virtual machines from available physical resources	3	3	3
CO3	demonstrate the benefits of various cloud computing platforms	3	3	3
CO4	make use of modern tools to built cloud applications	3	3	3
CO5	design and develop application using AWS	3	3	3

List of Experiments:

1. Register with AWS and create a windows/ Linux instance.
2. Create a S3 storage bucket and store documents in bucket.
3. Create a static website and host website by using S3.
4. Map www.cmritonline.ac.in (any domain name) with WebPages created in experiment 3.
5. Install nginx/apache in EC2 (elastic cloud compute) cloud server and host html WebPages.
6. Create a volume with 10GB hard disk and add to a server.
7. Create an AMI for Multi using purpose.
8. Install and configure any RDBMS database in Cloud.
9. Create a virtual private cloud (VPC) for managing organizational servers.
10. Implement paas (platform as a service) by using elastic beanstalk and deploy a simple web application.
11. Implement load balancing server with minimum 3 nodes.
12. Configure a SNS (Simple Notification Service) and cloud watch.

Micro-Projects: Student must submit a report on one of the following Micro–Projects before commencement of second internal examination.

1. Cloud Based Attendance System.
2. E-Blood Bank Application Using Cloud Computing.
3. Cloud Based Improved File Handling and Duplication Removal Using MD5.
4. Attribute Based Access Control in Personal Health Records Using Cloud Computing.
5. Secure Text Transfer Using Diffie Hellman Key Exchange Based on Cloud.
6. Implementation of Cloud Computing for Product based Search Engine.
7. Key exchange privacy preserving technique in cloud computing.
8. Preserving Privacy in Public Auditing For Data Storage Security in Cloud Computing.
9. A Research Homomorphism Encryption Scheme to Secure Data Mining in Cloud Computing for Banking System.
10. Cloud based Biometric Authentication System.

Reference:

1. Cloud Computing Lab Manual, Department of CSE, CMRIT, Hyd.

MACHINE LEARNING AND DATA SCIENCES LAB

III-B.Tech.-II-Sem. **L T P C**
Subject Code: CS-PCC-325 **- - 2 1**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO4	PO5	PO14
CO1	illustrate the implementation procedures for the ML algorithms	3	3	3
CO2	demonstrate the ID3 classification algorithms	3	3	3
CO3	analyze k-Means clustering on different datasets	3	3	3
CO4	apply predictive algorithms on live data	3	3	3
CO5	identify the regression algorithms to solve real world problems	3	3	3

LIST OF EXPERIMENTS

1. Implement and demonstrate the FIND-S algorithm for finding the most specific hypothesis based on a given set of training data samples. Read the training data from a .CSV file.
2. Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.
3. Implement the non-parametric Locally Weighted Regression algorithm in order to fit data points. Select appropriate data set for your experiment and draw graphs.
4. Apply EM algorithms to cluster a set of data stored in a .CSV file. Use the same data set for clustering using k-Means algorithm. Compare the results of these two algorithms and comment on the quality of clustering.
5. Write a program to implement k-Nearest Neighbor algorithm to classify the iris data set. Print both correct and wrong predictions.
6. Implementing Back propagation algorithm and test the same using appropriate data sets.
7. Write a program to do sentiment analysis of live tweets.
8. Write a program to predict the eligibility of a customer for loan disbursement.
9. Write a program to predict the quality of water.
10. Write a program to predict the winning team in IPL matches.

Micro-Projects: Student must submit a report on one of the following Micro–Projects before commencement of second internal examination.

1. Diagnose crop disease with Machine Learning.
2. Recurrence of prostate cancer using Machine learning for survival analysis.
3. Develop a system to find out duplicate data.
4. Develop a system to analyze buying behavior of a customer.
5. Develop a system to study sentiment of users on twitter.
6. Develop a predictive model to study the employee satisfaction in an organization.
7. Develop a predictive model to study the rainfall of your society.
8. Develop a predictive model to study Fake News on Facebook.
9. Analyze election data.
10. Do linear regression on housing prices and do a forecasting model of how much house prices would increase.

Reference:

1. Machine Learning and Data Sciences Lab Manual, Department of CSE, CMRIT, Hyd.

FULL STACK WEB DEVELOPMENT LAB

III-B.Tech.-II-Sem. **L T P C**
Subject Code: CS-PCC-326 **- - 2 1**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO4	PO5	PO14
CO1	illustrate implementation procedure of full stack web development	3	3	3
CO2	demonstrate HTML5, CSS5 scripting languages and Github	3	3	3
CO3	make use of scripting languages in web development	3	3	3
CO4	develop web applications using AJAX	3	3	3
CO5	build real time applications using full stack web development	3	3	3

List of Experiments

1. Write code in HTML5 to develop simple webpage.
2. Write CSS5 & HTML5 Code to show Dropdown Menu.
3. Write HTML5, CSS and Javscript code to Create one-page website having different menu items.
4. Write a program in CSS to show your city with building and moving cars.
5. Write a program to validate web form using javascript.
6. Write jquery code to show website slider.
7. Show version control in Github.
8. Write a program in javascript to Create a user login system.
9. Create a website showing jquery slider.
10. Write a program to show user details using HTML, CSS & AJAX
11. Write a program to display options in a search engine using Ajax.

Micro-Projects: Student must submit a report on one of the following Micro–Projects before commencement of second internal examination.

1. Develop Project MyNote - A HTML5 App
2. Develop a Bookstore application by using HTML5, CSS, jquery in Github
3. Develop a shopping cart application by using HTML5, CSS, jquery in Github
4. Develop an e-learning system using HTML5, CSS, jquery in Github
5. Build a personal portfolio webpage using HTML5, CSS, jquery.
6. Develop google.com Search result page using HTML5, CSS, jquery & Ajax
7. Develop a webpage to display solar system using HTML5, CSS, jquery & Ajax
8. Build Tajmahal using CSS.
9. Build a Real-Time Markdown Editor with Node.js
10. Develop an User model covering, Registration, Email verification(send an email), Login (with remember me)
11. Develop Chess Game using HTML5, CSS, jquery & Ajax

Reference:

1. Full Stack Web Development Lab Manual, Department of CSE, CMRIT, Hyd.

MOBILE APPLICATION DEVELOPMENT (ANDROID) LAB

III-B.Tech.-II-Sem. **L T P C**
Subject Code: CS-PCC-327 **1 - 2 2**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak; 0-No Correlation)

COs	Upon completion of course the students will be able to	PO2	PO3	PO4	PO5	PO8	PO14
CO1	outline installation of android application development kit	3	3	3	3	3	3
CO2	develop android applications for mobile devices	3	3	3	3	3	3
CO3	build GUI based android applications	3	3	3	3	3	3
CO4	appraise graphics and multimedia support in android	3	3	3	3	3	3
CO5	create database driven mobile applications	3	3	3	3	3	3

List of programs:

1. Install Android application development.
   a) Java JDK5 or later version. b) Android Studio.
2. Create an application that takes the name from a text box and shows hello message along with the name entered in text box, when the user clicks the OK button.
3. Create an android applications
   a) Play and control audio file. b) Record an audio.
4. Create a screen that has input boxes for User Name, Password, Address, Gender (radio buttons for male and female), Age (numeric), Date of Birth (Date Picket) and a Submit button. On clicking the submit button, print all the data below the Submit Button.
5. Develop an application that shows names as a list and on selecting a name it should show the details of the candidate on the next screen with a "Back" button.
6. Create an android application Grid View.
7. Create an android application for to create simple calculator.
8. Create an android application to convert text into speech.
9. Create an android application with image slide.
10. Create an android application to capture image using camera and display the image using image view.
11. Create a user registration application that stores the user details in a database table.
12. Create a database and a user table where the details of login names and passwords are stored. Insert some names and passwords initially. Now the login details entered by the user should be verified with the database and an appropriate dialog should be shown to the user.

Micro-Projects: Student must submit a report on one of the following Micro–Projects before commencement of second internal examination.

1. Develop a Login application.
2. Develop an application to display user profile image.
3. Develop an application that creates alarm clock.
4. Develop an application that writes data to the SD card.
5. Develop an application to display names and their details on clicking the "Back" button. On screen rotation to landscape mode it should display list on left fragment and details on right fragment instead of second screen.
6. City guide app using android.
7. Library Management app using android.
8. Music library using android app
9. Online Exam App with Levels using android
10. Develop an application that uses a menu with 3 options for dialing a number, opening a website and to send an SMS. On selecting an option, the appropriate action should be invoked.

Reference:

1. Mobile Application Development Lab Manual, Department of CSE, CMRIT, Hyd.

EMPLOYABILITY SKILLS – II
MANDATORY COURSE (NON-CREDIT)

III-B.Tech.-II-Sem. **L T P C**
Subject Code: MC-321 **3 - - -**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO9	PO10
CO1	make use of soft skills to become a professional team member	3	3
CO2	develop professional correspondence skills	3	3
CO3	apply knowledge of decision making, leadership, motivation	3	3
CO4	adapt principles of quantitative aptitude to achieve qualitative results	3	3
CO5	exhibit confidence in facing the interview process	3	3

Unit–I **10 Hours**

Soft Skills:

Introduction to Soft Skills: Self awareness and Self esteem, Discipline, Integrity, Attitude, Change and Adaptability.

Quantitative Aptitude:

Number Systems: Basic Concepts, Number Systems: Natural numbers, whole numbers, integers, fractions, Rational Numbers, Irrational Numbers, Real Numbers, Divisibility Rules, Logic Equations, Remainder theorem, Unit digit calculation

Progressions & Inequalities: Basic Concepts, Types: arithmetic, geometric, harmonic progression and applications.

Unit-II **9 Hours**

Soft Skills:

People Skills: Relationships - Personal & Professional Relationships – Rapport Building – Personal Space; Definition of Motivation –Motivation – Self-motivation; Time Management – Stephen Covey's time management.

Quantitative Aptitude:

Profit and Loss: Basic Concepts, discounts, marked price and list price, dishonest shopkeeper with manipulated weights, successive discounts etc.

Interest (Simple and Compound): Basic Concepts, Yearly, Half-yearly, and quarterly calculations, multiples, differences between simple and compound interest.

Ratio and Proportion: Basic Concepts of ratio and proportion, continued or equal proportions, mean proportions, invest proportion, alternative proportion, division proportion, compound proportion, duplication of ratio, finding values, coins and currencies, etc.

Unit–III **(5 + 5) 10 Hours**

Part-A:

Soft Skills:

Teamwork: Definition of Team, Team Dynamics – Specialization and Teamwork – Rewards of Teamwork.

Quantitative Aptitude:

Speed, Time and Distance: Basic Concepts, Single train problems, two train problems: some point same side, some point opposite sides, relative speed, different points meeting at common points, different points same side (different timings vs. same timings), ratios, number of stoppages, average speed, etc.

Part-B:

Soft Skills:

Leadership: Definition of Leadership, Leading a Team, Leadership Qualities – Leader vs Manager – Leadership Styles.

Quantitative Aptitude:

Time and Work: Basic Concepts, comparative work, mixed work, alternative work, middle leave and middle join, ratio efficiency.

Unit-IV **10 Hours**

Soft Skills:

Problem Solving and Decision Making: Definitions –Problem Solving and Decision Making – Hurdles in Decision Making - Case studies.

Quantitative Aptitude:

Permutations and combinations: Basic Concepts, differences between permutations and combinations, always together-never together, alternative arrangement, fixed positions, double fixations, items drawing from a single group, items drawing from a multiple group, total ways of arrangement with repetitions and without repetitions, dictionary, handshakes or line joining between two points or number of matches , sides and diagonals, etc.
Clocks and Calendars: Basic Concepts, Angle between minute hand and hour hand, reflex angle, hours hand angle, time gap between minute hand and hour hand, relative time: coincide, opposite sides and right angle, mirror images, faulty clock (slow/fast), miscellaneous, calendar.

Unit-V **9 Hours**

Soft Skills:

Preparation for Interviews: Body Language – Posture - Dressing and Grooming – Researching the Industry and the Organization- Types of Interviews – First Impressions – Dos and Don'ts of an Interview.

Quantitative Aptitude:

Geometry and Mensuration: Basic concepts, types of angles.
Plane figures: rectangles, squares, triangles, quadrilateral, areas, perimeters, etc.
Solid figures: cubes, cuboids, cylinders-area (total surface area and lateral surface area), volumes, perimeters.
Others: Parallelogram, Rhombus, Trapezium, Circle, Sector, Segment, Cone, Sphere, Hemisphere, etc.

Activities List:

1. Regular cumulative practice tests
2. Quiz, Crossword, Word-search and related activities
3. 5-minute presentations about concepts learnt
4. JAM and Picture Narration.
5. Mock Interviews.

Reference:

1. Employability Skills – II Manual, FED, CMRIT, Hyd.

IV-B.TECH.-I-SEMESTER SYLLABUS

MANAGEMENT, ECONOMICS AND ACCOUNTANCY

IV-B.Tech.-I-Sem. **L T P C**
Subject Code: HSMC-401 **3 - - 3**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO11	PO12
CO1	apply principles of management in professional career	3	2
CO2	make use of principles of economics for decision making	3	2
CO3	solve problems in the areas of production, cost and price	3	2
CO4	prepare balance sheet and maintain books of accounts	2	3
CO5	analyze financial performance of an enterprise	3	3

Unit-I: Management concepts **10 hours**

Introduction to Management and organization, Scientific management, Modern management – Functions, objectives and scope of functional areas of management, Levels of management.

Unit-II: Introduction to Managerial Economics **10 hours**

Fundamental concepts of Managerial Economics, Concept of Law of Demand, Factors influencing and limitations, Concept of Elasticity of Demand, types and methods, Demand forecasting methods and limitations.

Unit-III: Theory of Production, Cost and Market Structure **(4 + 4) 8 hours**

Part-A: Types of Production function, input output relationship and types of costs, cost output relationship.

Part-B: CVP Analysis-BEP analysis assumptions, limitations and uses. Different market structures-Perfect & Monopoly Competition.

Unit-IV: Introduction to Accounts **14 hours**

Accounting Objectives, Functions, GAAP – Basics of Accounting - Rules for preparation of Journal and Ledger. Process of Journalisation and Subsidiary books. Preparation of Trading, Profit & Loss Accounts and Balance Sheet (Simple Problems).

Unit- V: Financial Statement Analysis **6 hours**

Concept of Financial Statement Analysis uses and limitations – Liquidity, Leverage, Activity, Turnover, Profitability Ratios (Simple problems).

References:

1. L.M. Prasad, Principles and Practices of Management, Revised Edition, S. Chand Publishing.
2. IM Pandey, Financial Management, 12th Edition, Vikas, 2017.
3. Philip Kotler, Kevin Lane Keller, Abraham Koshy and Mithleshwar Jha: Marketing Management, 15/e, Pearson Education, 2012.
4. K. Aswathappa, “Human Resource Management, Text and Cases”, TMH, 2016.
5. Panneerselvam “Production and Operations Management” PHI, 2017.

INFORMATION SECURITY

IV- B.Tech.-I-Sem. **L T P C**
Subject Code: CS-PCC-411 **3 - - 3**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO2	PO3	PO6	PO8	PO12	PO13
CO1	perceive basic cryptographic algorithms, message and web authentication and security issues	2	2	2	3	2	3
CO2	identify security system requirements for both of them such as client and server	3	3	3	3	3	3
CO3	design various cryptographic algorithms	3	3	3	3	3	3
CO4	illustrate a network and flow of information	3	3	3	3	3	3
CO5	make use of security key management in network security	3	3	3	3	3	3

Unit-I **11 Hours**

Security Concepts: Introduction to Information security, the need for security, Principles of security, Types of Security attacks, Security Mechanisms, A model for Network Security.
Cryptography Concepts and Techniques: Introduction, plain text and cipher text, substitution techniques, transposition techniques, encryption and decryption, symmetric and asymmetric key cryptography, steganography, key range and key size.

Unit-II **10 Hours**

Symmetric key Ciphers: Block Cipher principles, DES, AES, Blowfish, Block cipher modes of operations, Stream ciphers, RC4.
Asymmetric key Ciphers: Principles of public key cryptosystems, RSA algorithm, Diffie-Hellman Key Exchange, Knapsack Algorithm.

Unit-III **(3 + 8) 11 Hours**

Part-A: Cryptographic Hash Functions: Message Authentication, Secure Hash Algorithm (SHA-512).
Part-B: Message authentication codes: Authentication requirements, HMAC, CMAC, Digital signatures, Kerberos, X.509 Authentication Service, Public – Key Infrastructure.

Unit-IV **8 Hours**

E-Mail Security: Pretty Good Privacy, S/MIME **IP Security:** IP Security overview, IP Security architecture, Authentication Header, Encapsulating security payload, combining security associations.

Unit-V **8 Hours**

Transport-level Security: Web security considerations, Secure Socket Layer, Transport Layer Security, HTTPS, Mobile device security, WI-FI security.

Textbooks:

1. Cryptography and Network Security - Principles and Practice: William Stallings, Pearson, 6/e.
2. Cryptography and Network Security: Atul Kahate, TMH, 3rd Edition.

References:

1. Cryptography and Network Security: C K Shyamala, N Harini, Dr T R Padmanabhan, Wiley India, 1st Edition.
2. Network Security: Forouzan Mukhopadhyay, TMH, 3rd Edition.
3. Network Security and Cryptography: Bernard Menezes, CENGAGE Learning.

SOFTWARE TESTING METHODOLOGIES
(Professional Elective-II)

IV-B.Tech.-I-Sem. **L T P C**
Subject Code: CS-PEC-401 **3 - - 3**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO3	PO4	PO5	PO12	PO13
CO1	explain the concepts of STM, flow graphs and path testing	3	2	2	3	3
CO2	illustrate domain testing mechanism	3	3	3	3	3
CO3	distinguish transaction and data flow testing methods	3	3	3	3	3
CO4	make use of paths, products, expressions and logical testing strategies	3	3	3	3	3
CO5	apply transition testing and graph matrices to solve real time problems	3	3	3	3	3

Unit-I **11 Hours**

Introduction: Purpose of testing, Dichotomies, model for testing, consequences of bugs, taxonomy of bugs.
Flow graphs and Path testing: Basics concepts of path testing, predicates, path predicates and achievable paths, path sensitizing, path instrumentation, application of path testing.

Unit-II **9 Hours**

Domain Testing: Domains and paths, Nice & ugly domains, domain testing, domains and interfaces testing, domain and interface testing, domains and testability.

Unit-III **(4 + 4) 8 Hours**

Part-A: **Transaction Flow Testing:** Transaction flows, Transaction flow testing techniques.

Part-B: Dataflow Testing: Basics of dataflow testing, strategies in dataflow testing, application of dataflow testing.

Unit-IV **10 Hours**

Paths, Path products and Regular expressions: Path products & path expression, reduction procedure, applications, regular expressions & flow anomaly detection**.**
Logic Based Testing: Overview, decision tables, path expressions, KV charts, specifications.

Unit-V **10 Hours**

State, State Graphs and Transition testing: State graphs, good & bad state graphs, state testing, Testability tips.
Graph Matrices and Application: Motivational overview, matrix of graph, relations, power of a matrix, node reduction algorithm, building tools. (Student should be given an exposure to a tool like JMeter or Win-runner).

Textbooks:

1. Software Testing Techniques, Baris Beizer, Dreamtech, 2nd edition.
2. Software Testing Tools, Dr.K.V.K.K.Prasad, Dreamtech.

References:

1. The craft of software testing - Brian Marick, Pearson Education.
2. Effective methods of Software Testing, Perry, John Wiley.
3. Software Concepts and Tools P Nageshwarrao, Dream Tech Press.
4. Software Testing S Desikan, J Ramesh, Pearson.

ADVANCED COMPUTER ARCHITECTURE
(Professional Elective - I)

IV-B.Tech.-I-Sem. **L T P C**
Subject Code: CS-PEC-405 **3 - - 3**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO3	PO4	PO12	PO13
CO1	explain the fundamentals of computer design	2	2	2	2
CO2	outline instruction-level parallelism (ILP) and its challenges	2	2	2	3
CO3	perceive memory hierarchy, multiprocessors and thread-level parallelism	3	3	2	3
CO4	illustrate various storage systems and its reliability measures	3	3	3	3
CO5	adapt software and hardware multithreading techniques	3	3	3	3

Unit-I **10 hours**

Fundamentals of Computer Design: Defining Computer Architecture, Trends in Technology, Dependability, Quantitative Principles of Computer Design.

Unit-II **9 hours**

Instruction-Level Parallelism: Concepts and Challenges, Hardware and software approaches-Dynamic scheduling, Speculation, Compiler techniques for exposing ILP - Branch prediction.

Unit-III **(5 + 5) 10 Hours**

Part-A: Multiprocessors and Thread-Level Parallelism: A Taxonomy of Parallel Architectures, Symmetric Shared-Memory Architectures, Distributed Shared Memory and Directory-Based Coherence, Synchronization, Models of Memory Consistency.

Part-B: Memory Hierarchy Design: Eleven Advanced Optimizations of Cache Performance, Memory Technology and Optimization, Protection: Virtual Memory and Virtual Machines.

Unit-IV **9 Hours**

Storage Systems: Types of storage devices, Buses, RAID, Disk Storage, Disk Power, Disk Arrays, errors and failures, bench marking a storage device.

Unit-V **10 Hours**

Software and hardware multithreading: SMT and CMP architectures, Design issues, Case studies, Intel Multi-core architecture, SUN CMP architecture, heterogeneous multi-core processors.
Case study: IBM Cell Processor.

Textbooks:

1. John L. Hennessey and David A. Patterson, "Computer architecture – A quantitative approach", Morgan Kaufmann, Elsevier Publishers, 4th Edition, 2007.

References:

1. David E. Culler, Jaswinder Pal Singh, "Parallel computing architecture: A hardware/software approach", Morgan Kaufmann, Elsevier Publishers, 1999.
2. Kai Hwang and Zhi.Wei Xu, "Scalable Parallel Computing", TMH, 2003.

NATURAL LANGUAGE PROCESSING
(Professional Elective - II)

IV-B.Tech.-I-Sem. **L T P C**
Subject Code: CS-PEC-409 **3 - - 3**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO2	PO3	PO5	PO6	PO12	PO13
CO1	explain fundamentals of NLP and morphology	3	2	3	3	3	3
CO2	demonstrate word level statements and syntactic analysis	3	2	3	3	3	3
CO3	make use of context free grammar and parsing techniques	3	3	3	3	3	3
CO4	apply semantic analysis techniques to solve various problems	3	3	3	3	3	3
CO5	illustrate language generation and discourse analysis	3	2	3	3	3	3

Unit-I: Overview and Morphology **9 hours**

Introduction: Models and Algorithms - Regular Expressions - Basic Regular Expression Patterns - Finite State Automata.
Morphology: Inflectional Morphology - Derivational Morphology - Finite-State Morphological Parsing -Porter Stemmer.

Unit-II: Word Level and Syntactic Analysis **10 hours**

N-grams Models of Syntax - Counting Words - Unsmoothed N- grams, Smoothing- Backoff Deleted Interpolation – Entropy - English Word Classes - Tagsets for English, Part of Speech Tagging-Rule Based Part of Speech Tagging - Stochastic Part of Speech Tagging - Transformation-Based Tagging.

Unit-III: Context Free Grammars and Parsing **(5 + 4) 9 hours**

PART A: Context Free Grammars for English Syntax- Context- Free Rules and Trees – Sentence-Level Constructions– Agreement – Sub Categorization

PART B: Parsing – Top-down – Earley Parsing - feature Structures – Probabilistic Context-Free Grammars.

Unit-IV: Semantic Analysis **10 hours**

Representing Meaning - Meaning Structure of Language - First Order Predicate Calculus; Representing Linguistically Relevant Concepts -Syntax- Driven Semantic Analysis - Semantic Attachments -Syntax- Driven Analyzer; Robust Analysis - Lexemes and Their Senses - Internal Structure - Word Sense Disambiguation -Information Retrieval

Unit-V: Language Generation and Discourse Analysis **10 hours**

Discourse -Reference Resolution - Text Coherence - Discourse Structure – Coherence; Dialog and Conversational Agents - Dialog Acts – Interpretation -Conversational Agents – Language Generation – Architecture - Surface Realizations - Discourse Planning; Machine Translation -Transfer Metaphor– Interlingua – Statistical Approaches.

Textbooks:

1. Speech and Language Processing, Daniel Jurafsky and James H. Martin, , Prentice Hall; 2nd Edition, 2008.
2. Foundations of Statistical Natural Language Processing, Christopher D. Manning and Hinrich Schuetze, MIT Press, 1999.

Reference:

1. James Allen, Natural Language Understanding, Addison Wesley; 2nd Edition, 1994.

VIRTUAL REALITY
(Professional Elective - II)

IV-B.Tech.-I-Sem. **L T P C**
Subject Code: CS-PEC-413 **3 - - 3**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO2	PO3	PO5	PO8	PO12	PO13
CO1	explain fundamental of virtual reality and 3D graphic systems	2	2	2	2	2	3
CO2	adapt geometric modeling in virtual reality environment	3	3	3	3	3	3
CO3	make use of virtual environment for animation and simulation	3	3	3	3	3	3
CO4	illustrate virtual reality hardware and software	3	2	3	3	2	3
CO5	develop virtual reality applications	3	3	3	3	3	3

Unit-I: Introduction to Virtual Reality **10 hours**

Virtual Reality and Virtual Environment: Introduction, computer graphics, real time computer graphics, flight simulation, virtual environment requirement, benefits of virtual reality, historical development of VR, scientific landmark.
3D Computer Graphics: Introduction, The virtual world space, positioning the virtual observer, the perspective projection, human vision, stereo perspective projection, 3D clipping, colour theory, simple 3D modelling, illumination models, reflection models, Shading algorithms, radiosity, hidden surface removal, realism-stereographic image.

Unit-II: Geometric Modelling **10 hours**

Geometric Modelling: Introduction, from 2D to 3D, 3D space curves, 3D boundary representation. Geometrical Transformations: Introduction, frames of reference, modelling transformations, instances, picking, flying, scaling the VE, collision detection
Generic VR system: Introduction, Virtual environment, computer environment, VR technology, model of interaction, VR systems.

Unit-III: Virtual Environment **(4 + 5) 9 hours**

Part A: Animating the Virtual Environment: Introduction, The dynamics of numbers, linear and non- linear interpolation, the animation of objects, linear and non-linear translation, shape & object inbetweening, free from deformation, particle system.

Part B: Physical Simulation: Introduction, objects falling in a gravitational field, rotating wheels, elastic collisions, projectiles, simple pendulum, springs, flight dynamics of an aircraft.

Unit-IV: VR Hardware and Software **11 hours**

Human factors: Introduction, the eye, the ear, the somatic senses.
VR Hardware: Introduction, sensor hardware, head-coupled displays, acoustic hardware, integrated VR systems.
VR Software: Introduction, modelling virtual world, physical simulation, VR toolkits, introduction to VRML.

Unit-V: VR Applications **8 hours**

Introduction, engineering, entertainment, science, training; the future: virtual environment, modes of interaction.

Textbook:
1. John Vince, “Virtual Reality Systems”, Pearson Education Asia, 2007.

References:
1. Anand R., “Augmented and Virtual Reality”, Khanna Publishing House, New Delhi.
2. Adams, “Visualizations of Virtual Reality”, Tata McGraw Hill, 2000.

QUANTUM COMPUTING
(Professional Elective - III)

IV-B.Tech.-I-Sem. **L T P C**
Subject Code: CS-PEC-402 **3 - - 3**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO1	PO2	PO3	PO5	PO12	PO13
CO1	explain the concepts of quantum computing	3	2	2	2	2	3
CO2	make use of mathematical foundations for quantum computing	3	3	3	2	2	3
CO3	outline the architecture and programming models	3	2	2	2	3	3
CO4	utilize basic techniques of quantum computing	3	3	3	3	2	3
CO5	elaborate major algorithms and discuss about OSS toolkits	3	3	3	3	3	3

Unit-I: Introduction to Quantum Computing **6 hours**

Motivation for studying Quantum Computing, Major players in the industry (IBM, Microsoft, Rigetti, D-Wave etc.), Origin of Quantum Computing, Overview of major concepts in Quantum Computing, Qubits and multi-qubits states, Bra-ket notation, Bloch Sphere representation, Quantum Superposition, Quantum Entanglement.

Unit-II: Mathematical Foundations **10 hours**

Math Foundation for Quantum Computing, Matrix Algebra: basis vectors and orthogonality, inner product and Hilbert spaces, matrices and tensors, unitary operators and projectors, Dirac notation, Eigen values and Eigen vectors.

Unit-III: Building Blocks **(8 + 5) 13 hours**

Part-A: Architecture & Information Representation: Architecture of Quantum Computing platform, Details of q-bit system of information representation: Block Sphere, Multi-qubits States, Quantum superposition of qubits (valid and invalid superposition), Quantum Entanglement, Useful states from quantum algorithmic perceptive e.g. Bell State, Operation on qubits: Measuring and transforming using gates, Quantum Logic gates and Circuit: Pauli, Hadamard, phase shift, controlled gates, Ising, Deutsch, swap etc.

Part-B: Programming Model for Quantum Computing: Steps performed on classical computer, Steps performed on Quantum Computer, Moving data between bits and qubits.

Unit-IV: Basic Techniques **5 hours**

Amplitude amplification, Quantum Fourier Transform, Phase Kick-back, Quantum Phase estimation, Quantum Walks.

.

Unit-V: Major Algorithms & OSS Toolkits **14 hours**

Shor's Algorithm, Grover's Algorithm, Deutsch's Algorithm, Deutsch -Jozsa Algorithm, IBM quantum experience, Microsoft Q, Rigetti PyQuil (QPU/QVM).

Textbooks:

1. Nielsen M. A., Quantum Computation and Quantum Information, Cambridge University Press.
2. David McMahon, "Quantum Computing Explained", Wiley.

Reference:

1. Phillip Kaye Raymond Laflamme Michele Mosca, An Introduction to Quantum Computing, Oxford University Press.

ADHOC AND SENSOR NETWORKS
(Professional Elective - III)

IV-B.Tech.-I-Sem. **L T P C**
Subject Code: CS-PEC-406 **3 - - 3**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO2	PO3	PO4	PO12	PO13
CO1	explain the concepts of adhoc and sensor networks	3	2	2	2	3
CO2	apply QoS for secure MANETs	3	3	3	3	3
CO3	illustrate load distribution and routing protocol in MANETs	3	3	3	2	3
CO4	utilize power management and time synchronization techniques in WSN	3	3	3	3	3
CO5	adapt wi-fi for Adhoc networks	3	2	2	3	3

Unit-I **11 Hours**

Introduction to Adhoc Networks: Wireless networks and communications, Ad hoc networks (MANET), Routing of ad hoc networks, Internet routing protocols.
Introduction to Sensor Networks: Definitions and Background, Challenges and Constraints, Structural Health Monitoring, Traffic Control, Health Care, Pipeline Monitoring, Precision Agriculture, Active Volcano, Underground Mining.

Unit-II **9 Hours**

Quality of Service in MANETs: Introduction, QoS: a definition, The OLSRQSUP protocol and QoS extensions, Implementation, Simulation, Conclusion.

Unit-III **(4 + 6) 10 Hours**

Part-A: Load Distribution in MANETs: The mica mote, sensing and communication range, Design issues, energy consumption, clustering of sensors, applications.

Part-B: Energy Optimization in Routing Protocols in MANETs: Introduction, Energy optimization techniques, Energy minimizing routing models in ad hoc networks, Comparison of energy consumption for an ad hoc network routing protocols simulated in ns-2, Conclusion.

Unit-IV **10 Hours**

Power Management & Time Synchronization in WSN: Local Power Management Aspects, Dynamic Power Management, Conceptual Architecture, Clocks and the Synchronization Problem, Time Synchronization in Wireless Sensor Networks, Basics of Time Synchronization, Time Synchronization Protocols.

Unit-V **10 Hours**

Wi-Fi Access for Adhoc Networks: Introduction, Wi-Fi network structure, Wi-Fi network architecture, Wi-Fi norms, 802.11n migration

Textbooks:
1. Ad Hoc Networks: Routing, Qos and Optimization, Mounir Frikha, WILEY Press, 2010.
2. Fundamentals of Wireless Sensor Networks: Theory and Practice, Waltenegus Dargie, Christian Poellabauer, WILEY Press, 2010.

References:
1. Guide to Wireless Sensor Networks, Sudip Misra, Isaac Woungang, and Subhas Chandra Misra, Springer International Edition, 2012.
2. Wireless Ad hoc and Sensor Networks – Protocols, Performance and Control, Jagannathan Sarangapani, CRC Press, Taylor & Francis Group, 2007, rp 2010.

INFORMATION RETRIEVAL SYSTEMS
(Professional Elective - III)

IV-B.Tech.-I-Sem. **L T P C**
Subject Code: CS-PEC-410 **3 - - 3**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO2	PO3	PO4	PO12	PO13
CO1	outline information retrieval strategies	3	2	2	3	3
CO2	make use of various retrieval utilities for improving search	3	3	3	3	3
CO3	illustrate CLIR and its efficiency	3	3	3	3	3
CO4	formulate queries for semi-structured data	3	3	3	3	3
CO5	demonstrate distributed Information retrieval data	3	3	3	3	3

Unit-I **10 Hours**

Introduction, Retrieval strategies: Vector space model, probabilistic retrieval strategies, simple weight terms, non binary independence model, language model.

Unit-II **10 Hours**

Retrieval Utilities: relevance feedback, clustering, N-grams, regression analysis, thesauri, semantic networks, parsing.

Unit-III **(4 + 5) 9 Hours**

Part-A: Cross-Language Information Retrieval (CLIR): Introduction, crossing the language barrier.

Part-B: Efficiency: Inverted index, query processing, signature files, duplicate document detection.

Unit-IV **10 Hours**

Integrating structured data and text: A historical progression, Information retrieval as a relational application, semi-structured search using relational schema.

Unit-V **9 Hours**

Distributed Information retrieval: A theoretical model of information retrieval, web search.

Textbooks:

1. David A. Grossman, Ophir Frieder, Information Retrieval – Algorithms and Heuristics, Springer.
2. Gerald J Kowalski, Mark T Maybury, Information Storage and Retrieval systems,Springer,2000.

References:

1. Soumen Chakrabarti, mining the Web: Discovering knowledge from hyper text data, Morgan Kaufmann publishers, and 2002.
2. Christopher D. manning, Prabhakar Raghavan, Hinrich schutze, An introduction to information Retrieval, Cambridge University Press, Cambridge England, 2009.

ETHICAL HACKING
(Professional Elective - III)

IV-B.Tech.-I-Sem. **L T P C**
Subject Code: CS-PEC-414 **3 - - 3**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO2	PO3	PO5	PO8	PO12	PO13
CO1	explain framework & security issues related to ethical hacking	3	2	2	3	2	3
CO2	plan and execute controlled attacks to safeguard the business	3	3	3	3	2	3
CO3	identify security lapses and prepare for an ethical hack	3	3	3	3	3	3
CO4	make use of enumeration and exploitation techniques	3	3	3	3	2	3
CO5	adapt best practices for deliverables and integration for security	3	3	3	3	3	3

Unit-I **10 hours**

Introduction: Hacking Impacts, the Hacker; **Framework:** Planning the test, Sound Operations, Reconnaissance, Enumeration, Vulnerability, Analysis, Exploitation, Final Analysis, Deliverable, Integration; **Information Security Models:** Computer Security, Network Security, Service Security, Application security, Security Architecture; **Information Security Program:** The Process of Information Security, Component Parts of Information Security Program, Risk Analysis and Ethical Hacking.

Unit-II **10 hours**

The Business Perspective: Business Objectives, Security Policy, Previous Test Results, Business Challenges.
Planning for a Controlled Attack: Inherent Limitations, Imposed Limitations, Timing is Everything, Attack Type, Source Point, Required Knowledge, Multi-Phased Attacks, Teaming and Attack Structure, Engagement Planner, The Right Security Consultant, The Tester, Logistics, Intermediates, Law Enforcement.

Unit-III **(4 + 4) 8 hours**

Part-A: Preparing for a Hack: Technical Preparation, Managing the Engagement.
Part-B: Reconnaissance: Social Engineering, Physical Security, Internet Reconnaissance.

Unit-IV **10 hours**

Enumeration: Enumeration Techniques, Soft Objective, Looking Around or Attack, Elements of Enumeration, Preparing for the Next Phase.
Exploitation: Intuitive Testing, Evasion, Threads and Groups, Operating Systems, Password. Crackers, Root Kits, applications, Wardialing, Network, Services and Areas of Concern.

Unit-V **10 hours**

Deliverable: The Deliverable, the Document, Overall Structure, Aligning Findings, Presentation.
Integration: Integrating the Results, Integration Summary, Mitigation, Defence Planning, Incident, Management, Security Policy, Conclusion.

Textbook:

1. James S. Tiller, "The Ethical Hack: A Framework for Business Value Penetration Testing", Auerbach Publications, CRC Press.

References:

1. EC-Council, "Ethical Hacking and Countermeasures Attack Phases", Cengage Learning.
2. Michael Simpson, Kent Backman, James Corley, "Hands-On Ethical Hacking and Network Defense", Cengage Learning.

ENVIRONMENTAL IMPACT ASSESSMENT
(Open Elective-II)

IV-B.Tech.-I-Sem. **L T P C**
Subject Code: OEC-401 **3 - - 3**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO6	PO7	PO10	PO12
CO1	identify the attributes to be considered for EIA	3	3	3	3
CO2	assess impact of deforestation	3	3	3	3
CO3	interpret impact prediction, significance of soil quality and mitigation	3	3	2	3
CO4	conduct environmental audit and prepare reports	3	3	2	3
CO5	illustrate environmental policies and provisions	3	3	3	3

Unit-I **10 hours**

Basic concept of EIA: Initial environmental Examination, Elements of EIA, factors affecting E-I-A Impact evaluation and analysis, preparation of Environmental Base map, Classification of environmental parameters. E I A Methodologies: introduction, Criteria for the selection of EIA Methodology, E I A methods, Ad-hoc methods, matrix methods, Network method Environmental Media Quality Index method, overlay methods, cost/benefit Analysis.

Unit-II **9 hours**

Assessment of impact of development activities on vegetation and wildlife, environmental Impact of Deforestation – Causes and effects of deforestation.

Unit-III **(5 + 4) 9 hours**

Part A: Procurement of relevant soil quality, impact prediction, assessment of impact significance.

Part B: Identification and incorporation of mitigation measures for enhancement of soil quality.

Unit-IV **10 hours**

Environmental Audit & Environmental legislation objectives of Environmental Audit, Types of environmental Audit, stages of Environmental Audit, onsite activities, evaluation of Audit data and preparation of Audit report, Post Audit activities.

Unit-V **10 hours**

The Environmental Protection Act, The water Act, The Air (Prevention & Control of pollution Act.), Motor Act, Wild life Act. Case studies and preparation of Environmental Impact assessment statement for various Industries.

Textbooks:

1. Environmental Pollution by R.K. Khitoliya S. Chand.
2. Environmental Impact Assessment, Barthwal, R. R. New Age International Publications.

References:

1. Larry Canter – Environmental Impact Assessment, TMH.
2. Suresh K. Dhaneja - Environmental Science and Engineering, S.K. Kataria & Sons Publication.
3. Bhatia, H. S. - Environmental Pollution and Control, Galgotia Publication, Pvt., Ltd., Delhi.

NON-CONVENTIONAL ENERGY SOURCES
(Open Elective-II)

IV-B.Tech.-I-Sem. **L T P C**
Subject Code: OEC-403 **3 - - 3**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO6	PO7	PO12
CO1	analyze global and national energy scenarios	3	3	3
CO2	illustrate the various solar energy systems	3	3	3
CO3	demonstrate the aspects related to wind energy power plants	3	3	3
CO4	build the power plants using bio gas	3	3	3
CO5	estimate the power generation in hydroelectric plants	3	3	3

Unit-I **10 hours**

Global and National Energy Scenario: Over view of conventional & renewable energy sources, need & development of renewable energy sources, types of renewable energy systems, Future of Energy Use, Global and Indian Energy scenario, Renewable and Non-renewable Energy sources, Energy for sustainable development, Potential of renewable energy sources, renewable electricity and key elements, Global climate change, CO_2 reduction potential of renewable energy- concept of Hybrid systems.

Unit-II **9 hours**

Solar Energy: Solar energy system, Solar Radiation, Availability, Measurement and Estimation, Solar Thermal Conversion Devices and Storage, Applications Solar Photovoltaic Conversion solar photovoltaic, solar thermal, applications of solar energy systems.

Unit-III **(5 + 5) 10 hours**

Part-A: Wind Energy: Wind Energy Conversion, Potential, Wind energy potential measurement, Site selection, Types of wind turbines, Wind farms, wind Generation and Control. Nature of the wind, power in the wind, factors influencing wind, wind data and energy estimation, wind speed monitoring, classification of wind, characteristics, applications of wind turbines, offshore wind energy.

Part-B: Hybrid systems, wind resource assessment, Betz limit, site selection, wind energy conversion devices. Wind mill component design, economics and demand side management, energy wheeling, and energy banking concepts. Safety and environmental aspects, wind energy potential and installation in India.

Unit-IV **10 hours**

Biogas: Properties of biogas (Calorific value and composition), biogas plant technology and status, Bio energy system, design and constructional features. Biomass resources and their classification, Biomass conversion processes, Thermo chemical conversion, direct combustion, biomass gasification, pyrolysis and liquefaction, biochemical conversion, anaerobic digestion, types of biogas Plants, applications.

Unit-V **9 hours**

Hydel Energy: Small hydro Power Plant - Importance of small hydro power plants and their Elements, types of turbines for small hydro, estimation of primary and secondary power.

Textbooks:

1. Non-Conventional Energy Sources by G.D Rai.
2. Twidell, J.W. and Weir, A., Renewable Energy Sources, EFN Spon Ltd., 1986.

PRINCIPLES OF COMMUNICATION SYSTEMS
(Open Elective-II)

IV-B.Tech.-I-Sem. **L T P C**
Subject Code: OEC-405 **3 - - 3**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO1	PO2	PO3	PO12
CO1	outline the fundamentals of communication systems	3	2	2	2
CO2	analyze various analog modulation and demodulation schemes	3	3	3	2
CO3	explain sampling theorem, pulse modulation and multiplexing techniques	3	3	3	2
CO4	illustrate digital modulation schemes	3	3	2	2
CO5	develop source and channel coding techniques	3	3	3	2

Unit-I **9 hours**

Fundamentals of communication systems: Block diagram of communication system; types of communications-analog and digital; Noise–types of noise, sources of noise, calculation of noise in linear systems, and noise figure.

Unit-II **10 hours**

Methods of Modulation: Need for modulation; Types of modulation, generation and detection of AM, DSB-SC, SSB-SC. Angle modulation: frequency & phase modulations, Narrow band and Wide band FM, comparison of AM, FM & PM.

Unit-III **(5 + 5) 10 hours**

Part-A: Pulse Modulations: Sampling theorem, Nyquist criteria, introduction to PAM, PWM and PPM.

Part-B: Multiplexing techniques: TDM, FDM, asynchronous multiplexing.

Unit-IV **10 hours**

Digital Communication: Advantages; Working principle of PCM; comparison of PCM, DM, ADM, ADPCM; introduction to digital modulation techniques-ASK, FSK, PSK, DPSK, QPSK.

Unit-V **9 hours**

Information Theory: Concept of information; rate of information and entropy; Coding efficiency-Shanon-Fano and Huffman coding; introduction to error detection and correction codes.

Textbooks:

1. Communication Systems Analog and Digital – R.P. Singh & SD Sapre, TMH, 20th reprint, 2004.
2. Principles of Communications – H. Taub and D. Schilling, TMH, 2003.

References:

1. Electronic Communication Systems – Kennedy and Davis, TMH, 4th edition, 2004.
2. Communication Systems Engineering – John. G. Proakis and Masoud Salehi, PHI, 2nd Ed. 2004.

DATABASE MANAGEMENT SYSTEMS
(Open Elective-II)

IV-B.Tech.-I-Sem. **L T P C**
Subject Code: OEC-407 **3 - - 3**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO1	PO2	PO3	PO5	PO12
CO1	design databases using E-R model	3	3	3	3	2
CO2	construct database using relational model	3	3	3	3	2
CO3	formulate SQL queries to interact with database	3	3	3	3	2
CO4	make use of transaction control commands	3	3	3	3	2
CO5	apply normalization on database to eliminate redundancy	3	3	3	3	2

Unit-I **11 hours**

Introduction to Database Systems: Introduction and applications of DBMS, Purpose of data base, History of database, Database architecture - Abstraction Levels, Data Independence, Database Languages, Database users and DBA.
Introduction to Database Design: Database Design Process, Data Models, ER Diagrams - Entities, Attributes, Relationships, Constraints, keys, Generalization, Specialization, Aggregation, Conceptual design with the E-R model for large Enterprise.

Unit-II **9 hours**

Relational Model: Introduction to the relational model, Integrity constraints over relations, Enforcing integrity constraints, Querying relational data, Logical database design: E-R to relational, Introduction to views, Destroying/altering tables and views.

Unit-III **(5 + 4) 9 hours**

Part-A: SQL Basics: DDL, DML, DCL, structure – creation, alteration, defining constraints – Primary key, foreign key, unique, not null, check, in operator.

Part-B: Functions: Aggregate functions, Built-in functions - numeric, date, string functions, set operations.

Unit-IV **10 hours**

Sub-queries: Introduction, correlated sub-queries, use of group by, having, order by, join and its types, Exist, Any, All, view and its types.
Transaction control commands: ACID properties, concurrency control, Commit, Rollback, save point, cursors, stored procedures, Triggers.

Unit-V **10 hours**

Normalization: Introduction, Normal forms - 1NF, 2NF, 3NF, BCNF, 4NF and 5NF, concept of De-normalization and practical problems based on these forms.

Textbooks:

1. Raghurama Krishnan, Johannes Gehrke, Database Management Systems, 3rd Edition, TMH.
2. Abraham Silberschatz, Henry F.Korth, S.Sudarshan, Database System Concepts, 6th Edn, TMH.

INTELLECTUAL PROPERTY RIGHTS
(Open Elective-II)

IV-B.Tech.-I-Sem. **L T P C**
Subject Code: OEC-409 **3 - - 3**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO1	PO6	PO8	PO10	PO12
CO1	outline basics of intellectual property law	3	3	2	3	3
CO2	identify the various trademarks	3	3	2	3	3
CO3	analyze patent and copy rights law	3	3	3	3	3
CO4	differentiate trade secret and unfair practice	3	3	3	3	3
CO5	summarize new developments in Intellectual Property Rights	3	3	3	3	3

Unit-I **10 hours**

Introduction to Intellectual property: Introduction, types of intellectual property, international organizations, agencies and treaties, importance of intellectual property rights.

Unit-II **9 hours**

Trade Marks: Purpose and function of trademarks, acquisition of trade mark rights, protectable matter, selecting and evaluating trade mark, trade mark registration processes.

Unit-III **(5 + 4) 9 hours**

Part-A: Law of copy rights: Fundamental of copy right law, originality of material, rights of reproduction, rights to perform the work publicly, copy right ownership issues, copy right registration, notice of copy right, international copy right law.

Part-B: Law of patents: Foundation of patent law, patent searching process, ownership rights and transfer

Unit-IV **10 hours**

Trade Secrets: Trade secrete law, determination of trade secrete status, liability for misappropriations of trade secrets, protection for submission, trade secrete litigation.
Unfair competition: Misappropriation right of publicity, false advertising.

Unit-V **10 hours**

New development of intellectual property: new developments in trade mark law; copy right law, patent law, intellectual property audits.
International overview on intellectual property, international - trade mark law, copy right law, international patent law, international development in trade secrets law.

Textbooks:

1. Intellectual property right, Deborah, E. Bouchoux, cengage learning.
2. Intellectual property right - Unleashing the knowledge economy, prabuddha ganguli, TMH.

TECHNICAL WRITING SKILLS LAB

IV-B.Tech.-I-Sem. **L T P C**
Subject Code: HSMC-402 **- - 2 1**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO5	PO10
CO1	make use of language for understanding discourse and make notes	3	3
CO2	demonstrate command over using library resources for academic and other pursuits	3	3
CO3	apply knowledge of English language for creative and academic purposes	3	3
CO4	adapt principles in conveying good professional ethics	3	3
CO5	exhibit thorough awareness on research-oriented activities and career development	3	3

List of Experiments

1. Definition of Writing – difference between General and Academic writing process - gathering ideas for academic writing - organizing ideas into sentences –language of writing - analysis of material.
   Assignment: exercises on creative, academic and other written formats.

2. Note making and Note taking techniques - collecting notes - writing outlines – precis writing - writing rough drafts.
   Assignment: exercises on precise writing and note making & taking techniques.

3. Description of mechanisms and processes – Information transfer process – technical vocabulary.
   Assignment: information transfer exercises such as flow charts, pai charts, and discussion on technical vocabulary.

4. Library and Digital Resources - Internet as a Tool for research - reference and research techniques - Proposal writing.
   Assignment: exercises on information gathering techniques using various online and manual resources on the topic assigned; samples on abstracts and research proposals.

5. Technical writing – types – process of technical writing – style and language – editing strategies to achieve appropriate technical style.
   Assignment: dealing with samples of technical reports and writing reports.

6. Technical communication - audience analysis, and persuasion – understanding graphic aids in technical reports.
   Assignment: showing various graphs of sample reports.

7. Elements of the Formal Research Report – Thesis Writing - Title - Abstract – Synopsis – Conclusions – Suggestions - References.
   Assignment: samples of project reports and written exercises on elements mentioned.

8. Job hunt - Resume - Cover Letter - Networking and Professional Success - Sources of networking - Research about Job Profile, Company, Competitors & Industry - Body Language and Grooming.
   Assignment: exercises on cover letter, job application, emails, resume writing, etc. discussion on personality development techniques.

9. Plagiarism and Professional Ethics - understanding Plagiarism and Tools to check plagiarism - Ethics of Research - Engineering ethics - Awareness of Professional Ethics.
   Assignment: exploration of plagiarism checks mechanisms and discussion on professional ethics.

10. Presentation styles - Inforgraphics - types & tools for presentation - audience-centered presentations - cross-cultural communication.
    Assignment: exercises on Oral Presentation.

Text/Reference Books:

1. David F. Beer and David McMurrey, Guide to writing as an Engineer, John Willey. New York, 2004.
2. Diane Hacker, Pocket Style Manual, Bedford Publication, New York, 2003. (ISBN0312406843)
3. Shiv Khera, You Can Win, Macmillan Books, New York,2003.
4. Raman Sharma, Technical Communications, Oxford Publication, London,2004.
5. Dale Jungk, Applied Writing for Technicians, McGraw Hill, New York, 2004. (ISBN:07828357-4)
6. Sharma, R. and Mohan, K. Business Correspondence and Report Writing, TMH New Delhi2002.
7. Xebec, Presentation Book, TMH New Delhi, 2000. (ISBN0402213)

INFORMATION SECURITY LAB

IV-B.Tech.-I-Sem. **L T P C**
Subject Code: CS-PCC-412 **- - 2 1**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO4	PO5	PO14
CO1	make use of open source tools to analyze information security	3	3	3
CO2	develop various cryptographic substitution techniques	3	3	3
CO3	implement symmetric key cryptographic algorithms	3	3	3
CO4	experiment with various public key cryptosystems	3	3	3
CO5	adapt MD5 algorithm to prevent authentication related problems	3	3	3

LIST OF EXPERIMENTS

1. Write a C/JAVA program to implement Ceaser Cipher Encryption-Decryption.
2. Write a C/JAVA program to implement Mono-alphabetic Substitution.
3. Write a C/JAVA program to implement Play fair Cipher.
4. Write a C/JAVA program to implement Hill Cipher Encryption-Decryption.
5. Write a C/JAVA program to implement Data Encryption Standards algorithm logic.
6. Write a C/JAVA program to implement Advanced Encryption Standards algorithm logic.
7. Write a C/JAVA program to implement the Blowfish algorithm logic.
8. Write a C/JAVA program to implement Diffie-Hellman Key Exchange.
9. Write a C/JAVA program to implement RSA Encryption-Decryption.
10. Calculate the message digest of a text using the MD5 algorithm in JAVA.

Micro-Projects: Student must submit a report on one of the following Micro–Projects before commencement of second internal examination.

1. Java Security Features.
2. Secure Back-up software system.
3. Practicing good password management.
4. How to keep an eye on third party accessing your data.
5. Unauthorized disclosure.
6. Investigation of information security.
7. Authentication in Kerberos.
8. Make a LAN massager app. To chat with people connected to the same LAN network without using Internet and at the same time provides data encryption, privacy and security.
9. Digital –Watermarking to hide text messages.
10. Android Video encryption and sharing.

Reference:

1. Information Security Lab Manual, Department of CSE, CMRIT, Hyd.

PROJECT - I

IV-B.Tech.-I-Sem.	L	T	P	C
Subject Code: CS-PRJ-413	-	-	6	3

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO1 to PO14
CO1	identify the problem statement, assess the scope and develop a prototype	3
CO2	execute the project using modern tools and prepare the report	3
CO3	demonstrate leadership, management skills for project development with ethics	3
CO4	function effectively as individual / member / leader in project teams	3
CO5	make use of engineering knowledge for societal sustenance	3

Guidelines:

The objective of the project work is to imbibe students with technical, analytical and innovative ideas to facilitate with theoretical and practical learning pertaining to relevant domain of interest. An individual or a peer of 2-5 students work under the guidance / mentorship of a departmental faculty with the aim of addressing solution to real world / societal problems using various R & D techniques. The team work fosters the communication and leadership skills among peers to survive and exercise during their career.

The project work normally includes:

1. Survey and study of published literature on the approved / assigned topic.
2. Conduct preliminary Analysis / Modeling / Simulation / Experiment / Design / Feasibility / ethnographical study.
3. Prepare an abstract/synopsis on the opted topic and present before Departmental Review Committee (DRC).
4. Prepare an Action Plan for conducting the investigation, including team work.
5. Apply suitable methodology for Designing / Modelling / Simulation / Experimentation as needed.
6. Develop an end product or process along with conclusions, recommendations and future scope.
7. Present and execute the project before DRC for CIE.
8. Prepare and publish a paper in Conference / Journal, if possible.
9. Prepare and submit the final dissertation in the prescribed format to the Department.
10. Present and execute the project before External Committee for viva-voce.

SUMMER INTERNSHIP - II
MANDATORY COURSE (NON-CREDIT)

IV-B.Tech.-I-Sem. **L T P C**
Subject Code: MC-411 - - - -

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO1 to PO14
CO1	utilize the domain knowledge with modern tools to solve real world problems	3
CO2	analyze the industrial processes that results in the end product / service	3
CO3	extend global needs for professional ethics, responsibility and communication	3
CO4	function well as an individual, member or leader in diverse teams	3
CO5	make use of engineering knowledge for societal sustenance	3

Guidelines:

1. The student has to complete the internship for a period of 4 to 6 weeks during summer vacation between VI Semester & VII Semester.
2. The internship can be carried out in any industry / R&D Organization / Research Institute / Premier Educational Institutes like IITs, NITs and IIITs etc.
3. The registration process of internship should be completed before the commencement of IV-semester end examinations.
4. The registration process for internship involves:
   e) Students have to approach respective course coordinator with name of proposed company / organization in which they wish to carry out internship.
   f) The Department shall nominate guide to supervise the interns.
   g) Student has to obtain a no objection certificate (NOC) in the prescribed format from the department and submit the same to the respective organization.
   h) Student has to submit acceptance letter issued by the respective organization to the course coordinator.
5. The internal guide has to visit place of internship at least once during student's internship.
6. The students shall report the progress of the internship to the guide in regular intervals and seek advice.
7. After the completion of Internship, students shall submit a final report along with internship and attendance certificates to the course coordinator with the approval of internal guide.
8. The evaluation of internship shall be done during VII-Semester.
9. The student has to give a PPT presentation for duration of 10 to 15 minutes in the presence of departmental evaluation committee consists of Head of the Department, Internal Guide and Two Senior Faculty from the respective departments.
10. After the successful presentation by the student, the evaluation committee recommends the result as satisfactory for the internship. In case of students who have not registered for internship / not submitted the internship certificate and report, the VII-Semester result will not be declared till completion.

IV-B.TECH.-II-SEMESTER SYLLABUS

SOFTWARE PROJECT MANAGEMENT
(Professional Elective - IV)

IV-B.Tech.-II-Sem. **L T P C**
Subject Code: CS-PEC-403 **3 - - 3**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO3	PO4	PO5	PO11	PO12	PO13
CO1	outline the concepts of software management and economics	3	2	2	2	3	3
CO2	illustrate artifacts and life cycle phases	3	3	3	2	3	3
CO3	design various workflows and process planning	3	3	3	3	3	3
CO4	adapt automated project planning and control	3	3	3	3	3	3
CO5	apply contemporary software project management practices	3	3	3	3	3	3

Unit-I **10 Hours**

Conventional Software Management: Waterfall model, Conventional software, Management performance.
Evolution of Software Economics: Software economics, Pragmatic software cost estimation, the old way and new way.

Unit-II **10 Hours**

Life Cycle Phases: Engineering and Production stages, inception phase, elaboration phase, construction phase, transition phase.
Artifacts of the process: Management artifacts, engineering artifacts and pragmatic artifacts, model based architecture.

Unit-III **(4 + 4) 8 Hours**

Part-A: Workflows and Checkpoints of process: Software process workflows, Iteration workflows, Major milestones, Minor milestones, Periodic status assessment.

Part-B: Process Planning: Work breakdown structures, Planning guidelines, cost and schedule estimating process, Pragmatic planning.

Unit-IV **10 Hours**

Project Organizations: Line-of-business organizations, project organizations, evolution of organizations, Round trip engineering, change management.
Project Control and process instrumentation: The seven core metrics, management indicators, quality indicators, life-cycle expectations, pragmatic software metrics and metrics automation.

Unit-V **10 Hours**

Future Software Project Management Practices: Tailoring the process: Process Discriminants, Modern Project Profiles, Next-Generation software Economics, Modern Process Transitions.

Textbooks:

1. Software Project Management, Walker Royce, Pearson Education.

References:

1. Software Project Management, Bob Hughes and Mike Cotterell: Tata McGraw Hill Edition.
2. Software Project Management, Joel Henry, Pearson Education.
3. Software Project Management in practice, Pankaj Jalote, Pearson Education.2005.

COMPUTATIONAL BIOLOGY
(Professional Elective – IV)

IV-B.Tech.-II-Sem. **L T P C**
Subject Code: CS-PEC-407 **3 - - 3**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO1	PO2	PO5	PO6	PO12	PO13
CO1	perceive the history and scope of computational biology	3	3	2	2	2	3
CO2	make use of biological databases and tools	3	3	3	3	3	3
CO3	outline the concepts sequence alignment and NGS	3	3	3	3	2	3
CO4	illustrate predictive methods & protein sequences	3	3	3	3	3	3
CO5	explain drug discovery process	3	3	3	3	3	3

Unit-I **10 Hours**

History, Scope and Importance: Important contributions - aims and tasks of Bioinformatics - applications of Bioinformatics - challenges and opportunities - internet basics- HTML - introduction to NCBI data model- Various file formats for biological sequences.

Unit-II **9 Hours**

Biological Databases – Tools and their uses: Importance of databases - Biological databases- primary sequence databases- Composite sequence databases- Secondary databases- nucleic acid sequence databases - Protein sequence data bases - structure databases – bibliographic databases - specialized genomic resources- analysis packages.

Unit-III **(5 + 5) 10 Hours**

Part-A: Sequence Alignment Methods : Sequence analysis of biological data-Significance of sequence alignment- pairwise sequence alignment methods- Use of scoring matrices and gap penalties in sequence alignments- multiple sequence alignment methods – Tools and application of multiple sequence alignment.

Part-B: NGS Platforms: Introduction to NGS, Roche/454 FLX, Illumina/Solexa Genome Analyzer, Applied Biosystems SOLID system, Helicos Heliscope, Pacific Biosciences/single molecule real time (SMRT) sequencing.

Unit-IV **10 Hours**

Predictive methods using DNA and protein sequences: Gene predictions strategies - protein prediction strategies - molecular visualization tools-phylogenetic analysis: Concept of trees-phylogenetic trees and multiple alignments.

Unit-V **9 Hours**

Drug discovery Process: Discovering a drug - target identification and validation - identifying the lead compound - optimization of lead compound - chemical libraries.

Textbooks:

1. S.C. Rastogi, “Bioinformatics- Concepts, Skills, and Applications”, CBS Publishing, 2003.
2. Next-generation DNA sequencing Informatics by Stuart M. Brown, Cold Spring Harbor Laboratory, 2013.

References:

1. Andreas D Baxevanis and B F Francis, "Bioinformatics- A practical guide to analysis of Genes and Proteins", John Wiley, 2000.
2. T K Attwood, D J parry-Smith,” Introduction to Bioinformatics”, Pearson Education, 1st Edition, 11th Reprint 2005.

CYBER-PHYSICAL SYSTEMS
(Professional Elective – IV)

IV-B.Tech.-II-Sem. **L T P C**
Subject Code: CS-PEC-411 **3 - - 3**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO2	PO3	PO5	PO6	PO12	PO13
CO1	outline the necessity of cyber physical system	3	2	2	3	2	3
CO2	analyse the future challenges & social impact of CPS	3	3	3	3	3	3
CO3	illustrate the computing fundamentals of CPS	3	3	3	2	2	3
CO4	demonstrate the applications & system requirements of CPS	3	3	3	2	3	3
CO5	appraise various applications of CPS	3	3	3	3	3	3

Unit-I: Introduction **9 hours**

Introduction: Cyber-physical systems, application domains, significance, importance of safety, Hybrid systems vs. Cyber-physical systems, Multi dynamical systems, how to learn about cyber physical systems, computational thinking of cyber physical systems.

Unit-II: Social Impact on Work Lives of the Future **10 hours**

Introduction, Economic, Social, and Organizational Challenges, Changing Demand in the World of Work, Greater Product Individualization and Shifting Factors of Global Influence, Cyber-Physical Systems and STEM Development: NASA Digital Astronaut Project.

Unit-III: Computing fundamentals in CPS **(5 + 5) 10 hours**

Part-A: Study of Systems, Standard Forms of System: Input-Output Description, State-Variable Description, Controllability, Observability, and Identifiability, Analytical Solutions of Linear Systems Models.

Part-B: Solution of state equations using the Laplace transform, Eigen values of the linear vector-equation systems, steady-state errors of systems; case study in systems stability analysis.

Unit-IV: Requirements & Applications **9 hours**

Requirements Engineering, Interoperability, Real-Time Systems, GPU Computing Communication, Consumer, Health, Transportation, Smart Cities and the Internet of Everything, Smart Cities and the Internet of Everything, Cyber-Physical Systems and STEM Development: NASA Digital Astronaut Project.

Unit-V: Social impact & Case Study **9 hours**

Economic, Social, and Organizational Challenges, Changing Demand in the World of Work, Greater Product Individualization and Shifting Factors of Global Influence, Vehicle Tracking System, RFID-Based Vehicle Tracking system, Requirements Analysis.

Textbooks:

1. Platzer, André. Logical Foundations of Cyber-Physical Systems. Heidelberg: Springer, 2018.
2. Möller, Dietmar PF. "Guide to computing fundamentals in cyber-physical systems." *Computer Communications and Networks. Springer, Heidelberg* (2016).

References:

1. Rajkumar, Raj, Dionisio De Niz, and Mark Klein. Cyber-physical systems. Addison-Wesley Professional, 2016.
2. Suh, Sang C., et al., eds. *Applied cyber-physical systems*. Springer New York, 2014.

COGNITIVE COMPUTING
(Professional Elective –IV)

IV-B.Tech.-II-Sem. **L T P C**
Subject Code: CS-PEC-415 **3 - - 3**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO1	PO2	PO3	PO4	PO5	PO6	PO12	PO13
CO1	explain the fundamentals of cognition systems	3	3	2	2	2	3	2	3
CO2	apply cognitive computing in day to day life	3	3	3	3	3	3	3	3
CO3	analyze various functions and resources of cognitive computing	3	3	3	3	3	3	3	3
CO4	classify mental states, perception and sensing	3	3	3	3	3	3	2	3
CO5	appraise various applications of cognitive computing	3	3	3	3	3	3	3	3

Unit-I **10 hours**

Introduction to Cognitive Systems and Computation: Cognitive systems, different modes of computing: turning machine lambda, calculus, hyper computing, super computing, pan computing and interactive computing.

Unit-II **9 hours**

Cognitive Computing Applications: Health care, cognitive businesses, human–robot interaction, cognitive robots, cross-media brain–computer, autonomous vehicle navigation.

Unit-III **(5 + 5) 10 hours**

Part-A: Cognitive Functioning & Resources: Learning, memorizing, adaptation, self-origination, control, thinking, reasoning, decision making & judgment, cognitive computing architectures and approaches – cognitive, connectionist, hybrid.

Part-B: Open source frameworks, tools, and digital libraries, non-open source infrastructures and cognitive computing systems.

Unit-IV **10 hours**

Mental States, Perception & Sensing: Belief desire intention (BDI) emotion and feeling. Computation of cognitive functioning in machines: robotics, human robotics interaction, hepatic. hardware machines of vision and audition with reference to human and machine.

Unit-V **9 hours**

Case Study: IBM Watson, brain & cognitive science – a probability and causality in human cognition, functional MRI

Textbooks:

1. Hurwitz, Kaufman, and Bowles, Cognitive Computing and Big Data Analytics, Wiley, Indianapolis, IN, 2005, ISBN: 978-1-118-89662-4.
2. Raghavan, V. V., Gudivada, V. N., Govindaraju, V., & Rao, C. R. (2016). Cognitive computing: Theory and applications (Vol. 35). Elsevier.

References:

1. Kelly III, John E., and Steve Hamm. Smart machines: IBM's Watson and the era of cognitive computing. Columbia University Press, 2013.
2. Wang, Yingxu, Du Zhang, and Witold Kinsner, eds. Advances in cognitive informatics and cognitive computing. Vol. 323. Springer, 2010.

COMPUTER FORENSICS
(Professional Elective - V)

IV-B.Tech.-II-Sem. **L T P C**
Subject Code: CS-PEC-404 **3 - - 3**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO2	PO3	PO5	PO8	PO12	PO13
CO1	explain the fundamentals of computer forensics	3	2	2	3	3	3
CO2	illustrate the methods for evidence collection and data seizure	3	3	3	3	3	3
CO3	analyze and validate digital forensic evidences	3	3	3	3	3	3
CO4	solve the computer fraud cases using forensics tools	3	3	3	3	3	3
CO5	make use of various operating systems for computer forensics	3	3	3	3	3	3

Unit-I: **Computer Forensics Fundamentals** **10 Hours**

Introduction, reporting cybercrime, law enforcement, Human resources, Services, benefits, applications , types of Law Enforcement, Indian Information Technology Act, Computer Forensics Evidence and Capture: Data Back-up and Recovery.

Unit-II: **Evidence Collection and Data Seizure** **10 Hours**

Importance of Evidence, Collection Options, Obstacles, Types of Evidence , The Rules of Evidence, Volatile Evidence, General Procedure, Collection and Archiving, Artifacts, Controlling Contamination: The Chain of Custody, Duplication and Preservation of Digital Evidence: Computer Evidence Processing Steps, Legal Aspects of Collecting and Preserving Evidence, Image Verification and Authentication.

Unit-III: **Computer Forensics analysis and validation** **(4 + 5) 9 Hours**

Part-A: Determining what data to collect and analyse, validating forensic data, addressing data-hiding techniques, performing remote acquisitions

Part-B: Processing Crime and Incident Scenes: Identifying digital evidence, collecting evidence in private-sector incident scenes, processing law enforcement crime scenes, preparing for a search, securing a computer incident or crime scene, seizing digital evidence at the scene, storing digital evidence, obtaining a digital hash, reviewing a case.

Unit-IV: **Current Computer Forensic tools** **10 Hours**

Evaluating computer forensic tool needs, computer forensics software and hardware tools, validation, E-Mail Investigations.

Cell phone and mobile device forensics: Understanding mobile device forensics, understanding acquisition procedures for cell phones and mobile devices.

Unit-V: **Working with Windows and DOS Systems** **9 Hours**

File systems, Microsoft File Structures, NTFS disks, disk encryption, windows registry, virtual machines.

Textbooks:

1. Computer Forensics, Computer Crime Investigation by John R.Vacca, Firewall Media, New Delhi.
2. Computer Forensics and Investigations by Nelson, Phillips Enfinger, Steuart, Cengage Learning.

References:

1. Computer Evidence Collection & Presentation by Christopher L.T. Brown, Firewall Media.
2. Software Forensics Collecting Evidence from the Scene of a Digital Crime by Robert M. Slade, TMH 2005.

DIGITAL IMAGE PROCESSING
(Professional Elective –V)

IV-B.Tech.-II-Sem. **L T P C**
Subject Code: CS-PEC-408 **3 - - 3**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO1	PO2	PO3	PO12	PO13
CO1	explain image fundamentals and transforms	3	3	3	2	3
CO2	utilize image enhancement and color image processing techniques	3	3	3	2	3
CO3	make use of image restoration techniques and wavelets	3	3	3	2	3
CO4	apply image segmentation techniques and morphological image processing	3	3	3	2	3
CO5	analyze image compression techniques	3	3	3	2	3

Unit-I **9 hours**

Digital Image Fundamentals: Elements of visual perception, image sensing and acquisition, image Sampling and quantization; basic relationships between pixels–neighbourhood, adjacency, Connectivity, distance measures.
Image Transforms: 2-D FFT, Walsh, Hadamard, Discrete Cosine, Haar, Slant and Hotelling Transforms, properties.

Unit-II **10 hours**

Image Enhancements and Filtering: Gray level transformations, histogram equalization and Specifications; pixel-domain smoothing filters – linear and order-statistics; pixel-domain sharpening filters – first and second derivative; frequency domain filters – low-pass and high-pass.
Color Image Processing: Color models–RGB, YUV, HSI; Color transformations– formulation, Color complements, color slicing, tone and color corrections; Color image smoothing and Sharpening; Color Segmentation.

Unit-III **(5 + 5) 10 hours**

Part-A: Image Restoration: Degradation Model, Algebraic Approach to Restoration, Inverse Filtering, LMS Filters, Constrained Least Squares Restoration, Interactive Restoration.

Part-B:Wavelets and Multi-resolution image processing: Uncertainty principles of Fourier Transform, Time-frequency localization, continuous wavelet transforms, wavelet bases and multi-resolution Analysis, wavelets and Sub band filter banks, wavelet packets.

Unit-IV **10 hours**

Image Segmentation: Detection of discontinuities, edge linking and boundary detection; thresholding–global and adaptive; region-based segmentation.
Morphological Image Processing: Dilation-Structuring Element Decomposition; Erosion; Combining Dilation and Erosion; Opening and Closing, Hit or Miss Transformation.

Unit-V **9 hours**

Image Compression: Redundancy–inter-pixel and psycho-visual; Lossless compression –predictive, entropy; Lossy compression- predictive and transform coding; Still image compression standards – JPEG and JPEG-2000.

Textbooks:

1. R.C. Gonzalez and R.E. Woods, Digital Image Processing, 3rd edition 2008, Pearson Education.

References:

1. Anil Kumar Jain, Fundamentals of Digital Image Processing, 2nd edition 2004, PHI.

NEURAL NETWORKS AND DEEP LEARNING
(Professional Elective - V)

IV-B.Tech.-II-Sem. **L T P C**
Subject Code: CS-PEC-412 **3 - - 3**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO2	PO3	PO5	PO6	PO12	PO13
CO1	illustrate the functionalities of Neural Networks and Learning process	3	3	2	3	3	3
CO2	analyze the single-layer and multi-layer perceptrons	3	3	3	3	3	3
CO3	interpret the deep feed forward networks along with regularization	3	3	3	3	3	3
CO4	demonstrate the convolutional neural networks in deep learning	3	3	3	3	3	3
CO5	outline the importance of autoencoders	3	2	2	3	3	3

Unit –I **10 Hours**

Introduction: A Neural Network, Human Brain, Models of a Neuron, Neural Networks viewed as Directed Graphs, Network Architectures, Knowledge Representation, Artificial Intelligence and Neural Networks.
Learning Process: Error Correction Learning, Memory Based Learning, Hebbian Learning, Competitive Learning, Boltzmann Learning, Credit Assignment Problem, Memory, Adaption, Statistical Nature of the Learning Process.

Unit-II **10 Hours**

Single Layer Perceptrons: Adaptive Filtering Problem, Unconstrained Organization Techniques, Linear Least Square Filters, Least Mean Square Algorithm, Learning Curves, Learning Rate Annealing Techniques, Perceptrons ,Convergence Theorem.
Multilayer Perceptrons: Back Propagation Algorithm, XOR Problem, Heuristics, Output Representation and Decision Rule, Computer Experiment, Feature Detection.

Unit-III **(4 + 6) 10 Hours**

Part-A: Deep Feed forward Networks: Learning XOR, Gradient-Based Learning, Hidden Units, Back-Propagation and Other Differentiation Algorithms.

Part-B: Regularization for Deep Learning: Parameter Norm Penalties, Norm Penalties as Constrained Optimization, Regularization and Under-Constrained Problems, Early Stopping, Parameter Tying and Parameter Sharing, Dropout.

Unit-IV **10 Hours**

Convolutional Neural Networks: The Convolution Operation, Pooling, Variants of the Basic Convolution Function, Structured Outputs, Data Types, Recurrent Neural Networks.

Unit-V **8 Hours**

Autoencoders: Under complete Autoencoders, Regularized Autoencoders, Representational Power, Layer Size and Depth, Stochastic Encoders and Decoders, Denoising Autoencoders.

Textbooks:

1. Neural Networks a Comprehensive Foundations, Simon Haykin, PHI edition.
2. Deep Learning, Goodfellow, I., Bengio,Y., and Courville, A., MIT Press, 2016

References:

1. Artificial Neural Networks, Yegnanarayana, B., PHI Learning Pvt. Ltd, 2009.
2. Neural Networks: A Classroom Approach, Satish Kumar, Tata McGraw-Hill Education, 2004.

CYBER SECURITY
(Professional Elective - V)

IV-B.Tech.-II-Sem. **L T P C**
Subject Code: CS-PEC-416 **3 - - 3**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO2	PO4	PO5	PO6	PO8	PO12	PO13
CO1	explain cyber security terminologies	2	2	2	2	2	2	2
CO2	identify various cyber offences	3	3	3	3	3	3	3
CO3	apply various tools and methods to control cybercrime	3	3	3	3	3	3	3
CO4	make use of standards and cyber laws to enhance cyber security	3	3	3	3	3	3	3
CO5	illustrate the importance of security policies & IT Act	3	3	2	3	3	3	3

Unit-I: Introduction **9 hours**

Essential Terminologies: NIA, Risks, Breaches, Threats, Attacks, Exploits. Information gathering (Social Engineering, Foot Printing & Scanning). Open Source/ Free/ Trial Tools: nmap, zenmap, Port scanners, Network scanners. Forming an incident response team, Reporting crime, Operating System attacks, Application attacks, Reverse engineering, Cracking techniques and Financial frauds.

Unit-II: Cyber Offences **10 hours**

Introduction, how criminals plan the attacks, social engineering, cyber stalking, cyber cafe and cybercrimes, Botnets: The fuel for cybercrime, attack vector, cloud security.

Unit-III: Tools and Methods Used in Cybercrime **(5 + 3) 8 hours**

Part-A: Introduction, proxy servers and anonymizers, phishing, password cracking, keyloggers and spywares, virus and worms, DoS and DDoS attacks, SQL injection, buffer overflow.

Part-B: Trojan horse and backdoors, steganography.

Unit-IV: Cyber Security Audit & Standards **9 hours**

Risk assessment and management, asset classification, crisis management plan, resources recovery strategy, security testing, international standards, analysis and logging, security certification.

Unit-V: Security Policy & IT ACT **9 hours**

Security policies, why policies should be developed, WWW policies, email security policies, policy review process- corporate policies, sample security policies, publishing and notification requirement of the policies. Information Security Standards-ISO, cyber laws in India; IT Act 2000 provisions, Intellectual Property Law: Copy right law, software license, semiconductor law and patent law.

Textbooks:

1. Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Nina Godbole and Sunil Belapure, Wiley INDIA
2. Anti-Hacker Tool Kit (Indian Edition) by Mike Shema, TMH.

References:

1. Charles P. Pfleeger, Shari Lawerance Pfleeger, “Analysing Computer Security ”, Pearson.
2. Schou, Shoemaker, “Information Assurance for the Enterprise”, TMH.
3. Chander, Harish,” Cyber Laws And It Protection ” , PHI, New Delhi, India

GREEN BUILDING TECHNOLOGIES
(Open Elective-III)

IV-B.Tech.-II-Sem. **L T P C**
Subject Code: OEC-402 **3 - - 3**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO1	PO2	PO7	PO12
CO1	explain the fundamentals of energy use and processes in building	3	2	2	2
CO2	identify indoor environmental requirement and its management	3	3	3	2
CO3	assess the impact of solar radiation on buildings	3	3	3	2
CO4	evaluate end-use energy utilization and requirements	3	3	2	2
CO5	adapt audit procedures for energy management	3	3	3	2

Unit-I **10 hours**

Overview of the significance of energy use and energy processes in building: Indoor activities and environmental control - Internal and external factors on energy use and the attributes of the factors - Characteristics of energy use and its management - Macro aspect of energy use in dwellings and its implications.

Unit-II **9 hours**

Indoor environmental requirement and management: Thermal comfort - Ventilation and air quality - Air-conditioning requirement - Visual perception - Illumination requirement - Auditory requirement.

Unit-III **(5 + 5) 10 hours**

Part-A: Climate, solar radiation and their influences: Sun-earth relationship and the energy balance on the earth's surface - Climate, wind, solar radiation.

Part-B: Temperature - Sun shading and solar radiation on surfaces - Energy impact on the shape and orientation of buildings.

Unit-IV **10 hours**

End-use, energy utilization and requirements: Lighting and day lighting - End-use energy requirements - Status of energy use in buildings Estimation of energy use in a building - Heat gain and thermal performance of building envelope - Steady and non-steady heat transfer through the glazed window and the wall - Standards for thermal performance of building envelope - Evaluation of the overall thermal transfer.

Unit-V **9 hours**

Energy management options: Energy audit and energy targeting - Technological options for energy management.

Textbooks:

1. Michael Bauer, Peter Mosle and Michael Schwarz, Green Building, Guidebook for Sustainable Architecture, Springer, Heidelberg, Germany.
2. Norbert Lechner, Heating, Cooling, Lighting - Sustainable Design Methods for Architects‖, Wiley, New York.
3. James Kachadorian, The Passive Solar House: Using Solar Design to Heat and Cool Your Home‖, Chelsea Green Publishing Co., USA.

FUNDAMENTALS OF ROBOTICS
(Open Elective-III)

IV-B.Tech.-II-Sem. **L T P C**
Subject Code: OEC-404 **3 - - 3**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO1	PO2	PO5	PO12
CO1	illustrate principles and functioning of the robot	3	2	2	2
CO2	perform kinematic analysis for end-effector positioning	3	3	3	2
CO3	integrate mechanical and electrical hardware for robot with feedback control	3	3	3	2
CO4	design control laws for a robot	3	3	2	2
CO5	develop robot programming for various applications	3	3	3	2

Unit-I **10 hours**

Introduction to Robotics: Types and components of a robot, Classification of robots, classification with respect to geometrical configuration (anatomy), closed-loop and open- loop control systems. Social issues and safety.

Unit-II **9 hours**

Robot Kinematics: Kinematics systems, Definition of mechanisms and manipulators, Kinematic Modelling: Translation and Rotation Representation, Coordinate transformation, Homogeneous Coordinate representation, DH parameters.

Unit-III **(5 + 4) 9 hours**

Part-A: Sensors and Vision System: Sensor: Contact and Proximity, Position, Velocity, Force, Tactile etc., Introduction to Cameras, Camera calibration, Geometry of Image formation, Euclidean / Similarity / Affine / Projective transformations Vision applications in robotics.

Part-B: Robot Actuation Systems: Actuators: Electric, Hydraulic and Pneumatic; Transmission: Gears, Timing Belts and Bearings, Parameters for selection of actuators.

Unit –IV **10 hours**

Robot Control: Basics of control: Transfer functions, Control laws: P, PD, PID, Non-linear and advanced controls.

Unit-V **9 hours**

Control Hardware and Interfacing: Embedded systems: Architecture and integration with sensors, actuators, components, Programming for Robot Applications.

Textbooks:

1. Niku Saeed B., “Introduction to Robotics: Analysis, Systems, Applications”, PHI, New Delhi.
2. Mittal R.K. and Nagrath I.J., “Robotics and Control”, Tata McGraw Hill.

References:

1. Saha, S.K., “Introduction to Robotics, 2nd Edition, McGraw-Hill Higher Education, 2014.
2. Ghosal, A., “Robotics”, Oxford, New Delhi, 2006.

FUNDAMENTALS OF EMBEDDED SYSTEMS
(Open Elective – III)

IV-B.Tech.-II-Sem. **L T P C**
Subject Code: OEC-406 **3 - - 3**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO1	PO2	PO3	PO12
CO1	outline the basic concepts of embedded computing	3	3	2	2
CO2	illustrate the architecture of 8051 microcontroller	3	3	3	2
CO3	develop embedded programs using 8051 microcontroller	3	3	3	2
CO4	demonstrate 8051 microcontroller interface with peripherals	3	3	3	2
CO5	explain real time operating system concepts	3	3	3	3

Unit-I **9 hours**

Embedded computing: Introduction, complex systems and microprocessor, the embedded system design process, formalisms for system design, design examples.

Unit-II **10 hours**

The 8051 architecture: Introduction, 8051 micro controller hardware, input / output ports and circuits, external memory, counter and timers, serial data input / output, interrupts.

Unit-III **(5 + 5) = 10 hours**

Part-A: Basic assembly language programming concepts: The assembly language programming process, programming tools and techniques, programming the 8051.

Part-B: Instructions set: Data transfer and logical instructions, arithmetic operations, decimal arithmetic. Jump and call instructions.

Unit – IV **9 hours**

Applications: Interfacing with keyboards, displays, D/A and A/D conversions, multiple interrupts, serial data communication.

Unit – V **10 hours**

Introduction to real - time operating systems: Tasks and task states, tasks and data, semaphores, and shared data; message queues, mailboxes and pipes, timer functions, events, memory management, interrupt routines in an RTOS environment.

Textbooks:

1. Computers as Components - Principles of Embedded Computer System Design, Wayne Wolf, Elseveir.
2. The 8051 Microcontroller, Third Edition, Kenneth J.Ayala, Thomson.

References:

1. Microcontrollers, Raj kamal, Pearson Education.
2. An Embedded Software Primer, David E. Simon, Pearson Education.

WEB TECHNOLOGIES
(Open Elective – III)

IV-B.Tech.-II-Sem. **L T P C**
Subject Code: OEC-408 **3 - - 3**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO2	PO3	PO5	PO6	PO12
CO1	design web pages using HTML and JavaScript	3	3	3	3	3
CO2	develop web applications using PHP	3	3	3	2	3
CO3	make use of XML and DTD for web design	3	3	3	2	2
CO4	build web applications using servlets and session tracking	3	3	3	2	2
CO5	establish database connectivity using JSP and JDBC	3	3	3	2	2

Unit-I **10 Hours**

Web: Introduction, Internet and web, web browsers, web servers, protocols.
HTML: Basics, elements, attributes, tags- list, tables, images, forms, frames, cascading style sheets.
Java Script: Introduction to scripting, control structures, conditional statements, arrays, functions, objects.

Unit-II **10 Hours**

PHP: Declaring variables, data types, arrays, strings, operators, expressions, control structures, functions, Reading data from web form controls, handling file uploads, connecting to database, executing simple queries, handling sessions and cookies, file handling.

Unit-III **(4 + 4) 8 Hours**

Part-A: XML: Basics of XML, Elements, Attributes, Name space, **Parsing:** DOM and SAX Parsers.
Part-B: Introduction to DTD: internal and external DTD, Elements of DTD, DTD Limitations, XML Schema, Schema structure, XHTML.

Unit-IV **10 Hours**

Servlets: Introduction, Lifecycle, Generic and HTTP servlet, passing parameters to servlet, HTTP servlet Request & Response interfaces, Deploying web Applications,
Session Tracking: Hidden form fields, cookies, URL- Rewriting, session.

Unit-V **10 Hours**

JSP: Introduction, Difference Between servlets & JSP, Anatomy of JSP page, JSP elements: Directives, comments, Expressions, scriptlets, Declaration, Implicit JSP objects, using Action elements.
JDBC: Introduction, JDBC Drivers, Loading Driver, establishing connection, Executing SQL statement in JSP pages, MVC architecture

Text Books:

1. Web Technologies, Uttam K Roy, Oxford University Press.
2. The Complete Reference PHP- Steven Hozner, TMH.

References:

1. Java Server Pages-Hans Bergsten, SPD O'Reilly.
2. JavaScript, D. Flanagan O'Reilly, SPD.
3. Beginning Web Programming-Jon Dckett WROX.

PRINCIPLES OF ENTREPRENEURSHIP
(Open Elective – III)

IV-B.Tech.-II-Sem. **L T P C**
Subject Code: OEC-410 **3 - - 3**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO7	PO8	PO9	PO11	PO12
CO1	illustrate concept & types of entrepreneurship	3	3	2	3	2
CO2	distinguish individual and corporate entrepreneurship	3	3	3	3	2
CO3	identify the process of launching new ventures	3	3	3	3	3
CO4	assess legal challenges of entrepreneurship	3	3	3	3	3
CO5	build entrepreneurial strategies	3	3	3	3	3

Unit-I: Entrepreneurship **10 hours**

The revolution impact of entrepreneurship- The evolution of entrepreneurship - Approaches to entrepreneurship- Process approach- Twenty first centaury trends in entrepreneurship.
Case: From candle seller to CEO (Arya Kumar P.No. 48).

Unit-II: Individual and corporate entrepreneurship **9 hours**

The entrepreneurial journey - Stress and the entrepreneur- the entrepreneurial ego- Entrepreneurial motivations - Corporate Entrepreneurial Mindset the nature of corporate entrepreneur.
Case: Globalizing Local Talent, (B. Janakiram, M. Rizwana, page 228).

Unit-III: Launching Entrepreneurial Ventures **(5 + 5) 10 hours**

Part-A: Opportunities identification - entrepreneurial Imagination and Creativity - the nature of the creativity Process - Innovation and Entrepreneurship - Methods to initiate Ventures.

Part-B: Creating New Ventures - Acquiring an established entrepreneurial venture – Franchising - hybrid disadvantage of Franchising.
Case: creativity in start-ups (Arya Kumar Page 166).

Unit-IV: Legal challenges of Entrepreneurship **9 hours**

Intellectual Property Protection-Patents, Copyrights, Trademarks and Trade Secrets-Avoiding Pitfalls- Formulation of the entrepreneurial Plan- The challenges of new venture start-ups.
Case: Tata Motors – Nano (Arya Kumar P.No. 279).

Unit-V: Strategic perspectives in entrepreneurship **10 hours**

Strategic Planning-Strategic actions-strategic positioning-Business stabilization-Building the adaptive firms-understanding the growth stage-unique managerial concern of growing ventures.
Case: To Lease or Not: A Cash flow Question (David H.Holt, Page 452).

References:

1. Arya Kumar “Entrepreneurship- creating and leading an entrepreneurial org” Pearson 2012.
2. ‘Entrepreneurship: New Venture Creation’ David H Holt PHI, 2013.
3. Entrepreneurship: Text and Cases P. Narayana Reddy, Cengage, 2010.

PROJECT - II

	L	T	P	C
IV-B.Tech.-II-Sem.				
Subject Code: CS-PRJ-421	**-**	**-**	**22**	**11**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO1 to PO14
CO1	identify the problem statement, assess the scope and develop a prototype	3
CO2	execute the project using modern tools and prepare the report	3
CO3	demonstrate leadership, management skills for project development with ethics	3
CO4	function effectively as individual / member / leader in project teams	3
CO5	make use of engineering knowledge for societal sustenance	3

Guidelines:

The objective of the project work is to imbibe students with technical, analytical and innovative ideas to facilitate with theoretical and practical learning pertaining to relevant domain of interest. An individual or a peer of 2-5 students work under the guidance / mentorship of a departmental faculty with the aim of addressing solution to real world / societal problems using various R & D techniques. The team work fosters the communication and leadership skills among peers to survive and exercise during their career.

The project work normally includes:

1. Survey and study of published literature on the approved / assigned topic.
2. Conduct preliminary Analysis / Modeling / Simulation / Experiment / Design / Feasibility / ethnographical study.
3. Prepare an abstract/synopsis on the opted topic and present before Departmental Review Committee (DRC).
4. Prepare an Action Plan for conducting the investigation, including team work.
5. Apply suitable methodology for Designing / Modelling / Simulation / Experimentation as needed.
6. Develop an end product or process along with conclusions, recommendations and future scope.
7. Present and execute the project before DRC for CIE.
8. Prepare and publish a paper in Conference / Journal, if possible.
9. Prepare and submit the final dissertation in the prescribed format to the Department.
10. Present and execute the project before External Committee for viva-voce.