ACADEMIC REGULATIONS (R22)

COURSE STRUCTURE AND DETAILED SYLLABUS

(CHOICE BASED CREDIT SYSTEM (CBCS))

B.Tech.

Computer Science and Engineering

(B.Tech. Regular: Applicable for the batches admitted from 2022 - 2023)

&

(B.Tech. LES: Applicable for the batches admitted from 2023 - 2024)

CMR GROUP OF INSTITUTIONS
EXPLORE TO INVENT

Department of Computer Science and Engineering

CMR INSTITUTE OF TECHNOLOGY

(UGC - Autonomous)

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

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FOREWORD

CMR Institute of Technology, established in the year 2005, Approved by AICTE, New Delhi, Permanently Affiliated to JNTUH, Accredited by NBA under Tier-I, Achieved UGC Autonomous Status and has been bestowed with NAAC 'A' Grade 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 2005 to attain the current academic excellence in improvement of the standards and ethics. Institutional Governance enriched by eminent personalities on many of its boards/councils such as the Governing Body, Academic Council, Boards of Studies, IQAC to frame the guidelines for curriculum design and development in the interest of the key-stakeholders.

The autonomous academic regulations, course structure and syllabi have been framed in accordance with the vision and mission of the institution on the valuable suggestions from various stakeholders from the diverse fields of academics, industry, R&D and society with a bird-eye-view to impart quality professional technical education to contribute the society with innovation and creativity.

All the staff members, parents and 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 embarrassments. The cooperation of all the stakeholders 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.

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CMR INSTITUTE OF TECHNOLOGY

Vision: To create world class technocrats for societal needs.

Mission: Achieve global quality technical education by assessing learning environment through

- Innovative Research & Development
- Eco-system for better Industry institute interaction
- Capacity building among stakeholders

Quality Policy: Strive for global professional excellence in pursuit of key-stakeholders.

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (CSE)

Vision: Develop competent software professionals, researchers and entrepreneurs to serve global society.

Mission: The department of **Computer Science and Engineering** is committed to

- create technocrats with proficiency in design and code for software development
- adapt contemporary technologies by lifelong learning and face challenges in IT and ITES sectors
- quench the thirst of knowledge in higher education, employment, R&D and entrepreneurship

I. Programme Educational Objectives (PEOs): Engineering Graduates will

1. Pursue successful professional career in IT and IT-enabled sectors.
2. Pursue lifelong learning skills to solve complex problems through multidisciplinary-research.
3. Exhibit professionalism, ethics and inter-personal skills to develop leadership qualities.

II. Programme Outcomes (POs): Engineering Graduates will be able to

1. Apply mathematics, science, engineering fundamentals to solve complex engineering problems.
2. Identify, formulate and analyze complex engineering problems to reach substantiated conclusions.
3. Design and develop a component/system/process to solve complex societal engineering problems.
4. Design and conduct experiments to analyze, interpret and synthesize data for valid conclusions.
5. Create, select and apply modern tools, skills, resources to solve complex engineering problems.
6. Apply contextual engineering knowledge to solve societal issues.
7. Adapt modern engineering practices with environmental safety and sustainable development.
8. Apply professional code of ethics, responsibilities and norms in engineering practices.
9. Compete as an individual and/or as a leader in collaborative cross cultural teams.
10. Communicate effectively through technical reports, designs, documentations and presentations.
11. Endorse cognitive management skills to prepare project report using modern tools and finance.
12. Engage in independent and life-long learning in the broad context of technological changes.

III. Programme Specific Outcomes (PSOs): Engineering Graduates will be able to

1. Design and develop Computer-Based-Systems using Algorithms, Networks, Security, Gaming, Full Stack, DevOps, IoT, Cloud, Data Science and AI&ML.
2. Apply cutting-edge technologies to solve real world problems.

Academic Regulations (R22)
B.Tech. - Regular Four Year Degree Programme
(For batches admitted from the academic year 2022 - 23)
&
B.Tech. - Lateral Entry Scheme
(For batches admitted from the academic year 2023 - 24)

PREAMBLE

For pursuing four year undergraduate 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 2022-23 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.

1.0 UNDERGRADUATE PROGRAMMES OFFERED (E&T)

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

S. No.	Branch	Code
1	Electronics and Communication Engineering (ECE)	04
2	Computer Science and Engineering (CSE)	05
3	Computer Science and Engineering (Cyber Security)	62
4	Computer Science and Engineering (AI & ML)	66
5	Computer Science and Engineering (Data Science)	67
6	Artificial Intelligence and Machine Learning (AI & ML)	73

2.0 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:

2.1.1.1 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.

2.1.1.2 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 the admission process.

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

3.0 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 undergraduate 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 undergraduate 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 the B.Tech. III 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 the B.Tech. programme.

3.2.2 The student shall register and secure 120 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 and in each Semester - 'Continuous Internal Evaluation (CIE)' and 'Semester End Examination (SEE)', Choice Based Credit System (CBCS) and Credit Based Semester System (CBSS) indicated by UGC, and curriculum/course structure 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 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 almost all the guidelines specified by AICTE/UGC/JNTUH. The subjects/courses offered in the B.Tech. programme are broadly classified as mentioned below.

S. No.	Broad Course Classification	Course Group/ Category	Course Description
1	Foundation Courses (FnC)	BS - Basic Sciences	Includes Mathematics, Physics and Chemistry subjects
2		ES - Engineering Sciences	Includes Fundamental Engineering Subjects
3		HS - Humanities and Social Sciences	Includes subjects related to Humanities, Social Sciences and Management
4	Core Courses (CoC)	PC – Professional Core	Includes core subjects related to the parent discipline/ department/ branch of Engineering.
5	Elective Courses (EℓC)	PE - Professional Electives	Includes elective subjects related to the parent discipline/department/branch of Engineering.
6		OE - Open Electives	Elective subjects which includes inter-disciplinary subjects or subjects in an area outside the parent discipline/department/ branch of Engineering.
7	Core Courses	PR - Project Work/ Internship/ Industry Oriented Mini-Project/Skill Enhancement Courses	Real Time/Societal Research Project, Project Stage - I & Project Stage - II including Seminar, Internship/Industry Oriented Mini-Project/ Skill Enhancement Courses.
8	MC - Mandatory Courses		Mandatory Courses (non-credit)

4.0 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 student 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 maximum of two additional theory subject(s)/ course(s) limited to 6 credits (any 2 elective subjects), 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 Choice for '**additional subjects/courses**', not more than any 2 elective subjects in any Semester, must be clearly indicated, which needs the specific approval and signature of the Faculty Advisor/Mentor/HOD.

4.6 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.

4.7 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.

4.8 Dropping of additional registered subject/course 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.

4.9 **Open Electives**: The students have to choose three Open Electives (OE-I, II & III) from the list of Open Electives given by other departments. However, the student can opt for an Open Elective subject offered by his own (parent) department, if the student has not registered and not studied that subject under any category (Professional Core, Professional Electives, Mandatory Courses etc.) offered by the parent department in any semester. Open Elective subjects already studied should not repeat/should not match with any category (Professional Core, Professional Electives and Mandatory Courses etc.) of subjects even in the forthcoming semesters.

4.10 **Professional Electives**: The students have to choose six professional electives (PE-I to VI) from the list of professional electives given.

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

5.0 SUBJECTS/COURSES TO BE OFFERED

5.1 A subject/ course may be offered to the students, **only if** a minimum of 15 students opt for it.

5.2 More than **one faculty member** may offer the **same subject** (lab/practical 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).

5.3 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**.

5.4 In case of options coming from students of other departments/branches/disciplines (not considering **open electives**), first **priority** shall be given to the student of the '**parent department**'.

6.0 ATTENDANCE REQUIREMENTS

6.1 A student shall be eligible to appear for the semester end examinations, if the student acquires a minimum of 75% of attendance in aggregate of all the subjects/courses including attendance in all mandatory courses for that semester. **Two periods** of attendance for each theory subject shall be considered, if the student appears for the mid-term examination of that subject.

6.2 Shortage of attendance in aggregate upto 10% (65% and above, and below 75%) in each semester may be condoned 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,** including all academic credentials(internal marks etc.) of that semester**. They will not be promoted to the next semester.**They may seek re-registration for all those subjects registered in that semester, in which the student is detained, by seeking re-admission into that semester as and when offered; 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.

7.0 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% (14 marks out of 40 marks) in the Continuous Internal Evaluation (CIE), not less than 35% (21 marks out of 60 marks) in the semester end examinations (SEE), and a minimum of 40% (40 marks out of 100 marks) in the sum total of the CIE and 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 Real-time/Societal Research Project (or) Industry Oriented Mini Project/Internship, if the student secures not less than 40% marks (i.e. 40 out of 100 allotted marks) in each of them. The student is deemed to have failed, if the student (i) does not submit a report on Industry Oriented Mini Project/Internship, or (ii) not make a presentation of the same before the evaluation committee as per schedule, or (iii) secures less than 40% marks in Real-time/Societal Research Project (or) Industry Oriented Mini Project/Internship evaluations.

7.3 A student may reappear once for each of the above evaluations, when they are scheduled again; if the student fails in such 'one reappearance' evaluation also, the student has to reappear for the same in the next subsequent semester, as and when it is scheduled.

7.4 Promotion Rules

S. No.	Promotion	Conditions to be fulfilled
1	I Semester to II Semester	Regular course of study of I Semester.
2	II Semester to III Semester	**(i)** Regular course of study of II Semester. **(ii)** Must have secured at least 20 credits out of 40 credits i.e., 50% credits up to second semester from all the relevant regular and supplementary examinations whether the student takes those examinations or not.
3	III Semester to IV Semester	Regular course of study of III Semester.

4	IV Semester to V Semester	**(i)** Regular course of study of IV Semester. **(ii)** Must have secured at least 48 credits out of 80 credits i.e., 60% credits up to fourth semester (20 credits out of 40 credits for LES) from all the relevant regular and supplementary examinations, whether the student takes those examinations or not.
5	V Semester to VI Semester	Regular course of study of V Semester.
6	VI Semester to VII Semester	**(i)** Regular course of study of VI Semester. **(ii)** Must have secured at least 72 credits out of 120 credits (48 credits out of 80 credits for LES) i.e., 60% credits up to sixth semester from all the relevant regular and supplementary examinations, whether the student takes those examinations or not.
7	VII Semester to VIII Semester	Regular course of study of VII Semester.

7.5 A student has to register for all subjects covering 160 credits (120 credits for 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 (120 credits for LES) securing a minimum of **'C'** grade or above in each subject, and 'earn all 160 credits (120 credits for LES) securing SGPA ≥ 5.0 (in each semester) and CGPA (at the end of each successive semester) ≥ 5.0, to successfully complete the undergraduate programme and shall be indicated in the grade card/marks memo of VIII semester.

7.6 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 (120 credits for 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 (120 credits for 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.

7.7 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.

7.8 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 the student has been detained.

7.9 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.

8.0 EVALUATION - DISTRIBUTION AND WEIGHTAGE OF MARKS

8.1 The performance of a student in every subject/course (including practical and Project Stage- I & II) will be evaluated for 100 marks each, with 40 marks allotted for CIE and 60 marks SEE.

8.2 Evaluation of Theory Subjects/Courses

A) Continuous Internal Evaluation (CIE): In CIE, for theory subjects, during a semester, there shall be **Two** Mid-Term Examinations. The first Mid-Term Examination shall be conducted for the first 50% of the syllabus, and the Second Mid-Term for the remaining 50% of the syllabus. Each Mid-Term examination consists of two parts (i) **Part - A** for 5 marks, (ii) **Part - B** for 25 marks with a total duration of 2 hours as follows:

- Part-A consists of one compulsory question with five sub questions carrying one mark each and Part-B consists of 5 essay questions with internal choice carrying five marks each; the student has to answer all 5 questions. The First and Second Mid-Term question papers comprise of 2,2,1 questions from I, II, III(A) Units and 1,2,2 questions from III(B), IV, V Units respectively. The **average of two Mid Term Examinations** shall be taken as final marks for Mid-Term Examination (for 30 marks).
- The remaining 10 marks of CIE are distributed as follows:
  (i) Assignment for 5 marks. First assignment should be submitted before the commencement of the first mid-term examinations and the second assignment before the commencement of second mid-term examinations. The assignments shall be specified/given by the concerned subject teacher. The average of two assignments shall be taken as final marks for assignment (for 5 marks).
  (ii) Subject Viva-Voce/PPT/Poster Presentation/Case Study on a topic in the subject concerned for 5 marks before commencement of II Mid-Term Examination.
- *There is NO Computer Based Test (CBT) for R22 regulations.*

B) Semester End Examinations (SEE): 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 60 marks consisting of two parts viz. i) **Part- A** for 10 marks, ii) **Part - B** for 50 marks.
- Part-A is compulsory, which consists of ten questions (two from each unit) carrying 1 mark 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 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 SEE. For practical subjects, there shall be a CIE during the Semester for 40 internal marks and 60 marks for SEE.

A) Continuous Internal Evaluation (CIE): The distribution of CIE 40 marks for practical subjects is as follows:

- A write-up on day-to-day experiment(s) in the laboratory shall be evaluated for 15 marks. The breakup of marks would be (i) 3 marks for observation and record (ii) 4 marks for performance of experiment (iii) 3 marks for expected outcome and (iv) 5 marks for Viva-Voce. The average marks of day-to-day experiments shall be the final marks (for 15 marks).
- Internal practical examination conducted by the laboratory teacher concerned shall be evaluated for 15 marks. The breakup of marks are (i) 3 marks for write-up (ii) 4 marks for experiment/program (iii) 3 for evaluation of results and (iv) 5 marks for viva-voce on concerned laboratory course.
- The remaining 10 marks are for Laboratory Project, which consists of the Design (or) Software/Hardware Model Presentation (or) App Development (or) Prototype Presentation submission which shall be evaluated after completion of laboratory course and before Semester End Practical Examination.

B) Semester End Examination (SEE): The Semester End Examination (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 for 60 marks. The allocation of marks is as given below

- (i) 10 marks for write-up (ii) 15 marks for experiment/program (iii) 15 marks for evaluation of results (iv) 10 marks for presentation on another experiment/program in the same lab course and (v) 10 marks for viva-voce on concerned laboratory course.

8.4 Condition for Passing CIE and SEE in Theory and Practical Subject(s)/Course(s): The Student, in each subject, shall have to earn 35% of marks (i.e. 14 marks out of 40 marks) in CIE, 35% of marks (i.e. 21 marks out of 60) in SEE and Overall 40% of marks (i.e. 40 marks out of 100 marks) both CIE and SEE marks put together.

- The student is eligible to write Semester End Examination of the concerned subject, if the student scores ≥ 35% (14 marks) of 40 CIE marks.
- In case, the student appears for SEE of the concerned subject but has not scored minimum 35% of CIE marks (14 marks out of 40 internal marks), the student performance in that subject in SEE shall stand cancelled in spite of appearing the SEE.

8.5 The Evaluation of Elements of CSE/CSE allied branches/ECE: There shall be only internal evaluation for 50 marks and NO external evaluation. Students have to earn 40%, i.e. 20 out of 50 marks. The student is deemed to have failed, if the student (i) is absent as per schedule, or (ii) secures less than 40% marks in this course.

A) CSE/CSE allied branches: There shall be two Mid-Term examinations and it shall take place during I Mid-Term and II Mid-Term examinations. The Continuous Internal Evaluation (CIE) will be for 50 marks. Each Mid-Term examination consists of two parts (i) **Part - A** for 10 marks, (ii) **Part - B** for 30 marks with a total duration of 2 hours.

- **Part-A** consists of one compulsory question with five sub questions carrying two marks each and **Part-B** consists of 5 essay questions with internal choice carrying six marks each; the student has to answer all 5 questions. The First and Second Mid-Term question papers comprise of 2,2,1 questions from I, II, III(A) Units and 1,2,2 questions from III(B), IV, V Units respectively. The average of two Mid-Term examinations marks is final for 40 marks.
- The remaining 10 marks of Continuous Internal Evaluation are for Assignment (5 marks) and Subject Viva-Voce/PPT/Poster Presentation/Case Study (5 marks) and the evaluation pattern will remain same as for other theory subjects.

B) ECE branch: The Continuous Internal Evaluation (CIE) will be for 50 marks. Out of the 50 marks for internal evaluation:

- A write-up on day-to-day experiment(s) in the laboratory shall be evaluated for 15 marks. The breakup of marks would be (i) 3 marks for observation and record (ii) 4 marks for performance of experiment (iii) 3 marks for expected outcome and (iv) 5 marks for Viva-Voce. The average marks of day-to-day experiments shall be the final marks (for 15 marks).
- Internal practical examination conducted by the laboratory teacher concerned shall be evaluated for 20 marks. The breakup of marks are (i) 5 marks for write-up (ii) 5 marks for experiment/program (iii) 5 for evaluation of results and (iv) 5 marks for viva-voce on concerned laboratory course.
- The remaining 15 marks are for Laboratory Project, which consists of the Design (or) Software/Hardware Model Presentation (or) App Development (or) Prototype Presentation submission which shall be evaluated after completion of laboratory course and before Semester End Practical Examination.

8.6 The Evaluation of Real-Time/Societal Research Project: The project will be evaluated for a total of 100 marks (CIE 40 marks and SEE 60 marks). The CIE marks are awarded by the supervisor based on the student's performance during the project work. The SEE marks are awarded by a Departmental Review Committee consisting of Head of the Department, Supervisor and a Senior Faculty Member. The student is deemed to have failed, if student (i) does not submit a report on the Project, or (ii) does not make a presentation of the same before the internal committee as per schedule, or (ii) secures less than 40% marks in this course.

8.7 The Evaluation of Internship/Industry Oriented Mini-Project/Skill Enhancement Courses: There shall be Internship (or) Industry Oriented Mini-Project (or) Skill Enhancement Courses, Students shall register for this immediately after IV SEE and complete before VI SEE without effecting regular classwork. Internship at reputed organization (or) Industry

Oriented Mini Project (or) Skill Enhancement Courses shall be submitted in a report form and presented before the committee in VI semester before End Semester Examination. It shall be evaluated only for SEE 100 marks. The committee consists of an External Examiner, Head of the Department, Supervisor of the Industry Oriented Mini Project (or) Internship etc, Internal Supervisor and a Senior Faculty Member of the Department. There shall be NO internal marks for Internship (or) Industry Oriented Mini-Project (or) Skill Enhancement Courses.

8.8 Main Project: The topic and content of the project should be different from Real-Time/Societal Research Project (or) Industry Oriented Mini-Project (or) Internship. The Main Project Work shall be carried out in two stages. The Project Stage-I will be initiated and completed in the VII Semester and the Project Stage-II will be initiated and completed in the VIII Semester. The student must present reports of Project Stage - I and Project Stage - II before II Mid examinations of VII semester and VIII semester respectively. Each report of the project stages I and II shall be evaluated for 100 marks before commencement of SEE theory examinations. Only those students who get Project Stage - I approved by Departmental Review Committee evaluation are eligible to start Project Stage - II work. The Departmental Review Committee comprises of Head of the Department, Project Supervisor and one Senior Faculty Member. The External Evaluation Committee comprises of Head of the Department, Project Supervisor and one External Examiner appointed by the Principal.

8.9 Project Stage - I: During the Project Stage - I the student in consultation with the Supervisor, decides on the title, objectives and plan of action of the Project work and submits the report to the Head of the Department on approval of Supervisor for evaluation. The Project Work is evaluated for a total of 100 marks, of which CIE is for 40 marks awarded by Supervisor and SEE is for 60 marks awarded by Departmental Review Committee. The student is deemed to be not eligible to register for the Project Stage - II, if the student (i) does not submit a report on Project Stage - I or (ii) does not make a Presentation of the same before the Evaluation Committee as per schedule or (iii) secures less than 40% marks in the sum total of the CIE and SEE taken together.

A student who has failed may reappear once for the above evaluation, when it is scheduled again; if the student fails in such 'one re-appearance' evaluation also, the student has to reappear for the same in the next subsequent semester, as and when it is scheduled next.

8.10 Project Stage - II: During the Project Stage - II the student executes the Project under the guidance of the Supervisor and submits the final Project Report to the Head of the Department for evaluation. The External Evaluation Committee shall evaluate the Project Stage - II work for 60 marks and the Internal Project Committee shall evaluate it for 40 marks. Out of 40 internal marks, the Departmental Review Committee shall evaluate the project work for 20 marks and Project Supervisor shall evaluate for 20 marks. The student is deemed to have failed, if the student (i) does not submit a Report on the Project, or (ii) does not make a Presentation of the same before the External Examiner as per schedule, or (iii) secures less than 40% marks in the sum total of the CIE and SEE taken together.

A student, who has failed, may reappear once for the above evaluation, when it is scheduled again; if student fails in such 'one re-appearance' evaluation also, the student has to reappear for the same in the next subsequent semester, as and when it is scheduled.

8.11 A student shall be given one time chance to re-register for a maximum of two subjects:

- If the internal marks secured by a student in the Continuous Internal Evaluation marks for 40 (Sum of average of two mid-term examinations consisting of two parts, Part-A (Short Answer Questions) and Part-B (Descriptive Questions), Average of two Assignments & Subject Viva-Voce/PPT/Poster Presentation/Case Study on a topic in the concerned subject) are less than 35% (14 out of 40 marks) and failed in those subjects.
- A student must re-register for the failed subject(s) for 40 marks within four weeks of commencement of the classwork in the next academic year.
- In the event of the student taking this chance, the Continuous Internal Evaluation marks for 40 and Semester End Examination marks for 60 obtained in the previous attempt stands cancelled.

8.12 Evaluation of Mandatory Non-Credit Courses: There shall be only Continuous Internal Evaluation for all mandatory (non credit) courses. Instead of marks, a letter grade '**S'** for **Satisfactory** or '**U'** for **Unsatisfactory** shall be indicated and this will not be counted for the computation of SGPA/CGPA.

9.0 GRADING PROCEDURE

9.1 Grades will be awarded to indicate the performance of students in each Theory Subject, Laboratory/Practical's/Industry-Oriented Mini Project/Internship/Skill Enhancement Course and Project Stage. Based on the percentage of marks obtained (CIE+SEE) 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 (As per UGC/AICTE/JNTUH 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 (Average)	6
Below 50% but not less than 40% (≥ 40% , < 50%)	C (Pass)	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 SEE, as and when offered. In such cases, CIE in those subject(s) will remain the same as those obtained earlier.

9.4 To a student who has not appeared for an examination in any subject, '**Ab'** grade will be allocated in that subject, and the student is deemed to have '**Failed'**. A student will be required to reappear as a '**supplementary student**' in the SEE, as and when offered next. In this case also, the internal marks in those subjects will remain the same as those obtained earlier.

9.5 A letter grade does not indicate any specific percentage of marks secured by the student, but it indicates only the range of percentage of marks.

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. The SGPA is

$$\textbf{SGPA } (S_i) = \sum (C_i \times G_i) / \sum C_i$$

Where C_i is the no. of credits of the i^{th} course and G_i is the GP scored 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 following formula:

$$CGPA = \sum (C_i \, X \, S_i) / \sum C_i$$

where S_i is the SGPA of the i^{th} semester and C_i is the total no. 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	20	7	20 x 7= 140
Course 2	4	O	10	4 x 10 = 40	Sem II	20	6	20 x 6= 120
Course 3	3	C	5	3 x 5 = 15	Sem III	20	6.5	20 x 6.5 =130
Course 4	3	B	6	3 x 6 = 18	Sem IV	20	6	20 x 6 = 120
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	**20**		**62**	**154.5**	**Total**	**160**		**1150**
SGPA = 154.5/20 = 7.70					**CGPA = 1150/160 = 7.19**			

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 SGPA and CGPA of a semester will be mentioned in the semester Memorandum of Grades if all subjects of that semester are passed in the first attempt. Otherwise the SGPA and CGPA shall be mentioned only on the Memorandum of Grades in which the student passed in the last exam in that semester. However, mandatory courses will not be taken into consideration.

10.0 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 undergraduate 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, number of credits, grade earned etc.), credits earned, SGPA, and CGPA. **There is NO exemption of credits in any case.**

11.0 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

12.0 AWARD OF DEGREE

12.1 After a student has satisfied the requirement prescribed for the completion of the programme 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 120 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.

12.6 Award of 2-Year B.Tech. Diploma Certificate

a) A student is awarded 2-Year UG Diploma Certificate in the concerned engineering branch on completion of all the academic requirements and has earned all the 80 credits (within 4 years from the date of admission) upto B.Tech. IV Semester, if the student wants to exit the 4-Year B.Tech. programme and *requests for the 2-Year* B.Tech. (*UG) Diploma Certificate.*

b) The student **once opted and awarded a 2-Year UG Diploma Certificate will be permitted to join** in B.Tech. V Semester and continue for completion of remaining years of study for 4-Year B. Tech. Degree ONLY in the next academic year along with next batch students. *However, if any student wishes to continue the study after opting for exit, student should register for the subjects/courses in V Semester before commencement of class work for that semester.*

c) *The students, who exit the 4-Year B. Tech. program after IV semester of study and wish to rejoin the B.Tech. program, must submit the 2 -Year* B. Tech. (*UG) Diploma Certificate awarded to him, subject to the eligibility for completion of Course/Degree.*

d) A student may be permitted to take one year break after completion of IV Semester or B. Tech. VI Semester (with university permission through the Principal of the college well in advance) and can re-enter the course in **next Academic Year in the same college** and complete the course on fulfilling all the academic credentials within a stipulated duration i.e. double the duration of the course (Ex. within 8 Years for 4-Year program).

13.0 WITHHOLDING OF RESULTS

13.1 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.

14.0 SUPPLEMENTARY EXAMINATIONS

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

15.0 TRANSITORY REGULATIONS

A. For students detained due to shortage of attendance:

a) A Student who has been detained in I year of R18/R20 Regulations due to lack of attendance, shall be permitted to join I year I Semester of R22 Regulations and the student is required to complete the study of B.Tech. programme within the stipulated period of eight academic years from the date of first admission in I Year.

b) A student, who has been detained in any semester of II, III and IV years of R18/R20 regulations for want of attendance, shall be permitted to join the corresponding semester of R22 Regulations and is required to complete the study of B.Tech. within the stipulated period of eight academic years from the date of first admission in I Year. The R22 Academic Regulations under which a student has been readmitted shall be applicable to that student from that semester. See rule (C) for further Transitory Regulations.

B. For students detained due to shortage of credits:

c) A student of R18/R20 Regulations, who has been detained due to lack of credits, shall be promoted to the next semester of R22 Regulations only after acquiring the required number of credits as per the corresponding regulations of their first admission. The total credits required are 160 including both R18/R20 & R22 regulations. The student is required to complete the study of B.Tech. within the stipulated period of eight academic years from the year of first admission. The R22 Academic Regulations are applicable to a student from the year of readmission. See rule (C) for further Transitory Regulations.

C. For readmitted students in R22 Regulations:

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

e) 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 their study including R22 Regulations. **There is NO exemption of credits in any case**.

f) If a student is readmitted to R22 Regulations and has any subject with 80% of syllabus common with their previous regulations, that particular subject in R22 Regulations will be substituted by another subject to be suggested by the University.

Note: If a student readmitted to R22 Regulations has not studied any subjects/topics in their earlier regulations of study which is prerequisite for further subjects in R22 Regulations, the Principal shall conduct remedial classes to cover those subjects/topics for the benefit of the students.

16.0 STUDENT TRANSFERS

There shall be no transfers from other colleges/streams.

17.0 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.

18.0 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, notebook, 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 the student 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, the student will be handed over to the police and a case is registered against them.
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 the 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 classwork 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 their 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 their 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 a 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 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.	

19.0 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 Academic Council is final.

iv) 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.

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INDUCTION PROGRAM

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	PO9	PO10	PO12
CO1	acquaint with new learning environment and inculcate ethos	3	3	3	3
CO2	explore professional comfort, sensitization and group dynamics	3	3	3	3
CO3	promote healthy bonding, professional advancement and excellence	3	3	3	3
CO4	build relationship among members of academic community	3	3	3	3
CO5	provide a panoramic view of art of living and build one's character	3	3	3	3

List of Activities

Schedule of 1st Week Induction Program (Each session may be of 2-3 hrs)		
Day	**Session**	**Events**
1	1	Orientation program (Institute policies, processes, practices, academic regulations, culture and values).
	2	Mentoring (group formation and introduction).
2	3	Diagnostic test (English, Mathematics and computer operation).
	4	Familiarization of Department and Institute (Visits to department, laboratory, Library, Examination cell, office, etc).
3	5	Physical Activity (Sports, Yoga and Meditation, Plantation).
	6	Universal human values session.
4	7	Proficiency Module (Short courses on Mathematics, English and computer operation)
	8	Physical Activity (Sports, Yoga and Meditation, Plantation).
5	9	Proficiency Module (Short courses on Mathematics, English and computer operation)
	10	Creative Arts, Cultural and Literary Activity.
Conduct a minimum 12 out of 20 sessions from 2nd week onwards to till end of the semester		
Session	**Event**	
11	Physical Activity (Sports, Yoga and Meditation, Plantation, etc.) - 1	
12	Extra-Curricular Activity - 1	
13	Physical Activity (Sports, Yoga and Meditation, Plantation, etc.) -2	
14	Extra-Curricular Activity - 2	
15	Physical Activity (Sports, Yoga and Meditation, Plantation, etc.) - 3	
16	Lectures/Workshops by Eminent People - 1	
17	Physical Activity (Sports, Yoga and Meditation, Plantation, etc.) - 4	
18	Lectures/Workshops by Eminent People - 2	
19	Creative Arts, Cultural and Literary Activity - 1	
20	Lectures/Workshops by Eminent People - 3	
21	Creative Arts, Cultural and Literary Activity - 2	
22	Universal Human Values - 1 (Group Discussion among students as per mentoring group on various aspects of life, values, ethics etc.)	
23	Creative Arts, Cultural and Literary Activity - 3	
24	Universal Human Values - 2 (Group Discussion among students as per mentoring group on various aspects of life, values, ethics etc.)	
25	Creative Arts, Cultural and Literary Activity - 4	
26	Universal Human Values - 3 (Group Discussion among students as per mentoring group on various aspects of life, values, ethics etc.)	
27	Creative Arts, Cultural and Literary Activity - 5	
28	Physical Activity (Sports, Yoga and Meditation, Plantation, etc.) - 5	
29	Feedback and Report on the Program - 1	
30	Feedback and Report on the Program - 2	

COURSE STRUCTURE

B.Tech. (CSE) – R22 COURSE STRUCTURE

(Applicable from the batch admitted during 2022-23 and onwards)

I – Semester								
S. No.	Course Code	Subject	POs	PSOs	Hours Per Week			Credits
					L	T	P	
1	22BS11	Matrices and Calculus	1,2,12		3	1	-	4
2	22BS14	Engineering Chemistry	1,2,12		3	1	-	4
3	22ES11	Basic Electrical & Electronics Engineering	1,2,3,12		3	-	-	3
4	22ES12	Programming for Problem Solving	1,2,3,12		3	-	-	3
5	22ES13	Elements of Computer Science & Engineering	1,2,3,4,5,9,12		-	-	2	1
6	22BS15	Engineering Chemistry Lab	4,9		-	-	2	1
7	22ES15	Basic Electrical & Electronics Engineering Lab	4,9		-	-	3	1.5
8	22ES16	Programming for Problem Solving Lab	4,5,9		-	-	2	1
9	22ES17	Computer Aided Engineering Graphics Lab	1,5,9,10		-	-	3	1.5
10	22MC11	Induction Program	8,9,10,12		-	-	-	-
TOTAL					**12**	**02**	**12**	**20**

II – Semester								
S. No.	Course Code	Subject	POs	PSOs	Hours Per Week			Credits
					L	T	P	
1	22BS21	Ordinary Differential Equations and Vector Calculus	1,2,12		3	1	-	4
2	22BS22	Applied Physics	1,2,12		3	1	-	4
3	22HS21	English for Skill Enhancement	10,12		2	-	-	2
4	22ES22	Data Structures through Python	1,2,3,12		3	-	-	3
5	22BS23	Applied Physics Lab	4,9		-	-	3	1.5
6	22HS22	English Language Laboratory for Effective Communication	5,9,10		-	-	3	1.5
7	22ES24	Data Structures through Python Lab	4,5,9		-	-	2	1
8	22ES26	IT Workshop Practice	1,5,9,10		-	1	2	2
9	22ES27	Design Thinking for Innovation and Startups	1 to 12	1,2	-	-	2	1
10	22MC21	Environmental Science & Disaster Management	1,6,7,12		2	-	-	-
TOTAL					**13**	**03**	**12**	**20**

III – Semester								
S. No.	Course Code	Subject	POs	PSOs	Hours Per Week			Credits
					L	T	P	
1	22BS31	Statistical Foundations for Computer Science	1,2,12		3	1	-	4
2	22ES32	Digital Logic Design and Computer Organization	1,2,3,6,12		3	-	-	3
3	22CSPC31	Software Design and Engineering	2,3,8,11,12	1	3	-	-	3
4	22CSPC32	OOP through Java	1,2,3,12		3	-	-	3
5	22CSPC33	Database Management Systems	1,2,3,12		3	-	-	3
6	22CSPC34	OOP through Java Lab	4,5,9		-	-	2	1
7	22CSPC35	Database Management Systems Lab	4,5,9		-	-	2	1
8	22CSPC36	Data Wrangling and Visualization - Python/R Programming/Power BI	3,4,5,9,12	2	-	-	2	1
9	22CSPC37	App development - Android/Flutter/Flask	3,4,5,9,12	2	-	-	2	1
10	22MC31	Gender Sensitization	9,12		-	-	2	-
11	22MC32	Employability Skills - I	9,10		-	-	3	-
TOTAL					**15**	**01**	**13**	**20**

IV – Semester								
S. No.	Course Code	Subject	POs	PSOs	Hours Per Week			Credits
					L	T	P	
1	22ES41	Discrete Mathematics & Graph Theory	1,2,12		3	-	-	3
2	22CSPC41	Design and Analysis of Algorithms	2,3,12	1	3	-	-	3
3	22CSPC42	Computer Networks	1,2,12	1	3	-	-	3
4	22CSPC43	Operating Systems	1,2,12		3	-	-	3
5	22CSPC44	Full Stack Development	2,3,6,12	1	3	-	-	3
6	22CSPC45	CN & OS (Linux) Lab	3,5,9	2	-	-	2	1
7	22CSPC46	Node JS/Angular/React JS/Django	4,5,9,12	2	-	-	2	1
8	22CSPC47	Automated Testing Tools - Selenium	3,4,5,8,9,12	2	-	-	2	1
9	22CSPR41	Real Time/Societal Research Project	1 to 12	1,2	-	-	4	2
10	22MC41	Indian Culture and Constitution	8,12		2	-	-	-
11	22MC42	Employability Skills - II	9,10		-	-	3	-
TOTAL					**17**	**-**	**13**	**20**

V – Semester								
S. No.	Course Code	Subject	POs	PSOs	Hours Per Week			Credits
					L	T	P	
1	22CSPC51	Automata and Compiler Design	1,2,3,12		3	-	-	3
2	22CSPC52	Artificial Intelligence and Machine Learning	1,2,3,6,12	1	3	-	-	3
3	22CSPC53	Data Mining and Data Analytics	1,2,3,12	1	3	-	-	3
4	22CSPC54	Information and Cyber Security	2,3,6,8,12	1	3	-	-	3
5	**Professional Elective – I**				3		-	3
	22CSPE51	Digital marketing	2,3,5,6,8,12					
	22CSPE52	Soft Computing	2,3,5,7,12	1				
	22CSPE53	Middleware Technologies	2,3,5,6,12	1				
	22CSPE54	Image Processing	2,3,5,7,12	1				
6	22CSPC55	Artificial Intelligence and Machine Learning Lab	4,5,9	2	-	-	2	1
7	22CSPC56	Data Mining and Data Analytics Lab	4,5,9	2	-	-	2	1
8	22CSPC57	Information and Cyber Security Lab	4,5,9	2	-	-	2	1
9	22CSPC58	Automated Writing Tools - ChatGPT	3,4,5,8,9,12	2	-	-	2	1
10	22HS51	Advanced English Communication Skills Lab	5,9,10		-	-	2	1
11	22MC51*	Environmental Science & Disaster Management	1,6,7,12		2	-	-	-
TOTAL					**17**	**-**	**10**	**20**

* For Lateral Entry Students only

VI – Semester								
S. No.	Course Code	Subject	POs	PSOs	Hours Per Week			Credits
					L	T	P	
1	22CSPC61	IoT and Cloud Computing	2,3,6,7,12	1	3	-	-	3
2	22CSPC62	Robotic Process Automation	2,3,6,12	1	3	-	-	3
3	22CSPC63	DevOps	2,3,6,12	1	3	-	-	3
4	**Professional Elective – II**				3		-	3
	22CSPE61	Data Science and Big Data Analytics	2,3,5,8,12	1				
	22CSPE62	Natural Language Processing	2,3,5,8,12	1				
	22CSPE63	Advanced Machine Learning	2,3,5,6,12	1				
	22CSPE64	Blockchain and Cryptocurrency	2,3,5,8,12	1				
5	**Open Elective – I**				3		-	3
	22OE61	E-Commerce	3,8,9,10,12					
	22OE62	Agile Methodologies	2,3,6,8,12					
	22OE63	Electronic Sensors	2,3,6,7,8,12					
6	22CSPC64	IoT and Cloud Computing Lab	4,5,9	2	-	-	2	1
7	22CSPC65	Robotic Process Automation Lab	4,5,9	2	-	-	2	1
8	22CSPC66	DevOps Lab	4,5,9	2	-	-	2	1
9	22CSPR61	Industry Oriented Mini Project/ Internship/Skill Enhancement Course - Big data-Spark	1 to 12	1,2	-	-	4	2
10	22MC61	Entrepreneurship and IPR	1,7,8,12		3	-	-	
TOTAL					**18**	**00**	**10**	**20**

VII – Semester								
S. No.	Course Code	Subject	POs	PSOs	Hours Per Week			Credits
					L	T	P	
1	22HS71	Management, Economics and Accountancy	11,12		3	-	-	3
2	22CSPC71	Go Programming	2,3,6,12	1	3	-	-	3
3	**Professional Elective – III**				3	-	-	3
	22CSPE71	Computer Vision and Robotics	2,3,5,6,12	1				
	22CSPE72	Information Storage and Retrieval	2,3,5,6,12	1				
	22CSPE73	Human Computer Interaction	2,3,5,6,12	1				
	22CSPE74	Ad-hoc and Sensor Networks	2,3,5,8,12	1				
4	**Professional Elective – IV**				3	-	-	3
	22CSPE75	Neural Networks and Deep Learning	2,3,5,8,12	1				
	22CSPE76	Data Optimization Techniques	2,3,5,6,12	1				
	22CSPE77	Quantum Computing	2,3,5,7,12	1				
	22CSPE78	Software Process & Project Management	2,3,6,8,12	1				
5	**Open Elective – II**				3	-	-	3
	22OE71	Chatbots	2,3,5,7,8,12					
	22OE72	Multimedia and Animation	2,3,5,6,8,12					
	22OE73	Embedded Systems	2,3,5,6,7,12					
6	22CSPC72	Go Programming Lab	4,5,9	2	-	-	2	1
7	22HS71	Professional Practice, Law & Ethics Lab	6,7,8,10,12		-	-	2	1
8	22CSPR71	Project Stage - I	1 to 12	1,2	-	-	6	3
TOTAL					**15**	**-**	**10**	**20**

VIII – Semester								
S. No.	Course Code	Subject	POs	PSOs	Hours Per Week			Credits
					L	T	P	
1	**Professional Elective – V**				3	-	-	3
	22CSPE81	Augmented and Virtual Reality	2,3,5,8,12	1				
	22CSPE82	Advanced Algorithms	2,3,4,12	1				
	22CSPE83	Nature Inspired Computing	2,3,5,7,12	1				
	22CSPE84	Computer Forensics	2,3,5,7,12	1				
2	**Professional Elective – VI**				3	-	-	3
	22CSPE85	Cognitive Computing	2,3,5,7,12	1				
	22CSPE86	Distributed Systems	3,4,5,12	1				
	22CSPE87	Vehicular ad-hoc Networks	2,3,5,8,12	1				
	22CSPE88	Drones	2,3,5,8,12	1				
3	**Open Elective – III**				3	-	-	3
	22OE81	Game Development	2,4,5,8,12					
	22OE82	Precision Agriculture	2,5,7,8,12					
	22OE83	Electronics for Health Care	2,5,6,8,12					
4	22CSPR81	Project Stage – II including Seminar	1 to 12	1,2	-	-	22	11
TOTAL					**09**	**-**	**22**	**20**

I-SEM. SYLLABUS

MATRICES AND CALCULUS

Course	B.Tech.-I-Sem.	L	T	P	C
Course Code	22BS11	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	verify mean value theorems and evaluate improper integrals	3	2	1
CO4	find the extreme values of functions of several variables	3	2	1
CO5	evaluate multiple integrals and apply them to find areas and volumes	3	2	1

Syllabus

Unit	Title/Topics	Hours
I	**Matrices**	9
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.		
II	**Eigen values and Eigen vectors**	11
Linear Transformation and Orthogonal Transformation: Eigen values, Eigen vectors 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.		
III	**Calculus**	4+6=10
Part A: Mean value theorems: Rolle's theorem, Lagrange's Mean value theorem with their Geometrical Interpretation and applications, Cauchy's Mean value Theorem, Taylor's Series.		
Part B: Applications of definite integrals to evaluate surface areas and volumes of revolutions of curves (Only in Cartesian coordinates), Definition of Improper Integral, Beta and Gamma functions and their applications.		
IV	**Multivariable calculus (Partial Differentiation and applications)**	9
Definitions of Limit and continuity. Partial Differentiation: Euler's Theorem, Total derivative, Jacobian, Functional dependence & independence. Applications: Maxima and minima of functions of two variables and three variables using method of Lagrange multipliers.		
V	**Multivariable Calculus (Integration)**	9
Evaluation of Double Integrals (Cartesian and polar coordinates), change of order of integration (only Cartesian form), Evaluation of Triple Integrals, Change of variables (Cartesian to polar) for double integrals. Applications: Areas (by double integrals) and volumes (by double integrals and triple integrals).		
Textbooks		
1. Higher Engineering Mathematics by B.S. Grewal, Khanna Publishers, 36th Edition, 2010. 2. R.K. Jain and S.R.K. Iyengar, Advanced Engineering Mathematics, Narosa Publications, 2016.		
References		
1. A text book of Engineering Mathematics, N.P. Bali and M. Goyal, Laxmi Publications, 2008. 2. Advanced Engineering Mathematics by Erwin kreyszig, 9th Edition, John Wiley & Sons, 2006.		

ENGINEERING CHEMISTRY

Course	B.Tech.-I-Sem.	L	T	P	C
Course Code	22BS14	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	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	3	2	1
CO5	analyze and understand the properties, applications of engineering materials	3	2	1

Syllabus

Unit	Title/Topics	Hours
I	**Water and its treatment**	9
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-Scales and sludges, 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 - Desalination of water - Reverse osmosis.		
II	**Electrochemistry and Corrosion**	10
Electrochemistry: Introduction, conductance - specific, equivalent and molar conductance, Electrode-Types of electrodes - Construction and functioning of calomel electrode and glass electrode, Nernst equation - electrochemical series and its applications. 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. Corrosion control methods- Cathodic protection - Sacrificial anode & impressed current cathodic methods-Electroplating.		
III	**Spectroscopic techniques and applications**	5+4=9
Part A: Introduction - UV-Visible spectroscopy: Absorbance, Extinction coefficient -Principle - Beer's-Lamberts law -applications, IR spectroscopy: Principle and applications.		
Part B: Basic concepts of nuclear magnetic resonance Spectroscopy- Spin-spin coupling, chemical shift. Introduction to Magnetic resonance imaging.		
IV	**Fuels and Polymers**	11
Fuels: Calorific value- HCV, LCV-Numerical Problems, Classification- Solid fuels - Coal – analysis of coal - proximate and ultimate analysis and their significance. Liquid fuels - Petroleum and its refining, Gaseous fuels - composition and uses of natural gas, LPG and CNG. **Polymers:** Definition - Classification of polymers with examples - Types of polymerization - addition and condensation polymerization with examples. Preparation, Properties, and engineering applications of PVC, Teflon and Nylon. Biodegradable Polymers: Poly lactic acid, Poly vinyl alcohol (synthesis & applications).		
V	**Engineering Materials**	9
Cement: Portland cement and its composition - setting and hardening of Portland cement. **Lubricants:** Classification of lubricants with examples - characteristics of a good lubricant - properties of lubricants: viscosity, cloud and pour point, flash and fire point. **Smart materials:** Engineering applications - Shape memory materials – Polyurathane - Thermo response materials - Poly acryl amide, Poly vinyl amide.		
Textbooks		
1. Engineering Chemistry by P.C. Jain and M.Jain, Dhanpatrai Publishing Co, New Delhi 2010. 2. Engineering Chemistry by Rama Devi, Ch. V. Ramana Reddy and Rath, Cengage learning, New Delhi 2016.		
References		
1. Engineering Chemistry by Shashi Chawla, Dhanpatrai and Co. Pvt. Ltd., New Delhi 2011.		

BASIC ELECTRICAL & ELECTRONICS ENGINEERING

Course	B.Tech.-I-Sem.	L	T	P	C
Course Code	22ES11	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	elaborate the concepts of network theorems & single phase AC circuits	3	3	2	1
CO3	explain three phase AC circuits and P-N Junction Diode	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

Syllabus

Unit	Title/Topics	Hours
I	**Introduction to Electrical Circuits**	11
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.		
II	**DC Theorems and Single Phase AC Circuits**	8
DC Theorems: Superposition, Reciprocity, Thevenin's, Norton's and Maximum power transfer Theorems for DC excitation. Simple problems. **Single Phase AC Circuits:** Introduction, Sinusoidal alternating quantities, RMS values, Average values, form factor and peak factor, AC through Series RL, RC & RLC circuits.		
III	**Three Phase AC circuits & P-N Junction Diode**	5+5=10
Part-A: Three Phase AC circuits: Introduction, relation between line and phase voltages & currents, power equation in three phase balanced star and delta connections, Advantages of Three phase systems.		
Part-B: P-N Junction Diode: PN Junction diode- V-I Characteristics, Ideal versus Practical, Temperature dependence.		
IV	**Rectifiers and Special Purpose Devices**	9
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 voltage regulator, principle of operation – SCR, solar cell, LED, schottky diode.		
V	**Bipolar Junction Transistor (BJT)**	10
Construction, Principle of Operation, Symbol, CE, CB, CC configurations. DC & AC load line, stability factor, Need for biasing & biasing techniques.		
Textbooks		
1. Circuit Theory (Analysis & synthesis) - A. Chakrabarti, Dhanpat Rai & Co, 7th Edn, 2015. 2. Electronic Devices and Circuits - R.L. Boylestad & Louis Nashelsky, PEI/PHI, 9th Edn, 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.		

PROGRAMMING FOR PROBLEM SOLVING

Course	B.Tech.-I-Sem.	L	T	P	C
Course Code	22ES12	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 and file handling	3	3	2	2
CO5	implement various searching and sorting techniques in C programming	3	3	2	2

Syllabus

Unit	Title/Topics	Hours
I	**Introduction to Programming**	11
Program Development steps, algorithm, flow chart, creating, compiling and executing a program. **Introduction to C Programming**: - Structure of C Program, C Tokens- Identifiers, Keywords, Variables, Constants, Strings, Operators, Input / Output, Data Types, Expressions, Precedence and Associativity, Expression Evaluation, Type conversions, Statements - Selection Statements(making decisions) –if and switch statements, Repetition statements (loops)-while, for, do-while statements, Loop examples, other statements related to looping-break, continue, goto, Simple C Programs.		
II	**Arrays and Functions**	8
Arrays: Concepts, using arrays in C, Types of arrays, accessing and manipulating elements of arrays. Program examples. **Functions:** Designing structured programs, declaring a function, signature of a function, parameters and return type of a function, user defined functions, standard functions, four categories of functions, inter function communication-call by value, scope, storage classes-auto, register, static, extern, recursion-recursive functions, differences between recursion and iteration, limitations of recursion, example c programs, preprocessor commands.		
III	**Pointers and Strings**	5+5=10
Part A: Pointers: Idea of pointers, defining pointers, pointers for inter function communication-call by reference, pointers to pointers, compatibility, void pointer, NULL pointer, pointer applications- accessing arrays using pointers, pointer arithmetic, dynamic memory allocation.		
Part B: Strings: Concepts, string input / output, basic string functions available in C (strlen, strcat, strcpy, strcmp, strstr, etc.), arrays of strings, C program examples.		
IV	**Structures, Unions and Files**	11
Structures: Defining and initializing structures, accessing structures, operations on structures, Nested structures, structures containing arrays, arrays of structures, self-referential structures, enum, typedef, bit fields. **Unions**: Defining, initializing and accessing unions, differences between Structures and unions. **Files**: Concept of a file, Types of Files, Differences between text and binary files, Opening and closing files, File input / output functions (standard library input / output functions for files), file status functions, Random access using fseek, ftell and rewind functions, C program examples.		
V	**Searching and Sorting**	8
Basic searching in an array of elements (linear and binary search techniques), Basic algorithms to sort array of elements (Bubble, Selection, Insertion, Quick and Merge sort algorithms), comparison of sorting algorithms.		
Textbooks		
1. Jeri R. Hanly and B.Koffman, Problem solving and Program Design in C 7th Edn, Pearson. 2. B.A. Forouzan and Gilberg C Programming and Data Structures, Cengage Learning, 3rd Edn.		
References		
1. C: The Complete Reference, Herbert Schildt, TMH, 4th Edition. 2. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, PHI.		

ELEMENTS OF COMPUTER SCIENCE & ENGINEERING

Course	B.Tech.-I-Sem.	L	T	P	C
Course Code	22ES13	-	-	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	PO1	PO2	PO3	PO4	PO5	PO9	PO12
CO1	explain the functions of a basic computer and PL	3	3	3	3	3	3	3
CO2	describe the need of OS, database systems and SE	3	3	3	3	3	3	3
CO3	illustrate networks, internet, WWW and security	3	3	3	3	3	3	3
CO4	outline the concepts of AI & ML	3	3	3	3	3	3	3
CO5	demonstrate concepts of DS and autonomous systems	3	3	3	3	3	3	3

Syllabus

Unit	Title/Topics	Hours
I	**Basics of a Computer and Programming Languages**	8
Basics of a Computer - hardware, software, generations of computers. Hardware - functional units, components of CPU, memory - hierarchy, types of memory, input and output devices. Software - systems & application software, packages, frameworks, IDEs. Types of computer languages - programming, markup, scripting. Program development - steps in program development, flowcharts, algorithms. Data structures - definition, types of data structures.		
II	**Operating Systems, DBMS and Software Engineering**	6
Operating systems - functions of operating systems, types of operating systems, device and resource management. Database Management Systems - Data models, RDBMS, SQL, database transactions, data centers, cloud services. Software development - waterfall model, agile.		
III	**Computer Networks and Web Technologies**	2+4=6
Part A: Computer Networks - Advantages of computer networks, LAN, WAN, MAN, internet, Wi-Fi, sensornetworks, vehicular networks, 5G Communication.		
Part B: World Wide Web - Basics, role of HTML, CSS, XML, Tools for web designing, social media, onlinesocial networks. Security - Information security, cyber security, cyber laws.		
IV	**Artificial Intelligence and Machine Learning**	6
Artificial Intelligence - Introduction to AI, history of AI, current status, Applications of AI, Intelligent Agents, Categories of AI, Agents Environment. Machine Learning - Introduction, well-posed learning problem, designing a learning system, perspectives and issues in machine learning, applications.		
V	**Data Science and Autonomous Systems**	6
Data Science - Introduction, types of data need for data science, data science components, tools for data science, data science life cycle, current status, data science process, a data scientist role in this process, applications. Autonomous Systems - IoT, Robotics, Drones, Cloud - Introduction and its applications.		
Textbooks		
1. Invitation to Computer Science, G. Michael Schneider, Macalester College, Judith L. GerstingUniversity of Hawaii, Hilo, Keith Miller University of Illinois, Springfield.		
References		
1. Fundamentals of Computers, Reema Thareja, Oxford University Press. 2. Introduction to computers, Peter Norton, 8th Edition, TMH. 3. Elements of computer science, Cengage. 4. Doing Data Science, Straight Talk from the Frontline, Cathy O'Neil and Rachel Schutt, O'Reilly, 2014.		

ENGINEERING CHEMISTRY LAB

Course	B.Tech.-I-Sem.	L	T	P	C
Course Code	22BS15	-	-	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	PO9
CO1	determine the hardness in water samples to solve societal problems	3	3
CO2	estimate the strength of the given solutions	3	3
CO3	determine surface tension, Acid value and viscosity of various fluids	3	3
CO4	analyze the rate of corrosion of mild steel in various conditions	3	3
CO5	verify and understand the distribution coefficient	3	3

List of Experiments

(Perform any 10 Experiments)

Week	Title/Experiment
	Volumetric Analysis
1	Determination of total hardness of water by complexometric method using EDTA.
2	Estimation of ferrous ion by dichrometry.
	Instrumentation
3	Estimation of HCl by Conductometric titrations.
4	Estimation of Fe^{2+} by Potentiometer using $KMnO_4$.
5	Estimation of copper by colorimetric method.
6	Determination of an acid concentration using P^H meter.
	Corrosion
7	Determination of rate of corrosion of mild steel in the presence and absence of inhibitor.
	Physical properties
8	Determination of viscosity of a liquid by using Ostwald's viscometer.
9	Estimation of acid value of given lubricant oil.
10	Determination of partition coefficient of acetic acid between n-butanol and water.
11	Determination of surface tension of a given liquid.

References

1. Engineering Chemistry Lab Manual, FED, CMRIT, Hyd.

Micro-Projects: Student should submit a report on one of the following/any other micro-project(s) approved by the lab faculty before commencement of lab 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. Preparation of hand sanitizer.
9. Determination of P^H values of various soft drinks.
10. Studies on the effect of metal coupling on corrosion.

BASIC ELECTRICAL & ELECTRONICS ENGINEERING LAB

Course	B.Tech.-I-Sem.	L	T	P	C
Course Code	22ES15	-	-	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	PO9
CO1	design electrical circuits to verify circuit laws	3	3
CO2	evaluate network theorems	3	3
CO3	verify the V-I characteristics of various electronic devices	3	3
CO4	determine the efficiency of various rectifiers	3	3
CO5	illustrate the configurations of Bi-polar junction transistor	3	3

List of Experiments

Week	Title/Experiment
	Part-A: Electrical lab
1	Verification of KVL & KCL.
2	Verification of Superposition theorem.
3	Verification of reciprocity theorem.
4	Verification of maximum power transfer theorem.
5	Experimental determination of Thevenin's equivalent circuits.
6	Experimental determination of Norton's equivalent circuits.
	Part-B: Electronics Lab
1	Forward and reverse bias characteristics of PN-Junction Diode.
2	Zener diode V-I characteristics and Zener diode as voltage regulator.
3	Efficiency of Half wave rectifier.
4	Efficiency of Full wave rectifier.
5	Input & output characteristics of Transistor in CB configuration.
6	Input & output characteristics of Transistor in CE configuration.

References

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

Micro-Projects: Student should submit a report on one of the following/any other micro-project(s) approved by the lab faculty before commencement of lab 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.

PROGRAMMING FOR PROBLEM SOLVING LAB

Course	B.Tech.-I-Sem.	L	T	P	C
Course Code	22ES16	-	-	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	PO9
CO1	execute simple programs using C compiler	3	3	3
CO2	apply control statements in designing programs	3	3	3
CO3	design programs using functions, arrays, strings and pointers	3	3	3
CO4	construct programs for heterogeneous data and file operations	3	3	3
CO5	implement various searching and sorting techniques in C programming	3	3	3

List of Experiments

Week	Title/Experiment
I	**Simple C programs**
a) Write a C program to Calculate Simple Interest b) Write a C program to Calculate the area of Circle c) The total distance travelled by vehicle in‘t’ seconds is given by distance = $ut+1/2at^2$ where ‘u’ and ‘a’ are the initial velocity (m/sec.) and acceleration (m/sec^2). Write C program to find the distance travelled at regular intervals of time given the values of ‘u’ and ‘a’. The program should provide the flexibility to the user to select his own time intervals and repeat the calculations for different values of ‘u’ and ‘a’	
II	**Decision Statements**
a) Write a C program that declares class awarded for a given percentage of marks, where marks <40%=Failed,40% to <60%=Second class,60%<70%=First Class,>=70%=Distinction. Read percentage from standard input b) Write a C program to find the roots of a quadratic equation c) Write a C program, which takes two integer operands and one operator from the user, performs the operation and then prints the result. (Consider the operators +,-,*, /, % and use Switch Statement)	
III	**Loops**
a) Write a C program to find the sum of individual digits of a positive integer. b) A Fibonacci sequence is defined as follows: the first and second terms in the sequence are 0 and 1. Subsequent terms are found by adding the preceding two terms in the sequence. Write a C program to generate the first n terms of the sequence. c) Write a C program to check whether the given number is prime or not d) Write a C program to read 2 numbers x and n then compute the sum of the Geometric Progression: $1+x+x^2+x^3+\ldots\ldots+x^n$	
IV	**Arrays**
a) Write a C program to find the largest integer in a list of integers b) Write a C program to perform the following: i) Addition of Two Matrices ii) Multiplication of Two Matrices	
V	**Functions**
Write a C program to find a) product of two numbers using functions without arguments, without return value b) difference of two numbers using functions without arguments, with return value c) sum of two numbers using functions with arguments, without return value d) product of two numbers using functions with arguments, with return value	
VI	**Recursion**
Write C program that use both recursive and non-recursive function to find a) factorial of a given integer b) GCD (greatest common divisor) of two given integers	
VII	**Pointers**
a) Write a C program to swap two numbers using Call by Value b) Write a C program to swap two numbers using Call by Reference (Using pointers)	

VIII	Strings and Structures
a) Write a C Program to demonstrate various string manipulations using built in functions b) Write a C program to determine whether the given string is a palindrome or not c) Write a C program that perform the following operations: i) Addition of two complex numbers ii) Multiplication of two complex numbers (Note: represent complex number using a Structure)	
IX	**File operations**
a) Write a C program which copies one file to another b) Write a C program to display the contents of a file c) 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)	
X	**Searching**
Write a C program to implement: a) Linear Search b) Binary Search	
XI	**Sorting**
Write a C program to implement: a) Bubble Sort b) Selection Sort c) Insertion Sort	
XII	**Sorting**
Write a C program to implement: a) Quick Sort b) Merge Sort	
References	
1. Programming for Problem Solving Lab Manual, FED, CMRIT, Hyd.	
Micro-Projects: Student should submit a report on one of the following/any other micro-project(s) approved by the lab faculty before commencement of lab 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.	

COMPUTER AIDED ENGINEERING GRAPHICS LAB

Course	B.Tech.-I-Sem.	L	T	P	C
Course Code	22ES17	-	-	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	apply engineering drawing concepts in technical graphic communication	3	3	3	3
CO2	construct conic sections using various methods	3	3	3	3
CO3	draw orthographic projections of points, lines, planes and solids	3	3	3	3
CO4	draw development of solid surfaces	3	3	3	3
CO5	draw the conversions of orthographic to isometric projections & vice versa	3	3	3	3

List of Experiments

Week	Title/Experiment
1	Introduction to engineering drawing and AutoCAD software, Lettering, dimensioning practice and Geometrical Constructions.
2	Conic sections: General method, Construction of Ellipse, Parabola and Hyperbola.
3	Construction of Cycloid, Epicycloid and Hypocycloid.
4	Construction of involutes.
5	Orthographic Projections: Principles of Orthographic projections, Projections of Points.
6	Projections of lines simple position and inclined to one plane.
7	Projections of Lines inclined to both the planes.
8	Projections of planes simple position and inclined to one plane.
9	Projections of planes inclined to both the planes.
10	Projections of Solids simple position.
11	Projections of Solids inclined to one plane and both the planes.
12	Development of surfaces: Development of Prisms and Cylinders, Pyramids and Cones.
13	Isometric projections: isometric views of lines, planes and solid figures; Conversion of Isometric to Orthographic views (3D to 2D).
14	Conversion of Orthographic to Isometric views (2D to 3D).

References

1. Computer Aided Engineering Graphics Lab Manual, FED, CMRIT, Hyd.

Micro-Projects: Student should submit a report on one of the following/any other Micro–Projects using AutoCAD approved by the lab faculty before commencement of lab internal examination.

1. Draw the orthographic projections of knuckle joint.
2. Draw the orthographic projections of Socket and spigot cotter joint.
3. Draw the orthographic projections of glass bottle.
4. Draw the orthographic Projections of Connecting rod of IC Engine.
5. Draw the isometric projections of Horse chess coin.
6. Draw the Pipe truss design.
7. Draw a 3-D bolt and nut with Threads.
8. Draw a 3-D Cross head pattern.
9. Draw the pipe vice.
10. Draw the satellite dish and Antenna.

II-SEM. SYLLABUS

ORDINARY DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS

Course	B.Tech.-II-Sem.	L	T	P	C
Course Code	22BS21	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	identify whether the given differential equation of first order is exact or not	3	2	1
CO2	solve ordinary differential equations of higher order	3	2	1
CO3	use the Laplace transforms techniques for solving ODE's	3	2	1
CO4	find vector differentiation of vector & scalar field/gradient/divergence/curl	3	2	1
CO5	solve the line, surface and volume integrals by using vector integration	3	2	1

Syllabus

Unit	Title/Topics	Hours
I	**First Order ODE**	11
Exact differential equations, Equations reducible to exact differential equations, linear and Bernoulli's equations, Orthogonal Trajectories (only in Cartesian Coordinates). Applications: Newton's law of cooling, Law of natural growth and decay.		
II	**Ordinary Differential Equations of Higher Order**	8
Second order linear differential equations with constant coefficients: Non-Homogeneous terms of the type e^{ax}, sinax , cosax ,polynomials in x , e^{ax} V(x) and xV(x) ,method of variation of parameters, Equations reducible to linear ODE with constant coefficients: Legendre's equation, Cauchy-Euler equation. Applications: Electric Circuits.		
III	**Laplace transforms**	5+5=10
Part A: Laplace Transforms: Laplace Transform of standard functions, First shifting theorem, Second shifting theorem, Unit step function, Dirac delta function, Laplace transforms of functions when they are multiplied and divided by't', Laplace transforms of derivatives and integrals of function, Evaluation of integrals by Laplace transforms, Laplace transform of periodic functions.		
Part B: Inverse Laplace transform: by different methods, convolution theorem (without proof). Applications: solving Initial value problems by Laplace Transform method.		
IV	**Vector Differentiation**	9
Vector Differentiation: Vector point functions and scalar point functions. Gradient, Divergence and Curl, Directional derivatives, Tangent plane and normal line, Vector Identities, Scalar potential functions. Solenoidal and Irratational vectors.		
V	**Vector Integration**	10
Vector Integration: Line, Surface and Volume Integrals. Theorems of Green, Gauss and Stokes (without proofs) and their applications.		
Textbooks		
1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010 2. R.K. Jain and S.R.K. Iyengar, Advanced Engineering Mathematics, Narosa Publications, 5th Edition, 2016.		
References		
1. A text book of Engineering Mathematics, N.P. Bali and Manish Goyal, Laxmi Publications, Reprint, 2008. 2. Advanced Engineering Mathematics by Erwin kreyszig, 9th Edition, John Wiley & Sons, 2006.		

APPLIED PHYSICS

Course	B.Tech.-II-Sem.	L	T	P	C
Course Code	22BS22	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	explain the principles of Quantum Physics and band theory of solids	3	2	1
CO2	classify semiconductors and relate functioning of semiconductor devices	3	2	1
CO3	outline the concepts of dielectric, magnetic and energy materials	3	2	1
CO4	use fabrication and characterization techniques of nano-materials	3	2	1
CO5	illustrate principles and applications of lasers and optical fibers	3	2	1

Syllabus

Unit	Title/Topics	Hours
I	**Quantum Physics and Solids**	10
Quantum Mechanics: Introduction to quantum physics, blackbody radiation - Planck's radiation law - photoelectric effect, de-Broglie's hypothesis, Davisson and Germer's experiment - Heisenberg's uncertainty principle - Born interpretation of the wave function - time independent Schrodinger wave equation - particle in one dimensional potential box. **Solids:** Free electron theory (Drude & Lorentz, Sommerfeld) - Bloch's theorem, Kronig-Penney model - origin of energy bands- classification of solids.		
II	**Semiconductors and Devices**	10
Intrinsic and extrinsic semiconductors - Hall effect - direct and indirect band gap semiconductors - construction, principle of operation and characteristics of P-N Junction diode, Zener diode and bipolar junction transistor (BJT) – LED and solar cells, their structure, materials, working principle and characteristics.		
III	**Dielectric, Magnetic and Energy Materials**	4+6=10
Part-A: Dielectric Materials: Basic definitions- types of polarizations (qualitative) - ferroelectric, piezoelectric and pyroelectric materials - applications.		
Part-B: Magnetic Materials: Hysteresis - soft and hard magnetic materials – magnetostriction, magnetoresistance - applications - bubble memory devices, magnetic field sensors and multiferroics. **Energy Materials:** Conductivity of liquid and solid electrolytes- superionic conductors - materials and electrolytes for super capacitors - rechargeable ion batteries.		
IV	**Nanotechnology**	9
Nanoscale, quantum confinement, surface to volume ratio, bottom-up fabrication: Sol-gel, Precipitation methods – top-down fabrication: Ball milling, Chemical Vapor Deposition (CVD) - characterization techniques - XRD, SEM &TEM - applications of nanomaterials.		
V	**Laser and Fiber Optics**	9
Laser beam characteristics-three quantum processes-Einstein coefficients and their relations, lasing action - pumping methods- Nd:YAG laser, CO_2 laser, semiconductor laser-applications of laser. Introduction to optical fiber- advantages of optical Fibers - total internal reflection - construction of optical fiber - acceptance angle - numerical aperture- classification of optical fibers - optical fiber for communication system - applications.		
Textbooks		
1. A Text book of Engineering Physics by M.N.Avadhanulu, P.G.Kshirsagar - S. Chand Publications, 2017. 2. Essentials of Nanoscience & Nanotechnology by Narasimha Reddy Katta, Typical Creatives Nano Digest, 1st Edition, 2021.		
References		
1. Applied Physics – P.K. Palanisamy, Scitech Publications, 11th Edition, 2018. 2. Fundamentals of Physics – Halliday, Resnick and Walker, John Wiley &Sons, 11th Edn, 2018. 3. Energy Materials, Taylor and Francis Group, 1st Edition, 2022.		

ENGLISH FOR SKILL ENHANCEMENT

Course	B.Tech.-II-Sem.	L	T	P	C
Course Code	22HS21	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 LSRW skills	3	2
CO2	demonstrate the acquired language in written and spoken contexts	3	2
CO3	express, restate and respond appropriately by comprehending the given data	3	2
CO4	develop proficiency to succeed in academic activities, research and career	3	2
CO5	excel in professional and social etiquette	3	2

Syllabus

Unit	Title/Topics	Hours
I	**Toasted English by R.K. Narayan**	7
Vocabulary Building: The Concept of Word Formation -The Use of Prefixes and Suffixes - Acquaintance withPrefixes and Suffixes from Foreign Languages to form Derivatives - Synonyms and Antonyms. **Grammar:** Identifying Common Errors in Writing with Reference to Articles and Prepositions. **Reading:** Reading and Its Importance- Techniques for Effective Reading. **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.		
II	**Appro JRD by Sudha Murthy**	11
Vocabulary: Words Often Misspelt - Homophones, Homonyms and Homographs. **Grammar:** Identifying Common Errors in Writing with Reference to Noun-pronoun Agreement and Subject-verb Agreement. **Reading:** Sub-Skills of Reading - Skimming and Scanning - Exercises for Practice. **Writing:** Nature and Style of Writing- Defining/Describing People, Objects, Places and Events - Classifying- Providing Examples or Evidence-Blog Writing.		
III	**Lessons from Online Learning by F. Haider Alvi, Deborah Hurst et al**	4+6=10
Part A: Vocabulary: Words often confused - 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 - Intensive and Extensive Reading - Exercises for Practice. **Writing**: Format of a Formal Letter-Writing Formal Letters E.g., Letter of Complaint, Letter of Requisition, Email Etiquette, Job Application with CV/Resume.		
IV	**Art and Literature by Abdul Kalam**	9
Vocabulary: Standard Abbreviations in English. **Grammar:** Redundancies and Clichés in Oral and Written Communication. **Reading**: Survey, Question, Read, Recite and Review (SQ3R Method) - Exercises for Practice. **Writing:** Writing Practices- Essay Writing-Writing Introduction and Conclusion -Précis Writing.		
V	**Go, Kiss the World by Subroto Bagchi**	9
Vocabulary: Technical Vocabulary and their Usage. **Grammar:** Common Errors in Active & Passive Voice, Degrees of Comparison. **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.		
Textbooks		
1. English: Language, Context and Culture by Orient Black Swan Pvt. Ltd, Hyderabad. 2022.		
References		
1. Swan, M. Practical English Usage. Oxford University Press, 2016. 2. Richards, Jack C. Interchange Series. Introduction, 1,2,3. Cambridge University Press, 2022. 3. Wood, F.T. Remedial English Grammar. Macmillan, 2007.		

DATA STRUCTURES THROUGH PYTHON

Course	B.Tech.-II-Sem.	L	T	P	C
Course Code	22ES22	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 fundamentals of python programming	3	3	2	2
CO2	develop programs using collections, classes and build error-free codes	3	3	2	2
CO3	illustrate operations and applications of linear data structures	3	3	2	2
CO4	make use of various concepts of non-linear data structures	3	3	3	2
CO5	design data structures using graphs	3	3	3	3

Syllabus

Unit	Title/Topics	Hours
I	**Introduction**	10
Introduction to Python, Installing Python. Using Python, Comments, Variables, Data types, Input and Output, Operators, Type conversions, Expressions, Stings. Control Flow Statements - Decision Structures: if, if-else, if-elif-else. Repetition Structures: Introduction, while loop, for loop. Control statements-break, continue and pass. **Functions:** Defining and using functions, passing arguments to functions, value-returning functions.		
II	**Collections, Classes, Files and Exceptions**	10
Collections: Lists, introduction to lists, list slicing, list methods and useful built-in functions, two-dimensional lists, tuples, tuple methods, sets, operations on sets, dictionaries and its methods. **Design with Classes**: Classes and objects, constructors and methods, working with instances, inheritance and its types, polymorphism. **Files:** Access modes, writing data to a file, reading data from a file, additional file methods. **Exceptions:** Error versus exception, handling exception, try-except block, raising exception, user-defined exception.		
III	**Linear Data Structures**	4+5=9
Part-A: Data Structures: Definition, Linear versus Non-linear. Linear - Stack and its operations, Applications of Stack, Queue and its operations, Applications of Queue.		
Part-B: Linked Lists: Implementation of Singly Linked Lists, Doubly Linked Lists and Circular Linked Lists.		
IV	**Non-Linear Data Structures**	10
Trees: Definition, terminology, binary trees-definition, properties, ADT, implementation, traversals. **Types of Trees:** Binary Search Tree: properties and operations, implementation. Balanced search trees: AVL tree, M-Way search trees: B tree.		
V	**Graphs and Hashing**	9
Graphs: Definition, terminology, applications, properties, graph ADT, graph representations-adjacency matrix, adjacency lists, graph search methods - DFS and BFS. **Hashing and Collision:** Introduction, hash tables, hash functions, collisions, applications of hashing.		
Textbooks		
1. Kenneth A. Lambert, The Fundamentals of Python: First Programs, 2011, Cengage Learning. 2. Data structures and algorithms in python by Michael T. Goodrich, Wiley, 2013. 3. Data Structures and Algorithmic Thinking with Python by Narasimha Karumanchi, Careermonk Publications.		
References		
1. Introduction to Computation and Programming Using Python. John V. Guttag, The MIT Press. 2. D. Samanta, "Classic Data Structures", PHI Learning, 2nd Edition, 2004.		

APPLIED PHYSICS LAB

Course	B.Tech.-II-Sem.	L	T	P	C
Course Code	22BS23	-	-	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	PO9
CO1	calculate the Planck's constant, Hall co-efficient and Energy gap of semiconductors	3	3
CO2	examine the working of semiconductor and optoelectronic devices	3	3
CO3	demonstrate the behavior of magnetic and dielectric materials	3	3
CO4	demonstrate the properties of laser and optical fiber	3	3
CO5	compare practical results with theoretical calculations in electrical circuits	3	3

List of Experiments

(Minimum 10 experiments to be conducted)

Week	Title/Experiment
1	Determination of work function and Planck's constant using photoelectric effect.
2	Determination of Hall co-efficient and carrier concentration of a given semiconductor.
3	Determination of Energy gap of a semiconductor.
4	V-I characteristics of a p-n junction diode and Zener diode.
5	a) V-I and L-I characteristics of light emitting diode (LED). b) V-I Characteristics of solar cell.
6	Input and output characteristics of BJT (CE, CB & CC configurations).
7	Determination of the resistivity of semiconductor by two probe method.
8	Study B-H curve of a magnetic material.
9	Determination of dielectric constant of a given material.
10	a) Determination of the beam divergence of the given LASER beam. b) Determination of Acceptance Angle and Numerical Aperture of an optical fiber.
11	Characteristics of series and parallel LCR circuits.
12	Stewart and Gee's method - Magnetic field along the axis of current carrying coil.

Reference

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

Micro-Projects: Student should submit a report on one of the following/any other micro-project(s) approved by the lab faculty before commencement of lab internal examination.

1. Design rechargeable torch.
2. Design temperature sensor.
3. Design a solar cooker.
4. Design a counter using photo cell.
5. Design smoke detector.
6. Design mechanical energy to light energy converter.
7. Design a mobile phone detector.
8. Design IR based obstacle detector.
9. Design security alarm.
10. Design a circuit to detect breakage in a conducting wire.

ENGLISH LANGUAGE LABORATORY FOR EFFECTIVE COMMUNICATION

Course	B.Tech.-II-Sem.	L	T	P	C
Course Code	22HS22	-	-	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	PO5	PO9	PO10
CO1	identify the nuances of the language through multimedia experience	3	3	3
CO2	express clearly with right accent, intonation to overcome MTI	3	3	3
CO3	demonstrate formal and informal English in real life scenarios	3	3	3
CO4	develop speaking and listening skills	3	3	3
CO5	appraise communication and correspond effectively	3	3	3

List of Experiments

Week	Title/Experiment
PART – A: COMPUTER ASSISTED LANGUAGE LEARNING (CALL) LAB	
1 2	Introduction to Phonetics - Speech Sounds - Vowels and Consonants - Minimal Pairs - Consonant Clusters - Past Tense Marker and Plural Marker.
4	Syllable Division, Accent & Stress, Stress Shift, Weak Forms and Strong Forms.
6	Intonation and Rhythm - Situational Dialogue.
9	Errors in Pronunciation - the Interference of Mother Tongue (MTI), Common Indian Variants in Pronunciation - Differences between British and American Pronunciation.
12	Listening Comprehension (Specific & General).
PART – B: INTERACTIVE COMMUNICATION SKILLS (ICS) LAB	
3	Spoken vs. Written Language - Formal and Informal English - Ice-Breaking Activity and JAM Session.
5	Role Play - Situational Dialogues - Greetings - Taking Leave - Introducing Oneself.
7	Expressions in Various Situations - Making Requests and Seeking Permissions - Telephone Etiquette.
8	Descriptions - Narrations - Giving Directions, Guidelines & Instructions - Seeking Clarifications - Thanking and Responding - Agreeing and Disagreeing - Seeking and Giving Advice - Making Suggestions.
10	Public Speaking - Exposure to Structured Talks - Non-Verbal Communication Presentation Skills - Making a Short Speech - Extempore - Making a Presentation.
11	Group Discussion.

References

1. English Language Laboratory for Effective Communication Manual, FED, CMRIT, Hyd.

Micro-Projects: Student should submit a report on one of the following/any other micro-project(s) approved by the lab faculty before commencement of lab 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

DATA STRUCTURES THROUGH PYTHON LAB

Course	B.Tech.-II-Sem.	L	T	P	C
Course Code	22ES24	-	-	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	PO9
CO1	write simple programs using python	3	3	3
CO2	develop programs using collections and classes	3	3	3
CO3	construct different linear data structures along with their operations	3	3	3
CO4	implement various search trees	3	3	3
CO5	design programs for traversing graphs	3	3	3

List of Experiments

Week	Title/Experiment
1	Write a Python program to a) compute the GCD of two numbers b) display first "N" prime numbers c) display first "N" Fibonacci sequence d) find the factorial value of a given number
2	Write a Python program to a) check whether the given string is palindrome or not b) simulate simple calculator c) count the characters in the string and store them in a dictionary data structure d) find the most frequent words in a text
3	Write a Python program to perform a) Linear Search. b) Binary Search.
4	Write a Python program to a) compute the matrix multiplication b) find mean, median, mode for the given set of numbers in a list c) create 2 functions dups and unique to find all duplicate and unique elements of a list
5	Write a Python function to a) compute "N"/0 and use try/except to catch the exceptions b) define a custom exception class which takes a string message as attribute
6	Write a Python program to implement the following sorting techniques: a) insertion sort b) merge sort
7	Write a Python program to implement a) stack ADT b) queue ADT.
8	Write a Python program to implement the following stack applications: a) infix to postfix b) postfix expression evaluation
9	Write a Python program that uses functions to perform the following operations on single linked list: a) creation b) insertion c) deletion d) traversal
10	Write a Python program that uses functions to perform the following operations on doubly linked list: a) creation b) insertion c) deletion d) traversal
11	Write a Python program to traverse the given binary search tree in a) pre-order b) in-order c) post-order
12	Write a Python Program to implement the following Graph Traversals: a) BFS b) DFS

References

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

Micro-Projects: Student should submit a report on one of the following/any other micro-project(s) approved by the lab faculty before commencement of lab internal examination.

1. Create a Student Record Management System.
2. Create a Digital Calculator.
3. Create an Employee Payroll Management System.
4. Create a class for ATM and implement its functions.
5. Create a Sales Management System.
6. Create a class for Library and Implement its Functions.
7. Create a Contact Management System.
8. Create a Hotel Booking System.
9. Create a Car Rental System.
10. Create any Game (tic-tac-toe, snake, etc.).

IT WORKSHOP PRACTICE

Course	B.Tech.-II-Sem.	L	T	P	C
Course Code	22ES26	-	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	PO5	PO9	PO10
CO1	classify hardware components and inter dependencies	3	3	2	2
CO2	install operating systems and MS office	3	3	2	2
CO3	configure IP and trouble shoot network connections	3	3	3	2
CO4	use internet and safeguard computer systems from viruses/worms	3	3	3	2
CO5	prepare documentation/presentation by using office tools	3	3	3	2

List of Experiments

Week	Title/Experiment
1	Block diagram of CPU, troubleshooting different parts of the computer peripherals, monitor, keyboard & CPU.
2	Disassemble & assemble the PC back to working condition.
3	Installation of various operating systems - Windows, Linux. Installation of MS office.
4	**Network Connections, Troubleshooting:** IP configurations and connecting to various network devices and troubleshooting.
5	**Internet &WWW:** Web browsers, surfing the web, search engines & netiquette. **Cyber Hygiene**: Introduction to virus, worms, threats. Install antivirus, personal firewall.
6	**Latex:** Handle different types of documents. Organize documents, formatting text and pages, mathematical formulae, tables and images, create presentations using Beamer.
7	**MS Word:** Accessing, overview of toolbars, saving files, using help and resources, rulers, format painter in word.
8	**MS Word:** Prepare the project document and resume. Creating a news letter.
9	**MS Excel:** Accessing, overview of toolbars, saving excel files, using help and resources. Spreadsheets, formatting, formulas.
10	**MS Excel:** Functions, sorting, filtering and charts.
11	**MS Power Point:** Basic power point utilities and tools which help to create basic power point presentations. Working with slides, add content, work with text, working with tables, graphics.
12	**MS Power Point:** Slide animation, reordering slides, adding sound to a presentation.

References

1. IT Workshop Practice Manual, FED, CMRIT, Hyd.

Micro-Projects: Student should submit a report on one of the following/any other micro-project(s) approved by the lab faculty before commencement of lab internal examination.

1. Develop a user manual for Disassemble & assemble the PC.
2. Develop a user manual for Installation of operating systems.
3. Develop a user manual for Installation of MS office and open office.
4. Develop an own dictionary for Network Connections, Troubleshooting.
5. Prepare a survey report/presentation on Virus, worms, threats and attacks.
6. Design monthly budget planner using Ms Excel.
7. Design a Photo album using Ms Power Point.
8. Design of various certificates/brochure using Ms Word.
9. Design a video presentation using open source tools.
10. Prepare a survey report/presentation on latest cyber-attacks.

DESIGN THINKING FOR INNOVATION AND STARTUPS

Course	B.Tech.-II-Sem.	L	T	P	C
Course Code	22ES27	-	-	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	PO1 to PO12	PSO1	PSO2
CO1	illustrate the design thinking practices for value based innovation	3	3	3
CO2	analyze stakeholder behaviour and empathy in ideation	3	3	3
CO3	develop and test prototype for its scalability	3	3	3
CO4	identify and standardize business process	3	3	3
CO5	prepare a startup pitch	3	3	3

List of Experiments

Week	Title/Experiment
1	**Introduction to Design Thinking** - Understanding the mindsets-empathy, optimism, learn from failure, iterate, create confidence, creativity convergent & divergent thinking. **Activity**: Take LRI: Launch Readiness Index assessment.
2	**Design Thinking Methodology** - The Five stages of the Design Thinking Process: Empathize, Define, Ideate, Prototype, and Test. **Activity:** Debate on innovation and creativity, Debate on value-based innovation.
3	**Empathize** - Understand customer needs, Empathy maps, customer Journey Maps **Activity**: Reframe problems from various perspectives, Personas.
4	**Define** - Analysis & drawing inferences from Empathy. **Activity:** Create a brief design for all stakeholders (use chart and sticky notes).
5	**Ideation** - Ideation tools & exercises. Sample design challenge, Introduction to the design challenge themes, storytelling and tools for innovation. **Activity:** Filed Visit to explore customer needs.
6	**Prototype** - Experimentation, Rapid Iteration: Choosing a wire-framing/UX prototyping tool. **Activity**: Hold Inspirational Rapid-Sketch Sessions or Design Sprints.
7	**Test** - Finding ways to test fast and collaboratively with consumers, preparing questions. **Activity**: Get fast, productive feedback from human beings.
8	**Design Thinking in Business Processes** - Design thinking applied in business and strategic innovation, design thinking principles that redefine business. **Activity**: Business Canvas Model
9	**Extreme competition** - Standardization, Design Thinking to meet corporate needs. **Activity:** External presentation of innovation on National or International terms.
10	**Design thinking for Startups** - Defining and testing business models and business cases. **Activity:** How to market own product, maintenance, reliability and plan for startup.
11	**Startup Capital Requirements and Legal Environment** - Identifying startup capital resource, develop financial assertions, approval for new ventures and taxes. **Activity:** Identifying your Startup capital Resources.
12	**Startup up Financial Issues, Survival and Growth** - Feasibility analysis: the cost and process of raising capital, stages of growth in a new venture: growing with the market, growing within the industry, venture life patterns. **Activity:** Feasibility analysis chart.
Reference	
1. Design Thinking for Innovation and Startups Manual, FED, CMRIT, Hyd.	

ENVIRONMENTAL SCIENCE & DISASTER MANAGEMENT
MANDATORY COURSE (NON-CREDIT)

Course	B.Tech.-II-Sem.	L	T	P	C
Course Code	22MC21	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	explain the role of ecosystem for livelihood	3	3	3	2
CO2	interpret methods to sustain environmental resources	3	3	3	2
CO3	identify solutions for sustainable development and pollution control	3	3	3	2
CO4	analyze various types of disasters	3	3	3	3
CO5	develop strategies for preparedness measures against disasters	3	3	3	2

Syllabus

Unit	Title/Topics	Hours
I	**Ecosystem**	6
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. ***Task:*** *Perform a case study on Biogeochemical cycles (Carbon/Nitrogen Cycles).*		
II	**Natural Resources**	6
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. ***Task:*** *Perform a case study on any one of renewable energy resources.*		
III	**Pollution control & Sustainable Development**	4+4=8
Part A: Environmental Pollution Control Technologies: Air, water & soil pollution control technologies; MSW & E. Waste Management, EIA concept, Environmental Audit; EPA Acts. ***Task:*** *Perform a case study on environmental audit.*		
Part B: Sustainable Development: Climate Change**: c**auses, effects, global warming, carbon footprint and environmental protection: brief idea on sustainable development: sustainable development concept, Sustainable Development Goal (SDGs), steps taken towards sustainable development: management of plastics, automobile scrapping policy and promotion of electrical vehicles. ***Task:*** *Perform a case study on sustainable development goals.*		
IV	**Disaster Management**	6
Types of Disasters: Natural and Man-made and their cause and effect, Vulnerability Assessment and Risk Analysis: Vulnerability to various disasters (Flood, Cyclone, Earthquake, Heat waves and Lightning). Institutional Framework: Institutional arrangements for disaster management - National Disaster Management Authority (NDMA), State Disaster Management Authority (SDMA), District Disaster Management Authority (DDMA) and National Disaster Response Force (NDRF). ***Task:*** *Perform a case study on any one of the institutional arrangements for disaster management.*		
V	**Preparedness Measure**	6
Disaster Management Cycle, Early Warning System, Pre-Disaster and Post-Disaster Preparedness, Strengthening of SDMA and DDMA, Community Preparedness, Stakeholder Participation, Corporate Social Responsibility (CSR), Survival Skills: Survival skills adopted during and after disaster Flood, Cyclone, Earthquake, Heat waves and Lightning. ***Task:*** *Prepare a case study on proactive and reactive disaster management plans.*		
Textbooks		
1. Environmental Science by Y. Anjaneyulu, B S Publications, 2004. 2. Climate Change Society & Sustainable Development, Jain Indu, Times Group, 2010. 3. Manual on Disaster Management, National Disaster Management Agency, Govt. of India.		

III-SEM. SYLLABUS

STATISTICAL FOUNDATIONS FOR COMPUTER SCIENCE

Course	B.Tech.-III-Sem.	L	T	P	C
Course Code	22BS31	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	explain the concepts of probability and random variables	3	2	1
CO2	illustrate the importance of discrete, continuous and sampling distributions	3	2	1
CO3	use various estimation methods and test hypothesis for large samples	3	2	1
CO4	test hypothesis for small samples and find correlation/regression analysis	3	2	1
CO5	apply the theory of stochastic processes to analyze classification of states	3	2	1

Syllabus

Unit	Title/Topics	Hours
I	**Probability and Random variables**	8
Introduction, Sample space and events-the axioms of probability-some elementary theorems-conditional probability-Baye's theorem. Random Variables, Mathematical Expectations-Discrete Random Variables and Continuous Random Variables. ***Task:*** *Write a program to find mathematical expectations.*		
II	**Distributions**	10
Basic Definitions, Discrete probability distributions- Binomial distribution, Poisson distribution Continuous probability Distributions-Normal distribution, Applications of Normal distributions Normal approximation to the binomial distribution, Chebyshev's theorem. Sampling distribution of means (σ Known and unknown). ***Task:*** *Write a program to find Binomial and Poisson distributions for a given data.*		
III	**Estimation and Testing of Hypothesis-I (large sample)**	6+6=12
PART-A: Introduction, Point Estimation-inferences concerning means, Interval Estimation-Confidence interval for the mean (σ known and unknown), Bayesian Estimation. ***Task:*** *Write a program to find point and interval estimations.*		
PART-B: Tests of Hypothesis, Large samples, Null hypothesis-Alternate hypothesis, type-I & Type-II errors-critical region confidence interval and test of hypothesis single mean, Difference between the means, confidence interval for the proportions. Tests of hypothesis for the single and difference between the proportions. ***Task:*** *Write a program to test the hypothesis for large samples.*		
IV	**Testing of Hypothesis-II (Small samples)**	10
Test concerning small samples- t-Test, F-Test and Chi-Square (χ^2) - Test for independence of attribute. Correlation and regression: Rank Correlation-coefficient of correlation-Regression coefficient-The lines of regression. ***Task:*** *Write a program to test the hypothesis for small samples.*		
V	**Stochastic Processes and Markov Chains**	8
Introduction to Stochastic processes- Markov process classification of states-Examples of Markov Chains, Stochastic Matrix, limiting probabilities. ***Task:*** *Write a program for classification of states of Markov chain.*		

Textbooks

1. S.C. Gupta and V.K. Kapoor, Fundamentals of Mathematical Statistics, 9th extensively revised edition, S Chand & Sons, 1999.
2. Johnson. R. A., "Miller & Freund's Probability and Statistics for Engineers" 6th Edition, Pearson Education, Delhi, 2000.
3. Probability and statistics by Dr.T.K.V. Iyengar, Dr.B.Krishna Gandhi, S.Ranganatham, Dr.M.V.S.S.N. Prasad. A division of S Chand & Co. Ltd.

References

1. Mathematics for engineers and scientists by Alan Jeffrey, 6th Edition, CRC press.

DIGITAL LOGIC DESIGN AND COMPUTER ORGANIZATION

Course	B.Tech.-III-Sem.	L	T	P	C
Course Code	22ES32	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

Syllabus

Unit	Title/Topics	Hours
I	**Binary System, Boolean algebra and logic gates**	10
Binary System: 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.		
II	**Combinational and Sequential Circuits**	10
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.		
III	**Basic Computer Organization & Design and CPU**	4+5=9
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).		
IV	**Computer Arithmetic and Input-Output Organization**	10
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.		
V	**Memory and Pipeline Processing**	9
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 Edn., Pearson. 2. Computer System Architecture, M.Morris Mano, 3rd Edn., Pearson. 3. Advanced Microprocessors and Peripherals, K. M. Bhurchandi, A.K Ray, 3rd Edn., TMH.		
References		
1. Fundamentals of Logic Design, C. H. Roth, L. L. Kinney, 7th Edn, Cengage Learning. 2. Microprocessors and Interfacing, D V Hall, SSSP Rao, 3rd Edn, TMH. 3. Carl Hamacher, ZvonkoVranesic, SafwatZaky: Computer Organization, 5th Edn., TMH, 2002.		

SOFTWARE DESIGN AND ENGINEERING

Course	B.Tech.-III-Sem.	L	T	P	C
Course Code	22CSPC31	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	PSO1
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

Syllabus

Unit	Title/Topics	Hours
I	**Introduction**	10
Introduction to Software Engineering: Evolving role of Software, SDLC, Software engineering- A layered technology, The Capability Maturity Model Integration (CMMI), Process Assessment. **Process Models:** The waterfall model, incremental process models, evolutionary process models, the unified process. **Software Requirements:** Functional and Nonfunctional requirements, User requirements, System requirements, the software requirements document. **Requirements Engineering Process:** Feasibility studies, requirements elicitation and analysis, requirements validation, requirements management. ***Task:*** *Develop a problem statement.*		
II	**Design**	9
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. ***Task:*** *Develop Data Flow Diagram Model.*		
III	**Modelling**	5+5=10
Part-A: Introduction to UML: Principles of modeling, conceptual model of the UML, **Class and Object Diagrams**: terms, concepts, modeling techniques. ***Task:*** *Create a Class diagram for ATM Application.*		
Part-B: Behavioral Modeling: Interaction diagrams, use case diagrams, activity diagrams**,** state chart diagram, component and deployment diagrams. ***Task:*** *Create a Use Case diagram for an ATM Application.*		
IV	**Testing**	10
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. **Process and Product Metrics**: Software Quality and measurement, Metrics for software quality, analysis model, design model, source code, testing and maintenance. ***Task:*** *Develop test cases for unit testing and integration testing.*		
V	**Management**	9
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, Software reliability, ISO 9000 Quality standards. ***Task:*** *Preparation of Software Configuration and Risk Management related documents.*		
Textbooks		
1. Roger S. Pressman, Software engineering- A practitioner's Approach, TMH (I), 7th Edn, 2019. 2. Ian Sommerville, Software Engineering, Pearson education Asia, 10th Edn, 2015. 3. Grady Booch, James Rumbaugh, Ivar Jacobson: The Unified Modelling Language User Guide, Pearson Education.		

OOP THROUGH JAVA

Course	B.Tech.-III-Sem.	L	T	P	C
Course Code	22CSPC32	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 java programs using OOP concepts	3	3	2	2
CO2	interpret programs using OOP concepts	3	3	2	2
CO3	build efficient codes using multithreading and exception handling	3	3	3	3
CO4	design GUI programs using AWT and event handling	3	3	3	2
CO5	develop real-time applications using applets and swings	3	3	3	3

Syllabus

Unit	Title/Topics	Hours
I	**Java Basics**	10
Java Basics: History of Java, Java buzzwords, data types, variables, scope and lifetime 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.		
II	**Inheritance, Polymorphism, Packages and Interfaces**	9
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, exploring java.util. Differences between classes and interfaces, defining an interface, implementing interface, applying interfaces, variables in interface and extending interfaces.		
III	**Exception handling and Multithreading**	5+5=10
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 subclasses.		
Part-B: Multithreading: Differences between multithreading and multitasking, thread life cycle, creating threads, thread priorities, synchronizing threads, inter thread communication.		
IV	**Event handling and AWT**	9
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.		
V	**Applets and Swings**	10
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 Edition, 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

Course	B.Tech.-III-Sem.	L	T	P	C
Course Code	22CSPC33	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 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	explain transaction processing and concurrency control	3	3	3	2

Syllabus

Unit	Title/Topics	Hours
I	**Introduction to Database Systems**	10
Introduction: Introduction and applications of DBMS, Purpose of database, database architecture and structure - 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.		
II	**Relational Model, Algebra and Calculus**	9
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.		
III	**SQL**	5+5=10
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.		
IV	**Schema Refinement and Normal Forms**	10
Schema Refinement and Normal Forms: Introduction to schema refinement, functional dependencies, reasoning about FDs. Normalization, normal forms: 1NF, 2NF, 3NF, BCNF, multi valued dependency-fourth normal form-join dependency-fifth normal form, properties of decomposition, dependency preservation.		
V	**Transactions Management, Concurrency Control and Recovery System**	9
Transactions Management: Transaction concept and ACID properties, 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.		
Textbooks		
1. Raghurama Krishnan, Johannes Gehrke, Database Management Systems, 3rd Edn, TMH. 2. Abraham Silberschatz, Henry F.Korth, S.Sudarshan, Database System Concepts, 5th Edn, TMH.		
References		
1. Elmasri Navate, Fundamentals of Database Systems, Pearson Education, India. 2. Database Management System Oracle SQL, P. K. Das Guptha and P Radha Krishna PHI.		

OOP THROUGH JAVA LAB

Course	B.Tech.-III-Sem.	L	T	P	C
Course Code	22CSPC34	-	-	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	PO9
CO1	write, compile and execute simple java programs	3	3	3
CO2	develop programs using inheritance, polymorphism, packages and Interfaces	3	3	3
CO3	demonstrate multithreading and exception handling mechanisms	3	3	3
CO4	design GUI using the concepts of AWT and event handling	3	3	3
CO5	build real-time applications using applets and swings	3	3	3

List of Experiments

Note: Use Eclipse or NetBeans platform and get acquainted with the various menus.

Week	Title/Experiment
1	Write a Java program to a) find the roots of quadratic equation $ax^2+bx+c = 0$ b) print all prime numbers up to a given integer (use Scanner class to read input)
2	Write a Java program to a) check whether a given string is a palindrome or not b) sort given list of strings. Read input from command line
3	Write a Java program to demonstrate a) method overloading and method overriding b) implement multiple inheritance
4	Write a Java program to a) demonstrate packages b) demonstrate abstract usage
5	Write a java program to a) demonstrate exception handling mechanism b) create user defined exception.
6	Write a Java program that implements the producer - consumer problem.
7	Write a Java program to handle a) mouse events b) key events.
8	Write an applet program to a) displays a simple message b) compute factorial value.
9	Write a Java program that creates a user interface to perform integer divisions.
10	Write a Java program that simulates a traffic light.
11	Write a Java program that works as a simple calculator. Use a grid layout to arrange buttons for thedigits and for the +, -,*, % operations.
12	Write Java programs to develop swing application using JList, JTree, and JTable.
13	Write Java programs to develop swing application using JTabbedPane and JScrollPane.

References

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

Micro-Projects: Student should submit a report on one of the following/any other micro-project(s) approved by the lab faculty before commencement of lab 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 GUIcomponents
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

DATABASE MANAGEMENT SYSTEMS LAB

Course	B.Tech.-III-Sem.	L	T	P	C
Course Code	22CSPC35	-	-	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	PO9
CO1	construct databases using SQL commands	3	3	3
CO2	apply normalization techniques to eliminate redundancy	3	3	3
CO3	design a database schema for a given domain	3	3	3
CO4	solve queries based on joins, nested queries and aggregate functions	3	3	3
CO5	execute PL/SQL programs for a given application	3	3	3

List of Experiments

Note: Take any database application and conduct experiments to get expertise on various case studies

Week	Title/Experiment
1	Student should decide on a case study, analyze and then formulate the problem Statement by populating objects (entities) and their role.
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 an ER Diagram.
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 the ER Model.
4	**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.
5	**Practicing DML commands** - Insert, Select, Update, Delete of Tables.
6	**Practicing Queries** using ANY, ALL, IN, EXISTS, NOT EXISTS, UNION, INTERSECT, EXCEPT, CONSTRAINTS etc.
7	**Practicing Sub queries** (Nested, Correlated) and Joins (Inner, Outer and Equi).
8	**Practice Queries** using Aggregate Operators - COUNT, SUM, AVG, MAX, MIN. GROUP BY, HAVING, VIEWS Creation and Dropping.
9	**Practicing on** Triggers - creation of trigger, Insertion using trigger, Deletion using trigger, Updating using trigger
10	**Procedures**- Creation of Stored Procedures, Execution of Procedure, and Modification of Procedure.
11	**Cursors** - Declaring Cursor, Opening Cursor, Fetching the data, closing the cursor.
12	**Normalization** -To remove the redundancies and anomalies in the above relational tables, Normalize up to Third Normal Form.

References

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

Micro-Projects: Student should submit a report on one of the following/any other micro-project(s) approved by the lab faculty before commencement of lab 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 a relational database for University Registrar's office.
4. Take any schema and convert it into 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.

DATA WRANGLING AND VISUALIZATION – PYTHON/ R PROGRAMMING/POWER BI

Course	B.Tech.-III-Sem.	L	T	P	C
Course Code	22CSPC36	-	-	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	PO9	PO12	PSO2
CO1	create python shell script for data validation	3	3	3	3	3	3
CO2	demonstrate how to import data into tableau	3	3	3	3	3	3
CO3	apply the tableau concepts of dimensions and measures	3	3	3	3	3	3
CO4	develop programs, map visual layouts and graphical properties	3	3	3	3	3	3
CO5	create a dashboard that links multiple visualizations	3	3	3	3	3	3

List of Experiments

Week	Title/Experiment
	Data Wrangling
1	Understanding Data, what is data, where to find data, data wrangling, data clean up basics - formatting, outliers, duplicates, normalizing and standardizing data.
2	Develop the python script to parse the pdf files using pdfminer.
3	Develop the python Shell Script to do the basic data cleanup on child labour and child marriagedata.xlsx a) check duplicates and missing data b) eliminate mismatches c) cleans line breaks, spaces, and special characters.
4	Draw the chart between perceived corruption scores compared to the child labour percentages using matplotlib.
5	Write a python program to download & display content of robot.txt for en.wikipedia.org.
	Data Visualization
6	Foundations for building data visualizations, Creating first visualization.
7	Getting started with tableau software using data file formats, connecting data to tableau,creating basic charts (line, bar charts, tree maps) using the show me panel.
8	Tableau calculations, overview of SUM, AVG and aggregate features, creating custom calculations and fields.
9	Applying new data calculations to visualizations, formatting visualizations, formatting tools and menus, formatting specific parts of the view.
10	Editing and formatting axes, manipulating data in tableau data, pivoting tableau data.
11	Structuring the data, sorting and filtering tableau data, pivoting tableau data.
12	Advanced visualization tools: using filters, using the detail panel, using the size panels, customizing filters, using and customizing tooltips, formatting data with colors.
13	Creating dashboards and storytelling, design for different displays, adding interactivity in the dashboard, distributing, publishing data visualization.
14	Creating custom charts, cyclical data and circular area charts, dual axis charts.

References

1. Data Wrangling & Visualization - Python/R Programming/Power BI Manual, Dept. of CSE, CMRIT.

Micro-Projects: Student should submit a report on one of the following/any other micro-project(s) approved by the lab faculty before commencement of lab internal examination.

1. Apply the raw data set, and implement the different data wrangling functionalities.
2. Perform Exploratory Data Analysis (EDA) and Data Wrangling in Pandas.
3. Perform Feature Engineering, one-hot encoding and deal with missing data.
4. Import Datasets and Perform Basic Statistical Data Analysis.
5. Develop a Scatter Plot with Matplotlib.
6. Basic Interactive Binned Scatter Plot with Altair.
7. Histogram with Plotnine (ggplot).
8. Create a Viz on Cricket Stadium.
9. Creating common visualizations on various charts and assembling a dashboard layout.
10. Develop data visualization on interactive plot with Plotly (using Cufflinks).

APP DEVELOPMENT - ANDROID/FLUTTER/FLASK

Course	B.Tech.-III-Sem.	L	T	P	C
Course Code	22CSPC37	-	-	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	PO9	PO12	PSO2
CO1	demonstrate android/flutter/flask installation	3	3	3	3	3	3
CO2	develop various applications using android	3	3	3	3	3	3
CO3	design various applications using flutter	3	3	3	3	3	3
CO4	implement various applications using flask	3	3	3	3	3	3
CO5	solve real-world problems using android/flutter/flask	3	3	3	3	3	3

List of Experiments

Week	Title/Experiment
	App development
1	Install Android studio and setup AVD.
2	Develop mobile apps with menu options for Dial number, Open website and Send SMS. On selecting an option, the appropriate action should be invoked using intents.
3	Develop mobile apps that inserts some notifications into Notification areas and whenever a notification is inserted, it should show a toast with details of the notification.
4	Develop mobile apps with register screen When the user submits registration details validate and register user.
5	Develop mobile apps with login and welcome screens, When the user submits a username and password validate and verify user details on success navigate to welcome screen.
	Flutter
6	Installing and Configuring Flutter SDK.
7	Creating a Dart Project Using IntelliJ IDEA.
8	Create a Navigation and Routing a Pizza Store App.
9	Create forgot password option for Pizza Store App using existing email to get password reset link.
10	Create a User Profile Interface using Firebase.
	Flask
11	Setup a virtual environment for Flask.
12	Using HTML templates create Web App with different menu items.
13	Design a form to get some data at the client side from the user, and try to access this data on the server by using the POST request.
14	Develop a web app with login and welcome pages When the user submits a username and password validate and verify user details on success navigate to the welcome page.
15	Implement a simple chatbot for answering python questions from text file.

References

1. App development - Android/Flutter/Flask Manual, Dept. of CSE, CMRIT, Hyd.

Micro-Projects: Student should submit a report on one of the following/any other micro-project(s) approved by the lab faculty before commencement of lab internal examination.

1. Design an App to Create a 2D Snake Game.
2. Design a responsive Nutrition App.
3. Design a Book search App.
4. Build a Chat App.
5. Develop a dynamic To Do App.
6. Design an E-Commerce App.
7. Design Quiz App.
8. Design BMI Calculator App.
9. Design Food Order/Travel App.
10. Design Sudoku Game App.

GENDER SENSITIZATION
(MANDATORY COURSE - NON-CREDIT)

Course	B.Tech.-III-Sem.	L	T	P	C
Course Code	22MC31	-	-	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

Syllabus

Unit	Title/Topics	Hours
I	**Understanding Gender**	6
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. ***Task:*** *Perform a case study on routes for gender sensitization.*		
II	**Gender Roles and Relations**	6
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. ***Task:*** *Perform a case study on gender discrimination in any one state in India.*		
III	**Gender and Labour**	4+4=8
Part-A: Division and valuation of labour-housework: the invisible labor - "my mother doesn't work." "Share the load."- Work: its politics and economics. ***Task:*** *Perform a case study on gender exploitation in unorganized sector.*		
Part-B: Fact and fiction. Unrecognized and unaccounted work. Gender development issues - gender, governance and sustainable development-gender and human rights - gender and mainstreaming. ***Task:*** *Perform a case study on implementation of human rights in its right-sense.*		
IV	**Gender - Based Violence**	6
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 out: Is home a safe place? - when women unite [film]. Rebuilding lives. Thinking about sexual violence blaming the victim - "I fought for my life". ***Task:*** *Perform a case study on domestic violence.*		
V	**Gender and Culture**	6
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. ***Task:*** *Perform a case study on cross gender and cross cultural awareness.*		
Textbooks		
1. Towards a world of equals: A bilingual textbook on gender, Telugu Akademi, Hyderabad, 2015		

EMPLOYABILITY SKILLS – I
MANDATORY COURSE (NON-CREDIT)

Course	B.Tech.-III-Sem.	L	T	P	C
Course Code	22MC32	-	-	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

List of Experiments

Week	Title/Experiment
1	**Verbal Ability:** Introduction to Business English - Functional English.
	Quantitative Aptitude: Basic concepts, combined mean, average principles.
2	**Verbal Ability:** Fundamentals of Grammar-Sentence Structure-Parts of Speech.
	Quantitative Aptitude: Wrong values taken, number added or deleted, average speed.
3	**Verbal Ability:** Articles and Prepositions.
	Quantitative Aptitude: **Percentages** - Basic Concepts, conversions, finding percentages from given numbers, quantity increases or decreases by given percentage.
4	**Verbal Ability:** Question Tags, Speeches and Voices.
	Quantitative Aptitude: **Percentages** - population increase by given percentage, comparisons, consumption when a commodity price increase or decrease and applications.
5	**Verbal Ability:** Subject-Verb Agreement and Tenses.
	Quantitative Aptitude: **Data Interpretation** - Introduction to Data Interpretation, quantitative and qualitative data.
6	**Verbal Ability:** Synonyms & Antonyms, Homonyms & Homophones, Word Formation.
	Quantitative Aptitude: **Data Interpretation** - Tabular Data, Line Graphs, Bar Chart, Pie Charts, X-Y Charts.
7	**Verbal Ability:** Idioms & Phrases, Word Analogy & One-Word Substitutes.
	Quantitative Aptitude: Number Series, Letter Series, Series completion and correction Coding and Decoding. Word analogy-Applied analogy.
8	**Verbal Ability:** Spotting Errors, Correction of Sentences.
	Quantitative Aptitude: **Reasoning Logical Diagrams** - Simple diagrammatic relationship, Multi diagrammatic relationship, Venn-diagrams, Analytical reasoning.
9	**Verbal Ability:** Verbal Logics & Jumbled Sentences.
	Quantitative Aptitude: **Number Systems:** Basic Concepts, Number Systems: Natural numbers, whole numbers, integers, fractions, Rational Numbers, Irrational Numbers, Real Numbers, Divisibility Rules.
10	**Verbal Ability:** Paragraph Writing, Picture Description.
	Quantitative Aptitude: **Number Systems:** Logic Equations, Remainder theorem, Unit digit calculation. **Gamification** - Deductive Logical Thinking.
11	**Verbal Ability:** Text Completion & Essay Writing
	Quantitative Aptitude: **Reasoning Ability** - Blood Relations, Seating arrangements, Directions, Decision making. **Gamification**- Inductive Logical Thinking.
12	**Verbal Ability:** Verbal Reasoning, Reading Comprehension & Cloze Passages.
	Quantitative Aptitude: **Progressions** - Basic Concepts, Types: arithmetic, geometric progression, Harmonic progression and applications. **Gamification**- Grid Motion, Motion Challenge, Colour The Grid.

13	**Verbal Ability:** Critical Reasoning - Statements, Arguments, Assumptions.
	Quantitative Aptitude: Profit and Loss: Basic Concepts, discounts, marked price and list price, dishonest shopkeeper with manipulated weights, successive discounts etc., **Gamification** - Switch Challenge.
14	**Verbal Ability:** Critical Reasoning - Conclusions, Assertions & Reasons.
	Quantitative Aptitude: Interest (Simple and Compound): Basic Concepts, Yearly, Half-yearly, and quarterly calculations, multiples, differences between simple and compound interest. **Gamification** – Digit Challenge.
Activities	
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 - I Manual, FED, CMRIT, Hyd.	

IV-SEM. SYLLABUS

DISCRETE MATHEMATICS & GRAPH THEORY

Course	B.Tech.-IV-Sem.	L	T	P	C
Course Code	22ES41	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

Syllabus

Unit	Title/Topics	Hours
I	**Mathematical logic**	10
Introduction, statements and notation, connectives, well-formed formulas, tautologies, equivalence of formulas, duality law, functionally complete set of connectives, other connectives. ***Task:*** *Write a program to implement connectives: AND, NAND, OR, NOT, XOR, NOR.*		
II	**Predicate Calculus**	9
Normal forms, rules of inference, automatic theorem proving, predicate calculus, mathematical induction. ***Task:*** *Write a program to implement principle normal forms.*		
III	**Set theory, Relations and Functions**	5+5=10
Part-A: Set theory: Basic concepts, representation of sets, operations on sets, principles of inclusion and exclusion. ***Task:*** *Write a program to implement various set operations*.		
Part-B: Relations and Functions: Relations and ordering, properties of binary relation, functions, partial ordered set, lattice. ***Task:*** *Write a program for the following operations: a) reflexive b) symmetric c) Transitive.*		
IV	**Elementary Combinatory**	10
Basics of counting, combinations and permutations, enumeration of combinations and permutations, enumerating combinations and permutations with repetitions, pigeonhole principle. ***Task:*** *Write a program to implement Fibonacci sequence.*		
V	**Graph Theory**	9
Basic concepts, isomorphism and sub-graphs, planar graphs, Euler's formula, multi-graphs and Euler circuits, Hamiltonian graphs, chromatic numbers, the four-color problem. ***Task:*** *Write a program to implement Chromatic Number for a given graph.*		
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.		

DESIGN AND ANALYSIS OF ALGORITHMS

Course	B.Tech.-IV-Sem.	L	T	P	C
Course Code	22CSPC41	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	PSO1
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

Syllabus

Unit	Title/Topics	Hours
I	**Introduction**	8
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. ***Task:*** *Program to perform operation count for a given pseudo code.*		
II	**Disjoint Sets, Divide and Conquer**	12
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. ***Task:*** *Write a Binary Search Program for a given list of values recursively and non-recursively.*		
III	**Greedy method and Dynamic Programming**	4+6=10
Part-A: Greedy method: General method, applications-Job sequencing with deadlines, knapsack problem, Minimum cost spanning trees, Single source shortest path problem. ***Task:*** *Program to implement knapsack problem using greedy method.*		
Part-B: Dynamic Programming: General method, applications - Optimal binary search trees, 0/1 knapsack problem, all pairs shortest path problem, Travelling salesperson problem, Reliability design. ***Task:*** *Program for finding shortest path for multistage graph using dynamic programming.*		
IV	**Backtracking**	10
Backtracking: General method, applications-n-queen problem, sum of subsets problem, graph coloring, Hamiltonian cycles. **Branch and Bound:** General method, applications - Travelling salesperson problem, 0/1 knapsack problem, LC Branch and Bound solution, FIFO Branch and Bound solution. ***Task:*** *Write a program to find the optimal profit of a Knapsack using Branch and Bound Technique.*		
V	**NP-Hard and NP-Complete problems**	8
NP-Hard and NP-Complete problems: Basic concepts, non-deterministic algorithms, NP - Hard and NP Complete classes, Cook's theorem statement. ***Task:*** *Write a program to color the nodes in a given graph such that no two adjacent can have the same color using backtracking.*		
Textbooks		
1. Fundamentals of Computer Algorithms, Ellis Horowitz, Satraj Sahni and Rajasekaran, Galgotia Publications Pvt. Ltd. 2. Introduction to Algorithms, 2nd Edition, T.H.Cormen, C.E.Leiserson, R.L.Rivest,and C.Stein, PHI Pvt. Ltd., Pearson Education.		
References		
1. Data structures and Algorithm Analysis in C++, Allen Weiss, 2nd Edition, Pearson education. Design and Analysis of algorithms, Aho, Ullman and Hopcroft, Pearson education.		

COMPUTER NETWORKS

Course	B.Tech.-IV-Sem.	L	T	P	C
Course Code	22CSPC42	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	PSO1
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

Syllabus

Unit	Title/Topics	Hours
I	**Overview of the Internet, Physical layer and Data link layer**	10
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. ***Task:*** *Write a program to compute CRC code for the polynomials.*		
II	**Multiple Access protocols**	9
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. ***Task:*** *Write a program for 1 bit collision free protocol.*		
III	**Network layer and Routing Algorithms**	5+5=10
Part-A: Network layer: Network layer Design issues, store and forward packet switching connection less and connection oriented networks. ***Task:*** *Write a program to implement i) Character stuffing ii) Bit stuffing.*		
Part-B: Routing Algorithms: Optimality principle, shortest path, flooding, distance vector routing, count to infinity problem, hierarchical routing, congestion control algorithms and admission control. ***Task:*** *Implement distance vector routing algorithm for obtaining routing tables at each node.*		
IV	**Internetworking and Transport Layer**	9
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. ***Task:*** *Write a program to demonstrate ARP.*		
V	**TCP/IP and Application Layer**	10
TCP/IP: 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. ***Task:*** *Write a program to implement RPC.*		
Textbooks:		
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		

OPERATING SYSTEMS

Course	B.Tech.-IV-Sem.	L	T	P	C
Course Code	22CSPC43	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 APIs	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

Syllabus

Unit	Title/Topics	Hours
I	**Operating Systems Overview and Operating Systems Structures**	9
Operating Systems Overview: Introduction, Operating System Objectives and functions, Evolution of operating System, operating system structure and services. **Basic Linux utilities and system calls:** File handling, Process utilities, Disk, Networking, Filters, Backup utilities, system calls-open, read, write, close.		
II	**Process Management, Concurrency and Synchronization**	10
Process Management: Process concepts creating process using fork, vfork system calls process state, process control block, scheduling queues, process scheduling, Threads Overview, Threading issues. **Concurrency and Synchronization:** Cooperating Processes, Inter-process Communication using pipes and fifo, Principles of Concurrency, Mutual Exclusion, Software and hardware approaches, Semaphores, Monitors, Message Passing, and Classic problems of synchronization.		
III	**Deadlocks and Memory Management**	5+5=10
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.		
IV	**File Management System**	10
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.		
V	**I/O Management System, Protection and Security**	9
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.		
Textbooks		
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. 3. Unix Concepts and Applications, 4th edition, Sumitabha Das, TMH.		
References		
1. Andrew S. Tanenbaum, Modern Operating Systems, 2nd Edition, 2007, PHI, India. 2. Unix System Programming using C++, T.Chan, PHI 3. Operating Systems – A concept based approach – DM Dhamdhere, 2nd Edition, TMH.		

FULL STACK DEVELOPMENT

Course	B.Tech.-IV-Sem.	L	T	P	C
Course Code	22CSPC44	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	PSO1
CO1	explain the concepts of HTML5 and version control	3	2	2	3	3
CO2	illustrate java script and jQuery concepts	3	2	2	3	3
CO3	use Node.js and MongoDB Driver for web development	3	3	3	3	3
CO4	develop app using Angular concepts	3	3	3	3	3
CO5	design app using ReactJS concepts	3	2	3	3	3

Syllabus

Unit	Title/Topics	Hours
I	**HTML5 & Version Control**	9
HTML5: Video & Audio, SVG, Web Storage, Drag & Drop, Geo Location. Styling using css, Bootstrap - Setup, Templates. **Version Control:** Getting Started with Git, Working with A Local Repository, Branches and Merging, Working with Remote Repository.		
II	**Java script & jQuery**	10
Java script: Variables, Arrays, Objects, Loops, Conditionals, Switches, Functions, Events, Form validating, Ajax. **jQuery**: Selectors & Mouse events, Form events, DOM Manipulation, Effects & Animation, Traversing & Filtering.		
III	**Node.js & MongoDB**	5+4=9
Part-A: Node.js: Getting Started With Node, Installation Node Js, Simple Server, Project using Simple Node Server, Express Setup and Routing, Middleware Password Encryption, Login Functionality, JWT.		
Part-B: Install MongoDB, Data Modeling, Query and Projection, Aggregation Pipeline.		
IV	**Angular**	10
Getting Started with angular, angular app from scratch, components & properties, events & binding with ngModel, fetch data from a service, submit data to service, http module & observables, routing.		
V	**React JS**	10
Install React JS, create-react-app, React Router, React Components, State, Props, React Forms, Component Life-Cycle, React Redux, Angular vs React JS.		

Textbooks

1. HTML 5 Black Book, Covers CSS 3, JavaScript, XML, XHTML, AJAX, PHP and jQuery, 2nd Ed. Paperback - 1 January 2016. (https://www.amazon.in/Black-Covers-JavaScript-XHTML-jQuery/dp/935119907X)
2. The Full Stack Developer: Your Essential Guide to the Everyday Skills Expected of a Modern Full Stack Web Developer Paperback – Import, 20 November 2018. (https://www.amazon.in/Full-Stack-Developer-Essential-Everyday/dp/1484241517)
3. Learning Node.js Development: Learn the fundamentals of Node.js, and deploy and test Node.js applications on the web Paperback – Import, 31 January 2018. (https://www.amazon.in/Learning-Node-js-Development-fundamentals-applications/dp/1788395549)
4. Angular 14 from Scratch. (https://leanpub.com/book-angular)
5. Full-Stack React Projects: Learn MERN stack development by building modern web apps using MongoDB, Express, React, and Node.js, 2nd Edition Paperback – Import, 17 April 2020. (https://www.amazon.in/Full-Stack-React-Projects-development-building/dp/1839215410)

Web References

1. Git: https://git-scm.com/ Github: https://github.com/
2. HTML: https://developer.mozilla.org/en-US/docs/Web/HTML
3. Javascript: https://developer.mozilla.org/en-US/docs/Web/JavaScript
4. Node: https://nodejs.org/en/ MongoDB: https://www.mongodb.com/try/download/community
5. Angular: https://angular.io/ React JS: https://reactjs.org/

CN & OS (LINUX) LAB

Course	B.Tech.-IV-Sem.	L	T	P	C
Course Code	22CSPC45	-	-	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	PO9	PSO2
CO1	implement datalink protocols	3	3	3	3
CO2	find shortest path using routing table	3	3	3	3
CO3	illustrate Linux shell environment	3	3	3	3
CO4	interpret CPU scheduling algorithms and file allocation methods	3	3	3	3
CO5	experiment with page replacement and memory management	3	3	3	3

List of Experiments

Week	Title/Experiment
1	Implement the data link layer framing method using character stuffing and bit stuffing.
2	Implement CRC on a data set of characters using CRC-12 / CRC-16 polynomial.
3	Implement Stop and Wait Protocol.
4	Implement Sliding Window Protocol.
5	Implement Dijkstra's shortest path algorithm through a graph.
6	Obtain broadcast tree for given subnet of hosts.
7	Implement collision free protocol.
8	a) Study of Linux general purpose utilities (File handling, Process, Disk, Networking, Filters) b) Implement Linux commands i) CP ii) MV
9	a) Write a shell script to find factorial of a given integer. b) Write a C program to create a child process and allow parent to display 'parent' and child to display 'child'. c) Write a C program in which a parent writes a message to a pipe and the child reads the message.
10	Write C programs to simulate the following CPU scheduling algorithms a) FCFS b) Priority
11	Write C programs to simulate the following CPU scheduling algorithms a) SJF b) RR
12	Write C programs to simulate the following file allocation strategies a) Sequential b) Linked c) Indexed
13	Write C programs to simulate the following memory management techniques a) Paging b) Segmentation
14	Write C programs to simulate the following page replacement techniques: a) FIFO b) LRU c) Optimal

References

1. CN & OS (Linux) Lab Manual, Department of CSE, CMRIT, Hyd.

Micro-Projects: Student should submit a report on one of the following/any other micro-project(s) approved by the lab faculty before commencement of lab internal examination.

1. Peer to Peer File Sharing Technology over LANs.
2. Client-Server based Instant Messenger.
3. Network Design Proposal for an Institution.
4. Simulate ARP / RARP protocols using NS2/NS3 tools.
5. Producer-Consumer problem using semaphores.
6. Dining-Philosopher problem using semaphores.
7. Readers-Writers problem using semaphores.
8. Implement DAG (Directed Acyclic Graph) file organization technique.
9. Simulate multi-level queue CPU scheduling algorithm.
10. Implement Matrix Multiplication using pthreads.

NODE JS/ANGULAR/REACT JS/DJANGO

Course	B.Tech.-IV-Sem.	L	T	P	C
Course Code	22CSPC46	-	-	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	PO9	PO12	PSO2
CO1	build website with HTML5, CSS, Bootstrap and JavaScript	3	3	3	3	3
CO2	demonstrate JavaScript using NodeJS and MongoDB	3	3	3	3	3
CO3	develop single page application using Angular	3	3	3	3	3
CO4	develop single page application using React JS	3	3	3	3	3
CO5	design web application using Django	3	3	3	3	3

List of Experiments

Week	Title/Experiment
1	Demonstrate version control in Git and Github using simple html code.
2	Design a simple webpage using bootstrap template.
3	Write a java script code to validate user registration and login form.
4	Write a jquery code to show website slider.
5	Create a simple Node.js server with routes login, register, profile and logout.
6	Write middleware to validate users and generate JWT.
7	Write middleware to validate JWT and redirect to profile.
8	Write MongoDB model for the user and query to fetch user, validate and register.
9	Design a Single Page Application with different menu items using Angular.
10	Fetch user details from server using REST API and show in profile menu using Angular.
11	Design Single Page Application with different menu items using react.
12	Install Django and setup a virtual environment.
13	Design Web Application with different menu items using Django.
14	Fetch user details from server using REST API and show in profile menu using Django.

References

1. Node JS/Angular/React JS/Django Manual, Dept. of CSE, CMRIT, Hyd.

Micro-Projects: Student should submit a report on one of the following/any other micro-project(s) approved by the lab faculty before commencement of lab internal examination.

1. Online Gift Store.
2. Online Pharmacy Store.
3. Online Cake Store.
4. Online Medicine Store.
5. Electronic Shop Management System.
6. Employee Management System.
7. Asset Management System.
8. Online Supermarket Store.
9. E-Farming Portal.
10. College Management System.

AUTOMATED TESTING TOOLS - SELENIUM

Course	B.Tech.- IV-Sem.	L	T	P	C
Course Code	22CSPC47	-	-	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	PO8	PO9	PO12	PSO2
CO1	install JAVA, Associate SWD Jars and Browser drivers	3	3	3	3	3	3	3
CO2	devise website issues using automation	3	3	3	3	3	3	3
CO3	develop programs using web drivers	3	3	3	3	3	3	3
CO4	design test cases for validation of data	3	3	3	3	3	3	3
CO5	plan automation to address real time problems	3	3	3	3	3	3	3

List of Experiments

Week	Title/Experiment
1	Download and Install JAVA, Associate SWD Jars and Browser drivers.
2	Launch Mercury Tour website a) Click Register link to get registration page b) Fill fields c) Click submit d) Close site
3	Write a code to search a specific month in the Facebook registration page (Birthday).
4	Write a program which pops out an alert message in frame in personal banking login page.
5	Write a test case to search result section on CMRIT Website.
6	Write a test case to perform automation on AJIO shopping website.
7	Write a program in web driver to open Google and search CMRIT.
8	Write a test case to open Google and download an image from Google images of CMRIT website.
9	Write a test case to get number of list items in a list.
10	Write a test case for validation in Gmail registration page.
11	Write a test case for Myntra sign in page.
12	Write a test case to convert PDF from word.

References

1. Automated Testing Tools - Selenium Manual, Department of CSE, CMRIT, Hyd.

Micro-Projects: Student should submit a report on one of the following/any other micro-project(s) approved by the lab faculty before commencement of lab internal examination.

1. Perform automation testing for any hotel booking website.
2. Perform automation testing for shopping cart.
3. Perform automation testing for utility bill payment portal.
4. Perform automation testing for travel booking website.
5. Perform automation testing for finding out list of employees having salaries greater than a specific amount.
6. Perform automation testing to find out total number of objects in Google search result with a specific query.
7. Perform automation testing for EMI calculator.
8. Perform automation testing for finding out the number of flights departing from Hyderabad airport in a day.
9. Perform automation testing for finding out the least and highest cost for a specific product in any e-commerce website.
10. Perform automation testing for voice based input in Google search engine.

REAL TIME/SOCIETAL RESEARCH PROJECT

Course	B.Tech.-IV-Sem.	L	T	P	C
Course Code	22CSPR41	-	-	4	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 PSO2
CO1	identify relevant problem and design & develop a prototype	3
CO2	execute project using modern tools and prepare the report	3
CO3	exhibit leadership and managerial skills in project development	3
CO4	function effectively as individual, member and/or leader in project teams	3
CO5	apply engineering knowledge for societal sustenance	3

Guidelines

The main aim of the project is to expose the students to solve societal/real-time issues as an individual or as a group of 3-4 students and work under the guidance of faculty/industry supervisor.

S. No.	Title
1	Prepare an abstract on the approved topic and submit to the Guide/Supervisor.
2	Conduct literature survey on the approved project title.
3	Analyze collected data, model, simulation, experiment, design and test project feasibility.
4	Prepare a Gantt chart for project schedule to conduct investigations with team.
5	Design and develop a prototype, simulate and test-facility by using modern tools.
6	Document end-to-end project/product process.
7	Submit a report in the prescribed format through the Guide to Head of the Department.
8	Demonstrate Project work before the Evaluation Committee.

Evaluation Procedure

CIE: 40 Marks		SEE: 60 Marks	
Internal Guide Evaluation		**Department Review Committee Evaluation**	
Item	**Marks**	**Item**	**Marks**
Societal Problem Identification	05	Problem Justification	05
Objectives	05	Content and Innovation	05
Literature Survey	05	Execution	15
Design and Execution	10	Technical Presentation	15
Viva-Voce (Q & A)	05	Viva-Voce (Q & A)	10
Project Report	10	Project Report	10
Total	**40**	**Total**	**60**

INDIAN CULTURE AND CONSTITUTION
MANDATORY COURSE (NON-CREDIT)

Course	B.Tech.-IV-Sem.	L	T	P	C
Course Code	22MC41	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	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

Syllabus

Unit	Title/Topics	Hours
I	**Indian Culture**	10
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. ***Task:*** *Perform a case study on cultural migration.*		
II	**Indian Languages, Religions and Literature**	9
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 - Pre-Vedic, Vedic religion, Buddhism and Jainism. ***Task:*** *Perform a case study on any unscripted languages in India.*		
III	**Indian Constitution and Union Administration**	5+5=10
Part A: Indian Constitution: Constitution' meaning of the term, Indian Constitution: Sources and constitutional history, Features: Citizenship, Fundamental Rights and Duties. ***Task:*** *Perform a case study on implementation of Fundamental Rights.*		
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. ***Task:*** *Perform a case study on Federalism and red-tape.*		
IV	**State and District Administration**	10
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. ***Task:*** *Perform a case study on limitations of democratic chair/position.*		
V	**Local Administration and Election Commission**	9
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. ***Task:*** *Perform a case study on functional difference between state & central Election Commission.*		
Reference		
1. A Hand Book on Indian Culture and Constitution, FED, CMRIT, Hyderabad.		

EMPLOYABILITY SKILLS – II
MANDATORY COURSE (NON-CREDIT)

Course	B.Tech.-IV-Sem.	L	T	P	C
Course Code	22MC42	-	-	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

List of Experiments

Week	Title/Experiment
1	**Soft skills:** Introduction to Soft Skills and Their Importance.
	Aptitude: Statements - Arguments, Assumptions, Conclusions. **Ratio and Proportion:** Basic concepts of ratio and proportion, continued or equal proportions, mean proportions, invest proportion, alternative proportion.
2	**Soft skills:** Self awareness and Self esteem Assertions & Reasons.
	Aptitude: Ratio and Proportion: Division proportion, compound proportion, duplication of ratio, finding values, coins and currencies, etc.
3	**Soft skills:** Discipline, Integrity, Attitude, Change and Adaptability. **People Skills** - Relationships - Personal & Professional Relationships - Rapport Building - Personal Space.
	Aptitude: Speed, Time and Distance: Basic Concepts, Single train problems, two train problems: some point on the same side.
4	**Soft skills:** Definition of Motivation - Motivation - Self-motivation; Time Management - Stephen Covey's Time Management.
	Aptitude: Speed, Time and Distance: Some point opposite sides, relative speed, different points meeting at common points, different points same side (different timings vs. same timings).
5	**Soft skills: Teamwork** - Definition of Team, Team Dynamics - Specialization and Teamwork - Rewards of Teamwork.
	Aptitude: Speed, Time and Distance: Ratios, number of stoppages, average speed, etc.
6	**Soft skills: Leadership** - Definition of Leadership, Leading a Team, Leadership Qualities - Leader vs. Manager - Leadership Styles.
	Aptitude: Time and Work: Basic Concepts, comparative work, mixed work, alternative work, middle leave and middle join ratio efficiency. **Gamification** - The Same Rule.
7	**Soft skills: Problem Solving and Decision Making** - Definitions - Problem Solving and Decision Making - Case Studies.
	Aptitude: Permutations and combinations: Basic concepts, differences between permutations and combinations, always together-never together, alternative arrangement, fixed positions, double fixations.
8	**Soft skills: Conflict Management** - Definitions - Strategies - Styles - Case Studies.
	Aptitude: Permutations and combinations: items drawing from a single group, items drawing from a multiple group, total ways of arrangement with repetitions and without repetitions.
9	**Soft skills: Preparation for Interviews** - Self Introduction - Professional Context, Pre-Interview Preparation Techniques, Analyzing Skills & Achievements**,** Researching the Industry and the Organization.
	Aptitude: Permutations and combinations: Dictionary, handshakes or line joining between two points or number of matches , sides and diagonals, etc.

10	**Soft skills:** **Develop the Interview File** - Resume Building -Types of Interviews.
	Aptitude: **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.
11	**Soft skills:** First Impressions - Body Language - Posture - Dressing and Grooming- Dos and Don'ts of an Interview.
	Aptitude: **Clocks and Calendars:** Basic opposite sides and right angle, mirror images, faulty clock (slow/fast), miscellaneous, calendar.
12	**Soft skills:** Interview Practice/Mock Interviews - FAQ's
	Aptitude: **Geometry and Mensuration:** Basic concepts, types of angles.
13	**Soft skills:** **Presentation** - Oral Presentation - Individual - Group - Poster.
	Aptitude: **Plane figures:** rectangles, squares, triangles, quadrilateral, areas, perimeters, etc. **Solid figures:** cubes, cuboids, cylinders-area (total surface area and lateral surface area). **Gamification** - Overall Revision.
14	**Soft skills:** **Presentation Skills** - How to Present a Project Effectively - PowerPoint Presentations.
	Aptitude: **Solid figures:** Volumes, perimeters. **Others:** Parallelogram, Rhombus, Trapezium, Circle, Sector, Segment, Cone, Sphere, Hemisphere, etc.
Activities	
1. Regular cumulative practice tests. 2. Quiz, Crossword, Word-search and related activities. 3. Five - minute presentations about concepts learnt. 4. JAM and Picture Narration. 5. Mock Interviews.	
Reference	
1. Employability Skills - II Manual, FED, CMRIT, Hyd.	

V-SEM. SYLLABUS

AUTOMATA AND COMPILER DESIGN

Course	B.Tech.-V-Sem.	L	T	P	C
Course Code	22CSPC51	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 various finite automata	3	3	3	2
CO2	write a context free grammar for a given language	3	3	3	2
CO3	construct various parsers, semantics and intermediate code forms	3	3	3	2
CO4	implement code optimization techniques	3	3	3	2
CO5	apply generic code generation algorithm to generate target code	3	3	3	2

Syllabus

Unit	Title/Topics	Hours
I	**Introduction to Formal Languages**	10
Formal Language and Regular Expressions: Languages, Definition Languages regular expressions, Finite Automata – DFA, NFA. Conversion of regular expression to NFA, NFA to DFA. Applications of Finite Automata. Chomsky hierarchy of languages and recognizers. ***Task:*** *Write a C program to recognize strings under 'a*', 'a*b+', 'abb'*		
II	**Introduction to Compiler Design**	9
Introduction: Phases of a Compiler, symbol Table management **Context Free grammars and parsing:** Context free grammars, derivation, parse trees, ambiguity **Parsing Techniques:** Top-Down parsing, BFT, Left-Recursion, Left-Factoring, Predictive parsing, LL(1) parsing. ***Task:*** *Design Predictive Parser for the given language.*		
III	**Parsing, Semantic and Intermediate Code Generations**	5+5=10
Part-A: Bottom-up parsing: Shift-Reduce parsing, LR Grammar Parsing. ***Task:*** *Design a LALR bottom-up parser for the given language.*		
Part-B: Semantics: Syntax directed translation, S-attributed and L-attributed grammars. **Intermediate code**: Intermediate Code Forms, abstract syntax tree, DAG, translation of simple statements and control flow statements, type checking. ***Task:*** *Design Three address code for the given Language.*		
IV	**Code Optimization Techniques**	10
Code optimization: Principal sources of optimization, optimization of basic blocks, peephole optimization. **Data Flow Analysis**: Flow graphs, Data flow Equation, Redundant Sub-Expression, Elimination of Dead-code, Live variable analysis, Copy propagation. ***Task:*** *A program to generate machine code from the abstract syntax tree generated by the parser.*		
V	**Code Generation**	9
Code Generation: Machine dependent code generation, object code forms, generic code generation algorithm, Register allocation and assignment. Using DAG representation of Blocks. ***Task:*** *Simulate DAG representation for a given expression.*		

Textbooks

1. Introduction to Theory of computation. Sipser, 2nd Edition, Thomson.
2. Compilers Principles, Techniques and Tools Aho, Ullman, Ravisethi, Pearson Education.

References

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.
3. Modern Compiler Design- Dick Grune, Henry E. Bal, Cariel T. H. Jacobs, Wiley dreamtech.

ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

Course	B.Tech.-V-Sem.	L	T	P	C
Course Code	22CSPC52	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	PSO1
CO1	illustrate the concepts of AI and various search algorithms	3	3	3	3	3	3
CO2	adapt knowledge representation and probabilistic reasoning	3	3	3	3	2	3
CO3	explain expert systems and concepts of machine learning	3	3	2	3	3	3
CO4	classify various supervised learning algorithms	3	3	2	3	2	3
CO5	demonstrate the various unsupervised learning algorithms	3	3	2	3	3	3

Syllabus

Unit	Title/Topics	Hours
I	**Introduction**	8
Introduction: Artificial Intelligence, AI Problems, AI Techniques, the Level of the Model, Criteria for Success. Defining the Problem as a State Space Search, Problem Characteristics, Production Systems, Search: Issues in the Design of Search Programs, Uninformed Search, BFS, and DFS. **Heuristic Search Techniques:** Generate and Test, Hill Climbing, Best-First Search, A* Algorithm, Problem Reduction, AO* Algorithm, Constraint Satisfaction, Means-Ends Analysis.		
II	**Knowledge Representation and Probabilistic Reasoning**	10
Knowledge Representation and Reasoning: Logical systems Knowledge Based systems, Propositional Logic Constraints, Predicate Logic First Order Logic, Inference in First Order Logic, Ontological Representations and applications. **Uncertainty and knowledge Reasoning:** Overview Definition of uncertainty, Bayes Rule Inference, Belief Network, Utility Based System, Decision Network.		
III	**Expert Systems and Machine Learning**	6+4=10
Part-A: Expert Systems: Architecture of expert systems, Roles of expert systems - Knowledge Acquisition - Meta knowledge, Heuristics. Typical expert systems - MYCIN, DART, XOON, Expert systems shells.		
Part-B: Machine Learning: Introduction of Machine Learning Concepts, Examples of Various Learning Paradigms Over fitting and train/set splits, Types of Machine Learning, Supervised, Unsupervised, Reinforcement Learning, Perspectives and Issues, Version Spaces, Finite and Infinite Hypothesis Spaces.		
IV	**Supervised Learning**	10
Supervised Learning: Learning a Class from Examples, Linear, Non-linear, Multi-class and Multi-label classification, Generalization error bounds: VC Dimension, Decision Trees: ID3. Linear Regression - model assumptions, regularization (lasso, ridge, elastic net), Classification and Regression Algorithms - Naïve Bayes, K-Nearest Neighbors, logistic regression, SVM, decision trees and random forest.		
V	**Unsupervised Learning**	10
Unsupervised Learning: Introduction to clustering, Hierarchical: AGNES, DIANA, Partitional: K-means clustering, K-Mode Clustering, Self-Organizing Map, Expectation Maximization, Gaussian Mixture Models, Principal components analysis (PCA), Subclass Discriminant Analysis (SDA), Factor Analysis.		
Textbooks		
1. Riche, Elaine., Knight, 2009. Artificial Intelligence, 3rd edition, TMH. 2. Ethem Alpaydin, Introduction to Machine Learning, MIT Press, 3rd Edition, PHI, 2014.		
References		
1. Russell, S. and Norvig, P. Artificial Intelligence - A Modern Approach, 3rd Edition, PHI, 2015. 2. Tom Mitchell, Machine Learning, McGraw Hill, 3rd Edition, 1997.		

DATA MINING AND DATA ANALYTICS

Course	B.Tech.-V-Sem.	L	T	P	C
Course Code	22CSPC53	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	PSO1
CO1	summarize fundamentals of data mining	3	2	3	3	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

Syllabus

Unit	Title/Topics	Hours
I	**Introduction to Data Mining**	8
Introduction to Data Mining: Kinds of Data, Data Mining Functionalities - Interesting Patterns, Task Primitives, Issues in Data Mining, Data Preprocessing.		
II	**Mining Frequent, Associations and Correlations**	10
Mining Frequent, Associations and Correlations: Basic Concepts, Frequent Itemset Mining Methods: Apriori Algorithm, Finding Frequent Itemsets by Confined Candidate Generation, FP-Growth, Generating Association Rules from Frequent Itemsets, Improving the Efficiency of Apriori, From Association Analysis to Correlation Analysis.		
III	**Classification and Clustering**	6+6=12
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.		
IV	**Data Definitions and Analysis Techniques**	10
Data Definitions: Introduction to statistical learning and R-Programming, Elements, Variables, Data structures, Data categorization, Levels of Measurement, Data management and indexing. **Analysis Techniques:** Introduction to statistical hypothesis generation and its types.		
V	**Testing Techniques**	8
Testing: Chi-Square test, t-Test, Z-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, 2nd 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.		

INFORMATION AND CYBER SECURITY

Course	B.Tech.-V-Sem.	L	T	P	C
Course Code	22CSPC54	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	PSO1
CO1	explain information and cyber security terminologies	2	2	2	3	2	3
CO2	apply cryptography for security networks	3	3	3	3	3	3
CO3	identify various cyber offences	3	3	3	3	3	3
CO4	use standards and cyber laws to enhance cyber security	3	3	3	3	3	3
CO5	illustrate the importance of security policies & IT Act	3	3	3	3	3	3

Syllabus

Unit	Title/Topics	Hours
I	**Introduction**	7
Essential Terminologies: Information security - Principles, Mechanisms, Network security models, NIA, Risks, Breaches, Threats, Attacks, Exploits. Information gathering. Incident response team, Reporting crime, Operating System attacks, Application attacks, cracking techniques, and financial frauds.		
II	**Cryptography**	10
Introduction to Cryptography, Message Authentication, Digital Signatures. Overview of Firewalls-Types of Firewalls, VPN Security, Security Protocols - security at the Application Layer- PGP and S/MIME, Security at Transport Layer- SSL and TLS, Security at Network Layer-IPSec.		
III	**Cryptanalysis and Cyber Offences**	7+7=14
Part-A: Open Source Tools: Implementation of Cryptographic techniques, OpenSSL, Hash Values Calculations MD5, SHA1, SHA256, SHA 512, introduction to Steganography.		
Part-B: Introduction to cyber offences, how criminals plan the attacks, social engineering, cyber stalking, cyber cafe and cybercrimes, Botnets, introduction to cloud security.		
IV	**Cyber Security Audit & Standards**	8
Risk assessment and management, asset classification, crisis management plan, resources recovery strategy, security testing, international standards, analysis and logging, security certification.		
V	**Security Policy & IT ACT**	9
Security policies, WWW policies, email security policies, policy review process- corporate policies, sample security policies, publishing and notification requirements of the policies. Cyber laws in India; IT Act 2000 provisions, Intellectual Property Law: Copyright law, software license and patent law.		
Textbooks		
1. William Stallings, "Cryptography and Network Security", Pearson Education/PHI, 2006. 2. Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Nina Godbole and Sunil Belapure, Wiley INDIA. 3. Chander, Harish, "Cyber Laws and IT Protection", PHI, New Delhi, India.		
References		
1. Charles P. Pfleeger, Shari Lawrence Pfleeger, "Analyzing Computer Security", Pearson. 2. Schou, Shoemaker, "Information Assurance for the Enterprise", TMH.		

DIGITAL MARKETING
(Professional Elective-I)

Course	B.Tech.-V-Sem.	L	T	P	C
Course Code	22CSPE51	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 and register a domain	3	2	3	3	3	3
CO5	apply digital marketing techniques in real time applications	3	3	3	3	3	3

Syllabus

Unit	Title/Topics	Hours
I	**Introduction**	8
Introduction to Digital Marketing, Start with the Customer and Work Backward, 3i Principles, Search Engine Optimization - An Introduction, Search Engine Result Pages: Positioning, Search Behavior, Goals, On-Page Optimization, Off-Page Optimization, Analyze. ***Task:*** *Perform a case study on digital marketing.*		
II	**Search Engine Optimization (SEO)**	8
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. ***Task:*** *Make a SEO friendly website design.*		
III	**Advertising & Marketing**	8+5=13
Part-A: Paid and Digital Advertising: Goals, Setup, Manage, Analyze, Digital display advertising - An Industry Overview - Define, Format, Configure, Analyze, Email Marketing, An Introduction - Data-Email Marketing Process, Design and Content, Delivery, Discovery. ***Task:*** *Perform a case study on email marketing.*		
Part-B: Social-Media and Mobile Marketing: Goals, Channels, Implementation, Analyze, Laws and Guidelines, Mobile marketing – Opportunity, Optimize, Advertise, Analyze. ***Task:*** *Implement social media marketing.*		
IV	**Website Essentials**	10
Domain Name Options, Domain Name Namespaces, Generic top-level domains, Country code top-level domains, Country code second-level domains, Buying Domain Names, Domain name size, Keyword-rich domain names, Nonsensical domain names, Domain registration period, Tapping into expired domain names, Buying existing domains, Utilizing the unsolicited approach, Domain name resellers. ***Task:*** *Perform a case study of Godaddy website.*		
V	**Applications**	9
Travel portal –Makemytrip, Yatra, IRCTC; E-commerce – Amazon, flipkart; Song portals – Wynk. ***Task:*** *Case study of travel / music / E-commerce based on website performance.*		
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, 2023.		
References		
1. SEO: Search Engine Optimization Bible Jerri L. Ledford; Wiley India; 2nd Edition, 2007.		

SOFT COMPUTING
(Professional Elective-I)

Course	B.Tech.-V-Sem.	L	T	P	C
Course Code	22CSPE52	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	PO7	PO12	PSO1
CO1	use search techniques in AI problems	3	2	2	2	2	3
CO2	describe various supervised learning techniques	3	2	3	3	2	3
CO3	apply special networks in soft computing problems	3	3	3	3	3	3
CO4	implement fuzzy systems in engineering applications	3	2	3	3	3	3
CO5	perform various operations of genetic algorithms	3	3	3	3	3	3

Syllabus

Unit	Title/Topics	Hours
I	**Introduction**	9
AI Problems, The Underlying Assumption, AI Techniques, The Level of the Model, Criteria for Success. Problems, Problem spaces and Search, Heuristic Search Techniques: Generate-and-test, Hill Climbing, Best First Search, Problem Reduction, Constant Satisfaction, Means Ends Analysis, Logic Rules. ***Task:*** *Write a Program to implement Best First Search.*		
II	**Supervised Learning Techniques**	10
Perceptron, Back Propagation Algorithm- classification. Problem Speech processing. Unsupervised learning Network- Introduction, Fixed Weight, Competitive Nets, MaxNet, Hamming Network, Kohonen self - organizing Feature Maps, Learning Vector Quantization. ***Task:*** *Write a program to implement artificial neural network with back propagation*		
III	**Special Networks**	5+5=10
Part-A: Boltzmann Machine, Gaussian Machine, Probabilistic Neural Net. ***Task:*** *Write a Program to implement Bayes Rule.*		
Part-B: Cellular Neural Network, Spatio-Temporal Connectionist Neural Network, Neuroprocessor Chips. ***Task:*** *Write a Program to implement a neural network.*		
IV	**Fuzzy Logic, Classical Sets and Fuzzy Sets**	10
Fuzzy Sets, Fuzzy Relations, Fuzzy Logic, Fuzzy Rule-Based Systems ***Task:*** *Write a Program to implement various operations on fuzzy sets.*		
V	**Genetic Algorithms**	9
Basic Concepts, Basic Operators for Genetic Algorithms, Crossover and Mutation Properties, Genetic Algorithm Cycle, Fitness Function, Applications of Genetic Algorithm. ***Task:*** *Write a Program to implement Simple Genetic Application.*		
Textbooks		
1. S. N. Sivanandam & S. N. Deepa, "Principles of Soft Computing", 3rd Edn, Wiley India, 2018.		
References		
1. Soft Computing – Advances and Applications B.K. Tripathy and J. Anuradha, Cengage Learning, Jan 2015. 2. Timothy J. Ross, "Fuzzy Logic with Engineering Applications", MGH International Editions, 1995.		

MIDDLEWARE TECHNOLOGIES
(Professional Elective-I)

Course	B.Tech.-V-Sem.	L	T	P	C
Course Code	22CSPE53	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	PSO1
CO1	explain the basic concepts of middleware elements	3	3	3	2	2	2
CO2	develop XML for a data source based website	3	3	3	3	3	2
CO3	make use of ASP.NET to implement database access	3	3	3	3	3	2
CO4	organize application and session states	3	3	3	3	2	2
CO5	demonstrate web services	3	3	3	3	3	2

Syllabus

Unit	Title/Topics	Hours
I	**Introduction**	6
Middleware: Learning from the history of ASP, reviewing the basics of ASP.NET platform, How web servers execute ASP files, Taking security precautions. Understanding ASP.NET Core, Handling requests with middleware pipeline. ***Task:*** *Perform a case study on middleware servers.*		
II	**ASP.NET Namespaces**	9
Reviewing the function of namespaces, using Microsoft. Visual basic namespace, understanding the root namespace: system, grouping objects and data types with the system, collections namespace, enabling client/browser communication with the System.Web Namespace, working with data sources using the system. Data namespace, processing XML files using the System.XML Namespace. ***Task:*** *Create a system server for communication.*		
III	**ASP Server Controls and Configuration**	9+7=16
Part A: ASP Server Controls: Major features of ASP.NET server controls, server-side processing in ASP.NET, code-behind versus in-page coding, using HTML server controls, using ASP.NET web controls, creating custom ASP server user controls. ***Task:*** *Make a list of HTML tags for server control.*		
Part B: Configuration: Overview of ASP.NET configuration, uses for a configuration file, anatomy of a configuration file. ***Task:*** *Check for the configuration of ASP.NET in a system.*		
IV	**ASP.NET Application**	9
Understanding ASP.NET Applications, managing state, analyzing Global.ajax, understanding application state, using application events, understanding session state, configuring sessions, using session events, comparing application and session states. ***Task:*** *Perform a case study of ASP.NET applications.*		
V	**Optimizing Caching Model and Web services**	8
Caching overview, output caching, fragment caching, data caching, best uses for caching, understanding web services, using XML in web services, an overview of the System.Web.Services Namespace, type marshalling, using datasets. ***Task:*** *Perform a case study on web services uses.*		
Textbook		
1. ASP.Net Developer's Guide. Turtschi, A., Werry, J., Hack, G., & Albahari, J., 2002, Elsevier.		
Reference		
1. Andrew Lock, ASP.NET Core in Action, Manning, 2018.		

IMAGE PROCESSING
(Professional Elective - I)

Course	B.Tech.-V-Sem.	L	T	P	C
Course Code	22CSPE54	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	PO7	PO12	PSO1
CO1	explain the fundamentals of image	3	2	2	2	3	3
CO2	illustrate image enhancement techniques	3	3	3	2	3	3
CO3	adapt image restoration to refine an image	3	3	3	3	3	3
CO4	use image processing color enhancement	3	2	2	3	3	3
CO5	demonstrate image segmentation & compression	3	2	2	3	3	3

Syllabus

Unit	Title/Topics	Hours
I	**Image Fundamentals**	10
Image Sensing and acquisition, image sampling and quantization, some basic relationship between pixels. An introduction to mathematical tools used in image processing, 2-D DFT, properties. Walsh transforms, Hadamard transforms. ***Task:*** *Perform a case study of image properties.*		
II	**Image Enhancement**	8
Some basic intensity transformation functions, histogram processing, smoothing and sharpening spatial filters, image smoothing and sharpening using frequency domain filters. ***Task:*** *Perform a case study on spatial filters.*		
III	**Image Restoration**	6+6=12
Part-A: A model of the image degradation, noise models, restoration in the presence of noise only. ***Task:*** *Make a list of image restoration techniques.*		
Part-B: Estimating the degradation function, inverse filtering, wiener filtering. ***Task:*** *Perform a case study on inverse filtering.*		
IV	**Color Image Processing**	8
Color models, pseudo color image processing, basics of full color image processing. ***Task:*** *Perform a case study on pseudo color image processing.*		
V	**Image Segmentation & Compression**	10
Point, Line and edge detection, thresholding – global and optimum global, region based segmentation, coding redundancy, spatial and temporal redundancy, image compression models. ***Task:*** *Perform a case study on image compression models.*		
Textbooks		
1. Digital Image processing: R.C. Gonzalez & R.E. Woods, Addison Wesley/ Pearson education, 3rd Edition, 2004. 2. Digital Image Processing: R.C. Gonzalez & R. E. Woods, Addison Wesley/ Pearson Education, 2nd Edition, 2002.		
References		
1. Fundamentals of Digital Image Processing: A. K. Jain, PHI. 2. Digital Image Processing using MAT LAB: Rafael C. Gonzalez, Richard E. Woods, Steven L. Eddins: Pearson Education India, 2004.		

ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING LAB

Course	B.Tech.-V-Sem.	L	T	P	C
Course Code	22CSPC55	-	-	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	PO9	PSO2
CO1	illustrate various search techniques	3	3	3	3
CO2	solve real-time problems using graph theory	3	3	3	3
CO3	use techniques of knowledge representation and probabilistic reasoning	3	3	3	3
CO4	design various supervised learning algorithms	3	3	3	3
CO5	implement various unsupervised learning algorithms	3	3	3	3

List of Experiments

Week	Title/Experiment
1	Write a program to implement BFS and DFS Traversal.
2	Write a program to implement A* Search.
3	Write a program to implement Travelling Salesman Problem and Graph Coloring Problem
4	Write a program to implement Knowledge Representation
5	Write a program to implement Bayesian Network.
6	Write a program to implement Hidden Markov Model.
7	Write a program to implement Regression algorithm
8	Write a program to implement decision tree based ID3 algorithm.
9	Write a program to implement K-Means Clustering algorithm.
10	Write a program to implement K-Nearest Neighbor algorithm (K-NN).
11	Write a program to implement Back Propagation Algorithm.
12	Write a program to implement Support Vector Machine.

References

1. Artificial Intelligence and Machine Learning Lab Manual, Department of CSE, CMRIT, Hyd.

Micro-Projects: Student should submit a report on one of the following/any other micro-project(s) approved by the lab faculty before commencement of lab internal examination.

1. Artificial Intelligence for Records Management.
2. Efficient, Scalable Processing of Patient Data using Artificial Intelligence.
3. Smart Bike Share Programs using Artificial Intelligence.
4. Automatic Document Classification using Bayesian theorem.
5. Artificial Intelligence in e-Commerce.
6. Diagnose crop disease with Machine Learning.
7. Develop a system to analyze buying behavior of a customer.
8. Develop a system to study sentiment of users on twitter.
9. Develop a predictive model to study the employee satisfaction in an organization.
10. Develop a predictive model to study the rainfall of your society.

DATA MINING AND DATA ANALYTICS LAB

Course	B.Tech.-V-Sem.	L	T	P	C
Course Code	22CSPC56	-	-	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	PO9	PSO2
CO1	make use of open source data mining and analytic tools	3	3	3	3
CO2	examine the interesting insights of Apriori algorithm using WEKA	3	3	3	3
CO3	demonstrate the classification and clustering techniques	3	3	3	3
CO4	analyze the concepts of data analytics and statistical testing methods	3	3	3	3
CO5	compare various kinds of regression techniques	3	3	3	3

List of Experiments

Week	Title/Experiment
	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
8	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.
9	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.
10	Write R program to find a) Time Series Analysis with the sample data and visualize the regression graphically. b) Non Linear Least Square with the sample data and visualize the regression graphically. c) Decision Tree with the sample data and visualize the regression graphically.
11	Write R program to find the following Distribution with the sample data and visualize the linear regression graphically. a) Normal Distribution b) Binomial Distribution
12	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
References	
1. Data Mining and Analytics Lab Manual, Department of CSE, CMRIT, Hyd.	
Micro-Projects: Student should submit a report on one of the following/any other micro-project(s) approved by the lab faculty before commencement of lab 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.	

INFORMATION AND CYBER SECURITY LAB

Course	B.Tech.-V-Sem.	L	T	P	C
Course Code	22CSPC57	-	-	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	PO9	PSO2
CO1	explain concepts of cryptanalysis	3	3	3	3
CO2	Examine different vulnerability attacks	3	3	3	3
CO3	illustrate Wi-Fi security techniques	3	3	3	3
CO4	Able to do malware analysis.	3	3	3	3
CO5	Able to configure simple firewall and IT audit	3	3	3	3

List of Experiments

Week	Title/Experiment
1	Cryptanalysis of Caesar Cipher using frequency analysis.
2	Cryptanalysis of RSA.
3	Examination of a website to test the vulnerability of attacks. – DVWA setup & SQLi.
4	Examination of a website to test the vulnerability of attacks. – XSS & CSRF & command line injection attack.
5	Implement firewall for an organization.
6	Implement Wi-Fi security (WPA2, IP based, MAC Based).
7	Analyze and exploit the root system of CMROS.
8	Implementing and analyzing target using Metasploit and gain control over the system.
9	Implementation of IT Audit, malware analysis and vulnerability assessment and generate the report.
10	Test security of UPI applications on desktop sharing applications.

References

1. Information and Cyber Security Lab Manual, Department of CSE, CMRIT, Hyd.

Micro-Projects: Student should submit a report on one of the following/any other micro-project(s) approved by the lab faculty before commencement of lab internal examination.

1. Survey for accessing the cyber-attack awareness of members in an organization.
2. Study of 2 real times cybercrime cases.
3. Implement SSL in a website.
4. Securing the files of a server on root folder for unauthorized access.
5. Use rules to protect your content and prevent data leaks to unauthorized users in email server.
6. Use detectors within a rule to identify sensitive content.
7. Analyze and prepare a report from Sent and received email report in Office 365 admin.
8. Monitor top email senders and receivers in an organization using office 365 admin
9. Configure anti malware in email server (office 365).
10. Add DKIM signatures to your domains so recipients know that email messages actually came from users in your organization and weren't modified after they were sent.

AUTOMATED WRITING TOOLS - ChatGPT

Course	B.Tech.-V-Sem.	L	T	P	C
Course Code	22CSPC58	-	-	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	PO8	PO9	PO12	PSO2
CO1	develop content using ChatGPT	3	3	3	3	3	3	3
CO2	plan data simulation using ChatGPT	3	3	3	3	3	3	3
CO3	sketch images using ChatGPT	3	3	3	3	3	3	3
CO4	take a part in validation of data using ChatGPT	3	3	3	3	3	3	3
CO5	modify research content using ChatGPT	3	3	3	3	3	3	3

List of Experiments

Week	Title/Experiment
Using Automated Writing Tools - ChatGPT	
1	Conduct a mock-interview.
2	Simulate of a bunch of Helium molecules.
3	Implement natural language processing in multi sentence conversation.
4	Create election campaign content.
5	Edit and change text that makes it useful for customer service.
6	Carry out python code translation.
7	Execute python code cleaning.
8	Enact Cross-Lingual Conversations.
9	Sketch scientific image.
10	Improvise a research paper.

References

1. Automated Writing Tools - ChatGPT Manual, Department of CSE, CMRIT, Hyd.

Micro-Projects: Student should submit a report on one of the following/any other micro-project(s) approved by the lab faculty before commencement of lab internal examination.

1. Fraud Detection System Using Sentiment Analysis.
2. Personalized Recommendation Engine Using Machine Learning.
3. Marketing Analytics Platform Using Predictive Models.
4. Image Recognition System Using Computer Vision Algorithms.
5. Marketing Analytics Platform Using Predictive Models.
6. Text generation for creative writing.
7. Draft Lawsuits for Spam Callers.
8. Summarize Text Intelligently.
9. Offer Personalized Recommendations.
10. Text generation for Social Media.

ADVANCED ENGLISH COMMUNICATION SKILLS LAB

Course	B.Tech.-V-Sem.	L	T	P	C
Course Code	22HS51	-	-	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	PO9	PO10
CO1	assess and utilize vocabulary in an effective way	3	3	3
CO2	interpret interpersonal relationships	3	3	3
CO3	elaborate academic reading and writing skills	3	3	3
CO4	formulate appropriate communication techniques in various contexts	3	3	3
CO5	adapt to different work-place and socio-cultural scenarios	3	3	3

List of Experiments

Week	Title/Experiment
1	Self-Introduction, Role Play, Simple Exercises on Personality Development, Vocabulary Test.
2	Non-Verbal Communication & Personality-Development - Self Assessment- Attitude - Self-Esteem.
3	Synonyms and Antonyms, One-word Substitutes, Prefixes and Suffixes, Idioms, Phrases, Collocations, Technical Vocabulary.
4	Reading Skills - General Vs Local Comprehension - Reading for Facts & Details - Understanding Pictures, Figures and Graphs - Guessing Meaning from Context - Skimming, Scanning, Inferring Meaning.
5	Unseen Passages on Various Topics for Reading Comprehension.
6	Different Types of Writing - Formal Letter Writing - Cover Letter - Resume - Email - Memos - SOP.
7	Technical Reports, Research Proposals, Thesis Writing (Abstract, Synopsis, Thesis Statement, Conclusion, etc.) - Editing - Understanding Plagiarism and its Tools.
8	Presentations - Styles (Oral and Written) - Tools - Info-graphics - Cross-Cultural Communication.
9	Oral Presentations (Audience-Centered, JAMs, Seminars, etc.) Written Presentations (Posters, PPTs, Pictures, etc.)
10	Dynamics of Group Discussion - Organization of Ideas - Rubrics of Evaluation.
11	GD Sessions for Practice.
12	Interview Skills - Do's & Don'ts pre, during & post Interview Techniques - Research about Job Profile and Mock Interviews.

References

1. Advanced English Communication Skills Lab Manual, FED, CMRIT, Hyd.

Micro-Projects: Student should submit a report on one of the following/any other micro-project(s) approved by the lab faculty before commencement of lab 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

ENVIRONMENTAL SCIENCE & DISASTER MANAGEMENT
MANDATORY COURSE (NON-CREDIT)

Course	B.Tech.-V-Sem.	L	T	P	C
Course Code	22MC51*	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	explain the role of ecosystem for livelihood	3	3	3	2
CO2	interpret methods to sustain environmental resources	3	3	3	2
CO3	identify solutions for sustainable development and pollution control	3	3	3	2
CO4	analyze various types of disasters	3	3	3	3
CO5	develop strategies for preparedness measures against disasters	3	3	3	2

Syllabus

Unit	Title/Topics	Hours
I	**Ecosystem**	6
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. ***Task:*** *Perform a case study on Biogeochemical cycles (Carbon/Nitrogen Cycles).*		
II	**Natural Resources**	6
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. ***Task:*** *Perform a case study on any one of renewable energy resources.*		
III	**Pollution control & Sustainable Development**	4+4=8
Part A: Environmental Pollution Control Technologies: Air, water & soil pollution control technologies; MSW & E. Waste Management, EIA concept, Environmental Audit; EPA Acts. ***Task:*** *Perform a case study on environmental audit.*		
Part B: Sustainable Development: Climate Change**: c**auses, effects, global warming, carbon footprint and environmental protection: brief idea on sustainable development: sustainable development concept, Sustainable Development Goal (SDGs), steps taken towards sustainable development: management of plastics, automobile scrapping policy and promotion of electrical vehicles. ***Task:*** *Perform a case study on sustainable development goals.*		
IV	**Disaster Management**	6
Types of Disasters: Natural and Man-made and their cause and effect, Vulnerability Assessment and Risk Analysis: Vulnerability to various disasters (Flood, Cyclone, Earthquake, Heat waves and Lightning). Institutional Framework: Institutional arrangements for disaster management - National Disaster Management Authority (NDMA), State Disaster Management Authority (SDMA), District Disaster Management Authority (DDMA) and National Disaster Response Force (NDRF). ***Task:*** *Perform a case study on any one of the institutional arrangements for disaster management.*		
V	**Preparedness Measure**	6
Disaster Management Cycle, Early Warning System, Pre-Disaster and Post-Disaster Preparedness, Strengthening of SDMA and DDMA, Community Preparedness, Stakeholder Participation, Corporate Social Responsibility (CSR), Survival Skills: Survival skills adopted during and after disaster Flood, Cyclone, Earthquake, Heat waves and Lightning. ***Task:*** *Prepare a case study on proactive and reactive disaster management plans.*		
Textbooks		
1. Environmental Science by Y. Anjaneyulu, B S Publications, 2004. 2. Climate Change Society & Sustainable Development, Jain Indu, Times Group, 2010. 3. Manual on Disaster Management, National Disaster Management Agency, Govt. of India.		

VI-SEM. SYLLABUS

IOT AND CLOUD COMPUTING

Course	B.Tech.-VI-Sem.	L	T	P	C
Course Code	22CSPC61	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	PO7	PO12	PSO1
CO1	explain the concepts of IoT	3	2	3	3	3	3
CO2	illustrate the foundations of IoT	3	2	3	3	3	3
CO3	adapt protocol and standards of IoT	3	3	3	3	3	3
CO4	outline the importance of cloud in IoT	3	3	3	3	3	3
CO5	make use of cloud in IoT enabled spaces	3	2	3	3	3	3

Syllabus

Unit	Title/Topics	Hours
I	**Introduction**	10
Introduction to Internet of Things, IoT Kaleidoscope, Ubiquitous IoT Applications**,** A Panoramic View of IoT Applications, Telematics and Intelligent Transport Systems, Smart Grid and Electric Vehicles, Smarter Planet and Smart Buildings.		
II	**Pillars and DNA of IoT**	10
Four Pillars of IoT, M2M: The Internet of Devices, RFID: The Internet of Objects, WSN: The Internet of Transducers, SCADA: The Internet of Controllers, The DNA of IoT - DCM: Device - Things that Talk. Connect - Via Pervasive Networks, Wired Networks, Wireless Networks. Manage - To Create New Business Value.		
III	**Smart Home Scheduling and Cloud Computing**	4+5=9
Part-A: Protocol Standards for IoT: TCP and UDP, M2M and WSN Protocols, SCADA and RFID Protocols, Issues with IoT Standardization.		
Part-B: Architecture Standardization for WoT: Platform Middleware for WoT, Standards for M2M, Frameworks for WSN, Standards for SCADA, Extensions on RFID Standards, Unified Multitier WoT Architecture, OSGi: The Universal Middleware, WoT Framework Based on Data Standards.		
IV	**The Cloud of Things**	10
Introduction to Cloud Computing, Cloud Middleware, NIST's SPI Architecture and Cloud Standards, Cloud Providers and Systems, The Cloud of Things, The Internet of Things and Cloud Computing, Mobile Cloud Computing, MAI versus XaaS: The Long Tail and the Big Switch, The Cloud of Things Architecture, Four Deployment Models, Vertical Applications.		
V	**Cloud in IoT Enabled Spaces**	9
Medium Access, Data Caching, Smart Parking, Indecision Service Delivery, Home, Learning in Cities', Data Delivery Pricing, Planting & Farming.		
Textbooks		
1. H. Zhou, "The Internet of Things in the Cloud: A Middleware Perspective", CRC Press, 2012. 2. Maheswaran, Muthucumaru et.al., "The Cloud in IoT-enabled Spaces", CRC Press, 2019.		
References		
1. HwaiyuGeng, "Internet of Things and Data Analytics Handbook", Wiley, 2016. 2. Al-Turjman, Fadi, "Trends in Cloud-based IoT", Springer, 2020.		

ROBOTIC PROCESS AUTOMATION

Course	B.Tech.-VI-Sem.	L	T	P	C
Course Code	22CSPC62	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	PSO1
CO1	outline the basics of RPA	3	3	3	3	3
CO2	implement RPA	3	3	3	3	3
CO3	demonstrate RPA tools and automation techniques	2	2	3	3	3
CO4	adapt RPA BOT Models	3	3	3	3	3
CO5	execute Orchestrator	3	3	3	3	3

Syllabus

Unit	Title/Topics	Hours
I	**Introduction to Automation & Robotic Process Automation**	9
Automation and History - RPA vs Automation - Business Processes & Use Cases- Scope & Limitations of RPA with Real world Industry use cases-Various Types of RPA Implementation Methodologies – RPA Centre of Excellence - Standardization of processes – Automation Life Cycle - Difference from SDLC - Robotic control flow architecture.		
II	**RPA Initiation & Implementation**	10
Initiation of RPA- Limitations & factors affecting in Implementing the RPA at the enterprise level - Environments setup for RPA Implementation- Infra types to implement the RPA – Automation Life Cycle in detail- RPA Feasibility Analysis- Process Design Document/Solution Design Document - Industriesbest suited for RPA Implementation - Risks & Challenges with RPA - RPA and an emerging ecosystem- Leaders in RPA - Future of RPA.		
III	**RPA Tools and Automation**	5+5=10
Part-A: Introduction to RPA Tool Uipath & Basics The User Interface - Variables - Managing Variables - Selectors- Type of Selectors- Customizing the Selectors-RPA Project Maintenance – Arguments-Managing Arguments - Control Flow Activities & Importance - Data Manipulation- Data Manipulation Introduction - Scalar variables, collections and Tables - Data Manipulation - Gathering and Assembling Data.		
Part-B: Advanced Automation concepts & Techniques: Recorders in Uipath - Input/Output Method- Debugging - RPA Challenge - Image, Text & Advanced Citrix Automation - Introduction to Image & Text Automation - Keyboard based automation -Advanced Citrix Automation challenges –PDF Automation- App Integration & Excel Automation- Email Automation & Database Automation.		
IV	**RPA BOT Models -Exception Handling**	9
RPA BOT Models: Attended Vs Unattended Bots- Monitor Events Triggers for Attended Automation. **Exception Handling:** Debugging and Exception Handling - Debugging Tools & best practices. **Deploying and Maintaining the BOT:** Publishing the Automation solution using publish utility - creating a provision robot from the server - connecting a robot to server - deploy the robot to server.		
V	**Orchestrator**	10
UiPath Orchestrator Introduction-Robots Configuration and Management-Connecting Robots to Orchestrator- Environment Configuration & Management -Managing Packages-Managing Processes-Managing Assets in Orchestrator and Studio -Managing Schedules & triggers -Managing Logs in Orchestrator- Practical use case scenarios.		

Textbooks

1. Robotic Process Automation: Guide To Building Software Robots, Automate Repetitive Tasks & Become An RPA Consultant - Tom Taulli.
2. Becoming Strategic with Robotic Process Automation, L.P. Willcocks, J.Hindle, M.C. Lacity.
3. Robotic Process Automation Projects: Build real-world RPA solutions using UiPath and Automation Anywhere - by Nandan Mullakara.
4. Learning Robotic Process Automation by Alok Mani Tripathi, Packt Publishing, 2018.

DEVOPS

Course	B.Tech.-VI-Sem.	L	T	P	C
Course Code	22CSPC63	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	PSO1
CO1	summarize DevOps and continuous delivery concepts	3	3	3	3	3
CO2	explain DevOps architecture	3	3	3	3	3
CO3	articulate source code control in system building	3	2	3	3	3
CO4	take part in server building	3	3	3	3	3
CO5	plan automation and system testing	3	2	3	3	3

Syllabus

Unit	Title/Topics	Hours
I	**Introduction**	8
Introduction to DevOps and Continuous Delivery, The Agile wheel of wheels, DevOps and ITIL, The DevOps process and Continuous Delivery – an overview, Release management, Scrum, Kanban, and the delivery pipeline, bottlenecks, examples.		
II	**DevOps influence on Architecture**	7
Introducing software architecture, The monolithic scenario, Architecture rules of thumb, The separation of concerns, Handling database migrations, Micro-services, and the data tier, DevOps, architecture, and resilience.		
III	**Source Code Control and System Building**	9+8=17
Part-A: Source Code Control: need, history, Roles and code, source code management system and migrations, Shared authentication, Hosted Git servers, Different Git server implementations, Docker intermission, Gerrit, The pull request model, GitLab.		
Part-B: System Building: Build systems, Jenkins build server, managing build dependencies, Jenkins plugins, and file system layout, The host server, build slaves, Software on the host, Triggers, Job chaining and build pipelines.		
IV	**Server Building and Testing**	7
Build servers and infrastructure as code, building by dependency order, Build phases, Alternative build servers, Collating quality measures, Various types of testing, Automation of testing Pros and cons, Selenium.		
V	**Testing Tools and automation**	9
Selenium features, JavaScript testing, Testing backend integration points, Test-driven development, REPL-driven development Deployment of the system: Deployment systems, Virtualization stacks, code execution at the client, Puppet master and agents, Ansible, Deployment tools: Chef, SaltStack and Docker.		
Textbooks		
1. Joakim Verona. Practical DevOps, Ingram short title, 2nd Edn., 2018, ISBN- 10: 1788392574.		
References		
1. Len Bass, Ingo Weber, Liming Zhu. DevOps: A Software Architect's Perspective. Addison Wesley; ISBN-10. 2. Deepak Gaikwad, Viral Thakkar. DevOps Tools from Practitioner's Viewpoint. Wiley publications. ISBN: 9788126579952.		

DATA SCIENCE AND BIG DATA ANALYTICS
(Professional Elective – II)

Course	B.Tech.-VI-Sem.	L	T	P	C
Subject Code	22CSPE61	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	PSO1
CO1	explain the basics of data science and big data analytics	3	3	3	3	3	3
CO2	illustrate exploratory data analysis	3	3	3	3	3	3
CO3	use advanced analytical theory and methods	3	3	3	2	2	3
CO4	sketch SQL commands for big data	3	3	3	3	3	3
CO5	describe data visualization	3	3	3	3	3	3

Syllabus

Unit	Title/Topics	Hours
I	**Introduction to data science and big data analytics**	9
Big data overview - Data structures, Analyst perspective, State of the perspective in analytics, Drivers of Big data, Emerging big data ecosystem, Data analytics life cycle - Key roles, background, Discovery, Learning the business domain, resources, framing the problem, identifying key stakeholders. Data preparation, preparing the analytic sandbox, performing ETLT, Learning about the data, Data conditioning Identifying potential data sources. ***Task:*** *Perform a case study of Big data analytics in the travel industry.*		
II	**Model Planning & Data Analytics**	8
Data exploration and variable selection, Model selection, Common tools for the models planning phase, Model building - Common tools for the models building phase, Communicate results, Operationalize, Introduction to R, Exploratory data analysis, Statistical methods for evaluation, Hypothesis testing, Difference of means, Wilcoxon rank sum test, ANOVA. ***Task:*** *Perform a case study of global innovation network and analysis (GANA).*		
III	**Advanced analytical theory and methods**	7+7=14
Part-A: Text analysis: Text analysis steps, Collecting raw text, Representing text, Term frequency - Inverse document frequency (TFIDF), Categorizing document by topics, Determining sentiments, Gaining insights. ***Task:*** *List of the benefits of topic categorization.*		
Part-B: MapReduce and Hadoop: Analysis of unstructured data - Use cases, MapReduce, Apache Hadoop, The Hadoop system, Pig, Hive, HBase, Mahout, NOSQL. ***Task:*** *Perform a case study of the Hadoop system functions.*		
IV	**In-Database Analytics and Final Deliverables**	10
SQL essentials-Joins, Set operations, Grouping extension, In-Database text analytics, Advanced SQL - Window functions, User defined functions and aggregates, Ordered aggregates, MADlib, Developing core material for multiple audiences - Project goals, Main findings, Approach, Model description, Key points supported with data, Model details. ***Task:*** *Write SQL commands for retrieving the data from a complex database.*		
V	**Data visualization**	7
Basics of data visualization, Key points supported with data, Evolution of a graph, Common representation methods, How to clean up a graphic, additional considerations. ***Task:*** *Perform a case study of Data visualization.*		
Textbook		
1. Data Science and Big Data Analytics Discovering, Analyzing, Visualizing and Presenting Data, EMC Education Services, 2015		

NATURAL LANGUAGE PROCESSING
(Professional Elective -II)

Course	B.Tech.-VI-Sem.	L	T	P	C
Subject Code	22CSPE62	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	PSO1
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

Syllabus

Unit	Title/Topics	Hours
I	**Overview and Morphology**	9
Introduction: Models and Algorithms - Regular Expressions - Basic Regular Expression Patterns - Finite State Automata. **Morphology:** Inflectional Morphology - Derivational Morphology - Finite-State Morphological Parsing -Porter Stemmer. ***Task:*** *Convert the text into tokens.*		
II	**Word Level and Syntactic Analysis**	10
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. ***Task:*** *Find the word frequency.*		
III	**Context Free Grammars and Parsing**	5+4=9
PART-A: Context Free Grammars for English Syntax- Context- Free Rules and Trees – Sentence-Level Constructions– Agreement – Sub Categorization. ***Task:*** *Find the synonym of a word using WordNet*		
PART-B: Parsing – Top-down – Earley Parsing - feature Structures – Probabilistic Context-Free Grammars. ***Task:*** *Resolve the ambiguity.*		
IV	**Semantic Analysis**	10
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 ***Task:*** *Implement semantic role labeling to identify named entities.*		
V	**Language Generation and Discourse Analysis**	10
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. ***Task:*** *Create a chatbot for CMRIT.*		
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.		
References		
1. James Allen, Natural Language Understanding, Addison Wesley; 2nd Edition, 1994.		

ADVANCED MACHINE LEARNING
(Professional Elective - II)

Course	B.Tech.-VI-Sem.	L	T	P	C
Subject Code	22CSPE63	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	PSO1
CO1	use Deep belief networks and CNN	3	3	2	2	3	3
CO2	classify autoencoders and CNN	3	3	3	2	2	3
CO3	illustrate semi-supervised learning and categorization	3	3	3	3	3	3
CO4	apply feature engineering	3	3	3	3	2	3
CO5	design application using ensemble methods	3	2	2	2	2	3

Syllabus

Unit	Title/Topics	Hours
I	**Unsupervised Machine Learning & Deep Belief Networks**	8
Principal component analysis, Introducing K-means clustering, self-organizing maps. Deep Belief Networks: Neural networks - a primer, composition of a neural network, network topologies, Restricted Boltzmann Machine, Introducing the RBM, Applications of the RBM, Further applications of the RBM, Deep belief Networks-Training a DBN, Applying the DBN, Validating the DBN. ***Task:*** *Perform a case study of network topologies.*		
II	**Stacked Denoising Autoencoders & Convolutional Neural Networks**	8
Autoencoders, Topology, Training, Denoising autoencoders, Applying a dA, Stacked Denoising Autoencoders, Applying the SdA, Assessing SdA performance Convolutional Neural Networks: Introduction to CNN, Understanding the convnet topology, understanding convent layers and pooling layers, training a convent, Applying a CNN. ***Task:*** *Perform a case study of autoencoders.*		
III	**Semi-Supervised Learning and Text Feature Engineering**	8+8=16
Part-A: Semi-Supervised Learning: Introduction, understanding semi-supervised learning, Semi-supervised algorithms in action, Self-training, implementing self-training, Finessing your self-training implementation, Contrastive Pessimistic Likelihood Estimation. ***Task:*** *Perform a case study of semi-supervised learning.*		
Part-B: Text Feature Engineering: Text Feature Engineering: Introduction, Text feature engineering, Cleaning text data, Text cleaning with Beautiful Soup, managing punctuation and tokenizing, Tagging and categorizing words, creating features from text data, stemming, Bagging and random forests, Testing our prepared data. ***Task:*** *Perform text cleaning.*		
IV	**Feature Engineering**	9
Introduction, creating a feature set, Engineering features for ML applications, using rescaling techniques to improve the learnability of features, creating effective derived variables, reinterpreting non-numeric features, using feature selection techniques, Performing feature selection, Feature engineering in practice, Acquiring data via RESTful APIs. ***Task:*** *Make a list of important features of ML applications.*		
V	**Ensemble Methods & Additional Python Machine Learning Tools**	7
Introducing ensembles, understanding averaging ensembles, using bagging algorithms, using random forests, applying boosting methods, Using XGBoost, Using stacking ensembles, Applying ensembles in practice, Using models in dynamic applications, Understanding model robustness, Identifying modeling risk factors, Strategies to managing model robustness. ***Task:*** *Perform a case study on the utility of Python in Machine Learning.*		
Textbook		
1. John Hearty, Advanced Machine Learning with Python, Packt Publishing Ltd, 2016.		

BLOCKCHAIN AND CRYPTOCURRENCY
(Professional Elective -II)

Course	B.Tech.-VI-Sem.	L	T	P	C
Course Code	22CSPE64	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	PSO1
CO1	explain the fundamentals of Blockchain techniques	3	2	2	3	3	3
CO2	analyze various consensus problems	3	3	3	3	3	3
CO3	adapt Blockchain technology to improve business	3	3	3	3	3	3
CO4	make use of ethereum frameworks to write smart contract	3	3	3	3	3	3
CO5	interpret Blockchain technology in real time applications	3	3	3	3	3	3

Syllabus

Unit	Title/Topics	Hours
I	**Introduction**	10
Introduction to Blockchain: Basics, History, Architecture, Conceptualization, Blockchain components, Creation of blocks, Merkle Tree, Gas Limit, Transactions, Bitcoin basics, characteristics of cryptocurrencies, Altcoins (Alternative cryptocurrencies), Peer-to-Peer Networks, Distributed Ledger Technology, Blockchain types: Public, Private, and Hybrid Blockchain. ***Task:*** *Blockchain architecture demo, installation, and usage of Cryptocurrency wallets.*		
II	**Mining and Consensus Protocols**	8
Miners, Bitcoin Mining, Consensus Protocols: Miners in Bitcoin network, steps in Bitcoin mining, Bitcoin – Wallet, hardness of mining - transaction verifiability - anonymity - forks - double spending - mathematical analysis of properties of Bitcoin, Bitcoin scripts. Distributed Consensus. ***Task:*** *Bitcoin wallet and querying API to get real time transactions.*		
III	**Consensus in Bitcoin and Ethereum**	6+6=12
Part-A: Consensus in Bitcoin: The basics, Proof of Work (PoW), 51% attacks on Bitcoin network, Sybil attacks, Proof of Stake (PoS), PoW vs PoS and Beyond, Miners in Blockchain, Permissioned Blockchain (Basics, Consensus), Permissioned Blockchain (RAFT Consensus, Byzantine General Problem, Practical Byzantine Fault Tolerance), Proof-of-authority. ***Task:*** *Installation and mining using GETH.*		
Part-B: Ethereum Blockchain: Characteristics of Ethereum Blockchain, Ethereum Virtual Machine (EVM)-Wallets for Ethereum: Ether and MetaMask wallets, Smart Contracts, introduction to Solidity programming, key concepts in solidity: value types, arrays, functions, structs and solidity mapping, building the Blockchain based decentralized applications (Dapps). ***Task:*** *Designing and deploying solidity contracts on Ethereum Blockchain.*		
IV	**Transform Business with Blockchain**	8
Hyperledger Frameworks: Introduction to Hyperledger fabric, Indy, Aries, Quilt, Ursa, and Caliper. Hyperledger Fabric – Transaction Flow, Hyperledger Fabric Details, Fabric – Membership and Identity Management, Hyperledger Fabric Network Setup. ***Task:*** *Installation of Hyperledger Aries and Indy demo.*		
V	**Blockchain trends and use cases**	10
Non-fungible Tokens (NFTs), Decentralized Autonomous Organization (DAOs), Soulbound Tokens (SBT), Zero Knowledge proofs, layer-2 protocols: Optimism and ZK-rollups, Para chains, substrate Blockchain. Blockchain industry use cases: Market place, supply chain, decentralized identity using Blockchain, Blockchain based certificate management, Blockchain-based E-voting, Dune analytics. ***Task:*** *Building decentralized applications (DApps) using Blockchain.*		

Textbooks

1. Narayanan, Arvind, et al. Bitcoin and Cryptocurrency technologies: A comprehensive introduction. Princeton University Press, 2016.
2. Thompsons, Josh. "Blockchain: The Blockchain for Beginners Guide to Blockchain Technology and Leveraging Blockchain Programming.", 2017.

E-COMMERCE
(Open Elective - I)

Course	B.Tech.-VI-Sem.	L	T	P	C
Course Code	22OE61	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	PO8	PO9	PO10	PO12
CO1	outline the concepts of E-Commerce	3	2	2	3	3
CO2	develop supporting environment for E-Commerce	3	2	3	3	3
CO3	make use of technology in E-Commerce	3	3	3	3	3
CO4	adapt payment technologies in E-Commerce	3	3	3	3	3
CO5	implement security in E-Commerce	3	3	3	3	3

Syllabus

Unit	Title/Topics	Hours
I	**Introduction**	7
The origin and development of e-commerce influence of mathematics on e-commerce, impact of computer science, communication science and management science on e-commerce, categories of e-commerce - B2B, B2C, B2G, G2G, C2C. ***Task:*** *Outline the importance of management in e-commerce.*		
II	**Constitution, Supporting Environment and M-Commerce**	10
Portal of the network, customer relationship management, supply chain management, logistic management, decision support, technical environment, legal environment, credit environment, financial environment. Origin of M-Commerce, M-Commerce components, development and applications of M-Commerce. ***Task:*** *Perform a case study on the supporting environment of E-commerce.*		
III	**Technology**	7+7=14
Part-A: E-commerce supporting technologies: E-Commerce fundamental technology - Web technology, HTML, XML, Java, Computer communication technology - TCP/IP protocols, HTTP Communication protocol, EDI Communication protocol, WAP Communication protocol, WLAN protocol, Bluetooth protocol. ***Task:*** *Perform a case study of e-commerce supporting technologies.*		
Part-B: Information processing technologies in E-Commerce - Global positioning system, Geographical information system, Decision supporting system, Group decision supporting system, Intelligent decision supporting system. ***Task:*** *Perform a case study on a global positioning system.*		
IV	**Payment Technologies in E-Commerce**	9
Online bank - Development of online banks, Function of online bank, Online banking technologies, E-Payment tools - E-Payment system, Intelligent card, E-Check, E-Wallet, E-Cash. ***Task:*** *Make a list of payment technologies in E-commerce.*		
V	**Security Technologies in E-Commerce**	8
Security problems in e-commerce, Reliability of e-commerce systems, Data encryption technology, - Symmetric encryption system, public key encryption algorithm, Mixed encryption technology, Digital signature - Sign the document with public key algorithm, Signature with one way hash function and public key system. ***Task:*** *Sign the document with a public key algorithm.*		
Textbooks		
1. Zheng Qin, Introduction to E-commerce, Springer. 2. Ravi Kalakota, Andrew Winston, "Frontiers of Electronic Commerce", Addison Wesley.		
References		
1. Pete Lohsin , John Vacca "Electronic Commerce", New Age International. 2. Goel, Ritendra "E-commerce", New Age International. 3. Laudon, "E-Commerce: Business, Technology, Society", Pearson Education.		

AGILE METHODOLOGIES
(Open Elective - I)

Course	B.Tech.-VI-Sem.	L	T	P	C
Course Code	22OE62	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
CO1	explain the concepts of agile methodology	3	2	3	3	3
CO2	make use of agile process	3	3	3	3	3
CO3	illustrate agility and knowledge management	3	3	3	3	3
CO4	adapt agility and requirements engineering	3	3	3	3	3
CO5	outline the importance agility and quality assurance	3	2	3	3	3

Syllabus

Unit	Title/Topics	Hours
I	**Agile Methodology**	8
Theories for agile management - agile software development - traditional model vs. agile model-classification of agile methods - agile manifesto and principles - agile project management - agile team interactions - ethics in agile teams - agility in design, testing - agile documentations - agile drivers, capabilities and values. ***Task:*** *Perform a case study on agile project management.*		
II	**Agile Processes**	8
Lean production SCRUM, crystal, feature driven development, adaptive software development, extreme programming: method overview, lifecycle, work products, roles and practices. ***Task:*** *Perform a case study on Extreme programming.*		
III	**Agility and Knowledge Management**	8+6=14
Part-A: Agile information systems - agile decision making – Earl_S schools of KM - Institutional knowledge evolution cycle - development, acquisition, refinement, distribution, deployment. ***Task:*** *Perform a case study on institutional knowledge evaluation cycle.*		
Part-B: Leveraging - KM in software engineering - managing software knowledge - challenges of migrating to agile methodologies - agile knowledge sharing - role of story-cards - Story-card Maturity Model (SMM). ***Task:*** *Perform a case study on challenges of migrating to agile methodologies.*		
IV	**Agility and Requirements Engineering**	9
Impact of agile processes in RE - current agile practices - variance - overview of RE using agile - managing unstable requirements - requirements elicitation - agile requirements abstraction model - requirements management in agile environment, agile requirements prioritization - agile requirements modeling and generation - concurrency in agile requirements generation. ***Task:*** *Perform a case study on agile requirements modeling and generation.*		
V	**Agility and Quality Assurance**	9
Agile product development - agile metrics - Feature Driven Development (FDD) - Financial and Production Metrics in FDD - agile approach to quality assurance - test driven development agile approach in global software development. ***Task:*** *Perform a case study on FDD.*		
Textbooks		
1. David J. Anderson and Eli Schragenheim, - Agile Management for Software Engineering: Applying the Theory of Constraints for Business Results, Prentice Hall, 2003. https://www.amazon.com/Agile-Management-Software-Engineering-Constraints/dp/0131424602 2. Hazza and Dubinsky, - Agile Software Engineering, Series: Undergraduate Topics in Computer Science, Springer, 2009.		
References		
1. Craig Larman - Agile and Iterative Development: A Manager_s Guide, Addison-Wesley, 2004. 2. Kevin C. Desouza - Agile Information Systems: Conceptualization, Construction and Management, Butterworth-Heinemann, 2007.		

ELECTRONIC SENSORS
(Open Elective-I)

Course	B.Tech.-VI-Sem.	L	T	P	C
Course Code	22OE63	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	PO7	PO8	PO12
CO1	analyze the characterization of sensors	3	3	2	2	3	3
CO2	illustrate thermal embedded system	3	2	3	3	3	3
CO3	adapt magnetic sensors	3	3	3	2	3	3
CO4	make use of radiation sensors	3	3	3	2	3	3
CO5	design a system with sensors	3	2	3	2	3	3

Syllabus

Unit	Title/Topics	Hours
I	**Introduction to Sensors**	9
Sensors/Transducers: Principles, classification, parameters, characteristics, environmental parameters (ep), characterization. **Electromechanical Sensors:** Introduction, resistive potentiometer, strain gauge, resistance strain gauge, semiconductor strain gauges -inductive sensors: sensitivity and linearity of the sensors, types of capacitive sensors: electrostatic transducer, force/stress sensors using quartz resonators, ultrasonic sensors. ***Task:*** *Perform a case study on linear variable differential transformer (LVDT).*		
II	**Thermal Sensors**	10
Thermal Sensors: Introduction, gas thermometric sensors, thermal expansion type thermometric sensors, acoustic temperature sensor, dielectric constant and refractive index thermo sensors, helium low temperature thermometer, nuclear thermometer, magnetic thermometer, resistance change type thermometric sensors, thermo EMF sensors, junction semiconductor types, thermal radiation sensors, quartz crystal thermoelectric sensors, heat flux sensors. ***Task:*** *Perform a case on thermocouple sensors.*		
III	**Magnetic sensors**	5+5=10
Part-A: Magnetic sensors: Introduction, principles, magneto-resistive sensors, anisotropic magneto resistive sensing. ***Task:*** *Perform a case on magnetic variable reluctance.*		
Part-B: Semiconductor magneto resistors, hall effect,inductance and eddy current sensors, angular/ rotary movement transducers, synchros. ***Task:*** *Perform a case on hall device applications.*		
IV	**Radiation and Electro analytical Sensors**	10
Radiation Sensors: Introduction, characteristics, types of photoresistors/photodetectors, X-ray and nuclear radiation sensors, fiber optic sensors. **Electro analytical Sensors:** The electrochemical cell, the cell potential - standard hydrogen electrode (SHE), liquid junction and other potentials, polarization, concentration polarization, reference electrodes, sensor electrodes, electro ceramics in gas media. ***Task:*** *Prepare a report on electrochemical sensors.*		
V	**Smart Sensors**	9
Smart Sensors: Introduction, primary sensors, excitation, amplification, filters, converters, standards for smart sensorinterface, the automation sensors - applications: on-board automobile sensors (Automotive Sensors), home appliance sensors, aerospace sensors, sensors for manufacturing and environmental monitoring. ***Task:*** *Draft a report on getting sensor information into the microcontroller*.		
Textbooks		
1. "Sensors and Transducers - D. Patranabis" - PHI Learning Private Limited., 2003. 2. Introduction to sensors - John Vetelino, Aravind Raghu, CRC press, 2011.		
References		
1. Sensors and Actuators, D. Patranabis, 2nd Edition, PHI, 2013. 2. Make Sensors: Terokarvinen, Kemo, Karvinen and Villey Valtokari, 1st Ed, Makermedia, 2014.		

IOT AND CLOUD COMPUTING LAB

Course	B.Tech.-VI-Sem.	L	T	P	C
Course Code	22CSPC64	-	-	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	PO9	PSO2
CO1	identify various IoT devices	3	3	3	3
CO2	use IoT devices in various applications	3	3	3	3
CO3	develop automation work-flow in IoT enabled cloud environment	3	3	3	3
CO4	take part in practicing and monitoring remotely	3	3	3	3
CO5	make use of various IoT protocols in cloud	3	3	3	3

List of Experiments

Week	Title/Experiment
1	Install necessary software for Arduino and Raspberry Pi.
2	Familiarization with Arduino and Raspberry Pi board.
3	Write a program to transfer sensor data to a Smartphone using Bluetooth on Arduino.
4	Write a program to implement RFID using Arduino.
5	Write a Program to monitor temperature and humidity using Arduino and Raspberry Pi.
6	Write a Program to interface IR sensorswith Arduino using IoT Cloud Application.
7	Write a Program to upload temperature and humidity data to the cloud using an Arduino or Raspberry Pi.
8	Write a program to retrieve temperature and humidity data from the cloud using Arduino and Raspberry Pi.
9	Write a program to create a TCP server on cloud using Arduino and respond with humidity data to the TCP client when requested.
10	Write a program to create a UDP server on cloud using Arduino and respond with humidity data to the UDP client when requested.

References

1. IoT and Cloud Computing Lab Manual, Department of CSE, CMRIT, Hyd.

Micro-Projects: Student should submit a report on one of the following/any other micro-project(s) approved by the lab faculty before commencement of lab internal examination.

1. Air Pollution Meter.
2. Smart Garbage Collector.
3. Weather monitoring system.
4. Baggage Tracker.
5. Circuit Breakage Detection.
6. Anti-Theft Flooring System.
7. IoT Based Smart Street Light.
8. IoT based Gas Leakage Monitoring system.
9. IoT Based Smart Irrigation System.
10. IoT Based Water Level Monitoring System.

ROBOTIC PROCESS AUTOMATION LAB

Course	B.Tech.-VI-Sem.	L	T	P	C
Course Code	22CSPC65	-	-	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	PO9	PSO2
CO1	install RPA packages	3	3	3	3
CO2	apply variables, data types, control statements in designing RPA	3	3	3	3
CO3	make use of data manipulation, recording and scrapping techniques	3	3	3	3
CO4	use selectors, data tables in excel for automation	3	3	3	3
CO5	develop email and PDF automation	3	3	3	3

List of Experiments

Week	Title/Experiment
1	Installation of RPA packages.
2	Perform automation for variables and data types.
3	Design a process for control flow: a) Conditional Statements b) Iteration
4	Create a process for data manipulation - scalar variables, collections, tables, text manipulation.
5	Design a process for recording-basic, desktop and web.
6	Design a process for scrapping: a) Screen scrapping b) Data scrapping
7	Perform automation for customizing the Selectors.
8	Create a process for image and text automation.
9	Design a process for automating Data tables in Excel.
10	Perform email automation.
11	Design a process to read all PDF files from a folder and then close them all.
12	Create an automation to change the background color of excel cell/range in Ui Path.
13	Design a process to Generate Covid-19 report and send this report to the required recipient.
14	Create a Process which reminds a user to take his medicine after every 4Hr.

References

1. Robotic Process Automation Lab Manual, Department of CSE, CMRIT, Hyd.

Micro-Projects: Student should submit a report on one of the following/any other micro-project(s) approved by the lab faculty before commencement of lab internal examination.

1. Web Scraping.
2. Data Migration.
3. CRM Upgrading.
4. Call Center Operations.
5. On-boarding Employees.
6. Payroll Processing.
7. Legal Process.
8. Data Wiring for Healthcare.
9. Claims Processing.
10. Support Sales and Marketing Process.

DEVOPS LAB

Course	B.Tech.-VI-Sem.	L	T	P	C
Course Code	22CSPC66	-	-	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	PO9	PSO2
CO1	identify DevOps workflow	3	3	3	3
CO2	use eclipse for DevOps	3	3	3	3
CO3	develop docker image	3	3	3	3
CO4	take part in grid deployment	3	3	3	3
CO5	make use of Jenkins framework in DevOps	3	3	3	3

List of Experiments

Week	Title/Experiment
1	Start DevOps with a workflow that includes four phases: to do, in progress, code review, and done.
2	Setup Eclipse for DevOps.
3	Jenkins Setup on AWS.
4	Ansible Setup and SSH keys.
5	Build WAR file in DevOps.
6	Create a docker image for any application using Docker file and push it to Docker hub.
7	Improvise the docker image quality using DevOps.
8	Build a selenium grid in DevOps.
9	Build and deploy a grid for Chrome and Firefox based testing.
10	Deploy a tested image on the server.
11	Perform automation using Jenkins.

References

1. DevOps Lab Manual, Department of CSE, CMRIT, Hyd.
2. https://www.udemy.com/course/practical-devops-for-beginners/

Micro-Projects: Student should submit a report on one of the following/any other micro-project(s) approved by the lab faculty before commencement of lab internal examination.

1. Deploy a Containerized Web Application.
2. Develop a Version Control System/Tool: GIT.
3. Create a Monitoring Dashboard for any Application.
4. Implement a Continuous Integration/Continuous Delivery (CI/CD) Pipeline for an application.
5. Implement DevOps Lifecycle with Amazon Web Services (AWS).
6. Build a Scalable Application with Docker.
7. Create a Jenkins project that connects to a remote Jenkins server and controls it.
8. Deploy an application (with high availability) with a database
9. Create a Continuous Delivery of a Java Web Application.
10. Build and execute a selenium project.

INDUSTRY ORIENTED MINI PROJECT/INTERNSHIP/SKILL ENHANCEMENT COURSE - BIG DATA-SPARK

Course	B.Tech.-VI-Sem.	L	T	P	C
Course Code	22CSPR61	-	-	4	2

Note:

1. A student can choose any one of the following courses: (i) Industry Oriented Mini Project (ii) Internship (iii) Skill Enhancement Course. However, the process of evaluation would be different for Skill Enhancement Course.
2. Evaluation guideline for (i) Industry Oriented Mini Project or (ii) Internship is as given below.
3. There shall be no separate evaluation by the institution for Skill Enhancement Course and the marks/grade would be the replica of Grade-Certificate issued by the respective organization.

INDUSTRY ORIENTED MINI PROJECT/INTERNSHIP

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 PSO1
CO1	apply domain knowledge to solve identified industrial problem	3
CO2	use industrial processes involved in end product/service	3
CO3	exhibit communication skills, professional ethics and social responsibility	3
CO4	manage and lead project in coordination with functional team-members	3
CO5	execute the project that meets industry requirements	3

Guidelines

S. No.	Title
1	Students should start the project/Internship under approved internal guide immediately after B.Tech. IV Semester End Examinations and complete before B.Tech. VI Semester End Examinations in any reputed organization without effecting regular classwork.
2	The students have to obtain NOC from both HOD and internship organization and submit the same to the guide for commencement of project/internship.
3	Upon commencement of work, the guide visits the internship organization periodically to monitor the performance of the student.
4	The students have to report the guide periodically on progress of work and seek advice.
5	On completion of internship, the students should submit the project report to the guide along with Certificate of Completion.
6	The project work is evaluated before commencement of VI-Semester End Examinations.
7	The student should give presentation before the Evaluation Committee for 10-15 minutes.
8	The Evaluation Committee awards the marks based on the student's performance.

Evaluation Procedure

External Committee Evaluation (SEE for 100 Marks)

S. No.	Item	Marks
1	Problem Justification/Observation	05
2	Content and Innovation	10
3	Use of Modern tools	15
4	Execution	15
5	Technical Presentation	30
6	Viva-Voce (Q & A)	10
7	Technical Report	15
Total		**100**

SKILLS ENHANCEMENT COURSE - BIG DATA-SPARK

Course	B.Tech.-VI-Sem.	L	T	P	C
Course Code	22CSPR61	-	-	4	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 PSO1
CO1	install Apache Spark	3
CO2	implement decision trees	3
CO3	execute support vector machine	3
CO4	weigh naïve Bayes' classifier	3
CO5	support Apache Spark	3

List of Experiments

There shall be no separate evaluation by the institution for Skill Enhancement Course and the marks/grade would be the replica of Grade-Certificate issued by the respective organization.

Week	Title/Experiment
1	Install, Deploy and configure Apache Spark.
2	Implement and demonstrate Word count application in Apache Spark.
3	Implement alternating least squares matrix factorization.
4	Implement decision trees.
5	Develop a pipeline on messaging.
6	Implement resilient distributed dataset.
7	Build a support vector machine.
8	Implement binary classification.
9	Implement naïve Bayes' binary.
10	Implement mean shift.
11	Implement decision tree regression.
12	Perform data analysis on a weather dataset using MapReduce.

References

1. Skills Enhancement Course - Big Data-Spark Manual, Department of CSE, CMRIT, Hyd.

Micro-Projects: Student should submit a report on one of the following/any other micro-project(s) approved by the lab faculty before commencement of lab internal examination.

1. Develop Spark Job server.
2. Airline Dataset Analysis using Spark MLlib.
3. Develop Predicting flight delays using Big Data Spark.
4. Develop a Data pipeline based on messaging.
5. Build data consolidation using Big Data Spark.
6. Develop zeppelin using Big Data Spark.
7. Develop an E-commerce project using Big Data Spark.
8. Analyze Yelp Dataset with Spark.
9. Integrating Spark and NoSQL Database for Data Analysis.
10. Develop a streaming analytics project on fraud detection.

ENTREPRENEURSHIP AND IPR
MANDATORY COURSE (NON-CREDIT)

Course	B.Tech.-VI-Sem.	L	T	P	C
Course Code	22MC61	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	PO7	PO8	PO12
CO1	illustrate entrepreneurship principles	3	3	3	3
CO2	analyze entrepreneurs' mindset	3	3	3	3
CO3	develop Business Plan and incubate innovative ideas	3	3	3	3
CO4	identify entrepreneurs' challenges in light of legal environment	3	2	3	2
CO5	demonstrate various types of IPRs applicable	3	3	3	3

Syllabus

Unit	Title/Topics	Hours
I	**Fundamentals of Entrepreneurship**	10
Introduction - development - evolution - entrepreneurship value creation-traits-role models - business model - entrepreneurial mind set-big companies vs. startups-misconceptions and myths about entrepreneurship. ***Task:*** *Perform a case study on a successful men and women entrepreneur.*		
II	**Entrepreneurship Development in Emerging Markets**	10
Types of startups - entrepreneurship - entrepreneurship as career option-youth and female entrepreneurship - small business enterprises - international entrepreneurship - role of educational institutions in entrepreneurship - mistakes startups make - leadership components and trends in entrepreneurship. ***Task:*** *Perform a case study on a child, youth and rural entrepreneur.*		
III	**Creativity in Business Ideas & Idea to Opportunity and Business Plan**	4+4=8
Part-A: Creativity & entrepreneurship - characteristics of creative people - blocks to creativity - creativity at work & sources of new ideas - techniques of generating ideas - idea not enough. ***Task:*** *Identify creativity in ideas among select Entrepreneurs.*		
Part-B: Opportunity recognition, process and sources of opportunities - steps involved in assessing business idea and tapping opportunity. Entrepreneurial opportunities & business plan, concept of business plan, steps, drivers and limitations. Reasons for business failures. ***Task:*** *Develop a format of Business Plan for any proto type.*		
IV	**Legal Aspects of Entrepreneurship**	10
Introduction - formation of business entity - different types of business entities (sole trader, partnership & types, limited companies, psus - promotion, registration, formation of different entities-governance & administration of various forms of enterprises. ***Task:*** *Prepare a model Memorandum and Articles of Association for private limited company.*		
V	**Entrepreneurship and Intellectual Property Rights (IPR)**	10
Intellectual Property Protection: Patents - Types of Patent Applications, Copyrights Trademarks and Trade Secrets-Avoiding Trademark Pitfalls. Formulation of the entrepreneurial Plan - The challenges of new venture startups, Critical factors for new venture development - Evaluation Process - Feasibility Criteria Approach. ***Task:*** *Draw a flow chart for filing of different IPRs under Indian patents act.*		
Textbooks		
1. Arya Kumar "Entrepreneurship - Creating and Leading an Entrepreneurial Organization" Pearson 2016. 2. D F Kuratko and T V Rao "Entrepreneurship - A South-Asian Perspective "Cengage Learning, 2nd Edition, 2015. 3. Robert Hisrich et al "Entrepreneurship" 7th Edition, TMH, 2016. 4. Intellectual Property Rights - Deborah E. Bouchoux, 4th Edition, Cengage Learning, 2013.		

VII-SEM. SYLLABUS

MANAGEMENT, ECONOMICS AND ACCOUNTANCY

Course	B.Tech.-VII-Sem.	L	T	P	C
Course Code	22HS71	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

Syllabus

Unit	Title/Topics	Hours
I	**Management concepts**	10
Introduction to Management and organization, Scientific management, Modern management – Functions, objectives and scope of functional areas of management, Levels of management. ***Task:*** *Perform a case study on various managerial positions & functions of any MNC.*		
II	**Introduction to Managerial Economics**	10
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. ***Task:*** *Fit a trend line for sales using MS-Excel.*		
III	**Theory of Production, Cost and Market Structure**	4+4=8
Part A: Types of Production function, input output relationship and types of costs, cost output relationship. ***Task:*** *Derive production function using MS-Excel.*		
Part-B: CVP Analysis-BEP analysis assumptions, limitations and uses. Different market structures-Perfect & Monopoly Competition. ***Task:*** *Find BEP for a desired profit using MS-Excel.*		
IV	**Introduction to Accounts**	10
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). ***Task:*** *Prepare horizontal final accounts from vertical statements using www.moneycontrol.com.*		
V	**Financial Statement Analysis**	10
Concept of Financial Statement Analysis uses and limitations – Liquidity, Leverage, Activity, Turnover, Profitability Ratios (Simple problems). ***Task:*** *Compute Liquidity, Leverage and Profitability Ratios using www.moneycontrol.com.*		

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 Mithileshwar 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.

GO PROGRAMMING

Course	B.Tech.-VII-Sem.	L	T	P	C
Subject Code	22CSPC71	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	PSO1
CO1	illustrate the concepts of Go programming	2	3	2	3	3
CO2	demonstrate the variables of Go programming	2	2	2	3	3
CO3	outline functions and packages of Go programming	3	3	3	2	2
CO4	interpret servers of Go programming	3	3	3	3	3
CO5	make use of servers and concurrency in Go programming	3	3	3	2	3

Syllabus

Unit	Title/Topics	Hours
I	**Introduction**	11
Getting started, Machine Setup - Text Editors, The Terminal, Environment, Go, Your First Program, How to Read a Go Program, Numbers - Integers, Floating-Point Numbers, Example - Strings, Booleans.		
II	**Variables**	10
How to Name a Variable, Scope, Constants, Defining Multiple Variables, Control Structures - The for Statement, the if Statement, the switch Statement, Arrays, Slices, and Maps, Arrays, Slices - append, copy, Maps.		
III	**Functions and Packages**	3+8=11
Part-A: Functions, Variadic Functions, Closure, Recursion, Defer, panic, and recover, Pointers - The * and & operators, new Structs and Interfaces.		
Part-B: Structs - Initialization, Fields, Methods - Embedded Types.		
IV	**Servers**	8
Packages, The Core Packages - Strings, Input/Output, Files and Folders, Errors, Containers and Sort, Hashes and Cryptography, Servers - TCP, HTTP–RPC.		
V	**Servers and Concurrency**	8
Parsing Command-Line Arguments, Creating Packages, Testing, Concurrency, Goroutines, Channels - Channel Direction, Select, Buffered Channels.		
Textbooks:		
1. The Go Programming Language - Alan A. A. Donovan, Brian W. Kernighan Released October 2015, Addison-Wesley Professional, ISBN: 9780134190570. 2. Go in Action - William Kennedy with Brian Ketelsen and Erik St. Martin Foreword by Steve Francia November 2015, ISBN: 9781617291784.		
References:		
1. Mastering Go: Create Golang Production Applications using Network Libraries, Concurrency, and Advanced Go Data Structures, Mihalis Tsoukalos, Packt Publisher, 2019.		

COMPUTER VISION AND ROBOTICS
(Professional Elective -III)

Course	B.Tech.-VII-Sem.	L	T	P	C
Course Code	22CSPE71	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	PSO1
CO1	explain the concepts of geometric camera models	3	2	2	3	2	3
CO2	demonstrate light and shading	3	3	3	3	2	3
CO3	illustrate the concepts of colour in computer vision	3	3	2	3	2	3
CO4	make use of linear filters and kinematics	3	3	2	3	2	3
CO5	adapt Stereopsis and Robotics	3	2	2	3	2	3

Syllabus

Unit	Title/Topics	Hours
I	**Geometric Camera Models**	10
Image Formation – Pinhole Perspective, Weak Perspective, Cameras with Lenses, The Human Eye, Intrinsic and Extrinsic Parameters - Rigid Transformations and Homogeneous Coordinates, Intrinsic Parameters, Extrinsic Parameters, Perspective Projection Matrices, Weak-Perspective Projection Matrices, Geometric Camera Calibration - A Linear Approach to Camera Calibration, A Nonlinear Approach to Camera Calibration. ***Task:*** *Program to calculate Windows and Plots of geometric camera model.*		
II	**Light and Shading**	10
Modelling Pixel Brightness - Reflection at Surfaces, Sources and Their Effects, The Lambertian + Specular Model, Area Sources, Inference from Shading – Radiometric Calibration and High Dynamic Range Images, The Shape of Specularities, Inferring Lightness and Illumination, Photometric Stereo: Shape from Multiple Shaded Images. ***Task:*** *Program to change the Brightness of Image.*		
III	**Colour**	4+5=9
Part-A: Human Colour Perception - Colour Matching, Colour Receptors, The Physics of Colour – The Colour of Light Sources, The Colour of Surfaces, Representing Colour – Linear Colour Spaces, Non-linear Colour Spaces. ***Task:*** *Program to find threshold of gray scale and RGB image.*		
Part-B:A Model of Image Colour – The Diffuse Term, The Specular Term, Inference from Colour – Finding Specularities Using Colour, Shadow Removal Using Colour, Colour Constancy: Surface Colour from Image Colour. ***Task:*** *Program to convert color image to gray and hsv.*		
IV	**Linear Filters and Convolution**	10
Convolution, Shift Invariant Linear Systems – Discrete Convolution, Continuous Convolution, Edge Effects in Discrete Convolutions, Spatial Frequency and Fourier Transforms, Fourier Transforms, Sampling and Aliasing – Sampling, Aliasing, Smoothing and Re-sampling. **Robot Kinematics**: iCub Physical Description, DH Parameters of the iCub, Computer vision, Inverse Homography, Offline Analysis of the Maze, Selection of the Grid Size, Online Analysis. ***Task:*** *Program for Image Filtering.*		
V	**Stereopsis and Robotics**	9
Stereopsis, Binocular Camera Geometry and the Epipolar Constraint - Epipolar Geometry, The Essential Matrix, The Fundamental Matrix, Binocular Reconstruction - Image Rectification. Human Stereopsis, Robot Navigation. ***Task:*** *Perform a case study on robot navigation.*		
Textbooks		
1. Computer Vision - A modern approach, by D. Forsyth and J. Ponce, Prentice Hall Robot Vision, by B. K. P. Horn, McGraw-Hill, 2012. 2. Autonomous Robotics and Deep Learning, by Vishnu Nath, Stephen E. Levinson, Springer, 2014.		

INFORMATION STORAGE AND RETRIEVAL
(Professional Elective - III)

Course	B.Tech.-VII-Sem.	L	T	P	C
Subject Code	22CSPE72	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	PSO1
CO1	outline the importance of Information storage and Retrieval	3	3	3	3	3	3
CO2	illustrate cataloging and indexing in information storage	3	2	3	3	3	3
CO3	adapt automatic indexing and clustering in information storage	3	3	3	3	3	3
CO4	implement user search techniques	3	3	3	3	3	3
CO5	apply text search algorithm in information retrieval	3	2	2	3	3	3

Syllabus

Unit	Title/Topics	Hours
I	**Introduction**	8
Introduction: Definition, Objectives, Functional Overview, Relationship to DBMS, Digital libraries and Data Warehouses. **Information Retrieval System Capabilities**: Search, Browse, Miscellaneous. ***Task:*** *Perform a case study on Information Retrieval System Capabilities.*		
II	**Cataloging and Indexing**	7
Objectives, Indexing Process, Automatic Indexing, Information Extraction. Data Structures: Introduction, Stemming Algorithms, Inverted file structures, N-gram data structure, PAT data structure, Signature file structure, Hypertext data structure. ***Task:*** *Perform a case study on Hypertext data structure.*		
III	**Automatic Indexing and Clustering**	9+8=17
Part-A: Automatic Indexing: Classes of automatic indexing, Statistical indexing, Natural language, Concept indexing, Hypertext linkages. ***Task:*** *Perform a case study on Statistical indexing*		
Part-B: Document and Term Clustering: Introduction, Thesaurus generation, Item clustering, Hierarchy of clusters. ***Task:*** *Perform a case study on Hierarchy of clusters.*		
IV	**Search Techniques and Visualization**	7
User Search Techniques: Search statements and binding, Similarity measures and ranking, Relevance feedback, Selective dissemination of information search, weighted searches of Boolean systems, Searching the Internet and hypertext. **Information Visualization:** Introduction, Cognition and perception, Information visualization technologies. ***Task:*** *Perform a case study on Cognition and perception of human being.*		
V		9
Text Search Algorithms: Introduction, Software text search algorithms, Hardware text search systems. Information System Evaluation: Introduction, Measures used in system evaluation, Measurement example - TREC results. ***Task:*** *Perform a case study on Software text search algorithms.*		
Textbooks		
1. Information Storage and Retrieval Systems: Theory and Implementation by Gerald J. Kowalski, Mark T. Maybury , Second Edition, Kluwer Academic Publishers. 2000		
References		
1. Frakes, W.B., Ricardo Baeza-Yates: Information Retrieval Data Structures and Algorithms, Prentice Hall, 1992. 2. Modern Information Retrieval By Yates Pearson Education.		

HUMAN COMPUTER INTERACTION
(Professional Elective – III)

Course	B.Tech.-VII-Sem.	L	T	P	C
Course Code	22CSPE73	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	PSO1
CO1	explain the concepts of human behaviour and memories	3	3	2	3	3	3
CO2	illustrate VR and 3D interaction	3	3	3	3	3	3
CO3	adapt interaction design	2	2	2	3	3	3
CO4	use design focus in iteration and prototyping	3	3	3	3	3	3
CO5	establish HCI in software process	3	3	3	3	3	3

Syllabus

Unit	Title/Topics	Hours
I	**Introduction**	9
Introduction – Input-output channels, Design focus: Getting noticed and in the middle, Human theory, Design focus – Cashing in and 7 ± 2 revisited, thinking reasoning and problem solving, Design focus: Human error and false memories, Emotion, Individual differences, Psychology, and the design of interactive systems. ***Task:*** *Perform a case study on and the design of interactive systems.*		
II	**Computer Interaction**	9
Introduction – Text entry devices, Design focus: Numeric keypads, Positioning, pointing and drawing, Display devices, Design focus: Hermes: a situated display, Devices for VR & 3D interaction, Physical controls, Sensors and Special devices, Design focus: Feeling the road, Design focus: Smart-its – making using sensors easy, Paper: printing and scanning, Design focus: Readability of text, Memory. ***Task:*** *Perform a case study on Devices for VR & 3D interaction.*		
III	**Interaction and Paradigms**	6+6=12
Part-A: Models of Interaction: Models of Interaction, Design focus: Video recorder, Frameworks and HCI, Ergonomics, Design focus: Industrial interfaces, Interaction styles, Design focus: Navigation in 2D & 3D. ***Task:*** *Perform a case study on models of interaction.*		
Part-B: Elements and Paradigms: Elements of the WIMP interface, Design focus: Learning toolbars, Interactivity, The context of the interaction, Design focus: Half of the picture, Experience, engagement and fun, Paradigms of interaction. ***Task:*** *Make a list of the elements of the WIMP interface.*		
IV	**Interaction Design Basics**	9
Introduction, Design, Process of design, User focus, Design focus: Cultural probes, Scenarios, Navigation design, Design focus: Beware of the big button trap and modes, Screen design and layout, Design focus: Alignment and layout matter, Checking screen colours, Iteration and prototyping. ***Task:*** *Perform a case study on Design layout.*		
V	**HCI in Software process and Design rules**	9
The software life cycle, Usability engineering, Iterative design and prototyping, Design focus: prototyping in practice, Design rationale, Principles to support usability, Standards, Guidelines, Golden rules and heuristics, HCI patterns. ***Task:*** *Prepare a sample for prototype of HCI supported software.*		
Textbooks		
1. Human Computer Interaction – 3rd Edition, A Dix et. al. Pearson, 2008.		

AD-HOC AND SENSOR NETWORKS
(Professional Elective - III)

Course	B.Tech.-VII-Sem.	L	T	P	C
Course Code	22CSPE74	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	PSO1
CO1	explain the concepts of Ad-hoc and sensor networks	3	3	2	2	2	3
CO2	apply QoS for secure MANETs	3	3	3	3	3	3
CO3	illustrate load distribution and routing protocol in MANETs	3	3	3	3	2	3
CO4	utilize power management & time synchronization techniques	3	3	3	3	3	3
CO5	adapt Wi-Fi for Ad-hoc networks	3	3	2	2	3	3

Syllabus

Unit	Title/Topics	Hours
I	**Introduction to Ad-hoc and Sensor Networks**	11
Introduction to Ad-hoc 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. ***Task:*** *Perform a case study on Precision Agriculture.*		
II	**Quality of Service in MANETs**	9
Introduction, QoS: a definition, The OLSRQSUP protocol and QoS extensions, Implementation, Simulation, Conclusion. ***Task:*** *Perform a case study on QoS in MANETs.*		
III	**Load Distribution and Energy Optimization in MANETs**	4+6=10
Part-A: Load Distribution in MANETs: The mica mote, sensing and communication range, Design issues, energy consumption, clustering of sensors, applications. ***Task:*** *Perform a case study on load distribution in cluster network.*		
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. ***Task:*** *Perform a case study on energy optimization protocols.*		
IV	**Power Management & Time Synchronization in WSN**	9
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. ***Task:*** *Perform a case low power management in WSN.*		
V	**Wi-Fi Access for Ad-hoc Networks**	9
Introduction, Wi-Fi network structure, Wi-Fi network architecture, Wi-Fi norms, 802.11n migration. ***Task:*** *Perform a case study on design of Wi-Fi architecture for a large group.*		
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, Subhas Chandra Misra, Isaac Woungang, and Sudip Misra, Springer International Edition, 2009. 2. Wireless Ad hoc and Sensor Networks – Protocols, Performance and Control, Jagannathan Sarangapani, CRC Press, Taylor & Francis Group, 2010.		

NEURAL NETWORKS AND DEEP LEARNING
(Professional Elective - IV)

Course	B.Tech.-VII-Sem.	L	T	P	C
Course Code	22CSPE75	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	PSO1
CO1	illustrate the functionalities of neural networks	3	3	2	3	3	3
CO2	analyze the single-layer and multi-layer perceptrons	3	3	3	3	3	3
CO3	interpret deep feedforward networks with regularization	3	3	3	3	3	3
CO4	demonstrate convolutional neural networks in deep learning	3	3	3	3	3	3
CO5	outline the importance of autoencoders	3	2	2	3	3	3

Syllabus

Unit	Title/Topics	Hours
I	**Introduction**	10
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. ***Task:*** *Write a program in Python to Calculate the output of a simple neuron.*		
II	**Single and Multilayer Layer Perceptrons**	10
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. ***Task:*** *Write a program to implement back propagation learning algorithm.*		
III	**Deep Feedforward Networks and Regularization for Deep Learning**	4+6=10
Part-A: Deep Feedforward Networks: Learning XOR, Gradient-Based Learning, Hidden Units, Back-Propagation and Other Differentiation Algorithms. ***Task:*** *Implement gradient-based learning algorithm.*		
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. ***Task:*** *Improve the Deep learning model by tuning hyper parameters.*		
IV	**Convolutional Neural Networks**	10
The Convolution Operation, Pooling, Variants of the Basic Convolution Function, Structured Outputs, Data Types, Recurrent Neural Networks. ***Task:*** *Object detection using Convolution Neural Network.*		
V	**Autoencoders**	8
Under complete Autoencoders, Regularized Autoencoders, Representational Power, Layer Size and Depth, Stochastic Encoders and Decoders, Denoising Autoencoders. ***Task:*** *Perform comparative analysis on various 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.		

DATA OPTIMIZATION TECHNIQUES
(Professional Elective - IV)

Course	B.Tech.-VII-Sem.	L	T	P	C
Subject Code	22CSPE76	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	PSO1
CO1	explain the concepts of optimization techniques	3	3	2	3	3	3
CO2	illustrate algorithms and complexity	3	3	2	3	3	3
CO3	demonstrate optimization techniques and algorithms	3	3	3	3	3	3
CO4	adapt optimization techniques approximation methods	3	3	3	3	3	3
CO5	make use of linear programming and evolutionary algorithms	3	3	3	3	3	3

Syllabus

Unit	Title/Topics	Hours
I	**Introduction**	11
Mathematical foundations - Functions, Continuity, Upper and lower bounds, Review of calculus - Differentiation, Taylor expansions, Partial derivatives, Lipschitz, Continuity, Integration, Vectors 16 - Vector algebra, Norms, 2D norms 19, Matrix algebra - Matrices, Determinant, Rank of a matrix, Frobenius norm, Eigen values and eigenvectors - Definiteness, Quadratic form, Optimization and optimality - Minimum and Maximum. ***Task:*** *Write a program to find rank of the matrix.*		
II	**Algorithms and Complexity**	6
Algorithm, Order notations, Convergence rate, Computational complexity - Time and Space Complexity - Class P 43, Class NP 44, NP-Completeness. ***Task:*** *Write a program on time complexity.*		
III	**Optimization Techniques and Algorithms**	7+6=13
Part-A: Regression Analysis: Unconstrained optimization - Univariate functions, Multivariate functions, Gradient-based methods - Newton's method, Convergence analysis, Steepest descent method, Line search, Conjugate gradient method, Stochastic gradient descent. ***Task:*** *Write a program on Stochastic gradient descent.*		
Part-B: Constrained Optimization: Mathematical Formulation, Lagrange Multipliers, Slack Variables, Generalized Reduced Gradient Method, KKT Conditions, Penalty Method. ***Task:*** *Write a program on Lagrange Multipliers.*		
IV	**Optimization Techniques: Approximation Methods**	12
BFGS method, Trust-region method, Sequential quadratic programming - Quadratic programming, SQP Procedure, Convex Optimization, Equality Constrained Optimization, Barrier Functions, Interior-Point Methods, Stochastic and Robust Optimization. ***Task:*** *Perform a case study on any optimization techniques.*		
V	**Linear Programming and Evolutionary Algorithms**	6
Introduction, Simplex method - Slack variables, Standard formulation, Duality, Augmented Form, Worked Example by Simplex Method, Interior-Point Method for LP, Evolutionary Computation - Basic Procedure, Choice of Parameters, Simulated Annealing, Differential Evolution. ***Task:*** *Write a program on Simplex Method.*		
Textbooks		
1. Xin-She Yang, "Optimization Techniques and Applications with Examples", Wiley, 2018 2. Andrew Kelleher, "Machine Learning in Production: Developing and Optimizing Data Science Workflows and Applications", Addison Wesley, 2018		
References		
1. Suvrit Sra et.al., Optimization for Machine Learning", MIT Press, 2011.		

QUANTUM COMPUTING
(Professional Elective – IV)

Course	B.Tech.-VII-Sem.	L	T	P	C
Course Code	22CSPE77	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	PO7	PO12	PSO1
CO1	explain the concepts of quantum computing	3	2	2	2	2	3
CO2	use 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

Syllabus

Unit	Title/Topics	Hours
I	**Introduction to Quantum Computing**	6
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. ***Task:*** *Detect data leakage in the cloud.*		
II	**Mathematical Foundations**	10
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. ***Task:*** *Protect data leakage in the cloud.*		
III	**Building Blocks**	8+5=13
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. ***Task:*** *Implement identity and access management on Zoom.*		
Part-B: Programming Model for Quantum Computing: Steps performed on classical computer, Steps performed on Quantum Computer, Moving data between bits and qubits. ***Task:*** *Perform case study on Digilocker.*		
IV	**Basic Techniques**	5
Amplitude amplification, Quantum Fourier Transform, Phase Kick-back, Quantum Phase estimation, Quantum Walks. ***Task:*** *Perform comparative analysis of SecaaS platforms.*		
V	**Major Algorithms & OSS Toolkits**	14
Shor's Algorithm, Grover's Algorithm, Deutsch's Algorithm, Deutsch -Jozsa Algorithm, IBM quantum experience, Microsoft Q, Rigetti PyQuil (QPU/QVM). ***Task:*** *Perform comparative analysis of mobile cloud platforms - Dropbox and OneDrive.*		
Textbooks		
1. Nielsen M. A., Quantum Computation and Quantum Information, Cambridge University Press. 2. David McMahon, "Quantum Computing Explained", Wiley.		
References		
1. Phillip Kaye Raymond Laflamme Michele Mosca, An Introduction to Quantum Computing, Oxford University Press.		

SOFTWARE PROCESS & PROJECT MANAGEMENT
(Professional Elective – IV)

Course	B.Tech.-VII-Sem.	L	T	P	C
Course Code	22CSPE78	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	PSO1
CO1	explain the concepts of Software process improvement	3	3	2	3	3	3
CO2	illustrate assessment phases and principles	3	3	3	3	3	3
CO3	adapt and establish software configuration management	2	2	2	3	3	3
CO4	use lifecycle phases in project maintenance	3	3	3	3	3	3
CO5	establish iterative process planning & automation	3	3	3	3	3	3

Syllabus

Unit	Title/Topics	Hours
I	**Introduction**	8
Introduction - A Software maturity framework - Software process improvement, process maturity levels, People in the optimization process, the need of the optimization process, The principles of software process change, Process in perspective, Six basic principles, Misconceptions, Strategy for implementing software process change. ***Task:*** *Perform a case study on a software maturity framework.*		
II	**Software process assessment**	8
Assessment overview, Assessment phases, five assessment principles, the assessment process, Assessment conduct, Implementation considerations, The initial process - The nature of the initial process, Software process entropy, The way out, Managing software organizations - Commitment discipline, The management system, Establishing a project management system. ***Task:*** *Perform a case study of a chaotic project.*		
III	**Repeatable & Define process**	8+8=16
Part-A: Project plan: The project plan, Principles, Contents, Size measures, Estimating, Productivity factors, Scheduling, Tracking. Development plan, Planning models, Final considerations. ***Task:*** *Perform a case study on a project management system.*		
Part-B: Software configuration management: The need of configuration management, Software product nomenclature, basic configuration management functions, Baselines, Configuration management responsibilities, The need of automated tools. ***Task:*** *Make a list of Basic configuration management functions.*		
IV	**Life Cycle Phases and Artifacts**	8
Engineering and production stages, Inception phase, Elaboration phase, Construction phase, Transition phase, The artifacts sets - The management sets, The engineering sets, Artifact evolution over the life cycle, Test artifacts, artifacts - Management, Engineering, Pragmatic. ***Task:*** *Make a stat chart diagram on the life cycle phases of software development.*		
V	**Iterative Process Planning & Automation**	8
Work breakdown structures - Conventional WBS issues, Evolutionary work breakdown structures, Planning guidelines, The cost and schedule estimating process, The iteration planning process, Pragmatic planning, Tools: Automation building blocks, The project environment. ***Task:*** *Perform a case study on factors influencing project environment.*		
Textbooks		
1. Managing the Software Process, Watts S. Humphrey, Pearson Education, 2002. 2. Software Project Management, Walker Royce, Pearson Education, 1998.		
References		
1. An Introduction to the Team Software Process, Watts S. Humphrey, Pearson Education, 2000.		

CHATBOTS
(Open Elective-II)

Course	B.Tech.-VII-Sem.	L	T	P	C
Course Code	22OE71	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	PO7	PO8	PO12
CO1	summarize chatbots and growth of internet	3	3	3	3	3	3
CO2	explain basics of bot building	3	3	3	3	3	3
CO3	articulate easy and hard ways of bot building	3	2	3	3	3	3
CO4	take part in deploying chatbot on apps	3	2	3	3	3	3
CO5	plan the deployment of chatbot	3	2	3	3	3	3

Syllabus

Unit	Title/Topics	Hours
I	**Introduction**	9
Introduction to Chatbots - Journey, Rise - Growth of internet users, Advancement in Technology, Developer ecosystem, messaging platforms, Setting Up the Developer Environment - Bot framework, Local installation – Installation NodeJS, Following the development pipeline, Storing messaging in database. ***Task:*** *Install NodeJS.*		
II	**Basics of Bot Building**	8
Intents, Entities, Design principles - keep it short and precise, make use of rich elements, Respect the source, use human handover, Common elements, showing product results - Integrating location lookup intent, saving messages - getting Mongoose, building the message model, adding the model file, Integrating the model into app, Building your own intent classifier. ***Task:*** *Build message model in Mongoose.*		
III	**Easy & Hard Way**	7+7=14
Part-A: Introduction to dialog flow, building a food ordering chatbot, building a food ordering chatbot, deploying dialog flow chatbot on the web, Integrate dialog flow chatbot on Facebook messenger, Fulfilment. ***Task:*** *Build a chatbot.*		
Part-B: Introduction to Rasa NLU, training and building a chatbot from scratch, dialog management using rasa core, writing custom actions of chatbot, data preparing for training the bot. ***Task:*** *Deploy chatbot on Facebook.*		
IV	**Deploying Chatbot on Apps**	8
First steps, Rasa's credential management, Deploying the chatbot on Facebook – Creating an app on Heroku, setting up Heroku on your local system, Creating and setting an app at Facebook, Creating and deploying Rasa actions server app on Heroku. ***Task:*** *Deploy chatbot in the local system.*		
V	**Deploying Chatbot on Slack**	9
Creating a standalone script for Slack chatbot, editing your Profile, Final deployment on SlackBot to Heroku, Subscribe to Slack events, Subscribe to Bot events, Post deployment verification: Slack Bot, Deploying the chatbot on slack, Deploying the chatbot on your own. ***Task:*** *Deploy chatbot on Slack.*		
Textbooks		
1. Rashid Khan, Anik Das "Build Better Chatbots", Apress, 2018. 2. Sumit Raj "Building Chatbots with Python", Apress, 2019.		
References		
1. Conversational AI: Chatbots that work By Andrew Freed, 2021.		

MULTIMEDIA AND ANIMATION
(Open Elective – II)

Course	B.Tech.-VII-Sem.	L	T	P	C
Course Code	22OE72	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	explain the concepts of multimedia	3	3	3	3	3	3
CO2	outline the concepts of animation	3	3	3	3	3	3
CO3	make use of 2D and 3D animation concepts	3	2	3	3	3	2
CO4	develop motion caption using animation techniques	3	2	3	3	3	2
CO5	build concept development using animation techniques	3	2	3	3	3	2

Syllabus

Unit	Title/Topics	Hours
I	**Introduction to Multimedia**	8
Introduction to Multimedia PCs, Components of Multimedia, Multimedia Tools, digital sound, interactive and non-interactive Graphics, digital image concepts. ***Task:*** *Make a list of components used in Interactive and Non-Interactive Graphics.*		
II	**Introduction to Animation**	9
Introduction, history of animation, uses of animation, types of animation, principles of animation, various techniques of animation, animation on the WEB, 3D animation, special effects, creating animation, creating animation in flash. ***Task:*** *Perform a case study on 3D animation.*		
III	**2D and 3D Animation**	7+7=14
Part-A: 2D animation, 3D animation & its concepts, types of 3D animation, skeleton & kinetic 3D animation. ***Task:*** *Perform a comparative analysis between 2D and 3D animation.*		
Part-B: Texturing and lighting of 3D animation, 3D camera tracking, applications & software of 3D animation. ***Task:*** *Perform a case study of Texturing & Lighting of 3D Animation.*		
IV	**Motion Caption**	8
Motion caption, formats, methods, usages, expression, motion capture software's, script animation usage, different language of script animation among the software. ***Task:*** *Create a motion caption using Script Animation.*		
V	**Concept Development**	9
Concept development, story development, audio & video, color model, device independent color model, gamma and gamma correction, production budgets, 3D animated movies. ***Task:*** *Perform a case study of Production Budgets.*		
Textbooks		
1. Principles of Multimedia, Ranjan Parekh, 2007, TMH. 2. Animation Techniques, Steve Roberts, 2021, Crowood Press.		
References		
1. Multimedia Technologies, Ashok Banerji, Ananda Mohan Ghosh, MGH. 2. TayVaughan, Multimedia Making it Work, TMH, 8th Edn, 2011.		

EMBEDDED SYSTEMS
(Open Elective-II)

Course	B.Tech.-VII-Sem.	L	T	P	C
Course Code	22OE73	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	PO7	PO12
CO1	analyze the basic concepts of embedded systems	3	2	2	2	3	3
CO2	illustrate typical embedded system	3	2	3	3	3	3
CO3	adapt the knowledge of interfacing in embedded domain	3	3	3	2	3	3
CO4	compile embedded systems programming	3	3	3	2	3	3
CO5	explain the various real time operating system concepts	3	2	3	2	3	3

Syllabus

Unit	Title/Topics	Hours
I	**Introduction to Embedded Systems**	9
Definition of Embedded System, embedded systems vs general computing systems, history of embedded systems, classification, major application areas, purpose of embedded systems, characteristics and quality attributes of embedded systems. ***Task:*** *Perform a case study of various embedded system processors and their applications.*		
II	**Typical Embedded System**	10
General Purpose and domain specific processors, ASICs, PLDs, commercial off-the-shelf components (COTS), Memory: ROM, RAM, memory according to the type of interface, memory shadowing. ***Task:*** *Perform a case study to compare the performance of different Embedded Systems.*		
III	**Interfacing**	5+5=10
Part-A: LCD, LED, Relay, DC Motor, Stepper Motor, DAC, ADC. ***Task:*** *Write a program for DC Motor, ADC and DAC.*		
Part-B: PID controller, communication interface: onboard and external communication interfaces. ***Task:*** *Write a program for Communication Interface.*		
IV	**Embedded Programming**	10
Software programming in assembly language and high level language, data types, structures, modifiers, loops and pointers, macros and functions, object oriented programming concepts. Reading switches introduction, basic techniques for reading from port pins, example: reading and writing bytes. ***Task:*** *Write a program for loop and function concept using a java programming.*		
V	**Real-Time Operating Systems**	9
OS services, process and memory management, basic design using an RTOS, task scheduling models, interrupt latency. Types of RTOS: RT Linux, Micro C/OS-II, VX works, tiny OS, and basic concepts of android OS. ***Task:*** *Write a program to develop an application by using real time operating system.*		
Textbooks		
1. Introduction to Embedded Systems - Shibu K.V., TMH. 2. Embedded Systems - Raj Kamal, TMH.		
References		
1. An Embedded software premier, David Simon, Pearson education, 2007. 2. Embedded C by Michael J. Pont, A Pearson.		

GO PROGRAMMING LAB

Course	B.Tech.-VII-Sem.	L	T	P	C
Subject Code	22CSPC72	-	-	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	PO9	PSO2
CO1	write simple programs using Go programming concepts	3	3	3	3
CO2	articulate the variables of Go programming	3	3	3	3
CO3	make use of functions and packages of Go programming	3	3	3	3
CO4	pivot servers of Go programming	3	3	3	3
CO5	prioritize servers and concurrency in Go programming	3	3	3	3

List of Experiments

Note: Codes and execution available at https://www.golangprograms.com/basic-programs.html

Week	Title/Experiment
1	Write a Go Program to find LCM and GCD of given two numbers.
2	Write a Go Program to print pyramid of numbers.
3	Write a program to use struct that is imported from another package.
4	Write a Go Program to calculate standard deviation in Math package.
5	Write a Program in Go language to print Floyd's Triangle.
6	Write a Go Program to take user input and addition of two strings.
7	Write a Go Program to check whether a string is Palindrome or not.
8	Write a Go Program to Build a contact form.
9	Write a Go Program to calculate average using arrays.
10	Write a Go program to delete duplicate element in a given array.
11	Write a Go Program with example of Array Reverse Sort Functions for integer and strings.
12	Write a program comprising of Contains, Contains Any, Count and Equal Fold string functions.
13	Write a Go Program for CRUD using MYSQL from scratch.
14	Write a Go Program to create multiple goroutines and implement how the goroutines scheduler behaves with three logical processors for CRUD using MYSQL from scratch.

References

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

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

1. Build a database using Go Programming.
2. Create a calculator in Go Programming.
3. Create a countdown using Go Programming.
4. Create a Tic Tac Toe using Go Programming.
5. Convert a text file to PDF using Go Programming.
6. Build a simple website using Go Programming.
7. Build a book management system using Go Programming
8. Build a restaurant management system using Go Programming.
9. Build an office management system using Go Programming.
10. Build a simple server in Go Programming.

PROFESSIONAL PRACTICE, LAW & ETHICS LAB

Course	B.Tech.-VII-Sem.	L	T	P	C
Course Code	22HS71	-	-	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	PO6	PO7	PO8	PO10	PO12
CO1	identify code of ethics and professional responsibilities	3	3	3	3	3
CO2	illustrate law of contract and legality of object	3	3	3	3	3
CO3	outline salient features of sale of goods act and agency law	3	3	3	3	3
CO4	assess the process for arbitration, adjudication and conciliation	3	3	3	3	3
CO5	apply legal provisions for cyber & environmental protection laws	3	3	3	3	3

List of Exercises

Week	Title/Experiment
1	Definition of Ethics, Professional Ethics - Engineering Ethics, Personal Ethics; Code of Ethics - Profession, Professionalism, Professional Responsibility.
2	Conflict of Interest, Gift Vs Bribery, Environmental breaches, Negligence, Deficiencies in state-of-the-art; Vigil Mechanism, Whistle blowing, protected disclosures.
3	Introduction to GST- salient features and classes of goods.
4	Law of Contract: Nature of Contract, Essential elements of valid contract, Offer and Acceptance, Consideration, Capacity to contract and Free Consent, Legality of Object.
5	Unlawful and illegal agreements, Contingent Contracts, Performance and discharge of Contracts, Remedies for breach of contract.
6	Indemnity and guarantee, Contract of Agency, Sale of goods General Principles, Conditions for guarantee and warranty.
7	Arbitration, Conciliation and ADR (Alternative Dispute Resolution) system: Arbitration – meaning, scope and types.
8	Arbitration and expert determination; Extent of judicial intervention; Arbitration agreements – essential and kinds, validity, and reference.
9	Arbitration tribunal appointment, challenge, jurisdiction of arbitral tribunal, powers, grounds of challenge, procedure and court assistance; Distinction between conciliation, negotiation, mediation and arbitration, confidentiality.
10	Provisions under Industrial Disputes Act, 1947; Collective bargaining; Industrial Employment (Standing Orders) Act, 1946; Workmen's Compensation Act, 1923.
11	Introduction & meaning of intellectual property, forms of IP, Copyright, Trademarks, Patents and Designs, Secrets.
12	Salient features of Laws relating to Copyright in India, computer programs, Ownership of copyrights and assignment, Piracy in Internet - Remedies and procedures in India; Law relating to Patents under Patents Act, 1970.

References

1. Professional Practice, Law & Ethics Lab Manual, FED, CMRIT, Hyd.

Micro-Projects: Student should submit a report on one of the following/any other micro-project(s) approved by the lab faculty before commencement of lab internal examination.

1. Whistle blowing, Corporate Governance and disclosure requirements.
2. Salient features of GST.
3. Unlawful & illegal agreements Performance discharge and remedies.
4. Indemnity, sale of goods, agency law and conditions for guarantee and warranty.
5. Arbitration, Conciliation and adjudication.
6. Appellate on Arbitration, adjudication and conciliation.
7. Legal provisions of industrial disputes act; collective bargaining; workmen's compensation act.
8. Trends in IPR, forms of IP, Copyright, Trademarks, Patents, Designs and Trade Secrets.
9. Salient features of Copyright Laws regarding intelligence protection.
10. Statutory provisions against Piracy, Cyber Crimes and Hacking.

PROJECT STAGE – I

Course	B.Tech.-VII-Sem.	L	T	P	C
Course Code	22CSPR71	-	-	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 PSO2
CO1	identify the real-world complex problems and set of objectives	3
CO2	review relevant literature from various sources	3
CO3	compile data and propose suitable tools and techniques	3
CO4	prepare an abstract of the proposed project	3
CO5	apply core competence to propose economically feasible solutions	3

Guidelines

The main aim of the Project Stage - I is to prepare the students to identify the real-world complex problems and submit a project proposal in report-form with set of objectives and proposed methodology to solve the problem as an individual or as a group of 3-4 to the approved faculty supervisor. **No student is allowed to change from one group to another group** till the completion of Project Stage - II.

S. No.	Title
1	Define a problem and identify the set of objectives.
2	Collect relevant literature from various sources.
3	Propose data collection methodology, design, modelling, and simulation.
4	Prepare and submit an abstract of proposed project with approval of Guide.
5	Present the abstract of the proposed project before the Evaluation Committee.
6	Evaluation Committee awards marks and gives approval to proceed for project stage-II.
7	If committee not satisfied with the student performance then the student has to reappear.
8	If the students fail even in reappearance then, they should appear as and when offered.

Evaluation Procedure

CIE: 40 Marks		SEE: 60 Marks	
Internal Guide Evaluation		**Department Review Committee Evaluation**	
Item	**Marks**	**Item**	**Marks**
Problem Identification	05	Title Justification	05
Abstract	05	Abstract	05
Objectives	05	Objectives	05
Literature Survey	10	Literature Review	10
Proposed Methodology	05	Proposed Methodology	10
Report Submission	05	Report Presentation	15
Viva-Voce (Q & A)	05	Viva-Voce (Q & A)	10
Total	**40**	**Total**	**60**

VIII-SEM. SYLLABUS

AUGMENTED AND VIRTUAL REALITY
(Professional Elective - V)

Course	B.Tech.-VIII-Sem.	L	T	P	C
Course Code	22CSPE81	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	PSO1
CO1	illustrate taxonomy and features of AR systems	2	2	2	2	2	3
CO2	explain fundamentals of virtual reality	3	3	3	3	3	3
CO3	adapt geometric modeling in virtual reality environment	3	3	3	3	3	3
CO4	make use of virtual environment for animation	3	2	3	3	2	3
CO5	develop VR and AR applications	3	3	3	3	3	3

Syllabus

Unit	Title/Topics	Hours
I	**Augmented Reality**	7
Taxonomy, technology and features of augmented reality, difference between AR and VR, Challenges with AR, AR systems and functionality, Augmented reality methods, visualization techniques for AR, enhancing interactivity in AR environments, evaluating AR systems. ***Task:*** *Explore human anatomy using AR and VR.*		
II	**Introduction to Virtual Reality**	9
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. ***Task:*** *Developing architecture of Flight Simulation using Virtual Reality.*		
III	**Computer Graphics And Geometric Modelling**	8+6=14
Part A: Introduction, The Virtual world space, positioning the virtual observer, the perspective projection, human vision, stereo perspective projection, Colour theory, Conversion From 2D to 3D, 3D space curves, 3D boundary representation, Simple 3D modelling, 3D clipping, Illumination models, Reflection models, Shading algorithms. ***Task:*** *Perform 2D/3D based experiment using Virtual world space.*		
Part B: Geometrical Transformations: Introduction, Frames of reference, Modelling transformations, Instances, Picking, Flying, Scaling the VE, Collision detection. ***Task:*** *Perform a case study on collision detection.*		
IV	**Virtual Environment**	9
Input: Tracker, Sensor, Digital Gloves, Movement Capture, Video-based Input, 3D Menus & 3D Scanner etc.; Output: Visual/Auditory/Haptic Devices. Generic VR system: Introduction, Virtual environment, Computer environment, VR technology, Model of interaction, VR Systems. ***Task:*** *Perform movement capture using a virtual environment.*		
V	**Development Tools and Frameworks**	9
Human factors: Introduction, the eye, the ear, the somatic senses. Hardware: Introduction, sensor hardware, Head-coupled displays, Acoustic hardware, Integrated VR systems. Software: Introduction, Modelling virtual world, Physical simulation, VR toolkits, Introduction to VRML. ***Task:*** *Developing concept of Virtual class room with multiplayer.*		
Textbooks		
1. Grigore C. Burdea, Philippe Coiffet, Virtual Reality Technology, Wiley 2016. 2. Anand R., "Augmented and Virtual Reality", Khanna Publishing House, Delhi.		
References		
1. Alan B. Craig, Understanding Augmented Reality, Concepts and Applications, Morgan Kaufmann, 2013.		

ADVANCED ALGORITHMS
(Professional Elective - V)

Course	B.Tech.-VIII-Sem.	L	T	P	C
Course Code	22CSPE82	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	PSO1
CO1	outline various analysis techniques for algorithms	3	3	2	2	3
CO2	develop applications using graph algorithms	2	3	3	3	3
CO3	analyze network sorting and matrix operations	3	3	3	3	3
CO4	illustrate various string-matching algorithms	3	3	3	3	3
CO5	solve problems using NP-Completeness & Approximate algorithms	2	3	3	2	3

Syllabus

Unit	Title/Topics	Hours
I	**Introduction**	10
Introduction: Role of Algorithms in computing, Order Notation, Recurrences, Probabilistic Analysis and Randomized Algorithms. Sorting and Order Statistics: Heap sort, Quick sort and Sorting in Linear Time. **Advanced Design and Analysis Techniques:** Dynamic Programming- Matrix chain Multiplication, Longest common Subsequence and optimal binary Search trees. ***Task:*** *Perform Matrix chain Multiplication.*		
II	**Algorithms**	9
Greedy Algorithms: Huffman Codes, Activity Selection Problem. Amortized Analysis. **Graph Algorithms:** Topological Sorting, Minimum Spanning trees, Single Source Shortest Paths, Maximum Flow algorithms. ***Task:*** *Write a program for Minimum Spanning trees.*		
III	**Sorting Networks and Matrix Operations**	5+5=10
Part-A: Sorting Networks: Comparison Networks, Zero-one principle, bitonic Sorting Networks, Merging Network, Sorting Network. ***Task:*** *Perform a case study on network sorting.*		
Part-B: Matrix Operations- Strassen's Matrix Multiplication, Inverting matrices, Solving system of linear Equations ***Task:*** *Write a program for Strassen's Matrix Multiplication.*		
IV	**String Matching**	10
Naive String Matching, Rabin-Karp algorithm, matching with finite Automata, Knuth- Morris - Pratt algorithm. ***Task:*** *Write a program for Knuth- Morris - Pratt algorithm.*		
V	**NP-Completeness and Approximation Algorithms**	10
Polynomial time, polynomial time verification, NP-Completeness and reducibility, NP-Complete problems. Approximation Algorithms- Vertex cover Problem, Travelling Salesperson problem. ***Task:*** *Perform a case study on Approximation Algorithms.*		
Textbooks		
1. Introduction to Algorithms, T.H. Cormen, C.E. Leiserson, R.L. Rivest, and C. Stein, 3rd Edition, 2009, PHI.		
References		
1. Fundamentals of Computer Algorithms, Ellis Horowitz, Satraj Sahni and Rajasekaran, Computer Science Press, 1998, England.		

NATURE INSPIRED COMPUTING
(Professional Elective - V)

Course	B.Tech.-VIII-Sem.	L	T	P	C
Course Code	22CSPE83	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	PO7	PO12	PSO1
CO1	explain the fundamentals of Nature Inspired Computing	3	3	2	2	3	3
CO2	develop programs using the concepts of Genetic Algorithms	3	3	3	2	3	3
CO3	make use of Swarm Intelligence and immunocomputing	3	3	3	3	3	3
CO4	show self-tuning algorithms	3	2	3	3	3	3
CO5	describe nature inspired computing for artificial life	3	2	2	2	3	3

Syllabus

Unit	Title/Topics	Hours
I	**Introduction**	8
Natural Computing, From nature to natural computing, sample idea, Philosophy of natural computing, Natural computing approaches, Conceptualization – general concept, Problem solving as a search track, Hill climbing, Simulated annealing. ***Task:*** *Perform a case study on Natural computing.*		
II	**Evolutionary Computing**	7
Evolutionary computing: Evolutionary biology, Evolutionary computing – standard evolutionary algorithm; Genetic algorithm, evolutionary strategies, Evolutionary programming. ***Task:*** *Perform a case study on evolutionary computing algorithms.*		
III	**Swarm Intelligence and Immunocomputing**	9+9=18
Part-A: Swarm Intelligence: Swarm intelligence-biological motivation, from natural to artificial, standard algorithm of Ant colony optimization, Ant clustering algorithm, Particle swarm optimization. ***Task:*** *Perform a case study on Particle swarm optimization.*		
Part-B: : Immunocomputing: The Immune System, Artificial Immune Systems, Bone Marrow Models, Negative Selection Algorithms, Clonal Selection and Affinity Maturation, Artificial Immune Networks, From Natural to Artificial Immune Systems, Scope of Artificial Immune Systems. ***Task:*** *Perform a case study on the need of moving from natural to artificial intelligence.*		
IV	**Biological Motivation**	8
Biological motivation, from natural to artificial, standard algorithm of cuckoo search, bat algorithm, flower pollination, firefly algorithm, framework for self-tuning algorithms - case study of firefly algorithm. ***Task:*** *Perform a case study on the need of artificial intelligent systems.*		
V	**Artificial Life**	7
The essence of life, Examples of ALife projects- flocks, herds and schools, computer viruses, synthesizing emotional behavior, AIBO robot, Turtles, termites, and traffic jams, framsticks, Scope of artificial life, Current trends and open problems. ***Task:*** *Make a comparative statement between natural and artificial life.*		
Textbooks		
1. L. N. de Castro, "Fundamentals of Natural Computing: Basic Concepts, Algorithms, and Applications", 2006, CRC Press, ISBN-13: 978-1584886433. 2. D. Floreano and C. Mattiussi, " Bio-Inspired Artificial Intelligence: Theories, Methods, and Technologies", 2008, MIT Press, ISBN-13: 978-0262062718.		
References		
1. Sam Jones (Editor), "Bio Inspired Computing-Recent Innovations and Applications", Clanrye International; 2nd Edition (2 January 2015), ISBN-10: 1632400812.		

COMPUTER FORENSICS
(Professional Elective – V)

Course	B.Tech.-VIII-Sem.	L	T	P	C
Course Code	22CSPE84	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	PO7	PO12	PSO1
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

Syllabus

Unit	Title/Topics	Hours
I	**Computer Forensics Fundamentals**	10
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. ***Task:*** *Perform a case study on Indian Information Technology Act.*		
II	**Evidence Collection and Data Seizure**	10
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. ***Task:*** *Prepare a sample chain of custody document for evidence collection and data seizure.*		
III	**Computer Forensics analysis and validation**	4+5=9
Part-A: Determining what data to collect and analyze, validating forensic data, addressing data-hiding techniques, performing remote acquisitions. ***Task:*** *Prepare steps for validating forensic data.*		
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. ***Task:*** *Perform a case study Incident Scenes.*		
IV	**Current Computer Forensic tools**	10
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. ***Task:*** *Perform a case study on forensic tools.*		
V	**Working with Windows and DOS Systems**	9
File systems, Microsoft File Structures, NTFS disks, disk encryption, windows registry, virtual machines. ***Task:*** *Create partition using NTFS.*		
Textbooks		
1. Computer Forensics, Computer Crime Investigation by John R.Vacca, Firewall Media, New Delhi, 2015. 2. Computer Forensics & Investigations by Nelson, P Enfinger, Steuart, Cengage Learning, 2020.		
References		
1. Computer Evidence Collection & Presentation by Christopher L.T. Brown, Firewall Media, 2005. 2. Software Forensics Collecting Evidence from the Scene of a Digital Crime by R M. Slade, TMH 2005.		

COGNITIVE COMPUTING
(Professional Elective - VI)

Course	B.Tech.-VIII-Sem.	L	T	P	C
Course Code	22CSPE85	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	PO7	PO12	PSO1
CO1	explain the fundamentals of cognitive computing	3	3	3	3	3	3
CO2	illustrate complex relationship between systems	3	3	3	3	3	3
CO3	describe the hypothesis and design principle of cognitive system	3	3	3	3	3	3
CO4	show the business implications of cognitive computing	3	3	3	3	3	3
CO5	articulate future applications of cognitive computing	3	2	2	3	3	3

Syllabus

Unit	Title/Topics	Hours
I	**The Foundation of Cognitive Computing**	8
Cognitive Computing as a new generation, The uses of cognitive systems, gaining insights from data, domains where cognitive computing is well suited, Artificial Intelligence as the foundation of cognitive computing, understanding cognition, two systems of judgment and choice, System 1-Automatic Thinking, System 2-controlled, Rule - Centric, and concentrated Effort. *Task: Perform a case study on the cognitive system of the human body.*		
II	**Understanding Complex Relationships Between Systems**	9
Types of Adaptive Systems, The elements of a cognitive system - infrastructure and deployment modalities, data access, metadata, and management services, the corpus, taxonomies, and data catalogs, data analytics services, continuous machine learning. *Task: Perform a case study on Infrastructure and Deployment Modalities of a cognitive system.*		
III	**Hypothesis and Design Principle**	7+7=14
Part-A: Generation and Evaluation: The Learning Process, Presentation and Visualization Services, Cognitive Applications, Components of a Cognitive System, Building the Corpus, Corpus Management Regulatory and Security Considerations. *Task: Perform a case study on Regulatory and Security Considerations.*		
Part-B: Data into the Cognitive System: Bringing Data into the Cognitive System, Leveraging Internal and External Data Sources, Data Access and Feature Extraction Services, Analytics Services, Hypotheses Generation and Scoring, Presentation and Visualization Services. *Task: Perform a case study on Presentation and Visualization Services in a cognitive system.*		
IV	**The Business Implications of Cognitive Computing**	9
Preparing for Change, advantages of new disruptive models, the difference with a cognitive systems approach, meshing data together differently, use business knowledge to plan for the future, answering business questions in new ways, building business specific solutions, making cognitive computing a reality. *Task: Perform a case study on "How to Make Cognitive Computing a Reality.*		
V	**Future Applications for Cognitive Computing**	8
Requirements for the next generation, leveraging cognitive computing to improve predictability, the new life cycle for knowledge management, creating intuitive human-to-machine interfaces, requirements to increase the packaging of best practices, technical advancements that will change the future of cognitive computing, the next five years, emerging innovations, cognitive training tools, neurosynaptic architectures. *Task: Perform a case study on Intuitive Human-to-Machine Interfaces.*		
Textbooks		
1. Cognitive Computing and Big Data Analytics by Judith Hurwitz, Marcia Kaufman and Adrian Bowles, Wiley, 2015. 2. The Cambridge Handbook of Computational Psychology by Ron Sun (ed.), Cambridge University Press, 2008.		

DISTRIBUTED SYSTEMS
(Professional Elective - VI)

Course	B.Tech.-VIII-Sem.	L	T	P	C
Course Code	22CSPE86	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	PSO1
CO1	explain distributed systems models	3	3	3	3	3
CO2	evaluate distributed algorithms for clock synchronization	3	2	3	3	3
CO3	relate various inter process communication techniques	3	3	3	3	3
CO4	illustrate distributed file systems and name servers	3	3	3	3	3
CO5	demonstrate transactions and concurrency control	3	2	2	3	3

Syllabus

Unit	Title/Topics	Hours
I	**Introduction**	9
Characterization of Distributed Systems: Introduction, Examples of Distributed systems, Resource sharing and the web, Challenges. **System models:** Introduction, Architectural and Fundamental Models. ***Task:*** *Perform a case study of distributed systems.*		
II	**Time and Agreement**	10
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. ***Task:*** *Perform a case study of global clock.*		
III	**Process Communication and RPC**	5+5=10
Part-A: Inter process Communication: Introduction, The API for the internet protocols, external data representation and marshalling, client-server communication, group communication. ***Task:*** *Perform a case study on group communication.*		
Part-B: Distributed objects and Remote Invocation: Introduction, Communication between Distributed Objects, RPC, Events and Notifications. ***Task:*** *List out the importance of remote invocation in communication.*		
IV	**Naming File Systems**	11
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. ***Task:*** *Perform a case study of SUN Network File System.*		
V	**Transactions and Concurrency Control**	8
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. ***Task:*** *List out the importance of Transactions and Concurrency Control in distributed systems.*		
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.		

VEHICULAR AD-HOC NETWORKS
(Professional Elective - VI)

Course	B.Tech.-VIII-Sem.	L	T	P	C
Course Code	22CSPE87	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	PSO1
CO1	explain the concepts of the concepts of VANET	3	3	2	2	2	3
CO2	illustrate the efficiency of VANET applications	3	3	3	3	3	3
CO3	support Vehicular Mobility Modelling frameworks	3	3	3	3	2	3
CO4	demonstrate physical layer in VANET	3	3	3	3	3	3
CO5	examine security of a VANET	3	3	2	2	3	3

Syllabus

Unit	Title/Topics	Hours
I	**Introduction**	8
Basic Principles and Challenges, Past and ongoing VANET activities, Cooperative Vehicular Safety applications - Enabling technologies, cooperative system architecture, safety applications, VANET-enabled Active Safety Applications, Information Dissemination in VANETs, Obtaining Local Measurements, Information Transport, Geographical Data Aggregation. ***Task:*** *Perform a case study of VANET.*		
II	**VANET Convenience and Efficiency Applications**	8
Obtaining Local Measurements, Information Transport, Geographical Data Aggregation, Limitations, Applications, Communication Paradigms, Probabilistic, Area-based Aggregation, Travel Time Aggregation. ***Task:*** *Perform a case study of communication systems in autonomous vehicles.*		
III	**Vehicular Mobility Modelling & Framework**	8+7=15
Part-A: Vehicular Mobility Modelling: Notation Description, Random models, flow and traffic models, behavioural models, trace and survey-based models, Integration with Network Simulators, A Design Framework for Realistic Vehicular Mobility Models. Joint transport and communication simulations. ***Task:*** *Perform a case study of Vehicular Mobility Modelling.*		
Part-B: Mobility Modelling Framework: A Design Framework for Realistic Vehicular Mobility Models. Joint transport and communication simulations ***Task:*** *Perform a case study of Joint transport.*		
IV	**Physical Layer MAC Considerations**	8
Standards Overview, Previous Work, Wireless Propagation Theory, Channel Metrics, Measurement Theory, Emperical Channel Characterization at 5.9 GHz, Future Directions, Challenges and Requirements of MAC, Communication Based on IEEE 802.11p, Performance Evaluation and Modeling, Aspects of Congestion Control. ***Task:*** *List out the important features of MAC in VANET.*		
V	**Efficient Application Level & Security**	9
Introduction to the Application Environment, Message Dispatcher, Example Applications, Data Sets, Predictive Coding, Architecture Analysis, Challenges of Data Security in Vehicular Networks Network, Applications, and Adversarial Model, Security Infrastructure, Cryptographic Protocols, Privacy Protection Mechanisms. ***Task:*** *List of the challenges of Security Infrastructure in VANET.*		
Textbooks		
1. H.Hartenstein and K.P. Laberteaux, VANET: Vehicular Applications and Inter-Networking Technologies, Wiley 2010.		
References		
1. H. Moustafa, Y. Zhang, Vehicular Networks: Techniques, Standards, and Applications, CRC Press, 2009.		

DRONES
(Professional Elective - VI)

Course	B.Tech.-VIII-Sem.	L	T	P	C
Subject Code	22CSPE88	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	PSO1
CO1	explain concepts of creative industries	3	3	3	3	3	3
CO2	outline the needs of creative industries	3	3	3	3	3	3
CO3	illustrate deployment and deadly abilities of drones	3	2	2	3	3	3
CO4	adapt price based data routing in dynamic IoT	3	2	2	3	3	3
CO5	make use of security in UAV/Drone communications	3	2	2	3	3	3

Syllabus

Unit	Title/Topics	Hours
I	**Introduction**	9
The creative industries: Concepts, Measurement, economic impact of the creative industries: Scenarios and theoretical models - Scenarios, Theoretical models, Measuring the economic impact of the creative industries - Direct impact of the creative industries. ***Task:*** *Implementation methods for photography in creative industries.*		
II	**Creative Industries' Needs: A Latent Demand**	8
Introduction, creative industries and film, emerging technologies - creative industries, importance of emerging technologies for creative industries, challenges. ***Task:*** *Comply on VR, AR and Drones together for Creative industries.*		
III	**Deployment and Deadly Abilities**	7+7=14
Part-A: The Deployment of Drones: The private invasion, The media invasion, The agricultural invasion, The commercial invasion, The medical invasion, The transportation invasion, The communication invasion, The controlled invasion. ***Task:*** *Develop design thinking method for drone application in agriculture fields.*		
Part-B: The Deadly Abilities of Drones: Drones in the police force, Drones in the military force, Drones in the animal world, Drones in the insect world. ***Task:*** *Recognize Do's and Don'ts of drone flying*		
IV	**Price Based Data Routing in Dynamic IoT**	8
Introduction, Background, IoT system model – IoT model, IoT node – Residual energy and power model, Load and buffer space, Delay, Trust, Pricing model, Communication model, Adaptive routing approach, Use case and theoretical analysis. ***Task:*** *Design an IoT model for any Drone application.*		
V	**Security in UAV/Drone Communications**	9
Introduction - PLS for UAV Systems - UAV as a mobile relay (UAV Relay), UAV as a mobile transmitter BS (UAV-BS), UAV as mobile jammer (UAV-Jammer), UAV as a flying UE (UAV-UE), One UAV as a cooperative jammer and another as a transmitter, Additional common attacks in UAV Systems - Attacker classification, Attack-type classification. ***Task:*** *Jamming of UAV remote control systems using software defined radio.*		
Textbooks		
1. Virginia Santamarina-Campos et.al., "Drones and the Creative Industry Innovative Strategies for European SMEs", Springer, 2018 2. Fadi Al-Turjman, "Drones in IoT-enabled Spaces", CRC Press, 2019 3. Billy Crone, "Drones, Artificial Intelligence, & the Coming Human Annihilation", Get A Life Ministries, 2018.		
References		
1. Ryan Nagelhout, "The Modern Nerd's Guide to Drone Racing", Gareth Stevens, 2018.		

GAME DEVELOPMENT
(Open Elective – III)

Course	B.Tech.-VIII-Sem.	L	T	P	C
Subject Code	22OE81	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	PO8	PO12
CO1	summarize game design concepts	3	3	2	3	2
CO2	explain basics of game & play	3	3	3	3	2
CO3	articulate game mechanics and experiences	3	3	3	3	3
CO4	take part in game structure development	3	3	3	3	3
CO5	plan aesthetics of game development	3	3	3	3	3

Syllabus

Unit	Title/Topics	Hours
I	**Introduction**	9
Introduction, Magic words, Skills needed, most important skill, five kinds of listening, secret of the gifted, designer creates an experience, three practical approaches to chasing rainbows, Introspection: powers, perils, and practice dissect your feelings defeating Heisenberg. ***Task:*** *Perform a case study on the need of gaming.*		
II	**Game & Player**	9
A Short history of software engineering, risk assessment and prototyping, eight tips for productive prototyping, closing the loop, Einstein's violin, project yourself, demographics, the medium is the misogynist, psychographics, modelling, focus, empathy, imagination, motivation, judgment. ***Task:*** *Project yourself as a player in any game.*		
III	**Game Mechanics, Balancing, Players & Experiences**	6+7=13
Part A: Twelve Most Common Types of Game, Game Balancing Methodologies, Balancing Game Economies, Dynamic Game Balancing, The Big Picture, The Puzzle of Puzzles, Aren't Puzzles Dead, A Final Piece ***Task:*** *Compare between puzzles and games.*		
Part B: Breaking it Down: The Loop of Interaction, Channels of Information, My First Lens, Interest Curves, Patterns Inside Patterns, What Comprises Interest, Interest Factor Examples, Putting It All Together. ***Task:*** *Make a list of interesting factors in the game.*		
IV	**Experience and Game Structure**	8
Story/Game Duality, The Myth of Passive Entertainment, The Dream, The Reality, The Problems, The Dream Reborn, Story Tips for Game Designers, The Feeling of Freedom, Indirect Control Method - Constraints, Goals, Interface, Visual Design, Characters, Music. ***Task:*** *Experience visual design of NFS3.*		
V	**Characters, Spaces & Aesthetics**	9
The Nature of Game Characters, Avatars, Creating Compelling Game Characters, The Purpose of Architecture, organizing your Game Space, Christopher Alexander is a Genius, Real vs. Virtual Architecture. ***Task:*** *Perform a case study of Real vs. Virtual Architecture.*		
Textbooks		
1. Jesse Schell, the Art of Game Design, Morgan Kaufmann Publishers, 2008. 2. George Skaff Elias, Richard Garfield, and K. Robert Gutschera, "Characteristics of Games", the MIT Press.		
References		
1. Jeremy Gibson, "Introduction to Game Design, Prototyping, and Development: From Concept to Playable Game with Unity and C#", Addison-Wesley Professional, 2nd Edition, 2016.		

PRECISION AGRICULTURE
(Open Elective – III)

Course	B.Tech.-VIII-Sem.	L	T	P	C
Subject Code	22OE82	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	PO5	PO7	PO8	PO12
CO1	explain the concepts of precision agriculture	3	3	3	3	3
CO2	outline the components of precision agriculture	3	3	3	3	3
CO3	illustrate about tools technologies and sampling	3	3	3	3	3
CO4	adapt recent advances in precision agriculture	2	2	3	3	3
CO5	make use of feasibility and evaluation of precision farming	2	2	3	3	3

Syllabus

Unit	Title/Topics	Hours
I	**Introduction**	9
Accuracy and precision, Comparison chart, Target comparison, Number of measurements, Quality, Bias, Degree of accuracy, A brief history of precision agriculture, Defining precision agriculture, Variability and the production system, Need for precision agriculture. ***Task:*** *Write a program on finding the precision in agricultural dataset.*		
II	**Components of Precision Agriculture**	9
Components of Precision Agriculture, Spatial Data Management, Geographical Positioning, Geographical Information System, Remote Sensing, Soil Sampling and Mapping, Yield Monitoring and Mapping, Components of a Yield Monitor. ***Task:*** *Perform a case study on Yield Monitoring.*		
III	**Tool, Technologies and Sampling**	6+6=12
Part-A: Tool and Technologies in Precision Agriculture: Global Positioning System (GPS), Sensor Technologies, Geographic Information System (GIS), Grid Soil Sampling and Variable Rate Fertilizer (VRT), Online Resources for Precision Agriculture. ***Task:*** *Perform a case study on Tool and Technologies in Precision Agriculture.*		
Part-B: Precision Soil Sampling: Introduction, Soil Sampling, Sampling Procedures – Depth, Pattern, Soil Sampling Instructions and Pattern Options, Grid Soil Sampling - Advantages and Disadvantages, Zone Sampling - Method, Advantages and Disadvantages, Prescription Maps. ***Task:*** *Perform a comparative analysis on soil sampling procedures.*		
IV	**Recent Advances in Precision Agriculture**	9
Internet of Things in Precision Agriculture, Prerequisites of IoT Applications in Agriculture, Structure of IOT for Agriculture, Drones or Unmanned Aerial Vehicles (UAVs). ***Task:*** *Perform a case study on the design concept of UAVs.*		
V	**Feasibility and Evaluation of Precision Farming in India**	9
Present Scenario, Economic Feasibility of Precision Farming, Constraints in the Adoption of Precision Agriculture, Capital Expenditures in Precision Agriculture, Farm Size and Technology Adoption, Profitability, Environmental Benefits. ***Task:*** *Perform the profitability analysis in Precision Agriculture.*		
Textbooks		
1. Latief Ahmad and Syed Sheraz Mahdi, 'Satellite Farming - An Information and Technology Based Agriculture' Springer, 2018. 2. Pedersen, Søren Marcus, 'Precision Agriculture: Technology and Economic Perspectives' Springer, 2018.		
References		
1. Ryan Nagelhout, 'The Modern Nerd's Guide to Drone Racing', Gareth Stevens, 2018. 2. Oerke, E.C et.al., 'Precision Crop Protection - the Challenge and Use of Heterogeneity' Springer, 2010.		

ELECTRONICS FOR HEALTH CARE
(Open Elective – III)

Course	B.Tech.-VIII-Sem.	L	T	P	C
Subject Code	22OE83	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	PO5	PO6	PO8	PO12
CO1	explain the various methods of recording of biopotentials	3	3	3	3	3
CO2	measure biochemical and various physiological information	2	3	2	3	3
CO3	make use of assist devices and biotelemetry	3	3	3	3	3
CO4	use of radiation for diagnostic and therapy	3	3	3	3	3
CO5	adapt techniques of electrical safety in hospitals	3	3	2	3	3

Syllabus

Unit	Title/Topics	Hours
I	**Electro-Physiology and Biopotential Recording**	8
The origin of Biopotential; Biopotential electrodes, biological amplifiers, ECG, EEG, EMG, PCG, EOG, lead systems and recording methods, typical waveforms and signal characteristics. ***Task:*** *Write a technical report on biometrics.*		
II	**Bio-Chemical and Non Electrical Parameter Measurement**	9
PH, PO2, PCO2, PHCO3, Electrophoresis, colorimeter, photometer, Auto analyzer, Blood flow meter, cardiac output, respiratory measurement, Blood pressure, temperature, pulse, Blood cell counters. ***Task:*** *Write a technical report on transducers for medical electronics.*		
III	**Assist Devices and Biotelemetry**	7+7=14
Part-A: Assist Devices: Cardiac pacemakers, DC Defibrillator. ***Task:*** *Write a technical report on measurement of heart sounds.*		
Part-B: Biotelemetry: Telemetry principles, frequency selection, Biotelemetry, radio-pill and Tele-stimulation. ***Task:*** *Write a technical report on remote SCADA.*		
IV	**Radiological Equipments**	8
Ionizing radiation, diagnostic X-Ray equipments, use of radioisotope in diagnosis, radiation therapy. ***Task:*** *Write a technical report on digital x-ray systems.*		
V	**Recent Trends In Medical Instrumentation**	9
Thermograph, endoscopy unit, Laser in medicine, Diathermy units, Electrical safety in medical equipment. ***Task:*** *Write a technical report on digital health care.*		
Textbooks		
1. Leislie Cromwell, “Biomedical instrumentation and measurement”, PHI, New Delhi, 2002.		
References		
1. Khandpur, R.S., “Handbook of Biomedical Instrumentation”, TMH, New Delhi, 1997. 2. Joseph J.Carr and John M.Brown, “Introduction to Biomedical equipment Technology”, John Wiley and Sons, New York, 1997.		

PROJECT STAGE – II INCLUDING SEMINAR

Course	B.Tech.-VIII-Sem.	L	T	P	C
Course Code	22CSPR81	-	-	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 PSO2
CO1	design and develop a prototype/process/simulation for identified problem	3
CO2	execute project using modern tools and prepare the report	3
CO3	exhibit leadership and managerial skills in project development	3
CO4	function effectively as individual and member or leader in project teams	3
CO5	apply engineering knowledge for societal sustenance	3

Guidelines

The Project Stage-II is an extension of Project Stage-I, subject to its successful completion. The main aim of the Project Stage-II is to give solution to the problem defined in the Project Stage-I.

S. No.	Title
1	Conduct detailed literature survey on the approved project title.
2	Prepare a Gantt chart for project schedule to conduct investigations with team.
3	Compile data and develop a model/simulation/prototype of the product/services.
4	Document end-to-end project/product process.
5	Organize a test-run, deploy the resources and prepare the user manual.
6	Submit a report in the prescribed format through the Guide to Head of the Department.
7	Demonstrate Project work before Evaluation Committee.
8	The Evaluation Committee awards the marks based on the student's performance.

Evaluation Procedure

CIE: 40 Marks				SEE: 60 Marks	
Internal Guide: 20 Marks		**DRC: 20 Marks**		**External Committee Evaluation**	
Item	**Marks**	**Item**	**Marks**	**Item**	**Marks**
Review - I		***Seminar-I***		Problem Justification	05
Abstract	05	Abstract	05	Content and Innovation	05
Design	05	Design	05	Execution	15
Review - I		***Seminar-II***		Technical Presentation	15
Execution	05	Execution	05	Viva-Voce (Q & A)	10
Report	05	Report	05	Project Report	10
Total	**20**	**Total**	**20**	**Total**	**60**

CMR INSTITUTE OF TECHNOLOGY

UGC Autonomous

(Approved by AICTE, Affiliated to JNTUH, Accredited by NBA & NAAC with 'A' Grade)
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Phone: 08418 – 200720 / 9247605109 Fax: 08418 – 200240, www.cmritonline.ac.in

UNDERTAKING BY STUDENT/PARENT REGARDING R22 REGULATIONS

ACADEMIC YEAR: 20___ - 20___

College Code	**R0**										Affix recent Stamp Size Photograph
Course	I - B.Tech.										
Branch	Computer Science and Engineering (CSE)										
Roll No.	2		R	0		A	0	5			
Student Name											
Fathers' Name											

Declaration

1. I am completely aware of academic regulations prescribed by CMR Institute of Technology from the Academic Year 2022-23 onwards under which I was admitted.
2. I am aware of course registration before commencement of each semester with help of faculty mentor/advisor/Head of the Department.
3. I am aware of attendance detention procedure/system and minimum attendance requirement, of 75% without condonation, to be promoted to the next academic semester/year.
4. I am aware of credit detention regulations and minimum credits to be earned by me to promote to next academic year.
5. Guidelines for Internship/Industry Oriented Mini-Project/Skill Enhancement course, Project Stage-I and Project Stage-II as per R22 Regulations.
6. I am aware that minimum marks required in Continuous Internal Evaluation (CIE) are 35% of 40 CIE i.e. 14 marks out of 40, minimum 35% of Semester End examination (SEE) for 60 marks i.e. 21 marks out of 60 and minimum 40% of total marks of 100 i.e. 40 marks out of 100 marks both CIE & SEE marks taken together.
7. Re-registration of course if marks in CIE are less than 35% of 40 marks to improve CIE marks. When this option is exercised, I will forego the marks of SEE if any.
8. Guidelines for re-admission from one regulation to readmitted year regulations.
9. Malpractice rules and punishment.
10. Punishment of ragging, if involved in ragging of any student(s).

Date		**Signature of the Student**		**Signature of the Parent**	

Endorsement by the Head of the concerned Department and Principal

Date		**Name of the Dept. Head**		**Signature**	
Date		**Name of the Principal**		**Signature**	
College Stamp					