CMR COLLEGE OF ENGINEERING& TECHNOLOGY

(UGC Autonomous)

Kandlakoya, Medchal Road, Hyderabad – 501 401

ACADEMIC REGULATIONS - R 22

FOR CBCS & OUTCOME BASED B.TECH (REGULAR, HONOURS and MINOR) PROGRAMMES

(**Effective for the students admitted into I year from the Academic Year 2022-23**)

1.0 Under-Graduate Degree Programme in Engineering & Technology (UGP in E&T)

CMR College of Engineering & Technology, Hyderabad offers 4 Years (8 Semesters) Bachelor of Technology (B.Tech.) Regular, Honours and Minor degree Programmes, under Choice Based Credit System (CBCS), with effect from the Academic Year 2022-23 and onwards, in the Branches of Engineering.

2.0 Eligibility for Admission

2.1 Admissions will be done as per the norms prescribed by the Government of Telangana. The Government orders in vogue shall prevail.

2.2 The candidate should have passed the qualifying examination Intermediate or equivalent on the date of admission.

2.3 Seats in each program in the college are classified into Category–A (70% of intake) and Category-B (30% of intake) besides Lateral Entry. Category-A seats will be filled by the Convener, TSEAMCET Admissions. Category-B seats will be filled by the College as per the guidelines of the Competent Authority.

2.4 Lateral Entry seats for 10% of the candidates from the approved strength of the course shall be admitted into the III Semester directly based on the rank secured by the candidate in TSECET in accordance with the guidelines from the Competent Authority.

2.5 The medium of instructions for the entire undergraduate programme in Engineering & Technology will be **English** only

3.0 B.Tech. Programme Structure

3.1 A student after securing admission shall complete the B.Tech. programme in 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 student shall forfeit seat in B.Tech course. Each student shall secure 160 credits (with CGPA $\geq$ 5) required for the completion of the undergraduate programme and award of the B.Tech. degree.

3.2 **UGC/ AICTE** specified definitions/ descriptions are adopted appropriately for various terms and abbreviations used in these academic regulations/ norms, which are listed below.

3.2.1 Semester Scheme

Each undergraduate programme is of 4 academic years (8 semesters) with the academic year divided into two semesters (First/Odd and Second/Even). Each Semester shall have a minimum of 90 Instructional Days.

semester - 'Continuous Internal Evaluation (CIE)' and 'Semester End Examination (SEE)' under Choice Based Credit System (CBCS) and Credit Based Semester System (CBSS) indicated by UGC, and curriculum/course structure suggested by AICTE are followed.

3.2.2 Credit Courses

All subjects/ courses are to be registered by the student in a semester to earn credits which shall be assigned to each subject/ course in an L: T: P: C (lecture periods: tutorial periods: practical periods: credits) structure based on the following general pattern.

- One credit for one hour/ week/ semester for Theory/ Lecture (L) courses or Tutorials.
- One credit for two hours/ week/ semester for Laboratory/ Practical (P) courses.

Courses like Environmental Science, Constitution of India, Intellectual Property Rights, and Gender Sensitization Lab are mandatory courses. These courses will not carry any credits.

3.2.3 Subject Course Classification

All subjects/ courses offered for the undergraduate programme in E&T (B.Tech. degree programmes) are broadly classified as follows. The University has followed almost all the guidelines issued by AICTE/UGC.

S. No.	Broad Course Classification	Course Group/ Category	Course Description
1	Foundation Courses (FnC)	BSC – Basic Sciences	Includes Mathematics, Physics and Chemistry subjects
2		ESC - Engineering Sciences	Includes Fundamental Engineering Subjects
3		HSMC – Humanities andSocial Sciences	Includes subjects related to Humanities, Social Sciences and Management
4	Core Courses (CoC)	PCC – Professional Core	Includes core subjects related to the parent discipline/ department/ branch of Engineering.
5	Elective Courses (EℓC)	PEC – Professional Electives	Includes elective subjects related to the parent discipline/ department/ branch of Engineering.
6		OEC – Open Electives	Elective subjects which include inter-disciplinary subjects or subjects in an area outside the parent discipline/ department/ branch of Engineering.

7	Core Courses (PROJ)	Project Work	B.Tech. Project or UG Project or UG Major Project or Project Stage I & II
8		Industry Training/ Internship/ Mini-project/ Mini- Project/ Skill Development Courses	Industry Training/ Internship/ Mini-Project/ Mini-Project/ Skill DevelopmentCourses
9		Seminar	Seminar/ Colloquium based on core contents related to parent discipline/ department/ branch of Engineering.
10	Minor Courses	-	1 or 2 Credit Courses (subset of HSMC)
11	Mandatory Courses (MC)	-	Mandatory Courses (non-credit)

4.0 Course Registration

4.1 A 'faculty advisor or counselor' shall be assigned to a group of 20 students, who will advise the students about the undergraduate programme, its course structure and curriculum, choice/option for subjects/ courses, based on their 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 'on-line registration', 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 **on-line** registration, **only after** obtaining the '**written approval**' from faculty advisor/counselor, which should be submitted to the college academic section through the Head of the Department. A copy of it shall be retained with the Head of the Department, Faculty Advisor/ Counselor and the student.

4.4 A student may be permitted to register for all the subjects/ courses in a semester as specified in the course structure with maximum additional subject(s)/course(s) limited to 6 Credits (any 2 elective subjects), based on **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 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 **on-line** registration are final and **cannot** be changed or inter-changed; further, alternate choices also will not be considered.

However, if the subject/ course that has already been listed for registration by the Head of the Department in a semester could not be offered due to any inevitable 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). Such alternate arrangements will be made by the Head of the Department, with due notification and time-framed schedule, within **a week** after the commencement of class-work for that semester.

4.8 Dropping of subjects/ courses may be permitted, only after obtaining prior approval from the faculty advisor/ counselor 'within a period of 15 days' from the beginning of the current 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 parent department in any semester. Open Elective subjects already studied should not repeat/should not match with any category (Professional Core, Professional Electives, 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.

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 of 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 Head of the Department concerned shall decide, 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 mandatory courses and Additional courses if any) 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 for 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 (Continuous Internal Evaluation) and SEE (Semester End Examination) 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 Research Project (or) Field Based Research Project (or) Mini Project (or) Internship (or) Technical Seminar, 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 he (i) does not submit a report on 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 ResearchProject (or) Field Based Research Project (or) Mini Project (or) Internship (or) Technical Seminar evaluations.

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.

7.3 Promotion Rules

S. No.	Promotion	Conditions to be fulfilled
1	First year first semester to first year second semester	Regular course of study of first year first semester.
2	First year second semester to Second year first semester	(i) Regular course of study of first year second semester. (ii) Must have secured at least 20 credits out of 40 credits i.e., 50% credits up to first year second semester from all the relevant regular and supplementary examinations, whether the student takes those examinations or not.
3.	Second year first semester to Second year second semester	Regular course of study of second year first semester.
4	Second year second semester to Third year first semester	(i) Regular course of study of second year second semester. (ii) Must have secured at least 48 credits out of 80 credits i.e., 60% credits up to second year second semester from all the relevant regular and supplementary examinations, whether the student takes those examinations or not.
5	Third year first semester to Third year second semester	Regular course of study of third year first semester.
6	Third year second semester to Fourth year first semester	(i) Regular course of study of third year second semester. (ii) Must have secured at least 72 credits out of 120 credits i.e., 60% credits up to third year second semester from all the relevant regular and supplementary examinations, whether the student takes those examinations or not.
7	Fourth year first semester to Fourth year second semester	Regular course of study of fourth year first semester.

7.4 A student (i) shall register for all courses/subjects covering 160 credits as specified and listed in the course structure, (ii) fulfills all the attendance and academic requirements

for 160 credits, (iii) earn all 160 credits by securing SGPA ≥ 5.0 (in each semester), and CGPA ≥ 5 (at the end of 8 semesters), (iv) **secured satisfactory grade in all the mandatory courses,** to successfully complete the undergraduate programme. The performance of the student in these 160 credits shall be considered for the calculation of the final CGPA **(at the end of undergraduate programme),** and shall be indicated in the consolidated grade cum credit sheet.

7.5 If a student registers for '**extra subjects'** (in the parent department or other departments/branches of Engg.) other than those listed subjects totaling to 160 credits as specified in the course structure of his department, the performances in those '**extra subjects**' (although evaluated and graded using the same procedure as that of the required 160 credits) will not be considered while calculating the SGPA and CGPA. For such '**extra subjects'** registered, percentage of marks and letter grade alone will be indicated in the grade card / marks memo as a performance measure, subject to completion of the attendance and academic requirements as stated in regulations Items 6 and 7.1 – 7.4 above.

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

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

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

8.0 Evaluation - Distribution and Weightage of Marks

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

8.2 In CIE, for theory subjects, during a semester, there shall be two mid-term examinations. Each Mid-Term examination consists of two parts i) **Part – A** for 10 marks, ii) **Part – B** for 20 marks with a total duration of 2 hours as follows:

1. Mid Term Examination for 30 marks:
   a. Part - A : Objective/quiz/short answer paper for 10 marks.
   b. Part - B : Descriptive paper for 20 marks.

The objective/quiz/short answer paper is set with multiple choice, fill-in the blanks, match the following type of questions and short answer questions for a total of 10

marks (10 questions). The descriptive paper shall contain6 full questions out of which, the student has to answer 4 questions, each carrying 5 marks. The **average of the two Mid Term Examinations** shall be taken as the final marks for Mid Term Examination (for 30 marks).

The remaining 10 marks of Continuous Internal Evaluation are distributed as:

2. Assignment for 5 marks. (**Average of 2 Assignments** each for 5 marks)
3. Subject Viva-Voce/PPT/Poster Presentation/ Case Study/quiz on a topic in the concerned subject for 5 marks.

While the first mid-term examination shall be conducted on 50% of the syllabus, the second mid-term examination shall be conducted on the remaining 50% of the syllabus.

Five (5) marks are allocated for assignments (as specified by the subject teacher concerned). The first assignment should be submitted before the conduct of the first mid-term examination, and the second assignment should be submitted before the conduct of the second mid-term examination. The average of the two assignments shall be taken as the final marks for assignment (for 5 marks).

Subject Viva-Voce/PPT/Poster Presentation/ Case Study on a topic in the subject concerned for 5 marks before II Mid-Term Examination.

- 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 Over all 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 Continuous Internal Examination (CIE) marks.

In case, the student appears for Semester End Examination (SEE) of the concerned subject but not scored minimum 35% of CIE marks (14 marks out of 40 internal marks), his performance in that subject in SEE shall stand cancelled inspite of appearing the SEE.

There is NO Computer Based Test (CBT)/onetime improvement test of mid examinations for R22 regulations.

The details of the end semester question paper pattern are as follows:

8.2.1 The semester end examinations (SEE), for theory subjects, 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 a compulsory question which consists of ten sub-questions from all units carrying equal marks.
- Part-B consists of five questions (numbered from 2 to 6) carrying 10 marks each. Each of these questions is from each unit and may contain sub-questions. For each question there will be an "either" "or" choice, which means that there will be two questions from each unit and the student should answer either of the two questions.
- The duration of Semester End Examination is 3 hours.

8.3 For practical subjects there shall be a Continuous Internal Evaluation (CIE) during the semester for 40 marks and 60 marks for semester end examination. Out of the 40 marks for internal evaluation:

1. A write-up on day-to-day experiment in the laboratory (in terms of aim, components/procedure, expected outcome) which shall be evaluated for 10 marks
2. **10 marks for viva-voce (**or) tutorial (or) case study (or) application (or) poster presentation of the course concerned.
3. Internal practical examination conducted by the laboratory teacher concerned shall be evaluated for 10 marks.
4. 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.

The Semester End Examination shall be conducted with an external examiner and the laboratory teacher. The external examiner shall be appointed from the cluster / other colleges which will be decided by the examination branch of the University.

In the Semester End Examination held for 3 hours, total 60 marks are divided and allocated as shown below:

1. 10 marks for write-up
2. 15 for experiment/program
3. 15 for evaluation of results
4. 10 marks for presentation on another experiment/program in the same laboratory course and
5. 10 marks for viva-voce on concerned laboratory course.

- 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 Over all 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 Continuous Internal Examination (CIE) marks.

In case, the student appears for Semester End Examination (SEE) of the concerned subject but not scored minimum 35% of CIE marks (14 marks out of 40 internal marks), his performance in that subject in SEE shall stand cancelled inspite of appearing the SEE.

8.4 The evaluation of courses having ONLY internal marks in I Year I Semester and II Year II Semester is as follows:

1. I Year I Semester course ***(ex., Elements of CE/ME/EEE/ECE/CSE etc*)**: The internal evaluation is for 50 marks and it shall take place during I Mid-Term examination and II Mid-Term examination. The average marks of two Mid-Term examinations is the final for 50 marks. Student shall have to earn 40%, i.e 20 marks out of 50 marks fromaverage of the two examinations. There shall be NO external

evaluation. The student is deemed to have failed, if he (i) is absent as per schedule, or (ii) secures less than 40% marks in this course.

For CSE/IT and allied branches the Continuous Internal Evaluation (CIE) will be for 50 marks. Each Mid-Term examination consists of two parts i) Part – A for 20 marks, ii) Part – B for 20 marks with a total duration of 2 hours.

Part A: Objective/quiz paper is set with multiple choice, fill-in the blanks and match the following type of questions for a total of 20 marks.

Part B: Descriptive paper shall contain 6 full questions out of which, the student has to answer 4 questions, each carrying 5 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.

For all other branches, the Continuous Internal Evaluation (CIE) will be for 50 marks. Out of the 50 marks for internal evaluation:

a) **A write-up on day-to-day experiment in the laboratory (in terms of aim, components/procedure, expected outcome) which shall be evaluated for 10 marks.**

b) **10 marks for viva-voce (or) tutorial (or) case study (or) application (or) poster presentation of the course concerned.**

c) **Internal practical examination conducted by the laboratory teacher concerned shall be evaluated for 15 marks.**

d) **The remaining 15 marks are for Laboratory Report/Project and Presentation, 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.**

2. II Year II Semester *Real-Time (or) Field-based Research Project* course: The internal evaluation is for 50 marks and it shall take place during I Mid-Term examination and II Mid-Term examination. The average marks of two Mid-Term examinations is the final for 50 marks. Student shall have to earn 40%, i.e 20 marks out of 50 marks from average of the two examinations. There shall be NO external evaluation. The student is deemed to have failed, if he (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.

8.5 There shall be Industry training (or) Internship (or) Mini-project (or) Skill Development Courses (or) Paper presentation in reputed journal in collaboration with an industry of their specialization. Students shall register for this immediately after II-Year II Semester Examinations and pursue it during summer vacation/semester break & during III Year without effecting regular course work. Internship at reputed organization (or) Skill development courses (or) Paper presentation in reputed journal (or) Mini Project shall be submitted in a report form and presented before the committee in III-year II semester before end semester examination. It shall be

evaluated for 100 external marks. The committee consists of an External Examiner, Head of the Department, Supervisor of the Mini Project (or) Internship etc, Internal Supervisor and a Senior Faculty Member of the Department. There shall be **NO internal marks** for Industry Training (or) Internship (or) Mini-Project (or) Skill Development Courses (or) Paper Presentation in reputed journal.

8.6 There shall be a **Technical Seminar** presentation in the VIII Semester. For the Technical Seminar, the student shall collect the information on a specialized topic related to his branch other than the Real-Time (or) Field-based Research Project/ Mini project/ Internship/ Major Projects Phase-I & II topic with due approval of the Head of the department and prepare a technical report and submit to the department. The presentation demonstrating understanding of the topic and technical report shall be evaluated by a Departmental committee consisting of the Head of the department, Technical Seminar supervisor and a senior faculty member from the department. The Technical Seminar will be evaluated for 100 marks.

8.7 The UG project shall be initiated at the end of the IV Year I Semester and the duration of the project work is one semester. The student must present Project Stage – I during IV Year I Semester before II Mid examinations, in consultation with his Supervisor, the title, objective and plan of action of his Project work to the departmental committee for approval before commencement of IV Year II Semester. Only after obtaining the approval of the departmental committee, the student can start his project work.

8.8 UG project work shall be carried out in two stages: Project Stage – I for approval of project before Mid-II examinations in IV Year I Semester and Project Stage – II during IV Year II Semester. Student has to submit project work report at the end of IV Year II Semester. The project shall be evaluated for 100 marks before commencement of SEE Theory examinations.

8.9 For Project Stage – I, the departmental committee consisting of Head of the Department, project supervisor and a senior faculty member shall approve the project work to begin before II Mid-Term examination of IV Year I Semester. The student is deemed to be not eligible to register for the Project work, if he does not submit a report on Project Stage - I or does not make a presentation of the same before the evaluation committee as per schedule.

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

8.10 For Project Stage – II, the external examiner shall evaluate the project work for 60 marks and the internal project committee shall evaluate it for 40 marks. Out of 40 internal marks, the departmental committee consisting of Head of the Department, Project Supervisor and a Senior Faculty Member shall evaluate the project work for 20 marks and Project Supervisor shall evaluate for 20 marks. The topics for Mini Project/ Internship/SDC etc. and the main Project shall be different from the topic already taken. The student is deemed to have failed, if he (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.

For conducting viva-voce of project, The External Examiner shall be nominated by the Controller of Examinations from the panel of 3 names of external faculty members (Professors or Associate Professors outside the College) submitted by the HoD.

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

8.11 A student can re-register for subjects in a semester:

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 Objective & descriptive parts, Average of two Assignments & Subject Viva-voce/PPT/ Poster presentation/ Case Study on a topic in the concerned subject) are less than 35% and failed in those subjects.

They may seek re-registration for all those subjects registered in that semester in which the student is failed. The student has to re-appear for CIE and SEE as and when offered.

A student must re-register for the failed subject(s) for 40 marks within four weeks of commencement of the classwork in next academic year. His Continuous Internal Evaluation marks for 40 obtained in the previous attempt stand cancelled. The student has to obtain fresh set of marks for 40 allotted for CIE (Sum of average of two mid-term examinations consisting of Objective & descriptive parts, Average of two Assignments & Subject Viva-voce/PPT/ Poster presentation/ Case Study on a topic in the concerned subject). Head of the Dept. will take care of this.

8.12 For mandatory courses, a student has to secure 40 marks out of 100 marks (i.e. 40% of the 100 marks allotted) in the Continuous Internal Evaluation for passing the subject/course.

8.13 No marks or letter grades shall be allotted for mandatory/non-credit courses. Only Pass/Fail shall be indicated in Grade Card.

9.0 Grading Procedure

9.1 Grades will be awarded to indicate the performance of students in each Theory Subject, Laboratory/Practicals/ Mini Project/Internship/SDC and Project Stage. Based on the percentage of marks obtained (Continuous Internal Evaluation plus Semester End Examination, both taken together) as specified in item 8 above, a corresponding letter grade shall be given.

9.2 As a measure of the performance of a student, a 10-point absolute grading system using the following letter grades (as per UGC/AICTE guidelines) and corresponding percentage of marks shall be followed:

% of Marks Secured in a Subject/Course (Class Intervals)	Letter Grade (UGC Guidelines)	Grade Points
Greater than or equal to 90%	O (Outstanding)	10
80 and less than 90%	A^+ (Excellent)	9
70 and less than 80%	A (Very Good)	8
60 and less than 70%	B^+ (Good)	7
50 and less than 60%	B (Average)	6
40 and less than 50%	C (Pass)	5
Below 40%	F (FAIL)	0
Absent	Ab	0

9.3 A student who has obtained an '**F'** grade in any subject shall be deemed to have '**failed'** and is required to reappear as a 'supplementary student' in the semester end examination, as and when offered. In such cases, internal marks in those subjects 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 he is deemed to have '**Failed'**. A student will be required to reappear as a 'supplementary student' in the semester end examination, 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 secured in that subject/ course. 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 …. For a course

9.7 A student passes the subject/ course only when **GP ≥ 5 ('C' grade or above)**

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

SGPA = { $\sum_{i=1}^{N} C_i G_i$ } / { $\sum_{i=1}^{N} C_i$ } …. For each semester,

where 'i' is the subject indicator index (considering all subjects in a semester), 'N' is the no. of subjects '**registered'** for the semester (as specifically required and listed under the course structure of the parent department), C_i is the no. of credits allotted to

the i^{th} subject, and G_i represents the grade points (GP) corresponding to the letter grade awarded for that i^{th} subject.

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 (of 160) 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 II semester onwards at the end of each semester as per the formula

$$\textbf{CGPA} = \{ \textstyle\sum_{j=1}^{M} C_j G_j \} / \{ \sum_{j=1}^{M} C_j \} \textbf{ … for all S semesters registered}$$

(i.e., up to and inclusive of S semesters, S ≥ 2),

where '**M'** is the **total** no. of subjects (as specifically required and listed under the course structure of the parent department) the student has '**registered'** i.e., from the 1^{st} semester onwards up to and inclusive of the 8^{th} semester, 'j' is the subject indicator index (takes into account all subjects from 1 to 8 semesters), C_j is the no. of credits allotted to the j^{th} subject, and G_j represents the grade points (GP) corresponding to the letter grade awarded for that j^{th} subject. After registration and completion of I year I semester, the SGPA of that semester itself may be taken as the CGPA, as there are no cumulative effects.

Illustration of calculation of SGPA:

Course/Subject	Credits	Letter Grade	Grade Points	Credit Points
Course 1	4	A	8	4 x 8 = 32
Course 2	4	O	10	4 x 10 = 40
Course 3	2	C	5	2 x 5 = 10
Course 4	3	B	6	3 x 6 = 18
Course 5	1	A+	9	1 x 9 = 9
Course 6	1	C	5	1 x 5 = 5
Course 7	1	O	10	1 x 10 = 10
Course 8	2	A	8	2 x 8 = 16
Course 9	1	B^+	7	1 x 7 = 7
Course 10	1	B^+	7	1 x 7 = 7
	20			154

SGPA = 154/20 = 7.7

Illustration of Calculation of CGPA up to 3rd Semester:

Semester	Course/ Subject Title	Credits Allotted	Letter Grade Secured	Corresponding Grade Point (GP)	Credit Points (CP)
I	Course 1	4	A	8	32
I	Course 2	4	O	10	40
I	Course 3	2	B	6	12

I	Course 4	3	A	8	24
I	Course 5	1	A+	9	9
I	Course 6	1	C	5	5
I	Course 7	1	B	6	6
I	Course 8	2	A	8	16
I	Course 9	1	C	5	5
I	Course 10	1	O	10	10
II	Course 11	2	B+	7	14
II	Course 12	4	B	6	24
II	Course 13	4	A	8	32
II	Course 14	3	O	10	30
II	Course 15	1	A	8	8
II	Course 16	1.5	C	5	7.5
II	Course 17	1.5	O	10	15
II	Course 18	1.5	B+	7	10.5
II	Course 19	1.5	B	6	9
III	Course 20	4	A	8	32
III	Course 21	3	B+	7	21
III	Course 22	3	A	8	24
III	Course 23	3	O	10	30
III	Course 24	3	A	8	24
III	Course 25	2	C	5	10
III	Course 26	1	O	10	10
III	Course 27	1	B+	7	7
	Total Credits	**60**		**Total Credit Points**	**467**

CGPA = 467/60 = 7.78

The calculation process of CGPA illustrated above will be followed for each subsequent semester until 8th semester. The CGPA obtained at the end of 8th semester will become the final CGPA secured for entire B.Tech. programme.

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 first attempt. Otherwise the SGPA and CGPA shall be mentioned only on the Memorandum of Grades in which sitting he passed his 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 he secures a GP ≥ 5 (**'C'** grade or above) in every subject/course in that semester (i.e. when the student gets

an SGPA ≥ 5.0 at the end of that particular semester); and he shall be declared successful or 'passed' in the entire undergraduate programme, only when gets a CGPA ≥ 5.00 (**'C'** grade or above) for the award of the degree as required.

10.2 After the completion of each semester, a grade card or grade sheet shall be issued to all the registered students of that semester, indicating the letter grades and credits earned. It will show the details of the courses registered (course code, title, no. of credits, grade earned, etc.) and credits earned. **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 to 9.9.

11.2 For final percentage of marks equivalent to the computed final CGPA, the following formula may be used.

% of Marks = (final CGPA – 0.5) x 10

12.0 Award of Degree

12.1 A student who registers for all the specified subjects/ courses as listed in the course structure and secures the required number of 160 credits (with CGPA ≥ 5.0), within 8 academic years from the date of commencement of the first academic year, shall be declared to have '**qualified'** for the award of B.Tech. degree in the branch of Engineering selected at the time of admission.

12.2 A student who qualifies for the award of the degree as listed in item 12.1 shall be placed in the following classes.

12.3 A student with final CGPA (at the end of the undergraduate programme) ≥ 8.00, and fulfilling the following conditions - shall be placed in '**First Class with Distinction'**. However, he

(i) Should have passed all the subjects/courses in '**First Appearance'** within the first 4 academic years (or 8 sequential semesters) from the date of commencement of first year first semester.

(ii) Should not have been detained or prevented from writing the semester end examinations in any semester due to shortage of attendance or any other reason.

A student not fulfilling any of the above conditions with final CGPA ≥ 8 shall be placed in **'First Class'.**

12.4 Students with final CGPA (at the end of the undergraduate programme) ≥ 7.0 but < 8.00 shall be placed in **'First Class'.**

12.5 Students with final CGPA (at the end of the undergraduate programme) ≥ 6.00 but < 7.00, shall be placed in '**Second Class'**.

12.6 All other students who qualify for the award of the degree (as per item 12.1), with final CGPA (at the end of the undergraduate programme) ≥ 5.00 but < 6, shall be placed in '**pass class**'.

12.7 A student with final CGPA (at the end of the undergraduate programme) < 5.00 will not be eligible for the award of the degree.

12.8 Students fulfilling the conditions listed under item 12.3 alone will be eligible for award of '**Gold Medal**'.

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

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

2. The student **once opted and awarded 2-Year UG Diploma Certificate, the student will be permitted to join** in B. Tech. III Year I 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, he/she should register for the subjects/courses in III Year I Semester before commencement of classwork for that semester.*

3. The students, who exit the 4-Year B. Tech. program after II Year of study and wish to re-join 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.*

4. A student may be permitted to take one year break after completion of II Year II Semester or B. Tech. III Year II 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 College 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 Transitory Regulations

A. For students detained due to shortage of attendance:

1. A Student who has been detained in I year of R18 Regulations due to lack of attendance, shall be permitted to join I year I Semester of R22 Regulations and he 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.

2. A student who has been detained in any semester of II to VIII semesters of R18 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:

3. A student of R18 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 his/her first admission. 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:

4. A student who has failed in any subject under any regulation has to pass those subjects in the same regulations.
5. The maximum credits that a student acquires for the award of degree, shall be the sum of the total number of credits secured in all the regulations of his/her study including R22 Regulations. **There is NO exemption of credits in any case**.
6. If a student is readmitted to R22 Regulations and has any subject with 80% of syllabus common with his/her previous regulations, that particular subject in R22 Regulations will be substituted by another subject to be suggested by the Board of Studies.
7. The total credits required are 160 including both R18 & R22 regulations, and if the total credits are less than 160 including both R18 & R22 Regulations then an additional course(s) suggested by the Board of Studies may be given to fulfill the minimum requirements of 160 credits.

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

15.0 Student Transfers

15.1 There shall be no Branch transfers after the completion of Admission Process.

15.2 Transfer of candidates from other Institutions will be governed by the regulations of Telangana State Government issued from time to time.

15.3 The students seeking transfer to colleges affiliated to JNTUH from various other Universities/institutions have to pass the failed subjects which are equivalent to the subjects of JNTUH, and also pass the subjects of JNTUH which the students have not studied at the earlier institution. Further, though the students have passed some of the

subjects at the earlier institutions, if the same subjects are prescribed in different semesters of JNTUH, the students have to study those subjects in JNTUH in spite of the fact that those subjects are repeated.

15.4 The transferred students from other Universities/Institutions to JNTUH affiliated colleges who are on rolls are to be provided one chance to write the CBT (for internal marks) in the equivalent subject(s) as per the clearance letter issued by the University.

15.5 The autonomous affiliated colleges have to provide one chance to write the internal examinations in the equivalent subject(s) to the students transferred from other universities/institutions to JNTUH autonomous affiliated colleges who are on rolls, as per the clearance (equivalence) letter issued by the University.

16.0 Scope

i) Where the words "he", "him", "his", occur in the write-up of regulations, they include "she", "her", "hers".

ii) Where the words "Subject" or "Subjects", occur in these regulations, they also imply "Course" or "Courses".

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

iv) In case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Principal/College Academic Council/Honourable Vice-Chancellor of JNTUH is final.

v) The College may change 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 College Authorities.

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ACADEMIC REGULATIONS FOR B.TECH (LATERAL ENTRY SCHEME)

(Applicable for the students admitted into II Year B.Tech (Lateral Entry Scheme) from the Academic Year 2023-24 and onwards)

1. Eligibility for the award of B.Tech Degree (LES)

The LES students after securing admission shall pursue a course of study for not less than three academic years and not more than six academic years.

2. The student shall register for 120 credits 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. The students, who fail to fulfil the requirement for the award of the degree in six academic years from the year of admission, shall forfeit their seat in B.Tech.

4. The attendance requirements of B. Tech. (Regular) shall be applicable to B.Tech. (LES).

5. Promotion rule

S. No	Promotion	Conditions to be fulfilled
1	**Second year first semester to second year second semester**	**Regular course of study of second year first semester.**
2	**Second year second semester to third year first semester**	**(i) Regular course of study of second year second semester.** **(ii) Must have secured at least 24 credits out of 40 credits i.e., 60% credits up to second year second semester from all the relevant regular and supplementary examinations, whether the student takes those examinations or not.**
3	**Third year first semester to third year second semester**	**Regular course of study of third year first semester.**
4	**Third year second semester to fourth year first semester**	**(i) Regular course of study of third year second semester.** **(ii) Must have secured at least 48 credits out of 80 credits i.e., 60% credits up to third year second semester from all the relevant regular and supplementary examinations, whether the student takes those examinations or not.**
5	**Fourth year first semester to fourth year second semester**	**Regular course of study of fourth year first semester.**

6. **All the other regulations as applicable to B. Tech. 4-year degree course (Regular) will hold good for B. Tech. (Lateral Entry Scheme).**

7. **LES students are not eligible for 2-Year B. Tech. Diploma Certificate.**

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MALPRACTICE RULES

Disciplinary Action for Malpractices/Improper Conduct in Examinations

	Nature of Malpractices/ Improper conduct	Punishment
1.(a)	Possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, Cell phones, pager, palm computers, smart watches, electronic gadgets or any other form of material concerned with or related to the subject of the examination (theory or practical) in which he is appearing but has not made use of (material shall include any marks on the body of the candidate which can be used as an aid in the subject of the examination)	Expulsion from the examination hall and cancellation of the performance in that subject only. Confiscation of Cell phones, pager, palm computers, smart watches, electronic gadgets etc. and the same would be handed over only after punishment finalized by Malpractice Committee.
(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, pager, palm computers, smart watches, electronic gadgets with any candidate or persons in or outside the exam hall in respect of any matter.	Expulsion from the examination hall and cancellation of the performance in that subject only of all the candidates involved. In case of an outsider, he will be handed over to the police and a case is registered against him. Confiscation of Cell phones, pager, palm computers, smart watches, electronic gadgets etc. and the same would be handed over only after punishment finalized by Malpractice Committee.
2.	Has copied in the examination hall from any paper, book, programmable calculators, palm computers, cell phones, smart watches, electronic gadgets 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 excluding Project work/ Mandatory Courses /Technical Seminar 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. Confiscation of Cell phones, pager, palm computers, smart watches, electronic gadgets etc. and the same would be handed over only after punishment finalized by Malpractice Committee.
3.	Impersonates any other candidate in connection with the examination.	The candidate who has impersonated shall be expelled from examination hall. The candidate is also debarred and forfeits the seat. The performance of the original candidate Who has been

		impersonated, shall be cancelled in all the subjects of the examination (including practicals and project work) already appeared and shall not be allowed to appear for examinations of the Remaining subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all end semester 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 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 end semester 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 Chief Superintendent/Assistant– Superintendent / any officer on duty or misbehaves or creates disturbance of any kind in and around the or organizes a walk out or instigates others **to** examination hall-walk out, or threatens the officer- in-charge or any person on duty in or outside the examination hall of any injury**,** to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the officer- in-charge, or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction of property in the examination hall or any part of the College	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 are also 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.

	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.	
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 Semester End Examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
8.	Possess any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of That semester/year. The candidate is also debarred and forfeits the seat.
9.	If student of the college, who is not a candidate for the particular examination or any person not connected with the college indulges in any malpractice or improper conduct mentioned in clause 6 to 8.	If the student belongs to the college, expulsion from the examination performance in that subject and all other subjects shall and cancellation of 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 state of inebriated/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 other remaining examinations of the subjects of that semester/year.
11.	Copying detected on the basis of internal evidence, such as, during valuation or during	Cancellation of the performance in that subject and all other subjects the

	special scrutiny.	candidate has appeared including practical examinations excluding Project work/ Mandatory Courses /Technical Seminar of that semester/year.
12.	If any malpractice is detected which is not covered in the above clauses 1 to 11 shall be reported to the College Academic Committee for further action to award suitable punishment.	

Malpractices identified by squad or special invigilators

Punishments to the candidates as per the above guidelines.

Malpractice identified at Spot center during valuation

1) The following procedure is to be followed in the case of malpractice cases detected during valuation, scrutiny etc. at spot center. Malpractice is detected at the spot valuation. The case is to be referred to the malpractice committee. Malpractice committee will meet and discuss/question the candidate and based on the evidences, the committee will recommend suitable action on the candidate.
2) A notice is to be served to the candidate(s) involved through the Principal regarding the malpractice and seek explanations.
3) The involvement of staff who are in charge of conducting examinations, invigilators valuing examination papers and preparing / keeping records of documents relating to the examinations in such acts (inclusive of providing in correct or misleading information) that infringe upon the course of natural justice to one and all concerned at the examinations shall be viewed seriously and recommended for award of appropriate punishment after thorough enquiry.
4) Based on the explanation and recommendation of the committee action may be initiated.

Malpractice committee:

(a) Chief Superintendent	Chairman
(b) Controller of Examinations	Member
(c) Dean Academics	Member
(d) Chief Examiner of the Course/ Subject Expert	Member
(e) Concerned Head of the Department	Member
(f) Observer	Member

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CMR COLLEGE OF ENGINEERING & TECHNOLOGY
(Autonomous)
DEPARTMENT OF AIML

Institute Vision.

To be a premier academic institution striving continuously for excellence in technical education , research and technological service to the nation.

Institute Mission.

- Create and sustain a community of learning in which students acquire knowledge and learn to apply it professionally with a concern for the society.
- Pursue and disseminate research findings and offer knowledge based technological services to satisfy the needs of society and the industry.
- Promote professional ethics, leadership qualities and social responsibilities.

Vision of the Department.

- To evolve as a centre of academic excellence in Computer Science & Engineering with Artificial Intelligence by building strong teaching and research environment.

Mission of the Department.

- To offer high quality graduate programs in computer science & Engineering with Artificial Intelligence education and to prepare students for professional career and/or higher studies globally.
- To develop self learning abilities and professional ethics to serve the society.

Program Educational Objectives (PEOs)

PEO I: Excel in their professional career and higher education in Computer Science & Engineering and chosen fields.

PEO II: Demonstrate leadership qualities, teamwork and professional ethics to serve the society

PEO III: Adapt to state of art technology through continuous learning in the areas of interest.

Program Outcomes

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

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

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

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

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

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

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

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

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

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

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

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

CMR COLLEGE OF ENGINEERING & TECHNOLOGY(UGC AUTONOMOUS)

B. Tech- AIML

CBCS & OUTCOME BASED COURSE STRUCTURE & SYLLABUS

(Effective for the students admitted into I year from the Academic Year 2022-23)

	SEMESTER - I								
S.No	**Course Code**	**Course Title**	**Category**	**Hours per Week**			**Credits**	**Maximum Marks**	
				L	**T**	**P**		**CIE**	**SEE**
1	A400101	English for Skill Enhancement	HSMC	2	0	0	2	40	60
2	A400001	Matrices and Calculus	BSC	3	1	0	4	40	60
3	A400008	Applied Physics	BSC	3	1	0	4	40	60
4	A405201	Programming for Problem Solving	ESC	3	0	0	3	40	60
5	A405501	Elements of Computer Science & Engineering	ESC	0	0	2	1	50	-
6	A400503	English Language and Communication SkillsLaboratory	HSMC	0	0	2	1	40	60
7	A400501	Applied Physics Laboratory	BSC	0	0	3	1.5	40	60
8	A405504	IT Workshop	ESC	0	0	3	1.5	40	60
9	A405502	Programming for Problem Solving Laboratory	ESC	0	0	2	1	40	60
10	A400505	Introduction to Social Innovation	HSMC	0	0	2	1	40	60
11	A400704	Universal Human Values	MC	2	0	0	0	-	-
	Total:			**13**	**2**	**14**	**20**		
	Total hours per Week:			**29**					

	SEMESTER – II								
S.No	**Course Code**	**Course Title**	**Category**	**Hours per Week**			**Credits**	**Maximum Marks**	
				L	**T**	**P**		**CIE**	**SEE**
1	A400002	Ordinary DifferentialEquation and Vector Calculus	BSC	3	1	0	4	40	60
2	A400009	Engineering Chemistry	BSC	3	1	0	4	40	60
3	A402201	Basic Electrical Engineering	ESC	2	0	0	2	40	60
4	A405301	Data Structures	PCC	3	0	0	3	40	60
5	A403502	Computer Aided Engineering Drawing	ESC	0	1	2	2	40	60
6	A400502	Engineering ChemistryLaboratory	BSC	0	0	2	1	40	60
7	A402502	Basic Electrical Engineering Laboratory	ESC	0	0	2	1	40	60
8	A405505	Data Structures Laboratory	PCC	0	0	3	1.5	40	60
9	A400506	Engineering Exploration & Practice	HSMC	0	0	3	1.5	40	60
10	A400703	Constitution of India	MC	2	0	0	0	-	-
	Total:			**13**	**3**	**12**	**20**		
	Total hours per Week			**28**					
	Total Credits in I Year: 40								

S.No	Course Code	Course Title	Category	Hours per Week			Credits	Maximum Marks	
				L	T	P		CIE	SEE
SEMESTER – III									
1	A400003	Mathematical and Statistical Foundations	BSC	3	1	0	4	40	60
2	A404203	Electronic Devices and Circuits	ESC	2	0	0	2	40	60
3	A405307	Computer Organization and Architecture	PCC	3	0	0	3	40	60
4	A405308	Software Engineering	PCC	3	0	0	3	40	60
5	A405305	Operating Systems	PCC	3	0	0	3	40	60
6	A405506	Python Programming Laboratory	ESC	0	1	2	2	40	60
7	A405509	Operating Systems Laboratory	PCC	0	0	2	1	40	60
8	A466501	Software Engineering Laboratory	PCC	0	0	2	1	40	60
9	A400507	Social Innovation in Practice	HSMC	0	0	2	1	40	60
10	A400702	Gender Sensitization	MC	2	0	0	0	-	-
		Total:		**16**	**2**	**8**	**20**		
		Total hours per Week:		**26**					
SEMESTER – IV									
S.No	**Course Code**	**Course Title**	**Category**	**Hours per Week**			**Credits**	**Maximum Marks**	
				L	**T**	**P**		**CIE**	**SEE**
1	A405306	Discrete Mathematics	PCC	3	0	0	3	40	60
2	A412303	Automata Theory and Compiler Design	PCC	3	0	0	3	40	60
3	A405304	Database Management Systems	PCC	3	0	0	3	40	60
4	A466301	Artificial Intelligence	PCC	3	0	0	3	40	60
5	A405303	Object Oriented Programming through Java	PCC	3	0	0	3	40	60
6	A405508	Database Management Systems Laboratory	PCC	0	0	2	1	40	60
7	A412504	Java Programming Laboratory	PCC	0	0	2	1	40	60
8	A466502	Artificial Intelligence Laboratory	PCC	0	0	2	1	40	60
9	A466801	Real-time Research Project/Field-Based Research Project	PROJ	0	0	4	2	50	-
10	A400701	Environmental Sciences	MC	2	0	0	0		
		Total:		**17**	**0**	**10**	**20**		
		Total hours per Week:		**27**					
		Total Credits in II Year: 40							

SEMESTER – V									
S.No	**Course Code**	**Course Title**	**Category**	**Hours per Week**			**Credits**	**Maximum Marks**	
				L	**T**	**P**		**CIE**	**SEE**
1	A473301	Design and Analysis of Algorithms	PCC	3	1	0	4	40	60
2	A473302	Machine Learning	PCC	3	0	0	3	40	60
3	A473303	Computer Networks	PCC	3	0	0	3	40	60
4	A473304	Deep Learning	PCC	3	0	0	3	40	60
5	PE	Professional Elective-I	PEC	3	0	0	3	40	60
6	A473501	Machine Learning Lab	PCC	0	0	2	1	40	60
7	A473502	Computer Networks Lab	PCC	0	0	2	1	40	60
8	A473503	Deep Learning Lab	PCC	0	0	2	1	40	60
9	A473504	UI design-Flutter	PCC	0	0	2	1	40	60
10	A400705	Intellectual Property Rights	MC	2	0	0	0	-	-
		Total:		**17**	**1**	**8**	**20**		
		Total hours per Week:		**26**					

SEMESTER – VI									
S.No	**Course Code**	**Course Title**	**Category**	**Hours per Week**			**Credits**	**Maximum Marks**	
				L	**T**	**P**		**CIE**	**SEE**
1	A473305	Nature Inspired Computing	PCC	2	0	0	2	40	60
2	A473306	Knowledge Representation and Reasoning	PCC	3	0	0	3	40	60
3	A473307	Principles Data Analytics	PCC	3	0	0	3	40	60
4	A473308	Natural Language Processing	PCC	3	0	0	3	40	60
5	PE	Professional Elective-II	PEC	3	0	0	3	40	60
6	A473505	Principles of Data Analytics Lab	PCC	0	0	3	1.5	40	60
7	A473506	Natural Language Processing Lab	PCC	0	0	3	1.5	40	60
8	A400504	Advanced English Communication SkillsLaboratory	HSMC	0	0	2	1	40	60
9	A473801	Industrial Oriented Mini Project/ Internship/ Skill Development Course	PROJ	0	0	4	2	-	100
		Total:		**14**	**0**	**12**	**20**		
		Total hours per Week:		**26**					
		Total Credits in III Year: 40							

SEMESTER – VII									
S.No	**Course Code**	**Course Title**	**Category**	**Hours per Week**			**Credits**	**Maximum Marks**	
				L	**T**	**P**		**CIE**	**SEE**
1	OE	OPEN ELECTIVE- I	OEC	3	0	0	3	40	60
2	PE	PROFESSIONAL ELECTIVE-III	OEC	3	0	0	3	40	60
3	PE	PROFESSIONAL ELECTIVE-IV	PEC	3	0	0	3	40	60
4	PE	PROFESSIONAL ELECTIVE-V	PEC	3	0	0	3	40	60
5	PE	PROFESSIONAL ELECTIVE-VI	PEC	3	0	0	3	40	60
6	A473309	Professional Practice, Law & Ethics	PCC	2	0	0	2	40	60
7	A473802	Major Project Phase-I	PROJ	0	0	6	3	40	60
	Total:			**17**	**0**	**6**	**20**		
	Total hours per Week:			**23**					

SEMESTER – VIII									
S.No	**Course Code**	**Course Title**	**Category**	**Hours per Week**			**Credits**	**Maximum Marks**	
				L	**T**	**P**		**CIE**	**SEE**
1	A400102	Business Economics & Financial Analysis	HSMC	3	0	0	3	40	60
2	OE	OPEN ELECTIVE-II	PEC	3	0	0	3	40	60
3	OE	OPEN ELECTIVE-III	OEC	3	0	0	3	40	60
4	A473804	Technical Seminar	PROJ	0	0	4	2	-	100
5	A473803	Major Project Phase-II	PROJ	0	0	16	9	40	60
	Total:			**9**	**0**	**20**	**20**		
	Total hours per Week			**29**					
	Total Credits in IV Year: 40								

Professional Electives			
S.No	**Subject Code**	**Name of the Subject**	**Category**
1	A473401	Graph Theory	PEC-I
2	A473402	Advanced Python Programming	
3	A473403	Computer Graphics	
4	A473404	Data Warehousing and Business Intelligence	
5	A473405	Software Testing Methodologies	PEC-II
6	A473406	Information Retrieval Systems	
7	A473407	Pattern Recognition	
8	A473408	Computer Vision and Robotics	
9	A473409	Data Mining	PEC-III
10	A473410	Scripting Languages	
11	A473411	Mobile Application Development	
12	A473412	Cryptography and Network Security	
13	A473413	Quantum Computing	PEC-IV
14	A473414	Expert Systems	
15	A473415	Semantic Web	
16	A473416	Mobile Computing	
17	A473417	Social Network Analysis	PEC-V
18	A473418	Federated Machine Learning	
19	A473419	Augmented Reality & Virtual Reality	
20	A473420	Ad-hoc & Sensor Networks	
21	A473421	Robotic Process Automation	PEC-VI
22	A473422	Randomized Algorithms	
23	A473423	Cognitive Computing	
24	A473424	Conservational AI	

Open Elective-I		
Sr.No	**Course Code**	**Course Name**
1	A404601	Fundamentals of Internet of Things
2	A404602	Principles of Digital Signal Processing
3	A402601	Renewable Energy Sources
4	A402602	Basics of Power Electronics & Drives
5	A405604	Java Programming
6	A405602	Fundamentals of Operating Systems
7	A403601	Fundamentals of Engineering Materials
8	A403602	Basics of Thermodynamics
9	A400601	Basics of Logistics and Supply Chain Management
10	A400602	Industrial Relations
11	A401601	Disaster Preparedness & Planning Management
12	A401602	Environmental Impact Assessment
Open Elective-II		
1	A404603	Sensors and Transducers
2	A404604	Image Processing
3	A402603	Electrical Vehicle Technology
4	A402604	Basics of Power Plant Engineering
5	A405601	Fundamentals of Database management Systems
6	A405605	Web programming
7	A403603	Fundamentals of Manufacturing Processes
8	A403604	Fundamentals of Automobile Engineering
9	A400603	Entrepreneurship
10	A400604	Ethics in Business & Corporate Governance
11	A401603	Remote Sensing & Geographical Information Systems
12	A401604	Solid Waste Management
Open Elective-III		
1	A404605	Fundamentals of Embedded Systems
2	A404606	Data Communications
3	A402605	Nano Technology
4	A402606	EV Batteries & Charging System
5	A405603	Fundamentals of Computer networks
6	A405606	Fundamentals of DevOps
7	A403605	Industrial safety Engineering
8	A403606	Waste to Energy
9	A400605	Basics of Marketing
10	A405607	Cloud Computing
11	A401605	Energy Efficient Buildings
12	A401606	Environmental Pollution

(A400101) ENGLISH FOR SKILL ENHANCEMENT

(Common to all branches)

B.Tech I Year I Sem **L T P C**

2 0 0 2

UNIT - I

Chapter entitled 'Toasted English' by R.K.Narayan from "English: Language, Context and Culture" published by Orient BlackSwan, Hyderabad.

Vocabulary: The Concept of Word Formation -The Use of Prefixes and Suffixes -Acquaintance with Prefixes 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: Sentence Structures -Use of Phrases and Clauses in Sentences- Importance of Proper Punctuation- Techniques for writing precisely – Paragraph Writing – Types, Structures and Features of a Paragraph - Creating Coherence-Organizing Principles of Paragraphs in Documents.

UNIT – II

Chapter entitled 'Approx. JRD 'by Sudha Murthy from "English Language, Context and Culture" published by Orient Black Swan, Hyderabad.

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

UNIT – III

Chapter entitled 'Lessons from Online Learning' by F.HaiderAlvi, Deborah Hurst et alfrom "English: Language, Context and Culture" published by Orient BlackSwan, Hyderabad.

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.

Reading: Sub-Skills of Reading – Intensive Reading and Extensive Reading – Exercises for Practice.

Writing: Format of a Formal Letter-Writing Formal Letters E.g., Letter of Complaint, Letterof Requisition, Email Etiquette, Job Application with CV/Resume.

UNIT - IV

Chapter entitled 'Art and Literature' by Abdul Kalam from "English: Language, Context andCulture" published by Orient BlackSwan, Hyderabad.

Vocabulary: Standard Abbreviations in English Grammar: Redundancies and Clichés in Oral and Written Communication.

Reading: Writing: Survey, Question, Read, Recite and Review (SQ3R Method) - Exercises for Practice Writing Practices

Essay Writing-Writing Introduction and Conclusion -Précis Writing

UNIT - V

Grammar: Common Errors in English (Covering all the other aspects of grammar which were not covered in the previous units)

Reading: Writing: Reading Comprehension-Exercises for Practice Technical Reports- Introduction.

NOTE:

Listening and Speaking Skills which are given under in AICTE Model Curriculum are covered in the syllabus of ELCS Lab Course.

- NOTE 1: As the syllabus of English given in AICTE Model Curriculum-2018 for B.Tech First Year is Open-ended, besides following the prescribed textbook, it is required to prepare teaching/learning materials by the teachers collectively in the form of handouts based on the needs of the students in their respective colleges for effective teaching/learning in the class.

- NOTE 2: Based on the recommendations of NEP2020, teachers are requested to be flexible to adopt Blended Learning in dealing with the course contents. They are advised to teach 40percent of each topic from the syllabus in blended mode.

TEXTBOOKS:

1. "English: Language, Context and Culture" by Orient BlackSwan Pvt. Ltd, Hyderabad. 2022. Print.
2. Remedial English Grammar by Wood F.T, Macmillan.2007.

REFERENCE BOOKS:

1. Effective Academic Writing, (2nd edition) by Liss and Davis (OUP)2014.
2. Richards, Jack C. Interchange Series. Introduction, (4th edition), Cambridge University Press 2022

COURSE OUTCOMES:

After completion of this course students will be able to:

1. Understand the importance of vocabulary and sentence structures.
2. Choose appropriate vocabulary and sentence structures for their oral and written communication.
3. Demonstrate their understanding of the rules of functional grammar.
4. Develop comprehension skills from the known passages.
5. Acquire basic proficiency in reading and writing modules of English and take an active part in drafting paragraphs, letters, essays, abstracts, precis, and reports in various contexts.

CO PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	-	-	-	2	3	-	-
CO2	-	-	-	-	-	-	-	-	-	2	2	
CO3	-	-	-	-	-	-	-	-	-	2	-	-
CO4	-	-	-	-	-	-	-	-		3	-	2
CO5	-	-								2		3

(A400001) MATRICES AND CALCULUS

(Common to All)

B.Tech: I Year I Sem

L	T	P	C
3	1	0	4

UNIT-I

Matrices: Rank of a matrix by Echelon form and Normal form, Inverse of Non-singular matrices by Gauss-Jordan method, System of linear equations: Solving system of Homogeneous equations and non-homogeneous equations by Gauss elimination method, Gauss Seidel Iteration Method.

UNIT-II

Eigen values and Eigen vectors:

Linear Transformation and Orthogonal transformation: Eigen values, Eigen vectors and their properties, Diagonalization of a square matrix, Cayley-Hamilton theorem (without proof) -Inverse and power of a matrix by Cayley-Hamilton theorem, Quadratic forms and nature of the quadratic forms, Reduction of quadratic form to canonical form by orthogonal transformations.

UNIT-III

Calculus:

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, Applications of definite integrals to evaluate surface areas and volumes of revolutions of curves (only in Cartesian coordinates),

Improper Integral: Beta, Gamma functions and their applications.

UNIT-IV

Multivariable calculus (Partial Differentiation and applications):

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.

UNIT-V

Multivariable Calculus (Integration):

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 and (Cartesian to Spherical and Cylindrical polar coordinates) for triple integrals.

TEXT BOOKS:

1. Higher Engineering Mathematics, (36thEdition), B.S. Grewal, Khanna Publishers, 2010.
2. Advanced Engineering Mathematics, (5thEdition), R.K. Jain and S.R.K Iyengar, NarosaPublications,2016.

REFERENCE BOOKS:

1. Advanced Engineering Mathematics, (9th Edition), Erwinkreyszig, JohnWiley & Sons,2006.
2. Calculus and Analytic geometry, (9thEdition), G.B. Thomas and R.L. Finney, Pearson, Reprint, 2002.
3. A textbook of Engineering Mathematics, (10th Edition), N.P. Bali and Manish Goyal, Laxmi Publications, Reprint, 2019.
4. Higher Engineering Mathematics, (11thReprint), Ramana B.V., Tata McGraw Hill New Delhi, 2010.

COURSE OUTCOMES:

On completion of the course students will be able to:

1. Solve linear system of equations represented by matrices
2. Obtain eigen values, eigen vectors and perform diagonalization of a square matrix.
3. Verify mean value theorems & evaluation of improper integrals by using Beta and Gamma functions.
4. Develop the skill of determining optimal values of multivariable functions using classical methods.
5. Evaluate the multiple integrals and apply the concept to find areas, volumes.

CO-PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**3**	**2**	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**
CO2	**3**	**2**	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**
CO3	**2**	**3**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**
CO4	**3**	**2**	**3**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**
CO5	**3**	**2**	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**

(A400008) APPLIED PHYSICS

(Common to all branches)

B.Tech: I Year I Sem

L	T	P	C
3	1	0	4

UNIT – I

QUANTUM MECHANICS:
Introduction to quantum physics, blackbody radiation – Stefan-Boltzmann's law, Wein's and Rayleigh-Jean's law, Planck's radiation law - photoelectric effect – de Broglie hypothesis- Davisson and Germer experiment – Heisenberg uncertainty principle - Born interpretation of the wave function – time independent Schrodinger wave equation - particle in one dimensional potential box.

ELECTRIC PROPERTIES OF SOLIDS:
Free electron theory (Drude& Lorentz, Sommerfeld) - Fermi-Dirac distribution - Bloch's theorem -Kronig-Penney model – E-K diagram- effective mass of electron-origin of energy bands- classification of solids.

UNIT – II

SEMICONDUCTORS AND DEVICES:
Intrinsic and extrinsic semiconductors, Variation of Fermi level with temperature – Hall Effect - Construction, principle of operation and characteristics of P-N Junction diode, Zener diode

PHOTONIC DEVICES:
Direct and indirect band gap semiconductors –LED, PIN diode, avalanche photo diode (APD) and solar cells, their structure, materials, working principle and characteristics.

UNIT – III

LASERS:
Laser beam characteristics-three quantum processes-Einstein coefficients and their relations- lasing action - pumping methods- ruby laser, He-Ne laser, CO_2 laser - semiconductor laser-applications of laser.

FIBER OPTICS:
Introduction to optical fiber - advantages of optical fibers - total internal reflection- construction of optical fiber - acceptance angle - numerical aperture- classification of optical fibers- losses in optical fiber - optical fibre for communication system - applications.

UNIT - IV

DIELECTRIC MATERIALS
Dielectric Materials: Basic definitions- types of polarizations (qualitative) –Local field, Clasius-Mossoti Equation ferroelectric, piezoelectric, and pyro electric materials – applications

MAGNETIC MATERIALS:
Introduction to magnetic materials - Hysteresis-soft and hard magnetic materials- magnetostriction, magnetoresistance - applications - bubble memory devices, magnetic field sensors and multiferroics.

UNIT - V

ENERGY MATERIALS:
Conductivity of liquid and solid electrolytes- superionic conductors - materials and electrolytes for super capacitors - rechargeable ion batteries, solid fuel cells.

NANOTECHNOLOGY:
Nanoscale, quantum confinement, surface to volume ratio, bottom-up fabrication: sol-gel, precipitation, combustion methods – top-down fabrication: ball milling - physical vapour deposition (PVD) - chemical vapor deposition (CVD) - characterization techniques - XRD, SEM &TEM - applications of nanomaterials.

TEX TBOOKS:

1. Engineering Physics (3rd edition), PK Palanisamy, SciTech Publications, 2015.
2. Essentials of Nano- Science & Nano- technology (1st Edition), Narasimha Reddy Katta, Typical Creatives NANO DIGEST, 2021.

REFERENCES:

1. Fundamentals of Physics. (6th edition), Halliday, R.Resnick and J.Walker,John Wiley and Sons, 2001.
2. Quantum Physics, (2nd edition), H.C. Verma, TBS Publication, 2012
3. Introduction to Solid State Physics, (7th edition), Charles Kittel, Wiley Eastern, 2019.

COURSE OUTCOMES:

On completion of the course students will be able to:

1. Understand the concepts of Quantum mechanics and visualize the differences between the solids by their classification.
2. Identify and analyse the importance of semiconductors and semiconductor devices in science. and Engineering Applications.
3. Appreciate the features and applications of Lasers and Optical fibres.
4. Applying the fundamental properties of dielectric and magnetic materials in different engineering fields.
5. Evaluate various aspects of Energy Materials and Nano- materials and their applications in diverse fields.

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**3**	**3**	**2**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**1**
CO2	**3**	**3**	**2**	**1**	**1**	**1**	**1**	**-**	**-**	**1**	**-**	**2**
CO3	**3**	**3**	**2**	**1**	**1**	**1**	**1**	**-**	**-**	**1**	**-**	**2**
CO4	**3**	**3**	**2**	**1**	**1**	**-**	**-**	**-**	**-**	**1**	**-**	**1**
CO5	**3**	**3**	**2**	**1**	**1**	**1**	**1**	**1**	**-**	**1**	**-**	**2**

(A405201) PROGRAMMING FOR PROBLEM SOLVING

(Common to CSE, IT, CSE-DS, CSE-AI&ML, AI&ML, AI&DS, CSE-CS)

B.Tech I Year I Sem

L	T	P	C
3	0	0	3

UNIT-I

Representation of Algorithm: Algorithms for simple task, decision making task like finding maximum numbers of a given set and repetitive task like sum of numbers, Flowchart/Pseudo code with examples, Introduction to C Programming Language: Simple C Programs, Desirable Program Characteristics. C Character Set, Identifiers and Keywords, Data Types, Constants, Variables, Expressions

Operators and Expressions: Unary Operators, Arithmetic Operators, Relational and Logical Operators, Bitwise Operators, Conditional Operator, Assignment Operators, Special Operators, Precedence & Associatively of Operators, Evaluation of Expressions. **Data Input and Output:** Preliminaries, Single Character Input- The get char Function, Single Character Output- The putchar Function, Entering Input Data- The scanf Function, More About the scanf Function, Writing Output Data- The printf Function, More About the printf Function, The gets and puts Functions.

UNIT-II

Conditional Branching and Loops: Writing and evaluation of conditionals and consequent branching with if, if-else, switch-case, ternary operator, goto, Iteration with for, while, do- while loops I/O: Simple input and output with scanf and printf, formatted I/O,

Arrays: one-and two-dimensional arrays, creating, accessing and manipulating elements of arrays

UNIT-III

Functions: Defining a Function, accessing a Function, Declaring a function, Parameters and return type of a function, passing parameters to functions, call by value, Passing arrays to functions, passing pointers to functions, idea of call by reference, Some C standard functions and libraries, Storage classes (auto, extern, static and register).

Recursion: Simple programs, such as Finding Factorial, Fibonacci series etc., Limitations of Recursive functions

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

UNIT-IV

Structures: Defining structures, initializing structures, unions, Array of structures **Pointers:** Idea of pointers, Defining pointers, Pointers to Arrays and Structures, Use of Pointers in self-referential structures, usage of self-referential structures in linked list (no implementation) Enumeration data type **Dynamic memory allocation:** Allocating and freeing memory, Allocating memory for arrays of

different data types.

Preprocessor: Commonly used Preprocessor commands like include, define, undef, if, ifdef, ifndef

UNIT-V

Files: Text and Binary files, Creating and Reading and writing text and binary files, appending data to existing files, Writing and reading structures using binary files, Random access using fseek, ftell and rewind functions, Command line arguments.

Searching and Sorting: Basic searching in an array of elements (linear and binary search techniques), Basic algorithms to sort array of elements (Bubble, Insertion and Selection sort algorithms), Basic concept of order of complexity through the example programs.

TEXTBOOKS:

1 Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill
2. B.A. Forouzan and R.F. Gilberg C Programming and Data Structures, Cengage Learning, (3rd Edition)

REFERENCE BOOKS:

1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India
2. E. Balagurusamy, Computer fundamentals and C, 2nd Edition, McGraw-Hill
3. YashavantKanetkar, Let Us C, 18th Edition, BPB

COURSE OUTCOMES:

After completion of this course students will be able to:

1. Describe the structure of C-program, and use iterative and decision control statements for developing solutions to computational problems.
2. Organize data in Arrays, structures and perform operations on data stored in Arrays.
3. Design and develop modular solutions using C-functions and allocate memory dynamically for variables.
4. Create and manipulate C-File structures and use preprocessing directives to control C source code.
5. Compare and contrast various searching and sorting strategies.

CO PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	3	2	3					1	1	2
CO2	1	3	2		2							
CO3	1	2	3	2								
CO4	1	1	3		3							
CO5		3	2		2						1	1

(A405501) ELEMENTS OF COMPUTER SCIENCE & ENGINEERING

(Common to CSE, IT, CSE-DS, CSE-AI&ML, AI&ML, AI&DS, CSE-CS)

B.Tech I Year I Sem

L	T	P	C
0	0	2	1

UNIT – I

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 software, application software, packages, frameworks, IDEs.

UNIT – II

Software Development: Waterfall model, Agile, Types of computer languages – Programming, markup, scripting Program Development – steps in program development, flowcharts, algorithms, data structures – definition, types of data structures

UNIT – III

Operating systems: Functions of operating systems, types of operating systems, Device & Resource Management

Database Management Systems: Data models, RDBMS, SQL, Database Transactions, data centers, Cloud services

UNIT – IV

Computer Networks: Advantages of computer networks, LAN, WAN, MAN, internet, WiFi, sensor Networks, vehicular networks, 5G communication.

World Wide Web: Basics, role of HTML, CSS, XML, Tools for web designing, Social media, Online social networks.

Security: Information security, cyber security, cyber laws

UNIT – V

Autonomous Systems: IoT, Robotics, Drones, Artificial Intelligence – Learning, Game Development, Natural language processing, image and video processing. Cloud Basics

TEXT BOOKS:

1. Invitation to Computer Science, G. Michael Schneider, Macalester College, Judith L. Gersting University of Hawaii, Hilo, Contributing author: Keith Miller University of Illinois, Springfield.
2. Computer Fundamentals, Anita Goel, Pearson Education India, 2010

REFERENCE BOOKS:

1. Fundamentals of Computers, Reema Thareja, Oxford Higher Education, Oxford University Press.
2. Introduction to computers, Peter Norton, 8th Edition, Tata McGraw Hill.
3. Elements of computer science, Cengage

COURSE OUTCOMES:

After completion of this course students will be able to:

1. Know the working principles of functional units of a basic Computer
2. Recognize program development, the use of data structures and algorithms in problem solving.
3. Know the needs and types of operating system, database systems.
4. Identify the significance of networks, internet, WWW and cybersecurity.
5. Know Autonomous systems, the application of artificial intelligence.

CO PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**3**	**-**		**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**
CO2	**3**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**
CO3	**3**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**
CO4	**3**	**-**	**1**	**-**	**-**	**1**	**-**	**2**	**-**	**-**	**-**	**2**
CO5	**3**	**1**	**2**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**2**

(A400503) ENGLISH LANGUAGE AND COMMUNICATION SKILLS LABORATORY

(Common to all branches)

B.Tech I Year I Sem

L	T	P	C
0	0	2	1

The English Language and Communication Skills (ELCS) Lab focuses on the production and practice of sounds of language and familiarizes the students with the use of English in everyday situations both in formal and informal contexts.

English Language and Communication Skills Lab (ELCS) shall have two parts:

a. Computer Assisted Language Learning (CALL) Lab
b. Interactive Communication Skills (ICS) Lab

Exercise – I

CALL Lab: Understand: Listening Skill- Its importance – Purpose- Process- Types- Barriers- Effective Listening. Practice: Introduction to Phonetics – Speech Sounds – Vowels and Consonants – Minimal Pairs - Past Tense Marker and Plural Marker- Testing Exercises

ICS Lab: Understand: Spoken vs. Written language- Formal and Informal English. Practice: Ice-Breaking Activity and JAM Session- Situational Dialogues – Greetings – Taking Leave – Introducing Oneself and Others.

Exercise – II

CALL Lab: Understand: Structure of Syllables – Word Stress– Weak Forms and Strong Forms – Stress pattern in sentences – Intonation. Practice: Basic Rules of Word Accent - Stress Shift - Weak Forms and Strong Forms- Stress pattern in sentences – Intonation - Testing Exercises.

ICS Lab: Understand: Features of Good Conversation – Strategies for Effective Communication. Practice: Situational Dialogues – Role Play- Expressions in Various Situations –Making Requests and Seeking Permissions - Telephone Etiquette.

Exercise – III

CALL Lab: Understand: Errors in Pronunciation-Neutralising Mother Tongue Interference (MTI). Practice: Common Indian Variants in Pronunciation – Differences between British and American Pronunciation -Testing Exercises

ICS Lab: Understand: Descriptions- Narrations- Giving Directions and Guidelines – Blog Writing Practice: Giving Instructions – Seeking Clarifications – Asking for and Giving Directions – Thanking and Responding – Agreeing and Disagreeing – Seeking and Giving Advice – Making Suggestions.

Exercise – IV

CALL Lab: Understand: Listening for General Details. Practice: Listening Comprehension Tests - Testing Exercises

ICS Lab: Understand: Public Speaking – Exposure to Structured Talks - Non-verbal Communication Presentation Skills. Practice: Making a Short Speech – Extempore- Making a Presentation.

Exercise – V

CALL Lab: Understand: Listening for Specific Details. Practice: Listening Comprehension Tests - Testing Exercises

ICS Lab: Understand: Group Discussion Practice: Group Discussion

Minimum Requirement of infrastructural facilities for ELCS Lab:

1. **Computer Assisted Language Learning (CALL) Lab:** The Computer Assisted Language Learning Lab has to accommodate 30 students with 30 systems, with one Master Console, LAN facility and English language learning software for self- study by students. System Requirement (Hardware component): Computer network with LAN facility (minimum 40 systems with multimedia) with the following specifications: i) Computers with Suitable Configuration ii) High Fidelity Headphones
2. **Interactive Communication Skills (ICS) Lab :** The Interactive Communication Skills Lab: A Spacious room with movable chairs and audiovisual aids with a Public Address System, a T. V. or LCD, a digital stereo –audio & video system and camcorder etc. Source of Material (Master Copy):
   - Exercises in Spoken English. Part 1,2,3. CIEFL and Oxford University Press Note: Teachers are requested to make use of the master copy and get it tailor-made to suit the contents of the syllabus

TEXT BOOKS:

1. ELCS Lab Manual: A Workbook for CALL and ICS Lab Activities, (Board of Editors), OrientBlack Swan Pvt. Ltd, 2016
2. English Language Skills: A Practical Approach, Mishra, Veerendra et al., Cambridge University Press, 2020

REFERENCE BOOKS:

1. English Language Communication Skills Lab Manual cum Workbook, (1st edition) ,by Rajesh Kumar
2. Cengage Learning India Pvt. Ltd,2022
3. Communicative English - A workbook, (Revised Edition) by Shobha, KN &Rayen, J. Lourdes,Cambridge University Press, 2019.
4. Communication Skills: A Workbook. Kumar, (2nd edition) by Sanjay &Lata, Pushp, Oxford University Press, 2019.

COURSE OUTCOMES:

On completion of the course students will be able to:

1. Identify the nuances of English language through audio- visual experience and groupactivities.
2. Neutralize their accent for intelligibility.
3. Speak with clarity and confidence which in turn enhances their employability skills
4. Students will learn public speaking skills and overcome stage fear.
5. Express clarity of thoughts, capability to hold the discussion with everyone and develop analytical thinking.

CO PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	-	-	-		2	-	-
CO2	-	-	-	-	-	-	-	-	-	2	-	-
CO3	-	-	-	-	-	-	-	-	-	3	2	-
CO4	-	-	-	-	-	-	-	-	-	3	-	2
CO5	-	-	-	-	-	-	-	-	-	2	-	2

(A400501) APPLIED PHYSICS LABORATORY

L	T	P	C
0	0	3	1.5

B.Tech I-Year I Sem

(Any 8 experiments are to be performed)

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. Characteristics of series and parallel LCR circuits.
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. Determination of Energy gap of a semiconductor.
7. Determination of the resistivity of semiconductor by two probe method.
8. Study of 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 Apertureof an optical fiber.
11. Understanding the method of least squares – torsional pendulum as an example.
12. Diffraction grating: Determination of wavelength of a source (LASER).

LABORATORY MANUAL:

1. Applied Lab (2nd Edition) Dr M Chandra Shekhar Reddy, Dr NeelimaPatnaik, Jaya Prakash Reddy Kasu, Skytech Publications, 2022.
2. "A Text book of Practical Physics" (2nd Edition) - S. Balasubramanian, M.N. Srinivasan S Chand Publishers, 2017.

COURSE OUTCOMES: On completion of the course students will be able to

1. Appreciate quantum physics in optoelectronics.
2. Determine the Planck's constant using Photo electric effect
3. Determine energy gap of a semiconductor diode and magnetic fields.
4. Identify the material whether it is n-type or p-type by Hall experiment.
5. Evaluate the basic properties of lasers and optical fibers.

CO PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**3**	**3**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**
CO2	**3**	**3**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**
CO3	**3**	**3**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**
CO4	**3**	**3**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**
CO5	**3**	**3**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**

(A405504) IT WORKSHOP

(Common to CSE, ECE, IT, CSE-DS, CSE-AI& ML,AI&ML, AI&DS, CSE-CS)

B.Tech I Year I Sem

L	T	P	C
0	0	3	1.5

PC Hardware:

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

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

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

Task 4: Every student should install Linux on the computer. This computer should have windows installed. The system should be configured as dual boot with both Windows and Linux. Lab instructors should verify the installation and follow it up with a Viva

Internet & World Wide Web:

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

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

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

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

LaTeX and WORD:

Task 1 – **Word Orientation:** The mentor needs to give an overview of LaTeX and Microsoft (MS) office or equivalent (FOSS) tool word: Importance of LaTeX and MS office or equivalent (FOSS) tool Word as word Processors, Details of the four tasks and features that would be covered in each, Using LaTeX

and word – Accessing, overview of toolbars, saving files, Using help and resources, rulers, format painter in word.

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

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

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

Excel:

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

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

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

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

Power point:

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

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

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

TEXT BOOKS:

1. Comdex Information Technology course tool kit Vikas Gupta, WILEY Dreamtech
2. The Complete Computer upgrade and repair book, 3rd edition Cheryl A Schmidt, WILEY Dreamtech

REFERENCE BOOKS:

1. Introduction to Information Technology, ITL Education Solutions limited, Pearson Education.
2. PC Hardware - A Handbook – Kate J. Chase PHI (Microsoft)
3. LaTeX Companion – Leslie Lamport, PHI/Pearson.

COURSE OUTCOMES:

After completion of the course Students shall be able to:

1. Identify various hardware components of a system and their significances
2. Assemble and disassemble the computer.
3. Use various Microsoft tools for text processing, visual presentations, and number crunching
4. Retrieve the information from the Internet using web browsers.
5. Safeguard the system from external and internal threats.

CO PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**3**			**2**			**1**					**1**
CO2	**3**			**2**	**2**	**1**						**1**
CO3					**3**					**2**		**2**
CO4		**2**		**2**	**3**	**1**		**1**		**2**		**2**
CO5					**3**	**3**	**2**	**2**				**3**

(A405502) PROGRAMMING FOR PROBLEM SOLVING LABORATORY

(Common to CSE, IT, CSE-DS, CSE-AI&ML, AI&ML,AI&DS,CSE-CS)

	L	T	P	C
B.Tech I Year I Sem	**0**	**0**	**2**	**1**

[Note: The programs may be executed using any available Open Source/ Freely

available IDESome of the Tools available are:

CodeLite: https://codelite.org/

Code:Blocks: http://www.codeblocks.org/

DevCpp : http://www.bloodshed.net/devcpp.html

Eclipse: http://www.eclipse.org

This list is not exhaustive and is NOT in any order of preference]

I. OPERATORS AND EVALUATION OF EXPRESSIONS:

Demonstration

1.Write a C program to print greetings message on the screen.

2.Write a C program to illustrate usage of comments in C.

3.Write a simple program that prints the results of all the operators available in C

(Including pre/post increment, bitwise and/or/not. etc.). Read required operand values from standard input.

4.Write a C program that converts given data type to another using auto conversion and casting. Take the

values from standard input.

5.Write a program for finding the max and min from the three numbers (using ternary operator).

Experiment

6.Write a C program to compute simple, compound interest.

7.Write a C Program that declares Class awarded for a given percentage of marks, where mark = 70% = Distinction.(Read percentage from standard input.)

8.Write a C Program that prints a multiplication table for a given number and the number of rows in the table.

(For example, for a number 5 and rows = 3, the output should be: 5 x 1 = 5, 5 x 2 = 10, 5 x 3 = 15….

9.Write a program that shows the binary equivalent of a given positive number between 0 to 255.

10. Write a program that asks the user to enter the total time elapsed, in seconds, since an event and converts the time to hours, minutes and seconds. The time should be displayed as hours: minutes: seconds. [Hint: Use the remainder operator]

II. Expression Evaluation:

Demonstration

1. A building has 10 floors with a floor height of 3 meters each. A ball is dropped from the top of the building. Find the time taken by the ball to reach each floor. (Use the formula $s = ut+(1/2)at^2$ where u and a are the initial velocity in m/sec (= 0) and acceleration in m/sec^2 (= 9.8 m/s^2)).

2. Write a program that asks the user to enter the highest rainfall ever in one season for a country, and the rainfall in the current year for that country, obtains the values from the user, checks if the current rainfall exceed the highest rainfall and prints an appropriate message on the screen. If the current rainfall is higher, it assigns that value as the highest rainfall ever. Use only the single-selection form of the if statement.

3. 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).

4. Write a program that finds if a given number is a prime number

5. Write a C program to find the sum of individual digits of a positive integer and test given number is palindrome.

6.Write a program that reads the radius of a circle (as a float value) and computes and prints the diameter, the circumference and the area. Use the value 3.14159 for π.

7.Write a menu driven C program that allows a user to enter n numbers and then choose between finding the smallest, largest, sum, or average. The menu and all the choices are to be functions. Use a switch statement to determine what action to take. Display an error message if an invalid choice is entered.

Experiment

8. Write a C program to generate all the prime numbers between 1 and n, where n is a value supplied by the user.

9. Write a C program to find the roots of a Quadratic equation.

III. Iterative statements:
Demonstration

1. Input an integer (5 digits or fewer) containing only 0s and 1s (i.e., a “binary” integer) and print its decimal equivalent. [Hint: Use the remainder and division operators to pick off the “binary” number’s digits one at a time from right to left. Just as in the decimal number system, in which the rightmost digit

has a positional value of 1, and the next digit left has a positional value of 10, then 100, then 1000, and so on, in the binary number system the rightmost digit has a positional value of 1, the next digit left has a positional value of 2, then 4, then 8, and so on. Thus the decimal number 234 can be interpreted as 4 * 1 + 3 * 10 + 2 * 100. The decimal equivalent of binary 1101 is 1 * 1 + 0 * 2 + 1 * 4 + 1 * 8 or 1 + 0 + 4 + 8 or 13.]

2. Armstrong numbers are numbers that are equal to the sum of their digits raised to power of the number of digits in them. The number 153, for example, equals 13 + 53 + 33. Thus, it is an Armstrong number. Write a program to display all three-digit Armstrong numbers.

3. Write a program that reads an integer (5 digits or fewer) and determines and prints how many digits in the integer are 9s.

4. Write a program that keeps printing the powers of the integer 3, namely 3, 9, 27, 91, 273, and so on. Your loop should not terminate (i.e., you should create an infinite loop). What happens when you run this program?

5. Write a C program to calculate the following, where x is a fractional value. $1-x/2 +x^2/4-x^3/6$ ……

6. Write a C program to read in two numbers, x and n, and then compute the sum of this geometric progression: $1+x+x^2+x^3+.....+ x^n$. For example: if n is 3 and x is 5, then the program computes 1+5+25+125.

7. Write a C program to construct a pyramid of numbers as follows:

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

Experiment

8. Write a program that reads three nonzero integer values and determines and prints whether they could represent the sides of a triangle.

9. Write a program that reads three nonzero integers and determines and prints whether they could be the sides of a right triangle

10. Write a program that reads a nonnegative integer and computes and prints its factorial

11. Write a program that estimates the value of the mathematical constant ***e*** by using the formula:

$$e^1 = 1 + \frac{1}{1!} + \frac{12}{2!} + \frac{13}{3!} + \cdots$$

12. Write a program that computes the value of e^x by using the formula

$$e^x = 1 + \frac{x}{1!} + \frac{x^2}{2!} + \frac{x^3}{3!} + \cdots, -\infty < x < \infty$$

IV. Arrays, Pointers, and Functions:

Demonstration

1. Write a C program to find the minimum, maximum and average in an array of integers.

2. Write a function to compute mean, variance, Standard Deviation, sorting of n elements in a single dimension

array.

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

i. Addition of Two Matrices ii. Multiplication of Two Matrices iii. Transpose of a matrix with memory

dynamically allocated for the new matrix as row and column counts may not be the same.

4. Write C programs that use both recursive and non-recursive functions

5. To find the factorial of a given integer.

Experiment

6. Write a C program to find the GCD (greatest common divisor) of two given integers.

7. Write a C program to compute x^n

8. Write a program for reading elements using a pointer into an array and display the values using the array.

9. Write a program for display values reverse order from an array using a pointer.

10. Write a program through a pointer variable to sum of n elements from an array.

V. Files:

Demonstration

1. Write a C program to display the contents of a file to standard output device.

2. Write a C program which copies one file to another, replacing all lowercase characters with their uppercase

equivalents.

3. Write a C program to count the number of times a character occurs in a text file. The file name and the character

are supplied as command line argum

Experiment

4. Write a C program that does the following:

It should first create a binary file and store 10 integers, where the file name and 10 values are given in the command line. (hint: convert the strings using a to function) Now the program asks for an index anda value from the user and the value at that index should be changed to the new value in the file. (hint: use fseek function) The program should then read all 10 values and print them back

5. 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).

VI. Strings:

Demonstration

1. Write a C program to convert a Roman numeral ranging from I to L to its decimal equivalent.

2. Write a C program that converts a number ranging from 1 to 50 to Roman equivalent c.

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

- To insert a sub-string into a given main string from a given position.
- To delete n Characters from a given position in a given string.

Experiment

4.Write a C program to determine if the given string is a palindrome or not (Spelled same in both directions with or without a meaning like madam, civic, noon, abcba, etc.)

5.Write a C program that displays the position of a character ch in the string S or – 1 if S doesn't contain ch.

6.Write a C program to count the lines, words and characters in a given text.

VII. Sorting and Searching:

1. Write a C program that uses non recursive function to search for a Key value in a given list of integers using linear search method.

2. Write a C program that uses non recursive function to search for a Key value in a given sorted list ofintegers using binary search method.

3. Write a C program that implements the Bubble sort method to sort a given list of integers in ascending order.

Experiment

4. Write a C program that sorts the given array of integers using selection sort in descending order

5. Write a C program that sorts the given array of integers using insertion sort in ascending order

6.Write a C program that sorts a given array of names

Project:

Students must submit a report on one of the following micro-projects before commencement of second internal examination.

1.Library management system

2.Payrol management system

3.Telecom billing management system

4.Bank management system

5.Employee's management system

6.Library management system

7.Personal Diary management system

8.Medical store management system.

9.Phone Contacts management

10. Fee Collection system

TEXT BOOKS:

1. Jeri R. Hanly and Elliot B.Koffman, Problem solving and Program Design in C 7th Edition, Pearson
2. B.A. Forouzan and R.F. Gilberg C Programming and Data Structures, Cengage Learning, (3rd Edition)

REFERENCE BOOKS:

1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, PHI
2. E. Balagurusamy, Computer fundamentals and C, 2nd Edition, McGraw-Hill
3. Yashavant Kanetkar, Let Us C, 18th Edition, BPB

COURSE OUTCOMES :

After Completion of the Course Students shall be able to understand:

1. Formulate the algorithms for simple problems and translate given algorithms to a working and correct program
2. Correct syntax errors as reported by the compilers identify and correct logical errors encountered during execution
3. Represent and manipulate data with arrays, strings and structures and use pointers of different types
4. Create, read and write to and from simple text and binary files
5. Develop reusable code with the help C-functions

CO PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**3**	**3**	**1**	**2**	**1**							
CO2			**3**	**3**	**1**						**2**	**2**
CO3	**3**	**3**		**2**								
CO4			**3**		**2**						**2**	
CO5	**2**	**2**	**3**								**1**	**1**

(A400505) INTRODUCTION TO SOCIAL INNOVATION

(Common to all branches)

	L	T	P	C
B.Tech I Year I Sem	**0**	**0**	**2**	**1**

WEEK-1:

Types and features of community- Rural, Suburban, Urban and Regional

WEEK-2:

Service based learning, Aims of Community based projects, Sustainable Development Goals

WEEK-3:

Community visit, Report Writing, Resource Diagram, Chapati Diagram, Transect Walk

WEEK-4:

The non-profit sector, public sector, the private sector, the informal sector

WEEK-5:

Poster presentation on four sectors

WEEK-6:

Process of Design Thinking

WEEK-7:

Social organizations and enterprises, social movements

WEEK-8:

Social software and open-source methods

WEEK-9:

Introduction to Ethics, moral values, significance of professional ethics

code of conduct for engineers

WEEK-10:

Identify ethical dilemmas in different tasks of engineering, applying moral theories and codes of conduct for resolution of ethical dilemmas

WEEK-11:

Case studies on Engineering Ethics

WEEK-12:

Documentation, Steps for Patent filing and Startups, Poster presentation

TEXT BOOKS:

1. Social Entrepreneurship for the 21st Century: Innovation Across the Non Profit, Private and Public Sectors; Georgia Levenson Keohane; Tata McGraw Hill
2. Social Enterprises: An Organizational Perspective edited; Benjamin Gidron, YeheskelHasenfeld; Palgrave Macmillan

REFERENCE BOOKS:

1. Hasso Plattner, Christoph Meinel and Larry Leifer (eds), "Design Thinking: Understand – Improve – Apply", Springer, 2011.
2. Solving Problems with Design Thinking - Ten Stories of What Works (Columbia Business School Publishing) Hardcover – 20 Sep 2013 by Jeanne Liedtka (Author), Andrew King (Author), Kevin Bennett (Author)
3. Engineering Ethics: An Industrial Perspective; Gail Baura; Elsevier

COURSE OUTCOMES:

On Completion of the course, the students will be able to:

1. Identify community issues through community Interaction
2. Illustrate the factors affecting social innovation in various sectors
3. Apply design thinking concept to analyze the community problems
4. Adopt the ethical values in implementing the social innovation
5. Describe the process of property rights and patent filing.

CO PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1						**1**	**2**		**3**	**2**		
CO2						**2**	**2**		**3**	**3**		
CO3				**2**		**2**	**3**		**2**	**3**		
CO4						**2**	**3**	**3**	**2**	**2**		
CO5		**2**		**2**		**2**	**3**		**2**	**3**		

(A400704) UNIVERSAL HUMAN VALUES

(Common to all branches)

B.Tech I Year I Sem

L	T	P	C
2	0	0	0

UNIT - I

Basic Guidelines, Content and Process for Value Education:

- Purpose and motivation for the course, recapitulation from Universal Human Values-I
- Self-Exploration–what is it? - Its content and process; 'Natural Acceptance' and Experiential Validation- as the process for self-exploration
- Continuous Happiness and Prosperity- A look at basic Human Aspirations
- Right understanding, Relationship and Physical Facility- the basic requirements for fulfilment of aspirations of every human being with their correct priority
- Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario
- Method to fulfil the above human aspirations: understanding and living in harmony at various levels.

Include practice sessions to discuss natural acceptance in human being as the innate acceptance for living with responsibility (living in relationship, harmony and co-existence) rather than as arbitrariness in choice based on liking-disliking

UNIT - II

Understanding Harmony in the Human Being - Harmony in Myself:

- Understanding human being as a co-existence of the sentient 'I' and the material 'Body'
- Understanding the needs of Self ('I') and 'Body' - happiness and physical facility
- Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer) • Understanding the characteristics and activities of 'I' and harmony in 'I'
- Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail
- Programs to ensure Sanyam and Health. Include practice sessions to discuss the role others have played in making material goods available to me. Identifying from one's own life. Differentiate between prosperity and accumulation. Discuss program for ensuring health vs dealing with disease

UNIT – III

Understanding Harmony in the Family and Society- Harmony in Human- Human Relationship:

- Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfilment to ensure mutual happiness; Trust and Respect as the foundational values of relationship

- Understanding the meaning of Trust; Difference between intention and competence • Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship
- Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals • Visualizing a universal harmonious order in society- Undivided Society, Universal Order from family to world family.

Include practice sessions to reflect on relationships in family, hostel and institute as extended family, real life examples, teacher-student relationship, goal of education etc., Gratitude as a universal value in relationships. Discuss scenarios. Elicit examples from students' lives

UNIT - IV

Understanding Harmony in the Nature and Existence – Whole existence as Coexistence:

- Understanding the harmony in the Nature
- Interconnectedness and mutual fulfilment among the four orders of nature- recyclability andself-regulation in nature
- Understanding Existence as Co-existence of mutually interacting units in all- pervasive space
- Holistic perception of harmony at all levels of existence. Include practice sessions to discuss human being as cause of imbalance in nature (film "Home" can be used), pollution, depletion of resources and role of technology etc.

UNIT – V

Implications of the above Holistic Understanding of Harmony on Professional Ethics:

- Natural acceptance of human values
- Definitiveness of Ethical Human Conduct
- Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order
- Competence in professional ethics:

a. Ability to utilize the professional competence for augmenting universal human order
b. Ability to identify the scope and characteristics of people friendly and eco-friendly production systems,
c. Ability to identify and develop appropriate technologies and management patterns for above production systems.

- Case studies of typical holistic technologies, management models and production systems
- Strategy for transition from the present state to Universal Human Order: a. At the level of individual: as socially and ecologically responsible engineers, technologists and managers b. At the level of society: as mutually enriching institutions and organizations
- Sum up. Include practice Exercises and Case Studies will be taken up in Practice (tutorial) Sessions eg. To discuss the conduct as an engineer or scientist etc.

TEXTBOOKS:

1. R R Gaur, R Asthana, G P Bagaria, "A Foundation Course in Human Values and Professional Ethics", 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-47-1
2. R R Gaur, R Asthana, G P Bagaria, "Teachers' Manual for A Foundation Course in Human Valuesand Professional Ethics", 2nd Revised Edition, Excel Books, New Delhi, 2019.

REFERENCE BOOKS:

1. JeevanVidya: EkParichaya, A Nagaraj, JeevanVidyaPrakashan, Amar kantak, 1999.
2. A. N. Tripathi, "Human Values", New Age Intl. Publishers, New Delhi, 2004.
3. The Story of Stuff (Book).

COURSE OUTCOMES:

On completion of the course students will be able to:

1. Students are expected to become more aware of themselves, and their surroundings (family, society, nature)
2. They would become more responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind. •
3. They would have better critical ability about various issues in life.
4. They would also become sensitive to their commitment towards what they have understood (human values, human relationships and human society).
5. It is hoped that they would be able to apply what they have learnt to their own self in different day-to-day settings in real life, at least a beginning would be made in this direction.

CO PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1						**2**						
CO2			**2**									
CO3									**2**			
CO4								**2**				
CO5												**2**

(A400002) ORDINARY DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS

(Common to All)

B.Tech. I Year II Sem

L	T	P	C
3	1	0	4

UNIT-I

First Order ODE:

Exact differential equations, Equations reducible to exact differential equations, linear and Bernoulli's differential equations, Orthogonal Trajectories (only in Cartesian Coordinates). Applications: Newton's law of cooling, Law of natural growth and decay.

UNIT-II

Ordinary Differential Equations of Higher Order:

Second and higher order linear differential equations with constant coefficients: Non-Homogeneous terms of the typee^{ax}, sin ax, cosax, polynomials in x, $e^{a}(x)$and $xV(x)$, method of variation of parameters.

UNIT-III

Laplace transforms:

Laplace Transforms: Laplace Transform of standard functions, First shifting theorem and Second shifting theorem. Unit step function, Dirac delta function, Laplace transforms of functions when they are multiplied and divided by 't'. Evaluation of integrals by Laplace transforms Laplace transform of periodic functions. Inverse Laplace transform by different methods, convolution theorem (without proof). Applications: solving Initial value problems by Laplace Transform method.

UNIT-IV

Vector Differentiation:

Vector point functions and scalar point functions, Gradient, Tangent plane and normal line, Directional derivatives, Divergence and Curl, Solenoidal and Irrotational vectors, Scalar potential functions, Vector Identities.

UNIT-V

Vector Integration:

Line, Surface and Volume Integrals. Theorems of Green, Gauss and Stoke's (without proofs) and their applications.

TEXTBOOKS:

1. Higher Engineering Mathematics, (36thEdition), B.S. Grewal, Khanna Publishers, 2010.
2. Advanced Engineering Mathematics, (5thEdition),R.K.JainandS.R.K.Iyengar,NarosaPublications,2016.

REFERENCE BOOKS:

1. Advanced Engineering Mathematics, (9th Edition), Erwinkreyszig, JohnWiley& Sons,2006.
2. Calculus and Analytic geometry, (9thEdition), G.B. Thomas and R.L. Finney, Pearson, Reprint, 2002.
3. A textbook of Engineering Mathematics, (10thEdition), N.P. Bali and Manish Goyal, Laxmi Publications, Reprint, 2019.
4. Higher Engineering Mathematics, (9thEdition), H.K.Dassand Er.RajnishVerma, SChandand company Limited, New Delhi, 2011.

COURSE OUTCOMES:

On completion of the course students will be able to:

1. Determine first order differential equations and obtain solutions.
2. Solve the Higher order differential equations and apply the differential equation concepts to real world problems.
3. Use the Laplace transforms techniques for solving ODE's.

4. Evaluate Gradient – Divergence – Curl, Directional derivatives.

5. Evaluate the line, surface and volume integrals and converting them from one to another.

CO-PO MAPPING:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	3	2	2	-	-	-	-	-	-	-	2
CO2	3	3	3	2	-	-	-	-	-	-	-	2
CO3	3	2	3	2	-	-	-	-	-	-	-	2
CO4	3	2	3	2	-	-	-	-	-	-	-	3
CO5	3	2	3	2	-	-	-	-	-	-	-	3

(A400009) ENGINEERING CHEMISTRY

(Common to all Branches)

B.Tech I Year II Sem

L	T	P	C
3	1	0	4

UNIT-I

Electrochemistry, Batteries and Corrosion Electrochemistry: Electrode potential, Standard electrode potential and E.M.F of the cell. Electrochemical cell, Nernst equation- derivation and applications, Types of electrodes- Quinhydrone electrode, Calomel electrode and Glass electrode. Electro chemical series and its applications. **Batteries**- primary (Lithium cell), secondary (Lead acid storage battery and Lithium-ion battery) and Fuel cells (H_2-O_2 and methanol-oxygen), Solar cells - Introduction and applications of Solar cells.

Corrosion: Introduction, Definition, Causes and effects of corrosion, Theories of chemical and electrochemical corrosion, Pilling-Bedworth rule, Types of corrosion- Galvanic, Waterline and Pitting corrosion, Factors affecting rate of corrosion, Corrosion control methods- Cathodic protection, Sacrificial anode and Impressed current cathodic methods, Surface coatings- Metallic coatings, hot dipping, galvanizing and tinning, Electroplating- Copper plating and electroless plating - Nickel plating.

UNIT-II

Material Chemistry - High Polymers:

Types of polymerizations (addition, condensation and copolymerization).

Plastics: Thermoplastic and Thermosetting resins, Compounding and fabrication of plastics (compression and injection moulding). Preparation, properties, Engineering applications of PVC, Teflon and Bakelite.

Fibers: Characteristics of fibers - preparation, properties and uses of Nylon-6,6 and Dacron, Fiber Reinforced Plastics (FRP) - applications.

Rubbers: Natural rubber and its vulcanization. Elastomers: Buna-s, Butyl rubber and Thiokol rubber. **Conducting polymers:** Characteristics and Classification with examples-mechanism of conduction in trans-polyacetylene and applications of conducting polymers.

Biodegradable polymers: Preparation and applications of Polyvinyl acetate, Polylactic acid and poly vinyl alcohol.

UNIT-III

Energy Sources: Introduction, Calorific value of fuel – HCV, LCV- Dulongs formula. Classification-solid fuels: coal – analysis of coal – proximate and ultimate analysis and their significance. Liquid fuels – petroleum and its refining, cracking types – moving bed catalytic cracking. Knocking – octane and cetane rating, synthetic petrol - Fischer-Tropsch's process; Gaseous fuels – composition and uses of natural gas, LPG and CNG, Biodiesel – Transesterification, advantages

UNIT-IV

Water Technology: Sources of water, Impurities in water, Hardness of water, Temporary and permanent hardness, Units of hardness, Estimation of temporary and permanent hardness of water, EDTA method, Numerical problems, Potable water Treatment-Specifications, Steps involved in Treatment-Sedimentation, Coagulation, Filtration, Sterilization, Desalination of Brackish Water, Reverse Osmosis and Electro dialysis.

Industrial water treatment, Boiler Troubles-Scales and sludges, Caustic embrittlement, Boiler corrosion, Priming and foaming. Hot lime and cold lime soda Process-Numerical problems, Zeolite process and Ion exchange process. Internal conditioning methods like Phosphate, Carbonate, Calgon and Colloidal conditioning.

UNIT-V

Engineering Materials Cement: Portland cement, its composition, setting and hardening.

Smart materials: Smart materials and their engineering applications

Advanced Glass Technology: Structure and nature of glasses, transformation range behaviour, dependence of physico-chemical characteristic of glasses on their constituents. Strength of glass and glass articles.

Lubricants: Classification of lubricants with examples-characteristics of a good lubricants - mechanism of lubrication (thick film, thin film and extreme pressure)- properties of lubricants: viscosity, cloud point, pour point, flash point and fire point.

TEXT BOOKS:

1. Engineering chemistry (1st edition), B. Rama Devi & Ch. VenkataRamana Reddy; Cengage Learning, 2012.
2. Engineering Chemistry (1st edition), P. C. Jain and M. Jain, DhanapatRai& Sons.
3. Engineering chemistry (1st edition), Dr. Bharathikumari, Dr. Jyotsna.

REFERENCE BOOKS:

1. Engineering Chemistry (2nd edition), ShikhaAgarwal; Cambridge University Press, 2015.
2. Engineering Chemistry (2nd edition), Wiley India Pvt. Ltd., Vairam and others, 2014.
3. Engineering Chemistry (1st edition), PrasanthRath, Cengage Learning, 2015.

COURSE OUTCOMES:

After completion of the course students will be able to:

1. Apply the concept of electrochemistry and corrosion science in various practical applications.
2. Predict the different engineering applications by preparing various polymers.
3. Summarize the manufacturing process of various fuels and their applications in daily life.
4. Understand the benefits of treated water as source in steam generation in industrial application.
5. Illustrate the importance and applications of various advanced engineering materials.

CO PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**3**	**3**										**2**
CO2	**3**	**3**										**2**
CO3	**3**	**3**										**2**
CO4	**3**	**3**										**2**
CO5	**3**	**3**										**2**

(A402201) BASIC ELECTRICAL ENGINEERING

(Common to CSE, INF, ECE)

B.Tech. I Year II Sem

L	T	P	C
2	0	0	2

UNIT-I

D.C. Circuits: Electrical circuit elements (R, L and C), voltage and current sources, KVL&KCL, analysis of simple circuits with dc excitation. Superposition, Thevenin and Norton Theorems. Time-domain analysis of first-order RL and RC circuits.

UNIT-II

A.C. Circuits: Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor, Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series and parallel), resonance in series R-L-C circuit. Three-phase balanced circuits, voltage and current relations in star and delta connections.

UNIT-III

Transformers: Ideal and practical transformer, equivalent circuit, losses in transformers, regulation and efficiency. Auto-transformer and three-phase transformer connections.

UNIT-IV

Electrical Machines: Construction and working principle of dc machine, performance characteristics of dc shunt machine. Generation of rotating magnetic field, Construction and working of a three-phase induction motor, Significance of torque-slip characteristics. Single-phase induction motor, Construction and working. Construction and working of synchronous generator.

UNIT-V

Electrical Installations: Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Earthing. Types of Batteries, Important Characteristics for Batteries. Elementary calculations for energy consumption, power factor improvement and battery backup.

TEXT BOOKS:

1. D.P. Kothari and I. J. Nagrath, “Basic Electrical Engineering”, Tata McGraw Hill, 4th Edition, 2019.

2. MS Naidu and S Kamakshaiah, “Basic Electrical Engineering”, Tata McGraw Hill, 2nd Edition, 2008.

REFERENCE BOOKS:

1. P. Ramana, M. Surya Kalavathi, G.T. Chandrashekar, "Basic Electrical Engineering", S. Chand, 2 ndEdition, 2019.

2. D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill, 2009

3. M. S. Sukhija, T. K. Nagsarkar, "Basic Electrical and Electronics Engineering", Oxford, 1st Edition, 2012.

COURSE OUTCOMES:

Upon the completion of the course the student will be able to

1. Recognize and analyze basic concepts of DC Circuits

2. Know and analyze basic concepts of AC Circuits

3. Discus the technical aspects of transformers

4. Study the working principles of Electrical Machines.

5. Introduce components of Low Voltage Electrical Installations

CO-PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**3**	**3**	**0**	**1**	**0**	**0**	**0**	**2**	**3**	**2**	**0**	**1**
CO2	**3**	**3**	**0**	**1**	**0**	**0**	**0**	**2**	**3**	**2**	**0**	**1**
CO3	**3**	**3**	**0**	**1**	**0**	**0**	**0**	**2**	**3**	**2**	**0**	**1**
CO4	**3**	**3**	**0**	**1**	**0**	**0**	**0**	**2**	**3**	**2**	**0**	**1**
CO5	**3**	**3**	**0**	**1**	**0**	**0**	**0**	**2**	**3**	**2**	**0**	**1**

(A405301) DATA STRUCTURES

(Common to CSE, IT, CSE-DS, CSE-AI&ML, AI&ML, AI&DS, CSE-CS)

B.Tech. I Year II Sem **L T P C**

3 0 0 3

UNIT-I

Introduction to Data Structures: Introduction to Data Structures, abstract data types, Linear list – singly linked list implementation, insertion, deletion and searching operations on linear list, concepts of circular linked link list, double linked list, Stacks Operations, array and linked representations of stacks, stack applications- infix to postfix conversion, postfix evaluation, Queues- operations, array, and linked representations.

UNIT-II

Dictionaries: linear list representation, skip list representation, operations - insertion, deletion and searching. Hash Table Representation: hash functions, collision resolution-separate chaining, open addressing linear probing, quadratic probing, double hashing, rehashing, extendible hashing.

UNIT-III

Search Trees: Binary Search Trees, Definition, Implementation, Operations- Searching, Insertion and Deletion, B Trees, B+ Trees, AVL Trees, Definition, Height of an AVL Tree, Operations – Insertion, Deletion and Searching, concepts of Red –Black, Splay Trees.

UNIT-IV

Graphs: Graph Implementation Methods. Graph Traversal Methods.

Sorting: Quick Sort, Heap Sort, External Sorting- Model for external sorting, Merge Sort.

UNIT-V

Pattern Matching and Tries: Pattern matching algorithms-Brute force, the Boyer –Moore algorithm, the KnuthMorris-Pratt algorithm, Standard Tries, Compressed Tries, Suffix tries.

TEXT BOOKS:

1. Fundamentals of Data Structures in C, 2nd Edition, E. Horowitz, S. Sahni and Susan AndersonFreed, Universities Press.

2. Data Structures using C – A. S.Tanenbaum, Y. Langsam, and M.J.

Augenstein,PHI/Pearson Education.

REFERENCE BOOKS:

1. Data Structures: A Pseudocode Approach with C,2nd Edition, R. F. Gilbergand, B.A.Forouzan, Cengage Learning.
2. Pai: ”Data Structures & Algorithms; Concepts, Techniques & Algorithms ”Tata McGraw Hill.

COURSE OUTCOMES:

Students shall be able understand

1. Design and Implement Linear Data structures.
2. Explain the need of Dictionary data structure and implement dictionary data structure using Hash tables and skip lists.
3. Design and Implement various forms of tree data structures.
4. Explain, analyze, and implement various graph traversal, sorting techniques.
5. Describe various pattern matching algorithms.

CO PO MAPPING::

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**3**	**3**	**1**	**1**								**1**
CO2	**3**	**3**	**1**	**1**								**1**
CO3	**3**	**3**	**1**	**1**								**1**
CO4	**3**	**3**	**1**	**1**								**1**
CO5	**3**	**3**	**1**	**1**								**1**

(A403502) COMPUTER AIDED ENGINEERING DRAWING

B.Tech. I Year II Sem

L	T	P	C
0	1	2	2

UNIT – I

Introduction to Engineering Drawing: Principles of Engineering Drawing and their Significance,Introduction to Computer aided drafting – views, commands.
Computer aided drafting of conic Sections: Ellipse, Parabola and Hyperbola – General Method(eccentricity) only.
Computer aided drafting of Cycloid, Epicycloids and Hypocycloid.

UNIT- II

Orthographic Projections: Introduction to Principles of Orthographic Projections – Conventions – Projections of Points and Lines, Projections of Plane regular geometric figures.

Computer aided orthographic projections – points, lines and planes

UNIT – III

Projections of Regular Solids: Introduction to Regular Solids – Prism, Cylinder, Pyramid,

Cone Computer aided projections of solids – Regular views

UNIT – IV

Isometric Projections: Principles of Isometric Projection – Isometric Scale – Isometric Views – Conventions – Isometric Views of Lines, Plane Figures, Simple and Compound Solids – Isometric

Projection of objects having non- isometric lines, Isometric Projection of Spherical Parts using computer aided drafting.

UNIT – V
Conversion of Isometric Views to Orthographic Views and Vice-versa : Conventions

Conversion of orthographic projection into isometric view and vice versa : using computer aideddrafting.

TEXT BOOKS:

1. Engineering Drawing, 51st Edition, N.D. Bhatt, Charotar Pub, 2012

2. Computer Aided Engineering Drawing, 2nd Edition, K. Balaveera Reddy et al, CBS Publishers, 2015

REFERENCE BOOKS:

1. Engineering Drawing, 2nd Edition, Basant Agrawal and C M Agrawal, McGraw Hill, 2014

2. Engineering Drawing, 1st Edition, M. B. Shah, B.C. Rane, Pearson, 2015

3. Engineering Drawing, 1st Edition, N. S. Parthasarathy and Vela Murali, Oxford, 2015

COURSE OUTCOMES:
At the end of the course, the student will be able to:

1. Apply computer aided drafting tools to create 2D objects like Conic section and Cycloidalcurves
2. Sketch the Orthographic projection of Point, Line and Plane objects by drafting tools
3. Create, read and interpret engineering drawings of Solids by computer tools
4. Create and interpret 2D and 3D Isometric objects by drafting tools
5. Conversion of orthographic projection into isometric view and vice versa by using computeraided drafting tools

CO PO MAPPING::

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**3**	**1**	**3**	**-**	**3**	**-**	**-**	**2**	**3**	**3**	**1**	**2**
CO2	**3**	**1**	**3**	**-**	**3**	**-**	**-**	**2**	**3**	**3**	**1**	**2**
CO3	**3**	**1**	**3**	**-**	**3**	**-**	**-**	**2**	**3**	**3**	**1**	**2**
CO4	**3**	**1**	**3**	**-**	**3**	**-**	**-**	**2**	**3**	**3**	**1**	**2**
CO5	**3**	**1**	**3**	**-**	**3**	**-**	**-**	**2**	**3**	**3**	**1**	**2**

(A400502) ENGINEERING CHEMISTRY LAB

(Common to all Branches)

B. Tech I Year II Sem

L	T	P	C
0	0	2	1

Lab Experiments:

1. Estimation of Hardness of water by EDTA Method.
2. Estimation of Alkalinity of Water.
3. Estimation of Copper by Colorimetric Method.
4. Conductometric Titration of a Strong Acid vs a Strong Base.
5. Conductometric Titration of a Weak Acid vs a Strong Base.
6. Potentiometric Titration of a Strong Acid vs a Strong Base.
7. Potentiometric Titration of Ferrous Ammonium Sulphate (FAS) vs Potassium Dichromate.
8. Preparation of Thiokol Rubber.
9. Determination of Viscosity of a Liquid.
10. Determination of Surface Tension of a liquid.
11. Adsorption of acetic acid on Activated charcoal.
12. Estimation of Iodine in Table Salt (by potentiometric)
13. Thin Layer Chromatography (Ortho-Nitro phenol &Para-Nitro phenol).
14. Determination of rate constant of acid catalyzed hydrolysis of methyl acetate.

TEXT BOOKS:

1. Engineering Chemistry Lab Manual (1st edition), Dr. K. Soujanya, Dr. J. Saroja, Lt. D. Divya, Sketch Publishers, 2022

REFERENCE BOOKS:

1. Engineering Chemistry Lab Manual (1st edition), Glaze Publishers 2018.
2. Engineering chemistry (1st edition), B. Rama Devi & Ch. VenkataRamana Reddy; Cengage Learning, 2012.
3. A Textbook of Engineering Chemistry (1st edition), SashiChawla, DhanapathRai& Sons.

COURSE OUTCOMES:

At the end of the course the student will be able to

1. Determine the extent of hardness of water and Assess the alkalinity and its consequences in industrial operations
2. Understand the principles, preparation and applications of key polymers like Thiokol rubber

3. Assess the properties of titrations involving acids, bases, redox reactions using potentiometric and conductometric analysis.
4. Develop proficiency in colorimetric analysis to accurately determine the amount of metals present in various industrial effluents
5. Apply analytical tools such as viscosity, and surface tension measurements to evaluate the physicochemical properties of liquid samples

CO-PO MAPPING:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2		2								
CO2	3	2	2		3		2					
CO3	3			3	2							
CO4	3			3	3		2					
CO5	3			3	2							

(A402502) BASIC ELECTRICAL ENGINEERING LABORATORY

(Common to CSE, INF, ECE)

B.Tech. I Year II Sem

L	T	P	C
0	0	2	1

List of experiments/demonstrations:

PART- A (compulsory):

1. Verification of KVL and KCL

2. Verification of Thevenin's and Norton's theorem

3. Transient Response of Series RL and RC circuits for DC excitation

4. Resonance in series RLC circuit

5. Calculations and Verification of Impedance and Current of RL, RC and

RLC seriesCircuits.

6. Measurement of Voltage, Current and Real Power in primary and Secondary Circuits of a Single-Phase

Transformer

7. Performance Characteristics of a DC Shunt Motor

8. Torque-Speed Characteristics of a Three-phase Induction Motor.

PART-B (any two experiments from the given list):

1. Verification of Superposition theorem.

2. Load Test on Single Phase Transformer (Calculate Efficiency and Regulation)

3. Measurement of Active and Reactive Power in a balanced Three-phase circuit

4. Magnetization Characteristics of DC Shunt Generator.

TEXT BOOKS:

1. D.P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill, 4th Edition,2019.

2. MS Naidu and S Kamakshaiah, "Basic Electrical Engineering", Tata McGraw Hill, 2nd Edition,2008.

REFERENCE BOOKS:

1. P. Ramana, M. Suryakalavathi, G.T.Chandrasheker,"Basic Electrical Engineering", S. Chand,2ndEdition, 2019.

2. D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill, 2009

3. M. S. Sukhija, T. K. Nagsarkar, "Basic Electrical and Electronics Engineering", Oxford, 1st Edition,2012.

COURSE OUTCOMES:

After completion of the course student will be able to:

1. Verify the basic Electrical circuits through different experiments.
2. Analyze the transient responses of R, L and C circuits for different input conditions.
3. Calculate the Impedance and Current of RL, RC and RLC series Circuits.
4. Evaluate the performance calculations of Electrical Machines and Transformers through varioustesting methods.
5. Measure the Active and Reactive Power in a single-phase transformer.

CO PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**3**											
CO2	**3**											
CO3	**3**											
CO4	**3**											
CO5	**3**											

(A405505) DATA STRUCTURES LABORATORY

(Common to ECE, EEE, Mech and Civil)

B.Tech. I Year II Sem

L	T	P	C
0	0	3	1.5

List of Experiments:

Week 1: Practice lab to perform the following:

1. Write a C program to implement the following operations on to a 1D Array: b. INSERT c. DELETE d. SEARCH e. TRAVERSE

2. Write a C program to implement Self-referential Structure.

3. Write a C program to Perform Dynamic Memory Allocation.

Week 2: Linked List Demonstration

1. Write a C program to implement Single linked list i) Insertion ii) Deletion iii) Display

2. Write a function to reverse the nodes of a Single linked list

Experimentation

1. Write a program that uses functions to perform the following operations on doubly linked list: i) Creation ii) Insertion iii) Deletion iv) Traversal

2. Write a program that uses functions to perform the following operations on circular linked list: i) Creation ii) Insertion iii) Deletion iv) Traversal

Week 3 Stacks, Queues.

Demonstration

1. Write a program that implement Stack (its operations) using Arrays

2. Write a program that implement Circular Queue (its operations) using Arrays

Experimentation

1.Write C programs to implement Stack ADT using Linked List,

2.Write C programs to implement Circular Queue ADT using linked list,

Week 4 : Applications of Stacks, Dictionaries and Hashing :

Demonstration

1. Write a C program to Convert the given Infix Expression to Postfix Expression.

2. Write a C program to implement different hash methods,

3. Write a C program to implement the following collision resolving i) Quadratic probing. ii) Linear Probing

Week 5: Applications of Stacks. & Dictionaries and Hashing:

Experimentation:

1. Write a C program to Evaluate the given Postfix Expression.

2. Implement Dictionary ADT using list data structure.

3. Implement Dictionary ADT using skip list data structure.

Week 6:

Search Trees

Demonstration

1. Write a C program to implement Binary search tree

i) Insertion ii) deletion iii) Traversals

2. Write a C program to implement binary search tree Non - recursively traversals

i) Pre- Order ii) Post –Order iii) In-Order

Week 7: Search Trees:

Experimentation

1. (A) Write a C Program to Check if a Given Binary Tree is an AVL Tree or Not

(B) Write a C program to find height of a Binary tree

2. Write a C program to count the number of leaf nodes in a tree.

3. Write a C program to implement AVL tree

i) Creation ii) Deletion iii) Traversals

Week 8: Graphs:

Demonstration

1. Write a C program for implementing Graph traversal

i) DFS

Experimentation:

1. Write a C program for implementing Graph traversal

i) BFS

Week 9: Sorting:

Demonstration:

1. Write C programs for implementing the following Sorting methods and display the important steps.

i) Quick Sort ii) Heap sort

Week 10: Sorting:

Experimentation:

1. Write C programs for implementing the following Sorting methods and display the important steps.

i) Merge sort ii) External Merge sort.

Week 11: Pattern Matching Algorithms:

Demonstration

1. Write a C program for implementing pattern matching algorithms

i) Knuth-Morris-Pratt ii) Brute Force

Week 12: Pattern Matching

Algorithms**Experimentation:**

1. Write a C program for implementing pattern matching algorithms

i. Boyer –Moore

TEXT BOOKS:

1. Fundamentals of Data Structures in C, 2nd Edition, E. Horowitz, S. Sahni and Susan Anderson Freed,Universities Press.

2. Data Structures using C – A. S. Tanenbaum, Y. Langsam, and M. J. Augenstein, PHI/PearsonEducation.

REFERENCE BOOKS:

1 Data Structures: A Pseudocode Approach with C, 2nd Edition, R. F. Gilberg and B. A. Forouzan,Cengage Learning.

COURSE OUTCOMES:

After completion of the course student will be able to

1. Design and Implement Linked List Data structure.
2. Design and Implement Linear Data structures.
3. Implement Sorting and Tree traversal techniques.
4. Design and Implement Non-Linear Data structures.
5. Implement KMP and Boyre-Moore pattern matching algorithms

CO PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**3**	**3**	**1**	**1**	**3**							**1**
CO2	**3**	**3**	**1**	**1**	**3**							**1**
CO3	**3**	**3**	**1**	**1**	**3**							**1**
CO4	**3**	**3**	**1**	**1**	**3**							**1**
CO5	**3**	**3**	**1**	**1**	**3**							**1**

(A400506) ENGINEERING EXPLORATION & PRACTICE

(Common to all branches)

B.Tech. I Year II Sem

L	T	P	C
0	0	3	1.5

Week-1
Difference between Science and Engineering, Scientist and Engineer needs and wants, various disciplines of engineering, some misconceptions of engineering, Expectation for the 21st century engineer. Significance of teamwork, Importance of communication in engineering profession
Week-2
Engineering Design Process, Need statement to Problem conversion, Pair wise comparison chart, decision matrix, Concepts of reverse engineering
Week-3
Project management tools: Checklist, Timeline, Gantt chart, Requirement Analysis

Week-4
Basic Components of a Mechanism, Degrees of Freedom or Mobility of a Mechanism, 4 Bar Chain, Crank Rocker Mechanism, Slider Crank Mechanism

Week-5
3-D Modelling of a Box with two holes and curvature
Week-6
3-D Modelling of Electronic Enclosure and Assembly of two parts

Week-7
Introduction to various platform-based development, Introduction to basic components, transducers, actuators and sensors, Introduction to Tinkercad

Week-8
Introduction to Arduino, basics of programming
Week-9
Interfacing Arduino with actuators and transducers
Week-10
Interfacing Arduino with Sensors, Liquid Crystal Display (LCD)
Week-11
Assembly and Crafting the Prototype
Week-12
Test and Validate the Prototype, Documentation, Panel Presentation

TEXT BOOKS:

1. Engineering Fundamentals: An Introduction to Engineering (MindTap Course List) 5th Edition by Saeed Moaveni
2. Software Project Management (SIE), (Fifth Edition); Bob Hughes, MikeCotterell, Rajib Mall; Published by Tata McGraw-Hill Education Pvt. Ltd (2011); ISBN 10: 0071072748 ISBN 13: 9780071072748

REFERENCE BOOKS:

1. A Ghosh and AK Malik: Theory of Mechanism and Machine; East West Press (Pvt) Ltd., New Delhi.
2. Arduino Cookbook, 2nd Edition by Michael Margolis: O'Reilly Media
3. Introduction to autocad®2017-2D and 3D design by Bernd S. Palm and Alf Yarwood, Routledge (Taylor and Francis group)

COURSE OUTCOMES:

On Completion of the course, the students will be able to:

1. Explain the importance of engineering profession in the world.
2. Identify multi-disciplinary approach required in solving an engineering problem
3. Build a mechanism for a given application
4. Create basic 3D models and animations
5. Design a mechatronic system using Arduino and electronic components

CO PO MAPPING:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	1					3	3	2		3	
CO2		3	1	3	2				3		3	
CO3	3		2		3				3		3	
CO4	2	3	2		3				3	2	3	
CO5			2	1	2		3		3		3	

(A400703) CONSTITUTION OF INDIA

(Common to all branches)

B.Tech I Year II Sem

L	T	P	C
2	0	0	0

UNIT - 1

History of Making of the Indian Constitution: History of Drafting Committee.

UNIT - 2

Philosophy of the Indian Constitution: Preamble Salient Features

UNIT - 3

Contours of Constitutional Rights & Duties: Fundamental Rights

- Right to Equality
- Right to Freedom
- Right against Exploitation
- Right to Freedom of Religion
- Cultural and Educational Rights
- Right to Constitutional Remedies
- Directive Principles of State Policy
- Fundamental Duties.

UNIT - 4

Organs of Governance: Parliament, Composition, Qualifications and Disqualifications, Powers and Functions, Executive, President, Governor, Council of Ministers, Judiciary, Appointment and Transfer of Judges, Qualifications, Powers and Functions

UNIT - 5

Local Administration: District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation. Panchayat raj: Introduction, PRI: Zila Panchayat. Elected officials and their roles, CEO Zila Panchayat: Position and role. Block level: Organizational Hierarchy (Different departments), Village level: Role of Elected and Appointed officials, Importance of grass root democracy

TEXT BOOKS:

1. The Constitution of India, 1950 (Bare Act), Government Publication.
2. Dr. B. R. Ambedkar framing of Indian Constitution, Dr. S. N. Busi, 1st Edition, 2015.

REFERENCE BOOKS:

1. Indian Constitution Law (7thEdn), M. P. Jain, Lexis Nexis, 2014.
2. Introduction to the Constitution of India, D.D. Basu, Lexis Nexis, 2015.

COURSE OUTCOMES:

On completion of the course students will be able to:

1. Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
2. Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.
3. Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru.
4. Discuss the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution
5. Discuss the passage of the Hindu Code Bill of 1956.

CO PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**2**											
CO2												**2**
CO3						**2**						
CO4				**2**		**3**						
CO5		**2**										

(A400003) MATHEMATICAL AND STATISTICAL FOUNDATION

(Common to CSM and AIM)

	L	T	P	C
B.Tech. II Year I Sem	**3**	**1**	**0**	**4**

UNIT-I

Greatest Common Divisors and Prime Factorization: Greatest common divisors, The Euclidean algorithm, The fundamental theorem of arithmetic, Factorization of integers and the Fermat numbers.

Congruences: Introduction to congruences, Linear congruences, The Chinese remainder theorem, Systems of linear congruences.

UNIT-II

Simple Linear Regression and Correlation: Introduction to Linear Regression, The Simple Linear Regression Model, Least Squares and the Fitted Model, Properties of the Least Squares Estimators, Inferences Concerning the Regression Coefficients, Prediction, Simple Linear Regression Case Study.

Random Variables and Probability Distributions: Concept of a Random Variable, Discrete Probability Distributions, Continuous Probability Distributions.

Discrete Probability Distributions: Binomial Distribution, Poisson distribution.

UNIT-III

Continuous Probability Distributions: Normal Distribution, Areas under the Normal Curve, Applications of the Normal Distribution, Normal Approximation to the Binomial.

Fundamental Sampling Distributions: Random Sampling, Sampling Distributions, Sampling Distribution of Means and the Central Limit Theorem, Sampling Distributions: t–distribution, F-distribution, χ^2 distribution.

UNIT-IV

Estimation & Tests of Hypotheses: Introduction, Statistical Inference, Classical Methods of Estimation. Estimating the Mean, Standard Error of a Point Estimate, Estimating the Variance, Estimating a Proportion.

Tests of Hypotheses: Single mean, Difference between Two Means, Single Proportion, Difference between Two Proportions.

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UNIT-V

Stochastic Processes and Markov Chains: Introduction to Stochastic processes- Markov process. Transition Probability, Transition Probability Matrix, First order and Higher order Markov process, n- step transition probabilities, Markov chain, Steady state condition, Markov analysis.

TEXT BOOKS:

1. Elementary number theory & its applications, (6thEdition), Kenneth H. Rosen, Addison-Wesley, 2015.
2. Fundamentals of Mathematical statistics, SC Gupta and V K Kapoor Khanna publications.

REFERENCE BOOKS:

1. Fundamentals of Probability and Statistics For Engineers, T.T. Soong, JohnWiley& Sons, Ltd,2004.
2. Probability and statistics for Engineers and scientists, (5thEdition), Sheldon MRoss, academic press, 2014.
3. Probability and Statistics for Engineers, (8th Edition), Miller and Freund's, Pearson Education, 2015.

COURSE OUTCOMES:

On completion of the course students will be able to:

1. Apply the number theory concepts to cryptography domain.
2. Fit the least squares Regression Model and solve problems involving random variables and discrete distributions.
3. Apply sampling techniques for analyzing experimental data.
4. Apply concept of estimation and testing of hypothesis to case studies.
5. Analyze the data using stochastic process and Markov chains.

CO-PO MAPPING:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	3	2	2	2							2
CO2	3	3	2	2	2							2
CO3	3	3	2	2	2							2
CO4	3	3	2	3	2							2
CO5	3	3	2	3	2							2

(A404203) ELECTRONIC DEVICES AND CIRCUITS

(Common to CSE, CSE (CS), CSE(DS), CSE(AIML), AIML, AI&DS, INF)

B. Tech. II Year I Sem

L	T	P	C
2	0	0	2

UNIT - I

Diodes: Diode - Static and Dynamic resistances, Equivalent circuit, Diffusion and Transition Capacitances, V-I Characteristics,Diode as a switch- switching times.

UNIT - II

Diode Applications: Rectifier - Half Wave Rectifier, Full Wave Rectifier, Bridge Rectifier, Rectifiers with Capacitive and Inductive Filters, Clippers-Clipping at two independent levels, Clamper-Clamping Circuit Theorem, Clamping Operation, Types of Clampers.

UNIT - III

Bipolar Junction Transistor (BJT): Principle of Operation, Common Emitter, Common Base and Common Collector Configurations, Transistor as a switch, switching times,

UNIT - IV

Junction Field Effect Transistor (FET): Construction, Principle of Operation, Pinch-Off Voltage, Volt-Ampere Characteristic, Comparison of BJT and FET, FET as Voltage Variable Resistor, MOSFET, MOSTET as a capacitor.

UNIT – V

Special Purpose Devices: Zener Diode - Characteristics, Zener diode as Voltage Regulator, Principle of Operation - SCR, Tunnel diode, UJT, Varactor Diode, Photo diode, Solar cell, LED, Schottky diode.

TEXT BOOKS:

1. Jacob Millman - Electronic Devices and Circuits, McGraw Hill Education
2. Robert L. Boylestead, Louis Nashelsky- Electronic Devices and Circuits theory, 11th Edition, 2009,Pearson.

REFERENCE BOOKS:

1. Horowitz -Electronic Devices and Circuits, David A. Bell – 5thEdition, Oxford.
2. Chinmoy Saha, Arindam Halder, Debaati Ganguly - Basic Electronics-Principles and Applications, Cambridge,2018.

Course Outcomes:

Upon successful completion of the course, students will be able to:

1. Know PN junction diode characteristics under various conditions.
2. Design different diode applications such as rectifiers, clippers & clampers.
3. Analyze the Bipolar Junction Transistor and its characteristics.
4. Know the Field Effect Transistor characteristics and its applications
5. Acquire the knowledge about the role of special purpose devices and their applications.

CO PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**3**	**3**	**2**									**2**
CO2	**3**	**3**	**2**									**2**
CO3	**3**	**3**	**2**									**2**
CO4	**3**	**3**	**2**									**2**
CO5	**3**	**3**	**2**									**2**

(A405307) COMPUTER ORGANIZATION AND ARCHITECTURE

B.Tech. II Year I Sem

L	T	P	C
3	0	0	3

UNIT - I

Digital Computers: Introduction, Block diagram of Digital Computer, Definition of Computer Organization, Computer Design and Computer Architecture.

Register Transfer Language and Micro operations: Register Transfer language, Register Transfer, Bus and memory transfers, Arithmetic Micro operations, logic micro-operations, shift micro-operations, Arithmetic logic shift unit.

Basic Computer Organization and Design: Instruction codes, Computer Registers Computer instructions, Timing and Control, Instruction cycle, Memory Reference Instructions, Input – Output and Interrupt.

UNIT - II

Microprogrammed Control: Control memory, Address sequencing, micro program example, design of control unit.

Central Processing Unit: General Register Organization, Instruction Formats, Addressing modes, Data Transfer and Manipulation, Program Control.

UNIT - III

Data Representation: Data types, Complements, Fixed Point Representation, Floating PointRepresentation.

Computer Arithmetic: Addition and subtraction, multiplication Algorithms, Division Algorithms,Floating–point Arithmetic operations. Decimal Arithmetic unit, Decimal Arithmetic operations.

UNIT - IV

Input-Output Organization: Input-Output Interface, Asynchronous data transfer, Modes of Transfer, Priority Interrupt Direct memory Access.

Memory Organization: Memory Hierarchy, Main Memory, Auxiliary memory, AssociateMemory, Cache Memory.

UNIT - V

Reduced Instruction Set Computer: CISC Characteristics, RISC Characteristics.

Pipeline and Vector Processing: Parallel Processing, Pipelining, Arithmetic Pipeline,Instruction Pipeline, RISC Pipeline, Vector Processing, Array Processor.

Multi Processors: Characteristics of Multiprocessors, Interconnection Structures,Inter processor arbitration, Inter processor communication and synchronization, Cache Coherence.

TEXT BOOKS:

1. Computer System Architecture – M. Morris Mano, Third Edition, Pearson/PHI.
2. Computer Organization And Architecture: Designing For Performance| By Pearson

REFERENCE BOOKS:

1. Computer Organization – Carl Hamacher, Zvonks Vranesic, SafeaZaky, Vth Edition, McGrawHill.
2. Computer Organization and Architecture – William Stallings Sixth Edition, Pearson/PHI.
3. Structured Computer Organization – Andrew S. Tanenbaum, 4 th Edition, PHI/Pearson.

Course Outcomes:

After completion of this course students will be able to

1. Recognize the basics of instruction sets and their impact on processor design.
2. Demonstrate an understanding of the design of the functional units of a digital computer system.
3. Evaluate cost performance and design trade-offs in designing and constructing acomputer processor including memory.
4. Design a pipeline for consistent execution of instructions with minimum hazards.
5. Recognize and manipulate representations of numbers stored in digital computers

CO PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**3**		**2**									**1**
CO2	**2**	**1**	**2**									**1**
CO3	**2**		**1**									**1**
CO4	**2**											**1**
CO5		**2**	**3**	**1**								**1**

(A405308) SOFTWARE ENGINEERING

B.Tech. II Year I Sem

L	T	P	C
3	0	0	3

UNIT - I

Introduction to Software Engineering: The evolving role of software, changing nature of software, software myths. **A Generic view of process**: Software engineering- a layered technology, a process framework, the capability maturity model integration (CMMI). **Process models**: The waterfall model, Spiral model and Agile methodology

UNIT - II

Software Requirements: Functional and non-functional requirements, user requirements, system requirements, interface specification, the software requirements document.

Requirements engineering process: Feasibility studies, requirements elicitation and analysis, requirements validation, requirements management.

UNIT - III

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, conceptual model of UML, basic structural modeling, class diagrams, sequence diagrams, collaboration diagrams, use case diagrams, component diagrams.

UNIT - IV

Testing Strategies: A strategic approach to software testing, test strategies for conventional software, black-box and white-box testing, validation testing, system testing, the art of debugging.

Metrics for Process and Products: Software measurement, metrics for software quality.

UNIT - V

Risk management: Reactive Vs proactive risk strategies, software risks, risk identification, risk projection, risk refinement, RMMM. **Quality Management:** Quality concepts, software quality assurance, software reviews, formal technical reviews, statistical software quality assurance, software reliability, the ISO 9000 quality standards.

TEXT BOOKS:

1. Software Engineering, A practitioner's Approach- Roger S. Pressman, 6th edition, McGraw Hill International Edition.
2. Software Engineering- Sommerville, 7th edition, Pearson Education.

REFERENCE BOOKS:

1. The unified modeling language user guide Grady Booch, James Rambaugh, Ivar Jacobson, Pearson Education.
2. Software Engineering, an Engineering approach- James F. Peters, Witold Pedrycz, John Wiley.
3. Software Engineering principles and practice- Waman S Jawadekar, The McGraw-Hill Companies
4. Fundamentals of object-oriented design using UML Meiler page-Jones: PearsonEducation

Course Outcomes:

After completion of this course students will be able to:

1. Recognize the basic role and nature of software and acquire knowledge to select process frameworkand process model for business system.
2. Ability to translate end-user requirements into system and software requirements and able to identify,analyse, validate, manage, and specify the requirements for the development of an application.
3. Demonstrate an ability to use the Design tools for designing software architecture and conceptualmodel through UML diagram.
4. Concede product quality through testing techniques employing appropriate metrics by understandingthe practical challenges associated with the development of a significant software system.
5. Apply the Risk management strategies, Quality management strategies and Quality Assuranceknowledge for handling the Application

CO PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**3**					**1**					**2**	**2**
CO2	**3**					**1**				**2**	**2**	**1**
CO3	**2**	**1**	**3**		**3**				**1**			
CO4	**3**	**1**	**2**		**3**				**1**			**1**
CO5	**1**							**2**			**3**	

(A405305) OPERATING SYSTMES

B.Tech. II Year I Sem.

L	T	P	C
3	0	0	3

Prerequisites:

1. A course on "Computer Programming and Data Structures".
2. A course on "Computer Organization and Architecture".

UNIT - I

Operating System: Introduction, Structures - Simple Batch, Multi programmed, Time-shared,Personal Computer, Parallel, Distributed Systems, Real-Time Systems, System components, Operating System services, System Calls

Process - Process concepts and scheduling, Operations on processes, Cooperating Processes, Threads

UNIT - II

CPU Scheduling: Scheduling Criteria, Scheduling Algorithms, Multiple -Processor Scheduling.System call interface for process management-fork, exit, wait, waitpid, exec

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

UNIT - III

Process Management and Synchronization: The Critical Section Problem, Synchronization Hardware, Semaphores, and Classical Problems of Synchronization, Critical Regions, Monitors **Inter process Communication Mechanisms:** IPC between processes on a single computer system, IPC between processes on different systems, using pipes, FIFOs, message queues, shared memory.

UNIT - IV

Memory Management and Virtual Memory: Logical versus Physical Address Space, Swapping, Contiguous Allocation, Paging, Segmentation, Segmentation with Paging, Demand Paging, Page Replacement, Page Replacement Algorithms.

UNIT - V

File System Interface and Operations: Access methods, Directory Structure, Protection, File System Structure, Allocation methods, Free-space Management. Usage of open, create, read, write, close, lseek, stat, ioctl system calls.
Disk Scheduling Algorithms

TEXT BOOKS:

1. Operating System Principles- Abraham Silberchatz, Peter B. Galvin, Greg Gagne 7thEdition, John Wiley.
2. Advanced programming in the UNIX environment, W.R. Stevens, Pearson education.

REFERENCE BOOKS:

1. Operating Systems- Internals and Design Principles, William Stallings, FifthEdition– 2005,Pearson Education/PHI
2. Operating System A Design Approach- Crowley, TMH.
3. Modern Operating Systems, Andrew S. Tanenbaum 2nd edition, Pearson/PHI
4. UNIX programming environment, Kernighan and Pike, PHI/ Pearson Education
5. UNIX Internals -The New Frontiers, U. Vahalia, Pearson Education.

Course Outcomes:

After completion of this course students will be able to:

1. Demonstrate the knowledge of the components of computers and their respective roles in computing.
2. Explain CPU Scheduling Algorithms and Explain the methods for handling Deadlocks.
3. Explain Process Management and Synchronization and Demonstrate Inter process Communication.
4. Analyze various Memory Management and Allocation Methods.
5. Discuss File System Interface and Operations.

CO PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**1**	**1**	**2**									**2**
CO2	**1**	**1**	**2**									**2**
CO3	**1**	**1**	**2**		**2**							**2**
CO4	**1**	**1**	**2**		**2**				**1**			**2**
CO5	**1**	**1**	**2**		**2**				**1**			**2**

(A405506) PYTHON PROGRAMMINGLABORATORY

B.Tech. II Year I Sem.

L	T	P	C
0	1	2	2

Week -1:

1. i) Use a web browser to go to the Python website http://python.org. This page contains information about Python and links to Python-related pages, and it gives you the ability to search the Python documentation.
   ii) Start the Python interpreter and type help() to start the online help utility.
2. Start a Python interpreter and use it as a Calculator.
3. i) Write a program to calculate compound interest when principal, rate and number of periods are given.
   ii) Given coordinates (x1, y1), (x2, y2) find the distance between two points
4. Read name, address, email and phone number of a person through keyboard and print the details.

Week - 2:

1. Print the below triangle using for loop.

5
4 4

3 3 3

2 2 2 2

1 1 1 1 1

2. Write a program to check whether the given input is digit or lowercase character or upper case character or a special character (use 'if-else-if' ladder)
3. Python Program to Print the Fibonacci sequence using while loop
4. Python program to print all prime numbers in a given interval (use break)

Week - 3:

1. i) Write a program to convert a list and tuple into arrays.
   ii) Write a program to find common values between two arrays.
2. Write a function called gcd that takes parameters a and b and returns their greatest common divisor.
3. Write a function called palindrome that takes a string argument and returns True if it is a palindrome and False otherwise. Remember that you can use the built-in function len to check the length of a string.

Week - 4:

1. Write a function called is sorted that takes a list as a parameter and returns True if the list is sorted in ascending order and False otherwise.
2. Write a function called has duplicates that takes a list and returns True if there is any element that appears more than once. It should not modify the original list.

i). Write a function called remove duplicates that takes a list and returns a new list withonly the unique elements from the original. Hint: they don't have to be in the same order.

ii). The word list I provided, words.txt, doesn't contain single letter words. So you might wantto add "I", "a", and the empty string.

iii). Write a python code to read dictionary values from the user. Construct a function toinvert its content. i.e., keys should be values and values should be keys.

3. i) Add a comma between the characters. If the given word is 'Apple', it should become 'A,p,p,l,e'
   ii) Remove the given word in all the places in a string?
   iii) Write a function that takes a sentence as an input parameter and replaces the first letter of every word with the corresponding upper case letter and the rest of the letters in the word by corresponding letters in lower case without using a built-in function?
4. Writes a recursive function that generates all binary strings of n-bit length

Week - 5:

1. i) Write a python program that defines a matrix and prints
   ii) Write a python program to perform addition of two square matrices
   iii) Write a python program to perform multiplication of two square matrices
2. How do you make a module? Give an example of construction of a module using different geometricalshapes and operations on them as its functions.
3. Use the structure of exception handling all general purpose exceptions.

Week-6:

1. a. Write a function called draw_rectangle that takes a Canvas and a Rectangle asarguments anddraws a representation of the Rectangle on the Canvas.
   b. Add an attribute named color to your Rectangle objects and modify draw_rectangle sothat ituses the color attribute as the fill color.
   c. Write a function called draw_point that takes a Canvas and a Point as arguments anddraws arepresentation of the Point on the Canvas.
   d. Define a new class called Circle with appropriate attributes and instantiate a few Circle objects.Write a function called draw_circle that draws circles on the canvas.
2. Write a Python program to demonstrate the usage of Method Resolution Order (MRO) in multiplelevels of Inheritances.
3. Write a python code to read a phone number and email-id from the user andvalidate it forcorrectness.

Week- 7

1. Write a Python code to merge two given file contents into a third file.
2. Write a Python code to open a given file and construct a function to check for given wordspresent init and display on found.
3. Write a Python code to Read text from a text file, find the word with most number of occurrences
4. Write a function that reads a file *file1* and displays the number of words, number ofvowels, blankspaces, lower case letters and uppercase letters.

Week - 8:

1. Import numpy, Plotpy and Scipy and explore their functionalities.
2. a) Install NumPy package with pip and explore it.
3. Write a program to implement Digital Logic Gates – AND, OR, NOT, EX-OR
4. Write a program to implement Half Adder, Full Adder, and Parallel Adder
5. Write a GUI program to create a window wizard having two text labels, two text fields and two buttonsas Submit and Reset.

TEXT BOOKS:

1. Supercharged Python: Take your code to the next level, Overland
2. Learning Python, Mark Lutz, O'reilly
3. Introduction to Python, Kenneth A. Lambert, Cengage

REFERENCE BOOKS:

1. Python for Data Science, Dr. Mohd. Abdul Hameed, Wiley Publications - 1st Ed. 2021.
2. Python Programming: A Modern Approach, Vamsi Kurama, Pearson
3. Python Programming A Modular Approach with Graphics, Database, Mobile, andWeb Applications, Sheetal Taneja, Naveen Kumar, Pearson
4. Programming with Python, A User's Book, Michael Dawson, Cengage Learning, India Edition
5. Think Python, Allen Downey, Green Tea Press
6. Core Python Programming, W. Chun, Pearson

Course Outcomes:

After completion of the course, the student should be able to:

1. To install and run the Python interpreter & learn control structures.
2. Develop the application specific codes using python.
3. Recognize Strings, Lists, Tuples and Dictionaries in Python
4. Verify programs using modular approach, file I/O, Python standard library
5. Implement Digital Systems using Python

CO PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1	3		2							1
CO2	1	2	3		3							1
CO3	2	2	2		3							1
CO4	2	3	2		3							1
CO5		2	1		3							1

(A405509) OPERATING SYSTEMS LABORATORY

B.Tech. II Year I Sem.

L	T	P	C
0	0	2	1

Prerequisites: A course on "Programming for Problem Solving"

A course on "Computer Organization and Architecture".

Co-requisite: A course on "Operating Systems".

List of Experiments:

1. Write C programs to simulate the following CPU Scheduling algorithms a) FCFS b) SJF c) Round Robin d) priority
2. Write programs using the I/O system calls of UNIX/LINUX operating system (open, read,write, close, fcntl, seek, stat, opendir, readdir)
3. Write a C program to simulate Bankers Algorithm for Deadlock Avoidance and Prevention.
4. Write a C program to implement the Producer – Consumer problem using semaphores using UNIX/LINUX system calls.
5. Write C programs to illustrate the following IPC mechanisms a) Pipes b) FIFOs c) Message Queues d) Shared Memory
6. Write C programs to simulate the following memory management techniques a) Paging b)Segmentation
7. Write C programs to simulate Page replacement policies a) FCFS b) LRU c) Optimal

TEXT BOOKS:

1. Operating System Principles- Abraham Silberchatz, Peter B. Galvin, Greg Gagne 7thEdition, John Wiley
2. Advanced programming in the Unix environment, W.R.Stevens, Pearson education.
3. Modern Operating Systems, Andrew S Tanenbaum, 2nd edition, Pearson/PHI

REFERENCE BOOKS:

1. Operating Systems – Internals and Design Principles, William Stallings, FifthEdition– 2005,Pearson Education/PHI
2. Operating System - A Design Approach-Crowley, TMH.
3. UNIX Programming Environment, Kernighan and Pike, PHI/Pearson Education
4. UNIX Internals: The New Frontiers, U. Vahalia, Pearson Education

Course Outcomes:

After completion of this course students will be able to:

1. considerate of the design aspects of operating system concepts through simulation
2. Introduce basic Unix commands,
3. Thoughtful system call interface for process management, inter process communication and I/O in Unix
4. Simulate and implement operating system concepts such as scheduling, deadlock management, file management and memory management.
5. Able to implement C programs using Unix system calls

CO PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2			1							2
CO2	1	2	3		1							2
CO3	1	2	3		1							2
CO4		2	3		1							2
CO5		2	3		1							2

(A466501) SOFTWARE ENGINEERING LABORATORY

B.Tech. II Year I Sem.

L	T	P	C
0	0	2	1

Prerequisites

- A course on "Programming for Problem Solving".

Co-requisite

- A Course on "Software Engineering".

List of Experiments

Do the following seven exercises for any two projects given in the list of sample projects or anyother Projects:

1. Development of problem statements.
2. Preparation of Software Requirement Specification Document, Design Documents andTesting Phase related documents.
3. Preparation of Software Configuration Management and Risk Management related documents.
4. Study and usage of any Design phase CASE tool
5. Performing the Design by using any Design phase CASE tools.
6. Develop test cases for unit testing and integration testing
7. Develop test cases for various white box and black box testing techniques.

Sample Projects:

1. Passport automation System
2. Book Bank
3. Online Exam Registration
4. Stock Maintenance System
5. Online course reservation system
6. E-ticketing
7. Software Personnel Management System
8. Credit Card Processing
9. E-book management System.
10. Recruitment system

TEXT BOOKS:

1. Software Engineering, A practitioner's Approach- Roger S. Pressman, 6th edition, McGrawHill International Edition.
2. Software Engineering- Sommerville, 7th edition, Pearson Education.

REFERENCE BOOKS:

1. Software Engineering, an Engineering approach- James F. Peters, WitoldPedrycz, JohnWiley.
2. Software Engineering principles and practice- Waman S Jawadekar, TheMcGraw-Hill

3. The unified modeling language user guide Grady Booch, James Rambaugh, Ivar Jacobson,Pearson Education.

Course Outcomes:

After completion of this course students will be able to:

1. To have hands on experience in developing a software project by using various software engineering principles
2. Thoughtful methods in each of the phases of software development.
3. Ability to translate end-user requirements into system and software requirements
4. Ability to generate a high-level design of the system from the softwarerequirements
5. Will have experience and/or awareness of testing problems and will be able to develop a simple testing report

CO PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**1**	**1**										**1**
CO2	**2**	**1**	**2**									**1**
CO3	**1**	**1**										**1**
CO4	**1**	**1**										**1**
CO5	**1**	**1**										**1**

(A400507) SOCIAL INNOVATION IN PRACTICE

(Common for all branches)

B.Tech. II Year I Sem.

L	T	P	C
0	0	2	1

Week-1

Identify community issues to be addressed, Requirements Analysis: Extensive User requirementsanalysis

Week-2 Generating effective System Requirement document

Week-3 Social Innovation – Case Studies

Week-4 Impact of Social Innovation on communities

Week-5 Process of Social Innovation Prompts – identifying needs, Proposals –generating ideas, Prototyping – testing the idea in practice

Week-6 Sustaining-developing a business model, Scaling and diffusion-growing social innovations, Systematic change

Week-7 Introduction to sustainability, Sustainability leadership, Life cycle assessment

Week-8 Carbon footprint Calculation

Week-9 Types of Start-Ups, Types of business models, Market risks and Marketing strategies**Week-10** Verification of Business Model and Validation

Week-11 Business Model Development

Week-12 Documentation and Panel presentation

Course Outcomes:

On Completion of the course, the students will be able to:

1. Identify several social issues to be addressed
2. Analyse the impact of social innovations on the society
3. Illustrate the process of social innovation for a community problem
4. Demonstrate the solution from sustainability perspectives.
5. Develop a scalable business model.

REFERENCE BOOKS:

1. Requirements Analysis: From Business Views to Architecture; David C. Hay; Prentice Hall Professional
2. Social Enterprises: An Organizational Perspective edited; Benjamin Gidron, YeheskelHasenfeld;Palgrave Macmillan
3. Social Enterprise Law: Trust, Public Benefit and Capital Markets By Dana Brakman Reiser &Steven A. Dean
4. Introduction to Sustainability by Robert Brinkmann, Wiley-Blackwell

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1					1	2		3	2			
CO2					2	2		2	3			
CO3			2		3	3		2	2			
CO4					2	3	3	2	2			
CO5	2		1		2	3		3	3			

(A400702) GENDER SENSITIZATION

B.Tech. II Year I Sem.

L	T	P	C
2	0	0	0

Unit-I: UNDERSTANDING GENDER

Introduction: Definition of Gender-Basic Gender Concepts and Terminology-Exploring Attitudes towards Gender-Construction of Gender-Socialization: Making Women,Making Men

- Preparing for Womanhood. Growing up Male. First lessons in Caste.

Unit – II: GENDER ROLES AND RELATIONS

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

Unit – III: GENDER AND LABOUR

Division and Valuation of Labour- Housework: The Invisible Labor- "My Mother doesn't Work." "Share the Load."-Work: Its Politics and Economics -Fact and Fiction. Unrecognized and Unaccounted work.

-Gender Development Issues-Gender, Governance and Sustainable Development-Gender andHuman Rights-Gender and Mainstreaming

Unit – IV: GENDER - BASED VIOLENCE

The Concept of Violence: Types of Gender-based Violence-Gender-based Violence from a Human Rights Perspective-Sexual Harassment: Say No!- Sexual Harassment, not Eve- teasing- Coping with Everyday Harassment- Further Reading: "*Chupulu".*

Domestic Violence: Speaking OutIs Home a Safe Place? -When Women Unite [Film]. Rebuilding Lives. Thinking about Sexual Violence Blaming the Victim-"I Fought for my Life…."

Unit – V: GENDER AND CULTURE

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.

Objectives of the Course:

1. To develop students' sensibility with regard to issues of gender in contemporary India.
2. To provide a critical perspective on the socialization of men and women.
3. To introduce students to information about some key biological aspects of genders.
4. To expose the students to debates on the politics and economics of work.
5. To help students reflect critically on gender violence.
6. To expose students to more egalitarian interactions between men and women.

Learning Outcomes:

1. Students will have developed a better understanding of important issues related to gender in contemporary India.
2. Students will be sensitized to basic dimensions of the biological, sociological, psychological and legal aspects of gender. This will be achieved through discussion of materials derived from research, facts, everyday life, literature and film.
3. Students will attain a finer grasp of how gender discrimination works in our society and how to counter it.
4. Students will acquire insight into the gendered division of labor and its relation to politics and economics.
5. Men and women students and professionals will be better equipped to work and live together as equals.
6. Students will develop a sense of appreciation of women in all walks of life.
7. Through providing accounts of studies and movements as well as the new laws that provide protection and relief to women, the textbook will empower students to understand and respond to gender violence.

CO-PO Mapping:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1						**2**						
CO2	**2**											
CO3						**2**						
CO4				**2**								
CO5			**3**									

ASSESSMENT AND GRADING:

- Discussion & Classroom Participation: 20%
- Project/Assignment: 30%
- End Term Exam: 50%

(A405306) DISCRETE MATHEMATICS

B.Tech. II Year II Sem.

L	T	P	C
3	0	0	3

UNIT - I

Mathematical logic: Introduction, Statements and Notation, Connectives, Normal Forms, Theory of Inference for the Statement Calculus, The Predicate Calculus, Inference Theory of the Predicate Calculus.

UNIT - II

Set theory: Introduction, Basic Concepts of Set Theory, Representation of Discrete Structures, Relations and Ordering, Functions.

UNIT - III

Algebraic Structures: Introduction, Algebraic Systems, Semi groups and Monoids, Lattices as Partially Ordered Sets, Boolean Algebra.

UNIT - IV

Elementary Combinatorics: Basics of Counting, Combinations and Permutations, Enumeration of Combinations and Permutations, Enumerating Combinations and Permutations with Repetitions, Enumerating Permutation with Constrained Repetitions, Binomial Coefficient, The Binomial and Multinomial Theorems, The Principle of Exclusion.

UNIT - V

Graph Theory: Basic Concepts, Isomorphism and Subgraphs, Trees and their Properties, Spanning Trees, Directed Trees, Binary Trees, Planar Graphs, Euler's Formula, Multi-graphs and Euler Circuits, Hamiltonian Graphs, Chromatic Numbers, The Four-Color Problem.

TEXT BOOKS:

1. Discrete Mathematical Structures with Applications to Computer Science: J.P.Tremblay, R. Manohar, McGraw-Hill, 1st ed.
2. Discrete Mathematics for Computer Scientists & Mathematicians: Joe l. Mott,Abraham Kandel, Teodore P. Baker, Prentis Hall of India, 2nd ed.

REFERENCE BOOKS:

1. Discrete and Combinatorial Mathematics - an applied introduction: Ralph.P. Grimald,Pearson education, 5th edition.
2. Discrete Mathematical Structures: Thomas Kosy, Tata McGraw Hill publishing co.
3. Discrete Mathematics and Its Applications (SIE)| 8th Edition by KENNETH H. ROSEN and DR. KAMALA KRITHIVASAN

Course Outcomes:

After completion of this course students will be able to:

1. Comprehend and construct precise mathematical proofs
2. Apply logic and set theory to formulate precise statements
3. Analyze and solve counting problems on finite and discrete structures
4. Describe and manipulate sequences
5. Apply graph theory in solving computing problems

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**1**	**2**	**2**									
CO2	**3**	**2**	**2**	**1**								
CO3	**3**	**2**	**2**	**2**								
CO4	**3**	**2**	**2**	**1**								
CO5	**3**	**2**	**2**									

(A412303) AUTOMATA THEORY AND COMPILER DESIGN

B.Tech. II Year II Sem.

L	T	P	C
3	0	0	3

UNIT - I

Introduction to Finite Automata: Structural Representations, Automata and Complexity, theCentral Concepts of Automata Theory – Alphabets, Strings, Languages, Problems.

Nondeterministic Finite Automata: Formal Definition, an application, Text Search, FiniteAutomata with Epsilon-Transitions.

Deterministic Finite Automata: Definition of DFA, How A DFA Process Strings, The language ofDFA, Conversion of NFA with €-transitions to NFA without €-transitions. Conversion of NFA to DFA

UNIT - II

Regular Expressions: Finite Automata and Regular Expressions, Applications of Regular Expressions, Algebraic Laws for Regular Expressions, Conversion of Finite Automata to Regular Expressions.

Pumping Lemma for Regular Languages: Statement of the pumping lemma, Applications of the Pumping Lemma.

Context-Free Grammars: Definition of Context-Free Grammars, Derivations Using a Grammar, Leftmost and Rightmost Derivations, the Language of a Grammar, Parse Trees, Ambiguity in Grammars and Languages.

UNIT - III

Push Down Automata: Definition of the Pushdown Automaton, the Languages of a PDA, Equivalence of PDA and CFG's, Acceptance by final state

Turing Machines: Introduction to Turing Machine, Formal Description, Instantaneous description, The language of a Turing machine

Undecidability: Undecidability, A Language that is Not Recursively Enumerable, An Undecidable Problem That is RE, Undecidable Problems about Turing Machines

UNIT - IV

Introduction: The structure of a compiler,

Lexical Analysis: The Role of the Lexical Analyzer, Input Buffering, Recognition of Tokens, TheLexical- Analyzer Generator Lex,

Syntax Analysis: Introduction, Context-Free Grammars, Writing a Grammar, Top-Down Parsing, Bottom- Up Parsing, Introduction to LR Parsing: Simple LR, More Powerful LR Parsers

UNIT - V

Syntax-Directed Translation: Syntax-Directed Definitions, Evaluation Orders for SDD's,Syntax-Directed Translation Schemes, Implementing L-Attributed SDD's.

Intermediate-Code Generation: Variants of Syntax Trees, Three-Address Code

Run-Time Environments: Stack Allocation of Space, Access to Nonlocal Data on the Stack, Heap Management

TEXT BOOKS:

1. Introduction to Automata Theory, Languages, and Computation, 3nd Edition, John E. Hopcroft, Rajeev Motwani, Jeffrey D. Ullman, Pearson Education.
2. Theory of Computer Science – Automata languages and computation, Mishra and Chandrashekaran, 2nd Edition, PHI.

REFERENCE BOOKS:

1. Compilers: Principles, Techniques and Tools, Alfred V. Aho, Monica S. Lam, Ravi Sethi,Jeffry D. Ullman, 2nd Edition, Pearson.
2. Introduction to Formal languages Automata Theory and Computation, KamalaKrithivasan, Rama R, Pearson.
3. Introduction to Languages and The Theory of Computation, John C Martin, TMH.
4. lex & yacc – John R. Levine, Tony Mason, Doug Brown, O'reilly Compiler Construction,Kennet C. Louden, Thomson. Course Technology.

Course Outcomes:

After completion of this course students will be able to:

1. Able to employ finite state machines for modeling and solving computing problems.
2. Able to design context free grammars for formal languages.
3. Able to distinguish between decidability and undecidability.
4. Demonstrate the knowledge of patterns, tokens & regular expressions for lexical analysis.
5. Acquire skills in using lex tool and design LR parsers

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	3									1
CO2		1	3									1
CO3		2		3								1
CO4	1	2										1
CO5		1	2		2							1

(A405304) DATABASE MANAGEMENT SYSTEMS

B.Tech. II Year II Sem

L	T	P	C
3	0	0	3

Prerequisites: A course on "Data Structures".

UNIT - I

Database System Applications: A Historical Perspective, File Systems versus a DBMS, the Data Model, Levels of Abstraction in a DBMS, Data Independence, Structure of a DBMS

Introduction to Database Design: Database Design and ER Diagrams, Entities, Attributes, and Entity Sets, Relationships and Relationship Sets, Additional Features of the ER Model, Conceptual Design With the ER Model

UNIT - II

Introduction to the Relational Model: Integrity constraint over relations, enforcing integrity constraints, querying relational data, logical database design, introduction to views, destroying/alteringtables and views.

Relational Algebra, Tuple relational Calculus, Domain relational calculus.

UNIT - III

SQL: QUERIES, CONSTRAINTS, TRIGGERS: form of basic SQL query, UNION, INTERSECT, and

EXCEPT, Nested Queries, aggregation operators, NULL values, complex integrity constraints in SQL,triggers and active databases.

Schema Refinement: Problems caused by redundancy, decompositions, problems related to decomposition, reasoning about functional dependencies, First, Second, Third normal forms, BCNF, lossless join decomposition, multivalued dependencies, Fourth normal form, Fifth normal form.

UNIT - IV

Transaction Concept, Transaction State, Implementation of Atomicity and Durability, Concurrent Executions, Serializability, Recoverability, Implementation of Isolation, Testing forserializability, Lock Based Protocols, Timestamp Based Protocols, Validation- Based Protocols, Multiple Granularity, Recovery and Atomicity, Log–Based Recovery, Recovery withConcurrent Transactions.

UNIT - V

Data on External Storage, File Organization and Indexing, Cluster Indexes, Primary and Secondary Indexes, Index data Structures, Hash Based Indexing, Tree based Indexing,

Comparison of File Organizations, Indexes:

Intuitions for tree Indexes, Indexed Sequential Access Methods (ISAM), B+ Trees: A Dynamic Index Structure.

TEXT BOOKS:

1. Database System Concepts, Silberschatz, Korth, McGraw hill, V edition.3rd Edition
2. Database Management Systems, Raghuram Krishnan, Johannes Gehrke, Tata Mc Graw Hill

REFERENCE BOOKS:

1. Database Systems design, Implementation, and Management, Peter Rob & Carlos Coronel 7thEdition.
2. Fundamentals of Database Systems, Elmasri Navrate, Pearson Education
3. Introduction to Database Systems, C. J. Date, Pearson Education
4. Oracle for Professionals, The X Team, S.Shah and V. Shah, SPD.
5. Database Systems Using Oracle: A Simplified guide to SQL and PL/SQL, Shah, PHI.
6. Fundamentals of Database Management Systems, M. L. Gillenson, Wiley Student Edition.

Course Outcomes:

After completion of this course students will be able to:

1. To recognize the basic concepts and the applications of database systems.
2. Gain knowledge of fundamentals of DBMS, database design and normal forms
3. Master the basics of SQL for retrieval and management of data.
4. Be acquainted with the basics of transaction processing and concurrency control.
5. Familiarity with database storage structures and access techniques

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1											2
CO2	1	2	1									2
CO3	1	2	2	1	3							2
CO4	1	2	2	1	3							2
CO5	1	1	1		3							2

(A466301) ARTIFICIAL INTELLIGENCE

B.Tech. II Year II Sem.

L	T	P	C
3	0	0	3

Prerequisite: Knowledge on Data Structures.

UNIT - I

Introduction to AI - Intelligent Agents, Problem-Solving Agents,

Searching for Solutions: Breadth-first search, Depth-first search, Hill-climbing search, Simulated annealing search, Local Search in Continuous Spaces.

UNIT-II

Games: Optimal Decisions in Games, Alpha–Beta Pruning, Defining Constraint Satisfaction Problems, Constraint Propagation, Backtracking Search for CSPs, Knowledge-Based Agents, **Logic-** Propositional Logic, Propositional Theorem Proving: Inference and proofs, Proof by resolution, Horn clauses and definite clauses.

UNIT-III

First-Order Logic: Syntax and Semantics of First-Order Logic, Using First Order Logic, Knowledge Engineering in First-Order Logic. Inference in First-Order Logic: Propositional vs. First-Order Inference, Unification, Forward Chaining, Backward Chaining, Resolution.

Knowledge Representation: Ontological Engineering, Categories and Objects, Events.

UNIT-IV

Planning: Definition of Classical Planning, Algorithms for Planning with State Space Search, Planning Graphs, other Classical Planning Approaches, Analysis of Planning approaches. Hierarchical Planning.

UNIT-V

Probabilistic Reasoning:

Acting under Uncertainty, Basic Probability Notation Bayes' Rule and Its Use, Probabilistic Reasoning, Representing Knowledge in an Uncertain Domain, The Semantics of Bayesian Networks, Efficient

Representation of Conditional Distributions, Approximate Inference in Bayesian Networks, Relational and First- Order Probability.

TEXT BOOKS:

1. Artificial Intelligence: A Modern Approach, Third Edition, Stuart Russell and PeterNorvig, Pearson Education.

2. Artificial Intelligence and Expert systems – Patterson, Pearson Education.

REFERENCE BOOKS:

1. Artificial Intelligence, 3rd Edn., E. Rich and K. Knight (TMH)
2. Artificial Intelligence, 3rd Edn., Patrick Henny Winston, Pearson Education.
3. Artificial Intelligence, Shivani Goel, Pearson Education.

Course Outcomes:

After completion of this course students will be able to:

1. Learn the distinction between optimal reasoning Vs human like reasoning and formulate an efficient problem space for a problem expressed in natural language. Also select a search algorithm for a problem and estimate its time and space complexities.
2. Apply AI techniques to solve problems of game playing, theorem proving, and machine learning.
3. Learn different knowledge representation techniques.
4. Recognize the concepts of state space representation, exhaustive search, heuristic searchtogether with the time and space complexities.
5. Comprehend the applications of Probabilistic Reasoning and Bayesian Networks.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**1**	**2**	**2**		**2**							**3**
CO2	**1**	**2**	**3**		**2**							**3**
CO3	**3**	**2**	**2**		**2**							**3**
CO4	**3**	**2**	**2**		**2**							**3**
CO5	**3**	**1**	**1**		**2**							**3**

(A405303) OBJECT ORIENTED PROGRAMMING THROUGH JAVA

B.Tech II Year II Semester

L	T	P	C
3	0	0	3

UNIT - I

Object oriented thinking and Java Basics- Need for oop paradigm, summary of oop concepts, coping with complexity, abstraction mechanisms. A way of viewing world – Agents, responsibility, messages, methods, History of Java, Java buzzwords, data types, variables, scope and lifetime of variables, arrays, operators, expressions, control statements, type conversion and casting, simple java program, concepts of classes, objects, constructors, methods, access control, this keyword, garbage collection, overloading methods and constructors, method binding, inheritance, overriding and exceptions, parameter passing, recursion, nested and inner classes, exploring string class.

UNIT - II

Inheritance, Packages and Interfaces – Hierarchical abstractions, Base class object, subclass, subtype, substitutability, forms of inheritance specialization, specification, construction, extension, limitation, combination, benefits of inheritance, costs of inheritance. Member access rules, super uses, using final with inheritance, polymorphism- method overriding, abstract classes, the Object class.

Packages: Defining, Creating and Accessing a Package, Understanding CLASSPATH, importing packages

Interfaces: Defining an interface, differences between classes and interfaces, implementing interface, applying interfaces, variables in interface and extending interfaces.

UNIT - III

Exception handling and Multithreading-- Concepts of exception handling, benefits of exception handling, Termination or resumptive models, exception hierarchy, usage of try, catch, throw, throws and finally, built in exceptions, creating own exception subclasses. String handling, exploring java.util. Differences between multithreading and multitasking, thread life cycle, creating threads, thread priorities, synchronizing threads, inter thread communication, thread groups, daemon threads. Enumerations, autoboxing, annotations, generics.

UNIT - IV

The AWT class hierarchy, user interface components- labels, button, canvas, scrollbars, text components, check box, checkbox groups, choices,

lists panels – scrollpane, dialogs, menubar, graphics, layout manager – layout manager types – border, grid, flow, card and grid bag.

Swing – Introduction, limitations of AWT, MVC architecture, components, containers, exploring swing- JApplet, JFrame and JComponent, Icons and Labels, text fields, buttons – The JButton class, Check boxes, Radio buttons, Combo boxes, Tabbed Panes, Scroll Panes, Trees, and Tables.

UNIT - V

Event Handling: Events, Event sources, Event classes, Event Listeners, Delegation event model, handling mouse and keyboard events, Adapter classes.

Applets – Concepts of Applets, differences between applets and applications, life cycle of an applet, types of applets, creating applets, passing parameters to applets. Servlets, JDBC, Collection framework, JAVA8 features (Functional Programming and Lambda Functions).

TEXTBOOKS:

1.Java the complete reference, 7th edition, Herbert schildt, TMH.

2.Understanding OOP with Java, updated edition, T. Budd, Pearson education.

REFERENCE BOOKS:

1.An Introduction to programming and OO design using Java, J.Nino and F.A. Hosch, John wiley & sons.
2.An Introduction to OOP, third edition, T. Budd, Pearson education.
3.Introduction to Java programming, Y. Daniel Liang, Pearson education.
4.An introduction to Java programming and object-oriented application development, R.A. Johnson- Thomson.
5.Core Java 2, Vol 1, Fundamentals, Cay.S. Horstmann and Gary Cornell, eighth Edition, Pearson Education.
6.Core Java 2, Vol 2, Advanced Features, Cay.S. Horstmann and Gary Cornell, eighth Edition, Pearson Education
7.Object Oriented Programming with Java, R.Buyya, S.T.Selvi, X.Chu, TMH.
8.Java and Object Orientation, an introduction, John Hunt, second edition, Springer. 9. Maurach's Beginning Java2 JDK 5, SPD.

Course Outcomes:

After completion of this course, students will be able to:

1. Demonstrate the behavior of programs involving the basic programming constructs like control structures, constructors, string handling and garbage collection.

2. Develop reusable programs using the concepts of inheritance, polymorphism, interfaces, and packages

3. Apply the concepts of Multithreading and Exception handling to develop efficient and error free codes.

4. Design event driven GUI and web related applications which mimic the real word scenarios using AWT, Swing

5. Able to develop interactive programs using Event Handler and applets.

CO PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**3**							**1**			**1**	**2**
CO2	**3**	**2**	**3**								**1**	**1**
CO3	**1**	**2**	**2**	**1**	**3**							
CO4	**3**	**1**	**3**	**1**	**3**				**1**		**1**	**1**
CO5	**1**	**1**	**3**		**3**				**1**		**1**	**1**

(A405508) DATABASE MANAGEMENT SYSTEMS LABORATORY

B. Tech II Year II Sem

L	T	P	C
0	0	2	1

Co-requisites: "Database Management Systems"List

of Experiments:

1. **Concept design with E-R Model**

Draw an ER diagram for the following

a. There are two entity sets **Employee** and **Department**. These entity sets are participating in a relationship **works in.** The relationship set is converted into relation with attributes EmpNo from **Employee** relation, D_id from **Department** relation and **Since**, the attribute of the relationship set itself.

2. **Relational Model**

a. Convert the above ER diagram into Relational Model

3. **Normalization**

Consider the following table.

a) Normalize the given Relation. Consider the given schema is in first normal form and Schema(Student id ,Student name, Project Id, Project name, City, country, ZIP)

Eid	E.Name	Ph.no	ProjId	ProjName	ProjLeader	EmpCity	City Zip
101	John	98765623,998234123	P03	Project103	Grey	ModelTown	110033
102	John	89023467	P01	Project101	Christian	Badarpur	110044
103	Ryan	76213908	P04	Project104	Hudson	Naraina	110028
104	stephine	98132452	P02	Project102	Petro	HariNagar	110064

Primary key(Student id, Project id)

Fd's: Project Id- Project name

country- ZIP,ZIP

b) Normalize the given Table to the BCNF
Consider the set of Functional Dependencies..

Eid EName, Ph.no, Empcity, CityZipPrimaryKey = (EmpId, ProjId)

ProjId ProjName, ProjLeader

EmpId,ProjId ProjLeader

EmpCity CityZip

ProjId ProjLeader

5.Practicing DML commands

1. a. Create a user and grant all permissions to the user.

   b. Insert the any three records in the employee table and use rollback. Check the result.

   c. Add primary key constraint and not null constraint to the employee table.

   d. Insert null values to the employee table and verify the result.

2. a. Create a user and grant all permissions to the user.

   b. Insert values in the department table and use commit.

   c. Add constraints like unique and not null to the department table.

   d. Insert repeated values and null values into the table.

3. a. Create a user and grant all permissions to the user.

   b. Insert values into the table and use commit.

   c. Delete any three records in the department table and use rollback.

   d. Add constraint primary key and foreign key to the table

4. a. Create a user and grant all permissions to the user.

   b. Insert records in the sailor table and use commit.

   c. Add save point after insertion of records and verify save point.

   d. Add constraints not null and primary key to the sailor table.

5. a. Create a user and grant all permissions to the user.

   b. Use revoke command to remove user permissions.

   c. Change password of the user created.

   d. Add constraint foreign key and not null.

6. a. Create a user and grant all permissions to the user.

   b. Update the table reserves and use save point and rollback.

   c. Add constraint primary key , foreign key and not null to the reserves table

   d. Delete constraint not null to the table column

Querying (using ANY, ALL, UNION, INTERSECT, JOIN, Constraints etc.)

Nested, Correlated subqueries

A. Find the Sid's of sailors who have reserved a red or a green boat.
B. Find the names of sailors who have reserved a red and a green boat.
C. Find the names of sailors who have reserved a red but not green boats.
D. Find all sids of sailors who have a rating of 10 or reserved boat 104.
E. Find the names of sailors who have reserved boat 103 using independent nested query.
F. Find the names of sailors who have reserved a red boat.
G. Find the names of sailors who have not reserved a red boat.

1. Find the names of sailors who have reserved boat number 103 using correlated nested query.
H. Find sailors whose rating is better than some sailor called 'Horatio'.
I. Find the sailors with the highest rating.

2. Find the names of sailors who have reserved both a red and a green boat usingnested queries.
J. Find the names of sailors who have reserved all boats.

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7. Queries using Aggregate functions, GROUP BY, HAVING and Creation and dropping ofViews.

a. who is the youngest sailor

b.Find the name of the sailor who have maximum rating

c.What is the average rating of all Sailors

d. how many sailors are there with the rating above 7

e. The following SQL lists the number of customers in each country, sorted high to low

f. The following SQL lists the number of customers in each country, sorted high to low (Only includecountries with more than 5 customers):

8. Triggers (Creation of insert trigger, delete trigger, update trigger)

1.

a. Create a pl/sql trigger which will calculate the total marks and percentage of students afterinsert/update the details of a student in database.

b. Write a trigger that keeps backup of deleted records of emp_trig table. Deleted records of

emp_trigger inserted in emp_backup table.

2. Creation of insert trigger, delete trigger, update trigger practice triggers using the passenger database.

Passenger (Passport_ id INTEGER PRIMARY KEY, Name VARCHAR (50) Not NULL, AgeInteger Not NULL, Sex Char, Address VARCHAR (50) Not NULL);

a. Write a Insert Trigger to check the Passport_id is exactly six digits or not.
b. Write a trigger on passenger to display messages '1 Record is inserted', '1 record is deleted', '1record is

updated' when insertion, deletion and updation are done on passenger respectively.

9. Procedures and functions

a. Create a procedure which displays employee salary for given employee number using outvariable
b. Write a pl/sql block which displays the department name for department 40.
c. Create a procedure to check whether the given number is prime or not
d. Create a function which returns week day of a given date
e. Create a function which returns number of sailors for a given rating level.
f. Create a procedure to find the lucky number of a given birth date
g. Create a function which returns average age of sailors for a given rating level.

10.Usage of Cursors

a. Display the employee names and their salary for the accepted department number.

b. Display the top N earners for an accepted department number.
c. To write a Cursor to display the list of employees who are working as a Managers or Analyst.
d. write a Cursor to find employee with given job and deptno.
e. Write a PL/SQL block using implicit cursor that will display message, the salaries of all the employees in the 'employee' table are updated. If none of the employee's salary are updated we get a message 'None of the salaries were updated'. Else we get a message like for example, 'Salaries for 1000 employees are updated' if there are 1000 rows in 'employee' table.

10. Packages

a. creates HR package which contains Hire and Fire functions.

Hire function adds the details of employee and Fire function deletes the details of Employee.

TEXT BOOKS:

1. Database Management Systems, Raghurama Krishnan, Johannes Gehrke, Tata Mc Graw Hill, 3rdEdition

2. Database System Concepts, Silberschatz, Korth, McGraw Hill, V edition.

REFERENCE BOOKS:

1. Database Systems design, Implementation, and Management, Peter Rob & Carlos Coronel 7thEdition.

2. Fundamentals of Database Systems, ElmasriNavrate, Pearson Education

3.Introduction to Database Systems, C.J. Date, Pearson Education 4.Oracle for

Professionals, The X Team, S. Shah and V. Shah, SPD.

5. Database Systems Using Oracle: A Simplified guide to SQL and PL/SQL, Shah, PHI.

6.Fundamentals of Database Management Systems, M. L. Gillenson, Wiley Student Edition.**Course**

Outcomes:

After completion of this course students will be able to:

1. Introduce ER data model, database design and normalization
2. Learn SQL basics for data definition and data manipulation
3. Design database schema for a given application and apply normalization.
4. Acquire skills in using SQL commands for data definition and data manipulation.

5. Develop solutions for database applications using procedures, cursors, and triggers.

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**1**				**2**							**1**
CO2	**1**	**1**	**2**	**1**	**2**							**1**
CO3	**1**	**1**	**2**	**2**	**2**							**1**
CO4	**1**	**1**	**2**	**1**	**2**							**3**
CO5	**1**	**1**	**2**		**2**							**3**

(A412504) JAVA PROGRAMMING LABORATORY

B.Tech. II Year II Sem.

L	T	P	C
0	0	2	1

List of Experiments:

1. Use Eclipse or Net bean platform and acquaint yourself with the various menus. Create a test project, add a test class, and run it. See how you can use auto suggestions, auto fill. Try code formatter and code refactoring like renaming variables, methods, and classes. Try debug step by step with a small program of about 10 to 15 lines which contains at least one if else condition and a for loop.

2. Write a Java program to demonstrate the OOP principles. [i.e., Encapsulation, Inheritance, Polymorphism and Abstraction]

3. Write a Java program to handle checked and unchecked exceptions. Also, demonstrate the usage of custom exceptions in real time scenario.

4. Write a Java program to demonstrate interfaces and different types of constructors

5. Write a Java program to demonstrate the working of different collection classes. [Use package structure to store multiple classes].

6. Write a program to synchronize the threads acting on the same object. [Consider the exampleof any reservations like railway, bus, movie ticket booking, etc.]

7. Write a program to demonstrate applet

8. Write a Java program that works as a simple calculator. Use a grid layout to arrange buttons for the digits and for the +, -,*, % operations. Add a text field to display the result. Handle any possible exceptions like divided by zero.

9. Write a Java program that handles all mouse events and shows the event name at the center of the window when a mouse event is fired. [Use Adapter classes]

10. Write a program to demonstrate swing components.

TEXT BOOKS:

1. Java The complete reference, 9th edition, Herbert Schildt, McGraw Hill Education (India)Pvt. Ltd.
2. Understanding Object-Oriented Programming with Java, updated edition, T. Budd, Pearson Education.

REFERENCE BOOKS:

1. Java for Programmers, P. J. Deitel and H. M. Deitel, 10th Edition Pearson education.
2. Thinking in Java, Bruce Eckel, Pearson Education.
3. Java Programming, D. S. Malik and P. S. Nair, Cengage Learning.
4. Core Java, Volume 1, 9th edition, Cay S. Horstmann and G Cornell, Pearson.

Course Outcomes:

After completion of this course students will be able to:

1. Know the operations of Net bean/Eclipse tools with simple application.
2. Write and execute Java applications using Encapsulation, Inheritance, Polymorphism and Abstraction technique.
3. Able to write programs using synchronize the threads and with Exceptional Handling.
4. Write and execute Java applications using collections and I/O classes.
5. Design Java Applications using JAVA GUI components with mouse events and test them by execution.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**3**	**2**	**1**		**1**							**1**
CO2	**1**	**2**	**1**		**1**							**1**
CO3	**1**	**2**	**1**		**1**							**1**
CO4	**1**	**2**	**3**		**1**							**1**
CO5	**1**	**2**	**3**		**1**							**1**

(A466502) ARTIFICIALINTELLIGENCE LABORATORY

B.Tech. II Year II Sem.

L	T	P	C
0	0	2	1

LIST OF EXPERIMENTS:

Week-1 & 2:

Basic programs in Python to get familiarize various programming structures

Week - 3:

Implementation of logical rules in Python

Week - 4, 5, 6 & 7:

Using any data apply the concept of:

a. Liner regression

b. Gradient decent

c. Logistic regression

Week - 8:

Perform and plot overfitting in a data set

Week - 9 &10:

Implementation of KNN classification algorithm

Week - 11 &12:

Implementation of k-means clustering algorithm

Week - 13:

Explore statistical methods for machine learning

TEXT BOOKS:

1. Artificial Intelligence, Cengage Learning, Saroj Kaushik, 1st Edition, 2011
2. Python Machine Learning by Example, Yuxi (Hayden) Liu, Packet PublishingLimited, 2017
3. Machine Learning, Saikar Dutt, Subramanian Chandramouli, Amit KumarDas,Pearson India

REFERENCE BOOKS:

1. Practical Workbook Artificial Intelligence and Soft Computing for beginners, Anindita Das Bhattacharjee, Shroff Publisher-X team Publisher

2. Machine Learning, Tom Mitchell, McGraw Hill, 2017

3. Pattern Recognition and Machine Learning, Christopher M. Bishop, Springer, 2011,4.The Elements of Statistical Learning, T. Hastie, R. Tibshirani, J. Friedman, 2e,2011

Course Outcomes:

After completion of this course students will be able to:

1. Understanding the basic programs structures
2. Explore the KNN classification algorithm
3. Learn different knowledge representation techniques.
4. Understand the Implementation of k-means clustering algorithm
5. Understanding the statistical methods

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**1**	**1**	**1**		**1**							**1**
CO2	**3**	**3**	**3**		**1**							**1**
CO3	**3**	**2**	**2**		**1**							**1**
CO4	**3**	**2**	**2**		**1**							**1**
CO5	**3**	**1**	**1**		**1**							**1**

(A400701) ENVIRONMENTAL SCIENCES

(MANDATORCOURSE)

B.Tech II Year II Sem

L	T	P	C
2	0	0	0

UNIT-I

Environmental Studies: Introduction, Definition, scope and importance, Ecosystems: Introduction, types, characteristic features, structure and functions of ecosystems, Bio-geo chemical cycle, Classification of Eco system.

UNIT-II

Natural Resources: Classification of Resources, Land resources, Land as resource, Common property resources, Land degradation, Soil erosion and desertification, Effects of modern agriculture, fertilizer – pesticide problems, Forest resources, Use and over-exploitation.

Mining and dams – their effects on forest and tribal people, Water resources, Use and over- utilization of surface and groundwater, Floods, droughts, Water logging and salinity, Dams –benefits and costs, Conflicts over Water, Energy resources.

UNIT-III

Bio-diversity and its conservation, Value of bio-diversity-consumptive and productive use, social, ethical, aesthetic and option values, Bio-geographical classification of India – India as a mega diversity habitat, Threats to bio-diversity –Hot-spots, habitat loss, poaching of wild life, loss of species, seeds, etc. Conservation of bio-diversity– In-situ and Ex-situ conservation.

UNIT-IV

Environmental Pollution–Local and Global Issues, Nature of thermal pollution and nuclear hazards, Global warming, Acid rain, Ozone depletion, Environmental case studies.

UNIT-V

Environmental Problems in India, drinking water, sanitation and public health, Effects of the activities on the quality of environment, Water scarcity and groundwater depletion, Controversies on major dams – resettlement and rehabilitation of people: problems and concerns, Rainwater harvesting, cloud seeding and watershed management. Economy and Environment, The economy and environment interaction, Economics of development, preservation and conservation, Sustainability: theory and practices, Limits to growth,Equitableuse of resources for sustainable life styles, Environmental Impact Assessment.

TEXT BOOKS:

1. Environmental Science (1st edition), Y.Anjaneyulu, B S Publications.
2. Environmental studies (1st edition), Deekshadave, Cengage learning India Pvt. Ltd.

REFERENCE BOOKS:

1. Environmental sciences and Engineering (1st edition), P. VenugopalRao, PHI learning Pvt. Ltd.,
2. Environmental Science and Technology (1st edition), M. Anji Reddy, B S Publications.
3. Environmental Encyclopedia (Cunningham, W.P., et al., Jaico Publishing House, Mumbai, 2003.

Course Outcomes:

On successful completion of this course, it is expected that students should be able to:

1. Understand the basic concepts, scope, and importance of environmental studies
2. Acquire knowledge on natural resources and analyze the impacts of modern agriculture

3. Evaluate the value, threats, and conservation methods of biodiversity, understand India's as a mega diversity habitat.
4. Analyze global environmental pollution issues and understand the hazardous effects of environmental pollution
5. Examine environmental problems in India, and understand various environmental issues to focus on sustainable practices for Environmental Impact Assessment

CO-PO MAPPING:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**3**	**2**	**1**			**2**	**3**	**1**		**1**		**2**
CO2	**3**	**3**	**2**	**2**		**2**	**3**	**1**				**2**
CO3	**2**	**2**	**3**	**1**		**2**	**3**	**1**				**2**
CO4	**2**	**3**	**2**	**2**		**2**	**3**	**1**				**2**
CO5	**2**	**2**	**3**	**3**		**3**	**3**	**1**				**2**

(A473301) DESIGN AND ANALYSIS OF ALGORITHMS

B.Tech. III Year I Sem. **L T P C**
3 1 0 4

Prerequisites:

- A course on "Computer Programming and Data Structures".
- A course on "Advanced Data Structures".

UNIT - I

Introduction: Algorithm, Performance Analysis-Space complexity, Time complexity, Asymptotic Notations- Big oh notation, Omega notation, Theta notation and Little oh notation.

Divide and conquer: General method, applications-Binary search, Quick sort,Merge sort, Strassen'smatrix multiplication.

UNIT - II

Disjoint Sets: Disjoint set operations, union and find algorithms, Priority Queue- Heaps, Heap-sort

Backtracking: General method, applications, n-queen's problem, sum of subsets problem, graph Coloring, hamitonian cycles.

UNIT - III

Dynamic Programming: General method, applications- Optimal binary search tree, 0/1 knapsack problem, All pairs shortest path problem, Traveling salesperson problem, Reliability design.

UNIT - IV

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

Basic Traversal and Search Techniques: Techniques for Binary Trees, Techniques for Graphs, Connected components, Bi-connected components.

UNIT - V

Branch and Bound: General method, applications - Traveling salesperson problem, 0/1 knapsack problem - LC Branch and Bound solution, FIFO Branch and Bound solution.

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

TEXT BOOKS:

1. Fundamentals of Computer Algorithms, Ellis Horowitz, Satraj Sahni andRaja sekharan, University press, 1998.
2. Algorithm Design: Foundations, Analysis and Internet Examples, M.T.Goodrich and R.Tamassia, John Wiley and sons.

REFERENCE BOOKS:

1. Design and Analysis of algorithms, Aho, Ullman and Hopcroft, Pearson education.
2. Introduction to Algorithms, second edition, T. H. Cormen, C.E. Leiserson, R. L. Rivest, and C.Stein, PHI Pvt. Ltd./ Pearson Education.
3. Algorithm Design: Foundations, Analysis and Internet Examples, M.T.Goodrich and R.Tamassia, John Wiley and sons.

Course Outcomes:

After completion of this course students will be able to:

1. Introduces the notations for analysis of the performance of algorithms,divide-and-conquer and
2. understanding the and the data structure of disjoint sets and backtracking approach
3. understanding the dynamic programming approach
4. understanding the greedy approach,
5. branch and bound methods) and mention problems for which each techniqueis appropriate introduces the problems that are P, NP and NP complete.

CO PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**2**	**2**	**1**		**1**							**1**
CO2	**1**	**2**	**1**		**1**							**1**
CO3	**1**	**2**	**3**		**1**							**1**
CO4	**1**	**2**	**3**		**1**							**1**
CO5	**1**	**2**	**3**		**1**							**1**

(A473302) MACHINE LEARNING

B.Tech. III Year I Sem.

L	T	P	C
3	0	0	3

UNIT - I

Learning – Types of Machine Learning – Supervised Learning – The Brain and theNeuron – Design a Learning System – Perspectives and Issues in Machine Learning – Concept Learning Task – Concept Learning as Search – Finding a Maximally Specific Hypothesis – Version Spaces and the Candidate Elimination Algorithm – Linear Discriminant: – Perceptron – Linear Separability – Linear Regression.

UNIT - II

Multi-layer Perceptron– Going Forwards – Going Backwards: Back Propagation Error – Multi-layer Perceptron in Practice – Examples of using the MLP – Overview – Deriving Back-Propagation – Radial Basis Functions and Splines – Concepts – RBF Network – Curse of Dimensionality – Interpolations and Basis Functions – Support Vector Machines

UNIT - III

Learning with Trees – Decision Trees – Constructing Decision Trees – Classification and Regression Trees – Ensemble Learning – Boosting – Bagging – Different ways to Combine Classifiers – Basic Statistics – Gaussian Mixture Models – Nearest Neighbor Methods – Unsupervised Learning – K means Algorithms

UNIT - IV

Dimensionality Reduction – Linear Discriminant Analysis – Principal Component Analysis – Factor Analysis – Independent Component Analysis – Locally Linear Embedding – Isomap – Least Squares Optimization

Evolutionary Learning – Genetic algorithms – Genetic Offspring: - Genetic Operators – Using Genetic Algorithms

UNIT - V

Reinforcement Learning – Overview – Getting Lost Example Markov Chain MonteCarlo Methods – Sampling – Proposal Distribution – Markov Chain Monte Carlo – Graphical Models – Bayesian Networks – Markov Random Fields – Hidden Markov Models – Tracking Methods

TEXT BOOKS:

1. Stephen Marsland, ―Machine Learning – An Algorithmic Perspective, Second Edition, Chapman and Hall/CRC Machine Learning and Pattern Recognition Series, 2014.

2. Ethem Alpaydin, ―Introduction to Machine Learning 3e (Adaptive Computation and Machine Learning Series), Third Edition, MIT Press, 2011

REFERENCE BOOKS:

1. Tom M Mitchell, ―Machine Learning, First Edition, McGraw Hill Education,2013.
2. Peter Flach, ―Machine Learning: The Art and Science of Algorithms thatMake Sense of Data‖, First Edition, Cambridge University Press, 2012.
3. Jason Bell, ―Machine learning – Hands on for Developers and Technical Professionals‖, First Edition, Wiley, 2014
4. Ethem Alpaydin, ―Introduction to Machine Learning 3e (Adaptive Computation and Machine Learning Series), Third Edition, MIT Press, 2014

Course Outcomes:

After completion of this course students will be able to:

1. Distinguish between, supervised, unsupervised and semi-supervised learning
2. To study the various probability-based learning techniques
3. Understand algorithms for building classifiers applied on datasets of non-linearly separable classes
4. Understand the principles of evolutionary computing algorithms
5. Design an ensembler to increase the classification accuracy

CO PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1	1									1
CO2	3	3	3									1
CO3	3	2	2		1							1
CO4	3	2	2		1							1
CO5	3	1	1		1							1

(A473303) COMPUTER NETWORKS

B.Tech. III Year I Sem. **L T P C**
3 0 0 3

Prerequisites

- A course on "Programming for problem solving"
- A course on "Data Structures"

UNIT - I

Network hardware, Network software, OSI, TCP/IP Reference models, ExampleNetworks: ARPANET, Internet.

Physical Layer: Guided Transmission media: twisted pairs, coaxial cable, fiberoptics, Wireless Transmission.

Data link layer: Design issues, framing, Error detection and correction.

UNIT - II

Elementary data link protocols: simplex protocol, A simplex stop and waitprotocol for an error-free channel, A simplex stop and wait protocol for noisy channel.

Sliding Window protocols: A one-bit sliding window protocol, A protocol usingGo-Back-N, A protocol using Selective Repeat, Example data link protocols.

Medium Access sub-layer: The channel allocation problem, **Multiple accessprotocols:** ALOHA, Carrier sense multiple access protocols, collision free protocols. Wireless LANs, Data link layer switching.

UNIT - III

Network Layer: Design issues, Routing algorithms: shortest path routing, Flooding, Hierarchical routing, Broadcast, Multicast, distance vector routing, Congestion Control Algorithms, Quality of Service, Inter-networking, The Network layer in the internet.

UNIT - IV

Transport Layer: Transport Services, Elements of Transport protocols, Connection management, TCP and UDP protocols.

UNIT - V

Application Layer –Domain name system, SNMP, Electronic Mail; the WorldWEB, HTTP, Streaming audio and video.

TEXT BOOKS:

1. Computer Networks -- Andrew S Tanenbaum, David. j. Wetherall, 5th Edition. Pearson Education/PHI
2. Data Communications and Networking – Behrouz A. Forouzan. Third Edition TMH.

REFERENCE BOOKS:

1. An Engineering Approach to Computer Networks-S. Keshav, 2nd Edition, Pearson Education
2. Data Communications and Networking – Behrouz A. Forouzan. Third Edition TMH.
3. "Computer Networking: Principles, Protocols and Practice" by Olivier Bonaventure

Course Outcomes:

After completion of this course students will be able to:

1. Gain the knowledge of the basic computer network technology.
2. Gain the knowledge of the functions of each layer in the OSI and TCP/IP referencemodel.
3. Obtain the skills of sub-netting and routing mechanisms and Understanding of Network layer
4. Understanding of transport layer
5. Understanding of Application layer

CO PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**1**	**1**	**1**		**1**							**1**
CO2	**2**	**2**	**3**		**1**							**1**
CO3	**1**	**2**	**3**		**1**							**1**
CO4	**1**	**2**	**3**		**1**							**1**
CO5	**1**	**2**	**3**		**1**							**1**

(A473304) DEEP LEARNING

B.Tech. III Year I Sem. **L T P C**
3 0 0 3

UNIT - I

Machine Learning Basics: Learning Algorithms, Capacity, Overfitting and Underfitting, Hyperparameters and Validation Sets, Estimators, Bias and Variance, Maximum Likelihood Estimation, Bayesian Statistics, Supervised Learning Algorithms, Unsupervised Learning Algorithms, Stochastic Gradient Descent, Building a Machine Learning Algorithm, Challenges Motivating Deep Learning

Deep Feedforward Networks: Learning XOR, Gradient-Based Learning, Hidden Units, Architecture Design, Back-Propagation and Other Differentiation Algorithms

UNIT - II

Regularization for Deep Learning: Parameter Norm Penalties, Norm Penalties as Constrained Optimization, Regularization and Under- Constrained Problems, Dataset Augmentation, Noise Robustness, Semi-Supervised Learning, Multi- Task Learning, Early Stopping, Parameter Tying and Parameter Sharing, Sparse Representations, Bagging and Other Ensemble Methods, Dropout, Adversarial Training, Tangent Distance, Tangent Prop, and Manifold Tangent Classifier, Optimization for Training Deep Models, Learning vs Pure Optimization, Challenges in Neural Network Optimization, Basic Algorithms, Parameter Initialization Strategies, Algorithms with Adaptive Learning Rates

UNIT - III

Convolutional Networks: The Convolution Operation, Motivation, Pooling, Convolution and Pooling as an Infinitely Strong Prior, Variants of the Basic Convolution Function, Structured Outputs, Data Types, Efficient Convolution Algorithms, Random or Unsupervised Features

UNIT - IV

Recurrent and Recursive Nets: Unfolding Computational Graphs, Recurrent Neural Networks, Bidirectional RNNs, Encoder-Decoder Sequence-to-Sequence Architectures, Deep Recurrent Networks, Recursive Neural Networks, The Challenge of Long-Term Dependencies, Echo State Networks, Leaky Units and Other Strategies for Multiple Time Scales, The Long Short-Term Memory and Other Gated RNNs, Optimization for Long- Term Dependencies, Explicit Memory

UNIT - V

Practical Methodology: Performance Metrics, Default Baseline Models, Determining Whether to Gather More Data**,** Selecting Hyperparameters, DebuggingStrategies, Example: Multi-Digit Number Recognition

Applications: Large-Scale Deep Learning, Computer Vision, Speech Recognition, Natural Language Processing, Other Applications.

TEXT BOOKS:

1. Deep Learning by Ian Good fellow, Yoshua Bengio and Aaron Courville, MIT Press.
2. Golub, G.,H., and Van Loan, C.,F., Matrix Computations, JHU Press, 2013.

REFERENCE BOOKS:

1. The Elements of Statistical Learning. Hastie, R. Tibshirani, and J. Friedman, Springer.
2. Probabilistic Graphical Models. Koller, and N. Friedman, MIT Press.
3. Bishop. C.M., Pattern Recognition and Machine Learning, Springer, 2006.
4. Yegnanarayana, B., Artificial Neural Networks PHI Learning Pvt. Ltd, 2009.
5. Satish Kumar, Neural Networks: A Classroom Approach, Tata McGraw-Hill Education, 2004.

Course Outcomes:

After completion of this course students will be able to:

1. Understand machine learning basics and neural networks
2. Understand optimal usage of data for training deep models
3. Apply CNN and RNN models for real-world data
4. Evaluate deep models
5. Develop deep models for real-world problems

CO PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1					**1**							**1**
CO2	**1**	**3**	**3**		**1**							**1**
CO3	**1**	**2**	**2**		**1**							**1**
CO4	**1**	**2**	**2**		**1**							**1**
CO5	**1**	**1**	**1**		**1**							**1**

(A473401) GRAPH THEORY

(Professional Elective – I)

B.Tech. III Year I Sem. **L T P C**
3 0 0 3

UNIT - I

Introduction : Discovery of graphs, Definitions, Sub-graphs, Isomorphic graphs, Matrix representations of graphs, Degree of a vertex, Directed walks, paths and cycles, Connectivity in digraphs, Eulerian and Hamilton digraphs, Eulerian digraphs, Hamilton digraphs, Special graphs, Complements, Larger graphs from smaller graphs, Union, Sum, Cartesian Product, Composition, Graphic sequences, Graph theoretic model of the LAN problem, Havel-Hakimi criterion, Realization of a graphic sequence.

UNIT - II

Connected graphs and shortest paths : Walks, trails, paths, cycles, Connected graphs, Distance, Cut-vertices and cut-edges, Blocks, Connectivity, Weighted graphs and shortest paths, Weighted graphs, Dijkstra‟s shortest path algorithm, Floyd-Warshall shortest path algorithm.

UNIT - III

Trees : Definitions and characterizations, Number of trees, Cayley‟s formula, Kircho - matrix-tree theorem, Minimum spanning trees, Kruskal‟s algorithm, Prim‟s algorithm, Special classes of graphs, Bipartite Graphs, Line Graphs, Chordal Graphs, Eulerian Graphs, Fleury‟s algorithm, Chinese Postman problem, Hamilton Graphs, Introduction, Necessary conditions and sufficient conditions.

UNIT - IV

Independent sets coverings and matchings : Introduction, Independent sets and coverings: basic equations, Matchings in bipartite graphs, Hall‟s Theorem, K¨onig‟s Theorem, Perfect matchings in graphs, Greedy and approximation algorithms.

UNIT - V

Vertex Colorings : Basic definitions**,** Cliques and chromatic number, Mycielski‟s theorem, Greedy coloring algorithm, Coloring of chordal graphs, Brooks theorem, Edge Colorings, Introduction and Basics, Gupta-Vizing theorem, Class-1 and Class- 2 graphs, Edge-coloring of bipartite graphs, Class-2 graphs, Hajos union and Class- 2 graphs, A scheduling problem and equitable edge-coloring.

TEXT BOOKS:

1. J. A. Bondy and U. S. R. Murty. Graph Theory, volume 244 of GraduateTexts in Mathematics. Springer, 1st edition, 2008.
2. J. A. Bondy and U. S. R. Murty. Graph Theory with Applications.

REFERENCE BOOKS:

1. Lecture Videos: http://nptel.ac.in/courses/111106050/13
2. Introduction to Graph Theory, Douglas B. West, Pearson.
3. "Graph Theory and Complex Networks: An Introduction" by Maarten van Steen,2010

Course Outcomes:

After completion of this course students will be able to:

1. Know some important classes of graph theoretic problems;
2. Understanding of connected graphs and shortest paths
3. Prove central theorems about trees, matching, connectivity, coloring and planargraphs;
4. Describe and apply some basic algorithms for graphs;
5. Use graph theory as a modeling tool.

CO PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1					1							1
CO2	1	2	3		1							1
CO3	1	2	3		1							1
CO4		2	3		1							1
CO5		2	3		1							1

(A473402) Advanced Python Programming

(Professional Elective – I)

B.Tech. III Year I Sem. **L T P C**
3 0 0 3

UNIT-I

Python Fundamentals: Python Character Set, Python Tokens, Keywords, Identifiers, Literals, Operators Variables and Assignments, Input and Output in Python, Program control flow, functions, modules, packages, class and objects, Object oriented Programming.

File Operations: Text and Bytes files, opening a file, Reading and Writing Files, Other File tools, Ms-Excel,

UNIT-II

Basic numerical processing using Python: Introduction to numpy, Creation of vectors and matrices, Matrix manipulation Indexing and Slicing

Basic data analysis using Python: Introduction to Pandas, Pandas data structures – Series and Data Frame, Data wrangling using pandas, Loading a dataset into a data frame, Selecting Columns from a data frame, Selecting Rows from a data frame, Adding new data in a data frame, Deleting data from a data frame.

UNIT-III

SCIPY: Introduction to SciPy, Create function, modules of SciPy, Introduction to NLTK Library in Python.

MATPLOTLIB: Scatter plot, Bar charts, histogram, Stack charts, Legend title Style, Figures and subplots, Plotting function in pandas, Labeling and arranging figures, Save plots.

UNIT-IV

Database programming using Python: Connecting to a database (mysql) using Python, Sending DML and DDL queries and processing the result from a Python.Introduction to Flask, Basic application structure, templates, webforms.

UNIT-V

GUI programming: Installing PyQT, Introduction, pop-up alert, dialogues: dumb dialogues, standard dialogs, smart dialogs, main window, handling user actions, Using Qt designer, data handling and custom file formats, Layouts and multiple documents, events, clipboard, drag and drop, custom widget, item-based graphics, rich text and printing. Creating an application for concurrency converter.

Web scraping: Installing beautiful soup, running beautiful soup, Scraping Webpages

TEXT BOOKS:

1. Kenneth A. Lambert, The Fundamentals of Python: First Programs,2011, Cengage Learning.
2. Think Python First Edition, by Allen B. Downey, Oriellypublishing
3. Web Scraping with Python by Ryan Mitchell, Published by O'Reilly Media

REFERENCE BOOKS:

1. Introduction to Computation and Programming Using Python. JohnV. Guttag, The MIT Press.
2. James Payne, Beginning Python using Python 2.6 and Python 3,Wrox publishing
3. Paul Gries, Practical Programming: An Introduction to Computer Scienceusing Python 3, The Pragmatic Bookshelf, 2ndedition
4. Flask Web Development by Miguel Grinberg by O Reilly

Course Outcomes:

After completion of this course students will be able to:

1. Know python fundamentals and file operations
2. Understanding of numerical and data analysis
3. Importance of scipy and matplotlib
4. Database access using python
5. Know about GUI programming and web scrapping

CO PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**3**		**1**									**1**
CO2	**1**		**3**									**1**
CO3	**1**	**2**	**3**		**1**							**1**
CO4		**2**	**3**		**1**							
CO5		**2**	**3**		**1**							

(A473403) COMPUTER GRAPHICS

(Professional Elective – I)

B.Tech. III Year I Sem. **L T P C**
3 0 0 3

Prerequisites

1. Programming for problem solving and Data Structures

UNIT - I

Introduction: Application areas of Computer Graphics, overview of graphics systems, video-display devices, raster-scan systems, random-scan systems, graphics monitors and work stations and input devices

Output primitives: Points and lines, line drawing algorithms (DDA and Bresenham's Algorithm) circle- generating algorithms and ellipse - generating algorithms

Polygon Filling: Scan-line algorithm, boundary-fill and flood-fill algorithms

UNIT - II

2-D geometric transformations: Translation, scaling, rotation, reflection and shear transformations, matrix representations and homogeneous coordinates, composite transforms, transformations between coordinate systems

2-D viewing: The viewing pipeline, viewing coordinate reference frame, windowto view-port coordinate transformation, viewing functions, clipping operations,point clipping, Line clipping-Cohen Sutherland algorithms, Polygon clipping- Sutherland Hodgeman polygon clipping algorithm.

UNIT - III

3-D object representation: Polygon surfaces, quadratic surfaces, spline representation, Hermite curve, Bezier curve and B-Spline curves, Bezier and B- Spline surfaces, Polygon rendering methods, color models and color applications.

UNIT - IV

3-D Geometric transformations: Translation, rotation, scaling, reflection and shear transformations, composite transformations.

viewing: Viewing pipeline, viewing coordinates, projections, view volume and general projection transforms and clipping.

UNIT - V

Computer animation: Design of animation sequence, general computer animation functions, raster animations, computer animation languages, key frame systems, motion specifications.

Visible surface detection methods: Classification, back-face detection, depth-buffer method, BSP- tree method and area sub-division method and octree method.

TEXT BOOKS:

1. "Computer Graphics C version", Donald Hearn and M. Pauline Baker, Pearson Education.
2. "Computer Graphics Principles & practice", second edition in C, Foley, Van Dam,Feiner and Hughes, Pearson Education. Computer Graphics, Steven Harrington, TMH

REFERENCE BOOKS:

1. Procedural elements for Computer Graphics, David F Rogers, Tata Mc Graw hill,2nd edition.
2. Principles of Interactive Computer Graphics", Neuman and Sproul, TMH.
3. Principles of Computer Graphics, Shalini Govil, Pai, 2005, Springer.

Course Outcomes:

After completion of this course students will be able to:

1. Provide the basics of graphics systems including Points and lines, line drawing algorithms, 2D,3D objective transformations
2. Explore applications of computer graphics
3. Understand 2D, 3D geometric transformations and clipping algorithms
4. Understand 3D object representations, curves, surfaces, polygon rendering methods, color models
5. Analyze animation sequence and visible surface detection methods

CO PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1			1									
CO2			3									
CO3	1	1	3		1							
CO4	1	1	3		1							
CO5	1	1	3		1							

(A473404) DATA WAREHOUSING AND BUSINESS INTELLIGENCE

(Professional Elective – I)

B.Tech. III Year I Sem. **L T P C**

3 0 0 3

UNIT - I

Data Warehouse, Data Warehouse Modelling, OLAP operations, Data Cube Computationmethods

UNIT - II

Business Intelligence Introduction – Definition, Leveraging Data and Knowledgefor BI, BI Components, BI Dimensions, Information Hierarchy, Business Intelligence and Business Analytics. BI Life Cycle. Data for BI - Data Issues and Data Quality for BI.

UNIT - III

BI Implementation - Key Drivers, Key Performance Indicators and Performance Metrics, BI Architecture/Framework, Best Practices, Business Decision Making, Styles of BI-vent-Driven alerts-A cyclic process of Intelligence Creation. The valueof Business Intelligence-Value driven and Information use.

UNIT - IV

Advanced BI – Big Data and BI, Social Networks, Mobile BI, emerging trends, Description of different BI-Tools (Pentaho, KNIME)

UNIT - V

Business Intelligence and integration implementation-connecting in BI systems- Issues of legality- Privacy and ethics- Social networking and BI.

TEXT BOOKS:

1. Data Mining – Concepts and Techniques - JIAWEI HAN & MICHELINE KAMBER, Elsevier, 4th Edition.
2. Rajiv Sabharwal "Business Intelligence" Wiley Publications, 2012.

REFERENCE BOOKS:

1. Efraim Turban, Ramesh Sharda, Jay Aronson, David King, Decision Support and Business Intelligence Systems, 9th Edition, Pearson Education, 2009.
2. David Loshin, Business Intelligence - The Savy Manager's Guide Getting Onboard withEmerging IT, Morgan Kaufmann Publishers, 2009.
3. Philo Janus, Stacia Misner, Building Integrated Business Intelligence.Solutions with SQLServer, 2008 R2 & Office 2010, TMH, 2011.
4. Business Intelligence Data Mining and Optimization for decision making [Author: Carlo-Verellis] [Publication: (Wiley)]
5. Data Warehousing, Data Mining & OLAP- Alex Berson and Stephen J. Smith- Tata McGraw-Hill Edition, Tenth reprint 2007

Course Outcomes:

After completion of this course students will be able to:

1. Understand architecture of data warehouse and OLAP operations.
2. Understand Fundamental concepts of BI
3. Application of BI Key Performance indicators
4. Understand Utilization of Advanced BI Tools and their Implementation.
5. Implementation of BI Techniques and BI Ethics.

CO-PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**1**											**2**
CO2	**1**	**2**	**1**									**2**
CO3	**1**	**2**	**2**	**1**	**3**							**2**
CO4	**1**	**2**	**2**	**1**	**3**							**2**
CO5	**1**	**1**	**1**		**3**							**2**

(A473501) MACHINE LEARNING LAB

B.Tech. III Year I Sem. **L T P C**
0 0 2 1

List of Experiments

- Write a python program to compute Central Tendency Measures:Mean, Median,Mode Measure of Dispersion: Variance, StandardDeviation
- Study of Python Basic Libraries such as Statistics, Math, Numpy and ScSipy
- Study of Python Libraries for ML application such as Pandas and Matplotlib
- Write a Python program to implement Simple Linear Regression
- Implementation of Multiple Linear Regression for House Price Prediction usingsklearn
- Implementation of Decision tree using sklearn and its parameter tuning
- Implementation of KNN using sklearn
- Implementation of Logistic Regression using sklearn
- Implementation of K-Means Clustering
- Performance analysis of Classification Algorithms on a specific dataset (Mini Project)

TEXT BOOKS:

1. Machine Learning – Tom M. Mitchell, - MGH.
2. "Pattern Recognition and Machine Learning" by Christopher M. Bishop**,** Springer, 2006

REFERENCE BOOKS:

1. Machine Learning: An Algorithmic Perspective, Stephen Marshland, Taylor & Francis.
2. "Machine Learning: A Probabilistic Perspective" by Kevin P. Murphy
3. "Deep Learning" by Ian Goodfellow, Yoshua Bengio, and Aaron Courville

Course Outcomes:

After completion of this course students will be able to:

1. overview of the various machine learning techniques andcan demonstratethem using python.
2. Understand modern notions in predictive data analysis
3. Select data, model selection, model complexity and identify the trends
4. Understand a range of machine learning algorithms along withtheir strengths and weaknesses
5. Build predictive models from data and analyze their performance

CO PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1	1		1							1
CO2	1	2	3		1							1
CO3	1	2	3		1							1
CO4	1	2	3		1							1
CO5	1	2	3		1							1

(A473502) COMPUTER NETWORKS LAB

B.Tech. III Year I Sem. **L T P C**
0 0 2 1

List of Experiments

1. Implement the data link layer framing methods such as character, character-stuffing and bit stuffing.
2. Write a program to compute CRC code for the polynomials CRC-12, CRC-16 andCRC CCIP
3. Develop a simple data link layer that performs the flow control usingthe sliding window protocol, and loss recovery using the Go-Back-N mechanism.
4. Implement Dijsktra's algorithm to compute the shortest path through a network
5. Take an example subnet of hosts and obtain a broadcast tree for the subnet.
6. Implement distance vector routing algorithm for obtaining routing tables at eachnode.
7. Implement data encryption and data decryption
8. Write a program for congestion control using Leaky bucket algorithm.
9. Write a program for frame sorting techniques used in buffers.
10. **Wireshark**
    - I. Packet Capture Using Wire shark
    - II. Starting Wire shark
    - III. Viewing Captured Traffic
    - IV. Analysis and Statistics & Filters.

    How to run Nmap scan

    Operating System Detection using map Do the following using NS2 Simulator
    - I. NS2 Simulator-Introduction
    - II. Simulate to Find the Number of Packets Dropped
    - III. Simulate to Find the Number of Packets Dropped by TCP/UDP
    - IV. Simulate to Find the Number of Packets Dropped due to Congestion
    - V. Simulate to Compare Data Rate & Throughput.
    - VI. Simulate to Plot Congestion for Different Source/Destination
    - VII. Simulate to Determine the Performance with respect to Transmission of Packets

TEXT BOOKS:

1. Computer Networks, Andrew S Tanenbaum, David. j. Wetherall, 5th Edition. Pearson Education/PHI.
2. "Computer Networking: Principles, Protocols and Practice" by Olivier Bonaventure

REFERENCE BOOKS:

1. An Engineering Approach to Computer Networks, S. Keshav, 2nd Edition, Pearson Education.
2. Data Communications and Networking – Behrouz A. Forouzan. 3rd Edition, TMH.
3. "Computer Networking: A Top-Down Approach" by James F. Kurose and Keith W.Ross

Course Outcomes:

Students shall be able to:

1. Implement data link layer farming methods
2. Analyze error detection and error correction codes.
3. Implement and analyze routing and congestion issues in network design.
4. Implement Encoding and Decoding techniques used in presentation layer
5. To be able to work with different network tools

CO PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**1**	**2**	**1**									
CO2	**1**	**2**	**3**									
CO3	**1**	**2**	**3**									
CO4	**1**	**2**	**3**									
CO5	**1**	**2**	**3**									

(A473503) DEEP LEARNING LAB

B. Tech. III Year I Sem

L	T	P	C
0	0	2	1

Week 1: Consider a neural network that takes two inputs, has one hidden layer with two nodes, and an output layer with one node. Let's start by randomly initializing the weights andthe biases in the network. print the weights and biases.

Week 2: Consider the week 1 network and compute the following

- The weighted sum.
- Assuming a sigmoid activation function, let's compute the activation of the first node.
- compute the activation of the second node
- compute the weighted sum of these inputs to the node in the output layer
- compute the output of the network as the activation of the node in the output layer

Week 3: Initialize a network with the following specification

- Takes 5 inputs has three hidden layers
- has 3 nodes in the first layer, 2 nodes in the second layer, and 3 nodes in the thirdlayer
- has 1 node in the output layer Print the network and its nodes

Week 4: Consider the Week 3 network and do the following

- Change the activation of the network from sigmoid to tanh and observe the performance of the network
- Compute the activation of every node in first hidden node
- Compute the activation of every node in second hidden node
- Compute the activation of every node in third hidden node

Week 5: Consider the Week 3 network and do the following

- Change the activation of the network from tanh to relu and observe the performanceof the network
- Compute the activation of every node in first hidden node
- Compute the activation of every node in second hidden node
- Compute the activation of every node in third hidden node

Week 6: Construct convolution neural network and perform the classification using MNISTdataset using K10 cross validation.

Week 7: consider the network and dataset from week 6 visualize the hidden layers features.Compute the confusion matrix.

Week 8: Construct CNN model with 7 layers and compute the performance of the model

using Cats and Dogs dataset with K5 cross validation.

Week 9: Construct Alex Net on MNIST dataset compute the performance evaluation matrices.

Week 10: Construct VGG16 network, transfer the pre trained weights from Imagenet forclassification of the cats and dogs.

Week 11: Construct RNN network for MNIST dataset. Evaluate all performance metrices

Week 12: Construct LSTM network for dogs and cats dataset, Evaluate all performancemetrices.

TEXT BOOKS:

1. Deep Learning by Ian Good fellow, Yoshua Bengio and Aaron Courville, MIT Press.
2. Golub, G.,H., and Van Loan, C.,F., Matrix Computations, JHU Press, 2013.

REFERENCE BOOKS:

1. The Elements of Statistical Learning. Hastie, R. Tibshirani, and J. Friedman, Springer.
2. Probabilistic Graphical Models. Koller, and N. Friedman, MIT Press.
3. Bishop. C.M., Pattern Recognition and Machine Learning, Springer, 2006.
4. Yegnanarayana, B., Artificial Neural Networks PHI Learning Pvt. Ltd, 2009.
5. Satish Kumar, Neural Networks: A Classroom Approach, Tata McGraw-Hill Education, 2004

Course Outcomes:

The student will be able to:

1. Design the Feed Forward Neural and apply back propagation technique.
2. Modify the existing fully connected network with various activation functions.
3. Develop the conventional convolution neural network and visualize the hidden layer weights.
4. Design transfer learning models and transfer the pre-trained weights trained on anothercohort.
5. Develop the RNN and LSTM models for computer vision problems.

CO PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**1**	**2**	**1**		**1**							
CO2	**1**	**2**	**3**		**1**							
CO3	**1**	**2**	**3**		**1**							
CO4	**1**	**2**	**3**		**1**							
CO5	**1**	**2**	**3**		**1**							

(A473504) UI DESIGN-FLUTTER

B.Tech. III Year I Sem

L	T	P	C
0	0	2	1

UNIT - I

Introducing Flutter and Getting Started : Introducing Flutter, Defining Widgets and Elements, Understanding Widget Lifecycle Events, The Stateless Widget Lifecycle, The Stateful Widget Lifecycle, Understanding the Widget Tree and the Element Tree, Stateless Widget and Element Trees, Stateful Widget and Element Trees, Installing the Flutter SDK, Installing on mac OS, System Requirements, Get the Flutter SDK, Check for Dependencies, iOS Setup: Install X-code, Android Setup: Install Android Studio, Set Up the Android Emulator, Installing on Windows, System Requirements, Get the Flutter SDK, Check for Dependencies, Install Android Studio, Set Up the Android Emulator, Installing on Linux, System Requirements, Get the Flutter SDK, Check for Dependencies, Install Android Studio, Set Up the Android Emulator, Configuring the Android Studio Editor.

UNIT - II

Creating a Hello World App : Setting Up the Project, Using Hot Reload, Using Themes to Style Your App, Using a Global App Theme, Using a Theme for Part of an App, Understanding Stateless and Stateful Widgets, Using External Packages, Searching for Packages, Using Packages

UNIT - III

Learning Dart Basics : Use of Dart, Commenting Code, Running the main() Entry Point, Referencing Variables, Declaring Variables, Numbers, Strings, Boolean's, Lists, Maps, Runes, Using Operators, Using Flow Statements, if and else, ternary operator, forLoops, while and do-while, while and break, continue, switch and case, Using Functions, Import Packages, Using Classes, Class Inheritance, Class Mixing, Implementing Asynchronous Programming.

UNIT- IV

Creating a Starter Project Template : Creating and Organizing Folders and Files,Structuring Widgets.

Understanding the Widget Tree : Introduction to Widgets, Building the Full Widget Tree, Building a Shallow Widget Tree, Refactoring witha Constant, Refactoring with aMethod, Refactoring with a Widget Class.

UNIT- V

Using Common Widgets : Using Basic Widgets, Safe Area, Container, Text, RichText, Column, Row, Column and Row Nesting, Buttons, Floating Action Button, Flat

Button, Raised Button, Icon Button, Popup Menu Button, Button Bar, Using Images and Icons, Asset Bundle, Image, Icon, Using Decorators, Using the Form Widget to Validate Text Fields, Checking Orientation. Adding Animation to an App, Using Animated Container, Using Animated Cross Fade, Using Animated Opacity, Using Animation Controller, Using Staggered Animations

TEXT BOOKS:

1. Marco L. Napoli, Beginning Flutter: A Hands-on Guide to App Development, 1st edition, Wroxpublisher.
2. Frank Zammetti, Practical Flutter: Improve your Mobile Development with Google's LatestOpen-Source SDK, 1st edition, Apress

REFERENCE BOOKS:

1. Flutter for Beginners: An introductory guide to building cross-platform mobile applications withFlutter and Dart 2, Packt Publishing Limited.
2. Rap Payne, Beginning App Development with Flutter: Create Cross-Platform Mobile Apps, 1st edition, Apress.
3. Frank Zammetti, Practical Flutter: Improve your Mobile Development with Google's LatestOpen-Source SDK, 1stedition, Apress

Course Objectives:

After completion of this course students will be able to:

1. To learn installation of SDK of Flutter, Xcode and Android Emulator
2. Understanding the Application of Animation to app
3. Learning of Dart basics
4. Understanding Stateless and Stateful Widgets and Widget Tree
5. Understanding of various Widgets

CO PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1	1		1							
CO2	1	2	1		1							
CO3	1	2	1		1							
CO4	1	2	1		1							
CO5	1	2	1		1							

(A400705) INTELLECTUAL PROPERTY RIGHTS

B.Tech. III Year I Sem. **L T P C**
3 0 0 0

UNIT – I

Introduction to Intellectual property: Introduction, types of intellectual property, international organizations, agencies and treaties, importance of intellectual property rights.

UNIT – II

Trade Marks: Purpose and function of trademarks, acquisition of trade mark rights, protect-able matter, selecting, and evaluating trade mark, trade mark registration processes.

UNIT – III

Law of copyrights: Fundamental of copyright law, originality of material, rights of reproduction, rights to perform the work publicly, copyright ownership issues, copyright registration, notice of copyright, International copyright law.

Law of patents: Foundation of patent law, patent searching process, ownership rights and transfer

UNIT – IV

Trade Secrets: Trade secret law, determination of trade secret status, liability for misappropriations oftrade secrets, protection for submission, trade secret litigation. Unfair competition: Misappropriation right of publicity, false advertising.

UNIT – V

New development of intellectual property: new developments in trade mark law; copyright law, patent law, intellectual property audits.

International overview on intellectual property, international – trade mark law, copyright law, international patent law, and international development in trade secrets law.

TEXT BOOKS:

1. Intellectual property right, Deborah. E. Bouchoux, Cengage learning.
2. "Intellectual Property: Valuation, Exploitation, and Infringement Damages" byRussell L. Parr

REFERENCE BOOK:

1. Intellectual property right – Unleashing the knowledge economy, prabuddha ganguli, TataMcGraw Hill Publishing company ltd.
2. "Intellectual Property Law" by Lionel Bently, Brad Sherman
3. "Principles of Intellectual Property Law" by Roger D. Blair, Thomas F.Cotter

Course Outcomes:

After completion of this course students will be able to:

1. Significance of intellectual property and its protection
2. Distinguish and explain various forms of IPRs.
3. Identify criteria to fit one's own intellectual work in particular form of IPRs.
4. Apply statutory provisions to protect particular form of IPRs.
5. Appraise new developments in IPR laws at national and international level.

(A473305) NATURE INSPIRED COMPUTING

B.Tech. III Year II Sem.

L	T	P	C
2	0	0	2

UNIT - I

Evolutionary Computing: Problem Solving as a Search Task, Hill Climbing and Simulated Annealing, Evolutionary Biology, Evolutionary Computing, The Other MainEvolutionary Algorithms, From Evolutionary Biology to Computing, Scope of Evolutionary Computing

UNIT - II

Neurocomputing: The Nervous System, Artificial Neural Networks, Typical ANNS andLearning Algorithms, From Natural to Artificial Neural Networks, Scope of Neurocomputing

UNIT - III

Swarm Intelligence

Ant Colonies, Swarm Robotics, Social Adaptation of Knowledge

UNIT - IV

Immuno computing: The Immune System, Artificial Immune Systems, Bone MarrowModels, Negative Selection Algorithms, Clonal Selection and Affinity Maturation, Artificial Immune Networks, From Natural toArtificial Immune Systems, Scope of Artificial Immune Systems

UNIT - V

Case Studies- Bio-informatics, Information Display

TEXT BOOKS:

1. Leandro Nunes de Castro - " Fundamentals of Natural Computing,Basic Concepts, Algorithms and Applications", Chapman & Hall/ CRC,Taylor and Francis Group, 2007
2. Albert Y.Zomaya - "Handbook of Nature-Inspired and Innovative Computing", Springer, 2006

REFERENCE BOOKS:

1. Floreano, D. and C. Mattiussi -"Bio-Inspired Artificial Intelligence:The oriesethods, andTechnologies" IT Press, 2008
2. Marco Dorrigo, Thomas Stutzle -" Ant Colony Optimization", Prentice Hallof India, New Delhi,2005
3. Vinod Chandra S S, Anand H S - "Machine Learning: A Practitioner's Approach", Prentice Hallof India, New Delhi, 2020

Course Outcomes:

After completion of this course students will be able to:

1. Familiar with Evolutionary Computing algorithms
2. Understand scope of neurocomputing
3. Compare different Ant Colony Optimization algorithmic models.
4. Understand the scope of artificial immune systems
5. Tackle different real world problems

CO PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**1**	**1**	**1**									
CO2	**1**	**2**	**3**									
CO3	**1**	**2**	**3**									
CO4	**1**	**2**	**3**									
CO5	**1**	**2**	**3**									

(A473306) KNOWLEDGE REPRESENTATION AND REASONING

B.Tech. III Year II Sem. **L T P C**
3 0 0 3

UNIT – I

The Key Concepts: Knowledge, Representation, Reasoning, Why knowledge representation and reasoning, Role of logic
Logic: Historical background, Representing knowledge in logic, Varieties of logic, Name, Type, Measures, Unity Amidst diversity

UNIT – II

Ontology: Ontological categories, Philosophical background, Top-level categories, describing physical entities, Defining abstractions, Sets, Collections, Types and Categories, Space and Time

UNIT – III

Knowledge Representations: Knowledge Engineering, Representing structure in frames, Rules and data, Object-oriented systems, Natural language Semantics, Levels of representation

UNIT – IV

Processes: Times, Events and Situations, Classification of processes, Procedures, Processes and Histories, Concurrent processes, Computation, Constraint satisfaction, Change Contexts: Syntax of contexts, Semantics of contexts, First- order reasoning in contexts, Modal reasoning in contexts, Encapsulating objects in contexts.

UNIT – V

Knowledge Soup: Vagueness, Uncertainty, Randomness and Ignorance, Limitations of logic, Fuzzy logic, Nonmonotonic Logic, Theories, Models and the world, Semiotics Knowledge Acquisition and Sharing: Sharing Ontologies, Conceptual schema, accommodating multiple paradigms, Relating different knowledge representations, Language patterns, Tools for knowledge acquisition

TEXT BOOKS:

1. Knowledge Representation logical, Philosophical, and Computational Foundations by John F.Sowa, Thomson Learning.
2. Knowledge Representation and Reasoning by Ronald J. Brachman, Hector J. Levesque,Elsevier.

REFERENCE BOOKS:

1. Artificial Intelligence: A Modern Approach" by Stuart Russell and Peter Norvig
2. Principles of Knowledge Representation and Reasoning" edited by Jon Doyle, Erik Sandewall, and Pietro Torasso
3. Logical Foundations of Artificial Intelligence" by Michael Genesereth andNils Nilsson

Course Outcomes: After completion of this course students will be able to:

1. Analyze and design knowledge-based systems intended for computer implementation.
2. To introduce the study of ontologies as a KR paradigm and applications of ontologies.
3. Acquire theoretical knowledge about principles for logic-based representation and reasoning.
4. Ability to understand knowledge-engineering process
5. Ability to implement production systems, frames, inheritance systemsand approaches to handle uncertain or incomplete knowledge.

CO PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1	1									1
CO2	1	2	3									1
CO3	1	2	3									1
CO4		2	3									1
CO5		2	3									1

(A473307) PRINCIPLES OF DATA ANALYTICS

B.Tech. III Year II Sem. **L T P C**
3 0 0 3

Prerequisites

- A course on "Database Management Systems".
- Knowledge of probability and statistics.

UNIT – I

Data Management: Design Data Architecture and manage the data for analysis, understand various sources of Data like Sensors/Signals/GPS etc. Data Management, Data Quality (noise, outliers, missing values, duplicate data) and DataProcessing & Processing.

UNIT – II

Data Analytics: Introduction to Analytics, Introduction to Tools and Environment, Application of Modeling in Business, Databases & Types of Data and Variables, Data Modeling Techniques, Missing Imputations etc. Need for Business Modeling.

UNIT - III
Regression: Concepts, Blue property assumptions, Least Square Estimation, Variable Rationalization, and Model Building etc.
Logistic Regression: Model Theory, Model fit Statistics, Model Construction, Analytics applications to various Business Domains etc.

UNIT - IV
Object Segmentation: Regression Vs Segmentation – Supervised and Unsupervised Learning, Tree Building – Regression, Classification, Overfitting, Pruning and Complexity, Multiple Decision Trees etc. **Time Series Methods:** Arima, Measures of Forecast Accuracy, STL approach, Extract features from generated model as Height, Average Energy etc. and analyze
for prediction,

UNIT V
Data Visualization: Pixel-Oriented Visualization Techniques, Geometric Projection Visualization Techniques, Icon-Based Visualization Techniques,
Hierarchical Visualization Techniques, VisualizingComplex Data and Relations.

TEXT BOOKS:

1. Student's Handbook for Associate Analytics – II, III.
2. Data Mining Concepts and Techniques, Han, Kamber, 3rd Edition, Morgan Kaufmann Publishers.

REFERENCE BOOKS:

1. Introduction to Data Mining, Tan, Steinbach and Kumar, Addison Wisley, 2006.
2. Data Mining Analysis and Concepts, M. Zaki and W. Meira

3. Mining of Massive Datasets, Jure Leskovec Stanford Univ. Anand Rajaraman Milliway Labs Jeffrey D Ullman Stanford Univ.

Course Outcomes:

After completion of this course students will be able to:

1. Understand the impact of data analytics for business decisions and strategy
2. Carry out data analysis/statistical analysis
3. To carry out standard data visualization and formal inference procedures
4. Design Data Architecture
5. Understand various Data Sources

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**1**											
CO2	**1**	**2**	**1**									
CO3	**1**	**2**	**2**									
CO4	**1**	**2**	**2**									
CO5	**1**	**1**	**1**									

(A473308) NATURAL LANGUAGE PROCESSING

B.Tech. III Year II Sem.

L	T	P	C
3	0	0	3

Prerequisites:

1. Data structures and compiler design

UNIT – I

Finding the Structure of Words: Words and Their Components, Issues and Challenges, Morphological Models
Finding the Structure of Documents: Introduction, Methods, Complexity of the Approaches, Performances of the Approaches, Features

UNIT – II

Syntax I: Parsing Natural Language, Treebanks: A Data-Driven Approach to Syntax, Representation of Syntactic Structure, Parsing Algorithms

UNIT – III

Syntax II: Models for Ambiguity Resolution in Parsing, Multilingual Issues
Semantic Parsing I: Introduction, Semantic Interpretation, System Paradigms, Word Sense

UNIT – IV

Semantic Parsing II: Predicate-Argument Structure, Meaning Representation Systems

UNIT – V

Language Modeling: Introduction, N-Gram Models, Language Model Evaluation, Bayesian parameter estimation, Language Model Adaptation, Language Models- class based, variable length, Bayesian topic based, Multilingual and Cross Lingual Language Modeling

TEXT BOOKS:

1. Multilingual natural Language Processing Applications: From Theory toPractice – Daniel M. Bikel and Imed Zitouni, Pearson Publication.
2. Natural Language Processing with Python: Analyzing Text with the Natural Language Toolkit" by Steven Bird, Ewan Klein, and Edward Loper

REFERENCE BOOK:

1. Speech and Natural Language Processing - Daniel Jurafsky & James H Martin, Pearson Publications.
2. Natural Language Processing and Information Retrieval: Tanvier Siddiqui, U.S. Tiwary.
3. Foundations of Statistical Natural Language Processing" by Christopher D. Manningand Hinrich Schütze

Course Outcomes:

After completion of this course students will be able to:

1. Introduction to some of the problems and solutions of NLP and their relation to linguistics and statistics.
2. Show sensitivity to linguistic phenomena and an ability to model them with formal grammar.
3. Understand and carry out proper experimental methodology for training and evaluating empirical NLP systems
4. Manipulate probabilities, construct statistical models over strings and trees, and estimate parameters using supervised and unsupervised trainingmethods.
5. Design, implement, and analyze NLP algorithms, and design different language modeling Techniques.

CO PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1					**1**							
CO2	**1**	**2**	**3**		**1**							
CO3	**1**	**2**	**3**		**1**							
CO4		**2**	**3**		**1**							
CO5		**2**	**3**		**1**							

(A473405) SOFTWARE TESTING METHODOLOGIES

(Professional Elective – II)

B.Tech. III Year II Sem.

L	T	P	C
3	0	0	3

Prerequisites:

1. Software Engineering

UNIT – I

Introduction: Purpose of testing, Dichotomies, model for testing, consequences of bugs, taxonomy of bugs Flow graphs and Path testing: Basics concepts of path testing, predicates, path predicates and achievable paths, path sensitizing, path instrumentation, application of path testing.

UNIT – II

Transaction Flow Testing: transaction flows, transaction flow testing techniques.Data Flow testing: Basics of data flow testing, strategies in data flow testing, application of data flow testing.
Domain Testing: domains and paths, Nice & ugly domains, domain testing, domains and interfaces testing, domain and interface testing, domains and test-ability.

UNIT – III

Paths, Path products and Regular expressions: path products & path expression,reduction procedure, applications, regular expressions & flow anomaly detection.
Logic Based Testing: overview, decision tables, path expressions, kv charts, specifications.

UNIT - IV
S**tate, State Graphs and Transition testing:** state graphs, good & bad stategraphs, state testing Testability tips.

UNIT – V

Graph Matrices and Application: Motivational overview, matrix of graph, relations, power of a matrix, node reduction algorithm, building tools. (Student should be given an exposure to a tool like JMeter/selenium/SoapUI/Catalon).

TEXT BOOKS:

1. Software Testing techniques - Baris Beizer, Dreamtech, second edition.
2. Software Testing Tools – Dr. K. V. K. K. Prasad, Dreamtech.

REFERENCE BOOKS:

1. The craft of software testing - Brian Marick, Pearson Education.
2. Software Testing Techniques – SPD(Oreille)
3. Software Testing in the Real World – Edward Kit, Pearson.
4. Effective methods of Software Testing, Perry, John Wiley.
5. Art of Software Testing – Meyers, John Wiley.

Course outcome:

After completion of this course students will be able to:

1. Understand purpose of testing and path testing
2. Understand strategies in data flow testing and domain testing
3. Develop logic-based test strategies
4. Understand graph matrices and its applications
5. Implement test cases using any testing automation tool

CO PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**1**	**1**	**2**									
CO2	**1**	**1**	**2**									
CO3	**1**	**1**	**2**		**2**							
CO4	**1**	**1**	**2**		**2**							
CO5	**1**	**1**	**2**		**2**							

(A473406) INFORMATION RETRIEVAL SYSTEMS

(Professional Elective – II)

B.Tech. III Year II Sem.

L	T	P	C
3	0	0	3

Prerequisites:

1. Data Structures

UNIT – I

Introduction to Information Retrieval Systems: Definition of Information Retrieval System, Objectives of Information Retrieval Systems, Functional Overview, Relationship to Database Management Systems, Digital Libraries and Data Warehouses Information Retrieval System Capabilities: Search Capabilities, Browse Capabilities, Miscellaneous Capabilities

UNIT – II

Cataloging and Indexing: History and Objectives of Indexing, Indexing Process, Automatic Indexing, **Information Extraction Data Structure:** Introduction to Data Structure, Stemming Algorithms, Inverted File Structure, N-Gram Data Structures, PAT Data Structure, Signature File Structure, Hypertext and XML Data Structures, Hidden Markov Models.

UNIT – III

Automatic Indexing: Classes of Automatic Indexing, Statistical Indexing, Natural Language, Concept Indexing, Hypertext Linkages
Document and Term Clustering: Introduction to Clustering, Thesaurus Generation, Item Clustering, Hierarchy of Clusters

UNIT-IV

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 to Information Visualization, Cognition and Perception, Information Visualization Technologies

UNIT - V
Text Search Algorithms: Introduction to Text Search Techniques, Software Text SearchAlgorithms, Hardware Text Search Systems
Multimedia Information Retrieval: Spoken Language Audio Retrieval, Non-Speech Audio Retrieval, Graph Retrieval, Imagery Retrieval, Video Retrieval

TEXT BOOKS:

1. Information Storage and Retrieval Systems – Theory and Implementation, Second Edition, Gerald J. Kowalski, Mark T. Maybury, Springer
2. Introduction to Information Retrieval" by Christopher D. Manning, Prabhakar Raghavan, and Hinrich Schütze

REFERENCE BOOKS:

1. Frakes, W.B., Ricardo Baeza-Yates: Information Retrieval Data Structuresand Algorithms, Prentice Hall, 1992.
2. Information Storage & Retrieval by Robert Korfhage – John Wiley & Sons.
3. Modern Information Retrieval by Yates and Neto Pearson Education.

Course outcome:

After completion of this course students will be able to:

1. To learn the concepts and algorithms in Information Retrieval Systems
2. Ability to apply IR principles to locate relevant information large collections of data
3. Ability to design different document clustering algorithms
4. Implement retrieval systems for web search tasks.
5. Design an Information Retrieval System for web search tasks.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2	**1**	**2**	**1**									
CO3	**1**	**2**	**2**		**3**							
CO4	**1**	**2**	**2**		**3**							
CO5	**1**	**1**	**1**		**3**							

(A473407) PATTERN RECOGNITION

(Professional Elective – II)

B.Tech. III Year II Sem. **L T P C**
3 0 0 3

Prerequisites:

- Programming for problem solving
- Computer Oriented Statistical Methods

UNIT – I

Introduction: Pattern Recognition, Data Sets for Pattern Recognition, Different Paradigms for Pattern Recognition. Representation: Data Structures for Pattern Representation, Representation of Clusters, Proximity Measures, Size of Patterns, Abstractions of the Data Set, Feature Extraction, Feature Selection, Evaluation of Classifier, Evaluation of Clustering.

UNIT – II

Nearest Neighbor Based Classifier: Nearest Neighbor Algorithm, Variants of the NN Algorithm, use of the Nearest Neighbor Algorithm for Transaction Databases, Efficient Algorithms, Data Reduction, Prototype Selection. Bayes Classifier: Bayes Theorem, Minimum Error Rate Classifier, Estimation of Probabilities, Comparison with the NNC, Naïve Bayes Classifier, Bayesian Belief Network.

UNIT – III

Hidden Markov Models: Markov Models for Classification, Hidden Morkov Models, Classification using HMMs. Decision Trees: Introduction, Decision Tree for Pattern Classification, Construction of Decision Trees, Splitting at the Nodes, Overfitting and Pruning, Examples of Decision Tree Induction.

UNIT – IV

Support Vector Machines: Introduction, Learning the Linear Discriminant Functions, Neural Networks, SVM for Classification. Combination of Classifiers: Introduction, Methods for Constructing Ensembles of Classifiers, Methods for Combining Classifiers.

UNIT – V

Clustering: Importance of clustering, Hierarchical Algorithms, Partitional Clustering, Clustering Large Data Sets. An Application-Handwritten Digit **Recognition:** Description of the Digit Data, Preprocessing of Data, Classification Algorithms, Selection of Representative Patterns, Results.

TEXT BOOKS:

1. Pattern Recognition: An Algorithmic Approach: Murty, M. Narasimha,Devi, V. Susheela, Pinger Pub, 1st Ed.
2. Pattern Recognition and Machine Learning" by Christopher M. Bishop

REFERENCE BOOKS:

1. Machine Learning - Mc Graw Hill, Tom M. Mitchell.
2. Fundamentals Of Speech Recognition: Lawrence Rabiner and Biing- Hwang Juang. Prentice Hall Pub.
3. Pattern Classification" by Richard O. Duda, Peter E. Hart, and David G. Stork

Course outcome:
After completion of this course students will be able to:

1. Introducing fundamental concepts, theories, and algorithms for pattern recognition and machine learning.
2. Understand the importance of pattern recognition and its representation
3. Analyze the variants of NN algorithm.
4. Understand the necessity of Hidden Markov models, decision tree and SVM for classification
5. Understand different types of clustering algorithms

CO PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												**1**
CO2	**1**	**1**	**2**									**1**
CO3	**1**	**1**	**2**									**1**
CO4	**1**	**1**	**2**						**1**			**1**
CO5	**1**	**1**	**2**						**1**			**1**

(A473408) COMPUTER VISION AND ROBOTICS

(Professional Elective – II)

B.Tech. III Year II Sem.

L	T	P	C
3	0	0	3

Pre-Requisites: Linear Algebra and Probability.

UNIT – I

CAMERAS: Pinhole Cameras

Radiometry – Measuring Light: Light in Space, Light Surfaces, Important Special Cases **Sources, Shadows, And Shading:** Qualitative Radiometry, Sources and Their **Effects, Local Shading Models, Application:** Photometric Stereo, Interreflections: Global Shading Models **Color:** The Physics of Color, Human Color Perception, Representing Color, AModel for Image Color, Surface Color from Image Color.

UNIT – II

Linear Filters: Linear Filters and Convolution, Shift Invariant Linear Systems, Spatial Frequency and Fourier Transforms, Sampling and Aliasing, Filters as Templates

Edge Detection: Noise, Estimating Derivatives, Detecting Edges

Texture: Representing Texture, Analysis (and Synthesis) Using Oriented Pyramids, Application: Synthesis by Sampling Local Models, Shape from Texture.

UNIT – III

The Geometry of Multiple Views: Two Views

Stereopsis: Reconstruction, Human Stereopsis, Binocular Fusion, Using More Cameras

Segmentation by Clustering: Segmentation, Human Vision: Grouping and Gestalt, Applications: Shot Boundary Detection and Background

Subtraction, Image Segmentation by Clustering Pixels, Segmentation by Graph- Theoretic Clustering.

UNIT – IV

Segmentation by Fitting a Model: The Hough Transform, Fitting Lines, Fitting Curves, Fitting as a Probabilistic Inference Problem, Robustness

Geometric Camera Models: Elements of Analytical Euclidean Geometry, Camera Parameters and the Perspective Projection, Affine Cameras and Affine Projection Equations

Geometric Camera Calibration: Least-Squares Parameter Estimation, A Linear Approach to Camera Calibration, Taking Radial Distortion into Account, Analytical Photogrammetry, An Application: Mobile Robot Localization

UNIT – V

Introduction to Robotics: Social Implications of Robotics, Brief history of Robotics, Attributes of hierarchical paradigm, Closed world assumption and frame problem, Representative Architectures, Attributes of Reactive Paradigm, Subsumption Architecture, Potential fields and Perception

Common sensing techniques for Reactive Robots: Logical sensors, BehavioralSensor Fusion, Pro- preceptive sensors, Proximity Sensors, Topological Planning and Metric Path Planning

TEXT BOOKS:

1. David A. Forsyth and Jean Ponce: Computer Vision – A Modern Approach,PHI Learning(Indian Edition), 2009.
2. Robin Murphy, Introduction to AI Robotics, MIT Press

REFERENCE BOOKS:

1. E. R. Davies: Computer and Machine Vision – Theory, Algorithms and Practicalities, Elsevier(Academic Press), 4th edition, 2013.
2. The Robotics premier, Maja J Matari, MIT Press
3. Richard Szeliski "Computer Vision: Algorithms and Applications" Springer-Verlag London Limited 2011.

Course outcome:
After completion of this course students will be able to:

1. Implement fundamental image processing techniques required for computer vision
2. Implement boundary tracking techniques
3. Apply chain codes and other region descriptors, Hough Transform for line,circle, and ellipse detection.
4. Apply 3D vision techniques and Implement motion related techniques.
5. Develop applications using computer vision techniques.

CO PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1					1							
CO2	1	2	3	1	1							
CO3	1	2	3	1	1							
CO4		2	3	1	1							
CO5		2	3	1	1							

(A473505) PRINCIPLES OF DATA ANALYTICS LAB

B.Tech. III Year II Sem.

L	T	P	C
0	0	3	1.5

List of Experiments:

- Data Preprocessing
  - Handling missing values
  - Noise detection removal
  - Identifying data redundancy and elimination
- Implement any one imputation model
- Implement Linear Regression
- Implement Logistic Regression
- Implement Decision Tree Induction for classification
- Implement Random Forest Classifier
- Implement ARIMA on Time Series data
- Object segmentation using hierarchical based methods
- Perform Visualization techniques (types of maps - Bar, Colum, Line, Scatter, 3DCubes etc)
- Perform Descriptive analytics on healthcare data
- Perform Predictive analytics on Product Sales data
- Apply Predictive analytics for Weather forecasting.

TEXT BOOKS:

1. Student's Handbook for Associate Analytics – II, III.
2. Data Mining Concepts and Techniques, Han, Kamber, 3rd Edition,
   Morgan Kaufmann Publishers.

REFERENCE BOOKS:

1. Introduction to Data Mining, Tan, Steinbach and Kumar, Addison Wesley, 2006.
2. Data Mining Analysis and Concepts, M. Zaki and W. Meira
3. Mining of Massive Datasets, Jure Leskovec Stanford Univ. Anand
   Rajaraman Milliway Labs Jeffrey D Ullman Stanford Univ.

Course outcome:
After completion of this course students will be able to:

1. To explore the fundamental concepts of data analytics and methods of statistical analysis
2. Understand linear regression and logistic regression
3. Understand the functionality of different classifiers
4. Implement visualization techniques using different graphs
5. Apply descriptive and predictive analytics for different types of data

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**1**											
CO2	**1**	**2**	**1**									
CO3	**1**	**2**	**2**									
CO4	**1**	**2**	**2**									
CO5	**1**	**1**	**1**									

(A473506) NATURAL LANGUAGE PROCESSING LAB

B.Tech. III Year II Sem.

L	T	P	C
0	0	3	1.5

Prerequisites:

1. Data structures, finite automata and probability theory.

List of Experiments

- Write a Python Program to perform following tasks on text
  - Tokenization b) Stop word Removal
- Write a Python program to implement Porter stemmer algorithm for stemming
- Write Python Program for a) Word Analysis b) Word Generation
- Create a Sample list for at least 5 words with ambiguous sense and Write aPython program to implement WSD
- Install NLTK tool kit and perform stemming
- Create Sample list of at least 10 words POS tagging and find the POS for any givenword
- Write a Python program to
  - Perform Morphological Analysis using NLTK library
  - Generate n-grams using NLTK N-Grams library
  - Implement N-Grams Smoothing
- Using NLTK package to convert audio file to text and text file to audio files.

TEXT BOOKS:

1. Multilingual natural Language Processing Applications: From Theory to Practice – Daniel M.Bikel and Imed Zitouni, Pearson Publication.
2. Oreilly Practical natural Language Processing, A Comprehensive Guide to Building Real World NLP Systems.

REFERENCE BOOKS:

1. Steven Bird, Ewan Klein and Edward Loper, ―Natural Language Processing with Python, First Edition, O'Reilly Media, 2009.
2. Daniel Jura sky, James H. Martin―Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech, Pearson Publication, 2014.
3. Practical natural Language Processing, A Comprehensive Guide to BuildingReal World NLP Systems.

Course outcome:
After completion of this course students will be able to:

1. To Develop and explore the problems and solutions of NLP
2. Show sensitivity to linguistic phenomena and an ability to model them with formal grammar.
3. Knowledge on NLTK Library implementation
4. Work on strings and trees and estimate parameters using supervised methods.
5. Work on strings and trees and estimate parameters using unsupervised training methods.

CO PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1					1							1
CO2	1	2	3		1							1
CO3	1	2	3		1							1
CO4	1	2	3		1							1
CO5	1	2	3		1							1

(A400504) ADVANCED ENGLISH COMMUNICATION SKILLS LAB

B.Tech. III Year II Sem.

L	T	P	C
0	0	2	1

INTRODUCTION: The introduction of the Advanced Communication Skills Lab is considered essential at 3rd year level. At this stage, the students need to prepare themselves for their careers which may require them to listen to, read, speak and write in English both fortheir professional and interpersonal communication in the globalized context.

The proposed course should be a laboratory course to enable students to use 'good'English and perform the following:

- Gathering ideas and information to organize ideas relevantly and coherently.
- Engaging in debates.
- Participating in group discussions.
- Facing interviews.
- Writing project/research reports/technical reports.
- Making oral presentations.
- Writing formal letters.
- Transferring information from non-verbal to verbal texts and vice-versa.
- Taking part in social and professional communication.

OBJECTIVES: This Lab focuses on using multi-media instruction for language development to meet the following targets:

- To improve the students' fluency in English, through a well-developed vocabulary and enable them to listen to English spoken at normal conversational speed by educated English speakers and respond appropriatelyin different socio-cultural and professional contexts.
- Further, they would be required to communicate their ideas relevantly and coherently in writing.
- To prepare all the students for their placements.

SYLLABUS:

The following course content to conduct the activities is prescribed for the Advanced English Communication Skills (AECS) Lab:

Activities on Fundamentals of Inter-personal Communication and Building Vocabulary

- Starting a conversation – responding appropriately and relevantly
  - using the right body language
  - Role Play in different situations & Discourse Skills- using visuals - Synonyms and antonyms, word roots, one-word substitutes, prefixes and suffixes, study of word origin, business vocabulary, analogy, idioms and phrases, collocations & usage of vocabulary.

- **Activities on Reading Comprehension** –General Vs Local comprehension, reading for facts, guessing meanings from context, scanning, skimming, inferring meaning, critical reading& effective googling.
- **Activities on Writing Skills** – Structure and presentation of different types of writing – *letter writing/Resume writing/ e-correspondence/Technical report writing/* – planning for writing – improving one's writing.
- **Activities on Presentation Skills** – Oral presentations (individual and group) through JAM sessions/seminars/**PPTs** and written presentations through posters/projects/reports/ e-mails/assignments etc.
- **Activities on Group Discussion and Interview Skills** – Dynamics of group discussion, intervention, summarizing, modulation of voice, body language, relevance, fluency and organization of ideas and rubrics for evaluation- Concept and process, pre-interview planning, opening strategies, answering strategies, interview through tele-conference & video- conference and MockInterviews.

MINIMUM REQUIREMENT: The Advanced English Communication Skills (AECS) Laboratory shall have the following infrastructural facilities to accommodate at least 35 students in the lab:

- Spacious room with appropriate acoustics.
- Round Tables with movable chairs
- Audio-visual aids
- LCD Projector
- Public Address system
- P – IV Processor, Hard Disk – 80 GB, RAM–512 MB Minimum, Speed – 2.8 GHZ
- T. V, a digital stereo & Camcorder
- Headphones of High quality

SUGGESTED SOFTWARE: The software consisting of the prescribed topics elaboratedabove should be procured and used.

- Oxford Advanced Learner's Compass, 7th Edition.
- DELTA's key to the Next Generation TOEFL Test: Advanced Skill Practice.
- Lingua TOEFL CBT Insider, by Dream tech
- TOEFL & GRE (KAPLAN, AARCO & BARRONS, USA, Cracking GRE by CLIFFS)

TEXT BOOKS:

1. Effective Technical Communication by M Asharaf Rizvi. McGraw Hill Education (India) Pvt. Ltd.2nd Edition
2. Academic Writing: A Handbook for International Students by Stephen Bailey, Routledge, 5th Edition.

REFERENCE BOOKS:

1. Learn Correct English – A Book of Grammar, Usage and Composition by Shiv K. Kumar and Hemalatha Nagarajan. Pearson 2007
2. Professional Communication by Aruna Koneru, McGraw Hill Education (India) Pvt.Ltd, 2016.
3. Technical Communication by Meenakshi Raman & Sangeeta Sharma, Oxford University Press2009.
4. Technical Communication by Paul V. Anderson. 2007. Cengage Learning pvt. Ltd.New Delhi.
5. English Vocabulary in Use series, Cambridge University Press 2008.

CO PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1									**2**	**3**		
CO2										**2**	**2**	
CO3										**2**		
CO4										**3**		**2**
CO5										**2**		**3**

(A473409) DATA MINING

(Professional Elective–III)

B. Tech. IV Year I Sem.

L	T	P	C
3	0	0	3

UNIT-I

Introduction to Data Mining:
What Data mining? Kinds of Data, Knowledge Discovery process, Data Mining Functionalities, Kinds of Patterns, Major Issues in Data Mining, Data Objects and Attribute Types, Basic Statistical Descriptions of Data, Data Visualization, Measuring Data Similarity and Dissimilarity, Data Pre-processing**:** Major Tasks in Data Pre-processing, Data Cleaning, Data Integration, Data Reduction, Data Transformation and Data Discretization.

UNIT-II
Tree
Association Analysis: Basic Concepts, Market Basket Analysis, Apriori Algorithm, FP-growth, From Association Analysis to Correlation Analysis, Pattern Mining in Multilevel Associations and Multidimensional Associations.

UNIT-III

Classification: Basic Concepts, Decision Induction, Bayes Classification Methods, Rule-Based Classification, Metrics for Evaluating Classifier Performance, Ensemble Methods, Multilayer Feed-Forward Neural Network, Support Vector Machines, k-Nearest- Neighbor Classifiers.

UNIT-IV

Cluster Analysis: Requirements for Cluster Analysis, Overview of Basic Clustering Methods, Partitioning Methods-k-Means, k-Medoids, Hierarchical Methods-AGENES, DIANA, BIRCH, Density-Based Method- DBSCAN, Outlier Analysis: Types of Outliers, Challenges of Outlier Detection, and Overview of Outlier Detection Methods.

UNIT-V

Advanced Concepts: Web Mining- Web Content Mining, Web Structure Mining, Web Usage Mining, Spatial Mining-Spatial Data Overview, Spatial Data Mining Primitives, Spatial Rules, Spatial Classification Algorithm, Spatial Clustering Algorithms, Temporal Mining- Modeling Temporal Events, Time Series, Pattern Detection, Sequences, Temporal Association Rules.

TEXT BOOKS:

1. Jiawei Han, Micheline Kamber, Jian Pei., Data Mining: Concepts and Techniques, 3rd Edition, Morgan Kaufmann/Elsevier,2012.
2. MargaretHDunham,Data Mining Introductory and Advanced Topics, 2nd Edition, Pearson Education,India,2006.

REFERENCE BOOKS:

1. Data Mining Techniques, ArunKPujari,3rdEdition, Universities Press.
2. Pang NingTan, Michael Steinbach, Anuj Karpatne and Vipin Kumar, Introduction toDataMining,2ndEdition,Pearson EducationIndia,2021.
3. Amitesh Sinha, Data Warehousing, Thomson Learning, India,2007.

Course outcome:

After completion of this course students will be able to:

1. Understand the need of data mining and pre-processing techniques.
2. Perform market basket analysis using association rule mining.
3. Utilize classification techniques for analysis and interpretation of data.
4. Identify appropriate clustering and outlier detection techniques to handle complex data.
5. Understand the mining of data from web, text and time series data.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**1**											
CO2	**1**	**2**	**1**									
CO3	**1**	**2**	**2**	**1**	**3**							
CO4	**1**	**2**	**2**	**1**	**3**							
CO5	**1**	**1**	**1**		**3**							

(A473410) SCRIPTING LANGUAGES

(Professional Elective–III)

B.Tech. IV Year I Sem.

L	T	P	C
3	0	0	3

UNIT-I

Introduction: Ruby, Rails, The structure and Execution of Ruby Programs, Package Management with RUBYGEMS, Ruby and web: Writing CGI scripts, cookies, Choice of Web Servers, SOAP and web services RubyTk – SimpleTk Application, widgets, Binding events, Canvas, scrolling.

UNIT-II

Extending Ruby: Ruby Objects in C, the Jukebox extension, Memory allocation, Ruby Type System, Embedding Ruby to Other Languages, Embedding a Ruby Interpreter.

UNIT-III

Introduction to PERL and Scripting

Scripts and Programs, Origin of Scripting, Scripting Today, Characteristics of Scripting Languages, Uses for Scripting Languages, Web Scripting, and the universe of Scripting Languages, PERL-Names and Values, Variables, scalar
Expressions ,Control Structures ,arrays, list, hashes, strings, pattern and regular expressions, subroutines.

UNIT-IV

Advanced PERL

Finer points of looping, pack and unpack, file system, eval, data structures, packages, modules, objects, interfacing to the operating system, Creating Internetware applications, Dirty Hands Internet Programming, security Issues.

UNIT-V

TCL

TCLStructure,syntax,VariablesandDatainTCL,ControlFlow,DataStructures,input/output,procedures, strings, patterns, files, Advance TCL- eval, source, exec and up level commands, Namespaces, trapping errors, event driven programs, making applications internet aware, Nuts and Bolts Internet Programming, Security Issues, Interface.

Tk

Tk-Visual Tool Kits, Fundamental Concepts of Tk,Tk by example, Events and Binding, Perl-Tk.

TEXT BOOKS:

1. The World of Scripting Languages, David Barron, Wiley Publications.
2. Ruby Programming language by David Flanagan and Yukihiro Matsumo to O'Reilly
3. "Programming Ruby" The Pragmatic Programmer's guide by Dabve Thomas Second edition

REFERENCE BOOKS:

1. Open Source Web Development with LAMP using Linux Apache, MySQL, Perland PHP, J.Leeand B.Ware(Addison Wesley) Pearson Education.
2. Perl by Example, E.Quigley, Pearson Education.
3. Programming Perl, LarryWall,T.Christian sen and J.Orwant, O'Reilly,SPD.
4. Tcl and the Tk Toolkit, Ousterhout, Pearson Education.
5. PerlPower, J.P.Flynt, Cengage Learning.

Course outcome:
After completion of this course students will be able to:

1. Gain knowledge of the strengths and weakness of Ruby; and select an appropriate languagefor solving a given problem.
2. Understanding advance concepts of ruby.
3. Gain knowledge of the strengths and weakness of Perl and select an appropriate languagefor solving a given problem.
4. Understanding advance concepts of ruby
5. Gain knowledge of the strengths and weakness of Perl, TCL and Ruby; and select anappropriate language for solving a given problem.

CO PO MAPPING:

After completion of this course students will be able to:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**3**	**2**			**1**							
CO2	**1**	**2**			**1**							
CO3	**1**	**2**			**1**							
CO4		**2**			**1**							
CO5		**2**			**1**							

(A473411) MOBILE APPLICATION DEVELOPMENT

(Professional Elective–III)

B.Tech. IV Year I Sem. **L T P C**
3 0 0 3

UNIT-I

Introduction to Android Operating System: Android OS design and Features – Android development framework, SDK features, Installing and running applications on Android Studio, Creating AVDs, Types of Android applications, Best practices in Android programming, Android tools Android application components – Android Manifest file, Externalizing resources like values, themes, layouts, Menus etc, Resources for different devices and languages, Runtime Configuration Changes
Android Application Lifecycle– Activities, Activity life cycle, activity states, monitoring state changes.

UNIT-II

Android User Interface: Measurements – Device and pixel density independent measuring units Layouts– Linear, Relative, Grid and Table Layouts
User Interface (UI) Components –Editable and non-editable Text Views, Buttons, Radio and Toggle Buttons, Check boxes, Spinners, Dialog and pickers
Event Handling– Handling clicks or changes of various UI components
Fragments– Creating fragments, Life cycle of fragments, fragment states, Adding fragments to Activity, adding, removing and replacing fragments with fragment transactions, interfacing between fragments and Activities, Multi-screen Activities.

UNIT-III

Intents and Broadcasts: Intent – Using intents to launch Activities, Explicitly starting new Activity, Implicit Intents, Passing data to Intents, Getting results from Activities, Native Actions, using Intent to dial a number or to send SMS
Broadcast Receivers–Using Intent filters to service implicit Intents, Resolving Intent filters, finding and using Intents received within an Activity Notifications–Creating and Displaying notifications, Displaying Toasts.

UNIT-IV

Persistent Storage: Files – Using application specific folders and files, creating files, reading data from files, listing contents of a directory Shared Preferences – Creating shared preferences, saving and retrieving data using Shared Preference

UNIT-V

Database– Introduction to SQLite database, creating and opening a database, creating tables, inserting, retrieving and etindelg data, Registering Content Providers, Using content Providers (insert, delete, retrieve and update)

TEXT BOOKS:

1. Professional Android4 Application Development, Reto Meier, Wiley India, (Wrox),2012.
2. Android Application Development for Java Programmers, James C Sheusi, Cengage Learning, 2013.

REFERENCE BOOKS:

1. Beginning Android4 Application Development, Wei-MengLee, Wiley India (Wrox),2013.
2. Professional Mobile Application Development, Jeff McWherter, Scott Gowell, David Smith, John Wille &sons, Inc,2012

Course Outcomes:

After completion of this course students will be able to:

1. To demonstrate their understanding of the fundamentals of Android operating systems.
2. To improves their skills of using Android software development tools.
3. To demonstrate their ability to develop software with reasonable complexity on mobile platform.
4. To demonstrate their ability to deploy software to mobile devices
5. To demonstrate their ability to debug programs running on mobile devices.

CO PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**1**	**1**	**2**									
CO2	**1**	**1**	**2**									
CO3	**1**	**1**	**2**		**1**							
CO4	**1**	**1**	**2**		**1**							
CO5	**1**	**1**	**2**		**1**							

(A473412) CRYPTOGRAPHY AND NETWORK SECURITY

(Professional Elective–III)

B.Tech IV Year I Semester

L	T	P	C
3	0	0	3

UNIT - I

Security Concepts: Introduction, The need for security, Security approaches, Principles of security, Types of Security attacks, Security services, Security Mechanisms, A model for Network Security Cryptography Concepts and Techniques: Introduction, plain text and cipher text, substitution techniques, transposition techniques, encryption and decryption, symmetric and asymmetric key cryptography, steganography, key range and key size, possible types of attacks.

UNIT - II

Symmetric key Ciphers: Block Cipher principles, DES, AES, Blowfish, RC5, IDEA, Block cipher operation, Stream ciphers, RC4.
Asymmetric key Ciphers: Principles of public key cryptosystems, RSA algorithm, Elgamal Cryptography, Diffie-Hellman Key Exchange, Knapsack Algorithm.

UNIT - III

Cryptographic Hash Functions: Message Authentication, Secure Hash Algorithm (SHA-512), Message authentication codes: Authentication requirements, HMAC, CMAC, Digital signatures, Elgamal Digital Signature Scheme.
Key Management and Distribution: Symmetric Key Distribution Using Symmetric & Asymmetric Encryption, Distribution of Public Keys, Kerberos, X.509 Authentication Service, Public – Key Infrastructure

UNIT - IV

Transport-level Security: Web security considerations, Secure Socket Layer and Transport Layer Security, HTTPS, Secure Shell (SSH)
Wireless Network Security: Wireless Security, Mobile Device Security, IEEE 802.11 Wireless LAN, IEEE 802.11i Wireless LAN Security

UNIT - V

E-Mail Security: Pretty Good Privacy, S/MIME IP Security: IP Security overview, IP Security architecture, Authentication Header, Encapsulating security payload, combining security associations, Internet Key Exchange

Case Studies on Cryptography and security: Secure Multiparty Calculation, Virtual Elections, Single sign On, Secure Inter-branch Payment Transactions, Cross site Scripting Vulnerability.

TEXT BOOKS:

1. Cryptography and Network Security - Principles and Practice: William Stallings, Pearson Education,6th Edition
2. Cryptography and Network Security: Atul Kahate, Mc Graw Hill, 3rd Edition
3. Cryptography and Network Security: C K Shyamala, N Harini, Dr T R Padmanabhan, Wiley India, 1stEdition.

REFERENCE BOOKS:

Cryptography and Network Security: Forouzan Mukhopadhyay, Mc Graw Hill, 3rd Edition

1. Information Security, Principles, and Practice: Mark Stamp, Wiley India.
2. Principles of Computer Security: WM. Arthur Conklin, Greg White, TMH
3. Introduction to Network Security: Neal Krawetz, CENGAGE Learning
4. Network Security and Cryptography: Bernard Menezes, CENGAGE Learning

Course Outcomes:

After completion of this course students will be able to:

1. Students will be able to understand basic cryptographic algorithms,
2. Message and web authenticationand security issues.
3. Ability to identify information system requirements for both of them such as client and server.
4. Ability to understand the current legal issues towards information security.
5. Know the security concepts related to email and web

CO PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**3**	**2**										**1**
CO2	**1**	**2**	**3**									**1**
CO3	**1**	**2**	**3**						**1**			**1**
CO4		**2**	**3**						**1**			**1**
CO5		**2**	**3**						**1**			**1**

(A473413) QUANTUM COMPUTING

(Professional Elective–IV)

B.Tech. IV Year I Sem. **L T P C**
3 0 0 3

UNIT-I

History of Quantum Computing: Importance of Mathematics, Physics and Biology. Introduction to Quantum Computing: Bits Vs Qubits, Classical Vs Quantum logical operations

UNIT-II

Background Mathematics: Basics of Linear Algebra, Hilbert space, Probabilities and measurements. Background Physics: Paul's exclusion Principle, Superposition, Entanglement and super-symmetry, density operators and correlation, basics of quantum mechanics, Measurements in bases other than computational basis. Background Biology: Basic concepts of Genomics and Proteomics (Central Dogma)

UNIT-III

Qubit: Physical implementations of Qubit. Qubit as a quantum unit of information. The Bloch sphere Quantum Circuits: singlequ bit gates, multiple qubit gates, designing the quantum circuits. Bell states.

UNIT-IV

Quantum Algorithms: Classical computation on quantum computers. Relationship between quantum and classical complexity classes. Deutsch's algorithm, Deutsch's-Jozsa algorithm, Shor's factorization algorithm, Grover's search algorithm.

UNIT-V

Noise and error correction: Graph states and codes, Quantum error correction, fault-tolerant computation. Quantum Information and Cryptography: Comparison between classical and quantum information theory. Quantum Cryptography, Quantum teleportation

TEXT BOOKS:

1. Nielsen M.A., Quantum Computation and Quantum Information, Cambridge.
2. Quantum Computing for Computer Scientists by Noson S.Yanofsky and MircoA.Mannucci

REFERENCE BOOKS:

1. Benenti G.Casati G.and Strini G., Principles of Quantum Computation and Information, Vol.I:Basic Concepts, VolII.
2. Basic Tools and Special Topics, World Scientific. Pittenger A. O., An Introduction to QuantumComputing Algorithms.
3. Quantum Computing ,A Gentle Introduction , by Eleanor G. Rieffel, Wolfgang H. Polak · 2014

Course Outcomes:

After completion of this course students will be able to:

1. Understand basics of quantum computing.
2. The problem-solving approach using finite dimensional mathematics
3. Understand physical implementation of Qubit.
4. Understand Quantum algorithms and their implementation
5. Understand The Impact of Quantum Computing on Cryptography.

CO PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2	**1**	**1**	**2**									
CO3	**1**	**1**	**2**									
CO4	**1**	**1**	**2**						**1**			
CO5	**1**	**1**	**2**						**1**			

(A473414) EXPERT SYSTEMS

(Professional Elective–IV)

B.Tech. IV Year I Sem. **L T P C**
3 0 0 3

UNIT-I

Introduction to AI programming languages, Blind search strategies, Breadth-first – Depth-first –Heuristic search techniques Hill Climbing – Best first – A Algorithms AO* algorithm – game trees, Min-max algorithms, game playing–Alpha-beta pruning.

UNIT-II

Knowledge representation issues predicate logic – logic programming Semantic nets-frames and inheritance,constraint propagation; Representing Knowledge using rules, Rules-based deduction systems.

UNIT-III

Introduction to Expert Systems: Architecture of expert systems, Representation and organization of knowledge, Basics characteristics and types of problems handled by expert systems.

UNIT-IV

Expert System Tools: Techniques of knowledge representations in expert systems, knowledge engineering, system-building aids, support facilities, stages in the development of expert systems.

UNIT-V

Building an Expert System: Expert system development, Selection of the tool, Acquiring Knowledge, Building process.

Problems with Expert Systems: Difficulties, common pitfalls in planning, dealing with domain experts, difficulties during development.

TEXTBOOKS:

1. Elain Richand Kevin Knight, “Artificial Intelligence”,Tata McGraw-Hill, New Delhi.
2. Waterman D.A.,“A Guide to Expert Systems”, Addison Wesley Longman.
3. Stuart Russel and other PeterNorvig,“ArtificialIntelligence–AModernApproach”,Prentice-Hall,

REFERENCEBOOKS:

1. Patrick Henry Winston, “Artificial Intelligence”, Addison Wesley,
2. Patterson, Artificial Intelligence& Expert System, PrenticeHallIndia,1999.
3. Hayes-Roth, Lenat, and Waterman: Building Expert Systems, Addison Wesley,
4. Weiss S.M. and KulikowskiC.A., “A Practical Guide to Designing Expert Systems”, Rowman &Allanheld, New Jersey.

Course Outcomes:

After completion of this course students will be able to:

1. Apply the basic techniques of artificial intelligence.
2. Understand the non-monotonic reasoning and statistical reasoning.
3. Discuss the architecture of an expert system and its tools.
4. Understand the importance of building an expert system
5. Understand various problems with an expert system

CO PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2	**1**	**2**										
CO3	**1**	**2**	**3**	**1**	**1**							
CO4		**2**	**3**	**1**	**1**							
CO5		**2**	**3**	**1**	**1**							

(A473415) SEMANTIC WEB

(Professional Elective–IV)

B.Tech. IV Year I Sem. **L T P C**
3 0 0 3

UNIT-I

Introduction: Introduction to Semantic Web, the Business Case for the Semantic Web, XML and Its Impact onthe Enterprise.

UNIT-II

Web Services: Uses, Basics of Web Services, SOAP, UDDI, Orchestrating Web Services, Securing Web Services, Grid Enabled and Semantic Web of Web Services.

UNIT-III

Resource Description Framework: Features, Capturing Knowledge with RDF.

XML Technologies: XPath, The Style Sheet Family: XSL, XSLT, and XSL FO, XQuery, XLink, XPointer, XInclude, XML Base, X HTML, XForms, SVG.

UNIT-IV

Taxonomies and Ontologies: Overview of Taxonomies, Defining the Ontology Spectrum, Topic Maps, Overview of Ontologies, Syntax, Structure, Semantics and Pragmatics, Expressing Ontologies Logically, Knowledge Representation.

UNIT-V

Semantic Web Application: Semantic Web Services, e-Learning, Semantic Bioinformatics, Enterprise Application Integration, Knowledge Base.

Semantic Search Technology: Search Engines, Semantic Search, Semantic Search Technology, Web Search Agents, Semantic Methods, Latent Semantic Index Search, TAP, Swoogle

TEXT BOOKS:

1. The Semantic Web: A Guide to the Future of XML, Web Services and Knowledge Management byMichael C.Daconta, Leo J.Obrst, KevinT.Smith, Wiley Publishing, Inc.
2. PeterMika, Social Networks and the Semantic Web, Springer
3. The Semantic Web:A Guide to the Future of XML, Web Services, and Knowledge Managementby Michael C.Daconta, LeoJ.Obrst, KevinT.Smith,Wiley Publishing, Inc.

REFERENCE BOOKS:

1. Thinking on the Web-BernersLee, Godel and Turing, Wiley Interscience
2. Semantic Web Technologies, Trends and Research in Ontology Based Systems, J.Davies, R.Studer, P.Warren, John Wiley& Sons.
3. Semantic Web and Semantic Web Services-LiyangLu Chapman and Hall/CRC Publishers, (Taylor & Francis Group)
4. Information Sharing on the semantic Web-Heiner Stuckenschmidt; Frank VanHarmelen, Springer Publications.
5. Programming the Semantic Web,T.Segaran, C.Evans, J.Taylor, O'Reilly,SPD.

Course Outcomes:

After completion of this course students will be able to:

1. Understand the characteristics of these mantic web technology
2. Understand the concepts of Web Science, semantics of knowledge resource and ontology
3. Describe logic semantics and inference with OWL.
4. Use ontology engineering approaches in semantic applications.
5. Learn about web graph processing for various applications such as search engine, communitydetection.

CO PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1					1							
CO2	1	2	3		1							
CO3	1	2	3		1							
CO4		2	3		1							
CO5		2	3		1							

(A473416) MOBILE COMPUTING

(Professional Elective–IV)

B.Tech. IV Year I Sem.

L	T	P	C
3	0	0	3

UNIT-I

Introduction

Mobile Communications, Mobile Computing– Paradigm, Promises/ Novel Applications and Impediments and Architecture; Mobile and Handheld Devices, Limitations of Mobile and Handheld Devices.

GSM – Services, System Architecture, Radio Interfaces, Protocols, Localization, Calling, Hand over, Security, New Data Services, GPRS, CSHSD, DECT.

UNIT-II

(Wireless)Medium Access Control (MAC)

Motivation for a specialized MAC (Hidden and exposed terminals, Near and far terminals), SDMA, FDMA,TDMA, CDMA, Wireless LAN/(IEEE802.11)

Mobile Network Layer

IP and Mobile IP Network Layers, Packet Delivery and Handover Management, Location Management,Registration, Tunneling and Encapsulation, Route Optimization, DHCP.

UNIT-III

Mobile Transport Layer

Conventional TCP/IP Protocols, Indirect TCP, Snooping TCP, Mobile TCP, Other Transport Layer Protocolsfor Mobile Networks.

Database Issues

Database Hoarding & Caching Techniques, Client-Server Computing & Adaptation, Transactional Models,Query processing, Data Recovery Process & QoS Issues.

UNIT-IV

Data Dissemination and Synchronization

Communications Asymmetry, Classification of Data Delivery Mechanisms, Data Dissemination, BroadcastModels, Selective Tuning and Indexing Methods, Data Synchronization – Introduction, Software and Protocols

UNIT-V

Mobile Adhoc Networks (MANETs)

Introduction, Applications & Challenges of a MANET, Routing, Classification of Routing Algorithms, Algorithms such asDSR, AODV, DSDV, Mobile Agents, Service Discovery.

TEXT BOOKS:

- Jochen Schiller, "Mobile Communications", Addison-Wesley, Second Edition,2009.
- RajKamal, "Mobile Computing", Oxford University Press,2007,ISBN:0195686772.

REFERENCE BOOKS:

1. Asoke K Talukder, Hasan Ahmed, Roopa Yavagal Mobile Computing: Technology, Applications andService Creation, McGraw-Hill Education.
2. Mobile Computing, by Kumkum Garg · 2010, Pearson Education
3. Mobile Computing by Raj Kamal · 2007 , Oxford University Press

Course Outcomes:

After completion of this course students will be able to:

1. Understand the concept of mobile computing paradigm, its novel applications and limitations.
2. Analyze and develop new mobile applications
3. Understand the issues of various layers of mobile networks and their solutions.
4. Classify data delivery mechanisms.
5. Understanding MANET and routing algorithms.

CO PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**1**	**1**	**2**									
CO2	**1**	**1**	**2**									
CO3	**1**	**1**	**2**									**1**
CO4	**1**	**1**	**2**									**1**
CO5	**1**	**1**	**2**									**1**

(A473417) SOCIAL NETWORK ANALYSIS

(Professional Elective–V)

B.Tech. IV Year I Sem. **L T P C**
3 0 0 3

UNIT-I

Introduction: Social Media and Social Networks
Social Media: New Technologies of Collaboration
Social Network Analysis: Measuring, Mapping and Modeling collections of Connections.

UNIT-II

Node XL, Layout, Visual Design and Labeling, Calculating and Visualizing Network Metrics, Preparing Data and Filtering, Clustering and Grouping.

UNIT-III

CASESTUDIES:
Email: The lifeblood of Modern Communication**.**
Thread Networks: Mapping Message Boards and Email Lists
Twitter: Conversation, Entertainment and Information

UNIT-IV
CASESTUDIES:
Visualizing and Interpreting Face book Networks, WWW Hyperlink Networks

UNIT-V
CASESTUDIES:
YouTube: Contrasting Patterns of Content Interaction and Prominence**.**
WikiNetworks : Connections of Creativity and Collaboration

TEXT BOOKS:

1. Hansen, Derek, BenSheiderman, MarcSmith, Analyzing Social Media Networks with NodeXL: Insights from a Connected World, MorganKaufmann,2011.
2. Social Network Analysis and Education Theory, Methods & Applications By Brian V. Carolan · 2013

REFERENCE BOOKS:

1. Avinash Kaushik, WebAnalytics2.0: The Art of Online Accountability, Sybex,2009.
2. Marshall Sponder, Social Media Analytics: Effective Tools for Building, Interpreting and UsingMetrics,1st Edition,MGH,2011·
3. Social Network Analysis Methods and Examples By Song Yang, Franziska B. Keller, Lu Zheng· 2016.

Course Outcomes:

After completion of this course students will be able to:

1. Analysis of widely used services such as email, Wikis, Twitter, flickr, YouTube.
2. Ability to construct social network maps easily.
3. Gain skills in tracking the content flow through the social media
4. Understand NodeXL use to perform social network analysis
5. Learn the mechanisms for social network analysis.

CO PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**3**	**2**	**1**									
CO2	**1**	**2**	**3**	**1**								
CO3	**1**	**2**	**3**	**1**								
CO4		**2**	**3**	**1**								
CO5		**2**	**3**	**1**								

(A473418) FEDERATED MACHINE LEARNING

(Professional Elective–V)

B.Tech. IV Year I Sem. **L T P C**
3 0 0 3

UNIT-I

Introduction: Motivation, Federated Learning as a Solution, The Definition of Federated Learning, Categories of Federated Learning, Current Development in Federated Learning, Research Issues in Federated Learning, Open-Source Projects, Standardization Efforts, The Federated AI Ecosystem Background: Privacy-Preserving Machine Learning, PPML and Secure ML, Threat and Security Models, Privacy Threat Models, Adversary and Security Models, Privacy Preservation Techniques, Secure Multi-Party Computation, Homomorphic Encryption,Differential Privacy.

UNIT-II

Distributed Machine Learning: Introduction to DML, The Definition of DML, DML Platforms, Scalability- Motivated DML, Large-Scale Machine Learning, Scalability-Oriented DML Schemes, Privacy- Motivated DML, Privacy-Preserving Decision Trees, Privacy-Preserving Techniques, Privacy-Preserving DML Schemes, Privacy-Preserving Gradient Descent, Vanilla Federated Learning, Privacy-Preserving Methods,

UNIT-III

Horizontal Federated Learning:TheDefinitionofHFL,ArchitectureofHFL,TheClient-ServerArchitecture, The Peer-to-Peer Architecture, Global Model Evaluation, The Federated Averaging Algorithm, Federated Optimization, the FedAvg Algorithm, The Secured FedAvg Algorithm, Improvement of the FedAvg Algorithm, Communication Efficiency, Client Selection Vertical Federated Learning: The Definition of VFL, Architecture of VFL, Algorithms of VFL, Secure Federated Linear Regression, Secure Federated Tree-Boosting.

UNIT-IV

Federated Transfer Learning: Heterogeneous Federated Learning, Federated Transfer Learning, The FTL Framework, Additively Homomorphic Encryption, The FTL Training Process, The FTL Prediction Process, Security Analysis, Secret Sharing-Based FTL

Incentive Mechanism Design for Federated Learning: Paying for Contributions, Profit-Sharing Games, Reverse Auctions, A Fairness-Aware Profit Sharing Framework, Modeling Contribution, Modeling Cost, Modeling Regret, Modeling Temporal Regret, The Policy Orchestrator, Computing Payoff Weightage.

UNIT-V

Federated Learning for Vision Language and Recommendation: Federated Learning for Computer Vision, Federated CV, Federated Learning for NLP, Federated NLP, Federated Learning for Recommendation Systems, Recommendation Model, Federated Recommendation System.

Federated Reinforcement Learning:

Introduction to Reinforcement Learning, Policy, Reward, Value Function, Model of the Environment, RLBackground Example, Reinforcement Learning Algorithms, Distributed Reinforcement Learning, Asynchronous Distributed Reinforcement Learning, Synchronous Distributed Reinforcement Learning, Federated Reinforcement Learning, Background and Categorization.

TEXT BOOKS:

1. Federated Learning, Qiang Yang, Yang Liu, Yong Cheng, Yan Kang, Tianjian Chen, and HanYuSynthesis Lectures on Artificial Intelligence and Machine Learning2019.
2. Federated Learning Fundamentals and Advances by Yaochu Jin, Hangyu Zhu, Jinjin Xu, Yang Chen ·2022 Springer Nature.

REFERENCE BOOKS:

1. Federated Learning A Comprehensive Overview of Methods and Applications by Heiko Ludwig, NathalieBaracaldo 2022 Springer International Publishing
2. Federated Learning Theory and Practice 2024 by Lam M. Nguyen, Pin-Yu Chen, Trong Nghia Hoang ElsevierScience.
3. Federated AI for Real-World Business Scenarios by Dinesh C.Verma · 2021,CRC Press

Course Outcomes: After completion of this course students will be able to

1. Understand the basics on privacy- preservingML
2. Analyze the key concepts of Distributed ML and FL
3. Understand the key concepts and applications of Horizontal FL and VerticalFL
4. Motivates the intensive mechanism design forFL
5. Analyze the concepts of federated reinforcement learning.

CO PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												**1**
CO2	**1**	**2**	**3**	**1**	**1**							**1**
CO3	**1**	**2**	**3**	**1**	**1**							**1**
CO4	**1**	**2**	**3**	**1**	**1**							**1**
CO5	**1**	**2**	**3**	**1**	**1**							**1**

(A473419) AUGMENTED REALITY & VIRTUAL REALITY

(Professional Elective–V)

B.Tech. IV Year I Sem. **L T P C**
3 0 0 3

UNIT-I

Introduction to Augmented Reality: Augmented Reality-Defining augmented reality, history of augmented reality, Examples, Related fields
Displays: Multimodal Displays, Visual Perception, Requirements and Characteristics, Spatial Display Model,Visual Displays
Tracking: Tracking, Calibration and Registration, Coordinate Systems, Characteristics of Tracking Technology, Stationary Tracking Systems, Mobile Sensors

UNIT-II

Computer Vision for Augmented Reality: Marker Tracking, Multiple-Camera Infrared Tracking, NaturalFeature Tracking by Detection, Outdoor Tracking.
Interaction : Output Modalities, Input Modalities, Tangible Interfaces, Virtual User Interfaces on RealSurfaces, Augmented Paper, Multi-view Interfaces, Haptic Interaction
Software Architectures: AR Application Requirements, Software Engineering Requirements, DistributedObject Systems, Data flow, Scene Graphs.

UNIT-III
Introduction to Virtual Reality: Defining Virtual Reality, History of VR, Human Physiology and Perception
The Geometry of Virtual Worlds: Geometric Models,Axis-Angle Representations of Rotation, ViewingTransformations
Light and Optics: Basic Behavior of Light, Lenses, Optical Aberrations, The Human Eye, Cameras, Displays

UNIT-IV

The Physiology of Human Vision: From the Cornea to Photoreceptors, From Photoreceptors to the Visual Cortex, Eye Movements, Implications for VR
Visual Perception: Visual Perception-Perception of Depth, Perception of Motion, Perception of Color **Visual Rendering:** Visual Rendering -Ray Tracing and Shading Models, Rasterization, Correcting Optical Distortions,Improving Latency and Frame Rates, Immersive Photos and Videos

UNIT-V

Motion in Real and Virtual Worlds: Velocities and Accelerations, The Vestibular System, Physics in the Virtual World, Mismatched Motion and Vection.
Interaction: Motor Programs and Remapping, Locomotion, Social Interaction
Audio: The Physics of Sound, The Physiology of Human Hearing, Auditory Perception, Auditory Rendering

TEXT BOOKS:

1. Augmented Reality: Principles & Practice by Schmalstieg / Hollerer, Pearson Education India; Firstedition(12October2016), ISBN-10:9332578494
2. Virtual Reality, Steven M.LaValle, Cambridge UniversityPress,2016
3. Understanding Virtual Reality: Interface, Application and Design, William RShermanb and Alan B Craig, (The Morgan Kaufmann Series in Computer Graphics)". Morgan Kaufmann Publishers, SanFrancisco,CA,2002

REFERENCE BOOKS:

1. Allan Fowler-AR Game Development‖, 1st Edition, A press Publications, 2018, ISBN 978-1484236178
2. Developing Virtual Reality Applications: Foundations of Effective Design,AlanBCraig,WilliamRSherman and JeffreyDWill,MorganKaufmann,2009
3. Designing for Mixed Reality, Kharis O'Connell Published by O'Reilly Media, Inc., 2016,ISBN:9781491962381
4. Sanni Siltanen- Theory and applications of marker-based augmented reality. Julkaisija –Utgivare Publisher.2012.ISBN978-951-38-7449-0
5. GerardJounghyunKim,"DesigningVirtualSystems:TheStructuredApproach",20 05.

Course Outcomes:
After completion of this course students will be able to:

1. Fundamentals of sensation, perception, technical and engineering aspects of virtual reality systems.
2. Describe how AR systems work and list the applications of AR.
3. Understand the software architectures of AR.
4. Understand the Visual perception and rendering in VR
5. Understand the interaction, auditory perception and rendering in VR

CO PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**1**	**1**	**2**									**2**
CO2	**1**	**1**	**2**									**2**
CO3	**1**	**1**	**2**		**2**							**2**
CO4	**1**	**1**	**2**		**2**				**1**			**2**
CO5	**1**	**1**	**2**		**2**				**1**			**2**

(A473420) AD-HOC & SENSOR NETWORKS

(Professional Elective–V)

B.Tech. IV Year I Sem. **L T P C**
3 0 0 3

UNIT - I

Introduction to Ad Hoc Networks - Characteristics of MANETs, Applications of MANETs and Challenges of MANETs.

Routing in MANETs - Criteria for classification, Taxonomy of MANET routing algorithms, Topology based routing algorithms-Proactive: DSDV; Reactive: DSR, AODV; Hybrid: ZRP; Position-based routing algorithms-Location Services- DREAM, Quorum-based; Forwarding Strategies: Greedy Packet, Restricted Directional Flooding-DREAM, LAR.

UNIT - II

Data Transmission - Broadcast Storm Problem, Rebroadcasting Schemes-Simple-flooding, Probability-based Methods, Area-based Methods, Neighbor Knowledge-based: SBA, Multipoint Relaying, AHBP. Multicasting: Tree-based: AMRIS, MAODV; Mesh-based: ODMRP, CAMP; Hybrid: AMRoute, MCEDAR.

UNIT - III

Geo casting: Data-transmission Oriented-LBM; Route Creation Oriented-GeoTORA, MGR.
TCP over Ad Hoc TCPprotocol overview, TCP and MANETs, Solutions for TCP over Ad hoc

UNIT – IV

Basics of Wireless, Sensors and Lower Layer Issues: Applications, Classification of sensor networks, Architecture of sensor network, Physical layer, MAC layer, Link layer, Routing Layer.

UNIT – V

Upper Layer Issues of WSN: Transport layer, High-level application layer support, Adapting to the inherent dynamic natureof WSNs, Sensor Networks and mobile robots.

TEXT BOOKS:

1. Ad Hoc and Sensor Networks – Theory and Applications, Carlos Corderio Dharma P. Aggarwal, World ScientificPublications, March 2006, ISBN – 981–256–681–3.
2. Wireless Sensor Networks: An Information Processing Approach, Feng Zhao, Leonidas Guibas, Elsevier Science,ISBN – 978-1-55860-914-3 (Morgan Kauffman).

REFERENCE BOOKS:

1. C. Siva Ram Murthy, B.S. Manoj Ad Hoc Wireless Networks: Architectures and Protocols.
2. TaiebZnati Kazem Sohraby, Daniel Minoli, Wireless Sensor Networks: Technology, Protocols and Applications,Wiley.
3. Wireless Ad Hoc and Sensor Networks ,Management, Performance, and applications by JingSelena He, Shouling Ji, Yingshu Li, Yi Pan · 2013,CRC Press

Course Outcomes:

After completion of this course students will be able to

1. To understand the challenges of routing in ad-hoc and sensor networks.
2. To understand various broadcast, multicast and geocasting protocols in adhoc and sensor networks
3. Understand the concepts of geocasting.
4. Understand and compare the MAC and routing protocols for adhoc networks.
5. Understand the transport protocols of sensor networks.

CO PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**1**	**1**										
CO2	**1**	**1**										
CO3	**1**	**1**			**1**							
CO4	**1**	**1**			**1**				**1**			
CO5	**1**	**1**			**1**				**1**			

(A473421) ROBOTIC PROCESS AUTOMATION

(Professional Elective–VI)

B.Tech. IV Year I Sem.

L	T	P	C
3	0	0	3

UNIT-I

Robotic Process Automation: Introduction**,** Scope and techniques of automation, Robotic process automation, Components of RPA,RPA platforms, About UiPath **UIPathStack** Uipath Studio, Uipath Robot, Types of Robots, UiPathOrchestrator

UIPath Studio Projects, User interface

The User Interface: Task recorder, Advanced UI interactions: Input methods, Output methods

UNIT-II

Sequence, Flowchart, and Control Flow: Sequencing the workflow, Activities, Control Flow, various types ofloops and decision making

Data Manipulation: Variables and scope, Collections, Arguments–Purpose and use,Data table usage with examples, File operation with step-by-step example, CSV/Excel to data table and vice versa.

UNIT-III

Taking Control of the Controls: Finding and attaching windows, Finding the control, Techniques for waiting for a control, Acton controls–mouse and keyboard activities, Handling events, revisit recorder, When to use OCR, Types of OCR available, How to use OCR

Plugins and Extensions: Terminal Plugin, SAP Automation, Citrix automation and Credential management

UNIT-IV

Handling User Events and Assistant Bots: Assistant bots, Monitoring system event triggers, Monitoring image and element triggers, launching an assistant bot on a keyboard event.

Exception Handling, Debugging, and Logging: Exception handling, Common exceptions and ways to handle them, Logging and taking screenshots, Debugging techniques, Collecting crash dumps, Error reporting

UNIT-V

Managing and Maintaining the Code: Project organization, nesting workflows, Reusability of workflows, Commenting techniques, State Machine, When to use Flowcharts, State Machines, or Sequences, Using config files

Deploying and Maintaining the Bot: Publishing using publish utility, using Orchestration Server to control bots, deploy bots, License Management, Publishing and-+

TEXT BOOKS:

1. Learning Robotic Process Automation: Create Software robots and automate business processes with theleading RPA tool - UiPath: Create Software robots. with the leading RPAtool–UiPath Kindle Edition
2. Learning Robotic Process Automation :Create Software Robots and Automate

Business Processeswith the Leading RPA Tool – UiPath by Alok Mani Tripathi · 2018, Packt publications

REFERENCE BOOKS:

1. Robotic Process Automation A Complete Guide-2020 Edition Kindle Edition.
2. Robotic Process Automation Management, Technology, Applications 2021, Christian Czarnecki,Peter Fettke publisher De Gruyter
3. Robotic Process Automation 2023 Anand Singh Gadwal, Rahul Choudhary,Wiley

Course Outcomes: After completion of this course students will be able to:

1. Understand the concepts of Robotic Process Automation.
2. Apply the flowchart mechanism in various calculations.
3. Applying UIPath tool for debugging process
4. Design system managing techniques.
5. Create application for process automation using UIPath tool.

CO PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**3**	**2**	**1**		**1**							**1**
CO2	**1**	**2**	**3**	**1**	**1**							**1**
CO3	**1**	**2**	**3**	**1**	**1**							**1**
CO4		**2**	**3**	**1**	**1**							**1**
CO5		**2**	**3**	**1**	**1**							**1**

(A473422) RANDOMIZED ALGORITHMS

(Professional Elective–VI)

B.Tech. IV Year I Sem. **L T P C**

3 0 0 3

UNIT-I

Introduction, A Min – Cut algorithm, Las Vegas and Monte Carlo, Binary Planar Partitions, A Probabilistic Recurrence

Game-Theoretic Techniques: Game Tree Evaluation,The Minimax Principle

UNIT-II

Moments and Deviations: Occupancy Problems, The Markov and Chebyshev Inequalities, Randomized Selection, Two Points ampling, The Coupon Collector's problem.

Markov Chains and Random Walks: A 2-SAT example, Markov Chains, Random Walks on Graphs, Graph Connectivity

UNIT–III

Algebraic Techniques: Fingerprinting and Freivald's Technique, Verifying Polynomial Identities, Perfect Matching in Graphs, Verifying Equality of Strings, A Comparison of Finger printing Techniques, Pattern Matching

UNIT-IV

Data Structures: The Fundamental of Data-structures, Random Treaps, Skip Lists, Hash Tables GraphAlgorithms: All Pairs Shortest Path, The Min-CutProblem, Minimum Spanning Trees

UNIT–V

Geometric Algorithms: Randomized Incremental Construction, Convex Hulls in the Plane, Duality, Half-Space Intersections, Dalaunay Triangulations, Trapezoidal Decompositions, Parallel and Distributed Algorithms: The PRAM Model, Sorting on a PRAM, Maximal Independent Sets, Perfect Matchings.

TEXT BOOKS:

1. Randomized Algorithms:RajeevMotwani,PrabhakarRaghavan,CambridgeUniversityPress
2. Probability and Computing: Randomization and Probabilistic Techniques in Algorithms and Data Analysis byEliUpfaland Michael Mitzenmacher.

REFERENCE BOOKS:

1. Design and Analysis of Randomized Algorithms Introduction to Design Paradigms by J. Hromkovic ,2005 Springer
2. Randomized Algorithms in Automatic Control and Data Mining ,by Oleg Granichin, Zeev (Vladimir)Volkovich, Dvora Toledano-Kitai · 2014 Springer Berlin Heidelberg
3. Randomized Algorithms: Approximation, Generation, and Counting by Russ Bubley · 2012 , SpringerLondon

Course Outcomes:

After completion of this course students will be able to:

1. Appreciate the fundamentals of randomized algorithm design.
2. Understand the fundamentals of Markov chains and the Monte Carlo method.
3. Understand the Finger print and Pattern Matching techniques
4. Apply high probability analysis to selected randomized algorithms.
5. Understanding of geometric algorithms

CO PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**1**	**1**										
CO2	**1**	**1**										
CO3	**1**	**1**	**2**									
CO4	**1**	**1**	**2**									
CO5	**1**	**1**	**2**									

(A473423) COGNITIVE COMPUTING

(Professional Elective–VI)

B. Tech IV Year I Sem.

L	T	P	C
3	0	0	3

UNIT-I

Introduction to Cognitive Science: Understanding Cognition, IBM's Watson, Design for Human Cognition, Augmented Intelligence, Cognition Modeling Paradigms: Declarative/logic-based computational cognitive modeling, connectionist models of cognition, Bayesian models of cognition, a dynamical systems approach to cognition.

UNIT-II

Cognitive Models of memory and language, computational models of episodic and semantic memory, modeling psycholinguistics.

UNIT-III

Cognitive Modeling: modeling the interaction of language, memory and learning, Modeling select aspects of cognition classical models of rationality, symbolic reasoning and decision making.

UNIT-IV

Formal models of inductive generalization, causality, categorization and similarity, the role of analogy in problem solving, Cognitive Development Child concept acquisition. Cognition and Artificial cognitive architectures such as ACT-R, SOAR, OpenCog, CopyCat, Memory Networks.

UNIT-V

Deep QA Architecture, Unstructured Information Management Architecture (UIMA), Structured Knowledge, Business Implications, Building Cognitive Applications, Application of Cognitive Computing and Systems.

TEXTBOOK:

1. The Cambridge Handbook of Computational Psychology by RonSun(ed.), Cambridge University Press.
2. Cognitive Computing: Theory and Applications: Volume35 (Handbook of Statistics), Vijay V Raghavan, Venkat N.Gudivada, Venu Govindaraju, NorthHollan.

REFERENCEBOOKS:

1. JudithS. Hurwitz, MarciaKaufman, Adrian Bowles Cognitive Computing and Big Data Analytics,Wiley
2. Emerging Trends and Applications in Cognitive Computing ,2018, IGI Global ,Pradeep KumarMallick, Samarjeet Borah
3. Cognitive Analytics Concepts, Methodologies, Tools, and Applications 2020 ,IGI Global, InformationResources Management Association

Course Outcomes:

After completion of this course students will be able to:

1. Understand cognitive computing
2. Plan and use the primary tools associated with cognitive computing.
3. Plan and execute a project that leverages cognitive computing.
4. Understand cognitive computing architectures
5. Understand and develop the business simplifications of cognitive computing

CO PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**1**	**1**	**1**									
CO2	**1**	**1**	**2**									
CO3	**1**	**1**	**2**		**1**							**1**
CO4	**1**	**1**	**2**		**1**							**1**
CO5	**1**	**1**	**2**		**1**							**1**

(A473424) CONVERSATIONAL AI

(Professional Elective–VI)

B.Tech. IV Year I Sem

L	T	P	C
3	0	0	3

UNIT-I Introducing Dialogue Systems

Introduction of Dialogue System, History of Dialogue Systems, Present-Day Dialogue Systems, Modeling Conversation Dialogue Systems, Designing and Developing Dialogue Systems.

UNIT-II Rule-Based Dialogue Systems: Architecture, Methods and Tools

Dialogue Systems Architecture, designing a Dialogue System, Tools for Developing Dialogue Systems, Rule- Based Techniques in Dialogue Systems Participating in the Alexa Prize.

UNIT-III Statistical Data-Driven Dialogue Systems

Motivating the Statistical Data-Driven Approach, Dialogue Components in the Statistical Data-Driven Approach, Reinforcement Learning(RL), Representing Dialogue as a Markov Decision Process, From MDPs to POMDPs, Dialogue State Tracking, Dialogue Policy, Problems and Issues with Reinforcement Learning in POMDPs

UNIT-IV Evaluating Dialogue Systems

Process of Evaluation, Evaluating Task-Oriented Dialogue Systems, Evaluating Open-Domain Dialogue Systems, Evaluation Frameworks- PARADISE, Quality of Experience (QoE) , Interaction Quality, Best Way to Evaluate Dialogue Systems.

UNIT-V End-to-End Neural Dialogue Systems

Neural Network Approaches to Dialogue Modeling, A Neural Conversational Model, Introduction to the Technology of Neural Dialogue, Retrieval-Based Response Generation, Task-Oriented Neural Dialogue Systems, Open-Domain Neural Dialogue Systems, Some Issues and Current Solutions, Dialogue Systems: Datasets, Competitions, Tasks and Challenges.

TEXT BOOKS:

1. MichaelMcTear,"ConversationalAI:DialogueSystems,ConversationalAgents,andChat bots", SecondEdition, Moran and Claypool Publishers, 2020.
2. Conversational Artificial Intelligence , 2024 , Wiley, Anand Rajavat, K. Sakthidasan Sankaran,

REFERENCE BOOKs:

1. Cathy Pearl, "Designing Voice User Interfaces: Principles ofConversational Experiences",O'REILLY,2016.
2. Conversational AI , Dialogue Systems, Conversational Agents, and Chatbots by Michael McTear · 2020 SpringerInternational
3. Conversational AI with Rasa ,Build, Test, and Deploy AI-powered, Enterprise-grade Virtual Assistants andChatbots By Xiaoquan Kong, Guan Wang, Alan Nichol · 2021 Packt Publishing

Course Outcomes:
After completion of this course students will be able to:

1. Understand the basic technologies required for building a conversational system.
2. Learn the rule-based dialogue system
3. Involve AI in building conversational system and build advanced systems that are cognitively inclinedtowards human behavior.
4. Develop a real time working conversational system for social domain that can intelligently processinputs and generate relevant replies.
5. To know the various applications of conversational systems and its future development

CO PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												**1**
CO2	**1**	**1**	**2**									**1**
CO3	**1**	**1**	**2**									**1**
CO4	**1**	**1**	**2**						**1**			**1**
CO5	**1**	**1**	**2**						**1**			**1**

(A473309) PROFESSIONAL PRACTICE, LAW& ETHICS

B.Tech. IV Year I Sem.

L	T	P	C
2	0	0	2

UNIT-I

Professional Practice and Ethics: Definition of Ethics, Professional Ethics - Engineering Ethics, Personal Ethics; Code of Ethics - Profession, Professionalism, Professional Responsibility, Conflict of Interest, Gift Vs Bribery, Environmental breaches, Negligence, Deficiencies in state-of-the-art; Vigil Mechanism, Whistle blowing, protected disclosures. Introduction to GST- Various Roles of Various Stakeholders

UNIT-II

Law of Contract: Nature of Contract and Essential elements of valid contract, Offer and Acceptance, Consideration, Capacity to contract and Free Consent, Legality of Object. Unlawful and illegal agreements, Contingent Contracts, Performance and discharge of Contracts, Remedies for breach of contract. Contracts-II: Indemnity and guarantee, Contract of Agency, Sale of goods Act-1930: General Principles, Conditions & Warranties, Performance of Contract of Sale.

UNIT-III

Arbitration, Conciliation and ADR (Alternative Dispute Resolution) system: Arbitration–meaning, scope and types – distinction between laws of 1940 and 1996; UNCITRAL model law – Arbitration and expert determination, Extent of judicial intervention; International commercial arbitration;

UNIT-IV

Arbitration agreements – essential and kinds, validity, reference and interim measures by court; Arbitration tribunal – appointment, challenge, jurisdiction of arbitral tribunal, powers, grounds of challenge, procedure and court assistance; Distinction between conciliation, negotiation, mediation and arbitration, confidentiality, resort to judicial proceedings, costs;Dispute Resolution Boards; Lok Adalats.

UNIT-V

Law relating to Intellectual property: Introduction – meaning of intellectual property, main forms of IP, Copyright, Trademarks, Patents and Designs, Secrets; Law relating to Copyright in India including Historical evolution of Copy Rights Act, 1957, Meaning of copyright – computer programs, Ownership of copyrights and assignment, Criteria of infringement, Piracy in Internet – Remedies and procedures in India; Law relating to Patents under PatentsAct,1970

TEXT BOOKS:

1. Professional Ethics: R.Subramanian,OxfordUniversityPress,2015.
2. Ravinder Kaur, Legal Aspects of Business,4e, CengageLearning,2016.

REFERENCE BOOKS:

1. Wadhera (2004),Intellectual Property Rights, Universal Law Publishing Co.
2. T.Ramappa (2010), Intellectual Property Rights Law in India, Asia Law House.
3. O.P.Malhotra, Law of Industrial Disputes, N.M.Tripathi Publishers.

Course Outcomes:

After completion of this course students will be able to:

1. Practice ethics and rule of the land in their profession
2. Follow the principles and elements of legal contracts
3. Able to resolve disputes pertaining to arbitration, reconciliation
4. Aware of intellectual property loss
5. To develop some ideas of the legal and practical aspects of their profession.

(A400102) BUSINESS ECONOMICS & FINANCIAL ANALYSIS

B.Tech IV Year II Sem

L	T	P	C
3	0	0	3

UNIT–I

Introduction to Business and Economics:

Business: Structure of Business Firm, Theory of Firm, Types of Business Entities, Limited Liability Companies, Sources of Capital for a Company, Non-Conventional Sources of Finance.

Economics: Significance of Economics, Micro and Macro Economic Concepts, Concepts and Importance of National Income, Inflation, Money Supply in Inflation, Business Cycle, Features and Phases of Business Cycle. Nature and Scope of Business Economics, Role of Business Economist, Multi disciplinary nature of Business Economics.

UNIT-II

Demand and Supply Analysis:

Elasticity of Demand: Elasticity, Types of Elasticity, Law of Demand, Measurement and Significance of Elasticity of Demand, Factors affecting Elasticity of Demand, Elasticity of Demand in decision making, Demand Forecasting: Characteristics of Good Demand Forecasting, Steps in Demand Forecasting, Methods of Demand Forecasting.

Supply Analysis: Determinants of Supply, Supply Function & Law of Supply.

UNIT-III

Production, Cost, Market Structures & Pricing:

Production Analysis: Factors of Production, Production Function, Production Function with one variable input, two variable inputs, Returns to Scale, Different Types of Production Functions.

Cost analysis: Types of Costs, Short run and Long run Cost Functions.

Market Structures: Nature of Competition, Features of Perfect competition, Monopoly, Oligopoly, Mono

polistic Competition.

Pricing: Types of Pricing, Product Life Cycle based Pricing, Break Even Analysis,Cost Volume ProfitAnalysis.

UNIT-IV

Financial Accounting: Accounting concepts and Conventions, Accounting Equation, Double-Entry system of Accounting, Rules for maintaining Books of Accounts, Journal, Posting to Ledger, Preparation of Trial Balance, Elements of Financial Statements, Preparation of Final Accounts.

UNIT-V

Financial Analysis through Ratios: Concept of Ratio Analysis, Liquidity Ratios, Turnover Ratios,Profitability Ratios, Proprietary Ratios, Solvency, Leverage Ratios (simple problems).

Introduction to Fund Flow and Cash Flow Analysis (simple problems).

TEXT BOOKS:

1. D.D. Chaturvedi, S.L.Gupta ,Business Economics-Theory and Applications,InternationalBookHousePvt.Ltd.2013.
2. Dhanesh K Khatri, Financial Accounting, Tata Mc GrawHill,2011.

REFERENCE BOOKS:

1. Paresh Shah,Financial Accounting for Management 2e,Oxford Press,2015.
2. S.N.Maheshwari, Sunil K Maheshwari, Sharad K Maheshwari, Financial Accounting,5e,VikasPublications,2013.
3. Geethika Ghosh, Piyali Gosh, Purba Roy Choudhury, Managerial Economics, 2e, Tata Mc Graw HillEducation Pvt.Ltd. 2012.

Course Outcomes:

After completion of this course students will be able to:

1. To learn the basic Business types, impact of the Economy on Business and Firms specifically.
2. To analyze the Business from the Financial Perspective
3. Various Forms of Business and the impact of economic variables on the Business.
4. The Demand, Supply, Production, Cost, Market Structure, Pricing aspects are learnt.
5. can study the firm's financial position by analysing the Financial Statements of a Company.