AR22
ACADEMIC REGULATIONS AND DETAILED SYLLABUS

COMPUTER SCIENCE AND ENGINEERING
(ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING)

FOR

CHOICE BASED CREDIT SYSTEM (CBCS) BASED B. TECH FOUR YEAR DEGREE PROGRAM
(Applicable for the batches admitted from the AY 2023-24)

Geethanjali College of Engineering and Technology
(UGC Autonomous)
(Approved by AICTE, Permanently Affiliated to JNTUH and Accredited by NAAC with 'A+' Grade)
Cheeryal (V), Keesara (M), Medchal Dist., Telangana – 501 301

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ACADEMIC REGULATIONS 2022

For CBCS Based B.Tech PROGRAMMES

(Effective for the students admitted into FIRST year from the Academic Year **2023-2024)**

1. Under-Graduate Degree Programme (B.Tech) in Engineering

Geethanjali College of Engineering and Technology (GCET) offers **four (**4) Year (**eight** (8) Semesters) **Bachelor of Technology** (B.Tech) Degree Programme, under Choice Based Credit System (CBCS) with effect from the Academic Year 2023-2024, in the following Branches of Engineering

S. No.	Branch
1	Civil Engineering
2	Computer Science and Engineering
3	Computer Science and Engineering (Artificial Intelligence and Machine Learning)
4	Computer Science and Engineering (Cyber Security)
5	Computer Science and Engineering (Data Science)
6	Electrical and Electronics Engineering
7	Electronics and Communication Engineering
8	Mechanical Engineering

2. Eligibility for Admission

2.1 Admission to the B.Tech Programme shall be made either on the basis of the merit rank obtained by the qualifying candidate at an Entrance Test conducted by the Telangana State Government (EAMCET), or on the basis of any other order of merit approved by the Government of Telangana, subject to reservations as prescribed from time to time.

2.2 The medium of instruction for all the B.Tech programmes shall be ENGLISH only.

3. B.Tech Programme Structure

3.1 A student after securing admission shall complete the B. Tech programme in a minimum period of **four (4)** academic years (**eight** (8) semesters), and a maximum period of **eight (8)** academic years (**sixteen (**16) semesters) starting from the date of commencement of first year first semester, failing which the student shall forfeit his seat in B. Tech program. The 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 as listed below.

3.2.1 **Semester Scheme:**

Each B. Tech program is of **four** (4) academic years (**eight** (8) semesters**)**, with each academic year being divided into two semesters of **20 weeks (minimum of 90 working days)** each. Each semester has - '**Continuous Internal Evaluation (CIE)**' and '**Semester End Examination (SEE)**'. **Choice Based Credit System (CBCS)** as indicated by UGC and curriculum / programme structure as suggested by AICTE are followed.

3.2.2 **Credit Courses:**

All courses are to be registered by a student in a semester to earn credits. Credits shall be assigned to each course in a L: T: P/D: C (Lecture periods: Tutorial periods: Practicals / Drawing periods: Credits) Structure, based on the following general pattern...

- One credit - for one hour / week / semester for Theory / Lecture (L) / Tutorial(T) courses;
- One-half (½) of a credit – for one hour / week / semester for Laboratory / Practical (P) or Drawing (D) courses.
- No Credits for mandatory courses.

3.2.3 **Course Classification:**

The College follows almost all the guidelines issued by AICTE/ UGC. All subjects/ courses offered for the B.Tech. Degree programmes are broadly classified as follows.

S. No	Broad Course Classification	Course Group/Category	Course Description
1	Foundation Courses (FnC)	BSC-Basic Science Courses	Includes Mathematics, Physics and Chemistry courses
2		ESC-Engineering Science Courses	Includes Fundamental Engineering Courses
3		HSMC-Humanities and Social sciences including Management Courses	Includes courses related to Humanities, Social Sciences and Management
4	Core Courses (CoC)	PCC-Professional Core Courses	Includes core courses related to parent discipline/department/ branch of Engineering
5	Elective Courses (EℓC)	PEC-Professional Elective Courses	Includes elective courses related to parent discipline / related department / branch of Engineering
6		OEC-Open Elective Courses	Elective Courses which include interdisciplinary courses or courses in an area outside the parent discipline/department /branch of engineering
7	Core Courses	PROJ –Project	Project Seminar/ Project
8			Design Thinking/ Internship/ Industry Oriented Mini-Project/ Mini-Project
9			Technical Seminar based on core contents related to parent discipline/ department/ branch of Engineering.
10	Mandatory Courses (MC)		Mandatory courses (Non Credit)

4. Course Registration

4.1 A 'Faculty Advisor or Counselor' shall be assigned to a group of around 20 students, who shall advise the students about the B.Tech programme, its structure along with curriculum, choice / option for course(s), based on their competence, progress, pre-requisites and interest.

4.2 The Academic Departments of the college invite 'Registration Forms' from students before the beginning of the semester. 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 may be permitted to register for all the courses in a semester as specified in the course structure with maximum additional course(s) (elective course(s)) limited to 6 credits, duly approved by faculty advisor, based on progress and SGPA/ CGPA, and completion of the 'pre- requisites' as indicated for various courses, in the department course structure and syllabus content.

4.4 A student can apply for registration, ONLY AFTER obtaining the 'WRITTEN APPROVAL' from his faculty advisor, which should be submitted to the College Academic Committee through Head of the Department concerned (a copy of the same being retained with Head of the Department, Faculty Advisor and the student).

4.5 If the student submits ambiguous choices or multiple options or erroneous entries - during registration for the course(s) under a given / specified course(s) Group/ Category, as listed in the programme structure, Faculty Advisor shall rectify such errors and advise the student accordingly.

4.6 Course(s) options exercised by the student and approved by Faculty Advisor are final and CANNOT be changed, or inter-changed. Further, alternate choices shall also not be considered. However, if the course(s) that has (have) already been listed for registration (by the department) in a semester could not be offered due to any unforeseen or unexpected reasons, then the student shall be allowed to have alternate choice: either for new course(s) (subject to offering of such course(s)), or for another existing course(s) offered, which may be considered. Such alternate arrangements shall be made by the department, with due notification and time-framed schedule, within the FIRST WEEK from the commencement of class-work for that semester.

4.7 Dropping of course(s) 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.

4.8 **Open electives**: The student has to choose open electives from the list of open electives given. However, the student cannot opt for an open elective course(s) offered by his own (parent) department.

4.9 **Professional electives**: The student has to choose the required professional electives from the list given.

5. Courses to be offered

5.1 A Course may be offered to the students, ONLY IF a Minimum of 15 students opt for it.

5.2 More than one Instructor may offer the same course(s) (laboratory / practical may be included with the corresponding theory course(s) in the same semester) in any semester. However, selection of choice for students shall be based on - 'first come first serve basis and CGPA criterion'. (i.e. the first focus shall be on early registration 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 course come into picture then the Head of the Department concerned shall decide whether or not to offer such a course for two or more sections.

5.4 In case of options coming from students of other departments / branches / disciplines (not considering OPEN ELECTIVES), PRIORITY shall be given to the student of the 'Parent Department'.

6 **Attendance Requirements**

6.1 A student shall be eligible to appear for the semester end examinations, if the student acquires a minimum of 75% attendance in aggregate of all the courses (including attendance in mandatory course like Environmental Science, Indian Constitution for that semester.

6.2 Shortage of attendance in aggregate upto 10% (65% and above, and below 75%) in each semester may be condoned by the college academic committee on genuine and valid grounds, based on the student's representation with supporting evidence.

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

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

6.5 **Students, whose shortage of attendance is not condoned in any semester, are not eligible to take their Semester End Examinations. They get detained and their registration for that semester shall stand cancelled. They shall not be promoted to the next semester.** They may seek re-registration for all those course(s) registered in the semester in which they were detained, by seeking re-admission into that semester as and when offered. In the case of elective course(s), namely, professional elective(s) and / or open elective(s), the same may also be re-registered, if offered. However, if those elective(s) are not offered in later semesters, then alternate elective(s) may be chosen from the SAME set of elective course(s) offered under that specific category.

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

7 Academic Requirements

The following academic requirements have to be satisfied, in addition to the attendance requirement mentioned in section 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 including minimum 35% of average Mid-Term examinations for 25 marks) in the internal examinations, not less than 35% (21 marks out of 60 marks) in the semester end examination, 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 Academic requirements in respect of Internship, Mini-Project, Technical Seminar, Project Seminar, Project, Activity Oriented (Non-Laboratory) courses such as Design Thinking, Logical

reasoning and English Language courses (English for effective communication, English for career development, English for professional success) are as follows:

Name of the Course	Academic Requirements
Internship	A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to Internship if the student: i. Submits a report on his Internship. ii. Makes a presentation of the Internship carried out before the Departmental Evaluation Committee as per schedule iii. Secures not less than 40% of the total marks allocated for the course in the evaluation by Departmental Evaluation Committee.
Mini-Project	A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to Mini-Project if the student: i. Submits a report on his Mini-Project. ii. Makes a presentation of the Mini-Project carried out before the Departmental Evaluation Committee as per schedule. iii. Secures not less than 40% of the total marks allocated for the course in the evaluation by Departmental Evaluation Committee.
Project Seminar	A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to Project Seminar if the student: i. Submits a report on his Project Seminar. ii. Makes a presentation of the Project Seminar carried out before the Departmental Evaluation Committee as per schedule. iii. Secures not less than 40% of the total marks allocated for the course in the evaluation by Departmental Evaluation Committee.
Technical Seminar	A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to Technical Seminar if the student: i. Submits a report on his Technical Seminar. ii. Makes a presentation of the Technical Seminar carried out before the Departmental Evaluation Committee as per schedule. iii. Secures not less than 40% of the total marks allocated for the course in the evaluation by Departmental Evaluation Committee.
*Project	A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to Project if the student: i. Submits a report on his Project. ii. Makes a presentation of the Project carried out before the Internal Project Review Committee as per schedule. iii. Secures not less than 40% of the total marks allocated for the course, in the project evaluation.
Activity Oriented (Non – Laboratory) courses (CIE) a. Design Thinking b. Logical reasoning c. English for effective communication d. English for career development e. English for professional success.	A student shall be deemed to have satisfied the academic requirements and earned the credits allotted if the student: i. Submits all assignments in time. ii. Secures not less than 40% of the total marks allocated for the course in continuous Internal Evaluation.

*Note: A student who has not satisfied the above requirements in any of the courses mentioned in the above table, is deemed to have failed; he may reappear once for each of the evaluations in the failed courses when they are 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.

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 50% of the credits specified in the program structure of first year (up to and including 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 60% of the credits specified in the program structure of second year (up to and including 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 60% of the credits specified in the program structure of third year (up to and including 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 program structure, (ii) fulfills all the attendance and academic requirements for 160 credits, (iii) earn all 160 credits by securing SGPA $\geq$5.0 (in each semester), and CGPA $\geq$ 5 (at the end of 8 semesters), (iv) **passes 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 grade card / marks memo of IV-year II semester

7.5 If a student registers for '**extra Courses'** (in the parent department or other departments/branches of Engg.) other than those listed Courses totaling to 160 credits as specified in the course structure of his department, the performances in those '**extra Courses**' (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 Courses'** 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 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 course will be carried over, and added to the marks to be obtained in the SEE supplementary examination for evaluating performance in that Course.

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 Evaluation - Distribution and Weightage of Marks

8.1 The performance of a student in each semester shall be evaluated course-wise (irrespective of credits assigned) with a maximum of 100 marks for all types of course(s), namely, theory, drawing, practicals, Internship, Mini-Project, Project Seminar, Project, Technical seminar, Activity Oriented (Non-Laboratory) courses etc., and their evaluation is as follows:

Theory, practical, drawing and Project course(s) shall be evaluated based on **40** marks CIE (Continuous Internal Evaluation) and **60** marks SEE (Semester End Examination)

Internship/ Mini-project/ Project Seminar / Technical seminar/ Activity Oriented (Non-Laboratory) courses shall be evaluated internally by the Department Evaluation Committee.

Note: A letter grade corresponding to the % marks obtained shall be given for all course(s) as mentioned in section 9.2.

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 paper for 10 marks.
   b. Part - B: Descriptive paper for 20 marks.

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

The descriptive paper shall contain 6 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 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 overall 40% of marks (i.e. 40 marks out of 100 marks) both CIE and SEE marks put together.

The student is eligible to write Semester End Examination of the concerned subject, if the student scores ≥ 35% (14 marks) of 40 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 makeup test in theory/laboratory internal examination for AR22 regulations

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.

8.2 For laboratory course(s), there shall be a Continuous Internal Evaluation (CIE) during the semester for 40 marks, and Semester End Examination (SEE) for 60 marks.
A detailed break up of 40 marks for CIE is given below:

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 other reputed colleges which will be decided/approved by the examination branch/Chief Controller of Examinations of the Institution.

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 Overall 40% of marks (i.e. 40 marks out of 100 marks) both CIE and SEE marks put together.

The student is eligible to write Semester End Examination of the concerned subject, if the student scores ≥ 35% (14 marks) of 40 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.

8.3. Internship, Mini-Project, Technical Seminar, Project seminar, Project and Activity Oriented courses.

8.3.1. There shall be an internship, which the student shall carryout immediately after Second year second semester examinations and pursue it during summer vacation for a duration of about four weeks. The Work carried out during Internship shall be submitted in the form of a report, and a presentation of the same shall be made before a committee, which evaluates it for 100 marks. The committee shall consist of Head of the Department or his nominee, the supervisor allocated for the internship, one senior faculty of the department. There shall be only CIE for 100 marks for internship and shall be evaluated during third year first semester.

8.3.2. There shall be a Mini Project, which the student shall carryout immediately after Third year second semester examinations and pursue it during summer vacation. Mini Project shall be submitted in the form of a report, duly approved by the departmental internal evaluation committee, and presented before the examination committee in Fourth year first semester. It shall be evaluated for 100 marks as SEE. The examination committee consists of Head of the Department or his nominee, supervisor of the mini project, a senior faculty member of the department. **There shall be no internal marks (CIE) for Mini Project.**

8.3.3. There shall be a technical seminar presentation in Fourth year second semester, for which, the student shall collect the information on a specialized topic, prepare a technical report, submit it and present the same before a departmental committee. It shall be evaluated by the departmental committee, consisting of Head of the Department or his nominee, seminar supervisor and a senior faculty member. The technical seminar report shall be evaluated for 100 marks as CIE.

8.3.4. There shall be a Project seminar presentation in Fourth year First semester, for which, the student shall collect the information on the Project topic, prepare a report, submit it and present the same before a departmental committee. It shall be evaluated internally (CIE) for 100 marks by the departmental committee, consisting of Head of the Department or his nominee, seminar supervisor and a senior faculty member.

8.3.5. The student shall carryout the Project in final year second semester. There shall be three reviews, one at the end of the fourth week, another at the end of the ninth week and third at the end of the fourteenth week. The reviews shall be conducted and evaluated by an internal project review committee. The committee shall consist of Head of the Department or his nominee, the supervisor allocated for the Project, and two Professors /Assoc-Professors of the department. Each review shall be evaluated for forty (40) marks and average of all three reviews shall constitute CIE of forty (40) marks. Project carried out shall be submitted in a dissertation form, and a presentation of the same shall be made before a final examination committee consisting of Head of the Department or his nominee, the supervisor and an external examiner, appointed by the chief controller of examinations, selected from a panel of examiners suggested by the chairperson, BoS, which evaluates it for sixty (60) marks.

8.3.6. Activity Oriented (Non-laboratory) courses shall be evaluated internally (CIE) for 100 marks; there shall be no SEE.

8.3.7. For mandatory / non-credit course(s), a student has to secure 40 marks out of 100 marks (i.e. 40% of the marks allotted) in the continuous internal evaluation for securing satisfactory grade.

8.3.8. No marks / letter grades shall be allotted for mandatory/non-credit course(s). Only Satisfactory (S) / Unsatisfactory (US) shall be indicated in Grade Card.

8.4. A student shall be given only one time chance to re-register for a maximum of two 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 Vivavoce/ PPT/ Poster presentation/ Case Study on a topic in the concerned subject) are less than 35% and failed in those subjects.
- A student must re-register for the failed subject(s) for 40 marks within four weeks of commencement of the classwork in next academic year. In the event of the student taking this chance, his Continuous Internal Evaluation marks for 40 and Semester End Examination marks for 60 obtained in the previous attempt stand cancelled.

9 Grading procedure

9.1 Grades shall be awarded to indicate the performance of students in each theory course, laboratory / practicals / Engineering Graphics / Drawing, Technical Seminar, Internship, Mini-Project, Project, Activity Oriented courses based on the percentage of marks obtained (Continuous Internal Evaluation plus Semester End Examination, both taken together) as specified in section 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 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 course(s) shall be deemed to have '**failed**' and is required to reappear as a 'supplementary candidate' in the semester end examination, as and when conducted. However, the internal marks in those course(s) shall remain the same as obtained earlier.

9.4 A student, who has not appeared for an examination in any course(s), shall be awarded '**Ab**' grade in that course(s), and shall be deemed to have '**failed**' in that course(s). Such a student shall be required to reappear as a 'supplementary candidate' in the semester end examination, as and when conducted. However, the internal marks in those course(s) shall remain the same as 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 a grade point (GP) in each course, on the basis of the letter grade secured in that course. The corresponding 'Credit Points (CP)' for a course are computed by multiplying the grade point with credits for that particular course.

Credit points (CP) = grade point (GP) x credits …. For a course

9.7 A student passes a course, only when the student secures a **GP ≥ 5 ('C' grade or above)** in that course.

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

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

where 'i' is the course indicator index (takes into account all course(s) in a semester), 'N' is the number of courses '**registered**' for in that semester (as specifically required and listed under the program structure of the parent department), C is the number of credits allotted to the i^{th} course, and G represents the grade points (GP) corresponding to the letter grade awarded for that i^{th} course.

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

$$\text{CGPA} = \{ \sum_{j=1}^{M} C_j G_j \} / \{ \sum_{j=1}^{M} C_j \} \text{ ... for all S Semesters registered (ie., upto and inclusive of S Semesters, } S \geq 2 \text{)},$$

where '**M**' is the **total** number of courses (as specifically required and listed under the program structure of the parent department) the student has '**registered**' for i.e. from the first semester onwards up to and inclusive of the eighth semester, 'j' is the course indicator index (takes into account, all course(s) from first semester to eighth semester), C is the number of credits allotted

to the j^{th} course, and G_j represents the grade points (GP) corresponding to the letter grade awarded for that j^{th} course. After registration and completion of First year first 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	Credits	Letter Grade	Grade Point	Credit Points
Course1	4	A	8	4 x 8=32
Course 2	4	O	10	4 x 10=40
Course 3	4	C	5	4 x 5=20
Course 4	3	B	6	3 x 6=18
Course 5	3	A+	9	3 x 9=27
Course 6	3	C	5	3 x 5=15
Total	**21**	**Total Credit Points**		**152**

SGPA = 152/21 = 7.24

Illustration of calculation of CGPA up to 3rd semester:

Semester	Course Title	Credits Allotted	Letter Grade Secured	Corresponding Grade Point	Credit Points(CP)
I	Course 1	3	A	8	24
I	Course 2	3	O	10	30
I	Course 3	3	B	6	18
I	Course 4	4	A	8	32
I	Course 5	3	A+	9	27
I	Course 6	4	C	5	20
II	Course 7	4	B	6	24
II	Course 8	4	A	8	32
II	Course 9	3	C	5	15
II	Course 10	3	O	10	30
II	Course 11	3	B+	7	21
II	Course 12	4	B	6	24
II	Course 13	4	A	8	32
II	Course 14	3	O	10	30
III	Course 15	2	A	8	16
III	Course 16	1	C	5	5
III	Course 17	4	O	10	40
III	Course 18	3	B+	7	21
III	Course 19	4	B	6	24
III	Course 20	4	A	8	32
III	Course 21	3	B+	7	21
Total Credits		**69**	**Total Credit Points**		518

CGPA = 518/69 = 7.51

The above illustrated calculation process of CGPA shall be followed for each subsequent semester until eighth semester. The CGPA obtained at the end of eighth 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 shall be used.

9.11 SGPA and CGPA of a semester shall be mentioned in the semester Memorandum of Grades if all courses of that semester are passed in the first attempt. Otherwise, the SGPA and CGPA shall be mentioned only on the Memorandum of Grades generated after the student has passed his last examination in that semester. However, mandatory course(s) will not be taken into consideration.

10. Passing Standards

10.1 A student shall be declared **'SUCCESSFUL'** or **'PASSED'** in a semester, only when he gets an SGPA ≥ 5.00 (at the end of that particular Semester); and a student shall be declared **'SUCCESSFUL'** or **'PASSED'** in the entire B.Tech programme, only when he gets a CGPA ≥ 5.00, subject to the condition that he secures a GP ≥ 5 (C Grade or above) in every registered course(s) in each semester (during the entire B.Tech Programme) for award of the degree.

10.2 After the completion of each semester, a Grade Card or Grade Sheet (Memorandum of Grades) shall be issued to all the registered students of that semester, indicating the letter grades and credits earned. It shall show the details of the course(s) registered (course(s) code, title, number of credits, grade earned etc.), credits earned, SGPA and CGPA.

10.3 **There shall be no exemption of credits under any circumstances.**

11. Declaration of Results

11.1 Computation of SGPA and CGPA are done using the procedure listed in sections 9.5 through 9.8.

11.2 For final % of marks equivalent to the computed final CGPA, the following formula shall be used:

% of Marks = (final CGPA – 0.5) x 10

12. Award of Degree

12.1 A student who registers for all the specified course(s) as listed in the programme structure, satisfies all the programme requirements, and passes all the examinations prescribed in the entire B.Tech programme, and secures the required number of 160 credits (with CGPA ≥ 5.0), within eight (8) academic years from the date of commencement of the first academic year, shall be declared to have **'QUALIFIED'** for the award of the B.Tech degree in the branch of Engineering studied.

12.2 A student who qualifies for the award of the degree as listed in section 12.1, shall be placed in the following classes based on evaluation as per section 7.4:

12.2.1 Students with final CGPA (at the end of the B. Tech Programme) ≥ 8.00 and fulfilling the following conditions shall be placed in 'FIRST CLASS with DISTINCTION' -

i. Should have passed all the courses in 'FIRST APPEARANCE' within the first four (4) academic years (or eight (8) sequential semesters) from the date of commencement of his first academic year,

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.

12.2.2 Students having final CGPA (at the end of B.Tech Programme) ≥ 8.00, but not fulfilling the above conditions shall be placed in 'FIRST CLASS'.

12.2.3 Students with final CGPA (at the end of the B.TECH Programme) ≥ 7.00 but < 8.00, shall be placed in 'FIRST CLASS'.

12.2.4 Students with final CGPA (at the end of the B.TECH Programme) ≥ 6.00 but < 7.00, shall be placed in 'SECOND CLASS'.

12.2.5 All other Students who qualify for the award of the degree (as per Section 12.1), with final CGPA (at the end of the B.Tech Programme) ≥ 5.00 but < 6.00, shall be placed in 'PASS CLASS'.

12.3 A student with final CGPA (at the end of the B. Tech Programme) < 5.00 shall not be eligible for the award of the degree.

12.4 Students fulfilling the conditions listed under of 12.2.1 alone shall be eligible for the award of 'college rank' and / or 'gold / silver / bronze medal'.

12.5 **Award of 2-Year B.Tech. Diploma Certificate**

12.5.1 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(with in 4 years from the date of admission) up to B. Tech. – II Year – II Semester, if the student want to exit the 4-Year B. Tech. program. The student once opted and awarded for 2-Year UG Diploma Certificate, the student will not 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.

12.5.2 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 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. Withholding of Results

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

14. Transitory Regulations

A. For students detained due to shortage of attendance:

1. A Student who has been detained in I year of AR18/AR20 Regulations due to lack of attendance, shall be permitted to join I year I Semester of AR22 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, III and IV years of AR18/AR20 regulations for want of attendance, shall be permitted to join the corresponding semester of

AR22 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 AR22 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 AR18/AR20 Regulations who has been detained due to lack of credits, shall be promoted to the next semester of AR22 Regulations only after acquiring the required number of credits as per the corresponding regulations of his/her first admission. The total credits required are 160 including AR18, AR20 and AR22 regulations. The student is required to complete the study of B.Tech. within the stipulated period of eight academic years from the year of first admission. The AR22 Academic Regulations are applicable to a student from the year of readmission. See rule (C) for further Transitory Regulations.

C. For readmitted students in AR22 Regulations:

4. A student who has failed in any Course under any regulation has to pass those Courses 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 AR22 Regulations. There is NO exemption of credits in any case.
6. If a student is readmitted to AR22 Regulations and has any Course with 80% of syllabus common with his/her previous regulations, that particular Course in AR22 Regulations will be substituted by another Course to be suggested by the College.

Note: If a student readmitted to AR22 Regulations and has not studied any Courses/topics in his/her earlier regulations of study which is prerequisite for further Courses in AR22 Regulations, the College shall conduct remedial classes to cover those Courses/topics for the benefit of the students.

15. Student Transfers

15.1 There shall be no branch transfers after the completion of admission process.

15.2 The students seeking transfer to this college from other Universities/institutions should obtain NoC from the college and apply to Department of Technical Education, Government of Telangana, and Telangana state. The student, on transfer, shall pass additional courses, from the courses, from the courses prescribed in the curriculum of AR22, upto the class/ semester preceding the class/ semester into which the student is admitted, if he had not studied those courses or their equivalents, or failed in those courses at the previous institution.

15.3 Further, though the students have passed some of the Courses at the earlier institutions, if the same Courses are prescribed in different semesters of GCET, the students have to study those Courses in GCET in spite of the fact that those Courses are repeated.

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

16. Scope

1. Where the words “he”, “him”, “his”, occur in the write-up of regulations, they include “she”, “her”, “hers”.
2. The Academic Regulations should be read as a whole, for the purpose of any interpretation.

3. In case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Head of the Institution is final.
4. The college may change or amend the Academic Regulations, Program 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.
5. B. Tech (Regular) program is B. Tech 4-year degree program to which students are admitted to FIRST year.
6. B. Tech LE Scheme refers to the system under which students are admitted to SECOND year of the B. Tech FOUR (4) year degree program.
7. The terms “mid-term” and “internal” are used interchangeably.

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17. PUNISHMENT FOR MALPRACTICE

	Nature of Malpractices	Punishment
	If the candidate:	
1 (a)	Possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, Cell phones, pager, palm computers or any other form of material concerned with or related to the course 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 course of the examination)	Expulsion from the examination hall and cancellation of the performance in that course only.
1 (b)	Gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or communicates through cell phones with any candidate or persons in or outside the exam hall in respect of any matter.	Expulsion from the examination hall and cancellation of the performance in that course only of all the candidates involved. In case of an outsider, he shall be handed over to the police and a case is registered against him.
2	Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the course of the examination (theory or practical) in which the candidate is appearing.	Expulsion from the examination hall and cancellation of the performance in that course and all other courses the candidate has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the courses of that Semester/year. The Hall Ticket of the candidate is to be cancelled.
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 courses of the examination (including practicals and project work) already appeared and shall not be allowed to appear for examinations of the remaining courses of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. If the impostor is an

		outsider, he shall be handed over to the police and a case is registered against him.
4	Smuggles in the answer book or additional sheet or takes out or arranges to send out the question paper during the examination or answer book or additional sheet, during or after the examination.	Expulsion from the examination hall and cancellation of performance in that course and all the other courses the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the courses of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
5	Uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks.	Cancellation of the performance in that course.
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 examination hall or organizes a walk out or instigates others to 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 campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination.	In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that course and all other courses the candidate(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the courses of that semester/year. The candidates also are debarred and forfeit their seats. In case of outsiders, they shall be handed over to the police and a police case is registered against them.
7	Leaves the exam hall taking away answer script or tears of the script or any part thereof inside or outside the examination hall with the mala fide intention of destroying any evidence of use of unfair means.	Expulsion from the examination hall and cancellation of performance in that course and all the other courses the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the courses of that

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

18. ACADEMIC REGULATIONS FOR B.TECH **(LATERAL ENTRY SCHEME)** FROM THE AY 2024-2025

18.1. **Eligibility for award of B. Tech. Degree (LES)**

1. 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 SECOND year through FOURTH year B. Tech programme (LES) for the award of B. Tech degree.
3. The students, who fail to fulfill 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).

18.2 **Promotion rules**

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 60% of the credits specified in the program structure of second year (up to and including 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 60% of the credits specified in the program structure of third year (up to and including 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.

5. All the other regulations as applicable to B. Tech. FOUR (4) - year degree course (Regular) will hold good for B. Tech. (Lateral Entry Scheme).
6. LES students are not eligible for 2-year B. Tech Diploma Certificate.

18.3 **Punishment for Malpractice**

	Nature of Malpractices	Punishment
	If the candidate:	
1 (a)	Possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, Cell phones, pager, palm computers or any other form of material concerned with or related to the course 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 course of the examination)	Expulsion from the examination hall and cancellation of the performance in that course only.
1 (b)	Gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or communicates through cell phones with any candidate or persons in or outside the exam hall in respect of any matter.	Expulsion from the examination hall and cancellation of the performance in that course only of all the candidates involved. In case of an outsider, he shall be handed over to the police and a case is registered against him.
2	Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the course of the examination (theory or practical) in which the candidate is appearing.	Expulsion from the examination hall and cancellation of the performance in that course and all other courses the candidate has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the courses of that Semester/year. The Hall Ticket of the candidate is to be cancelled.
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 courses of the examination (including practicals and project work) already appeared and shall not be allowed to appear for examinations of the remaining courses of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. If the impostor is an outsider, he shall be handed over to the police and a case is registered against him.
4	Smuggles in the answer book or additional sheet or takes out or arranges to send out the question paper during the examination or	Expulsion from the examination hall and cancellation of performance in that course and all the other courses the candidate has already

	answer book or additional sheet, during or after the examination.	appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the courses of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
5	Uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks.	Cancellation of the performance in that course.
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 examination hall or organizes a walk out or instigates others to 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 campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination.	In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that course and all other courses the candidate(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the courses of that semester/year. The candidates also are debarred and forfeit their seats. In case of outsiders, they shall be handed over to the police and a police case is registered against them.
7	Leaves the exam hall taking away answer script or tears of the script or any part thereof inside or outside the examination hall with the mala fide intention of destroying any evidence of use of unfair means.	Expulsion from the examination hall and cancellation of performance in that course and all the other courses the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the courses of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all examinations. The continuation of the course by the candidate is course 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 course and all other courses the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the courses of that semester/year. The candidate is also debarred and forfeits the seat.
9	If student of the college, who is not a candidate for the particular examination or any person not connected with the college indulges in any malpractice or improper conduct mentioned in clause 6 to 8.	Student of the colleges expulsion from the examination hall and cancellation of the performance in that course and all other courses the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the Courses of that semester/year. The candidate is also debarred and forfeits the seat. Person(s) who do not belong to the College shall be handed over to police and, a police case shall be registered against them.
10	Comes in a drunken condition to the examination hall.	Expulsion from the examination hall and cancellation of the performance in that Course and all other Courses the student has already appeared for including practical examinations and project work and shall not be permitted for the remaining examinations of the Courses of that semester/year.
11	Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny.	Cancellation of the performance in that Course and all other Courses the student has appeared for including practical examinations and project work of that semester/year examinations.
12	If any malpractice is detected which is not covered in the above clauses 1 to 11 shall be reported to Chief Controller of Examination.	

GEETHANJALI COLLEGE OF ENGINEERING AND TECHNOLOGY
(UGC Autonomous)
Cheeryal (V), Keesara (M), Medchal Dist., - 501 301

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (AIML)

VISION OF THE INSTITUTE

Geethanjali visualizes dissemination of knowledge and skills to students, who would eventually contribute to wellbeing of the people of the nation and global community.

MISSION OF THE INSTITUTE

1. To impart adequate fundamental knowledge in all basic sciences and engineering, technical and Inter-personal skills to students.
2. To bring out creativity in students that would promote innovation, research and entrepreneurship.
3. To Preserve and promote cultural heritage, humanistic and spiritual values promoting peace and harmony in society.

VISION OF THE DEPARTMENT

To produce globally competent and socially responsible computer science engineers contributing to the advancement of engineering and technology which involves creativity and innovation by providing excellent learning environment with world class facilities.

MISSION OF THE DEPARTMENT

1. To be a centre of excellence in instruction, innovation in research and scholarship, and service to the stake holders, the profession, and the public.
2. To prepare graduates to enter a rapidly changing field as a competent computer science engineer.
3. To prepare graduate capable in all phases of software development, possess a firm understanding of hardware technologies, have the strong mathematical background necessary for scientific computing, and be sufficiently well versed in general theory to allow growth within the discipline as it advances.
4. To prepare graduates to assume leadership roles by possessing good communication skills, the ability to work effectively as team members, and an appreciation for their social and ethical responsibility in a global setting

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

Program Educational Objectives (PEOs) are broad statements that describe what graduates are expected to attain within a few years of graduation. The PEOs for Computer Science and Engineering (Artificial Intelligence and Machine Learning) graduates are:

PEO-I. To provide graduates with a good foundation in mathematics, sciences and engineering fundamentals required to solve engineering problems that will facilitate them to find employment in industry and / or to pursue postgraduate studies with an appreciation for lifelong learning.

PEO-II. To provide graduates with analytical and problem solving skills to design algorithms, other hardware / software systems, and inculcate professional ethics, inter-personal skills to work in a multi-cultural team.

PEO-III. To facilitate graduates get familiarized with state of the art software / hardware tools, imbibing creativity and Innovation that would enable them to develop cutting-edge technologies of multi-disciplinary nature for societal development.

PROGRAM OUTCOMES (POs)

Program Outcomes (POs) describe what students are expected to know and be able to do by the time of graduation to accomplish Program Educational Objectives (PEOs). The Program Outcomes for Computer Science and Engineering (Artificial Intelligence and Machine Learning) graduates are:

Engineering Graduates would be able to:

PO1. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2. **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.

PO3. **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.

PO4. **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.

PO5. **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

PO6. **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.

PO7. **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.

PO8. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10. **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.

PO11. **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.

PO12. **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.

PROGRAM SPECIFIC OUTCOMES (PSOs)

PSO1: Demonstrate competency in Programming and problem solving skills and apply those skills in solving computing problems

PSO2: Select appropriate programming languages, Data structures and algorithms in combination with modern technologies and apply them in developing innovative solutions

PSO3: Demonstrate adequate knowledge in the concepts and techniques of artificial intelligence and machine learning, apply them in developing intelligent systems to solve real world problems

GEETHANJALI COLLEGE OF ENGINEERING AND TECHNOLOGY
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B.TECH. COMPUTER SCIENCE AND ENGINEERING
(ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING)

AR22 STRUCTURE

S.No.	Category	Credits as per GCET AR22	Credits as per AICTE Model Curriculum
1	**Humanities and Social Sciences including Management Courses**	**14**	**12**
2	**Basic Sciences Courses**	**27**	**24**
3	**Engineering Sciences Courses** including workshop, drawing, basics of electrical/ mechanical/ computer etc.	**20**	**29**
4	**Program Core Courses**	**57**	**49**
5	**Program Elective Courses**: Subjects relevant to chosen specialization/branch	**15**	**18**
6	**Open Elective Courses**: Electives from other technical and/or emerging subjects	**9**	**12**
7	**Project work, Seminar and Internship** in industry or else where	**18**	**15**
8	**Mandatory Courses**	**4 slots provided**	
	Total	**160**	**159**

COURSE CODE AND DEFINITION

S.No.	Category Abbreviation	Description
1	HSMC	Humanities and Social Sciences including Management Course
2	BSC	Basic Science Course
3	ESC	Engineering Science Course
4	PCC	Program Core Course
5	PEC	Professional Elective Course
6	OEC	Open Elective Course
7	PROJ	Project, Seminar and Internship
8	MC	Mandatory Course

DEFINITION OF CREDIT

S. No.	Abbreviation	Credits	Description
1	L	1	1 Hour Lecture (L) per week
2	T	1	1 Hour Tutorial (T) per week
3	P/D	0.5 1	1 Hour Practical (P)/ Drawing (D) per week 2 Hours Practical (P)/ Drawing (D) per week

GEETHANJALI COLLEGE OF ENGINEERING AND TECHNOLOGY
(UGC Autonomous)
(Approved by AICTE, Permanently Affiliated to JNTUH and Accredited by NAAC with 'A' Grade)
Cheeryal (V), Keesara (M), Medchal Dist., Telangana – 501 301

SCHEME OF INSTRUCTION AND EXAMINATION

B.TECH. COMPUTER SCIENCE AND ENGINEERING
(ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING)

Academic Regulation: AR22 **Academic Year 2023-24**

PROGRAM STRUCTURE

FIRST YEAR SEMESTER-I

S. No	Course Code	Course Title	Category	Number of Periods per Week			Scheme of Examination with Maximum Marks			No of Credits
				L	T	P/D	CIE	SEE	Tot	
1	20EN11001	English	HSMC	3	-	-	40	60	100	3
2	20MA11001	Basic Engineering Mathematics	BSC	3	1	-	40	60	100	4
3	20PH11003	Applied Physics	BSC	3	-	-	40	60	100	3
4	20CH11001	Engineering Chemistry	BSC	3	-	-	40	60	100	3
5	20CS11001	Programming for Problem Solving-I	ESC	2	-	-	40	60	100	2
6	20CS11L01	Programming for Problem Solving-I Lab	ESC	-	-	2	40	60	100	1
7	20CH11L01	Engineering Chemistry Lab	BSC	-	-	2	40	60	100	1
8	20EN11L01	English Language Communication Skills Lab	HSMC	-	-	2	40	60	100	1
9		Induction Program	MC	-	-	-	-	-	-	-
Total				**14**	**1**	**6**	**320**	**480**	**800**	**18**
Total Periods per Week				**21**						

FIRST YEAR SEMESTER-II

S.No.	Course Code	Course Title	Category	Number of Periods per Week			Scheme of Examination with Maximum Marks			No of Credits
				L	T	P/D	CIE	SEE	Tot	
1	20PH12001	Semiconductor Devices	BSC	3	-	-	40	60	100	3
2	20MA12001	Multi Variable Calculus	BSC	3	1	-	40	60	100	4
3	20CS12001	Programming for Problem Solving-II	ESC	2	-	-	40	60	100	2
4	20EE12001	Basic Electrical Engineering	ESC	3	-	-	40	60	100	3
5	20ME12002	Engineering Graphics	ESC	2	-	2	40	60	100	3
6	20CS12002	Discrete Mathematics	ESC	3	-	-	40	60	100	3
7	20PH12L01	Semiconductor Devices Lab	BSC	-	-	2	40	60	100	1
8	20CS12L01	Programming for Problem Solving-II Lab	ESC	-	-	2	40	60	100	1
9	20EE12L01	Basic Electrical Engineering Lab	ESC	-	-	2	40	60	100	1
10	20ME12L01	Engineering Workshop	ESC	-	-	2	40	60	100	1
Total				**16**	**1**	**10**	**400**	**600**	**1000**	**22**
Total Periods per Week				**27**						

SECOND YEAR SEMESTER-I

S.No.	Course Code	Course Title	Category	Number of Periods per Week			Scheme of Examination with Maximum Marks			No of Credits
				L	T	P/D	CIE	SEE	Tot	
1	20CS21001	Data Structures	PCC	3	-	-	40	60	100	3
2	20EC21002	Digital Design	ESC	3	-	-	40	60	100	3
3	20CS21002	Object Oriented Programming	PCC	3	-	-	40	60	100	3
4	20MB21004	Engineering Economics and Accounting	HSMC	3	-	-	40	60	100	3
5	20CS21003	Database Management Systems	PCC	3	-	-	40	60	100	3
6	20CS21L01	Data Structures Lab	PCC	-	-	2	40	60	100	1
7	20CS21L02	Object Oriented Programming Lab	PCC	-	-	2	40	60	100	1
8	20CS21L03	Database Management Systems Lab	PCC	-	-	2	40	60	100	1
9	20EN21P01	English for Effective Communication*	HSMC	-	-	2	100	-	100	1
10	20CH21M01	Environmental Science	MC	3	-	-	-	-	-	-
Total				**18**	**0**	**8**	**420**	**480**	**900**	**19**
Total Periods per Week				**26**						

***Activity Based Non-Laboratory Course (NO LABORATORY REQUIRED)**

SECOND YEAR SEMESTER-II

S.No.	Course Code	Course Title	Category	Number of Periods per Week			Scheme of Examination with Maximum Marks			No of Credits
				L	T	P/D	CIE	SEE	Tot	
1	20CS22001	Design and Analysis of Algorithms	PCC	3	-	-	40	60	100	3
2	20CS22002	Computer Architecture and Assembly Language Programming	PCC	3	-	-	40	60	100	3
3	20CS22003	Operating Systems	PCC	3	-	-	40	60	100	3
4	20CS22004	Web Technologies	PCC	3	-	-	40	60	100	3
5	**Open Elective I**		OEC	3	-	-	40	60	100	3
	20CE22061	Building Technology								
	20EE22062	Industrial Safety and Hazards								
	20ME22063	Nano Materials and Technology								
	20EC22064	Electronic Measuring Instruments								
	20MB22066	Intellectual Property Rights								
6	20CS22L01	Design and Analysis of Algorithms Lab	PCC	-	-	2	40	60	100	1
7	20CS22L02	Operating Systems and Assembly Language Programming Lab	PCC	-	-	2	40	60	100	1
8	20CS22L03	Web Technologies Lab	PCC	-	-	2	40	60	100	1
9	20EN22P01	English for Career Development*	HSMC	-	-	2	100	-	100	1
10	20CS22P01	Design Thinking	PROJ	-	-	4	100	-	100	2
Total				**15**	**0**	**12**	**520**	**480**	**1000**	**21**
Total Periods per Week				**27**						

***Activity Based Non-Laboratory Course (NO LABORATORY REQUIRED)**

Note: Students have to undergo internship program during the summer vacation which shall be evaluated internally during third year first semester. There is no Semester End Examination for internship.

THIRD YEAR SEMESTER-I

S.No.	Course Code	Course Title	Category	Number of Periods per Week			Scheme of Examination with Maximum Marks			No of Credits
				L	T	P/D	CIE	SEE	Tot	
1	20MA31001	Statistics for Machine Learning	BSC	3	-	-	40	60	100	3
2	20CS31002	Computer Networks	PCC	3	-	-	40	60	100	3
3	20CS31003	Artificial Intelligence	PCC	3	-	-	40	60	100	3
4	Professional Elective I		PEC	3	-	-	40	60	100	3
	20CS31010	Theory of Computation								
	20CS31011	Design Patterns								
	20CS31012	Digital Image Processing								
	20CS31006	Data Warehousing and Data Mining								
5	20MA31L01	Statistics for Machine Learning Lab	BSC	-	-	2	40	60	100	1
6	20CS31L02	Computer Networks Lab	PCC	-	-	2	40	60	100	1
7	20CS31L03	Artificial Intelligence Lab	PCC	-	-	2	40	60	100	1
8	20MA31P01	Logical Reasoning-I*	BSC	-	-	4	100	-	100	2
9	20EN31P01	English for Professional Success*	HSMC	-	-	2	100	-	100	1
10	20CS31004	Internship	PROJ	-	-	-	100	-	100	2
11	20CS31M03	Introduction to Cyber Security	MC	3	-	-	-	-	-	-
Total				**15**	**0**	**12**	**580**	**420**	**1000**	**20**
Total Periods per Week				**27**						

***Activity Based Non-Laboratory Course (NO LABORATORY REQUIRED)**

THIRD YEAR SEMESTER-II

S.No.	Course Code	Course Title	Category	Number of Periods per Week			Scheme of Examination with Maximum Marks			No of Credits
				L	T	P/D	CIE	SEE	Tot	
1	20CS32008	Cryptography and Network security	PCC	3	-	-	40	60	100	3
2	20CS32005	Machine Learning	PCC	3	-	-	40	60	100	3
3	**Professional Elective-II**		PEC	3	-	-	40	60	100	3
	20CS32016	Optimization Techniques								
	20CS32017	Software Engineering								
	20CS32013	Distributed Systems								
	20CS32009	Information Retrieval Systems								
4	**Professional Elective–III**		PEC	3	-	-	40	60	100	3
	20CS32012	Principles of Programming Languages								
	20CS32001	Internet of Things								
	20CS32018	Distributed Databases								
	20CS32019	Natural Language Processing								
5	**Open Elective II**		OEC	3	-	-	40	60	100	3
	20CE32071	Green Buildings								
	20EE32072	Energy Conservation and Management								
	20ME32073	Digital Fabrication								
	20EC32074	Principles of Communication Systems								
	20MB32076	Supply Chain Management								
6	20CS32L06	Cryptography and Network security Lab	PCC	-	-	2	40	60	100	1
7	20CS32L04	Machine Learning Lab	PCC	-	-	2	40	60	100	1
8	20EN32L01	Professional Communication Skills Lab	HSMC	-	-	2	40	60	100	1
9	20MA32P01	Logical Reasoning-II*	BSC	-	-	4	100	-	100	2
10	20MB32M04	Professional Ethics	MC	3	-	-	-	-	-	-
Total				**18**	**0**	**10**	**420**	**480**	**900**	**20**
Total Periods per Week				**28**						

***Activity Based Non-Laboratory Course (NO LABORATORY REQUIRED)**

Note: Students have to do Mini Project during the summer vacation which shall be evaluated during fourth year first semester through Semester End Examination.

FOURTH YEAR SEMESTER-I

S.No.	Course Code	Course Title	Category	Number of Periods per Week			Scheme of Examination with Maximum Marks			No of Credits
				L	T	P/D	CIE	SEE	Tot	
1	20CS41001	Big Data Analytics	PCC	3	-	-	40	60	100	3
2	20CS41011	Computational Intelligence	PCC	3	-	-	40	60	100	3
3	20CS41008	Deep Learning	PCC	3	-	-	40	60	100	3
4	20CS41003	Cloud Computing	PCC	3	-	-	40	60	100	3
5	**Professional Elective – IV**		PEC	3	-	-	40	60	100	3
	20CS41012	Web Services								
	20CS41018	Software Testing Methodologies								
	20CS41020	Digital forensics								
	20CS41021	Bioinformatics								
6	20CS41L01	Big Data Analytics Lab and Cloud computing lab	PCC	-	-	2	40	60	100	1
7	20CS41L08	Deep Learning Lab	PCC	-	-	2	40	60	100	1
8	20CS41004	Project Seminar	PROJ	-	-	2	100	-	100	1
9	20CS41005	Mini Project	PROJ	-	-	-	-	100	100	2
Total				**15**	**0**	**06**	**380**	**520**	**900**	**20**
Total Periods per Week				**21**						

FOURTH YEAR SEMESTER-II

S.No.	Course Code	Course Title	Category	Number of Periods per Week			Scheme of Examination with Maximum Marks			No of Credits
				L	T	P/D	CIE	SEE	Tot	
1	**Professional Elective-V**		PEC	3	-	-	40	60	100	3
	20CS42007	IoT Analytics								
	20CS42004	Software Project Management								
	20CS42011	Machine Learning for Cyber Security								
	20CS42003	Human Computer Interaction								
2	**Open Elective III**		OEC	3	-	-	40	60	100	3
	20CE42081	Disaster Management								
	20EE42082	Micro-electro-mechanical Systems								
	20ME42083	Principles of Automobile Engineering								
	20EC42084	Biomedical Instrumentation								
	20MB42086	Entrepreneurship								
3	20MB42005	Project Management and Finance	HSMC	3	-	-	40	60	100	3
4	20CS42001	Project	PROJ	-	-	20	40	60	100	10
5	20CS42002	Technical Seminar	PROJ	-	-	2	100	-	100	1
Total				**9**	**0**	**22**	**260**	**240**	**500**	**20**
Total Periods per Week				**31**						

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Cheeryal (V), Keesara (M), Medchal Dist., Telangana-501301

20EN11001-ENGLISH

B.Tech. CSE (AIML) - I Year, I Sem.

L	T	P/D	C
3	-	-/-	3

Prerequisite(s): None.

Course Objectives
Develop ability to
1. Improve the language proficiency in English with an emphasis on Vocabulary, Grammar, Reading and Writing skills.
2. Communicate formally in a given context.

Course Outcomes (COs)
At the end of the course, student would be able to
CO1. Infer and use the vocabulary/ grammatical components befitting the context.
CO2. Comprehend any given text and respond precisely.
CO3. Construct meaningful and explicit sentences in written form befitting the context

UNIT–I
'Raman effect' from the prescribed text book 'English for Engineers' published by Cambridge University press.
Vocabulary Building
Etymology; The Concept of word formation, the use of Prefixes and Suffixes, One-word substitutes.
Grammar
Identifying Common Errors in writing with reference to Articles and Prepositions.
Reading
Improving Reading Comprehension Skills-Techniques for effective reading.
Writing
Importance of proper Punctuation, Types of sentences-simple, compound and complex sentences.

UNIT-II
'Ancient Architecture in India', from the prescribed text book 'English for Engineers' published by Cambridge University press.
Vocabulary Building
Synonyms and Antonyms, homonyms, homophones, homographs.
Grammar
Identifying Common Errors in writing with reference to Noun-Pronoun Agreement and Subject Verb-Agreement.
Reading
Improving Reading Comprehension skills; Skimming and Scanning: Techniques for good Comprehension.
Writing-Paragraph writing: types, Structures and features of Paragraph, Creating Coherence, Organizing Principles of Paragraphs in a document, expansion of proverbs.

UNIT-III

'Patriotism beyond politics and religion' from 'Ignited Minds'-unleashing the power within India by Dr. APJ Abdul Kalam-Published by Penguin Books.

Vocabulary Building: Words from Foreign Languages and their use in English-word roots.

Grammar

Identifying common errors in writing with reference to misplaced and dangling modifiers and Tenses.

Reading

Sub skills of Reading; Skimming and Scanning.

Writing

Format of a formal Letter, Writing Formal Letters: Letter of Complaint, Letter of Requisition, Cover Letter with Resume, Abstract Writing.

UNIT-IV

'What should you be Eating' from the prescribed text book 'English for Engineers' Published by Cambridge University press.

Vocabulary Building

Idioms and phrases, phrasal verbs.

Grammar

Redundancies and Clichés in Oral and Written Communication.

Reading

Comprehension-Intensive Reading and Extensive Reading, searching for implied meaning-answering the questions on theme and tone.

Writing

Writing Practices-Writing Introduction and Conclusion, Blog Writing and Responding to Blogs, Essay Writing - Précis Writing.

UNIT-V

'How a Chinese Billionaire built her fortune' from the prescribed text book 'English for Engineers' Published by Cambridge University press.

Vocabulary Building

Practice exercises.

Grammar

Active and Passive Voice.

Reading

Reading Comprehension-Exercises for Practice-unseen passages.

Writing

Technical Reports; Introduction, Characteristics of report, categories of reports, Formats, Structure of reports (Manuscript Format) and Types of Report.

TEXT BOOK(S)

1. Sudarshana, N.P. and Savitha, C. (2018). *English for Engineers*, Cambridge University Press.
2. Penguin Books eBook: Ignited Minds- unleashing the power within India by Dr. A.P.J.Abdul Kalam- Published by Penguin Books.

REFERENCE BOOK(S)

1. Swan, M. (2016) *Practical English Usage*. Oxford University Press.
2. Mikulecky Beatrice S & Linda Jeffries, Pearson Publications, 2007

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20MA11001-BASIC ENGINEERING MATHEMATICS

B.Tech. CSE (AIML) - I Year, I Sem.

L	T	P/D	C
3	1	-/-	4

Prerequisite(s): None.

Course Objectives

Develop ability to

1. Understand various types of matrices, properties and rank of the matrix to find the solution for system of equations, if it exists.
2. Apply the knowledge of eigenvalues and eigenvectors of a matrix from quadratic form into a canonical form through linear transformation.
3. Solve first and higher order differential equations of various types.
4. Analyze properties of Laplace Transform, Inverse Laplace Transform and to understand how the product of the Transforms of two functions relates to their convolution
5. Identify the methods of solving the differential equations of first and higher order applications namely, Newton's law of cooling, Natural growth and decay, Electrical circuits, Simple harmonic motion and Bending of Beams.

Course Outcomes(COs)

At the end of course, student would be able to

CO1. Apply elementary transformations to solve a system of linear equations and reduce the quadratic form to the canonical form using linear and / or orthogonal transformation.

CO2. Form first order differential equations for Heat flow, Growth and Decay, Electrical Circuits and apply appropriate methods for solving them.

CO3. Form higher order differential equations for Bending of beams, Simple harmonic motion, Electrical circuits and apply appropriate methods and / or Laplace Transforms for solving them.

UNIT-I

Matrices

Types of Matrices: Symmetric**,** Hermitian, Skew-symmetric, Skew-Hermitian, Orthogonal matrices, Unitary Matrices; rank of a matrix by Echelon form and Normal form, Inverse of Non-singular matrices by *Gauss-Jordan method.

System of linear equations: Solving system of Homogeneous and Non-Homogeneous equations**,** *Gauss elimination method.

UNIT-II

Eigenvalues and Eigenvectors

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

UNIT-III

Ordinary Differential Equations

First order Ordinary Differential Equations: *Exact differential equations, *Linear differential equations and Bernoulli's equations.

Second and higher order linear differential equations with Constant Coefficients: Non homogeneous of the type e^{ax}, sin ax, cos ax, x^n, $e^{ax}V(x)$ and $xV(x)$**,** Method of variation of parameters, Equations reducible to linear order differential equations with constant coefficients: Legendre's equation, Cauchy-Euler equation.

UNIT-IV

Laplace Transforms

Definition of Laplace Transform, Existence of Laplace Transform, Laplace Transform of standard functions, first shifting theorem, Laplace Transform of functions when they are multiplied or divided by "t", Laplace Transforms of derivatives and integrals of functions, Unit step function, second shifting theorem, Dirac's delta function, Periodic function, Evaluation of integrals using Laplace Transforms, Inverse Laplace Transform by Partial fractions (Heaviside method), Inverse Laplace Transforms of functions when they are multiplied or divided by "s", Inverse Laplace Transforms of derivatives and integrals of functions, Convolution theorem.

UNIT-V

Applications of Ordinary Differential Equations

Applications of First order Ordinary Differential Equations: *Newton's law of cooling, *Law of Natural growth and decay, Electrical circuits.

Applications of Higher order Ordinary Differential Equations: Electrical circuits, Simple harmonic motion, Bending of beams.

***Enlightenment with flowchart and algorithmic approach.**

TEXT BOOK(S)

1. Higher Engineering Mathematics, B.S. Grewal, Khanna Publishers, 44th Edition, 2017.
2. Advanced Engineering Mathematics, Erwin Kreyszig, John Wiley & Sons, 10th Edition, 2011.

REFERENCE BOOK(S)

1. A Text book of Engineering Mathematics, N.P. Bali and Manish Goyal, Laxmi Publications, 10th Edition, 2015.
2. Advanced Engineering Mathematics, H.K. Das, S. Chand and Company Ltd, 21st Edition, 2013.
3. Advanced Engineering Mathematics, Jaggi and Mathur, Khanna Publishers, 6th Edition, 2019.
4. Advanced Engineering Mathematics, R.K. Jain and S.R.K. Iyengar, Alpha Science International Limited, 4th Edition, 2013.

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20PH11003 – APPLIED PHYSICS

B.Tech. CSE (AIML) - I Year, I Sem.

L	T	P/D	C
3	-	-/-	3

Prerequisite(s): None.

Course Objectives

Develop ability to

1. Understand the fundamental concepts of quantum behavior of matter in its micro state and experimental evidence to dual nature of matter, and physical significance and application of wave function.
2. Impart the knowledge of the formation of energy bands in solids, effective mass of an electron and classification of solids.
3. Understand the characteristics of intrinsic and extrinsic semiconductors, and applications of Hall effect.
4. Understand the basic principles, construction, working and applications of various lasers and optical fibers, and causes for attenuation in optical fibers.
5. Understand different types of dielectric polarization mechanisms, properties and applications of different dielectric and magnetic materials.

Course Outcomes (COs)

At the end of the course, student would be able to

CO1. Explain the quantum principles to analyze the behavior of quantum systems through Schrodinger's wave equation for classification of solids.

CO2. Compare and classify dielectric, magnetic materials and semiconductors in the presence of external fields for various applications.

CO3. Apply the principles of energy matter interactions to various types of lasers, optical fibers and analyze their characteristics for different applications.

UNIT-I

Quantum Mechanics

Introduction to quantum physics, Black body radiation, Planck's law (qualitative), Photoelectric effect, de-Broglie's hypothesis, Wave-particle duality, Davisson and Germer experiment, Heisenberg's uncertainty principle, Born's interpretation of the wave function, Schrodinger's time independent wave equation, Particle in one dimensional box.

UNIT-II

Band Theory of Solids

Electrons in a periodic potential-Bloch theorem, Kronig-Penney Model (qualitative treatment), Brillouin Zones (E-k curve), origin of energy band formation in solids, concept of effective mass of an electron, classification of materials into conductors, semiconductors and insulators.

UNIT-III

Semiconductors

Classification of semiconductors: n-type, p-type, carrier concentration in intrinsic and extrinsic semiconductors, Fermi level in intrinsic and extrinsic semiconductors, variation of Fermi level with temperature and concentration of dopants in extrinsic semiconductors, direct and indirect band gap semiconductors, Hall effect and its applications.

UNIT-IV

Lasers and Fiber Optics

Laser: Interaction of radiation with matter: absorption, spontaneous emission and stimulated emission. Characteristics of laser, resonating cavity, active medium, pumping methods and mechanisms, population inversion, construction and working of lasers: Nd: YAG laser, He-Ne laser, Carbon dioxide (CO_2) laser, applications of lasers.

Fiber Optics: Introduction, total internal reflection, acceptance angle, acceptance cone and numerical aperture, step and graded index optical fibers, losses associated with optical fibers, applications of optical fibers.

UNIT-V

Dielectric and Magnetic Properties of Materials

Electric dipole, dipole moment, dielectric constant, polarizability, electric susceptibility, displacement vector, electronic and ionic polarizations (quantitative), orientation and space charge polarizations (qualitative). Internal fields in solids, Clausius-Mosotti equation, Ferroelectric, Piezoelectric and their applications.

Origin of magnetic moment, Bohr magneton, classification of Dia, Para, Ferro, Antiferro and Ferrimagnetic materials, domain theory of Ferro magnetism, hysteresis curve, soft and hard magnetic materials and their applications.

TEXT BOOK(S)

1. Physics, Halliday, Resnick and Krane, Wiley Publishers, 5th edition, 2018.
2. Engineering Physics, B.K. Pandey, S. Chaturvedi, Cengage Learing, 2018.

REFERENCE BOOK(S)

1. Semiconductor optoelectronics: Physics and Technology, J.Singh, McGraw-Hill Inc., 1995.
2. A Textbook of Engineering Physics, Dr. M. N. Avadhanulu, Dr. P.G. Kshirsagar, S. Chand, Revised edition, 2018.
3. Online Course: “Optoelectronic Materials and Devices” by Monica Katiyar and Deepak Gupta on NPTEL.
4. Introduction to Solid State Physics, C. Kittel, Wiley Publications, 8th edition, 2004.

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20CH11001-ENGINEERING CHEMISTRY

B.Tech. CSE (AIML) - I Year, I Sem.

L	T	P/D	C
3	-	-/-	3

Prerequisite(s): None.

Course Objectives

Develop ability to

1. Acquire the knowledge of atomic, molecular and electronic modifications for understanding properties of transition complexes.
2. Comprehend the basic concepts of hardness of water, corrosion and their impact on industries.
3. Learn the essential concepts of electro chemistry and working of Lead acid battery and Lithium battery.
4. Learn the synthetic aspects of drugs and polymers through organic reaction mechanisms.
5. Understand the basic concepts of UV-Visible, IR, Microwave and NMR spectroscopyfor identifying molecular/atomic changes

Course Outcomes(COs)

At the end of the course, student would be able to

CO1. Apply the concepts of atomic and molecular changes for analyzing the nature of diatomic molecules and transition metal complexes.
CO2. Analyze the causes of hardness of water, corrosion and apply the knowledge acquired to solve the problems of industrial significance.
CO3. Utilize the concepts of electrochemistry to explain the functioning of Lead acid and Lithium batteries.
CO4. Apply the fundamentals of reaction mechanisms for the synthesis of organic compounds and polymers of industrial importance.
CO5. Identify the molecular/atomic changes using UV-Visible, IR, Microwave and NMR spectroscopic techniques.

UNIT–I

Molecular structure and Theories of Bonding

Atomic and Molecular orbitals. Linear Combination of Atomic Orbitals (LCAO), Molecular orbitals of diatomic molecules, Molecular Orbital Energy Level diagrams of N_2, O_2 and F_2 molecules. Crystal Field Theory (CFT):Salient Features of CFT – Crystal Field Splitting of transition metal ion d-orbitals in Tetrahedral and Octahedral geometries. Crystal Field Stabilization Energies (CFSE). Applications of CFT- Magnetic Properties of the Octahedral and Tetrahedral Complexes.

UNIT-II

Water and its treatment

Introduction – Hardness of water – Causes of hardness - Types of hardness: temporary and permanent – Expression and units of hardness – Estimation of hardness of water by complexometric method. Potable water and its specifications. Steps involved in treatment of water – Disinfection of water by chlorination and ozonization. Boiler feed water and its treatment – Calgon conditioning, Phosphate conditioning and Colloidal conditioning. External treatment of water – Ion exchange process. Desalination of water - Reverse osmosis. Numerical problems.

UNIT-III

Electrochemistry and corrosion

Electrochemical cells – Electrode potential, Standard electrode potential, Types of electrodes – calomel, quinhydrone and glass electrode. Nernst equation, Determination of pH of a solution by using quinhydrone and glass electrode. Electrochemical series and its applications. Numerical problems. Potentiometric titrations. Batteries – Primary (Lithium cell) and secondary batteries (Lead – acid storage battery and Lithium-ion battery).

Causes and effects of corrosion – Theories of chemical and electrochemical corrosion – Mechanism of electrochemical corrosion, Types of corrosion: galvanic, water-line and pitting corrosion. Factors affecting rate of corrosion, Corrosion control methods- Cathodic protection – Sacrificial anode and impressed current cathodic methods. Surface coatings – metallic coatings – methods of application. Electroless plating of Nickel.

UNIT-IV

Reaction Mechanisms

Substitution reactions: Nucleophilic substitution reactions: Mechanism of S_N1, S_N2 reactions. Electrophilic and Nucleophilic addition reactions: Addition of HBr to propene. Markovnikov's and anti-Markovnikov's additions. Grignard additions on carbonyl compounds. Elimination reactions: Dehydrohalogenation of alkyl halides, Saytzeff's rule. Oxidation reactions: Oxidation of alcohols using $KMnO_4$ and Chromic acid.

Reduction reactions: Reduction of carbonyl compounds using $LiAlH_4$ & $NaBH_4$. Hydroboration of olefins. Structure, synthesis and pharmaceutical applications of Paracetamol and Aspirin.

Polymeric materials

Classification of polymers, Types of Polymerizations - addition and condensation, Differences between addition and condensation polymers, Mechanism of free radical addition polymerization. Preparation, properties and engineering applications of PVC, Teflon and Nylon- 6, 6.

UNIT-V

Spectroscopic techniques and applications

Introduction to spectroscopic techniques- Electronic spectroscopy- Beer lambert's law, Principle of UV-Visible spectroscopy, Selection rules, Types of electronic transitions and applications of UV-Visible spectroscopy; Vibrational and rotational spectroscopy- IR spectroscopy-Principle- Mode of vibrations, Selection rules, Applications of IR spectroscopy, Nuclear magnetic resonance Spectroscopy- Principle, Chemical shift, Factors influencing chemical shift, Medical application of NMR spectroscopy - Magnetic Resonance Imaging.

TEXT BOOK(S)

1. Engineering Chemistry by B.Ramadevi, Prasanta Rath and Ch.Venkata Ramana Reddy, Cengage Publications, 2018.
2. A Text Book of Engineering Chemistry by M. Thirumala Chary, E. Laxminarayana and K. Shashikala, Pearson Publishers, 2020.

REFERENCE BOOK(S)

1. Engineering Chemistry by P.C Jain & Monica Jain, Dhanpatrai Publishing Company, 17th edition, 2015.
2. Elements of Physical Chemistry by P.W. Atkins 4th Edition.
3. Fundamentals of Molecular Spectroscopy, by C.N. Banwell, 4th Edition.
4. Selected topics in Inorganic Chemistry by Wahid U. Malik, G.D. Tuli and R.D Madan. S. Chand publications, 17th Edition.

GEETHANJALI COLLEGE OF ENGINEERING AND TECHNOLOGY
(UGC Autonomous)
Cheeryal (V), Keesara (M), Medchal Dist., Telangana-501301

20CS11001-PROGRAMMING FOR PROBLEM SOLVING-I

B.Tech. CSE (AIML) - I Year, I Sem.

L	T	P/D	C
2	-	-/-	2

Prerequisite(s): None.

Course Objectives
Develop ability to
1. Developing flowcharts for given problem.
2. Understand the concepts of variables, constants, basic data types and input and output statements in C programming language.
3. Understand the use of sequential, selection and repetitive statements in algorithms implemented using C programming language.
4. Understand structured design by implementing programs with functions to solve complex problems.
5. Understand the concepts related to arrays and pointers along with dynamic memory allocation using C programming language.

Course Outcomes (COs)
At the end of the course, student would be able to
CO1. Develop Flowchart and Convert it into C Program for a given problem.
CO2. Apply conditional branching, iteration and recursion to solve a given problem.
CO3. Analyze the given problem and write a C Program by applying the concept of function call mechanism for a given problem
CO4. Solve problems through C programs using the concepts of Arrays, Pointers and Dynamic Memory Allocation.

UNIT–I
Basics of Computers
Introduction to components of a computer system: disks, primary and secondary memory, processor, operating system, compilers.
Logic Building
Flow chart, Algorithm, Pseudo code.
Introduction to Programming
Computer Languages, Creating and running programs, Program Development.
Introduction to the C Language
Background, C Programs, Identifiers, Data Types, Variables, Constants, Input/output functions.
Operators
Arithmetic, relational, logical, bitwise, conditional, increment/decrement, assignment, C program examples. Expressions, Precedence and Associativity, Expression Evaluation, Type conversions.

UNIT-II
Statements
Selection Statements (decision making) – if and switch statements with C program examples.
Repetition statements (loops)
while, for, do-while statements with C Program examples
Statements related to looping
break, continue, goto, Simple C Program examples.

UNIT-III

Functions

Designing Structured Programs, Functions, user defined functions, inter function communication, Scope and Lifetime of variables, Storage classes-auto, register, static, extern, type qualifiers, C program examples.

Recursion

recursive functions, Limitations of recursion, example C programs

UNIT-IV

Arrays

Concepts, using arrays in C, arrays and functions, Bubble Sort, Linear Search, two – dimensional arrays-matrix addition and matrix multiplication, Declaration of Multidimensional arrays, Pre-processor Directives, C program examples.

UNIT-V

Pointers

Introduction (Basic Concepts), Pointers for inter function communication, pointers to pointers, compatibility, void pointer, null pointer.

Pointer Applications

Arrays and Pointers, Pointer Arithmetic and arrays, passing an array to a function.

Memory allocation functions

malloc(), calloc(), realloc(), free(), Array of pointers, pointers to functions, C program examples.

TEXT BOOK(S)

1. Computer Science: A Structured Programming Approach Using C, B.A.Forouzan and R.F. Gilberg, Third Edition, Cengage Learning.

REFERENCE BOOK(S)

1. Raptor-A flow charting Tool http://raptor.martincarlisle.com
2. The C Programming Language, B.W. Kernighan and Dennis M.Ritchie, PHI.
3. 3.Programming in C. P. Dey and M Ghosh , Oxford University Press.
4. Programming with C, B.Gottfried, 3rd edition, Schaum's outlines, TMH.
5. Problem Solving and Program Design in C, J.R. Hanly and E.B. Koffman, 7th Edition, Pearson education.

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20CS11L01-PROGRAMMING FOR PROBLEM SOLVING-I LAB

B.Tech. CSE (AIML) - I Year, I Sem.

L	T	P/D	C
-	-	2/-	1

Prerequisite(s): None.

Course Objectives

Develop ability to

1. Developing flowcharts for given problem.
2. Understand the concepts of variables, constants, basic data types and input and output statements in C programming language.
3. Understand the use of sequential, selection and repetitive statements in algorithms implemented using C programming language.
4. Understand structured design by implementing programs with functions to solve complex problems.
5. Understand the concepts related to arrays and pointers along with dynamic memory allocation using C programming language.

Course Outcomes(COs)

At the end of the course, student would be able to

CO1. Develop Flowchart and Convert it into C Program for a given problem.

CO2. Apply conditional branching, iteration and recursion to solve a given problem.

CO3. Analyze the given problem and write a C Program by applying the concept of function call mechanism for a given problem

CO4. Solve problems through C programs using the concepts of Arrays, Pointers and Dynamic Memory Allocation.

LIST OF EXPERIMENTS

Week-1

Introduction to RAPTOR Tool

Draw Flow chart using RAPTOR to,

a. Read two numbers from user and calculate addition and subtraction of those numbers
b. Read two numbers from user at the time of execution and calculate multiplication and division of those numbers
c. Find the square of a given number (take the number from the user)
d. Calculate the value of Y from the equation $y = x^2 + 2x + 3$ (read the value of X from user)
e. Calculate the area of a Circle
f. Find the sum of square of two numbers

Week-2

a. Write a C program to perform arithmetic operations
b. Write a C program to implement increment and decrement operators
c. Write a C program to implement conditional operator
d. Write a C program to implement bit wise operator

Week-3

Draw Flow chart using RAPTOR tool and Implement using C program to,

a. Check whether the given number is Positive or Negative.
b. Check whether the given number is even or odd.

c. Calculate the Largest of two numbers.
d. Check the given year is leap year or not.

Week-4

Draw Flow chart using RAPTOR tool and Implement using C program to,

a. Calculate and display the grade of a student
   i. < 30 % - Fail
   ii. Between 31 and 50 – C grade
   iii. Between 51 to 60 – B grade
   iv. Between 61 to 75 – A grade
   v. Greater than 75 – distinction
b. Find the quadratic roots of an equation (real or imaginary)
c. Check the given number is multiple of 2,4and 8.

Week-5

Draw Flow chart using RAPTOR for,

a. Displaying n numbers using looping
b. Calculating the sum of n natural numbers
c. Calculating sum of even numbers and odd numbers from 1 to n (n value supplied by the user)

Week-6

a. Write a C program to implement arithmetic calculator using switch-case.
b. Write a C program to find sum of n natural numbers.
c. Write a C program to find sum of individual digits of the given number
d. Write a C program to find factorial of a given number

Week-7

a. Write a C program to check the given number is prime or not.
b. Write a C program to check the given number is Palindrome or not.
c. Write a C program to display the prime numbers below n.

Week-8

a. Write a C program to find GCD and LCM of two given numbers using functions
b. Write a C program to check the given number is Armstrong number or not using functions.

Week-9

a. Write a C program to find the sum of prime numbers from 1 to n using functions.
b. Write a C program to generate Fibonacci series for n number of terms.

Week-10

a. Write a C program to find the factorial of a given number using recursive function
b. Write a C program to generate the Fibonacci series using recursive function.
c. Write a C program to find GCD and LCM of two numbers using recursive function.

Week-11

a. Write a c program to find largest and smallest numbers in a list of array elements using functions
b. Write a C program to sort the given list of elements in ascending order using Bubble Sort.
c. Write a c program to search for a given element in the list of array and display the “location” if the number is found else print “the number is not found”. Using fixed length and variable length array

Week-12

a. Find the duplicate elements in the list of sorted array
b. Write a C program that uses functions to perform the Addition of Two Matrices
c. Write a C program that uses functions to perform the Multiplication of Two Matrices

Week-13

a. Write a C program to swap two integers using following methods
    i. call by value
    ii. call by reference
b. Write a C program to find sum of even and odd numbers using functions and pointers

Week-14

a. Write a C program to find Largest Number Using Dynamic Memory Allocation.
b. Write a C program to return multiples values from a function using pointers

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20CH11L01-ENGINEERING CHEMISTRY LAB

B.Tech. CSE (AIML) - I Year, I Sem.

L	T	P/D	C
-	-	2/-	1

Prerequisite(s): None.

Course Objectives

Develop ability to

1. Estimate the hardness content in water and check its suitability for drinking purpose.
2. Use instrumental methods namely, Potentiometry and Conductometry to find the concentration of a given solution.
3. Measure physical properties like surface tension, adsorption, acid value and viscosity.
4. Explain the synthesis of simple drug molecules such as Aspirin.
5. Determine the rate constant of reactions from concentrations as a function of time.

Course Outcomes(COs)

At the end of the course, student would be able to

CO1. Determine the temporary and permanent hardness in water to verify its suitability for drinking purpose.
CO2. Find the concentration of given solution using instrumental techniques suchasPotentiometry and Conductometry.
CO3. Determine physical properties, namely, surface tension, acid value and viscosityof a given fluid.
CO4. Use fundamental preparatory techniques for the synthesis of drugs such as aspirin.
CO5. Estimate the rate constant of a reaction from concentration – time relationship.

LIST OF EXPERIMENTS

I. Titrimetry

1. Determination of total hardness of water by complexometric method using EDTA.
2. Determination of acid value of coconut oil.

II. Instrumental Methods

A. Potentiometry

3. Estimation of HCl by Potentiometric titrations.
4. Estimation of Fe^{2+} by Potentiometry using $KMnO_4$.

B. Conductometry

5. Estimation of HCl by Conductometric titrations.
6. Estimation of Acetic acid by Conductometric titrations.

III. Physical Constants

7. Determination of viscosity of a given liquid by using Ostwald's Viscometer.
8. Determination of surface tension of a given liquid using Stalagmometer.

IV. Synthesis

9. Synthesis of Aspirin.

V. Kinetics

10. Determination of rate constant of acid catalysed hydrolysis of methyl acetate.

VI. Additional Experiments

11. Verification of Freundlich adsorption isotherm-adsorption of acetic acid on charcoal.
12. Determination of partition coefficient of acetic acid between n-butanol and water.

REFERENCE BOOK(S)

1. Senior Practical Physical Chemistry, B.D. Khosla, A. Gulati and V. Garg (R. Chand & Co., Delhi).
2. An introduction to Practical Chemistry, K.K. Sharma and D. S. Sharma (Vikas publishing, N. Delhi).
3. Vogel's text book of practical Organic Chemistry 5th edition.
4. Text book on Experiments and calculations in Engineering Chemistry – S.S. Dara.

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20EN11L01-ENGLISH LANGUAGE COMMUNICATION SKILLS LAB

B.Tech. CSE (AIML) - I Year, I Sem.

L	T	P/D	C
-	-	2/-	1

Prerequisite(s): None.

Course Objectives

Develop ability to

1. Use computer-assisted multimedia instruction for independent language learning.
2. Enunciate English speech sounds, word accent, intonation and rhythm appropriately.
3. Present their ideas and views in any formal context.

Course Outcomes(COs)

At the end of the course, student would be able to

CO1. Listen actively, speak intelligibly and write clearly.
CO2. Use Phonetics to neutralize accent.
CO3. Articulate ideas explicitly, both verbally and non-verbally.
CO4. Demonstrate basic skills to succeed in interviews.

English Language and Communication Skills Lab (ELCS) shall have two parts:
a. Computer Assisted Language Learning (CALL) Lab
b. Interactive Communication Skills (ICS) Lab

MODULE-I
CALL Lab:
Understand: Listening: Listening Skill-Its Importance-Purpose-Process-Types-Barriers to Listening.
Practice: Introduction to Phonetics-Speech Sounds-Vowels and Consonants-Minimal pairs.

ICS Lab:
Understand: Communication at Work Place-Spoken vs. Written language.
Practice: Speaking: Ice-Breaking Activity and JAM Session. Know your partner activity.

MODULE-II
CALL Lab:
Understand: Listening: Structure of Syllable, Word Stress and Rhythm, Weak Forms and Strong Forms in Context**.**
Practice: Basic Rules of Word Accent-Stress Shift-Weak Forms and Strong Forms in Context.

ICS Lab:
Understand: Features of Good Conversation–Non-verbal Communication.
Practice: Speaking: Telephone Etiquette, Situational Dialogues-Greetings-Taking Leave-Making request and seeking permission-Introducing oneself and others.

MODULE-III
CALL Lab:
Understand: Listening: Intonation; Errors in pronunciation-The interference of Mother Tongue (MTI) examples from different parts of the country.
Practice: Common Indian Variants in Pronunciation- Differences in British and American Pronunciation.

ICS Lab:
Understand: How to make Formal Presentations.
Practice: Speaking: Descriptions- Places, Objects, Events and Process-Formal Presentations.

MODULE-IV
CALL Lab:
Understand: Listening for General Details. (2 practice exercises)
Practice: Listening Comprehension Tests. (2 practice exercises)
ICS Lab:
Understand: Public Speaking-Debate-Exposure to Structured talks.
Practice: Speaking: Making a Short Speech-Extempore. (2 practice exercises, Talks. (2 practice exercises) 'My Newspaper' activity.

MODULE-V
CALL Lab:
Understand: Listening: Listening for Specific Details. (2 practice exercises)
Practice: Listening Comprehension Tests. (2 practice exercises)
ICS Lab:
Understand: Speaking: General Interview Skills.
Practice: General Interview Strategies and Skills.

TEXT BOOK(S)

1. Krishna Mohan & N. P Singh: *Speaking English Effectively* 2nd ed., MacMillan Publishers, 2011.
2. ELCS Lab Manual prepared by Faculty, Department of English, GCET.

REFERENCE BOOK(S)

1. English Language Communication Skills Lab Manual cum Workbook by Cengage Learning India, 2013.
2. Podcasts on Listening, Cambridge University Press.

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20PH12001-SEMICONDUCTOR DEVICES

B.Tech. CSE (AIML) - I Year, II Sem.

L	T	P/D	C
3	-	-/-	3

Prerequisite(s):
20PH11003-APPLIED PHYSICS

Course objectives
Develop ability to
1. Understand the energy band diagrams and characteristics of semiconductor diodes and optoelectronic devices.
2. Understand the performance of rectifier and voltage regulator circuits.
3. Understand the various transistor configurations and their characteristics needed for applications.
4. Understand the concept of stability factor and different biasing methods for the stability of a circuit.

Course Outcomes (COs)
At the end of the course, student would be able to
- CO1. Analyze the characteristics of diodes and optoelectronic devices using basic concepts of semiconductors for their suitability in electronic circuits.
- CO2. Apply the characteristics of semiconductors to design rectifier and voltage regulator circuits.
- CO3. Analyze the characteristics of transistor and compare various transistor configurations for their suitability as various amplifiers.
- CO4. Analyze the biased stability for a given circuit and design a biased circuit for a given stability factor.

UNIT–I
P-N junction diode
Qualitative theory of p-n junction, Energy level diagram of p-n junction in forward & reverse bias condition, p-n junction as a diode, volt-ampere characteristics, temperature dependence of V-I characteristics, Transition and Diffusion capacitances(qualitative),breakdown mechanisms in semiconductor diodes, Zener diode characteristics, Varactor diode characteristics.

UNIT-II
Optoelectronics
Radiative and non-radiative recombination mechanisms in semiconductors, direct and indirect band gap semiconductors, LED and semiconductor lasers: device structure, materials, characteristics, semiconductor photo detectors: photodiode, solar cell, PIN, avalanche and their structure, materials, working principle and characteristics.

UNIT-III
Rectifiers and Filters
p-n junction diode as a rectifier, half wave rectifier, full-wave rectifier, bridge rectifier, harmonic components in a rectifier circuit, inductor filter, capacitor filter, L- section filter, π-Section filter, comparison of filters, voltage regulation using Zener diode.

UNIT-IV

Bipolar Junction Transistor

Junction transistor, BJT symbol, transistor construction, BJT operation, common base, common emitter and common collector configurations. Transistor current components, limits of operation, transistor as an amplifier, comparison of CB, CE, CC amplifier configurations.

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UNIT-V

Transistor biasing-stabilization and Field Effect Transistor

The DC and AC load lines, Operating point, need for biasing, bias stability and stabilization factors, stabilization against variations in V BE and β: fixed bias, collector feedback bias, Emitter feedback bias, Collector-Emitter feedback bias, Voltage divider bias.

Field Effect Transistor: The Junction field effect Transistor (Construction, Principle of operation, symbol) Pinch–off voltage, V-I characteristics, comparison of BJT and FET (Qualitative treatment).

TEXT BOOK(S)

1. Electronic Devices & Circuits, Millman, Halkias and Sathyabrata Jit, McGraw Hill Book Publishers.
2. Engineering Physics, K. Malik, A.K. Singh, Tata McGraw Hill Book Publishers.

REFERENCE BOOK(S)

1. Electronic Devices & Circuits, S Salivahanan, N. Srush kumar, A. Vallava Raj, Second edition, Tata McGraw Hill Book Publishers.
2. Fundamentals of Physics, David Halliday, John Weily Publishers.
3. University Physics, Sear's and Zemansky (10^{th} Edition), Wesly Publishers.
4. Online course: "Optoelectronic materials and devices" by Monica Katiyar and Deepak Gupta on NPTEL.

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20MA12001-MULTI VARIABLE CALCULUS

B.Tech. CSE (AIML) - I Year, II Sem.

L	T	P/D	C
3	1	-/-	4

Prerequisite(s):
20MA11001-BASIC ENGINEERING MATHEMATICS

Course Objectives
Develop ability to
1. Compute partial derivatives, composite functions of several variables and apply the methods of differential calculus to optimize multivariable functions and evaluate improper integrals using Beta and Gamma functions.
2. Evaluate definite integrals to calculate surface and volume of revolutions of curves, multiple integrals and apply the same to solve engineering problems.
3. Explain properties of vector operators to determine solenoidal and irrotational vectors, directional derivatives of vectors.
4. Determine the length of a curve, area between the surfaces and volumes of solids using vector integration.
5. Formation of Partial differential equations and various methods to solve them.

Course Outcomes(COs)
At the end of course, student would be able to
- CO1. Apply the concept of partial differentiation to solve constrained optimization problems without graphical representation.
- CO2. Apply the definite / multiple integrals to compute arc length and areas / volumes of any region / solids.
- CO3. Transform line, surface and volume integrals by using vector integral theorems to measure the boundary of a region, area of a surface and / or volume of solids.
- CO4. Form first and higher order partial differential equations and apply appropriate methods to solve one-dimensional heat and wave equations.

UNIT-I
Partial Differentiation, Applications and Beta, Gamma Functions
Definitions of Limit and Continuity, Partial differentiation, Euler's theorem, Total derivative, Jacobian, Functional dependence and independence, *Maxima and Minima of functions of two variables and three variables using Lagrange's method of multipliers.
Improper Integrals: Beta and Gamma functions and their applications.

UNIT-II
Multiple Integrals and Applications of Integration
Applications of definite integrals to evaluate surface areas and volumes of revolutions of curves (Only in Cartesian coordinates).
Evaluation of Double Integrals (Cartesian and Polar coordinates),change of order of integration (only Cartesian form).
Evaluation of Triple Integrals, change of variables (Cartesian to Polar) for double integrals, (Cartesian to Spherical and Cylindrical Polar coordinates) for triple integrals.
Applications: Areas (by double integrals) and volumes (by double integrals and triple integrals).

Unit-III

Vector Differentiation

Vector point functions and Scalar point functions, Gradient, Divergence and Curl, Directional derivatives, Tangent plane and Normal line, Vector identities, Scalar potential function, Solenoidal and Irrotational vectors.

UNIT-IV

Vector Integration

Line, Surface and Volume Integrals. Fundamental theorems of Vector Integration: Green's Theorem, Gauss divergence Theorem and Stoke's Theorem (without proofs).

UNIT-V

Partial Differential Equations

Introduction and formation of Partial Differential Equations by elimination of arbitrary constants and arbitrary functions, solutions of first order Linear (Lagrangian) equation, Method of separation of variables for second order equations. Applications of Partial differential equations: One dimensional Wave equation, One dimensional Heat equation.

*****Enlightenment with flowchart and algorithmic approach.

TEXT BOOK(S)

1. Higher Engineering Mathematics, B.S. Grewal, Khanna Publishers, 44th Edition, 2017.
2. Advanced Engineering Mathematics, Erwin Kreyszig, John Wiley & Sons, 10th Edition, 2011.

REFERENCE BOOK(S)

1. A Text book of Engineering Mathematics, N.P. Bali and Manish Goyal, Laxmi Publications, 10th Edition, 2015.
2. Advanced Engineering Mathematics, H.K. Das, S. Chand and Company Ltd, 21st Edition, 2013.
3. Advanced Engineering Mathematics, Dr. A. B. Mathur and Prof. V.P. Jaggi, Khanna Publishers, 6th Edition, 2019.
4. Advanced Engineering Mathematics, R.K. Jain and S.R.K. Iyengar, Alpha Science International Limited, 4th Edition, 2013.

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20CS12001-PROGRAMMING FOR PROBLEM SOLVING-II

B.Tech. CSE (AIML) - I Year, II Sem.

L	T	P/D	C
2	-	-/-	2

Prerequisite(s):
20CS11001-PROGRAMMING FOR PROBLEM SOLVING-I

Course Objectives
Develop ability to
1. Understand the concepts of strings ,structure, union, and enumerated types
2. Understand linear lists and their implementation using arrays and linked list.
3. Understand the classical approaches to sorting arrays: selection sort, quick sort, insertion sort; sequential and binary searching algorithms.
4. Concepts and principles of stacks and queues and their applications.
5. Understand the basic characteristics of text, binary files and C implementation of file I/O using streams and command line arguments.

Course Outcomes(COs)
At the end of course, student would be able to
CO1. Solve problems using concepts of string functions, structures, unions.
CO2. Perform basic operations by building Linear Linked List.
CO3. Build C Programs for searching and sorting algorithms
CO4. Build Stacks and Queues through C programs for different applications.
CO5. Perform operations on files using C programs.

UNIT-I
Strings
Concepts, C Strings, String Input / Output functions, string manipulation functions, arrays of strings, string / data conversion, C program examples.
Enumerated Types
The Type Definition (typedef), Enumerated types.
Structure and Union Types
Declaration, initialization, accessing structures, operations on structures, Complex structures, Structures and functions, passing structures through pointers, self-referential structures, unions, bit fields.

UNIT-II
Linear list
Singly linked list implementation, insertion, deletion and searching operations on linear list

UNIT-III
Sorting
Selection sort, Quick Sort, Insertion sort techniques (Using Arrays)
Searching
Linear search, Binary search techniques (Using Arrays)

UNIT-IV

Stacks

Introduction, Principle, Operations: Push and Pop, In-fix to Post-Fix Conversion and Post-Fix evaluation. (Array implementation.)

Queues

Introduction, Principle, Operations: Enqueue and Dequeue. (Array implementation.)

UNIT-V

File Input and Output

Concept of a file, text files and binary files, Differences between text and binary files, State of a file, Opening and Closing files, file input / output functions (standard library input / output functions for files), file status functions (error handling), Positioning functions.

Command line arguments.

Program Development

Multi-source files, Separate Compilation of functions.

TEXT BOOK(S)

1. Computer Science: A Structured Programming Approach Using C, B.A. Forouzan and R.F. Gilberg, Thompson Learning, 3rd Edition,

REFERENCE BOOK(S)

1. The C Programming Language, B.W. Kernighan and Dennis M.Ritchie, PHI.
2. Programming in C. P. Dey and M Ghosh , Oxford University Press.
3. Programming with C, B.Gottfried, 3rd edition, Schaum‟s outlines, TMH.
4. Problem Solving and Program Design in C, J.R. Hanly and E.B. Koffman, 7th Edition, Pearson education.
5. C & Data structures – P. Padmanabham, 3rd Edition, B.S. Publications.

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20EE12001–BASIC ELECTRICAL ENGINEERING

B.Tech. CSE (AIML) - I Year, II Sem.

L	T	P/D	C
3	-	-/-	3

Prerequisite(s): None.

Course Objectives

Develop ability to

1. Understand the concepts of DC circuits and its analysis.
2. Understand the concepts of AC single phase circuits and its analysis.
3. Understand the concepts of single phase and three phase Transformers.
4. Understand the concepts of AC and DC machines.
5. Understand the working of various domestic electrical installation components.

Course Outcomes(COs)

At the end of the course, student would be able to

CO1. Analyze DC and AC electrical circuits using basic laws and network theorems
CO2. Illustrate the fundamental laws used in the working of different AC and DC machines Analyze the characteristics of DC and AC machines.
CO3. Determine the performance characteristics of various DC and AC machines
CO4. Differentiate various electrical installation components based on the application and perform the energy consumption calculations

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 RL-C circuit.

UNIT-III

Faradays Laws of Electromagnetic Induction. Statically and dynamically induced emf. Transformers: Ideal and practical transformers, equivalent circuit, losses in transformers and efficiency. Auto-transformer and Three-phase transformer connections, voltage and current relation.

UNIT-IV

Direct-Current Machines: Construction, operation and Types. Torque-Speed Characteristics of DC shunt and series motors and its applications. Generation of rotating magnetic fields, Construction and working of a three-phase induction motor, Significance of torque-slip characteristic. Single-phase induction motor: Construction and working and its applications.

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 and their applications. Elementary calculations for energy consumption.

TEXT BOOK(S)

1. Basic Electrical Engineering - D.P. Kothari and I.J. Nagrath, 3rd edition 2010, Tata McGraw Hill.
2. Electrical Engineering Fundamentals, Vincent Del Toro, Second Edition, Prentice Hall India, Pvt. Ltd.

REFERENCE BOOK(S)

1. D.C. Kulshreshtha, “Basic Electrical Engineering”, McGraw Hill, 2009.
2. L.S. Bobrow, Fundamentals of Electrical Engineering”, Oxford University Press, 2011
3. “Basic Electrical Engineering”, T.K. Nagsarkar, M.S Sukhija, JNTU Edition, 2005
4. “A text book of Electrical Technology”, Volume II, B.L.Thereja, A.K.Thereja

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20ME12002-ENGINEERING GRAPHICS

B.Tech. CSE (AIML) - I Year, II Sem.

L	T	P/D	C
2	-	2/-	3

Prerequisite(s): None.

Course Objectives
Develop ability to
1. Understand basic concepts in engineering drawing.
2. Understand the principle of orthographic projection and isometric projection for planes and solids.
3. Draw sectional views of various solids.
4. Draw isometric views and pictorial views of solids.
5. Learn basic concepts and commands in AutoCAD.

Course Outcomes (COs)
At the end of the course, student would be able to
CO1. Illustrate dimensioning, specifications, conventions and CAD tools used in Engineering Drawing.
CO2. Construct scales, geometric curves (conic sections & cycloids) and apply them in engineering drawing.
CO3. Apply the principles of orthographic projections to draw projections of points, straight lines, planes, solids and sections of solids.
CO4. Develop the isometric views from orthographic views and vice versa for the better visualization and communication.

UNIT–I
Introduction to Engineering Drawing: Principles of Engineering Graphics and their Significance, Conic Sections including the Rectangular Hyperbola – General method only. Cycloid, Epicycloid, Hypocycloid.

UNIT-II
Engineering Scales
Plain, Diagonal.
Orthographic Projections
Principles of orthographic Projections Conventions-Projections of Points.

UNIT-III
Projections of Lines
Projections of Plane regular geometric figures.

UNIT-IV
Projections of Regular Solids inclined to one plane, Sections or Sectional views of Right Regular Solids – Prism, Cylinder, Pyramid, Cone, Sphere.

UNIT-V
Isometric Projections
Principles of Isometric Projection – Isometric Scale – Isometric Views –Conventions – Isometric Views of Lines, Plane Figures, Simple Solids – Isometric Projection of objects having non- isometric lines.

Conversion of Isometric views to Orthographic Views and vice versa.
Introduction to CAD: (For Internal Evaluation only)
Introduction to CAD Software Package Commands. - Free Hand Sketches of 2D- Creation of 2D Sketches by CAD Package.

TEXT BOOK(S)

1. Engineering Drawing, N.D. Bhatt / Charotar, 53rd Edition 2016.
2. Engineering Drawing, Basant Agrawal and C M Agrawal, McGrawHill, 2nd Edition 2013.

REFERENCE BOOK(S)

1. Engineering Drawing , N. S. Parthasarathy and Vela Murali, Oxford, 1st Edition 2015.
2. Engineering Drawing/ M. B. Shah, B.C. Rane / Pearson, 2nd Edition 2013.
3. Computer Aided Engineering Drawing – K Balaveera Reddy, CBS Publishers. 2nd Edition 2015.
4. Engineering Graphics with AutoCAD, Dr.D.M. Kulkarni and A. Sarkar., Prentice Hall India, New Delhi, 2009

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20CS12002-DISCRETE MATHEMATICS

B.Tech. CSE (AIML) - I Year, II Sem.

L	T	P/D	C
3	-	-/-	3

Prerequisite(s): None

Course Objectives

Develop ability to

1. Understand concepts of Mathematical Logic, mechanisms of inference rules for propositional and predicate logic and their applications.
2. Understand the concepts of Sets, Relations, Functions and their applications.
3. Learn the concepts of Algebraic Structures, basics of counting, Principles of inclusion/exclusion and the pigeonhole methodology.
4. Understand Generating Functions, Recurrence Relations and various ways of solving them.
5. Understand basic definitions and properties of graphs and their applications in computer science and engineering.

Course Outcomes(COs)

At the end of the course, student would be able to

CO1. Construct a mathematical argument and verify its correctness using symbolic logic and truth tables.

CO2. Apply properties of sets, relations, functions, and algebraic structures for a given problem.

CO3. Apply basic, advanced counting techniques and recurrence relations for a given problem.

CO4. Apply concepts of Graph theory for a given problem.

UNIT-I

Mathematical Logic

Statements and notations, Connectives, Normal forms, The Theory of inference for the Statement Calculus, The Predicate Calculus, Inference theory of the Predicate Calculus.

UNIT-II

Set Theory

Basic concepts of set theory, Properties of Binary Relations, equivalence, transitive closure, compatibility and partially ordered set, Hasse diagram, Lattices, Functions, Inverse Function, Composition of functions, recursive Functions,

UNIT-III

Algebraic structures

Algebraic Systems Examples and General Properties, Semi groups and Monoids, Groups, Homomorphisms.

Elementary Combinatorics

Basis of Counting, Combinations & Permutations, Enumeration of combinations and permutations - with Repetitions -with Constrained repetitions, Binomial Coefficients, The Binomial and Multinomial Theorems, The Principle of Inclusion – Exclusion, Pigeon hole principle and its application.

UNIT-IV

Recurrence Relations

Generating Functions of Sequences, Calculating Coefficients of Generating Functions, Recurrence relations, Solving Recurrence Relations by Substitution and Generating Functions, The Method of Characteristic roots, Solutions of Inhomogeneous Recurrence Relations.

UNIT-V

Graph Theory

Basic Concepts, Isomorphisms and Sub graphs, Trees and Their Properties, Spanning Trees, Planar Graphs, Euler's Formula, Multi graphs and Euler's Circuits, Hamiltonian graphs, Chromatic Numbers, The Four-Color Problem.

TEXT BOOK(S)

1. Discrete Mathematical Structures with Applications to Computer Science, J.P.Tremblay, R.Manohar, 1st Edition, Tata McGraw Hill, 2001. (Unit 1,Unit 2, Unit 3 - Algebraic structures)
2. Discrete Mathematics for Computer Scientists & Mathematicians, J.L. Mott, A. Kandel, T.P. Baker, 2nd Edition, PHI, 2009. (Unit 3-Elementary Combinatorics, Unit 4,Unit 5)

REFERENCE BOOK(S)

1. Elements of Discrete Mathematics- A computer Oriented Approach-C L Liu, D P Mohapatra. Third Edition, Tata McGraw Hill.
2. Discrete Mathematics and its Applications, Kenneth H. Rosen, Fifth Edition.TMH.
3. Discrete Mathematical structures Theory and application-Malik & Sen, Cengage.
4. Discrete Mathematics with Applications, Thomas Koshy, Elsevier.
5. Logic and Discrete Mathematics, Grass Man &Trembley, Pearson Education.

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20PH12L01-SEMICONDUCTOR DEVICES LAB

B.Tech. CSE (AIML) - I Year, II Sem.

L	T	P/D	C
-	-	2/-	1

Prerequisite(s):
20PH11003-APPLIED PHYSICS

Course Objectives
Develop ability to
1. Determine magnetic induction at several points on the axis of circular coil carrying current.
2. Determine time constant of a RC circuit, energy gap of a given semiconductor, Hall coefficient, work function of a given photo sensitive material.
3. Plot V-I characteristics of LED, LASER, p-n junction and Zener diode, understand rectification process and working of rectifier, understand the conversion of light into electrical energy.
4. Plot the characteristics of transistor in CB and CE configurations.
5. Plot drain and transfer characteristics of a Field Effect Transistor (FET).

Course Outcomes(COs)
At the end of the course, student would be able to
- CO1. Plot and analyze the characteristics of various p-n junction diodes, BJT, FET, and identify type of semiconductor.
- CO2. Measure the time constant of a given capacitor using RC circuit.
- CO3. Demonstrate the conversion of AC to DC with and without filters.
- CO4. Demonstrate dual nature of light.
- CO5. Explain the variation of magnetic field with distance.

Any ten of the following twelve experiments are mandatory to perform by each student
1. Determination of Planck's constant using the V-I characteristics of LED.
2. Draw the V-I characteristics of a given source of LASER.
3. Determination of time constant of a given RC combination.
4. Determination of energy gap of a given semiconductor using p-n diode.
5. Plot the V-I characteristics of p-n junction diode and Zener diode.
6. Plot the input and output characteristics of n-p-n transistor - CE and CB configurations.
7. Conversion of ac to dc using full wave rectifier with and without filters.
8. Plot the drain and transfer characteristics of FET.
9. Plot the V-I characteristics of a Solar cell.
10. Determination of Hall coefficient and carrier density of a given semiconductor.
11. Determination of work function of a given photo sensitive material.
12. Determination of magnetic field along the axis of a current carrying circular coil using Stewart and Gee's apparatus.

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20CS12L01-PROGRAMMING FOR PROBLEM SOLVING-II LAB

B.Tech. CSE (AIML) - I Year, II Sem.

L	T	P/D	C
-	-	2/-	1

Prerequisite(s):
20CS11L01-PROGRAMMING FOR PROBLEM SOLVING-I LAB

Course Objectives
Develop ability to
1. Understand the concepts of strings ,structure, union, and enumerated types
2. Understand linear lists and their implementation using arrays and linked list.
3. Understand the classical approaches to sorting arrays: selection sort, quick sort, insertion sort; sequential and binary searching algorithms.
4. Concepts and principles of stacks and queues and their applications.
5. Understand the basic characteristics of text, binary files and C implementation of file I/O using streams and command line arguments.

Course Outcomes(COs)
At the end of the course, student would be able to
CO1. Solve problems using concepts of string functions, structures, unions.
CO2. Perform basic operations by building Linear Linked List.
CO3. Build C Programs for searching and sorting algorithms
CO4. Build Stacks and Queues through C programs for different applications.
CO5. Perform operations on files using C programs.

LIST OF EXPERIMENTS
Week-1
a. Write a C program to find whether a given string is palindrome or not.
b. Write a C program to insert characters at a given location in a given string.
c. Write a C program to delete characters from a given string and position
d. Write a C program to print the number of vowels and consonants using Strings

Week-2
a. Write a C program to convert Roman number to Decimal Number.
b. Write a C program to find the 2's Compliment of a given string
c. Write a C program to Reverse a String by Passing it to function
d. Write a C Program to Input a String with at least one Number, Print the Square of all the Numbers in a String

Week-3
a. Write a C program to implement complex structures for the following operations.
   i. Addition of two Complex numbers
   ii. Multiplication of two Complex Numbers

Week-4
a. Write a C program to implement arrays of structures?
b. Write a C program to implement bit fields in C?

Week-5

a. Write a C Program to store the information (name, roll no, and branch) of a student using unions.
b. Write a C program to implement inter function communication by passing pointers to a structure.

Week-6

a. Write a C program to implement singly linked list for the following operations.
i)Insertion ii)Deletion iii)Search

Week-7

a. Write a C program to sort the elements using Selection sort
b. Write a C program to sort the elements using Quick sort.

Week-8

a. Write a C program to sort the elements using Insertion sort
b. Write a C program to search a string in a list of strings using linear search. If the string is found display the position, otherwise print "string not present".

Week-9

a. Write a C program to search an element in a list of elements using Binary search. If the element is found, display the position, otherwise print "element not present".

Week-10

a. Write a C program convert infix to postfix notation and postfix evaluation using stack.

Week-11

a. Write a C program implement Queue using arrays for the following operations.
i)Enqueue ii)Dequeue iii) Peek iv)Display

Week-12

a. Write a C program open a new file and implement the following I/O functions.
i) fprintf(), fscanf()
ii) getw(), putw()
iii) getc(), putc()

Week-13

a. Write a C program to copy data from one file to another.
b. Write a C program to merge two files, using command line arguments.

Week-14

a. Write a C program to implement multi file programming for basic arithmetic operations

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20EE12L01–BASIC ELECTRICAL ENGINEERING LAB

B.Tech. CSE (AIML) - I Year, II Sem.

L	T	P/D	C
-	-	2/-	1

Prerequisite(s): None.

Course Objectives

Develop ability to

1. Analyze a given network by applying various electrical laws and network theorems
2. Know the response of electrical circuits for different excitations.
3. apply physical laws to solve for unknowns like currents, voltages, impedances, etc.
4. Inspect the speed torque characteristics of DC motor
5. Inspect the speed torque characteristics Three Phase Induction Motor

Course Outcomes (COs)

At the end of the course, student would be able to

CO1. Apply various fundamental laws and theorems to electrical circuits with AC and DC excitations

CO2. Calculate electrical parameters in single phase and three phase circuits

CO3. Determine the performance characteristics of various AC and DC machines

LIST OF EXPERIMENTS:

1. Verification of KVL and KCL
2. Verification of Superposition Theorem
3. Transient Response of Series RL and RC circuits using DC excitation
4. Calculations and Verification of Impedance and Current of RL, RC and RL Cseries circuits
5. Resonance in series RLC circuit
6. Measurement of Voltage, Current and Real Power in primary and Secondary Circuits of a Single-Phase Transformer
7. Load Test on Single Phase Transformer (Efficiency Calculations)
8. Measurement of Active and Reactive Power in a balanced Three-phase circuit
9. Torque-Speed Characteristics of a DC Shunt Motor
10. Torque-Speed Characteristics of a Three-phase Induction Motor

Additional Experiments:

1. Verification of Thevenin's Theorem.
2. Three Phase Transformer: Verification of Relationship between Voltages and Currents (Star-Delta, Delta-Delta, Delta-star, Star-Star)

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20ME12L01-ENGINEERING WORKSHOP

B.Tech. CSE (AIML) - I Year, II Sem.

L	T	P/D	C
-	-	2/-	1

Prerequisite(s): None.

Course Objectives

Develop ability to

1. Provide hands on experience about use of different engineering materials, tools, equipments and processes those are common in the engineering field.
2. Impart a good basic working knowledge required for the production of various engineering products.

Course Outcomes (COs)

At the end of the course, student would be able to

CO1. Devise plan of experimentation encompassing process identification, preparatory sketches, and methodology

CO2. Apply various hand tools and perform basic manufacturing operations in different trades to produce engineering components adhering to workshop safety regulations.

CO3. Demonstrate usage of power tools in different trades

CO4. Demonstrate the experimental learning through presentation/ prototype submission.

NOTE: *At least **TWO** exercises to be done from each trade.*

I. TRADES FOR EXERCISES:

A. Carpentry exercises:

a) Making of T-lap joint from given pieces of wood as per as for the job drawing.
b) Making of mortise and tenon joint from given pieces of wood as per as for the job drawing.
c) Making of Bridle joint from given pieces of wood as per as for the job drawing.
d) Making of Corner lap joint from given pieces of wood as per as for the job drawing.
e) Making of cross lap joint from given pieces of wood as per as for the job drawing.

B. Fitting exercises:

a) Making of L-Fitting joint from given pieces of mild steel as per as for the job drawing.
b) Making of "V" – joint from given pieces of mild steel as per as for the job drawing.
c) Making of "Half round" joint from given pieces of mild steel as per as for the job drawing.
d) Making of "Dovetail" joint from given pieces of mild steel as per as for the job drawing.
e) Making of "Square" joint from given pieces of mild steel as per as for the job drawing.

C. Tin-Smithy exercises:

a) Making of an Open scoop with soldering from given G.I. sheet as for the job drawing.
b) Making of Rectangular tray with soldering from given G.I. sheet as for the job drawing.
c) Making of Cylinder with soldering from given G.I. sheet as for the job drawing.
d) Making of Hopper with soldering from given G.I. sheet as for the job drawing.
e) Make a funnel with soldering from given G.I. sheet as for the job drawing

D. Black Smithy exercises:

a) Making of an "S-Hook" from given piece of mild steel rod by hand forging.
b) Making of "U-Hook" from given piece of mild steel rod by hand forging.
c) Making of "C-Hook" from given piece of mild steel rod by hand forging.
d) Making of "Flat chisel" from given piece of mild steel rod by hand forging.

E. House-wiring exercises:

a) Practicing of Wiring for simple light circuit for controlling light/fan point (PVC conduit wiring).
b) Practicing of Wiring for light/fan circuit using two way switches (staircase wiring)
c) Measurement of voltage, current and power in a single phase circuit using voltmeter, ammeter and wattmeter. Calculate power factor of the circuit.
d) Practicing of Wiring for a water pump with single phase starter.

F. Foundry exercises:

a) Preparation of mould for the given single piece pattern with green sand.
b) Preparation of mould for the given split piece pattern with green sand.

G. Welding Practice exercises:

a) Preparation of simple butt joint using arc welding from given pieces of mild steel.
b) Preparation of lap joint using arc welding from given pieces of mild steel.
c) Preparation of corner joint using arc welding from given pieces of mild steel.

TEXT BOOK(S)

1. Workshop Practice /B. L. Juneja / Cengage
2. Workshop Manual / K. Venugopal / Anuradha.

REFERENCE BOOK(S)

1. Work shop Manual – P. Kannaiah/ K. L. Narayana/ SciTech
2. Workshop Manual / Venkat Reddy/ BSP

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20CS21001-DATA STRUCTURES

B.Tech. CSE (AIML) - II Year, I Sem.

L	T	P/D	C
3	-	-/-	3

Prerequisite(s):
20CS11001-PROGRAMMING FOR PROBLEM SOLVING-I
20CS12001-PROGRAMMING FOR PROBLEM SOLVING-II

Course Objectives
Develop ability to

1. Understand the basic concepts of Abstract Data Types, Linear and Non Linear Data structures.
2. Identify the notations used to represent the Performance of algorithms.
3. Understand the behavior of data structures such as stacks, queues, trees, hash tables, search trees, Graphs and their representations.
4. Familiarize with various data structures for various applications.
5. Understand various searching and sorting algorithms.
6. Write programs in C to solve problems using data structures such as arrays, linked lists, stacks, queues, trees, graphs, hash tables and search trees.

Course Outcomes(COs)
At the end of the course, student would be able to

CO1. Use asymptotic notation in representing space and time complexities of algorithms.
CO2. Construct different linear and non-linear data structures using array and linked representations and use them in appropriate applications.
CO3. Implement, use and compare different sorting, searching and pattern-matching algorithms for solving various problems.

UNIT-I
Data Abstraction, Performance analysis
Time complexity and space complexity, Asymptotic Notation-Big O, Omega and Theta notations.
Introduction to Linear and Non-Linear data structures: Circularly linked lists-Operations for Circularly linked lists, Doubly Linked Lists- Operations- Insertion, Deletion. Representations of array-row major and column major, Sparse matrices-array and linked representations.

UNIT-II
Stack ADT
Definition, operations, linked list implementation, Application of stack – Tower of Hanoi, Parenthesis Checker iterative and recursion implementation.
Queue ADT
Definition and operations, linked list implementation, Circular queues- Insertion and deletion operations, Deque (Double ended queue) ADT, array and linked implementations.

UNIT-III
Trees
Terminology, Representation of Trees, Binary tree ADT, Properties of Binary Trees, Binary Tree Representations-array and linked representations, Binary Tree traversals, Threaded binary trees.

Max Priority Queue ADT
Implementation-Max Heap-Definition, Insertion into a MaxHeap, Deletion from a Max Heap.
Sorting- Merge sort, Heap Sort, Radix Sort, Binary insertion sort Comparison of Sorting methods.

UNIT-IV

Search Trees

Binary Search Trees, Definition, Operations- Searching, Insertion and Deletion, AVL Trees-Definition and Examples, Insertion into an AVL Tree

B-Trees - Definition, B-Tree of order m, operations-Insertion and Searching, Introduction to Red-Black and Splay Trees, Comparison of Search Trees.

UNIT-V

Graphs

Introduction, Definition, Terminology, Graph ADT, Graph Representations-Adjacency matrix, Adjacency lists, Adjacency multi lists, Graph traversals- DFS and BFS. Static Hashing-Introduction, hash tables, hash functions, Overflow Handling. Pattern matching algorithm- The Knuth-Morris-Pratt algorithm.

TEXT BOOK(S)

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

REFERENCE BOOK(S)

1. Data structures and Algorithm Analysis in C, 2nd edition, M.A.Weiss, Pearson.
2. Data Structures using C, R.Thareja, Oxford University Press.
3. Data structures: A Pseudocode Approach with C, 2nd edition, R.F.Gilberg And B.A.Forouzan, Cengage Learning.
4. Data Structures using C, A.M.Tanenbaum,Y. Langsam, M.J.Augenstein, Pearson.
5. Data structures and Program Design in C, 2nd edition, R.Kruse, C.L.Tondo and B.Leung, Pearson.

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20EC21002–DIGITAL DESIGN

B.Tech. CSE (AIML) - II Year, I Sem.

L	T	P/D	C
3	-	-/-	3

Prerequisite(s): None.

Course Objectives

Develop ability to

1. Understand basic concepts of various number systems used in digital systems.
2. Understand Boolean algebra and various Boolean simplification theorems.
3. Understand simplification of Boolean functions using k-map and tabular method.
4. Understand design and analysis of combinational and sequential logic circuits.
5. Understand symmetric functions and design the same using relay contacts.
6. Understand Threshold logic and design switching functions using threshold elements

Course Outcomes(COs)

At the end of the course, student would be able to

CO1. Apply knowledge of number systems, codes and Boolean algebra to the analysis and design of digital logic circuits

CO2. Apply the knowledge of logic gates to design and implement various digital circuits

CO3. Identify, formulate, and solve simple problems in the area of digital logic circuit design.

CO4. Apply the concepts of symmetric functions, Threshold logic to design logic circuits.

CO5. Design digital circuits, component(s) or process to meet desired needs within realistic constraints

UNIT–I

Number Systems

Base Conversion Methods, Binary arithmetic, Complements of Numbers, Codes-Binary Codes, Binary Coded Decimal (BCD) Code and its Properties, Unit Distance Codes, Alpha Numeric Codes, Error Detecting and Correcting Codes.

Boolean Algebra and Switching Functions

Switching algebra, Basic Gates, Basic Theorems and Properties, Switching Functions, Canonical and Standard Form, Algebraic Simplification of Digital Logic Gates. Properties of XOR Gates, Universal Gates, Multilevel NAND/NOR realizations.

UNIT-II

Minimization of switching functions

Introduction, Minimization with theorems, The Karnaugh Map Method – Three, Four, Five and Six Variable maps. Prime Implicants and essential Prime Implicants. Don't care map entries, using the map for simplifying Boolean expressions, Tabular method, partially specified expressions, multi-output minimizations.

UNIT-III

Design of Combinational Circuits

Adders, Subtractors, Multiplexers, Realization of Switching Functions using Multiplexers, De-multiplexers, Decoders, Encoders, Priority Encoder, Comparators, Parity Generators, Code Converters. Static Hazards and Hazard Free Realizations.

UNIT-IV

Synthesis of Symmetric Networks

Relay Contacts, Analysis and Synthesis of Contact Networks, Symmetric Networks, Identification of Symmetric Functions and realization of the same.

Threshold Logic

Threshold Element, Capabilities and Limitations of Threshold logic, Elementary Properties, Synthesis of threshold networks (Unate function, Linear seperability, Identification and realization of threshold functions, Map based synthesis of two-level Threshold networks).

UNIT-V

Sequential Machines Fundamentals

Introduction, NAND/NOR latches, SR, JK, JK Master slave, D and T Flip-flops, Excitation functions of SR, JK, JK Master Slave, D and T Flip-flops. State table, State Diagram, State Assignment. Finite State Model - Basic Definitions. Synthesis of Synchronous Sequential circuits - Sequence Detector, Serial Binary adder, Binary counter and Parity bit generator.

Counters and Shift Registers

Ripple Counter, Shift Registers and their types, Ring Counters, Twisted Ring Counters.

TEXT BOOK(S)

1. Switching and Finite Automata Theory, ZviKohavi & Niraj K. Jha, 2nd Edition, 2009, Cambridge University Press.

REFERENCE BOOK(S)

1. Digital Fundamentals - A Systems Approach", Thomas L. Floyd,Pearson, 2013.
2. Fundamentals of Logic Design, Charles H. Roth, CengageLearning, 5th Edition, 2004.
3. Digital Design, Morris Mano, PHl, 3rd Edition

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20CS21002-OBJECT ORIENTED PROGRAMMING

B.Tech. CSE (AIML) - II Year, I Sem.

L	T	P/D	C
3	-	-/-	3

Prerequisite(s): None.

Course Objectives

Develop ability to

1. Understand basic concepts of object-oriented programming.
2. Understand the primitive data types built into the Java language and features of strongly typed language.
3. Learn scope, lifetime, and the initialization mechanism of variables and parameter passing mechanisms.
4. Write simple graphics programs involving drawing of basic shapes.
5. Create Graphical User Interfaces by means of Java Programming Language.

Course Outcomes(COs)

At the end of the course, student would be able to

CO1. Apply Object Oriented concepts to develop programs.
CO2. Develop multi-threaded applications with synchronization.
CO3. Use exception handling towards successful execution of programs.
CO4. Develop programs using Java Collection Frameworks and I/O classes.
CO5. Design GUI based applications using AWT and Swing
CO6. Use JDBC to develop programs.

UNIT-I

OOP concepts

Data abstraction, encapsulation, inheritance, benefits of inheritance, polymorphism, classes and objects, procedural and Object oriented programming paradigms.

Java Programming

History of Java, comments, data types, variables, constants, scope and life time of variables, operators, operator hierarchy, expressions, type conversion and casting, enumerated types, control flow block scope, conditional statements, loops break and continue statements. simple java program, arrays, console input and output, formatting output, constructors, methods, parameter passing, static fields and methods, access control, this keyword, overloading methods and constructors recursion, garbage collection, building strings, exploring string class

UNIT-II

Inheritance

Definition, hierarchies, super and subclasses, Member access rules, super keyword, preventing inheritance: final classes and methods, the Object class and its methods.

Polymorphism

Dynamic binding, method overriding, abstract classes and methods.

Interfaces

Interfaces vs. Abstract classes, defining an interface, implementing interfaces, accessing implementations through interface references, extending interface.

Inner classes

Uses of inner classes, local inner classes, anonymous inner classes, static inner classes, examples.

Packages

Definition, Creating and Accessing a package, understanding CLASSPATH, importing packages.

UNIT-III

Exception handling

Dealing with errors, benefits of exception handling, the classification of exceptions- exception hierarchy, checked exceptions and unchecked exceptions, usage of try, catch, throw, throws and finally, rethrowing exceptions, exception specification, built in exceptions, creating own exception sub classes.

Multi-Threading

Differences between multiple processes and multiple threads, thread states, creating threads, interrupting threads, thread priorities, synchronizing threads, inter thread communication, producer consumer pattern.

UNIT–IV

GUI Programming with java

The AWT class hierarchy, Introduction to Swing, Swing Vs AWT, Hierarchy for Swing components, containers- JFrame, JApplet, JDialog, JPanel, Overview of some swing components - JButton, JLabel, JTextField, JTextArea, simple Swing Applications, Layout Management- Layout Manager types- border , grid and flow

Event handling

Events, event sources, event classes, event Listeners, Relationship between event sources and Listeners Delegation event model, Examples: handling a button click, handling mouse events, Adapter classes.

UNIT–V

Connecting to Database

JDBC type 1 to 4 drivers, connecting to a data base, querying a data base and processing the results, updating data with JDBC.

Files: streams

byte streams, character streams, text input/ Output binary input/ output Random access file operations, file management using File class

Collection Frame work in java

Introduction to java Collections, overview of java collection frame work, Generics, commonly used collection classes- ArrayList, Vector, Hash table, Stack, Enumeration, Iterator, StringTokenizer.

TEXT BOOK(S)

1. Java fundamentals- A comprehensive Introduction, Herbert Schildt and Dale Skrien, TMH, 1st Edition, 2013.

REFERENCE BOOK(S)

1. Core Java 2–Volume1, Cay S. Horstmann and Gary Cornell
2. Java for Programmers, PJ. Dietel and H.M Deitel Pearson education.
3. Object Oriented Programming through Java. P.Radha Krishna. Universities Press.
4. Thinking in Java, Bruce Eckel, Pearson Education.

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20MB21004-ENGINEERING ECONOMICS AND ACCOUNTING

B.Tech. CSE (AIML) - II Year, I Sem.

L	T	P/D	C
3	-	-/-	3

Prerequisite(s): None.

Course Objectives

Develop ability to

1. Learn the basic Business types
2. Understand the impact of the Economy on Business and Firms specifically.
3. Analyze the Business from the Financial Perspective.
4. Understand the importance of handling Capital.
5. Learn fundamental concepts of accounting.

Course Outcomes (COs)

At the end of the course, student would be able to

CO1. Apply micro and macroeconomic concepts of business entities.
CO2. Explain elasticity of demand and types of market structures in business operations.
CO3. Apply the concepts of theories of production and demand forecasting in decision-making.
CO4. Categorize sources of raising capital and analyze the methods of capital budgeting.
CO5. Evaluate and interpret the financial statements.

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, Multidisciplinary 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, and Monopolistic Competition.

Pricing: Types of Pricing, Product Life Cycle based Pricing, Break Even Analysis, and Cost Volume Profit Analysis.

UNIT-IV

Capital Budgeting

Capital and its significance, Types of Capital, Estimation of Fixed and Working capital requirements, Methods and sources of raising capital – Trading Forecast, Capital Budget, Cash Budget. Capital **Budgeting**

Features of capital budgeting proposals, Methods of Capital Budgeting: Payback Method, Accounting Rate of Return (AR A) and Net Present Value Method (simple problems).

UNIT-V

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, and Preparation of Final Accounts.

TEXT BOOK(S)

1. Geethika Ghosh, Piyali Gosh, Purba Roy Choudhury, Managerial Economics, 2e, Tata McGraw Hill Education Pvt. Ltd. 2012.
2. S.N.Maheswari & S.K. Maheswari, Financial Management, Vikas, 2012.

REFERENCE BOOK(S)

1. Paresh Shah, Financial Accounting for Management 2e, Oxford Press, 2015.
2. S. N. Maheshwari, Sunil K Maheshwari, Sharad K Maheshwari, Financial Accounting, 5e, Vikas Publications, 2013.

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20CS21003-DATABASE MANAGEMENT SYSTEMS

II Year. B.Tech. (CSE) – I Sem

L	T	P/D	C
3	-	-/-	3

Prerequisite(s):
20CS12001-PROGRAMMING FOR PROBLEM SOLVING-II

Course Objectives
Develop ability to

1. Learn and practice data modeling using entity-relationship and develop database design.
2. Understand the features of database management systems and Relational database.
3. Understand Structured Query Language (SQL) and learn SQL syntax.
4. Understand normalization process of a logical data model and correct any anomalies.
5. Understand needs of database processing and learn techniques for controlling the consequences of concurrent data access.

Course Outcomes(COs)
At the end of the course, student would be able to

CO1. Design simple database using ER modelling and analyse the RDBMS approach towards database design
CO2. Apply theoretical and practical database querying languages to efficiently retrieve data stored in the database
CO3. Apply functional dependency and normalization techniques to arrive at a minimally redundant database
CO4. Apply concepts of concurrency control and data recovery in database transactions.
CO5. Apply indexing techniques to organize the data on the secondary storage devices enabling efficient data retrieval.

UNIT-I
Introduction
Data base System Applications, Purpose of Database Systems, View of Data – Data Abstraction , Instances and Schemas , Data Models ,Introduction to Data base design , ER diagrams, Beyond ER Design, Entities, Attributes and Entity sets , Relationships and Relationship sets , Additional features of ER Model , Conceptual Design with the ER Model , Conceptual Design for Large enterprises, database Access for applications Programs ,Data Storage and Querying,– data base Users and Administrator ,data base System Structure ,History of Data base Systems. Database Languages–DDL, DML, DCL.
Relational Model
Introduction to the Relational Model - Integrity Constraint Over relations – Enforcing Integrity constraints – Querying relational data, Logical data base Design, Introduction to Views – Destroying /altering Tables and Views.

UNIT-II
Relational Algebra and Calculus
Relational Algebra – Selection and projection ,set operations , renaming , Joins , Division , Examples of Algebra overviews , Relational calculus – Tuple relational Calculus – Domain relational calculus – Expressive Power of Algebra and calculus.

Form of Basic SQL Query

Examples of Basic SQL Queries , Introduction to Nested Queries, Correlated Nested Queries Set – Comparison Operators – Aggregative Operators , NULL values – Comparison using Null values – Logical connectivity's – AND, OR and NOT – Impact on SQL Constructs ,Outer Joins ,Disallowing NULL values , Complex Integrity Constraints in SQL Triggers and Active Data bases.

UNIT-III

Introduction to Schema refinement

Problems Caused by redundancy, Decompositions – Problem related to decomposition, Function dependencies- reasoning about FDS,

Normal Forms

FIRST, SECOND, THIRD Normal forms – BCNF – properties of Decompositions Lossless join Decomposition – Dependency preserving Decomposition – Schema refinement in Data base Design – Multi valued Dependencies – FORTH Normal Form, Join Dependencies, FIFTH Normal Form, Inclusive Dependencies.

UNIT-IV

Transaction Management

Transaction Concept- Transaction State- Implementation of Atomicity and Durability – Concurrent – Executions – Serializability- Recoverability – Implementation of Isolation – Implementation of Consistency - Testing for serializability.

Concurrency Control

Lock –Based Protocols – Timestamp Based Protocols- Validation- Based Protocols – Multiple Granularity.

Recovery system

Failure Classification- Storage Structure- Recovery – Atomicity – Log – Based Recovery- Recovery with Concurrent Transactions – Buffer Management – Failure with loss of non volatile storage - Advance Recovery systems- Remote Backup systems.

UNIT-V

Overview of Storage and Indexing

Data on External Storage, File Organization and Indexing – Cluster Indexes, Primary and Secondary Indexes, Index data Structures – Hash Based Indexing, Tree base Indexing, Comparison of File Organizations.

Tree Structured Indexing

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

Hash Based indexing

Static Hashing, Extendable Hashing, Linear Hashing, Extendible vs. Linear Hashing.

TEXT BOOK(S)

1. Fundamentals of Database Systems, Elmasri, Navathe, 7th Edition, Pearson Education, 2016.
2. Database Management Systems, Raghurama Krishnan, Johannes Gehrke, TATA McGrawHill, 3rd Edition

REFERENCE BOOK(S)

1. Data base System Concepts, Silberschatz, Korth, McGraw hill, VI edition.
2. Data base Systems design, Implementation, and Management, Peter Rob & Carlos Coronel 7th Edition.
3. Introduction to Database Systems, C.J.Date, Pearson Education

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20CS21L01-DATA STRUCTURES LAB

B.Tech. CSE (AIML) - II Year, I Sem.

L	T	P/D	C
-	-	2/-	1

Prerequisite(s):
20CS11L01-PROGRAMMING FOR PROBLEM SOLVING-I LAB
20CS12L01-PROGRAMMING FOR PROBLEM SOLVING-II LAB

Course Objectives
Develop ability to

1. Understand the basic concepts of Abstract Data Types, Linear and Non Linear Data structures.
2. Identify the notations used to represent the Performance of algorithms.
3. Understand the behavior of data structures such as stacks, queues, trees, hash tables, search trees, Graphs and their representations.
4. Familiarize with various data structures for various applications.
5. Understand various searching and sorting algorithms.
6. Write programs in C to solve problems using data structures such as arrays, linked lists, stacks, queues, trees, graphs, hash tables and search trees.

Course Outcomes (COs)
At the end of the course, student would be able to

CO1. Use asymptotic notation in representing space and time complexities of algorithms.
CO2. Construct different linear and non-linear data structures using array and linked representations and use them in appropriate applications.
CO3. Implement, use and compare different sorting, searching and pattern-matching algorithms for solving various problems.

LIST OF EXPERIMENTS

Week-1
Write a C program for polynomial addition using linked lists

Week-2
a. Write a C program that uses functions to perform the following:
   i. Create circularly linked lists
   ii. Delete a given integer from the above linked list.
   iii. Display the contents of the above list after deletion.
b. Write a C program that uses functions to perform the following:
   i. Create a doubly linked list of integers.
   ii. Delete a given integer from the above doubly linked list.
   iii. Display the contents of the above list after deletion

Week-3
Write C programs to implement a Stack and Queue ADT using singly linked list.

Week-4
Write a C program to implement the following by using stack
   i. Towers of Hanoi.
   ii. Parenthesis Checker

Week-5

Write a C program to implement Circular Queue

Week-6

Write C programs to implement a double ended queue ADT using linked list.

Week-7

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

i. Create a binary search tree of integers.
ii. Traverse the above Binary search tree in in-order, pre-order, post-order.

Week-8

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

i. Merge Sort
ii. Heap Sort

Week-9

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

i. Radix Sort
ii. Binary insertion sort

Week-10

Write a C program to perform the following operation:

i. Insertion into a B-tree.
ii. Searching a B-Tree

Week-11

Write C programs for implementing the following graph traversal algorithms:

i. Depth first traversal
ii. Breadth first traversal

Week-12

Write a C program to implement all the functions of a dictionary (ADT) using hashing

Week-13

Write a C program for pattern matching algorithm (KMP).

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20CS21L02-OBJECT ORIENTED PROGRAMMING LAB
B.Tech. CSE (AIML) - II Year, I Sem.

L	T	P/D	C
-	-	2/-	1

Prerequisite(s): None.

Course Objectives
Develop ability to
1. Understand basic concepts of object oriented programming.
2. Understand the primitive data types built into the Java language and features of strongly typed language.
3. Learn scope, lifetime, and the initialization mechanism of variables and parameter passing mechanisms.
4. Write simple graphics programs involving drawing of basic shapes.
5. Create Graphical User Interfaces by means of Java Programming Language.

Course Outcomes (COs)
At the end of the course, student would be able to
CO1. Apply Object Oriented concepts to develop programs.
CO2. Develop multi-threaded applications with synchronization.
CO3. Use exception handling towards successful execution of programs.
CO4. Develop programs using Java Collection Frameworks and I/O classes.
CO5. Design GUI based applications using AWT and Swing.
CO6. Use JDBC to develop programs

LIST OF EXPERIMENTS

Week-1
(Basic programs to get used to java syntax)
Write a Java program to
a. Print the Fibonacci series upto the given number.
b. Print the reverse of the given number
c. Find factorial of the given number at command line.
d. Prompt the user for an integer and then prints out all prime numbers up to that integer

Week-2
Write a Java program to
a. Check whether a given string is a palindrome or not. Ex: MADAM is a palindrome.
b. Sort a given list of names in ascending order.
c. Find frequency count of words in a given text.

Week-3
Write a java program to
a. Illustrate creation of classes and objects
b. Illustrate constructor and method overloading
c. Create a stack ADT

Week-4
Write a java program to
a. Implement different types of inheritance

b. Illustrate method overriding and Dynamic method dispatch
c. Illustrate static keyword with variables and methods

Week-5

Write a java program to

a. Create an interface for stack of integers with abstract methods push, pop and display. Write an implementation of the above mentioned abstract methods for a fixed size stack and a dynamic size stack.
b. Illustrate inner classes

Week-6

Write a java program to

a. Illustrate usage of try, catch, finally with multiple exceptions
b. Create user defined exceptions.

Week-7

Write a java program to

a. Create a thread by implementing Runnable interface.
b. Implement producer consumer problem using the concept of inter thread communication.

Week-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.

Week-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.

Week-10

Write a program that creates a user interface to perform integer divisions. The user enters two numbers in the text fields, Num1 and Num2. The division of Num1 and Num2 is displayed in the Result field when the Divide button is clicked. If Num1 or Num2 were not an integer, the program would throw a Number Format Exception. If Num2 were Zero, the program would throw an Arithmetic Exception Display the exception in a message dialog box.

Week-11

a. Write a java program that simulates a traffic light. The program lets the user select one of three lights: red, yellow, or green. When a radio button is selected, the light is turned on, and only one light can be on at a time No light is on when the program starts.
b. Write a Java program that allows the user to draw lines, rectangles and ovals.

Week-12

Write a java program to create an abstract class named Shape that contains an empty method named numberOfSides ( ).Provide three classes named Trapezoid, Triangle and Hexagon such that each one of the classes extends the class Shape. Each one of the classes contains only the method numberOfSides( ) that shows the number of sides in the given geometrical figures.

Week-13

a. Write a java Program that loads names and phone numbers from a text file where the data is organized as one line per record and each filed in a record are separated by a tab (\t). It takes a name or phone number as input and prints the corresponding other value from the hash table (hint: use hash tables).
b. Implement the above program with database instead of a text file.

Week-14

a. Write a java Program that takes tab separated data (one record per line) from a text file and inserts them into a database.
b. Write a java program that prints the meta-data of a given table.
c. Write a java program that connects to a database using JDBC and does add, delete, modify and retrieve operations.

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20CS21L03-DATABASE MANAGEMENT SYSTEMS LAB

II Year. B.Tech. (CSE) – I Sem

L	T	P/D	C
-	-	2/-	1

Prerequisite(s): None

Course Objectives

Develop ability to

1. Learn and practice data modeling using entity-relationship and develop database design.
2. Understand the features of database management systems and Relational database.
3. Understand Structured Query Language (SQL) and learn SQL syntax.
4. Understand normalization process of a logical data model and correct any anomalies.
5. Understand needs of database processing and learn techniques for controlling the consequences of concurrent data access.

Course Outcomes(COs)

At the end of the course, student would be able to

CO1. Design simple database using ER modeling and analyse the RDBMS approach towards database design.
CO2. Apply theoretical and practical database querying languages to efficiently retrieve data stored in the database.
CO3. Apply functional dependency and normalization techniques to arrive at a minimally redundant database.
CO4. Apply concepts of concurrency control and data recovery in database transactions.
CO5. Apply indexing techniques to organize the data on the secondary storage devices enabling efficient data retrieval.

LIST OF EXPERIMENTS

Week-1

E-R Model: Analyze the problem with the entities which identify data persisted in the database which contains entities, attributes.

Week-2

Concept design with E-R Model: Apply cardinalities for each relationship, identify strong entities and weak entities for relationships like generalization, aggregation, specialization.

Week-3

Relation Model: Represent attributes as columns in tables and different types of attributes like Composite, Multi-valued, and Derived. Apply Normalization.

Week-4

Installation of MySQL and Queries using DATA DEFINITION LANGUAGE (DDL) COMMANDS - Create, Alter, Drop, Truncate

Week-5

Data Manipulation Language (DML) COMMANDS:- SELECT, INSERT, UPDATE, DELETE

Week-6

Data Control Language (DCL):- GRANT, REVOKE
Transaction Control Language (TCL) COMMANDS :- COMMIT , ROLL BACK SAVE POINT

Week-7

In Built Functions: - DATE FUNCTION, NUMERICAL FUNCTIONS , CHARACTER FUNCTIONS, CONVERSION FUNCTION

Querying: Using aggregate functions COUNT, SUM using GROUPBY and HAVING

a. Using aggregate functions AVERAGE using GROUPBY and HAVING

Week-8

Querying: Queries using ANY, ALL, IN, INTERSECT, UNION

Week-9

Querying: NESTED QUERIES AND JOIN QUERIES: Nested Queries , Correlated sub queries , Simple Join, a) Equi-join b) Non Equi-join , Self join , Outer Join

Week-10

Set Operators: Union , Union all , Intersect , Minus

Week-11

Views: Creating and dropping view

Week-12

Triggers: Creation of INSERT TRIGGER, DELETE TRIGGER, UPDATE TRIGGER

Week-13

Procedures: Creation, Execution and Modification of stored Procedure

Week-14

Database Design and Implementation: MINI DATABASE PROJECT

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20EN21P01-ENGLISH FOR EFFECTIVE COMMUNICATION
(Classroom Activity based Course. Hence, Lab. is not required.)

B.Tech. CSE (AIML) - II Year, I Sem.

L	T	P/D	C
-	-	2/-	1

Prerequisite(s): None.

Course Objectives
Develop ability to

1. Delineate the contextual meaning of various words and their functions in sentence.
2. Equip themselves with English language skills using appropriate vocabulary.
3. Improve English language proficiency with an emphasis on Reading skills.
4. Develop ability to think critically and articulate their views.

Course Outcomes(COs)
At the end of the course, students would be able to

CO1. Use appropriate words befitting the context.
CO2. Draw valid inferences by comprehending the given text.
CO3. Interpret the given picture/text and draw implications.

UNIT-I
History of Words
Etymology: Word Origin, Advanced word roots, words borrowed from different languages to English, Portmanteau words**,** also called blended words (new coinage of words), assimilation of words.

UNIT-II
Word Analogy
Vocabulary**:** Same words with different meaning and different words with same meaning, Analogies: different relationships: worker and tools, worker and article, time sequence, cause and effect, class and species, synonyms, antonyms, person and things sought or avoided, part to the whole and symbols that stand for, degree of intensity, parts of speech.

UNIT-III
Comprehension Techniques
Reading: Reading for facts, opinions and inferences, reading for critical understanding, addressing point of view of the author/writer, jumbled paragraphs.

UNIT-IV
Sentence Equivalence
Writing: sentence completion, Picture perspective: critical thinking, individual perception and obtaining implications.

TEXT BOOK(S)

1. Quirk Randolph:*A Comprehensive Grammar of the English Language*, Pearson publications.
2. Lewis Norman: *Word Power Made Easy*,Goyal Publisher, 2011.

REFERENCE BOOK(S)

1. Fernald James Champlin, Synonyms and Antonyms, Project Gutenberg, www.gutenberg.net
2. 501 Word Analogy Questions, Learning Express, New York, 2002.

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20CH21M01-ENVIRONMENTAL SCIENCE
(MANDATORY COURSE)

B.Tech. CSE (AIML) - II Year, I Sem.

L	T	P/D	C
3	-	-/-	-

Prerequisite(s): None.

Course Objectives

Develop ability to

1. Identify the importance of ecosystem and its functions.
2. Understand the natural resources and their usage in day to day life.
3. Understand the concept of bio-diversity, its values and conservation.
4. Be aware of the causes of different types of pollution and its control.
5. Understand various environmental impacts, requirement of various policies, and legislations towards environmental sustainability.

Course Outcomes(COs)

At the end of the course, student would be able to

CO1. Explain ecosystem and its functions namely, food chain, ecological pyramids etc.
CO2. Acquire knowledge about different types of natural resources such as land, water, minerals, non-renewable energy and their excessive usage leading to detrimental effects on environment.
CO3. Comprehend ecosystem diversity, its values and importance of hot spots to preserve the same.
CO4. Explain different types of pollution, its control and impact on global environment.
CO5. Recognize various environmental impacts and the importance of various acts and policies towards environmental sustainability.

UNIT–I

Ecosystems

Definition, Scope, and Importance of ecosystem. Classification, structure, and function of an ecosystem, food chains, food webs, and ecological pyramids. Flow of energy, Bio-geochemical cycles, Bioaccumulation, Bio magnification.

UNIT-II

Natural Resources

Classification of Resources: Living and Non-Living resources, Water resources: use and over utilization of surface and ground water, floods and droughts, Dams: benefits and problems. Environmental effects of extracting and using mineral resources, Land resources: Forest resources, Energy Resources-renewable and non-renewable.

UNIT-III

Biodiversity and Biotic Resources

Introduction, Definition, genetic, species and ecosystem diversity. Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and optional values. Hot spots of biodiversity. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts; conservation of biodiversity: In-Situ and Ex-situ conservation. National Biodiversity Act.

UNIT-IV

Environmental Pollution and Control Technologies

Environmental Pollution: Classification of pollution, Air Pollution: Primary and secondary pollutants, Automobile and Industrial pollution, Ambient air quality standards. Water pollution: Sources and types of pollution, drinking water quality standards. Soil Pollution: Sources and types, Impacts of modern agriculture, degradation of soil. Noise Pollution: Sources and Health hazards, standards, Solid waste: Municipal Solid Waste management, composition and characteristics of e-Waste and its management. Pollution control technologies: Waste water Treatment methods: Primary, Secondary and Tertiary. Overview of air pollution control technologies.

Global Environmental Issues and Global Efforts

Green House Gases and its effect, Climate change and impacts on human environment. Ozone depletion and Ozone depleting substances (ODS).International conventions / Protocols: Earth summit, Kyoto protocol, and Montréal Protocol. NAPCC-GoI Initiatives.

UNIT-V

Environmental Policy, Legislation & EIA

Environmental Protection act, Legal aspects, Air Act- 1981, Water Act, Forest Act, Wild life Act, Municipal solid waste management and handling rules, hazardous waste management and handling rules. EIA: EIA structure, methods of baseline data acquisition. Overview on Impacts of air, water, biological and Socio-economic aspects. Strategies for risk assessment, Concepts of Environmental Management Plan (EMP). Towards Sustainable Future: Concept of sustainable development goals, Population and its explosion, Crazy Consumerism, Environmental Education, Urban Sprawl, Human health, Environmental Ethics, Concept of Green Building, Ecological Foot Print, Life Cycle assessment (LCA), Low carbon life style.

TEXT BOOK(S)

1. Environmental Studies by Anubha Kaushik, 4th Edition, New age international publishers.
2. Textbook of Environmental Studies for Undergraduate Courses by Erach Bharucha for University Grants Commission.

REFERENCE BOOK(S)

1. Environmental Science: towards a sustainable future by Richard T. Wright. 2008 PHL Learning Private Ltd. New Delhi.
2. Environmental Engineering and science by Gilbert M. Masters and Wendell P. Ela. 2008 PHI Learning Pvt. Ltd.
3. Environmental Science by Daniel B. Botkin & Edward A. Keller, Wiley INDIA edition.
4. Environmental Studies by R. Rajagopalan, Oxford University Press.
5. Text book of Environmental Science and Technology - Dr. M. Anji Reddy 2007, BS Publications.
6. Introduction to Environmental Science by Y. Anjaneyulu, BS. Publications.

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20CS22001-DESIGN AND ANALYSIS OF ALGORITHMS

B.Tech. CSE (AIML) - II Year, II Sem.

L	T	P/D	C
3	-	-/-	3

Prerequisite(s):
20CS12002-DISCRETE MATHEMATICS
20CS21001-DATA STRUCTURES

Course Objectives
Develop ability to
1. Learn the asymptotic notations and understand the performance of algorithms.
2. Learn the behavior of Greedy strategy, Divide and Conquer approach, Dynamic
3. Programming and branch and bound theory and apply them for several problem solving techniques.
4. Explore various data structures and algorithm design methods together impacts the performance of programs.
5. Distinguish between deterministic and non-deterministic algorithms and their computational efficiency.

Course Outcomes(COs)
At the end of the course, student would be able to
CO1. Analyze time and space complexity of a given algorithm and use asymptotic notation to represent the complexities.
CO2. Apply divide and conquer, greedy, dynamic programming, backtracking and branch and bound algorithmic approaches to a given problem.
CO3. Prove that a given problem is NP-Complete by using the concepts of NP-Completeness.

UNIT-I
Introduction
Algorithm, Pseudo code for expressing algorithms, Performance analysis, Time complexity and space complexity, Asymptotic Notations: O notation, Omega notation, theta notation, and little o notation.
Divide and Conquer
General method, applications – binary search, merge sort, quick sort, Strassen's matrix multiplication.

UNIT-II
Searching and Traversal Techniques
Efficient non-recursive binary tree traversal algorithms, spanning trees, graph traversals- BFS and DFS, Connected components, bi-Connected components.
Disjoint Sets
operations, union and find algorithms.

UNIT-III
Greedy Method
General method, Applications-Job sequencing with deadlines, 0/1 knapsack problem, minimum cost spanning tree, single source shortest path problem.
DYNAMIC PROGRAMMING
General method, applications-multistage graphs, matrix chain multiplication, optimal binary search trees, 0 /1 knapsack problem, travelling sales person problem, reliability design problem.

UNIT-IV

Back Tracking

General method, applications: n-queens problem, sum of sub set problem, graph colouring problem, Hamiltonian cycles.

Branch and Bound

General method, applications: Job Sequencing with deadlines, travelling sales person problem, 0 /1 knapsack problem, LC branch and bound, FIFO branch and bound solution.

UNIT-V

NP-Hard and NP-Complete Problems

Basic concepts, non-deterministic algorithms, NP-hard and NP- complete classes, NP- Hard problems, Cook's theorem.

TEXT BOOK(S)

1. Fundamentals of Computer Algorithms Ellis Horowitz, Satraj Sahni and Sanguthevar Rajasekharan, 2 nd Edition, Universities Press, 2009 Reprint.
2. Introduction to Algorithms, secondediton, T.H.Cormen, C.E.Leiserson, R.L.Rivest, and C.Stein, PHI Pvt.Ltd/Person Education.

REFERENCE BOOK(S)

1. Design and Analysis of Algorithms, Aho, Ullman and Hopcroft, Pearson education, Reprint 2004.
2. Introduction to Design and Analysis of Algorithms A strategic approach, R.C.T.Lee, S.S.Tseng, R.C.Chang and T.Tsai, Mc.Graw Hill
3. Data structures and Algorithm Analysis in C++, Allen Weiss, Second edition, Perason education
4. Algorithms-Richard Johnson baugh and Marcus Schaefer, Pearson Education
5. Design and Analysis Algorithms-Parag Himanshu Dave, Himanshu Bhalachndra Dave Publisher: Person
6. Algorithm Design: Foundations, Analysis and Internet examples, M.T.Goodrich and R.Tomassia, John wiley and sons

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20CS22002-COMPUTER ARCHITECTURE AND ASSEMBLY LANGUAGE PROGRAMMING

B.Tech. CSE (AIML) - II Year, II Sem.

L	T	P/D	C
3	-	-/-	3

Prerequisite(s):
20EC21002-DIGITAL DESIGN

Course Objectives
Develop ability to
1. To introduce principles of computer organization and the basic architectural concepts.
2. Recommend instruction formats, addressing modes, micro instructions for design of control unit
3. Write assembly level programs using 8086 microprocessors.
4. Understand the I/O and memory organizations of a computer system
5. Recognize different parallel processing architectures

Course Outcomes(COs)
At the end of the course, student would be able to
CO1. Explain various aspects of the stored program concept of computer architecture and organization.
CO2. Develop micro programs towards the design of Microprogrammed Control Unit
CO3. Use 8086 microprocessor architecture, develop assembly language programs.
CO4. Compare various input-output and memory organization techniques
CO5. Differentiate various parallel processing architectures

UNIT-I
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, Instruction cycle.

UNIT-II
Micro programmed Control
Control memory, Address sequencing, micro program example, design of control unit.
Central Processing Unit
General Register Organization, Instruction Formats, Addressing modes, Program Control, Program interrupts, CISC Characteristics, RISC Characteristics.

UNIT-III
8086 Architecture
Register Organization of 8086, 8086 Architecture, Signal Description of 8086, Physical Memory Organization, Pipelining in 8086, 8086 Flag Registers.
8086 Instruction Set and Assembler Directives
Instruction Formats and Addressing Modes of 8086, Instruction Set, Assembler Directives, Assembly Language Programs

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, Associate Memory, Cache Memory, Hit and Miss ratio, associative mapping, direct mapping, set-associative mapping, Writing into cache.

UNIT-V

Pipeline and Vector Processing

Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction Pipeline.

Multi Processors

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

TEXT BOOK(S)

1. Computer System Architecture, M. Morris Mano, 3/e, Pearson Education. (UNIT-1,2,4,5).
2. Advanced Micro Processor and Peripherals, Hall/A K Ray, McGraw Hill Education, 2006. (UNIT-3).

REFERENCE BOOK(S)

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

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20CS22003-OPERATING SYSTEMS

B.Tech. CSE (AIML) - II Year, II Sem.

L	T	P/D	C
3	-	-/-	3

Prerequisite(s): None.
20CS11001-PROGRAMMING FOR PROBLEM SOLVING-I

Course Objectives
Develop ability to
1. Understand main components of Operating System (OS) and their working.
2. Implement the different CPU scheduling policies, and process synchronization.
3. Apply the different memory management techniques.
4. Understand File management techniques.
5. Handing Deadlock situations and provide system protection.

Course Outcomes(COs)
At the end of the course, student would be able to
CO1. Explain the fundamental concepts, evolution and services of Operating Systems.
CO2. Apply concepts of process management in terms scheduling and coordination for a given problem .
CO3. Apply Memory Management techniques for a given problem.
CO4. Elucidate the concept of File Management System
CO5. Explain various protection and access control mechanisms.

UNIT-I
Operating System Introduction
Operating Systems Objectives and functions, Computer System Architecture, OS Structure, OS Operations, Evolution of Operating Systems - Simple Batch, Multi programmed, time shared, Personal Computer, Parallel, Distributed Systems, Real-Time Systems, Special - Purpose Systems, Operating System services, user OS Interface, System Calls, Types of System Calls, System Programs, Operating System Design and Implementation, OS Structure, Virtual machines.

UNIT-II
Process and CPU Scheduling
Process concepts - The Process, Process State, Process Control Block, Threads, Process Scheduling - Scheduling Queues, Schedulers, Context Switch, Pre-emptive Scheduling, Dispatcher, Scheduling Criteria, Scheduling algorithms, Multiple-Processor Scheduling, Real-Time Scheduling, Thread scheduling, Case studies: Linux, Windows.
Process Coordination
Process Synchronization, The Critical section Problem, Peterson's solution, Synchronization Hardware, Semaphores, and Classic Problems of Synchronization, Monitors, Case Studies: Linux, Windows.

UNIT-III
Memory Management and Virtual Memory
Logical & physical Address Space, Swapping, Contiguous Allocation, Paging, Structure of Page Table. Segmentation, Segmentation with Paging, Virtual Memory, Demand Paging, Performance of Demand Paging, Page Replacement Page Replacement Algorithms, Allocation of Frames, Thrashing.

UNIT-IV

File System Interface

The Concept of a File, Access methods, Directory Structure, File System Mounting, File Sharing, Protection, File System Implementation - File System Structure, File System Implementation, Allocation methods, Free-space Management, Directory Implementation, Efficiency and Performance. Mass Storage Structure - Overview of Mass Storage Structure, Disk Structure, Disk Attachment, Disk Scheduling, Disk Management, and Swap space Management.

UNIT-V

Deadlocks

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

Protection

System Protection, Goals of Protection, Principles of Protection, Domain of Protection, Access Matrix, Implementation of Access Matrix, Access Control, Revocation of Access Rights, Capability-Based Systems, Language-Based Protection.

TEXT BOOK(S)

1. Operating System Principles, Abraham Silberchatz, Peter B. Galvin, Greg Gagne 8th Edition, Wiley Student Edition.

REFERENCE BOOK(S)

1. Operating systems - Internals and Design Principles, W. Stallings, 6th Edition, Pearson.
2. Modern Operating Systems, Andrew S Tanenbaum 3rd Edition PHI.
3. Operating Systems A concept - based Approach, 2nd Edition, D. M. Dhamdhere, TMH.
4. Principles of Operating Systems, B. L. Stuart, Cengage learning, India Edition.
5. Operating Systems, A. S. Godbole, 2nd Edition, TMH
6. An Introduction to Operating Systems, P.C.P. Bhatt, PHI.
7. Operating Systems, S, Haldar and A. A. Arvind, Pearson Education.
8. Operating Systems, R. Elmasri, A. G. Carrick and D. Levine, McGraw Hill.
9. Operating Systems in depth, T. W. Doeppner, Wiley.

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20CS22004-WEB TECHNOLOGIES

B.Tech. CSE (AIML) - II Year, II Sem.

L	T	P/D	C
3	-	-/-	3

Prerequisites:
20CS21002-OBJECT ORIENTED PROGRAMMING

Course Objectives
Develop ability to
1. Understand the basic web concepts and internet protocols.
2. Acquire knowledge in XML and processing of XML data.
3. Introduce client side scripting with JavaScript and DHTML
4. Understand Server-side programming with Java Servlets and JSP.
5. Implement Server side scripting with PHP.

Course Outcomes (COs)
At the end of the course, student would be able to
CO1. Design static WebPages with HTML and CSS
CO2. Implement client side scripts using Java Script
CO3. Prepare and parse XML schemas
CO4. Implement and deploy server side programs using Servlets, JSP and PHP

UNIT-I
HTML
Common Tags- List, Tables, images, forms, frames, types of Cascading Style Sheets. Client-side Scripting: Introduction to Javascript, declaring variables, scope of variables, functions, event handlers (onclick, onsubmit etc.), Document Object Model, Form validation.

UNIT-II
XML
introduction to XML, defining XML tags, their attributes and values, Document type definition, XML Schemas, Document Object model, XHTML. Parsing XML Data: DOM and XML parsers in java.

UNIT-III
Servlets
Introduction to Servlets, Common gateway interface (CGI), Lifecycle of a Servlet, Deploying a Servlet, The Servlet API, Reading Servlet parameters, Reading Initialization parameters, Handling Http Request & Responses, Using Cookies and Sessions connecting to database using JDBC.

UNIT-IV
JSP
Introduction to JSP: The Anatomy of a JSP page, JSP Processing. Declarations, Directives, Expressions, Code Snippets, implicit objects, using beans in JSP pages, using cookies in Session for Session tracking, connecting to databases in jsp.

UNIT-V
PHP
Introduction to PHP: Declaring variables, data types, arrays, strings, operators, expressions, control statements, functions, Reading data from web, form controls like text boxes, radio buttons, lists etc.

Handling file uploads, connecting to database (Mysql as reference), executing simple queries, handling results, handling sessions and cookies File handling in PHP: file operations like opening, closing, reading, writing, appending, deleting etc. on text and binary files, listing directories.

TEXT BOOK(S)

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

REFERENCES BOOK(S)

1. Web Programming, building internet applications, Chris Bates 2nd edition, WILEY Dreamtech.
2. The complete Reference Java 2 Fifth Edition by Patrick Naughton and Herbert Schildt. TMH.
3. Java Server Pages, Hans Bergsten, SPD O‟Reilly.
4. Programming world wide web, Sebesta, Pearson.
5. Core Servlets and Java Server Pages Volume 1, Core Technologies, Marty Hall and Larry Brown Pearson,
6. Internet and World Wide Web – How to program, Dietel and Nieto PHI/Pearson Education Asia.
7. Jakarta Struts Cookbook, Bill Siggelkow, S P D O‟Reilly.

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20CE22061-BUILDING TECHNOLOGY
(OPEN ELECTIVE – I)

B.Tech. CSE (AIML) - II Year, II Sem.

L	T	P/D	C
3	-	-/-	3

Prerequisite(s): None.

Course Objectives
Develop ability to
1. Know the various materials used in the buildings.
2. Understand the building by-laws and ventilation required in the buildings.
3. Estimate the repairs and transportation systems required in buildings.
4. Know the prefabrication and Air condition requirements.
5. Know the plumbing systems required in building.

Course Outcomes (COs)
At the end of the course, student would be able to
CO 1: Explain characteristics of building materials.
CO2: Describe the types of buildings, building by-laws and prefabrication systems in buildings.
CO3: Describe ventilation, lighting, acoustics and plumbing services for a building.
CO4: Explain the repairs, fire protection measures and vertical transportation for a building.

UNIT–I
Stones
Uses of stones as building materials, Characteristics of good building stones. Types of stones and their significance.
Bricks
Characteristics of good building bricks. Types of bricks and their significance.
Cement and Concrete
Ingredients of cement – Types of cement, properties and uses of cement. Overview on concrete.

UNIT–II
Building
Basic definitions, Types, components, economy and design, principles of planning of buildings and their importance, building bye-laws.
Ventilation
Definitions and importance of circulation; Lighting and ventilation; how to consider these aspects during planning of building.

UNIT–III
Repairs in Buildings
Inspection, control measures and precautions for various construction defects, General principles of design of openings, and various types of fire protection measures to be considered while planning a building.

Vertical transportation in buildings
Types of vertical transportation, Stairs, different forms of stairs, planning of stair cases, other modes of vertical transportation – lifts, ramps, escalators.

UNIT–IV

Prefabrication systems

Prefabrication systems in residential buildings – walls, openings, cupboards, shelves, etc., planning and modules and sizes of components in prefabrication.

Air conditioning

Process and classification of air conditioning, Dehumidification. Systems of air conditioning, ventilation, functional requirements of ventilation.

UNIT–V

Acoustics

Acoustics, effect of noise, properties of noise and its measurements, Principles of acoustics of building. Sound insulation – Importance and measures.

Plumbing services

Water supply system, maintenance of building pipe line, Sanitary fittings, principles governing design of building drainage.

TEXT BOOK(S)

1. Building Materials, P.C. Varghese, Prentice Hall of India Learning Pvt. Ltd., 2015.
2. Building Construction, B.C.Punmia, Ashok Kumar Jain and Arun Kumar Jain, Laxmi Publications, 2016.

REFERENCE BOOK(S)

1. Building Materials, S.K. Duggal, New Age, 2016.
2. Building Materials, S.S. Bhavikatti, Vikas Publishers, 2016.
3. Engineering Materials and Building Construction, Rangwala, Charotar Publishing House, 2015.
4. A Text book of Building Construction, Arora and Bindra, Dhanpat Rai Publications, 2014.

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20EE22062 – INDUSTRIAL SAFETY AND HAZARDS
(OPEN ELECTIVE – I)

B.Tech. CSE (AIML) - II Year, II Sem.

L	T	P/D	C
3	-	-/-	3

Prerequisite(s): None.

Course Objectives
Develop ability to
1. Determine responsibility for safety in the workplace.
2. Learn to recognize workplace hazards.
3. Learn how to develop procedures to eliminate or lessen those hazards.
4. Apply basic Federal and State Safety Rules to the workplace.

Course Outcomes (COs)
At the end of the course, student would be able to
CO1. Apply risk management principles to anticipate, identify, evaluate and control physical, chemical, biological and electrical hazards..
CO2. Apply the methods of prevention of fire and explosions.
CO3. Analyze the effect of release of toxic substances.
CO4. Interpret and apply legislative requirements, industry standards, and best practices in a variety of workplaces.

UNIT-I
Fire and explosion
Introduction-Industrial processes and hazards potential, mechanical electrical, thermal and process hazards. Safety and hazards regulations, Industrial hygiene. Factories Act, 1948 and Environment (Protection) Act, 1986 and rules thereof. Shock wave propagation, vapour cloud and boiling liquid expanding vapours explosion (VCE and BLEVE), mechanical and chemical explosion, multiphase reactions, transport effects and global rates.

UNIT-II
Relief systems
Preventive and protective management from fires and explosion-inerting, static electricity passivation, ventilation, and sprinkling, proofing, relief systems –relief valves, flares, scrubbers.

UNIT-III
Electrical hazards
Primary and secondary hazards-shocks, burns, scalds, falls-human safety in the use of electricity. Energy leakage-clearances and insulation-classes of insulation-voltage classifications excess energy-current surges-Safety in handling of war equipment's-over current and short circuit current-heating effects of current-electromagnetic forces-corona effect-static electricity –definition, sources, hazardous conditions, control, electrical causes of fire and explosion-ionization, spark and arc-ignition energy-national electrical safety code ANSI. Lightning, hazards, lightning arrestor, installation–earthing, specifications, earth resistance, earth pit maintenance.

UNIT-IV
Leaks and leakages
Spill and leakage of liquids, vapours, gases and their mixture from storage tanks and equipment; Estimation of leakage/spill rate through hole, pipes and vessel burst; Isothermal and adiabatic flows of gases, spillage and leakage of flashing liquids, pool evaporation and boiling; Release of toxics and

dispersion. Naturally buoyant and dense gas dispersion models; Effects of momentum and buoyancy; Mitigation measures for leaks and releases.

UNIT-V

Case studies

Flixborough, Bhopal, Texas, ONGC offshore, HPCL Vizag and Jaipur IOC oil-storage depot incident; Oil, natural gas, chlorine and ammonia storage and transportation hazards.

TEXT BOOK(S)

1. Fordham Cooper, W., "Electrical Safety Engineering" Butterworth and Company, London, 1986.

REFERENCE BOOK(S)

1. Crowl D.A. and Louvar J.F., "Chemical Process Safety: Fundamentals with Applications", 2nd Ed., Prentice Hall.2001
2. Mannan S., "Lee's Loss Prevention in the Process Industries", Volume. I, 3rdEd., Butterworth-Heinemann.2004.
3. Indian Electricity Act and Rules, Government of India.
4. Power Engineers –Handbook of TNEB, Chennai, 1989.
5. Martin Glov Electrostatic Hazards in powder handling, Research Studies Pvt. LTd., England,1988.

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20ME22063– NANOMATERIALS AND TECHNOLOGY
(OPEN ELECTIVE - I)

B.Tech. CSE (AIML) - II Year, II Sem.

L	T	P/D	C
3	-	-/-	3

Prerequisite(s): None.

Course Objectives
Develop ability to
1. Expose the students to a highly interdisciplinary subject
2. Enable the students to understand the basic concepts of Nanotechnology
3. Enhance the knowledge of students in nanomaterials, properties and their applications

Course Outcomes (COs)
At the end of the course, student would be able to
CO1. Identify the need of nano materials in engineering applications
CO2. Explain the synthesis of zero dimensional, one-dimensional and two-dimensional nano structured materials
CO3. Illustrate the synthesis of thin films and special nano materials

UNIT-I
Introduction
Importance of Nano-technology, Emergence of Nano-Technology, Bottom-up and Top-down approaches, challenges in Nano Technology.

UNIT-II
Zero-Dimensional Nano-Structures
Nano particles through homogenous nucleation; Growth of nuclei, synthesis of metallic Nano particles, Nano particles through heterogeneous nucleation; Fundamentals of heterogeneous nucleation and synthesis of nano particles using micro emulsions and Aerosol.

UNIT-III
One Dimensional Nano-Structures
Nano wires and nano rods, Spontaneous growth: Evaporation and condensation growth, vapor-liquid-solid growth, stress induced re-crystallization.
Template based synthesis
Electrochemical deposition, Electro-phoretic deposition. Electro- spinning and Lithography

UNIT-IV
Two-Dimensional Nano-Structures
Fundamentals of film growth. Physical vapour Deposition (PVD): Evaporation molecular beam epitaxy (MBE), Sputtering, Comparison of Evaporation and sputtering.
Chemical Vapour Deposition (CVD)
Typical chemical reactions, Reaction kinetics, transportant phenomena, CVD methods, diamond films by CVD.

UNIT-V
Thin Films
Atomic layer deposition (ALD), Electro-chemical deposition (ECD), Sol-Gel films.
Special Nano Materials

Carbon fullerence and nano tubes. Carbon fullerness: formation, properties and applications. Carbon Nano tubes: formation and applications.

TEXT BOOK(S)

1. Nano structures and Nano materials: Synthesis, properties and applications, Guozhong Cao, Imperial College press in 2004, 2nd edition.
2. Nanotechnology, Rechard Booker and Earl Boysen, Willey, 2006.

REFERENCE BOOK(S)

1. Nano: The Essentials; T. Pradeep, Tata McGraw-Hill, 2008.
2. Nanotechnology and Nano electronics, W.R. Fahrner, Springer, 2006.

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20EC22064– ELECTRONIC MEASURING INSTRUMENTS
(OPEN ELECTIVE - I)

B.Tech. CSE (AIML) - II Year, II Sem.

L	T	P/D	C
3	-	-/-	3

Prerequisite(s): None.

Note: No detailed mathematical treatment is required for this course.

Course Objectives
Develop ability to
1. It provides an understanding of various measuring systems functioning and metrics for performance analysis.
2. Provides understanding of principle of operation, working of different electronic instruments viz. signal generators, signal analyzers, recorders and measuring equipment.
3. Provides understanding of use of various measuring techniques for measurement of different physical parameters using different classes of transducers.

Course Outcomes (COs)
At the end of the course, student would be able to
CO1. Analyze static and dynamic characteristics of measuring systems.
CO2. Illustrate the functionality of various signal generators.
CO3. Explain the operations of various DC and AC measuring instruments.
CO4. Illustrate the working principles of various recording instruments.

UNIT-I
Block Schematics of Measuring Systems and Performance Metrics
Performance Characteristics, Static Characteristics, Accuracy, Precision, Resolution, Types of Errors, Gaussian Error, Root Sum Squares formula, Dynamic Characteristics, Repeatability, Reproducibility, Fidelity, Lag.

UNIT-II
Signal Generators
AF, RF Signal Generators, Sweep Frequency Generators, Pulse and Square wave Generators, Function Generators, Arbitrary Waveform Generator, and Specifications.

UNIT-III
Measuring Instruments
DC Voltmeters, D' Arsonval Movement, DC Current Meters, AC
Voltmeters and Current Meters, Ohmmeters, Multimeters, Meter Protection, Extension of Range,
True RMS Responding Voltmeters, Specifications of Instruments. CRT, Block Schematic of CRO, Time Base Circuits, Lissajous Figures, CRO Probes.

UNIT-IV
Recorders
X-Y Plotter, Curve tracer, Galvanometric Recorders, Servo transducers, pen driving mechanisms, Magnetic Recording, Magnetic recording techniques.

UNIT-V

Transducers

Classification, Strain Gauges, Bounded, unbounded; Force and Displacement Transducers, Resistance Thermometers, Hotwire Anemometers, LVDT, Thermocouples, Synchros, Special Resistance Thermometers, Digital Temperature sensing system, Piezoelectric Transducers, Variable Capacitance Transducers, Magneto Strictive Transducers.

TEXT BOOK(S)

1. Electronic Measurements and Instrumentation: B.M. Oliver, J.M. Cage TMH Reprint 2009.
2. Electronic Instrumentation: H.S.Kalsi – TMH, 2nd Edition 2004.

REFERENCE BOOK(S)

1. Electronic Instrumentation and Measurements – David A. Bell, Oxford Univ. Press, 1997.
2. Modern Electronic Instrumentation and Measurement Techniques: A.D. Helbincs, W.D. Cooper: PHI 5th Edition 2003.
3. Electronic Measurements and Instrumentation – K. Lal Kishore, Pearson Education 2010.
4. Industrial Instrumentation: T.R. Padmanabham Springer 2009.

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20MB22066 - INTELLECTUAL PROPERTY RIGHTS
(OPEN ELECTIVE – I)

B.Tech. CSE (AIML) - II Year, II Sem.

L	T	P/D	C
3	-	-/-	3

Prerequisite(s): None.

Course Objectives
Develop ability to
1. Understand the various concepts, importance and types of intellectual property rights.
2. Discuss the purpose of trademarks.
3. Analyze the fundamental laws of copy rights and patents.
4. Understand trade secret laws, trade secret litigation and unfair completion.
5. Understand the latest developments in IPR.

Course Outcomes (COs)
At the end of the course, student would be able to
CO1. Define the fundamental concepts of IPR and distinguish between patents, copyrights, trademarks, and trade secrets.
CO2. Distinguish between fundamental laws of copyright, patents, and trademark.
CO3. Explain the registration process of IPR.
CO4. Evaluate unfair competition practices in business.
CO5. Justify the need for IPR and IP Audits to protect business secrets.
CO6. Evaluate the national and international developments in IPR.

UNIT-I
Introduction to Intellectual property
Concepts, types of intellectual property, international organizations, agencies and treaties, and importance of intellectual property rights.

UNIT-II
Trade Marks
Purpose and function of trademarks, acquisition of trade mark rights, protectable matter, selecting and evaluating trade mark, trade mark registration processes.

UNIT-III
Law of Copy Rights
Fundamentals of copy right law, originality of material, rights of reproduction, rights to perform the work publicly, copy right ownership issues, copy right registration, notice of copy right, international copy right laws.
Law of patents: Foundation of patent law, patent searching process, ownership rights and transfer.

UNIT-IV
Trade Secrets
Trade secrete law, determination of trade secret status, liability for misappropriations of trade secrets, protection for submission, trade secret litigation. Unfair competition- misappropriation right of publicity, false advertising.

UNIT-V

Latest development of intellectual property Rights: new developments in trade mark law; copy right law, patent law, intellectual property audits. International overview on intellectual property, international - trade mark law, copy right law, international patent law, and international development in trade secrets law.

TEXT BOOK(S)

1. Intellectual property right, Deborah, E. Bouchoux, cengage learning.
2. Intellectual property right - Unleashing the knowledge economy, Prabuddha Ganguli, Tata Mc Graw Hill Publishing Company Ltd.
3. Intellectual property: patents, copyright, trademarks and allied rights, Cornish, William Rodolph & Llewelyn, David. Sweet & Maxwell, 8/e, 2013.

REFERENCE BOOK(S)

1. Cases and materials on intellectual property, Cornish, William Rodolph, Sweet & Maxwell, 5/e, 2006.
2. How to make patent drawings: a patent it yourself companion, Lo, Jack and Pressman, David. Nolo, 5/e 2007.

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20CS22L01-DESIGN AND ANALYSIS OF ALGORITHMS LAB

B.Tech. CSE (AIML) - II Year, II Sem.

L	T	P/D	C
-	-	2/-	1

Prerequisite(s):
20CS11001-PROGRAMMING FOR PROBLEM SOLVING-I LAB
20CS21001-DATA STRUCTURES LAB

Course Objectives
Develop ability to
1. Learn the asymptotic notations and understand the performance of algorithms.
2. Learn the behavior of Greedy strategy, Divide and Conquer approach, Dynamic
3. Programming and branch and bound theory and apply them for several problem solving techniques.
4. Explore various data structures and algorithm design methods together impacts the performance of programs.
5. Distinguish between deterministic and non-deterministic algorithms and their computational efficiency.

Course Outcomes (COs)
At the end of the course, student would be able to
CO1. Analyze time and space complexity of a given algorithm and use asymptotic notation to represent the complexities.
CO2. Apply divide and conquer, greedy, dynamic programming, backtracking and branch and bound algorithmic approaches to a given problem.
CO3. Prove that a given problem is NP-Complete by using the concepts of NP-Completeness.

LIST OF EXPERIMENTS

Week-1
Using OpenMP, implement a parallelized Merge Sort algorithm to sort a given set of elements and determine the time required to sort the elements. Repeat the experiment for different values of n, the number of elements in the list to be sorted and plot a graph of the time taken versus n. The elements can be read from a file or can be generated using the random number generator.

Week-2
Write and implement an algorithm determining articulation points and the bi-connected components in the given graph

Week-3
Implement an algorithm to find the minimum cost spanning tree using
a. Prim’s algorithm
b. Kruskal’s Algorithm

Week-4
From a given vertex in a weighted connected graph, find shortest paths to other vertices using Dijkstra’s algorithm.

Week-5

Implement Job Sequencing with Deadlines algorithm and Fast Job Sequencing with Deadlines

Week-6

Implement Matrix Chain multiplication algorithm. Parallelize this algorithm, implement it using Open and determine the speed-up achieved.

Week-7

Implement 0/1 Knapsack problem using Dynamic Programming.

Week-8

Implement an algorithm to find the optimal binary search tree for the given list of identifiers.

Week-9

Find a subset of a given set S = {sl,s2,.....,s_n} of n positive integers whose Sum is equal to a given positive integer d. For example, if S= {1, 2, 5, 6, 8} and d = 9 there are two solutions {1, 2, 6} and {1, 8}.A suitable message is to be displayed if the given problem instance doesn't have a solution.

Week-10

Implement n-Queens problem using Back Tracking.

Week-11

Write a program for Hamiltonian Cycle Problem

Week-12

Implement the solution for TSP problem using Branch & Bound technique

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20CS22L02-OPERATING SYSTEMS AND ASSEMBLY LANGUAGE PROGRAMMING LAB

B.Tech. CSE (AIML) - II Year, II Sem.

L	T	P/D	C
-	-	2/-	1

Prerequisite(s):
20CS11L01-PROGRAMMING FOR PROBLEM SOLVING-I LAB

OPERATING SYSTEM LAB

Course Objectives
Develop ability to
1. Understand main components of Operating System (OS) and their working.
2. Implement the different CPU scheduling policies, and process synchronization.
3. Apply the different memory management techniques.
4. Understand File management techniques.
5. Handing Deadlock situations and provide system protection.

Course Outcomes (COs)
At the end of the course, student would be able to
- CO1. Explain the fundamental concepts, evolution and services of Operating Systems.
- CO2. Apply concepts of process management in terms scheduling and coordination for a given problem.
- CO3. Apply Memory Management techniques for a given problem.
- CO4. Elucidate the concept of File Management System
- CO5. Explain various protection and access control mechanisms.

LIST OF EXPERIMENTS

Week-1
Simulate the following CPU scheduling algorithms
   a. First Come First Serve (FCFS)
   b. Shortest Job First (SJF)
   c. Priority
   d. Round Robin

Week-2
a. Simulate Multiprogramming with Variable number of Tasks (MVT)
b. Simulate Multiprogramming with Fixed number of Tasks (MFT)

Week-3
Simulate all page replacement algorithms
   a. First In First Out (FIFO)
   b. Optimal
   c. Least Recently Used (LRU)

Week-4
Simulate all File Organization Techniques
   a. Single level directory
   b. Two level directory

c. Hierarchical directory

Week-5
Simulate all File allocation strategies
a. Sequential
b. Indexed
c. Linked

Week-6
Simulate Bankers Algorithm for Dead Lock Avoidance

ASSEMBLY LANGUAGE PROGRAMMING LAB

Course Objectives
Develop ability to
1. To introduce principles of computer organization and the basic architectural concepts.
2. Recommend instruction formats, addressing modes, micro instructions for design of control unit
3. Write assembly level programs using 8086 microprocessor.
4. Understand the I/O and memory organizations of a Computer system
5. Recognize different parallel processing architectures

Course Outcomes (COs)
At the end of the course, students would be able to
CO1. Explain various aspects of the stored program concept of computer architecture and organization.
CO2. Develop micro programs towards the design of Microprogrammed Control Unit
CO3. Use 8086 microprocessor architecture, develop assembly language programs.
CO4. Compare various input-output and memory organization techniques
CO5. Differentiate various parallel processing architectures

Week-1
a. Architecture of 8086 microprocessor
b. Instruction Set of 8086 microprocessor

Week-2
a. Write a program to display string "Computer Science and Engineering".
b. Write an Assembly Language Program (ALP) to display multiple strings line by line.
c. Write an Assembly Language Program (ALP) to find the maximum of three numbers.

Week-3
a. Write an Assembly Language Program (ALP) to print numbers from 0 to 9
b. Write an Assembly Language Program (ALP) to check whether a given number is even or odd.

Week-4
a. Write an Assembly Language Program (ALP) to find the factorial of a number.
b. Write an Assembly Language Program (ALP) to print fibo series up to 5 numbers.

Week-5
a. Write an Assembly Language Program (ALP) to take n values from user and calculate their sum.(BL contains the result)

b. Write an Assembly Language Program (ALP) to take n values from user and calculate maximum and minimum values

Week-6

a. Write 8086 Assembly Language Program (ALP) to transfer a block of data from one location to another.
b. Write an Assembly Language Program (ALP) to reverse the given string.
c. Write an Assembly Language Program (ALP) to perform addition of two 2X2 matrices.

Week-7

a. Write an Assembly Language Program (ALP) for linear search.
b. Write an Assembly Language Program (ALP) to take n values from user and sort them in ascending order.

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20CS22L03-WEB TECHNOLOGIES LAB

B.Tech. CSE (AIML) - II Year, II Sem.

L	T	P/D	C
-	-	2/-	1

Prerequisite(s):

- 20CS11L01-PROGRAMMING FOR PROBLEM SOLVING-I LAB
- 20CS21L02-OBJECT ORIENTED PROGRAMMING LAB
- 20CS21L03-DATABASE MANAGEMENT SYSTEMS LAB

Course Objectives

Develop ability to

1. Understand the basic web concepts and internet protocols.
2. Acquire knowledge in XML and processing of XML data.
3. Introduce client side scripting with JavaScript and DHTML
4. Understand Server-side programming with Java Servlets and JSP.
5. Implement Server side scripting with PHP.

Course Outcomes(COs)

At the end of the course, student would be able to

CO1. Design static WebPages with HTML and CSS
CO2. Implement client side scripts using Java Script
CO3. Prepare and parse XML schemas
CO4. Implement and deploy server side programs using Servlets, JSP and PHP

LIST OF EXPERIMENTS

Week-1

Write a HTML page including any required java script that takes a number from one text field in the range of 0 to 999 and shows it in another text field in words. if the number is out of range, it should show “out of range” and if it is not a number, it should show “not a number” message in the result box.

Week-2

Write a HTML page that has one input, which can take multi-line text and a submit button. Once the user clicks the submit button, it should show the number of characters, words and lines in the text entered using an alert message. Words are separated with white space and lines are separated with new line character.

Week-3

Write a HTML page that contains a selection box with a list of 5 countries. When user selects a country, its capital should be printed next to the list. Add CSS to customize the properties of the font of capital (color, bold, and font size).

Week-4

Write a XML file which will display the Book information which includes the following:
Title of the book, Author Name, ISBN number, Publisher name, Edition, Price
i. Write a Document Type Definition (DTD) to validate the above XML file.
ii. Write a XSD to validate the above XML file.

Week-5

Create a XML document that contains 10 users information. Write a java Program, which takes User Id as input and returns the user details by taking the user information from XML document using (a) DOM Parser and (b) SAX parser.

Week-6

a. Write a Servlet for User validation web application, where the user submits a login name and password to the server. The name and password are checked against the data already available in Database and if the data matches, a successful login page is returned. Otherwise a failure message is shown to the user.

b. Modify the above Program to an xml file instead of database.

Week-7

a. Write a Servlet for a simple calculator web application that takes two numbers and an operator (+,-,/,*,%) from an HTML page and returns the result page with the operation performed on the operands.

b. Write a Servlet for web application that lists all cookies stored in the browser on clicking "List Cookies" button. Assume cookies if necessary.

Week-8

a. Write JSP for User validation web application, where the user submits a login name and password to the server. The name and password are checked against the data already available in Database and if the data matches, a successful login page is returned. Otherwise a failure message is shown to the user.

b. Write JSP for a simple calculator web application that takes two numbers and an operator (+,-,/,*,%) from an HTML page and returns the result page with the operation performed on the operands.

Week-9

a. Write JSP for a web application that lists all cookies stored in the browser on clicking "List Cookies" button. Assume cookies if necessary.

b. Write JSP for a web application that takes name and age from an HTML page. If the age is less than 18, it should be sending a page with "Hello <name >, you are not authorized to visit this site" message, where < name> should be replaced with the entered name. Otherwise it should send "Welcome <name> to this site" message.

Week-10

a. Write PHP code for user validation web application, where the user submits a login name and password to the server. The name and password are checked against the data already available in Database and if the data matches, a successful login page is returned. Otherwise a failure message is shown to the user.

b. Write PHP code for a simple calculator web application that takes two numbers and an operator (+,-,/,*,%) from an HTML page and returns the result page with the operation performed on the operands.

Week-11

Write PHP Code Validate the following fields of registration page.

i. Name (it should contains alphabets and length at least 6 characters)
ii. Password(it should not be less than 6 characters)
iii. Email id (it should not contains any invalid character must follow the standard pattern name@domain.com)
iv. Phone number (it should contain 10 digits only)

Week-12

A web application for implementation using PHP. The user is first served login page which takes user's name and password. After submitting the details the server checks these values against the data from a database and takes the following decisions

If name and password match serve a welcome page with user's full name

If name matches and password doesn't match, then server "password mismatch" page

If name is not found in the full name, it stores, the login name, password and full name in the database.(hint: Use session for storing the submitted login name and password)

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20EN22P01-ENGLISH FOR CAREER DEVELOPMENT
(Classroom Activity based Course. Hence, Lab. is not required)
B.Tech. CSE (AIML) - II Year, II Sem.

L	T	P/D	C
-	-	2/-	1

Prerequisite(s): None.

Course Objectives
Develop ability to
1. Understand the importance of vocabulary to be used in different situations.
2. Read, comprehend and summarize the given text.
3. Articulate in different socio-cultural contexts both oral and written.

Course Outcomes(COs)
At the end of the course, student would be able to
CO1. Use appropriate collocations, connotations and prepositional phrases in any given text.
CO2. Predict the flow of information in a given text and draw inferences.
CO3. Articulate views, ideas and events in various contexts both oral and written.

UNIT-I
Must have words/Word power
Vocabulary: Collocations: noun and noun, noun and verb, noun and adverb, noun and adjective, prepositional phrases-connotative words.
UNIT-II
Cognitive Reading
Reading: Reading comprehension: rapid reading (vertical reading), meta-cognition, cloze tests, paragraph jumbles.
UNIT-III
Advanced Articulation
Speaking: Narrating: techniques, events, experiences, stories. Interactive speaking: Contextual Vocabulary and Oral presentations.
UNIT-IV
Essentials of composition
Writing: Picture interpretation: analyzing and expressing in either oral or written form. Sentences out of context, summarizing, Essay (Analytical, argumentative and exploratory) writing practice.

TEXT BOOK(S)
1. Wilfred J.Funk,Six Weeks to Words of Power, Binny Publishing House.
2. Sue Gilbert, The Essentials of Grammar and Composition, Oxford University Press.

REFERENCE BOOK(S)
1. Inc. Bar Charts, English Composition & Style, Inc. Bar Charts , 2009-11-30
2. K.Buehler Huber Gray, *Practical Exercises in English*, Project Gutenberg, www.gutenberg.net

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20CS22P01-DESIGN THINKING

B.Tech. CSE (AIML) - II Year, II Sem.

L	T	P/D	C
-	-	4/-	2

Prerequisite(s): None.

Course Objectives
Develop ability to
1. To familiarize students with design thinking concepts and principles
2. To ensure students can practices the methods, processes and tools of design thinking.
3. To ensure students can apply the design thinking approach and have ability to model real world situations.
4. To enable students to analyze primary and secondary research in the introduction to design thinking

Course Outcomes (COs)
At the end of the course, student would be able to
CO1. Explain Design Thinking concepts and principles
CO2. Use the methods, processes, and tools of Design Thinking
CO3. Apply the Design Thinking approach and model to real world Problems
CO4. Analyze the role of primary and secondary research in the discovery stage of Design Thinking

UNIT-I
Introduction
Introduction to Design Thinking, Business Model Innovation, Challenges Best-Suited for Design Thinking, Visualization Tool, Product Life Cycle - Design Ethics

UNIT-II
Process of Design
Introduction Design Process - Four Step - Five Step - Twelve Step - Creativity and Innovation in Design Process - Design limitation, Creative Thinking, Lean Canvas Model and other Business Models

UNIT-III
Generating And Developing Ideas
Introduction -Generating Design Ideas - Lateral Thinking – Analogies – Brainstorming - Mind mapping - National Group Technique – Synectics - Development of work - Analytical Thinking.

UNIT-IV
Learning
The Physics of Innovation, The IBM model of design thinking, Learning Launch Tool, Strategic Opportunities, identifying customer needs- Empathic design, Customer needs and markets analysis tools, Translating customer needs into measurable specifications, Case-studies

UNIT-V
The Macro Framework
Commercial assessment tools, Integral and modular approaches to design, Design for environment theories, Sustained and maintained innovation – creating systemic innovation culture and principles

TEXT BOOK(S)

1. An AVA Book, “Design Thinking”, AVA Publishing, 2010.
2. David Ralzman, “History of Modern Design”, 2nd edition, Laurence King Publishing Ltd., 2010

REFERENCE BOOK(S)

1. Tom Kelley, Jonathan Littman, “Ten Faces in Innovation”, Currency Books, 2006
2. G. Pahl, W.Beitz, J. Feldhusen, KH Grote, “Engineering Design: A Systematic Approach”, 3rd edition, Springer, 2007.
3. The field guide to human centered design by Design Kit.

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20MA31001- STATISTICS FOR MACHINE LEARNING

B.Tech. CSE (AIML) - III Year, I Sem.

L	T	P/D	C
3	-	-	3

Prerequisite(s): None

Course Objectives

Develop ability to

1. Understand the fundamental principles of probability, types of random variables, distributions and random numbers to generate.
2. Learn the concept of population and sample to estimate the population parameter and test its significance level.
3. Learn to predict and classify the linear regression and logistic regression.
4. Impart the knowledge of reduction and classification techniques.

Course Outcomes(COs)

At the end of the course, student would be able to

CO1. Apply the basics of probability to calculate posterior probabilities, distributions, boundary limits and generate random numbers.

CO2. Estimate the population parameter and test its significance level by using various test statistics.

CO3. Predict the response variable and test the significance of the parameters for Multiple Linear Regression (MLR) or Logistic Regression (LR) or both.

CO4. Reduce the given high dimensional data sets by applying Principal Component Analysis (PCA) or classification techniques using K-means clustering, Support Vector Machine (SVM).

UNIT-I

Basics of Probability Theory, Baye's Theorem; Random Variables (Discrete and Continuous); Probability Distribution of RV, Expectation, Variance (Binomial, Poisson, Uniform, Normal and Exponential).

Unit-II

Chebyshev's and Markov inequalities, Law of Large Numbers and Central Limit Theorem. Data simulations in parametric setup- Random number generation (a) Discrete RVs (Binomial, Poisson and Uniform) (b) Continuous RVs (Normal and Exponential). Acceptance/Rejection algorithm.

UNIT-III

Parameter Estimation: Estimation of Model Parameters (Maximum Likelihood Estimation and Method of Moments), Confidence Interval (CI) Estimation, Bayesian Estimation and CI.
Testing of Hypothesis: Z-test, t-test, chi squared-test and F-test (concept of p-value).

UNIT-IV

Linear/Non-linear models- Multiple Linear Regression: Multiple Regression Models, Hypothesis Test for Significance of regressors, Logistic Regression: Models with a Binary Response Variable, Estimating the Parameters in a Logistic Regression Model, Interpretation of the Parameters in a Logistic Regression Model; Classification and Density Estimation.

UNIT V

Classification (SVM), Clustering (K-means) and Dimension Reduction (PCA).
Kernel Methods-Mercer's Kernels, Kernel Classification, Kernel PCA.

TEXT BOOK(S)

1. Probability and Statistics for Engineers and Scientists by Sheldon Ross, Academic Press, 5th Edition, 2014.
2. Introduction to Statistical Machine Learning, Masashi Sugiyama, Book Aid International, 2016.

REFERENCE BOOK(S)

1. Probability for Statistics and Machine Learning: Fundamentals and Advanced Topics by Anirban Das Gupta, Springer 2011.
2. Statistical Inference by George Casella and Roger L. Berger, Thomson Learning, 2002.
3. An Introduction to Statistical Learning with Applications in R by James, G., Witten, D., Hastie, T., Tibshirani, R. Springer 2013.
4. Introduction to Linear Regression Analysis, Fifth Edition by Douglas C. Montgomery, Elizabeth A. Peck, G. Geoffrey Vining, Wiley series in Probability and Statistics 2012.

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20CS31002 – COMPUTER NETWORKS

B.Tech. CSE (AIML) - III Year, I Sem.

L	T	P/D	C
3	-	-	3

Prerequisite(s): None

Course Objectives

Develop ability to

1. Develop an understanding of modern network architectures from a design and performance perspective.
2. Understand the protocols of data link layer and MAC sub layer and apply different techniques of error detection and error correction.
3. Distinguish and explain different network layer protocols and routing algorithms.
4. Describe the functions of TCP and UDP protocols.
5. Illustrate the application layer protocols such as HTTP, FTP, SMTP, DNS and TELNET.

Course Outcomes (COs)

At the end of the course, student would be able to

CO1: Analyze different types of network topologies, various physical media in terms of their suitability for different applications, OSI and TCP/IP models.
CO2: Apply channel allocation, framing, error and flow control techniques at data link layer.
CO3: Distinguish between circuit and packet switching, logical and physical addressing and analyze various routing algorithms.
CO4: Explain different Transport Layer functions and analyse congestion control algorithms.
CO5: Explain various Application layer protocols and classical cryptographic techniques.

UNIT-I

Data communication Components: Representation of data and its flow, Networks, Various Connection Topology, Protocols and Standards, OSI model, TCP/IP Protocol Suite, Transmission Media, Switching, Circuit Switched Networks, Datagram Networks and Virtual Circuit Networks; LAN: Wired LAN, Wireless LANs, Connecting LAN and Virtual LAN, Techniques for Bandwidth utilization: Multiplexing - Frequency division, Time division and Wave division, Concepts on spread spectrum.

UNIT-II

Data Link Layer: Design Issues, Services provided to Network Layer, Error Detection and Error Correction - Fundamentals, Block coding, Hamming Distance, CRC; Flow Control and Error control protocols - Stop and Wait, Go back – N ARQ, Selective Repeat ARQ, Sliding Window, Piggybacking. Medium Access Control Sub Layer: Random Access, Multiple Access Protocols-Pure ALOHA, Slotted ALOHA, CSMA/CD, CDMA/CA.

UNIT-III

Network Layer: Network Layer Design Issues, Logical addressing – IPV4, IPV6 Protocols; Address mapping – CIDR, ARP, RARP, BOOTP and DHCP–Delivery, Forwarding, Uni-Cast Routing protocols, Multicast Routing Protocols.

UNIT-IV

Transport Layer: Process to Process Communication, Client/Server Paradigm, User Datagram Protocol (UDP), Transmission Control Protocol (TCP), SCTP Congestion Control; Quality of Service, QoS improving techniques: Leaky Bucket and Token Bucket algorithm.

UNIT-V

Application Layer: Domain Name Space (DNS), DDNS, TELNET, EMAIL, File Transfer Protocol (FTP), WWW, HTTP, SNMP, Bluetooth, Firewalls, Basic concepts of Cryptography.

TEXT BOOK(S)

1. Data Communication and Networking, Fourth Edition, Behrouz A. Forouzan, McGraw-Hill. (2017)
2. Computer Networks, Fifth Edition, Andrew S. Tanenbaum, Pearson New International Edition. (2013)

REFERENCE(S)

1. Data and Computer Communication, Eighth Edition, William Stallings, Pearson Prentice Hall India. (2015)
2. Internetworking with TCP/IP, Volume 1, sixth Edition Douglas E. Comer, Prentice Hall of India. (2015)
3. TCP/IP Illustrated, Volume 1, Second Edition, Kevin R. Fall, W. Richard Stevens, Pearson Education. (2011)
4. Computer Networking: A Top-Down Approach Featuring the Internet, James F.Kursoe, K.W.Ross, Fifth Edition, Pearson Education. (2021)

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20CS31003 – ARTIFICIAL INTELLIGENCE

B.Tech. CSE (AIML) - III Year, I Sem.

L	T	P/D	C
3	-	-	3

Prerequisite(s):
20CS21001- DATA STRUCTURES
20CS12002- DISCRETE MATHEMATICS

Course Objectives
Develop ability to

1. Understand the difference between various intelligent agents and environments including solving problems by searching the solution space.
2. Learn adversarial search and propositional logic and understand solutions of constraint satisfaction problems
3. Learn inference using first order logic and describe knowledge representation
4. Learn planning solutions for problems in real world environment.
5. Learn to infer in uncertain domains using probabilistic learning models

Course Outcomes (COs)
At the end of the course, student would be able to

CO1. Apply search techniques to given problem instances.
CO2. Use adversarial search and propositional logic to solve constraint satisfaction problems.
CO3. Apply first order logic to infer and describe knowledge representation.
CO4. Apply suitable planning methods to AI problems.
CO5. Apply Probabilistic and inductive reasoning techniques to make inferences in uncertain domains.

UNIT-I
Problem Solving by Search-I & II
Introduction to AI, Intelligent Agents, Problem-Solving Agents, Searching for Solutions, Uninformed Search Strategies: Breadth-first search, Uniform cost search, Depth-first search, Iterative deepening Depth-first search, Bidirectional search, Informed (Heuristic) Search Strategies: Greedy best-first search, A* search, Heuristic Functions, Beyond Classical Search: Hill-climbing search, Simulated annealing search, Local Search in Continuous Spaces, Searching with Non-Deterministic Actions, Searching with Partial Observations, Online Search Agents and Unknown Environment.

UNIT-II
Adversarial Search
Games, Optimal Decisions in Games, Alpha–Beta Pruning, Imperfect Real-Time Decisions.
Constraint Satisfaction Problems
Defining Constraint Satisfaction Problems, Constraint Propagation, Backtracking Search for CSPs, Local Search for CSPs, The Structure of Problems.
Propositional Logic
Knowledge-Based Agents, The Wumpus World, Logic, Propositional Logic, Propositional Theorem Proving: Inference and proofs, Proof by resolution, Horn clauses and definite clauses, Forward and backward chaining, Effective Propositional Model Checking, Agents Based on Propositional Logic.

UNIT-III

Logic

First-Order Logic-Representation, 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 and Lifting, Forward Chaining, Backward Chaining, Resolution.

Knowledge Representation:

Ontological Engineering, Categories and Objects, Events. Mental Events and Mental Objects, Reasoning Systems for Categories, Reasoning with Default Information.

UNIT-IV

Planning Classical Planning

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

Planning and Acting in the Real World

Time, Schedules, and Resources, Hierarchical Planning, Planning and Acting in Nondeterministic Domains, Multi agent Planning,

UNIT-V

Uncertain knowledge and Learning Uncertainty

Acting under Uncertainty, Basic Probability Notation, Inference Using Full Joint Distributions, Independence, 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, Other Approaches to Uncertain Reasoning; Dempster-Shafer theory.

Learning

Forms of Learning, Supervised Learning, Learning Decision Trees. Knowledge in Learning: Logical Formulation of Learning, Knowledge in Learning, Explanation-Based Learning, Learning Using Relevance Information, Inductive Logic Programming.

TEXT BOOK(S)

1. Artificial Intelligence a Modern Approach, Stuart Russell and Peter Norvig, 4th Edition, Pearson Education, 2020.

REFERENCE(S)

1. Artificial Intelligence, E.Rich and K.Knight, , 3rd Edition, TMH, 2009.
2. Artificial Intelligence, Patrick Henny Winston, 3rd Edition, Pearson Education, 2015.
3. Artificial Intelligence, Shivani Goel, Pearson Education, 2013.
4. Artificial Intelligence and Expert systems – Patterson, Pearson Education, 2005.

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20CS31010-THEORY OF COMPUTATION
(PROFESSIONAL ELECTIVE I)

B.Tech. CSE (AIML) - III Year, I Sem.

L	T	P/D	C
3	-	-	3

Prerequisite(s):
20MA11001-BASIC ENGINEERING MATHEMATICS
20CS12002-DISCRETE MATHEMATICS

Course Objectives
Develop ability to
1. Understand mathematical methods of computing devices called abstract machines namely finite automata, pushdown automata and turing machines.
2. Explain deterministic and non-deterministic machines.
3. Identify different formal language classes and their relationships.
4. Design grammars and recognizers for different formal languages.
5. Determine the decidability and intractability of computational problems and comprehend the hierarchy of problems arising in computer science.
6. Illustrate all the major phases in process of compilation.

Course Outcomes (COs)
At the end of the course, student would be able to
CO1. Design mathematical models that recognize different classes of languages and carryout computations.
CO2. Build language generators.
CO3. Explain the functioning of phases of compilation process and data structures used in this process
CO4. Perform lexical and syntax analysis for high level programs.
CO5. Generate intermediate code and optimize to prepare the code for absolute machine code generation.
CO6. Explain how machine code generation algorithm works and how compiler efficiently uses various system resources in machine code generation.

UNIT-I
Fundamentals
Strings, Alphabet, Language, Operations, Finite state machine, definitions, finite automaton model, acceptance of strings, and languages, deterministic finite automaton (DFA) and non deterministic finite automaton (NFA), transition diagrams and Language recognizers.
Finite Automata
NFA to DFA conversion, minimization of FSM, equivalence between two FSM's, Finite Automata with output- Moore and Mealy machines.

UNIT-II
Regular Languages
Regular sets, regular expressions, identity rules, Constructing finite Automata for a given regular expressions, Conversion of Finite Automata to Regular expressions.
Context Free Grammars
Definition, Ambiguity in context free grammars. Simplification of Context Free Grammars. Chomsky normal form, Greibach normal form, Enumeration of properties of CFLs (proofs omitted), Chomsky's hierarchy of languages.

UNIT-III

Push Down Automata

Push down automata, definition, model, acceptance of CFL, by final state and by empty stack.

Turing Machine

Turing Machine, definition, model, design of TM, counter machine, types of Turing machines (proofs not required).

Overview of Compilation

Phases of compilation-lexical analysis, regular grammar and regular expression for common programming language features, Pass and phases of translation, interpretation, bootstrapping, data structures in compilation

UNIT-IV

Top Down Parsing

Back Tracking, LL(1), Recursive Descent Parsing, Predictive Parsing, Pre-processing steps required for predictive parsing.

Bottom Up Parsing

Shift Reduce Parsing, LR and LALR Parsing, Error Recovery in Parsing, Handling Ambiguous grammar.

Semantic Analysis

Intermediate forms of source programs-abstract syntax tree, polish notation and three address codes, conversion of popular programming languages language constructs into intermediate code forms.

UNIT-V

Code Optimization

Consideration for optimization, scope of optimization, loop optimization, frequency reduction folding, DAG representation, reduction in strengths.

Object Code Generation

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

TEXT BOOK(S)

1. Introduction to Automata Theory Languages and Computation, Hopcroft H.E. and Ullman J. D. Pearson Education, 2002.
2. Principles of Compiler Design, A.V. Aho, J.D. Ullman, Pearson Education, 1977.

REFERENCE BOOK(S)

1. Introduction to Theory of Computation – Sipser 2nd edition Thomson, 2005.
2. Introduction to Formal languages Automata Theory and Computation Kamala Krithivasan Rama R, Pearson Education, 2009.
3. Introduction to Computer Theory, Daniel I.A. Cohen, John Wiley, 1991.
4. Theory Of Computation: A Problem - Solving Approach, Kavi Mahesh, Wiley India Pvt. Ltd, 2011.
5. Elements of Theory of Computation, Lewis H.P. & Papadimition C.H. Pearson/PHI, 1981.
6. Theory of Computer Science – Automata languages and computation -Mishra and Chandrashekaran, 2nd edition, PHI, 2006.

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20CS31011-DESIGN PATTERNS
(PROFESSIONAL ELECTIVE I)

B.Tech. CSE (AIML) - III Year, I Sem.

L	T	P/D	C
3	-	-	3

Prerequisites
20CS21002-OBJECT ORIENTED PROGRAMMING

Course Objectives
Develop ability to

1. Each design pattern systematically names, explains, and evaluates an important and recurring design in object-oriented systems.
2. The goal of design patterns is to capture design experience in a form that people can effectively Use.
3. At the end of design patterns course it has documented some of the most important design patterns and presented them as a catalog.
4. To understand that design patterns are standard solutions to common software design problems.
5. To be able to use systematic approach that focus and describe abstract systems of interaction between classes, objects, and communication.

Course Outcomes (COs)
At the end of the course, student would be able to

CO1. Explain the fundamental concepts of Design patterns in software design.
CO2. Apply design pattern approach in designing a Document Editor.
CO3. Analyze creational, structural and behavourial patterns in the context of software design.

UNIT-I
Introduction
What is a design pattern? Design patterns in Smalltalk MVC, Describing Design Patterns, The Catalog of Design Patterns, Organizing the Catalog, How Design Patterns Solve Design Problems, How to Select a Design Pattern, How to Use a Design Pattern.

UNIT-II
Designing a Document Editor
Design Problems, Document Structure, Formatting, Embellishing the User Interface, Supporting Multiple Look-and-Feel Standards, Supporting Multiple Window Systems, User Operations Spelling Checking and Hyphenation, Summary.

UNIT-III
Creational Patterns
Abstract Factory, Builder, Factory Method, Prototype, Singleton, Discussion of Creational Patterns.

UNIT-IV
Structural Pattern
Adapter, Bridge, Composite, Decorator, Façade, Flyweight, Proxy

UNIT-V

Behavioral Patterns

Chain of Responsibility, Command, Interpreter, Iterator, Mediator, Memento, Observer, State, Strategy, Template Method, Visitor.

TEXT BOOK(S)

1. Design Patterns, Erich Gamma, Pearson Education, 1995.

REFERENCE BOOK(S)

1. Pattern's in Java, Vol –I, Mark Grand, Wiley Dream Tech, 1994.
2. Patterns in Java, Vol-II, Mark Grand, Wiley Dream Tech, 1999.
3. Java Enterprise Design Patterns Vol-III, Mark Grand, Wiley Dream Tech, 2002.
4. Head First Design Patterns, Eric Freeman, O'reily publications, 2004.

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20CS31012-DIGITAL IMAGE PROCESSING
(PROFESSIONAL ELECTIVE I)

B.Tech. CSE (AIML) - III Year, I Sem.

L	T	P/D	C
3	-	-	3

Prerequisite(s): None

Course Objectives
Develop ability to
1. Understand the fundamental steps in image processing and various components of image processing system.
2. Understand spatial and frequency domain filters for smoothening and sharpening operations on images.
3. Understand morphological operations, segmentation and edge detection on images.
4. Understand various concepts related to image compression and color image processing.
5. Identify the need for and perform object representation, description and image transformations.

Course Outcomes(COs)
At the end of the course, student would be able to
CO1: Explain the fundamental concepts and various components of image processing system.
CO2: Analyze images in spatial and frequency domains using various filtering techniques
CO3: Perform morphological operations, segmentation and edge detection on images.
CO4: Apply various compression techniques on the images.
CO5: Explain the various concepts related to colour image processing.
CO6: Perform object representation and image transformations.

UNIT-I
Fundamental steps of image processing, components of an image processing of system, the image model and image acquisition, sampling and quantization, station ship between pixels, distance functions, scanner.

UNIT-II
Statistical and spatial operations, Grey level transformations, histogram equalization, smoothing and sharpening-spatial filters, frequency domain filters, homomorphic filtering, image filtering and restoration. Inverse and Weiner filtering. FIR Weiner filter. Filtering using image transforms, smoothing splines and interpolation.

UNIT-III
Morphological and other area operations, basic morphological operations, opening and closing operations, dilation erosion, Hit or Miss transform, morphological algorithms, extension to grey scale images.
Segmentation and Edge detection region operations, basic edge detection, second order detection, crack edge detection, gradient operators, compass and Laplace operators, edge linking and boundary detection, thresholding, region based segmentation, segmentation by morphological watersheds.

UNIT-IV
Image compression: Types and requirements, statistical compression, spatial compression, contour coding, quantizing compression, image data compression-predictive technique, pixel coding, transfer coding theory, lossy and lossless predictive type coding.

Basics of color image processing, pseudo color image processing, color transformation, color smoothing and sharpening, color segmentation, color image compression, compression standards.

UNIT-V

Image Transforms - Fourier, DFT, DCT, DST, Haar, Hotelling, Karhunen - Loeve, Walsh, Hadamard, Slant. Representation and Description - Chain codes, Polygonal approximation, Signatures Boundary Segments, Skeltons, Boundary Descriptors, Regional Descriptors, Relational Descriptors, PCA.

TEXT BOOK(S)

1. Digital Image Processing, Rafael C. Gonzalez and Richard E. Woods, 3 rd edition, Pearson Education, 2008.(UNIT-I,II,II,IV)
2. Fundamentals of Digital Image Processing, A.K. Jain, PHI, 2015. (UNIT-V)

REFERENCE BOOK(S)

1. Digital Image Processing – William K, Part I - John Wiley edition, 2002.
2. Digital Image Processing using MATLAB – by Rafael C. Gonzalez, Richard E. Woods and Steven L.Eddins, Pearson Education, 2006.
3. Digital Image Processing, Kenneth R. Castleman, Pearson Education, 2007.

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20CS31006 - DATA WAREHOUSING AND DATA MINING
(PROFESSIONAL ELECTIVE I)

B.Tech. CSE (AIML) - III Year, I Sem.

L	T	P/D	C
3	-	-	3

Prerequisite(s):
20CS21003- DATABASE MANAGEMENT SYSTEMS

Course Objectives
Develop ability to

1. Understand and implement classical models and algorithms in data warehousing and data mining.
2. Design and build data warehouse from heterogeneous data sources using data integration tools.
3. Identify the problems and analyze given data and choose the relevant models and algorithms.
4. Apply models and algorithms for mining the data and to discover knowledge and generate reports accordingly.
5. Assess the strengths and weaknesses of various methods and algorithms and analyze their behavior.

Course Outcomes (COs)
At the end of the course, student would be able to

CO1. Explain Data warehouse architecture, Schema design and OLAP operations.
CO2. Apply different data pre-processing techniques to make data sets amenable for subsequent machine learning algorithms.
CO3. Apply different data mining algorithms on data sets to extract association rules.
CO4. Apply different classification or clustering algorithms to a given problem.

UNIT-I
Data Warehouse
Introduction to Data warehouse, Difference between operational database systems and data warehouses. Data warehouse Characteristics, Data warehouse Architecture and its Components, Extraction – Transformation – Loading, Logical (Multi – Dimensional), Data Modeling, Schema Design, Star and Snow – Flake Schema, Fact Consultation, Fact Table, Fully Addictive, Semi – Addictive, Non Addictive Measures; Fact – Less – Facts, Dimension Table Characteristics; OLAP Cube, OLAP Operations, OLAP Server Architecture – ROLAP, MOLAP and HOLAP.

UNIT-II
Introducing to Data Mining
Introduction, What is Data Mining, Definition, KDD, Challenges, Data Mining Tasks, Data Preprocessing, Data Cleaning, Missing data, Dimensionality Reduction, Feature Subset Selection, Discretization and Binarization, Data Transformation; Measures of Similarity and Dissimilarity – Basics.

UNIT-III

Association Rules

Problem Definition, Frequent Item Set Generation, The APRIORI Principle, Support and Confidence Measures, Association Rule Generation; APRIOIRI Algorithm, The Partition Algorithms, FP - Growth Algorithms, Compact Representation of Frequent Item set- Maximal Frequent Item Set, Closed Frequent Item Sets.

UNIT-IV

Classification

Problem Definition, General Approaches to solving a classification problem, Evaluation of classifiers, Classification Techniques, Decision Tree – Decision tree Construction, Methods for Expressing attribute test conditions, Measures for Selecting the Best Split, Algorithm for Decision tree Induction; Naive Bayes Classifier, Bayesian Belief Networks; K – Nearest neighbour classification – Algorithm and Characteristics.

UNIT-V

Clustering

Problem Definition, Clustering Overview, Evaluation of Clustering Algorithms, Partitioning Clustering - K-Means Algorithm, PAM Algorithm; Hierarchical Clustering – Agglomerative Methods and divisive methods, Outlier Detection.

TEXT BOOK(S)

1. Data Mining – Concepts and Techniques – Jiawei Han, MichelinenKamber, Morgan Kaufmann Publishers, Elsevier, 3rd Edition, 2012.
2. Introduction to Data Mining, Pang – Ning Tan, Vipin Kumar, Michael Steinbanch, Pearson Education, 2014.

REFERENCE BOOK(S)

1. Data Mining Techniques, Arun K Pujari, 3rd Edition,Universities Press,2008.
2. Data Warehouse Fundamentals, Pualraj Ponnaiah, Wiley Student Edition, 2001.
3. Data Mining, Vikaram Pudi, P Radha Krishna, Oxford University Press, 2010

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20MA31L01- STATISTICS FOR MACHINE LEARNING LAB

B.Tech. CSE (AIML) - III Year, I Sem.

L	T	P/D	C
-	-	2	1

Course Objectives

Develop ability to

1. Perform various operations and apply built in commands to constructfrequency distribution.
2. Generate therandom samples by Acceptance Rejection algorithmfrom probability distributions.
3. Identify the appropriate test statistic to test the significance of the population parameter(s).
4. Impart the knowledge of reduction and classification techniques.

Course Outcomes(COs)

At the end of course, student would be able to use R software to:

CO1. Construct frequency distribution for the given data.
CO2. Obtain specified set of samples from large data through random variables using Acceptance-Rejection (AR) algorithm.
CO3. Estimate and test the significance of the specified populationparameter(s) for the given data.
CO4. Reduce the dimensionality of large data sets using Principal Component Analysis (PCA), Logistic Regression (LR), K-means clustering and Support Vector Machine (SVM) for selecting variables.

LIST OF EXPERIMENTS

Week-1

Introduction to R Programming.

Week-2

Introduction to descriptive statistics using R (Frequency Distribution and Cumulative Distribution Function).

Week-3

Acceptance/Rejection Sampling in R.

Week-4

Maximum likelihood and method of moments estimation. Testing of Hypothesis based on Z-test. Concept of p-value in R.

Week-5

Testing of hypothesis based on t-test, chi-square test and F-test.

Confidence interval estimation in R.

Week-6

Multiple linear regression: Outlier analysis, residual analysis, test for normality, multi-collinearity in R.

Week-7

Logistic Regression in R.

Week-8

Classification with SVM in R.

Week-9

Dimensionality reduction with PCA in R and K-means Clustering in R.

Week-10

Kernel PCA and Kernel SVM in R.

LIST OF ADDITIONAL PROGRAMS

1 Generating Functions (Binomial , Poisson, Uniform, Normal and Exponential) using R.

2 Multiple linear regression: Testing overall hypothesis and testing significance of individual variables, model selections and prediction in R.

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20CS31L02 – COMPUTER NETWORKS LAB

B.Tech. CSE (AIML) - III Year, I Sem.

L	T	P/D	C
-	-	2	1

Prerequisite(s):
20CS11L01-PROGRAMMING FOR PROBLEM SOLVING-I LAB
20CS21L02-OBJECT ORIENTED PROGRAMMING LAB

Course Objectives
Develop ability to
1. Develop a modern network architecture from a design and performance perspective.
2. Understand the protocols of data link layer and MAC sub layer.
3. Distinguish and explain different network layer protocols and routing algorithms.
4. Describe the functions of TCP and UDP protocols.
5. Illustrate the application layer protocols such as HTTP, FTP, SMTP, DNS and TELNET.

Course Outcomes (COs)
At the end of the course, student would be able to
CO1: Analyze different types of network topologies, various physical media in terms of their suitability for different applications, OSI and TCP/IP models.
CO2: Apply channel allocation, framing, error and flow control techniques at data link layer.
CO3: Distinguish between circuit and packet switching, logical and physical addressing and analyze various routing algorithms.
CO4: Explain different Transport Layer functions and analyse congestion control algorithms.
CO5: Explain various Application layer protocols and classical cryptographic techniques.

LIST OF EXPERIMENTS

Week-1
Study of different types of Network cables and practically implement the cross-wired cable and straight through cable using Crimping tool.

Week-2
Connect the computers in LAN, Study of basic network commands and network configuration commands.

Week-3
Study of Network simulator tool and implement IP Address configuration in Network simulator tool.

Week-4
Configure different network topologies using Packet Tracer/Network Simulator tool.

Week-5
a. Write a program to implement the Data link layer framing methods character stuffing and bit stuffing.
b. Write a program to simulate Stop and Wait Protocol and Sliding Window Protocols.

Week-6
Write a program to implement on a data set of characters using the Cyclic Redundancy Check.

Week-7
Write a program to simulate Carrier Sense Multiple Access/Collision Detection (CSMA/CD) and Carrier Sense Multiple Access/Collision Avoidance (CSMA/CA).

Week-8
Configure a network using Distance Vector Routing protocol using packet tracer tool.

Week-9
Write a program to implement Client - Server communication for chat using Transmission Control Protocol (TCP).

Week-10
Configure FTP Server on a Linux/Windows machine using a FTP client. Use a TFTP client and repeat the experiment.

Week-11
Install Telnet on one of the systems connected by a switch and telnet to it from the other system. Using Wireshark tool, capture the packets and analyze the TCP 3-way Handshake for connection establishment and tear down.

Week-12
Using RSA Algorithm encrypt a text data and decrypt the same.

Software's used:

- C/ Java/ Equivalent compiler
- Network Simulator like NS2/NS3/CISCO Packet tracer tool/Wireshark tool

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20CS31L03 – ARTIFICIAL INTELLIGENCE LAB

B.Tech. CSE (AIML) - III Year, I Sem.

L	T	P/D	C
-	-	2	1

Prerequisite(s): None

Course Objectives

Develop ability to

1. Learn the difference between optimal reasoning and human like reasoning.
2. Know about basic concepts of state space representation, exhaustive search, and heuristic search together with the time and space complexities.
3. Obtain a thorough knowledge of various knowledge representation techniques.
4. Study about various reasoning techniques.
5. Know about various applications of AI, namely game playing

Course Outcomes (COs)

At the end of the course, student would be able to

CO1. Apply search techniques to given problem instances.
CO2. Use adversarial search and propositional logic to solve constraint satisfaction problems.
CO3. Apply first order logic to infer and describe knowledge representation.
CO4. Apply suitable planning methods to AI problems.
CO5. Apply Probabilistic and inductive reasoning techniques to make inferences in uncertain domains.

LIST OF EXPERIMENTS

Week-1

(a). Write a python program to print the multiplication table for the given number?
(b). Write a python program to check whether the given number is prime or not?
(c) Write a python program to find factorial of the given number?

Week-2

(a) Write a python program to demonstrate the usage of List operations. (Nested List, Length, Concatenation, Membership, Iteration, Indexing and Slicing, Add, Append, Extend & Delete)
(b)Write a Python Program to Remove Duplicate Element from a List.

Week-3

(a)Write a python program to implement Water Jug Problem?

Week-4

(a)Write a python program to implement Breadth-first search and Depth-first search

Week-5

(a)Write a Python code to implement 8-puzzle Problem.

Week-6

(a)Write a python program to implement Tic-Tac-Toe game.

Week-7
(a)Write a python program to implement constraint satisfaction problem.

Week-8
(a) Write a python program to implement Greedy best-first search.

Week-9
(a)Write a Python code to implement alpha–beta pruning.

Week-10
(a)Write a python program to construct a Bayesian network by considering any example data.

Week-11
(a)Write a Python program to implement A* search.

Week-12
(a) Write a Python code to solve traveling salesman problem.

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20MA31P01 - LOGICAL REASONING - I

B.Tech. CSE (AIML) - III Year, I Sem.

L	T	P/D	C
-	-	4	2

Prerequisite(s): None

Course Objectives

Develop ability to

1. Distinguish between simple and compound interest and demonstrate how to determine each; Evaluate profit/loss for the given various price related problems; Understand the importance of percentage, ratio and proportions while solve the problems in different scenarios.
2. Evaluate the average by various methods; Understand the concepts of speed, distance and time, solve the related problems; Understand the concepts of work done in a given period of time in various contexts.
3. Understand the statements and their connectives; Identify the validity of conclusions drawn from the given statements and identify strong/weak arguments from a given statement; Determine various Analogies to identify the similarities of the objects.
4. Understand the various concepts of Non-Verbal reasoning; Create awareness on blood relations and solve the related problems; Understand the concepts of binary logic and solve the analytical problems.

Course Outcomes(COs)

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

CO1. Interpret the validity conclusion from arguments and/or statements.
CO2. Develop strategies to find solutions and persevere in solving them.
CO3. Perform advance tricky approaches for solving reasoning and aptitude problems.

Quantitative Aptitude:

1. **Simple Interest**: Definitions, Problems on interest and amount, Problems when rate of interest and time period are numerically equal. **Compound Interest:** Definition and formula for amount in compound interest, Difference between simple interest and compound interest for 2 years on the same principle and time period.
2. **Profit & Loss:** Cost price, selling price, marked/list price, profit/gain, discount, use of false scale for selling an article, discount series and net selling price, successive Selling.
3. **Percentages, Ratio & Proportions:**
   Calculating a percentage, calculating increase or decrease, calculating percent change, calculating successive percentages, definition of ratio and proportions, direct proportion, Inverse or reciprocal proportion, continued proportion, Mean proportion, Third proportion, Fourth proportion, compound ratio.
4. **Averages:** Definition of Average, Rules of Average, Problems on Average, Problems on Weighted Average, Finding average using assumed mean method**.**
5. **Time and Distance:** Relation between speed, distance and time, converting km/h into m/s and vice versa, Problems on average speed, Problems on relative speed, Problems on trains.
6. **Time and Work:** Problems on Unitary method, Relation between Men, Days, Hours and Work, Problems on Man-Day-Hours method, Problems on alternate days, Problems on Pipes and Cisterns.

Logical Reasoning:

7. **Logical Connectives:** Definition of simple statement, Definition of compound statement, finding the implications for compound statements, finding the negations for compound statements.
8. **Syllogism:** Definition of statement/premises and conclusion, explanation through Venn diagram, problems on two/three statements and one/two conclusions, identification of statements and conclusions from the given set of statements. **Statements and Arguments**: Types of arguments, Strong argument, weak argument, identifying strong/weak arguments from a given statement
9. **Analogy Classifications:** Definition of Analogy, Problems on number analogy, Problems on letter analogy, Problems on verbal analogy.
10. **Non-Verbal Reasoning:** Identification of continued figure or odd figure by using analogy, series, rotation in clockwise and rotation in anticlockwise, vertical, horizontal, alternative rotation, addition , subtraction.
11. **Blood Relations:** Blood relations on Family Tree concepts (relationships in the family), paternal side relations, maternal side relations, simple and direct relationships, relation puzzles, coded relations.
12. **Binary Logic:** Definition of a truth-teller, Definition of a liar, Definition of an alternator, solving problems using method of assumptions, solving analytical puzzles using binary logic.

TEXT BOOK(S)

1. A modern approach to Logical reasoning, R S Agarwal, S. Chand Publications, 2013.
2. Quantitative Aptitude for Competitive Examinations, Dinesh Khattar, Pearson Education, 4th Edition, 2019.

REFERENCE BOOK(S)

1. Quantitative Aptitude and Reasoning, R. V. Praveen, PHI Learning Private Ltd, 2nd Edition, 2013.
2. Quantitative Aptitude for competitive examinations, AbhijithGuha, McGraw Hill Education, 6th Edition, 2017.
3. Analytical & Logical Reasoning, Peeyush Bhardwaj, Arihant Publications, 4th Edition, 2015.
4. Logical Reasoning for the CAT, Arun Sharma, McGraw Hill Education, 2nd Edition 2014.

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20EN31P01 – ENGLISH FOR PROFESSIONAL SUCCESS

B.Tech. CSE (AIML) - III Year, I Sem.

L	T	P/D	C
-	-	2	1

Prerequisite(s): None

Course Objectives
Develop ability to
1. Identify and practice the most commonly used Phrases, Phrasal verbs, Idioms and Technical vocabulary.
2. Read critically and comprehend the given text.
3. Understand the importance of presentation skills to prepare an effective presentation.
4. Realize the importance of organizational communication.

Course Outcomes(COs)
At the end of the course, student will be able to
CO1. Use Phrases, Phrasal verbs, Idioms and Technical vocabulary befitting the context in communication.
CO2. Review a book and an article by analyzing arguments and viewpoints.
CO3. Prepare and deliver engrossing and impressive presentations.
CO4. Correspond formally in a given context.

Module-I
Advanced Vocabulary
Vocabulary: Idioms and phrases, phrasal verbs: practice exercises. Jargon-Technical Vocabulary

Module-II
Critical Reading
Reading: Book review/ Article review: reviewing skills.

Module-III
Oral Skills
Speaking: Oral Technical Presentations, Project Presentations: genre, originality and accountability.

Module-IV
Official Correspondence
Writing: Circulars, notices, memos, Agenda, Minutes of Meeting (MoM)
Letter of Recommendation.

TEXT BOOK(S)
1. Objective English by Edger Thorpe and Showick Thorpe, Pearson, 6th Edition.
2. All About Words: an adult approach to vocabulary by Maxwell Nurnberg, Prentice-Hall.

REFERENCE BOOK(S)
1. Oxford Collocation Dictionary by Diana Lea.
2. Ed Swick, Writing Better English for ESL Learners,Mc.GrawHill, 2nd ed.

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20CS31M03 – INTRODUCTION TO CYBER SECURITY
(MANDATORY COURSE)

B.Tech. CSE (AIML) - III Year, I Sem.

L	T	P/D	C
3	-	-	-

Prerequisite(s): None

Course Objectives
Develop ability to
1. To familiarize various types of Cyber Security concepts, cyber-attacks and cyber-crimes.
2. To give an overview of the cyber laws, National Cyber Security Policy, Forensics Investigation.
3. To study the defensive techniques against Mobile and Wireless attacks
4. To Learn about Cyber security and Cyber terrorism.
5. To familiarize various Basic Data Privacy Concepts.

Course Outcomes (COs)
At the end of the course, student would be able to
CO1: Explain different aspects of cyber security ecosystem
CO2: Explain Indian and International laws for cyber security and basics of cyber forensics
CO3: Explain cyber security related threats to organizations in general and when using mobile and wireless devices and organizational policies to protect against them.
CO4: Analyze various case studies in the area of cyber crime

UNIT-I
Introduction to Cyber Security
Basic Cyber Security Concepts, layers of security, Vulnerability, threat, Harmful acts, Internet Governance – Challenges and Constraints, Computer Criminals, CIA Triad, Assets and Threat, motive of attackers, active attacks, passive attacks, Software attacks, hardware attacks, Spectrum of attacks, Taxonomy of various attacks, IP spoofing, Methods of defense, Security Models, risk management, Cyber Threats-Cyber Warfare, Cyber Crime, Cyber terrorism, Cyber Espionage, etc., Comprehensive Cyber Security Policy.

UNIT-II
Cyberspace and the Law and Cyber Forensics
Introduction, Cyber Security Regulations, Roles of International Law. The INDIAN Cyberspace, National Cyber Security Policy. Introduction, Historical background of Cyber forensics, Digital Forensics Science, The Need for Computer Forensics, Cyber Forensics and Digital evidence, Forensics Analysis of Email, Digital Forensics Lifecycle, Forensics Investigation, Challenges in Computer Forensics, Special Techniques for Forensics Auditing.

UNIT-III
Cybercrime
Mobile and Wireless Devices: Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication service Security, Attacks on Mobile/Cell Phones.
Mobile Devices: Security Implications for Organizations, Organizational Measures for Handling Mobile, Organizational Security Policies and Measures in Mobile Computing Era, Laptops.

UNIT-IV

Cyber Security

Organizational Implications: Introduction, cost of cybercrimes and IPR issues, web threats for organizations, security and privacy implications, social media marketing: security risks and perils for organizations, social computing and the associated challenges for organizations.

Cybercrime and Cyber terrorism

Introduction, intellectual property in the cyberspace, the ethical dimension of cybercrimes the psychology, mindset and skills of hackers and other cyber criminals.

UNIT-V

Privacy Issues

Basic Data Privacy Concepts: Fundamental Concepts, Data Privacy Attacks, Data linking and profiling, privacy policies and their specifications, privacy policy languages, privacy in different domains- medical, financial, etc.

Cybercrime

Examples and Mini-Cases: Examples: Official Website of Maharashtra Government Hacked, Indian Banks Lose Millions of Rupees, Parliament Attack, Pune City Police Bust Nigerian Racket, e-mail spoofing instances.

Mini-Cases

The Indian Case of online Gambling, An Indian Case of Intellectual Property Crime, Financial Frauds in Cyber Domain.

TEXT BOOK(S)

1. Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives ,First Edition, Nina Godbole and SunitBelpure, Wiley, 2011.
2. Computer and Cyber Security: Principles, Algorithm, Applications and Perspectives Brij B. Gupta, Dharma. P. Agrawal, Haoxiang Wang, CRC Press Taylor and Francis Group, 2019.

REFERENCE BOOK(S)

1. Cyber Security Essentials, James Graham, Richard Howard and Ryan Otson, CRC Press Taylor and Francis Group, 2010.
2. Introduction to Cyber Security, Chwan-Hwa(John) Wu, J.David Irwin, CRC Press Taylor and Francis Group, 2013.

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20CS32008– CRYPTOGRAPHY AND NETWORK SECURITY

B.Tech. CSE (AIML) - III Year, II Sem.

L	T	P/D	C
3	-	-	3

Prerequisite(s):
20CS31002-COMPUTER NETWORKS

Course Objectives
Develop ability to

1. Develop a basic understanding of cryptography, its evolution, and some key encryption techniques used today.
2. Develop an understanding of security policies (such as authentication, integrity and confidentiality), as well as protocols to implement such policies in the form of message exchanges.
3. Illustrate Symmetric and asymmetric cryptosystem.
4. Develop an understanding of web security services and mechanisms, viruses, threats, IDS and concepts of firewalls.
5. Describe the enhancements made to IPv4 by IPSec.

Course Outcomes (COs)
At the end of the course, student would be able to

CO1. Explain various attacks on the ciphertext, security services provided and analyse classical ciphers.
CO2. Analyze symmetric and asymmetric key ciphers and their strength.
CO3. Analyze various hash functions and authentication codes.
CO4. Distinguish different Key Management and Distribution techniques.
CO5. Explain PGP, S/MIME, transport-level, IP and wireless network security mechanisms.
CO6. Explain payment transactions and virtual elections using various cryptographic concepts.

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, and 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, 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 BOOK(S)

1. Cryptography and Network Security - Principles and Practice: William Stallings, Pearson Education, 6th Edition, 2014.

REFERENCE BOOK(S)

1. Cryptography and Network Security: C K Shyamala, N Harini, Dr T R Padmanabhan, Wiley India, 1st Edition, 2011.
2. Cryptography and Network Security : Forouzan Mukhopadhyay, Mc Graw Hill, 3rd Edition, 2016.
3. Cryptography and Network Security: Atul Kahate, Mc Graw Hill, 3rd Edition, 2013.
4. Information Security, Principles, and Practice: Mark Stamp, Wiley India, 2011.
5. Principles of Computer Security: WM. Arthur Conklin, Greg White, TMH, 2016.
6. Introduction to Network Security: Neal Krawetz, CENGAGE Learning, 2007.
7. Network Security and Cryptography: Bernard Menezes, CENGAGE Learning, 2010.

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20CS32005– MACHINE LEARNING

B.Tech. CSE (AIML) - III Year, II Sem.

L	T	P/D	C
3	-	-	3

Prerequisite(s):
20MA31001-STATISTICS FOR MACHINE LEARNING

Course Objectives
Develop ability to
1. To understand the basic concepts of machine learning and probability theory.
2. To appreciate supervised learning and their applications.
3. To understand unsupervised learning like clustering and EM algorithms.
4. To understand the theoretical and practical aspects of probabilistic graphical models.
5. To learn other learning aspects such as reinforcement learning, representation learning, deep learning, neural networks and othertechnologies.

Course Outcomes (COs)
At the end of the course, student would be able to
CO1. Distinguish between supervised and unsupervised learning.
CO2. Explain and apply supervised learning algorithms for a given problem.
CO3. Explain and apply Unsupervised learning models for a given problem.
CO4. Explain and apply probability based supervised and unsupervised learning methods for a given problem.
CO5. Explain advanced learning methods.

UNIT-I

Introduction

Machine Learning – Types of Machine Learning – Supervised Learning – Unsupervised Learning – Basic Concepts in Machine Learning – Machine Learning Process – Weight Space – Testing Machine Learning Algorithms – A Brief Review of Probability Theory – Turning Data into Probabilities – The Bias-Variance Tradeoff.

UNIT-II

Supervised Learning

Linear Models for Regression – Linear Basis Function Models – The Bias-Variance Decomposition – Bayesian Linear Regression – Common Regression Algorithms – Simple Linear Regression – Multiple Linear Regression – Linear Models for Classification – Discriminant Functions – Probabilistic Generative Models – Probabilistic Discriminative Models – Laplace Approximation – Bayesian Logistic Regression – Common Classification Algorithms – k-Nearest Neighbors – Decision Trees – Random Forest model – Support Vector Machines.

UNIT-III

Unsupervised Learning

Mixture Models and EM – K-Means Clustering – Dirichlet Process Mixture Models – Spectral Clustering – Hierarchical Clustering – The Curse of Dimensionality – Dimensionality Reduction – Principal Component Analysis – Latent Variable Models (LVM) – Latent Dirichlet Allocation (LDA).

UNIT-IV

Graphical Models

Bayesian Networks – Conditional Independence – Markov Random Fields – Learning – Naive Bayes Classifiers – Markov Model – Hidden Markov Model.

UNIT-V

Advanced Learning

Reinforcement Learning – Representation Learning – Neural Networks – Active Learning – Ensemble Learning – Bootstrap Aggregation – Boosting – Gradient Boosting Machines – Deep Learning.

TEXT BOOK(S)

1. Ethem Alpaydin, "Introduction to Machine Learning", Third Edition, Prentice Hall of India, 2015.

REFERENCE BOOK(S)

1. Christopher Bishop, "Pattern Recognition and Machine Learning", Springer, 2006.
2. Kevin P. Murphy, "Machine Learning: A Probabilistic Perspective", MIT Press, 2012.
3. Stephen Marsland, "Machine Learning – An Algorithmic Perspective", Second Edition, CRC Press, 2014.
4. Tom Mitchell, "Machine Learning", McGraw-Hill, 2017.
5. Trevor Hastie, Robert Tibshirani, Jerome Friedman, "The Elements of Statistical Learning", Second Edition, Springer, 2008.
6. Fabio Nelli, "Python Data Analytics with Pandas, Numpy, and Matplotlib", Second Edition, Apress, 2018.

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20CS32016-OPTIMIZATION TECHNIQUES
(PROFESSIONAL ELECTIVE–II)

B.Tech. CSE (AIML) - III Year, II Sem.

L	T	P/D	C
3	-	-	3

Prerequisites: None

Course Objectives

Develop ability to

1. Interpret various classical optimization techniques.
2. Apply the basics of linear programming on real time scenarios.
3. Build an Understanding on the basis of optimization techniques.
4. Classify the Characteristics a constrained problem.
5. Generalize the concept of Dynamic programming and its applications to project implementation.

Course Outcomes (COs)

At the end of the course, student would be able to

CO1: Apply classical optimization techniques to a given problem.
CO2: Apply linear programming to a given problem.
CO3: Apply Constrained and Unconstrained nonlinear programming techniques to a given problem
CO4: Explain the computational procedures of dynamic programming approach for Optimization

UNIT-I

Introduction and Classical Optimization Techniques

Statement of an Optimization problem – design vector – design constraints – constraint surface – objective function – objective function surfaces – classification of Optimization problems. Classical Optimization Techniques: Single variable Optimization – multi variable Optimization without constraints – necessary and sufficient conditions for minimum/maximum – multivariable Optimization with equality constraints. Solution by method of Lagrange multipliers – Multivariable Optimization with inequality constraints – Kuhn – Tucker conditions.

UNIT-II

Linear Programming

Standard form of a linear programming problem – geometry of linear programming problems – definitions and theorems – solution of a system of linear simultaneous equations – pivotal reduction of a general system of equations – motivation to the simplex method – simplex algorithm. Transportation Problem: Finding initial basic feasible solution by north – west corner rule, least cost method and Vogel's approximation method – testing for optimality of balanced transportation problems.

UNIT-III

Unconstrained Nonlinear Programming

One dimensional minimization methods, Classification, Fibonacci method and Quadratic interpolation method. Unconstrained Optimization Techniques: Univariant method, Powell's method and steepest descent method.

UNIT-IV

Constrained Nonlinear Programming

Characteristics of a constrained problem classification Basic approach of Penalty Function method – Basic approach of Penalty Function method – Basic approaches of Interior and Exterior penalty function methods – Introduction to convex programming problem.

UNIT-V

Dynamic Programming

Dynamic programming multistage decision processes – types-concept of sub optimization and the principle of optimality – computational procedure in dynamic programming – examples illustrating the calculus method of solution – examples illustrating the tabular method of solution.

TEXT BOOK(S)

1. Engineering Optimization: Theory and Practice by John Wiley and Sons by Singiresu S. Rao, 4th edition, 2009. (Unit I to Unit V)
2. Introductory Operations Research, Springer (India), Pvt. Ltd., 2004 by H. S. Kasene & K. D. Kumar.(Unit II)

REFERENCE BOOK(S)

1. Linear programming, Springer series in operations research 3rd edition, 2003 by George Bernard Dantzig, Mukund Narain Thapa.
2. Operations Research: An Introduction, 8th Edition, Pearson/Prentice Hall, 2007 by H.A. Taha.
3. Optimization for Engineering Design – Algorithms and Examples, PHI Learning Pvt. Ltd, New Delhi, 2005 by Kalyanmoy Deb.

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20CS32017-SOFTWARE ENGINEERING
(PROFESSIONAL ELECTIVE–II)

B.Tech. CSE (AIML) - III Year, II Sem.

L	T	P/D	C
3	-	-	3

Prerequisites(s): None

Course Objectives
Develop ability to
1. Understand the basis of software development process.
2. Design the requirements of the customer.
3. Elaborate the design process of software development.
4. Identify various project and process metrics.
5. Apply software testing and its importance in assuring quality.

Course Outcomes(COs)
At the end of this course, student would be able to
CO1: Compare various software process models.
CO2: Analyze the requirements and draft the SRS Document using various analysis models.
CO3: Illustrate design of user interface and software architecture.
CO4: Explain various aspects of software project management.
CO5: Distinguish various software testing methods and explain software quality parameters.

UNIT-I
INTRODUCTION
Evolving role of software – Generic view of process-Software engineering a layered technology - Process framework – CMMI - **Process models** –perspective models, waterfall model, Incremental process models, evolutionary process models, unified process models, specialized process models, Agile modeling. Software engineering ethics.

UNIT-II
REQUIREMENTS ANALYSIS
Requirements engineering tasks – Eliciting Requirements-Building an analysis model-functional and non-functional requirements analysis –Analysis modeling approaches-Data modeling concepts-Flow oriented modeling-class based modeling.

UNIT-III
SOFTWARE DESIGN
Design concepts – Design model - Software architecture - Architectural design –mapping data flow in to software architecture – Modeling component level design – performing user interface design – Golden rules of user interface – Interface design steps.

UNIT-IV
MANGING THE SOFTWARE PROJECTS
Project management- Process and Project Metrics – Software estimation - Empirical estimation models- Risk analysis – RMMM plan - Software project scheduling, control & monitoring–- Software Configuration Management.

UNIT-V

SOFTWARE TESTING AND QUALITY

Strategic issues – Software testing fundamentals – Levels of testing – Art of debugging- Black and White box testing and their techniques – Basis path testing – Control Structures testing – OO testing–SQA-Quality metrics-Software Reliability-Software reliability–Quality models-Software maintenance-CASE tools.

TEXT BOOK(S)

1. Software Engineering, A Practitioner's Approach – Roger S. Pressman, 6th Edition, McGraw Hill International Edition, 2005.

REFERENCE BOOK(S)

1. Software Engineering, Ian Sommerville, 7th edition, Pearson Education, 2005.
2. Software Engineering, an Engineering approach-James F Peters,Witeld Pedryez, John Wiely, 1999.
3. Software Testing Techniques, Boris Beizer, Second edition, dreamtech Press, 1983.

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20CS32013-DISTRIBUTED SYSTEMS
(PROFESSIONAL ELECTIVE–II)

B.Tech. CSE (AIML) - III Year, II Sem.

L	T	P/D	C
3	-	-	3

Prerequisite(s):
20CS22003-OPERATING SYSTEMS
20CS31002-COMPUTER NETWORKS

Course Objectives
Develop ability to
1. Demonstrate the concepts of distributed systems.
2. Design theoretical concepts namely virtual time, agreement and consensus protocol.
3. Build IPC, group communication and RPC Concepts.
4. Distinguish the concepts of DFS and DSM.
5. Identify transaction in distributed environment and associated to namely, concurrency control, deadlocks and error recovery.

Course Outcomes (COs)
At the end of the course, student would be able to
CO1. Analyze various aspects of distributed systems, deductively, and explain various models of distributed systems.
CO2. Apply the concepts of time and global states, coordination and agreement as well as Inter process communication for building a distributed system.
CO3. Apply RPC for communication among distributed objects.
CO4. Explain distributed file systems, name services and distributed shared memory.
CO5. Apply the concepts of transaction and concurrency control for distributed transactions.

UNIT-I
Characterization of Distributed Systems
Introduction, Examples of Distributed systems, Goals of Distributed System, Hardware and Software Concepts, Advantages & Disadvantages of distributed System, Issues in Designing Distributed Systems, Resource sharing and web, challenges.
System models
Introduction, Architectural Models, Fundamental models.

UNIT-II
Time and Global States
Introduction, Clocks Events and Process states, Synchronizing physical clocks, logical time and logical clocks, global states, distributed debugging.
Coordination and Agreement
Introduction, Distributed mutual exclusion, Elections, Multicast communication, consensus and related problems.

UNIT-III

Inter Process communication

Introduction, The API for the internet protocols, External data representation and Marshalling, server communication, communication, Case study-IPC in UNIX.

Distributed objects and Remote Invocation

Introduction, Communication between distributed objects, RPC, Events and notifications.

UNIT-IV

Distributed File Systems

Introduction, File Service architecture, case study1- SUN network file systems.

Name Services

Introduction; Name Services and the Domain Name System, Directory Services.

Distributed shared memory

Introduction, Design and Implementation issues, Sequential consistency, other consistency models.

UNIT-V

Transactions and Concurrency control

Introduction, Transactions, Nested Transactions, Locks, Optimistic concurrency control, Timestamp ordering, Comparison of methods for concurrency controls.

Distributed Transactions

Introduction, Flat and Nested Distributed Transactions, Atomic commit protocols, Concurrency control in distributed transactions, Distributed deadlocks, Transaction recovery.

TEXT BOOK(S)

1. Distributed Systems Concepts and Design, G Coulouris, J Dollimore and T Kindberg, Fourth Edition, Pearson Education, 2013.

REFERENCE BOOK(S)

1. Distributed Systems, Principles and Paradigms, A.S. Tanenbaum and M.V. Steen, 2nd edition Pearson Education, 2007.
2. Distributed Systems, An algorithm Approach, Sukumar Ghosh, Chapman & Hall/CRC, Taylor & Francis Group, 2007.

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20CS32009-INFORMATION RETRIEVAL SYSTEMS
(PROFESSIONAL ELECTIVE–II)

B.Tech. CSE (AIML) - III Year, II Sem.

L	T	P/D	C
3	-	-	3

Prerequisites:
20CS21001-DATA STRUCTURES

Course Objectives
Develop ability to
1. Study the different models for information storage and retrieval.
2. Learn about the various retrieval utilities.
3. Understand indexing and querying in information retrieval systems.
4. Interpret the various notions of structured and semi structured data.
5. Learn about web search and its retrieval methods.

Course Outcomes(COs)
At the end of the course, student would be able to
CO1. Explain elements of Information Retrieval Systems and their capabilities.
CO2. Apply cataloging and indexing algorithms for efficient document retrieval.
CO3. Apply search techniques and ranking methods to rank the retrieved documents.
CO4. Explain issues to be addressed to build a multimedia Information Retrieval system.

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 Search Algorithms, Hardware Text Search Systems Multimedia Information Retrieval: Spoken Language Audio Retrieval, Non-Speech Audio Retrieval, Graph Retrieval, Imagery Retrieval, Video Retrieval.

TEXT BOOK(S)

1. Information Storage and Retrieval Systems – Theory and Implementation, Gerald J. Kowalski, Mark T.Maybury, 2nd Edition, Springer, 2002.

REFERENCE BOOK(S)

1. Information Retrieval Data Structures and Algorithms, Frakes, W.B., Ricardo Baeza-Yates, Prentice Hall, 1992.
2. Information Storage & Retrieval, Robert Korfhage, John Wiley & Sons, 1997.
3. Modern Information Retrieval: The Concepts and Technology behind Search, Rcardo Baeza-Yates, Dr Berthier Ribeiro-Neto, Pearson Education, 2nd Edition, 2011.

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20CS32012-PRINCIPLES OF PROGRAMMING LANGUAGES
(PROFESSIONAL ELECTIVE–III)

B.Tech. CSE (AIML) - III Year, II Sem.

L	T	P/D	C
3	-	-	3

Prerequisite(s):
20CS11001-PROGRAMMING FOR PROBLEM SOLVING – I
20CS21002- OBJECT ORIENTED PROGRAMMING

Course Objectives
Develop ability to

1. To understand and describe syntax and semantics of programming languages and introduce important paradigms of programming languages.
2. Explore and acquire data, data types, and basic statements.
3. To understand call-return architecture and ways of implementing them.
4. To familiarize object-orientation, concurrency, and event handling in programming languages
5. To develop programs in non-procedural programming paradigms.

Course Outcomes (COs)
At the end of the course, student would be able to

CO1. Explain design criteria and use formal notation to describe syntax and semantics of programming languages.
CO2. Analyze the design issues of programming languages in the context of Scope, Data Types, Expressions, statements and Control structures.
CO3. Analyze the design issues in implementing subprograms.
CO4. Compare the mechanisms of ADT, concurrency, exception handling and event handling in various programming languages.
CO5. Analyze different programming language paradigms.

UNIT-I
Preliminary Concepts
Reasons for Studying Concepts of Programming Languages, Programming Domains, Language Evaluation Criteria, Influences on Language Design, Language Categories, Language Design Trade-Offs, Implementation Methods, Programming Environments.
Syntax and Semantics
General Problem of Describing Syntax and Semantics, Formal Methods of Describing Syntax, Attribute Grammars, Describing the Meanings of Programs.

UNIT-II
Names, Bindings, and Scopes
Introduction, Names, Variables, Concept of Binding, Scope, Scope and Lifetime, Referencing Environments, Named Constants.
Data Types
Introduction, Primitive Data Types, Character String Types, User Defined Ordinal Types, Array, Associative Arrays, Record, Union, Tuple Types, List Types, Pointer and Reference Types, Type Checking, Strong Typing, Type Equivalence.
Expressions and Statements
Arithmetic Expressions, Overloaded Operators, Type Conversions, Relational and Boolean Expressions, Short Circuit Evaluation, Assignment Statements, Mixed-Mode Assignment.

Control Structures
Introduction, Selection Statements, Iterative Statements, Unconditional Branching, Guarded Commands.

UNIT-III
Subprograms and Blocks
Fundamentals of Sub-Programs, Design Issues for Subprograms, Local Referencing Environments, Parameter Passing Methods, Parameters that are Subprograms, Calling Subprograms Indirectly, Overloaded Subprograms, Generic Subprograms, Design Issues for Functions, User Defined Overloaded Operators, Closures, Coroutines.
Implementing Subprograms
General Semantics of Calls and Returns, Implementing Simple Subprograms, Implementing Subprograms with Stack-Dynamic Local Variables, Nested Subprograms, Blocks, Implementing Dynamic Scoping.
Abstract Data Types
The Concept of Abstraction, Introductions to Data Abstraction, Design Issues, Language Examples, Parameterized ADT, Encapsulation Constructs, Naming Encapsulations.

UNIT–IV
Concurrency
Introduction, Introduction to Subprogram Level Concurrency, Semaphores, Monitors, Message Passing, Java Threads, Statement Level Concurrency.
Exception Handling and Event Handling
Introduction, Exception, Handling in Ada, C++, Java, and Introduction to Event Handling, Event Handling with Java and c #.

UNIT–V
Functional Programming Language
Introduction, Mathematical Functions, Fundamentals of Functional Programming Language, LISP, Support for Functional Programming in Primarily Imperative Languages, Comparison of Functional and Imperative Languages.
Logic Programming Language
Introduction, an Overview of Logic Programming, Basic Elements of Prolog, Applications of Logic Programming.
Scripting Language
Pragmatics, Key Concepts, Case Study: Python – Values and Types, Variables, Storage and Control, Bindings and Scope, Procedural Abstraction, Data Abstraction, Separate Compilation, Module Library. (Text Book 2)

TEXT BOOK(S)
1. Concepts of Programming Languages Robert. W. Sebesta 10/E, Pearson Education, 2012.
2. Programming Language Design Concepts, D. A. Watt, Wiley Dreamtech, 2007.

REFERENCE BOOK(S)
1. Programming Languages, 2nd Edition, A.B. Tucker, R. E. Noonan, TMH, 2007.
2. Programming Languages, K. C. Louden, 2nd Edition, Thomson, 2003.

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20CS32001-INTERNET OF THINGS
(PROFESSIONAL ELECTIVE–III)

B.Tech. CSE (AIML) - III Year, II Sem.

L	T	P/D	C
3	-	-	3

Prerequisites:
20CS11L01-PROGRAMMING FOR PROBLEM SOLVING-I
20CS31002-COMPUTER NETWORKS

Course Objectives
Develop ability to
1. Assess the vision and introduction of IoT and understanding how M2M is connected to internet of things
2. Identify the appropriate Hardware and software components of IoT for communication
3. Gain knowledge on Cloud Storage models, web servers and how to integrate device, data and cloud management framework for IoT.
4. Learn the concepts of various data analytics and operational technology security with IoT.
5. Understand advanced and emerging concepts fog computing and Edge computing-IoT

Course Outcomes(COs)
At the end of the course, student would be able to
CO1. Explain IoT architecture with hardware and software components, design principles and its applications.
CO2. Design an IoT system for a given problem using physical servers or cloud.
CO3. Apply various types of analytics to an IoT System.
CO4. Evaluate the suitability of cloud, fog and edge computing services for different IoT applications.

UNIT-I
Introduction to Internet of Things
Definition and Characteristics of IoT, Architectural Overview, Design principles and needed capabilities, IoT Applications, Sensing, Actuation, Basics of Networking, M2M and IoT Technology Fundamentals- Devices and gateways, Data management, Business processes in IoT, Everything as a Service(XaaS), Role of Cloud in IoT, Security aspects in IoT.

UNIT-II
Elements of IoT
Hardware Components- Computing (Arduino, Raspberry Pi), Communication, Sensing, Actuation, I/O interfaces.
Software Components
Programming API's (using Python/ Node.js/ Arduino) for Communication Protocols-MQTT, ZigBee, Bluetooth, CoAP, UDP, TCP.

UNIT-III
IoT Physical Servers and Cloud Offerings
Introduction to Cloud Storage models and communication APIs Web server – Web server for IoT, Cloud for IoT
IoT Application Development
Solution framework for IoT applications- Implementation of Device integration, Data acquisition and integration, Device data storage- Unstructured data storage on cloud/local server, Authentication, authorization of devices.

UNIT-IV

Data and Analytics for IoT

Introduction to Big Data Analytical Tools for IoT, Data Analytics for IoT, Edge Streaming Analytics, Network Analytics, Machine Learning for IoT

Securing IoT

Introduction to OT (Operational Technology) security, a brief history and common challenges in OT (Operational Technology) Security,

UNIT-V

Introduction To Fog Computing

Fog Computing-Definition-Characteristics-Application Scenarios -Issues -Fog Computing and Internet of Things-Pros and Cons-Myths of Fog Computing -Need and Reasons for Fog Computing Fog Computing and Edge Computing-IoT.

TEXT BOOK(S)

1. Internet of Things - A Hands-on Approach, Arshdeep Bahga and Vijay Madisetti, Universities Press, 2015, ISBN: 9788173719547

REFERENCE BOOK(S)

1. The Internet of Things: Enabling Technologies, Platforms, and Use Cases, Pethuru Raj and Anupama C. Raman, CRC Press, 2017.
2. Designing the Internet of Things, Adrian McEwen & Hakim Cassimally, Wiley, 2013.
3. Getting Started with the Internet of Things, Cuno Pfister, O‟Reilly Media, 2011.

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20CS32018-DISTRIBUTED DATABASES
(PROFESSIONAL ELECTIVE–III)

B.Tech. CSE (AIML) - III Year, II Sem.

L	T	P/D	C
3	-	-	3

Prerequisites:
20CS21003-DATABASE MANAGEMENT SYSTEMS

Course Objectives
Develop ability to
1. Acquire knowledge on parallel and distributed databases and its applications.
2. Study the usage and applications of Object Oriented databases.
3. Learn the modeling and design of databases.
4. Acquire knowledge on parallel and distributed databases and its applications.
5. Equip students with principles and knowledge of parallel and object oriented databases.

Course Outcomes(COs)
At the end of the course, student would be able to
CO1. Explain the fundamental concepts of distributed database systems.
CO2. Construct queries for distributed databases.
CO3. Analyse a given schedule of distributed transactions from the perspective of concurrency control and reliability.
CO4. Apply object oriented approach for distributed databases query optimization and concurrency control for efficient transaction management.

UNIT-I
Features of Distributed versus Centralized Databases, Principles of Distributed Databases, Levels Of Distribution Transparency, Reference Architecture for Distributed Databases, Types of Data Fragmentation, Integrity Constraints in Distributed Databases, Distributed Database Design

UNIT-II
Translation of Global Queries to Fragment Queries, Equivalence transformations for Queries, Transforming Global Queries into Fragment Queries, Distributed Grouping and Aggregate Function Evaluation, Parametric Queries. Optimization of Access Strategies, A Framework for Query Optimization, Join Queries, General Queries

UNIT-III
The Management of Distributed Transactions, A Framework for Transaction Management, Supporting Atomicity of Distributed Transactions, Concurrency Control for Distributed Transactions, Architectural Aspects of Distributed Transactions Concurrency Control, Foundation of Distributed Concurrency Control, Distributed Deadlocks, Concurrency Control based on Timestamps, Optimistic Methods for Distributed Concurrency Control.

UNIT-IV
Reliability, Basic Concepts, Nonblocking Commitment Protocols, Reliability and concurrency Control, Determining a Consistent View of the Network, Detection and Resolution of Inconsistency, Checkpoints and Cold Restart, Distributed Database Administration, Catalog Management in Distributed Databases, Authorization and Protection.

UNIT-V

Architectural Issues, Alternative Client/Server Architectures, Cache Consistency, Object Management, Object Identifier Management, Pointer Swizzling, Object Migration, Distributed Object Storage, Object Query Processing, Object Query Processor Architectures, Query Processing Issues, Query Execution, Transaction Management, Transaction Management in Object DBMSs, Transactions as Objects Database Integration, Scheme Translation, Scheme Integration, Query Processing Query Processing Layers in Distributed Multi-DBMSs, Query Optimization Issues Transaction Management Transaction and Computation Model, Multi database Concurrency Control, Multi database Recovery, Object Orientation and Interoperability, Object Management Architecture CORBA and Database interoperability, Distributed Component Object Model, COM/OLE and Database Interoperability, PUSH-Based Technologies

TEXT BOOK(S)

1. Distributed Databases Principles & Systems, Stefano Ceri, Giuseppe Pelagatti, TMH, 1988.

REFERENCE BOOK(S)

1. Principles of Distributed Database Systems, M. Tamer Ozsu, Patrick Valduriez , Pearson Education, 2nd Edition, 1999.
2. Distributed Database Systems, Chanda Ray, Pearson, 2009.
3. Distributed Database Management Systems, S. K. Rahimi and Frank. S. Haug, Wiley,2015.

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20CS32019-NATURAL LANGUAGE PROCESSING
(PROFESSIONAL ELECTIVE–III)

B.Tech. CSE (AIML) - III Year, II Sem.

L	T	P/D	C
3	-	-	3

Pre-requisite(s):
20CS21001-DATA STRUCTURES

Course Objectives
Develop ability to
1. Understand the Structure of Words and Structure of Document.
2. Learn different Parsing Algorithms and Models for Ambiguity Resolution in Parsing.
3. Understand encoding ambiguity in the Logical form, verbs and states in Logical form.
4. Explain Predicate Structure and Discourse Processing.
5. Demonstrate different language modeling Techniques.

Course Outcomes (COs)
At the end of the course, student would be able to
CO1. Apply different methods to determine the Structure of Words and Documents.
CO2. Perform syntax analysis on a given natural language text.
CO3. Apply the concepts of predicate logic in the context of argument and its meaning representation.
CO4. Apply discourse processing techniques to a given conversation.
CO5. Analyze and evaluate different Language Modeling Techniques.

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.

UNIT-II
Syntax Analysis
Parsing Natural Language, Tree banks: A Data-Driven Approach to Syntax, Representation of Syntactic Structure, Parsing Algorithms, Models for Ambiguity Resolution in Parsing, Multilingual Issues

UNIT-III
Semantic and Logical Form
Semantics and logical form, word senses and ambiguity, the basic logical formal language, encoding ambiguity in the logical form, verbs and states in logical form, thematic roles, speech acts and embedded sentences and defining semantics structure model theory.

UNIT-IV
Predicate
Argument Structure, Meaning Representation Systems.
Discourse Processing
Cohesion, Reference Resolution, Discourse Cohesion and Structure.

UNIT-V

Language Modeling

Introduction, N-Gram Models, Language Model Evaluation, Parameter Estimation, Language Model Adaptation, Types of Language Models, Language-Specific Modeling Problems, Multilingual and Cross lingual Language Modeling.

TEXT BOOK(S)

1. Multilingual natural Language Processing Applications: From Theory to Practice – Daniel M. Bikel and Imed Zitouni, Pearson Publication, 2012.(Unit I ,II & V)
2. Natural Language Processing and Information Retrieval: Tanvier Siddiqui, U.S. Tiwary, Oxford Higher Education, 2008. (Unit III & IV)

REFERENCE BOOK(S)

1. Speech and Language Processing - Daniel Jurafsky & James H Martin, Pearson Publications, 2008.

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20CE32071-GREEN BUILDINGS
(OPEN ELECTIVE II)

B.Tech. CSE (AIML) - III Year, II Sem.
Prerequisite(s): None.

L	T	P/D	C
3	-	-	3

Course objectives
Develop ability to
1. Impart knowledge on the sustainable construction strategies.
2. Understand green building assessment and LEED certification process.
3. Understand effective energy management systems for a smart building.
4. Learn emerging building materials and their application.
5. Understand green building implementation concepts.

Course Outcomes (COs)
At the end of the course, student would be able to
CO1. Explain the scope and importance of a green building, green building movement.
CO2. Differentiate between conventional and green buildings and its rating system.
CO3. Describe the conservative use of environmental components and identify the materials for green building.
CO4. Explain green buildings implementation strategies.

UNIT-I
Introduction to Green Buildings
Definition of green buildings and sustainable development– typical features of green building– Increased CO_2 trade – Sustainable construction – Major environmental and resource concerns – Green building movement and obstacles – Green building requirements – Perceived use of green building.

UNIT-II
Green Building Process and Assessment
Conventional versus green building delivery systems – Execution of green building process – Integrated design process – Ecological design –Merits and demerits – Historical perspective – Green building rating systems – GRIHA, IGBC and LEED, Overview of the criteria as per these rating systems. International building assessment standards – Building rating system and its future – Case study of a green building.

UNIT-III
Sustainable landscaping, Energy and Atmosphere
Land and landscape approaches for green buildings – Sustainable landscapes – Enhancing ecosystems – Storm water management – Heat Island mitigation – Building energy issues – Building energy design strategies – Building envelope – Active mechanical systems – Electrical power systems – Innovative energy optimization strategies – Smart buildings and energy management systems – Ozone depleting chemicals in HVAC & R and fire suppression.

UNIT-IV

Building Hydrologic System and Material Loops

Energy policy act of 1992 – High performance building hydrologic strategy - High performance building water supply strategy - High performance building wastewater strategy – Landscaping water efficiency – Green building materials issues and priorities – Difference between green building buildings and green building materials – Waste Management–Handling of construction waste materials, separation of household waste, on-site and off-site organic waste management.

UNIT-V

Green Building Implementation

Site protection planning – Health and safety planning – Construction and demolition – Waste management – Reducing the footprint of construction operations – Essentials of building commissioning – Costs and benefits of building commissioning – Case study for high performance green buildings – The economics of green buildings – Quantifying green building costs – Future directions in green buildings.

TEXT BOOK(S)

1. Sustainable Construction: Green Building Design and Delivery, Charles.J.Kibert, JohnWiley & Sons, New Jersey, 2016
2. Green Building: Guidebook for Sustainable Architecture, M.Bauer, P. Mosle and M. Schwarz, Springer, Verlag Berlin Heidelberg, 2010.

REFERENCE BOOK(S)

1. Marketing Green Building Services: Strategies for success, Jerry Yudelson, Elsever, 2008
2. IGBC Green Homes Rating System, Version 2.0., Abridged reference guide, 2013, Indian Green Building Council Publishers.
3. Marketing Green Buildings: Guide for Engineering, Construction and Architecture, Jerry Yudelson, The Fairmont Press Inc., 2006.
4. GRIHA version 2015, GRIHA rating system, Green Rating for Integrated Habitat Assessment.
5. Green by Design: Creating a Home for Sustainable Living, Angela M. Dean, Gibbs Smith Publication, 2003.
6. Indian Green Building Council Website: https://igbc.in/igbc/
7. http://cpwd.gov.in/Publication/Guideleines_Sustainable_Habitat.pdf
8. For case studies: http://www.nmsarchitects.com/
9. For case studies: http://www.nmsarchitects.com/

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20EE32072- ENERGY CONSERVATION AND MANAGEMENT
(OPEN ELECTIVE II)

B.Tech. CSE (AIML) - III Year, II Sem.

L	T	P/D	C
3	-	-	3

Prerequisite(s): None.

Course Objectives
Develop ability to
1. Understand different basic terms related to Indian Energy Scenario.
2. Understand the importance of energy conservation.
3. Understand different acts and policies related to energy conservation.
4. Understand about energy management and types of audits.
5. Understand basic types of management schemes in energy conservation.

Course Outcomes (COs)
At the end of the course, student would be able to
CO1: Identify the demand supply gap of energy.
CO2: Interpret the importance of energy conservation and the schemes to conserve energy along with different policies.
CO3: Explain the need of energy audit, prepare a report suggesting appropriate conservation scheme which include energy planning.
.

UNIT-I
General aspects of energy
Introduction – Types of Energy – Primary and Secondary, Commercial and Non-Commercial, Renewable and Non-Renewable – Global Primary Reserves and Commercial Energy Production - Energy Scenario – Sector Wise Energy Production and Consumption in India – Energy Needs of Growing Economy – Energy Security.

UNIT-II
Energy Conservation and Its Importance
Energy Conservation – Definition – Benefits – Identification of Energy Conservation Opportunities – Technical and Economic Feasibility – Classification of Energy Conservation Measures: Low Cost-High Return, Medium Cost-Medium Return, High Cost-High Return.

UNIT-III
Energy Conservation Act and Its Policies
Introduction – Salient Features of Energy Conservation Act (EC Act),2001 – Schemes of BEE Under the EC Act-2001 – Electricity Act, 2003 – Integrated Energy Policy – National Action Plan on Climate Change (NAPCC).

UNIT-IV
Energy Management and Audit
Definition and Objectives of Energy Management – Need for Energy Audit – Types of Energy Audit and Approach – Understanding Energy Costs – Benchmarking – Energy Performance – Matching Energy Usage to Requirement – Maximizing System Efficiencies – Optimizing Input Energy Requirements – Fuel and Energy Substitution.

UNIT-V

Energy Action Planning, Management, Monitoring and Targeting

Steps Involved in Energy Action Planning – Financial Analysis Techniques – Cash Flow – Sensitivity and Risk Analysis – Financing Options – Energy Performance Contracting and Role of Energy Service Companies (ESCOs) – Developing a Typical ESCO Contract – Project Management – Project Development Cycle (PDC) – Project Planning Techniques – Monitoring and Targeting – Setting up M&T – Key Elements of M&T System.

TEXT BOOK(S)

1. "Energy Management – Conservation and Audits", Anil Kumar, Om Prakash, Prashant Singh Chauhan and, Samsher Gautam, CRC Press, 2020
2. "Energy Management Handbook", Wayne C. Turner and Steve Doty, Fairmont Press; Distributed by CRC Press/Taylor & Francis.

REFERENCE BOOK(S)

1. "General Aspects of Energy Management and Energy Audit", Guide Book for National Certification Examination for Energy Managers and Energy Auditors, Bureau of Energy Efficiency.
2. "Handbook of Energy Audits", Albert Thumann, Terry Niehus, William J. Younger, Fairmont Press, Inc.

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20ME32073- DIGITAL FABRICATION
(OPEN ELECTIVE II)

B.Tech. CSE (AIML) - III Year, II Sem.

L	T	P/D	C
3	-	-	3

Prerequisite(s): None.

Course Objectives

Develop ability to

1. Introduce basics of geometric modelling of physical objects,
2. Convert digital data to obtain physical components by metal subtraction and addition processes.

Course Outcomes (COs)

At the end of the course, student would be able to

CO1. Prepare a geometric modelling scheme required for additive/ subtractive manufacturing
CO2. Develop process codes required in subtractive manufacturing and additive manufacturing
CO3. Illustrate additive manufacturing methods-SLA, SLS, FDM and their superiority over subtractive manufacturing methods
CO4. Explain the robotic manipulations in cutting, bending, folding, stacking, weaving, stitching, Bio printing, and Food Printing
CO5. Select suitable polymer for additive manufacturing

UNIT-I

Geometric modelling

2D, 2 ½ D, 3D Modelling; Solid representations-CSG, Boundary representations, VOXEL representations; Overview of digital manufacturing processes

UNIT-II

Subtractive Manufacturing

Introduction to G codes and M codes; Operations on CNC Lathe- Turning and facing; operations on CNC Mill-Planing, grooving and drilling; Introduction to simple CNC Program (Demonstration only);

UNIT-III

Additive Manufacturing

Stereo lithography, Selective Laser Sintering, Fused Deposition Modelling; Conversion of Geometric model to .stl for 3D printing (Demonstration only)

UNIT-IV

Robotic manipulations

Cutting- Laser Cutting, Plasma Cutting, Water jet cutting; bending; folding; stacking; weaving; stitching, Bio printing, Food Printing;

UNIT-V

Introduction to Engineering polymers

acetals (polyoxymethylenes), ABS, (Acrilonitrile-Butadiene-Suyrene), polycarbonates, polyphenylene ethers and oxides, polyamides (nylons); and thermoplastic polyesthers.

TEXT BOOK(S)

1. Digital Fabrication, Philip F. Yuan, Neil Leach, Tonji University press
2. Digital Fabrication in Architecture, Luca Caneparo, Engineering and Construction, Springer

REFERENCE BOOK(S)

1. Additive Manufacturing Methodologies: Rapid Prototyping to Direct Digital Manufacturing, Gibson, I, Rosen, D W., and Stucker, B., Springer, 2010.
2. Rapid Prototyping – Laser Based and Other Technologies, Venu vinod, PK., Ma, W., Kluwer, 2004.
3. Fundamentals of electronic materials and devices, Safa O Kasap, Mc Graw Hill, 3rd edition.

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20EC32074 - PRINCIPLES OF COMMUNICATION SYSTEMS
(OPEN ELECTIVE II)

B.Tech. CSE (AIML) - III Year, II Sem.

L	T	P/D	C
3	-	-	3

Prerequisite(s): None.

Note: Only Block Diagram Approach with Qualitative Treatment of the topics is required. Detailed mathematical treatment is not required.

Course Objectives
Develop ability to
1. Introduce the students to modulation and various analog and digital modulation schemes.
2. They can have a broad understanding of satellite, optical, cellular, mobile, wireless and telecom concepts.

Course Outcomes (COs)
At the end of the course, student would be able to
CO1. Explain the concepts of AM, FM, PAM and PWM modulation techniques
CO2. Explain the fundamental aspects of wired and wireless networks
CO3. Describe the functional aspects of satellite, optical and cellular communication systems.

UNIT-I
Introduction
Need for Modulation, Frequency translation, Electromagnetic spectrum, Gain, Attenuation and decibels.

UNIT-II
Simple description on Modulation
Analog Modulation-AM, FM, Pulse Modulation-PAM, PWM, AM Radio, FM Radio, Transmitters and Receivers

UNIT-III
Telecommunication Systems
Telephones Telephone system, Paging systems, Internet Telephony.
Networking and Local Area Networks
Network fundamentals, LAN hardware, Ethernet LANs, Token Ring LAN.
UNIT-IV
Satellite Communication
Satellite Orbits, Satellite communication systems, Satellite subsystems, Ground Stations, Satellite Applications, Global Positioning systems.

Optical Communication
Optical Principles, Optical Communication Systems, Fiber –Optic Cables, Optical Transmitters & Receivers, Wavelength Division Multiplexing.

UNIT-V
Cellular and Mobile Communications
Cellular telephone systems, AMPS, GSM, CDMA,
WCDMA.

Wireless Technologies
Wireless LAN, PANs and Bluetooth, ZigBee and Mesh Wireless networks, Wimax and MANs, Infrared wireless, RFID communication, UWB.

TEXT BOOK(S)

1. Principles of Electronic Communication Systems, Louis E. Frenzel, 3e, McGraw Hillpublications, 2008.
2. Kennedy, Davis, Electronic Communications Systems, 4e, TMH, 1999

REFERENCE BOOK(S)

1. TarmoAnttalainen, Introduction to Telecommunications Network Engineering, Artech House
2. Theodore Rappaport, Wireless Communications-Principles and practice, Prentice Hall, 2002.
3. Roger L. Freeman, Fundamentals of Telecommunications, 2e, Wiley publications.
4. Wayne Tomasi, Introduction to data communications and networking, Pearson Education, 2005.

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20MB32076- SUPPLY CHAIN MANAGEMENT
(OPEN ELECTIVE II)

B.Tech. CSE (AIML) - III Year, II Sem.

L	T	P/D	C
3	-	-	3

Prerequisite(s): None.

Course Objectives
Develop ability to
1. Distinguish the different functional areas in business management; understand the cross functional integrations and map supply chains of various business sectors.
2. Identify different types of distribution/ modes of transport/ network design.
3. Analyze the operational issues in SCM.
4. Recognize the drivers of the supply chain.
5. Interpret the importance of relationships with suppliers and customers.

Course Outcomes (CO's)
At the end of the course, student would be able to
CO1. Develop and understand the role of supply chain management and logistics in business.
CO2. Identify the best practices in logistics operations and design distribution network and channel structure.
CO3. Analyse the effectiveness of functional and cross-functional operations in business.
CO4. Determine the supply chain drivers and logistics performance indicators.
CO5. Compare domestic and global supply chain management.
CO6. Evaluate the role of technologies in supply chain management.

UNIT-I
Introduction to Supply Chain Management
Understanding the Supply Chain, Supply Chain Performance: Achieving Strategic Fit and Scope including: Customer and Supply Chain Uncertainty, Competitive and Supply Chain Strategies, Product development strategy, Marketing and sales strategy, Supply chain strategy, Scope of strategic fit; Supply Chain Drivers and Metrics.

UNIT-II
Logistics Management
Designing distribution networks and applications to e-Business, Network design in the Supply Chain, Designing global supply chain, network design, 3 PL, 4 PL, Transportation in supply chain management.

UNIT-III
Planning and managing inventories
Managing Economies of Scale in a Supply Chain: Cycle Inventory, Managing Uncertainty in a Supply Chain: Safety Inventory, Determining the Optimal Level of Product Availability. Demand Forecasting in a Supply Chain, Aggregate Planning in a Supply Chain, Sales and Operations Planning: Planning Supply and Demand in a Supply Chain, Coordination in a Supply Chain. E- Procurement, Global alliances.

UNIT-IV

Managing Cross-Functional Drivers in a Supply Chain

Importance of sourcing decisions in Supply Chain Management, Price and Revenue management, role of Information Technology in a Supply Chain, Sustainability and the Supply Chain. Customer Relationship management.

UNIT-V

Logistics and supply chain relationships

Identifying logistics performance indicators- channel structure- economics of distribution- channel relationships- logistics service alliance. Managing global logistics and global supply chains: Logistics in a global economy- Views of global logistics- global operating levels interlinked global economy. Global supply chain, Supply chain management in Global environment Global strategy- Global purchasing- Global logistics- Global alliances- Issues and Challenges in global supply chain management.

TEXT BOOK(S)

1. Sunil Chopra, Peter Meindle, D.V Kalra, Supply Chain Management 6/e, Pearson.
2. Donald J. Bowersox and David J. Closs, Logistics Management: The Integrated Supply Chain Process TMH 2006.

REFERENCE BOOK(S)

1. The Toyota Way Paperback by Jeffrey Liker.

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20CS32L06 – CRYPTOGRAPHY AND NETWORK SECURITY LAB

B.Tech. CSE (AIML) - III Year, II Sem.

L	T	P/D	C
-	-	2	1

Prerequisite(s):
20CS31002-COMPUTER NETWORKS

Course Objectives
Develop ability to

1. Develop a basic understanding of cryptography, its evolution, and some key encryption techniques used today.
2. Develop an understanding of security policies (such as authentication, integrity and confidentiality), as well as protocols to implement such policies in the form of message exchanges.
3. Illustrate Symmetric and asymmetric cryptosystem.
4. Develop an understanding of web security services and mechanisms, viruses, threats, IDS and concepts of firewalls.
5. Describe the enhancements made to IPv4 by IPSec.

Course Outcomes(COs)
At the end of the course, student would be able to

CO1. Explain various attacks on the ciphertext, security services provided and analyse classical ciphers.
CO2. Analyze symmetric and asymmetric key ciphers and their strength.
CO3. Analyze various hash functions and authentication codes.
CO4. Distinguish different Key Management and Distribution techniques.
CO5. Explain PGP, S/MIME, transport-level, IP and wireless network security mechanisms.
CO6. Explain payment transactions and virtual elections using various cryptographic concepts.

LIST OF EXPERIMENTS

Week-1
Write a Java program to Implement the following

a) Ceasar Cipher
b) Substitution
c) Hill cipher techniques.

Week-2
Write a Java program to implement Playfair cipher.

Week-3
Write a JAVA program to implement the DES algorithm.

Week-4
Write a Java program to implement RSA algorithm.

Week-5
Write a Java program to implement Diffie-Hellman key exchange mechanism.

Week-6
Write a Java program to implement Message Authentication Code using any cryptographic (VMAC/HMAC) function.

Week-7
Implement secure hash algorithm for Data Integrity, Implement MD5 and SHA-1 algorithm, which accepts a string input and produce a fixed size number -128 bits for MD5; 160 bits for SHA-1, this number is a hash of the input. Show that a small change in the in the input results in a substantial change in the output.

Week-8
Write a Java program that performs addition of two points and subtraction of two points on an elliptic curve.

Week-9
Install NMAP and use NMAP in command line to scan a host/network, so as to find out the possible vulnerable points in the hosts.

Week-10
Demonstrate how to provide secure data storage, secure data transmission and for creating digital signatures (GnuPG).

Week-11
Demonstrate the typical use of steganography, using a steganography tool to store and retrieve hidden data from a jpeg file.

Week-12
Install Wireshark tool and perform packet filtering while capturing packets in Wireshark tool.

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20CS32L04 – MACHINE LEARNING LAB

B.Tech. CSE (AIML) - III Year, II Sem.

L	T	P/D	C
-	-	2	1

Prerequisite(s):
20CS11L01-PROGRAMMING FOR PROBLEM SOLVING – I
20MA32L01-STATISTICS FOR MACHINE LEARNING LAB

Course Objectives
Develop ability to

1. To understand the basic concepts of machine learning and probability theory.
2. To appreciate supervised learning and their applications.
3. To understand unsupervised learning like clustering and EM algorithms.
4. To understand the theoretical and practical aspects of probabilistic graphical models.
5. To learn other learning aspects such as reinforcement learning, representation learning, deep learning, neural networks and othertechnologies.

Course Outcomes (COs)
At the end of the course, student would be able to

CO1. Distinguish between supervised and unsupervised learning.
CO2. Explain and apply supervised learning algorithms for a given problem.
CO3. Explain and apply Unsupervised learning models for a given problem.
CO4. Explain and apply probability based supervised and unsupervised learning methods for a given problem.
CO5. Explain advanced learning methods.

List Of Experiments

Note: Use Open-Source Software Tools, Programming Languages (Python) to perform the experiments or to implement the Machine Learning Algorithms.

Week-1

Write a program to implement the naïve Bayesian classifier for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets.

Week-2

Write a program to demonstrate the working of the decision tree algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.

Week-3

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

Week-4

Write a program to implement Support Vector Machine algorithm to classify the iris data set. Print both correct and wrong predictions.

Week-5

Apply EM algorithm to cluster a set of data stored in a .CSV file. Use the same data set for clustering using k-Means algorithm. Compare the results of these two algorithms and comment on the quality of clustering.

Week-6

Apply Hierarchical Clustering algorithm to cluster a set of data stored in a .CSV file. Use the same data set for clustering using k-Means algorithm. Compare the results of these two algorithms and comment on the quality of clustering.

Week-7

Write a program to construct a Bayesian network considering medical data. Use this model to demonstrate the diagnosis of heart patients using standard Heart Disease Data Set.

Week-8

Build an Artificial Neural Network by implementing the Backpropagation algorithm and test the same using appropriate data sets.

Week-9

Write a program to implement AdaBoost algorithm to classify the iris data set. Print both correct and wrong predictions.

Week-10

Perform model aggregation on MNIST digit dataset.

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20EN32L01- PROFESSIONAL COMMUNICATION SKILLS LAB
B.Tech. CSE (AIML) - III Year, II Sem.

L	T	P/D	C
-	-	2	1

Course Objectives

Develop ability to
1. Improve students' fluency in spoken English.
2. Enable them to acquire behavioural skills required for their personal and professional life.
3. Help students develop their vocabulary.
4. Read and comprehend texts and respond appropriately in different Socio-Cultural contexts.
5. Communicate their ideas effectively orally and in written form.

Course Outcomes(COs)

At the end of the course, student would be able to
- CO1. Use acquired vocabulary from etymology in different contexts
- CO2. Demonstrate self-management, interpersonal skills and group discussion skills
- CO3. Interpret and infer from the given text employing different reading techniques
- CO4. Prepare diverse documents for various purposes

Module-I
Activities on Fundamentals of Inter-Personal Communication
Responding appropriately and relevantly using the right body language, discourse skills. Resilience and Personal Management-Managing stress, time, anger and other emotions, assertiveness and culture shock.

Module-II
Activities on Reading Skills
Reading for facts, reading for specific information, reading between the lines, negative facts, inferential reading, critical reading.

Module-III
Activities on Writing Skills
Writing process, gather information, analyzing the content, formatting, editing, Resume writing and CV preparation, writing SOP, letter writing and email writing and Video Resume or Visume'.

Module-IV
Activities on Presentation Skills
Oral Presentations (individual & group), seminars, ppts and written presentations through posters, projects, portfolio building or management, brochures and reports.

Module-V
Activities on Group Discussion and Interview Skills
Dynamics of Group Discussion-Videos of MockGDs-intervention, summarizing, body language, relevance and organization of ideas and rubrics for evaluation.Threestagesof Interviews-pre,during and postinterview planning, opening strategies, answering strategies, interview through Tele-Conference and Video Conference and Mock Interviews, Videos of Mock Interviews, H.R questions, SJT questions.

TEXT BOOK(S)

1. PCS Lab Manual prepared by the Faculty of English, Freshman Engineering Department.
2. David A. McMurrey& Joanne Buckley: Handbook for Technical Communication, Cengage Learning Pvt.Ltd .,New Delhi, 2012.

REFERENCE BOOK(S)

1. Paul V.Anderson: Technical Communication, Cengage Learning Pvt.Ltd.,New Delhi, 2007.
2. O'Connor Tamara,Generic Skills Integration Project (GENSIP)Interpersonal Skills ModuleExercises& Handouts, University of Dublin, Trinity College, 2003.

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20MA32P01- LOGICAL REASONING - II

B.Tech. CSE (AIML) - III Year, II Sem.

L	T	P/D	C
-	-	4	2

Prerequisite(s):
20MA31P01 - LOGICAL REASONING-I

Course Objectives
Develop ability to

1. Distinguish between permutation and combination and demonstrate how to determine each; Understand the basic concept of probability and illustration of Venn diagram; Classify the numbers and compute LCM, HCF, Square Roots, Cube Roots, Surds and Indices; Understand the concepts of allegation and mixture
2. Distinguish between the linear and circular sitting arrangements and also understand the coding and decoding problems; Understand the pattern of number and letter series.
3. Understand concepts of calendars; Classify the different forms of Alphabet Arrangements; Interpret the clues in the form of direction wise.
4. Identify the placements of numerals and hands on clock; Understand the various properties of cubes; Understand the concepts of data sufficiency and data interpretation.

Course Outcomes(COs)
At the end of the course, student will be able to

CO1. Apply logical thinking and analytical abilities to solve quantitative aptitude questions.

CO2. Critique and evaluate quantitative arguments that utilizemathematical, statistical and quantitative information.

CO3. Think constructively and apply logic to solve problems.

Quantitative Aptitude:

1. **Permutation and Combinations:** Fundamental Principle of Counting, Counting Methods, Definition of permutation, Linear Permutations, Rank of a word, Circular Permutations, Definition of Combinations, Problems on Combinations.
2. **Probability:** Definitions of Probability, Addition and Multiplication Theorems. Deductions: Introduction, expressing different types of statements using Venn diagrams, Definition of complimentary pairs, finding the conclusions using Venn diagrams for two and more statements.
3. **Number system:** Classification of numbers, Divisibility rules, Finding the units digit, Finding remainders in divisions involving higher powers, LCM and HCF Models**,** Decimal fractions, Simplifications, Square Roots & Cube Roots, Surds and Indices.
4. **Allegation and Mixture:** Definition of allegation, mean price, rules of allegation on quantity and cost price, diagrammatic explanation, removal and replacement.

Logical Reasoning:

5. **Sitting Arrangement:** Problems on Linear arrangement, Problems on Circular arrangement, Problems on Double line-up, Problems on Selections, Problems on Comparisons. **Coding and decoding:** Coding using same set of letters, Coding using different set of letters, Coding into a number Comparison & Elimination.

6. **Number and letter Series:** Difference series, Product series, Squares series, Cubes series, Alternate series, Combination series, Miscellaneous series, Place values of letters.

7. **Day sequence/Calendars**: Definition of a Leap Year, Finding the number of Odd days, framing the year code for centuries, finding the day of any random calendar date.
8. **Alphabet Test:** Alphabetical order of verbs, letter-word problems, rule-detection, alphabetical quibble, word formation.
9. **Direction sense Test:** Direction from the initial point: directions, cardinal directions, problems on distances, problems on clocks, problems on angles, problems on shadows
10. **Clocks**: Finding the angle when the time is given, Finding the time when the angle is known, Relation between Angle, Minutes and Hours, Exceptional cases in clocks.
11. **Cubes:** Basics of a cube, finding the minimum number of cuts when the number of identical pieces are given, Finding the maximum number of pieces when cuts are given, Problems on painted cubes of same and different colours, Problems on cuboids, Problems on painted cuboids, Problems on Dice.
12. **Data Sufficiency:** Different models in Data Sufficiency, Problems on Data sufficiency, Problems on data redundancy. **Data Interpretation:** Problems on tabular form, Problems on Line Graphs, Problems on Bar Graphs, Problems on Pie Charts.

TEXT BOOK(S)

1. A modern approach to Logical reasoning, R S Agarwal, S. Chand Publications, 2013.
2. Quantitative Aptitude for Competitive Examinations, Dinesh Khattar. Pearson Education, 4th Edition, 2019.

REFERENCE BOOK(S)

1. Quantitative Aptitude and Reasoning, R. V. Praveen, PHI Learning Private Ltd, 2nd Edition, 2013.
2. Quantitative Aptitude for competitive examinations, AbhijithGuha, McGraw Hill Education, 6th Edition, 2017.
3. Analytical & Logical Reasoning, Peeyush Bhardwaj, Arihant Publications, 4th Edition, 2015.
4. Logical Reasoning for the CAT, Arun Sharma, McGraw Hill Education, 2nd Edition 2014.

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20MB32M04 – PROFESSIONAL ETHICS
(MANDATORY COURSE)

B.Tech. CSE (AIML) - III Year, II Sem.

L	T	P/D	C
3	-	-	-

Pre-requisites: None

Course Objective

Develop ability to

1. Imbibe and internalize the Values and Ethical Behaviour in the personal and Professional lives.

Course Outcomes (CO's)

At the end of the course, student would be able to

CO1. Understand the importance of Values and Ethics in their personal lives and professional careers.

CO2. Learn the rights and responsibilities as an employee, team member and a global citizen

UNIT-I

Introduction to Professional Ethics: Basic Concepts, Governing Ethics, Personal & Professional Ethics, Ethical Dilemmas, Life Skills, Emotional Intelligence, Thoughts of Ethics, Value Education, Dimensions of Ethics, Profession and professionalism, Professional Associations, Professional Risks, Professional Accountabilities, Professional Success, Ethics and Profession.

UNIT-II

Basic Theories: Basic Ethical Principles, Moral Developments, Deontology, Utilitarianism, Virtue Theory, Rights Theory, Casuist Theory, Moral Absolution, Moral Rationalism, Moral Pluralism, Ethical Egoism, Feminist Consequentialism, Moral Issues, Moral Dilemmas, Moral Autonomy.

UNIT-III

Professional Practices in Engineering: Professions and Norms of Professional Conduct, Norms of Professional Conduct vs. Profession; Responsibilities, Obligations and Moral Values in Professional Ethics, Professional codes of ethics, the limits of predictability and responsibilities of the engineering profession. Central Responsibilities of Engineers - The Centrality of Responsibilities of Professional Ethics; lessons from 1979 American Airlines DC- 10 Crash and Kansas City Hyatt Regency Walk away Collapse.

UNIT-IV

Work Place Rights & Responsibilities, Ethics in changing domains of Research, Engineers and Managers; Organizational Complaint Procedure, difference of Professional Judgment within the Nuclear Regulatory Commission (NRC), the Hanford Nuclear Reservation. Ethics in changing domains of research - The US government wide definition of research misconduct, research misconduct distinguished from mistakes and errors, recent history of attention to research misconduct, the emerging emphasis on understanding and fostering responsible conduct, responsible authorship, reviewing & editing.

UNIT-V

Global issues in Professional Ethics: Introduction – Current Scenario, Technology Globalization of MNCs, International Trade, World Summits, Issues, Business Ethics and Corporate Governance, Sustainable Development Ecosystem, Energy Concerns, Ozone Deflection, Pollution, Ethics in Manufacturing and Marketing, Media Ethics; War Ethics; Bio Ethics, Intellectual Property Rights.

TEXT BOOK(S)

1. Professional Ethics: R. Subramanian, Oxford University Press, 2015.
2. Ethics in Engineering Practice & Research, Caroline Whitbeck, 2e, Cambridge University Press 2015.

REFERENCE BOOK(S)

1. Engineering Ethics, Concepts Cases: Charles E Harris Jr., Michael S Pritchard, Michael J Rabins, 4e , Cengage learning, 2015.
2. Business Ethics concepts & Cases: Manuel G Velasquez, 6e, PHI, 2008.

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20CS41001-BIG DATA ANALYTICS

B.Tech. CSE (AIML) - IV Year, I Sem.

L	T	P/D	C
3	-	-	3

Prerequisites:
20CS21002-OBJECT ORIENTED PROGRAMMING
20CS21003-DATABASE MANAGEMENT SYSTEMS

Course Objectives
Develop ability to

1. Know the basic elements of Big Data and Data science to handle huge amount of data.
2. Gain knowledge of basic mathematics behind the Big data.
3. Understand the different Big data processing technologies.
4. Apply the Analytical concepts of Big data using R and Python.
5. Visualize the Big Data using different tools.

Course Outcomes (COs)
At the end of the course, student would be able to:

CO1. Explain various elements of Big data analytics.
CO2. Apply the concepts of Hadoop for big data storage and processing.
CO3. Apply data analytics life cycle to analyse data using R programming.
CO4. Elucidate different data visualizations and employ tools for big data visualization.

UNIT-I
Getting an Overview of Big Data: What is Big Data?, History of Data Management – Evolution of Big Data, Structuring Big Data, Elements of Big Data, Big Data Analytics, Careers in Big Data, Future of Big Data.

UNIT-II
Introducing Technologies for Handling Big Data: Distributed and Parallel Computing for Big Data, Introducing Hadoop, Cloud Computing and Big Data, In-Memory Computing Technology for Big Data, Understanding Hadoop Ecosystem.

UNIT-III
Big Data processing: Big Data technologies, Introduction to Google file system, Hadoop Architecture, Hadoop Storage: HDFS, Common Hadoop Shell commands, NameNode, Secondary NameNode, and DataNode, Hadoop MapReduce paradigm, Map Reduce tasks, Job, Task trackers, Introduction to NOSQL, Textual ETL processing.

UNIT-IV
Big Data analytics: Data analytics life cycle, Data cleaning , Data transformation, Comparing reporting and analysis, Types of analysis, Analytical approaches, Data analytics using R, Exploring basic features of R, Exploring R GUI, Reading data sets, Manipulating and processing data in R, Functions and packages in R, Performing graphical analysis.

UNIT -V

Big Data Visualization: Introduction to Data visualization, Challenges to Big data visualization, Types of data visualization, Visualizing Big Data, Tools used in data visualization, Proprietary Data Visualization tools, Open source data visualization tools, Data visualization with Tableau.

TEXT BOOK(S)

1. Big Data, Black Book, DT Editorial Services, ISBN: 9789351197577, 2016 Edition.

REFERENCES BOOK(S)

1. Algorithmic and Analysis Techniques in Property Testing, Dana Ron, School of EE, 2010.
2. Synopses for Massive Data:Samples, Histograms, Wavelets, Sketches, Foundation and trends in databases, Graham Cormode, Minos Garofalakis, Peter J. Haas and Chris Jermaine, 2012.
3. R for Business Analytics, A.Ohri, Springer, ISBN:978-1-4614-4343-8, 2016.
4. Hadoop in practice, Alex Holmes, Dreamtech press, ISBN:9781617292224, 2015.

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20CS41011 - COMPUTATIONAL INTELLIGENCE

B.Tech. CSE (AIML) - IV Year, I Sem.

L	T	P/D	C
3	-	-	3

Prerequisite(s):
20CS12002-DISCRETE MATHEMATICS

Course Objectives
Develop ability to
The main objectives of this course are:

1. Understand Fuzzy Logic techniques and their roles in building intelligent machines.
2. Learn fuzzy logic and reasoning to handle uncertainty and solve engineering problems.
3. Learn Evolutionary Computation Methods to find solutions to complex problems
4. Understand parameter choices in the use of Evolutionary Computation
5. Understand current research in Genetic Algorithms and Evolutionary Computing

Course Outcomes(COs)
At the end of the course, student would be able to

CO1. Apply fundamental concepts of fuzzy set theory and fuzzy logic to a given problem instance.
CO2. Apply fuzzy clustering and classification algorithms for a given dataset.
CO3. Explain the fundamental concepts of evolutionary computation and apply different optimization techniques for a given problem.
CO4. Apply evolutionary learning in different problem domains.
CO5. Explain collective intelligence methods and extensions of evolutionary computation and apply them for a given problem.

UNIT-I
Basic Fuzzy Set Theory
Introduction, A Brief History, Fuzzy Membership Functions and Operators, Alpha-Cuts, Decomposition Theorem, Extension Theorem.
Fuzzy Relations and Fuzzy Logic Inference
Introduction, Fuzzy Relations and Propositions, Fuzzy Logic Inference and Fuzzy Logic for Real-Valued Functions.

UNIT-II
Fuzzy Clustering and Classification
Introduction to Fuzzy Clustering, Fuzzy C-Means, An Extension to Fuzzy C-Means, Possibilistic C-Means, Fuzzy Classifiers-Fuzzy.
Fuzzy Measures and Integrals
Fuzzy Measures, Fuzzy Integrals, Training the Fuzzy Integrals.

UNIT-III
Evolutionary Computation
Basic Ideas and Fundamentals, Evolutionary Algorithms: Generate and Test, Representation, Search and Selection Operators, Major Research and Application Areas.
Evolutionary Optimization

Global Numerical Optimization, Combinatorial Optimization, Some Mathematical Considerations, Constraint Handling, Self Adaptation.

UNIT-IV

Evolutionary Learning and Problem Solving

Evolving Parameters as Regression Equation, Evolving the Structure And Parameters Of Input-Output Systems, Evolving Clusters, Evolutionary Classification Models, Evolutionary Control Systems, Evolutionary Games.

UNIT–V

Collective Intelligence and Other Extensions of Evolutionary Computation

Particle swarm optimization, Differential Evolution, Ant Colony Optimization, Evolvable Hardware, Interactive Evolutionary Computation, Multicriteria Evolutionary Optimization.

TEXT BOOK(S)

1. David B Fogel, Derong Liu, James M Keller, Fundamentals of Computational Intelligence: Neural Networks, Fuzzy Systems, and Evolutionary Computation, ISBN:9781119214342 |Online ISBN:9781119214403 |DOI:10.1002/9781119214403, Wiley Publications, IEEE Press, 2016

REFERENCE BOOK(S)

1. Ross T J, "Fuzzy Logic with Engineering Applications", McGraw Hill, 2002.
2. Rajashekaran S and Vijayalakshmi Pai G A, "Neural Networks, Fuzzy Logic and Genetic Algorithms", PHI, 2003.
3. Eiben A E and Smith J E, "Introduction to Evolutionary Computing", Second Edition, Springer, Natural Computing Series, 2007.

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20CS41008 – DEEP LEARNING

B.Tech. CSE (AIML) - IV Year, I Sem.

L	T	P/D	C
3	-	-	3

Prerequisite(s):
20CS31003-ARTIFICIAL INTELLIGENCE

Course Objectives
Develop ability to
The main objectives of this course are:

1. Understand various learning models.
2. Learn feed forward neural networks for learning
3. Learn to use auto encoders and regularization
4. Understand Convolution Neural Networks for learning
5. Understand Recurrent Neural Networks for learning

Course Outcomes (COs)
At the end of the course, student would be able to

CO1. Explain the underlying concepts of classical feed forward neural networks
CO2. Apply the concepts of auto encoders and regularization in the design of Neural Networks
CO3. Design convolutional neural networks, recurrent neural networks for training deep networks

UNIT-I
Introduction

Historical Trends in Deep Learning, McCulloch Pitts Neuron, Thresholding Logic, Perceptron, Perceptron Learning Algorithm. Representation Power of MLPs, Sigmoid Neurons, Gradient Descent, Feed forward Neural Networks, Representation Power of Feed forward Neural Networks

UNIT-II
Feed Forward Neural Networks
Back propagation, Gradient Descent (GD), Momentum Based GD, Nesterov Accelerated GD, Stochastic GD, AdaGrad, RMS Prop, Adam, Eigenvalues and eigenvectors, Eigenvalue Decomposition, Basis Principal Component Analysis and its interpretations, Singular Value Decomposition

UNIT-III
Auto encoders
relation to PCA, Regularization in auto encoders, Denoising auto encoders, Sparse auto encoders, Contractive auto encoders,
Regularization
Bias Variance Tradeoff, L2 regularization, Early stopping, Dataset augmentation, Parameter sharing and tying, Injecting noise at input, Ensemble methods, Dropout, Greedy Layer wise Pre-training, Better activation functions, better weight initialization methods, Batch Normalization

UNIT-IV
Convolutional Neural Network
The Convolution Operation, Motivation, Pooling, Convolution and Pooling as an Innitely Strong Prior, Variants of the Basic Convolution Function, Structured Outputs, Data Types. LeNet, AlexNet,

ZF-Net, VGGNet, GoogLeNet, ResNet, Visualizing Convolutional Neural Networks, Guided Back propagation, Deep Dream, Deep Art, Fooling Convolutional Neural Networks.

UNIT–V

Recurrent Neural Networks

Back propagation through time (BPTT), Vanishing and Exploding Gradients, Truncated BPTT, GRU, LSTMs, Encoder Decoder Models, Attention Mechanism, Attention over images.

TEXT BOOK(S)

1. Goodfellow. I., Bengio. Y. and Courville. A., " Deep Learning", MITPress, 2016.

REFERENCE BOOK(S)

1. Ragav Venkatesan, Baoxin Li, "Convolutional Neural Networks in Visual Computing", CRC Press, 2018.
2. Navin Kumar Manaswi, "Deep Learning with Applications Using Python", A press, 2018.
3. John D Kelleher "Deep Learning" (The MIT Press Essential Knowledge series) The MIT Press, 2019.
4. Daniel Graupe "Deep Learning Neural Networks: Design and Case Studies", World Scientific Publishing Co Pte Ltd, 2016.
5. Rajiv Chopra "Deep Learning", Khanna Book Publishing, 2018.

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20CS41003 – CLOUD COMPUTING

B.Tech. CSE (AIML) - IV Year, I Sem.

L	T	P/D	C
3	-	-	3

Pre requisite(s):
20CS22003-OPERATING SYSTEMS

Course Objectives
Develop ability to

1. Understand different computing models.
2. Introduce various types of virtualizations and hypervisors
3. Use and adopt Cloud Computing services and tools in their real-life scenarios.
4. Explore some important cloud computing driven commercial systems such as Amazon Web Services, Google cloud services, Microsoft Azure etc.
5. Describe the security aspects in cloud

Course Outcomes(COs)
At the end of the course, student would be able to

CO1. Explain the concepts of distributed and cloud computing in terms of the services provided by Amazon, Google, Microsoft.
CO2. Illustrate the role of virtualization in Cloud computing and its implementation.
CO3. Describe various policies and analyze the mechanisms for resource management in cloud.
CO4. Develop applications using AWS cloud services.
CO5. Distinguish different storage models in cloud computing.
CO6. Elucidate security mechanisms required at various levels in implementation of cloud.

UNIT-I

Introduction
Network-Centric Computing and Network-Centric Content, Distributed computing, Cloud Computing, Cloud Computing Delivery Models and Services, Ethical Issues in Cloud Computing, Cloud Vulnerabilities, Major Challenges of Cloud Computing

Cloud Infrastructure
Cloud Computing at Amazon, Cloud Computing: The Google Perspective, Microsoft Windows Azure and Online Services, Open-Source Software Platforms for Private Clouds, System Models for distributed and cloud computing: Clusters of cooperative computers, grid computing infrastructures, Peer-to-Peer Systems.

UNIT-II

Cloud Computing
Applications and Paradigms, Challenges for Cloud Computing, Existing Cloud Applications and New Application Opportunities, Architectural Styles for Cloud Applications, Workflows: Coordination of Multiple Activities.

Cloud Resource Virtualization
Virtualization, Layering and Virtualization, Virtual Machine Monitors , Virtual Machines , Performance and Security Isolation , Full Virtualization and Para virtualization , Hardware Support for Virtualization , Case Study: Xen, a VMM Based on Para virtualization , Optimization of Network Virtualization in Xen, The Darker Side of Virtualization.

UNIT-III

Cloud Resource Management

Policies and Mechanisms for Resource Management , Applications of Control Theory to Task Scheduling on a Cloud , Stability of a Two-Level Resource Allocation Architecture , Feedback Control Based on Dynamic Thresholds , Coordination of Specialized Autonomic Performance Managers, A Utility-Based Model for Cloud-Based Web Services, Resource Management and Dynamic Application Scaling.

UNIT-IV

Storage Systems

The Evolution of Storage Technology, Storage Models, File Systems, and Databases, Distributed File Systems: General Parallel File System, Google File System, Transaction Processing and NoSQL Databases, BigTable, Megastore Cloud

Application Development

Amazon Web Services: EC2 Instances, Security Rules for Application and Transport Layer Protocols in EC2, How to Launch an EC2 Linux Instance and Connect to it, How to Use S3 in Java, How to Install the Simple Notification Service on Ubuntu.

UNIT-V

Cloud Security

Cloud Security Risks, Privacy and Privacy Impact Assessment, Trust, Operating System Security, Virtual Machine Security, Security of Virtualization, Security Risks Posed by Shared Images, Security Risks Posed by a Management OS.

TEXT BOOK(S)

1. Cloud Computing Theory and Practice, Dan C. Marinescu, Elsevier, 2nd edition, 2017.

REFERENCE BOOK(S)

1. Cloud Computing ,A practical approach, Anthony T. Velte, Toby J. Velte, Robert Elsenpeter, McGraw-Hill Education; 1st edition, 2009
2. Cloud Computing: Principles and Paradigms by Rajkumar Buyya, James Broberg and Andrzej M. Goscinski, Wiley, 2011.
3. Distributed and Cloud Computing: From parallel processing to the Internet of Things, Kai Hwang, Geoffrey C. Fox, Jack J.Dongarra, 2013
4. Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance, Tim Mather, Subra Kumaraswamy, Shahed Latif, O'Reilly, SPD, 2009.

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20CS41012-WEB SERVICES
(PROFESSIONAL ELECTIVE – IV)

B.Tech. CSE (AIML) - IV Year, I Sem.

L	T	P/D	C
3	-	-	3

Prerequisite(s):
20CS22004-WEB TECHNOLOGIES

Course Objectives
Develop ability to
1. Summarize evolution, emergence, introduction and architecture of web services.
2. Discover core fundamentals of REST and Resource Oriented Architecture.
3. Understand Web Services Description Language.
4. Implement the Services and design the Client Representations.
5. Understand big web problems solved by Web Services.

Course Outcomes(COs)
At the end of the course, student would be able to
- CO1: Develop client programs for existing web services using HTTP library and Parsers
- CO2: Develop simple services and clients using amazon's Simple Storage Service (S3)
- CO3: Design clients for Read-Only and Read/Write Resource-Oriented Services using the principles of REST
- CO4: Explain REST and ROA best practices

UNIT-I
The Programmable Web and Its Inhabitants
Kinds of Things on the Programmable Web, HTTP: Documents in Envelopes ,Method Information, Scoping Information, The Competing Architectures, Technologies on the Programmable Web, Leftover Terminology.
Writing Web Service Clients
Web Services Are Web Sites, del.icio.us: The Sample Application, Making the Request: HTTP Libraries, Processing the Response: XML Parsers, JSON Parsers: Handling Serialized Data Clients Made Easy with WADL

UNIT-II
What Makes RESTful Services Different?
Introducing the Simple Storage Service, Object-Oriented Design of S3, Resources, HTTP Response Codes, An S3 Client, Request Signing and Access Control, Using the S3 Client Library, Clients Made Transparent with Active Resource, Parting Words .
The Resource-Oriented Architecture
Resource-Oriented What Now?,What's a Resource?, URIs, Addressability ,Statelessness, Representations, Links and Connectedness, The Uniform Interface.
UNIT-III
Designing Read-Only Resource-Oriented Services
Resource Design, Turning Requirements Into Read-Only Resources, Figure Out the Data Set, Split the Data Set into Resources, Name the Resources, Design Your Representations, Link the Resources to Each Other, The HTTP Response.
Designing Read/Write Resource-Oriented Services
User Accounts as Resources, Custom Places, A Look Back at the Map Service.

UNIT-IV

A Service Implementation

A Social Bookmarking Web Service, Figuring Out the Data Set, Resource Design, Design the Representations Accepted from the Client, Design the Representations Served to the Client, Connect Resources to Each Other, What's Supposed to Happen?, What Might Go Wrong?, Controller Code, Model Code, What Does the Client Need to Know?.

REST and ROA Best Practices

Resource-Oriented Basics, The Generic ROA Procedure , Addressability ,State and Statelessness, Connectedness, The Uniform Interface, This Stuff Matters, Resource Design, URI Design, Outgoing Representations,Incoming Representations, Service Versioning, Permanent URIs Versus Readable URIs, Standard Features of HTTP, Faking PUT and DELETE, The Trouble with Cookies, Why Should a User Trust the HTTP Client?

UNIT-V

The Building Blocks of Services

Representation Formats , Prepackaged Control Flows Hypermedia Technologies.

The Resource-Oriented Architecture Versus Big Web Services

What Problems Are Big Web Services Trying to Solve?, SOAP, WSDL, UDDI, Security, Reliable Messaging, Transactions, BPEL, ESB, and SOA.

TEXT BOOK(S)

1. RESTful Web Services, Leonardo Richardson and Sam Ruby. O'Reilly.2nd Edition, May 2007.

REFERENCE BOOK(S)

1. Building Web Services with Java, 2nd Edition, S. Graham and others. PearsonEdn., 2008.
2. Java Web Services, D. A. Chappell & T. Jewell, O'Reilly,SPD, 2002.
3. Java Web Services Architecture, McGovern, et al., Morgan Kaufmarrn Publishers, 2005.
4. J2EE Web Services, Richard Monson-Haefel, Pearson Education, 2004.

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20CS41018-SOFTWARE TESTING METHODOLOGIES
(PROFESSIONAL ELECTIVE – IV)

B.Tech. CSE (AIML) - IV Year, I Sem.

L	T	P/D	C
3	-	-	3

Prerequisites: None

Course Objectives

Develop ability to

1. To understand the fundamental concepts in software testing such as testing process, criteria, strategies, and methodologies.
2. To gain knowledge on transaction flow testing and data flow testing techniques.
3. To identify various software testing types and levels of testing like black and white box testing along with levels of unit test, integration, regression, and system testing.
4. To understand the concepts of state graphs, graph matrixes and transition testing along with testability tips in order to enhance the testing process in different way.
5. To apply skills in software test automation and management using latest tools.

Course Outcomes(COs)

At the end of the course, student would be able to

CO1. Explain different types of software bugs and their impact on software functionality.
CO2. Apply path testing strategies to ensure adequate code coverage.
CO3. Apply data flow, transaction flow and domain testing techniques to improve the overall quality of a software application.
CO4. Apply logic based testing, regular expressions, anomaly detection and state transition testing techniques to improve the performance of software systems.
CO5. Apply the concept of graph matrices to software testing

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.

Dataflow testing

Basics of dataflow testing, strategies in dataflow testing, application of dataflow testing.

Domain Testing

domains and paths, Nice & ugly domains, domain testing, domains and interfaces testing, domain and interface testing, domains and testability.

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

State, State Graphs and Transition testing

state graphs, good & bad state graphs, 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. (Exposure to a tool like JMeter or Win-runner).

TEXT BOOK(S)

1. Software Testing techniques - Baris Beizer, Dreamtech, second edition, 1983.
2. Software Testing Tools – Dr. K. V. K. K. Prasad, Dreamtech.1st edition, 2004.

REFERENCE BOOK(S)

1. The craft of software testing - Brian Marick, Pearson Education, 1st edition, 2007.
2. Software Testing Techniques – SPD (Oreille) ,2nd edition,2003.
3. Software Testing in the Real World – Edward Kit, Pearson, 2nd edition, 1996.
4. Effective methods of Software Testing, Perry, John Wiley, 2nd edition, 2000.
5. Art of Software Testing – Meyers, John Wiley, 3rd edition, 2011.

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20CS41020-DIGITAL FORENSICS
(PROFESSIONAL ELECTIVE – IV)

B.Tech. CSE (AIML) - IV Year, I Sem.

L	T	P/D	C
3	-	-	3

Prerequisite(s):
20CS22003- OPERATING SYSTEMS

Course Objectives
Develop ability to
1. To understand the cyber space.
2. To gain knowledge on fundamentals of Digital forensics.
3. To understand the evidence capturing process.
4. To understand the preservation of digital evidence.
5. To understand different file systems and disk encryption.

Course Outcomes(COs)
At the end of the course, student would be able to
- CO1. Explain the fundamental concepts of digital forensics services, technology with regard to their applications.
- CO2. Apply digital forensics concepts for evidence collection, preservation and data recovery.
- CO3. Analyze, validate digital forensics data, obtain crime scene evidence and process it for further investigation.
- CO4. Apply various digital forensic tools to a given scenario
- CO5. Apply the concepts of Windows and DOS operating systems to digital forensics

UNIT-I
Digital Forensics Fundamentals
Digital Forensics definition, Use of Digital Forensics in Law Enforcement, Digital Forensics Assistance to Human Resources/Employment Proceedings, Digital Forensics Services, Benefits of Professional Forensics Methodology, Steps taken by Digital Forensics Specialists Types of Digital Forensics Technology: Types of Military Digital Forensic Technology, Types of Law Enforcement, Digital Forensic Technology, Types of Business Digital Forensic Technology Digital Forensics Evidence and Capture: Data Recovery Defined, Data Back-up and Recovery, The Role of Back-up in Data Recovery, The Data Recovery Solution.

UNIT-II
Evidence Collection and Data Seizure
Reasons to collect Evidence. Collection Options, Obstacles, Types of Evidence, The Rules of Evidence, Volatile Evidence, General Procedure, Collection and Archiving, Methods of Collection, Artifacts, Collection Steps, Controlling Contamination,
The Chain of Custody Duplication and Preservation of Digital Evidence
Preserving the Digital Crime Scene, Computer Evidence Processing Steps, Legal Aspects of Collecting and Preserving Digital Forensic Evidence Computer Image Verification and Authentication, Special Needs of Evidential Authentication, Practical Consideration, Practical Implementation.

UNIT-III

Digital Forensics analysis and validation

Determining what data to collect and analyze, validating forensic data, addressing data-hiding techniques, performing remote acquisitions

Network Forensics

Network forensics overview, performing live acquisitions, developing standard procedures for network forensics, using network tools, examining the honey net project.

Processing Crime and Incident Scenes

Identifying digital evidence, collecting evidence in private-sector incident scenes, processing law enforcement crime scenes, preparing for a search, securing a computer incident or crime scene, seizing digital evidence at the scene, storing digital evidence, obtaining a digital hash, reviewing a case

UNIT-IV

Current Digital Forensic tools

evaluating Digital forensic tool needs, Digital forensics software tools, Digital forensics hardware tools, validating and testing forensics software E-Mail Investigations: Exploring the role of e-mail in investigation, exploring the roles of the client and server in e-mail, investigating e-mail crimes and violations, understanding e-mail servers, using specialized e-mail forensic tools.

Cell phone and mobile device forensics

Understanding mobile device forensics, understanding acquisition procedures for cell phones and mobile devices.

UNIT-V

Working with Windows and DOS Systems

understanding file systems, exploring Microsoft File Structures, Examining NTFS disks, Understanding whole disk encryption, windows registry, Microsoft startup tasks, MS-DOS startup tasks, virtual machines.

TEXT BOOK(S)

1. Computer Forensics, Computer Crime Investigation by John R. Vacca, Firewall Media, New Delhi, 2002.
2. Computer Forensics and Investigations by Nelson, Phillips Enfinger, Steuart, CENGAGE Learning, 2018.

REFERENCE BOOK(S)

1. Real Digital Forensics by Keith J. Jones, Richard Bejtiich, Curtis W. Rose, Addison- Wesley Pearson Education, 2005.
2. Forensic Compiling, A Tractitioneris Guide by Tony Sammes and Brian Jenkinson, Springer International edition, 2014.
3. Computer Evidence Collection & Presentation by Christopher L.T. Brown, Firewall Media, 2005.
4. Homeland Security, Techniques & Technologies by Jesus Mena, Firewall Media, 2004.
5. Software Forensics Collecting Evidence from the Scene of a Digital Crime by Robert M.Slade, TMH 2005.
6. Windows Forensics by Chad Steel, Wiley India Edition, 2006.

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20CS41021-BIO INFORMATICS
(PROFESSIONAL ELECTIVE – IV)

B.Tech. CSE (AIML) - IV Year, I Sem.

L	T	P/D	C
3	-	-	3

Prerequisites(s): None

Course Objectives
Develop ability to
1. Understand the theoretical basis behind bioinformatics.
2. Learn to use homologues, analyze sequences, construct and interpret evolutionary trees.
3. Learn to analyze protein sequences, identify proteins, and retrieve protein structures from databases.
4. Understand homology modeling and computational drug design.
5. Learn biological information modeling and apply this to the solution of biological problems in any arena involving molecular data.

Course Outcomes (COs)
At the end of the course, student would be able to
CO1. Explain the type of databases and challenges involved in biological information retrieval
CO2. Apply sequence alignment and gene prediction algorithms
CO3. Explain the foundational concepts of phylogenetics
CO4. Apply sequence based and microarray based approaches to problems of genomics

UNIT-I
Introduction to Bioinformatics
What is a Data Base, Types of Databases, Biological Databases, Pitfalls of Biological Databases, Information Retrieval from Biological Databases?

UNIT II
Pair wise Sequence Alignment
Evolutionary Basics, Sequence homology versus similarity, Sequence similarity versus Identity, Scoring Matrices, Statistical Significance of Sequence alignment, Database similarity searching: Unique requirement of Database searching, Heuristic Database searching.

UNIT III
Basic alignment search tool
Comparison of FASTA and BLAST, Multiple Sequence Alignment, Scoring Function, Exhaustive Algorithms, Heuristic Algorithms, Gene Prediction, Categories of gene prediction programs, Gene prediction in prokaryotes and Eukaryotes.

UNIT IV
Phylogenetics
Phylogenetics Basics Molecular phylogenetics and molecular basics Gene phylogeny versus species phylogeny, Forms of tree representation, Why finding a true tree is difficult, Phylogenetic tree construction methods and programs Protein structure basics: Amino acid, peptide formation, Dihedral Angles, Hierarchy, Secondary structures, Tertiary structure, Determination of protein 3-D structure, Protein structure data base.

UNIT V

Genome

Genome mapping, assembly and comparison, Genome mapping, Genome sequencing, Genome sequence assembly, Genome Annotation, Comparative genomics, Functional Genomics, Sequence based approaches, Microarray based approaches, Comparisons of SAGE and DNA microarray.

TEXT BOOK(S)

1. Jin Xiong, Essential Bioinformatics, 1th Edition, Cambridge University Press, 2011.
2. Arthur M Lesk, Introduction to Bioinformatics, 2nd Edition, Oxford University Press, 2007.

REFERENCE BOOK(S)

1. D E Krane & M L Raymer, " Fundamental concepts of Bioinformatics", Perason Education, 2006.
2. Rastogi, Mendiratta, Rastogi, "Bioinformatics Methods & applications, Genomics,Proteomics & Drug Discovery" PHI, New Delhi, 2018.
3. Shubha Gopal et.al. "Bioinformatics: with fundamentals of genomics and proteomics", Mc Graw Hill, 2006.
4. O'Reilly, " Developing Bio informatics computer skills", CBS, 2001.
5. Forsdyke, "Evolutionary Bioinformatics", Springer, 2016.

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20CS41L01 – BIG DATA ANALYTICS LAB AND CLOUD COMPUTING LAB
B.Tech. CSE (AIML) - IV Year, I Sem.

L	T	P/D	C
-	-	2	1

BIG DATA ANALYTICS LAB

Course Objectives
Develop ability to
1. Know the basic elements of Big Data and Data science to handle huge amount of data.
2. Gain knowledge of basic mathematics behind the Big data.
3. Understand the different Big data processing technologies.
4. Apply the Analytical concepts of Big data using R and Python.
5. Visualize the Big Data using different tools.

Course Outcomes (COs)
At the end of the course, student would be able to:
CO1. Explain various elements of Big data analytics.
CO2. Apply the concepts of Hadoop for big data storage and processing.
CO3. Apply data analytics life cycle to analyse data using R programming.
CO4. Elucidate different data visualizations and employ tools for big data visualization.

LIST OF EXPERIMENTS

Week-1
Installation, Configuration, and Running of Hadoop and HDFS.

Week-2
Implement the following file management tasks in Hadoop: Adding files and directories, retrieving files and Deleting files.

Week-3
Implementation of Word Count / Frequency Programs using MapReduce.

Week-4
Implementation of MR Program that processes a Weather Dataset.

Week-5
Install and Run Pig then write Pig Latin scripts to sort, group, join, project, and filter your data

CLOUD COMPUTING LAB

Course Objectives
Develop ability to
1. Understand different computing models.
2. Introduce various types of virtualizations and hypervisors.
3. Use and adopt Cloud Computing services and tools in their real life scenarios.
4. Explore some important cloud computing driven commercial systems such as Amazon Web Services, Google cloud services, Microsoft Azure etc.

5. Describe the security aspects in cloud.

Course Outcomes (COs)

At the end of the course, student would be able to

CO1. Explain the concepts of distributed and cloud computing in terms of the services provided by Amazon, Google, Microsoft.
CO2. Illustrate the role of virtualization in Cloud computing and its implementation.
CO3. Describe various policies and analyze the mechanisms for resource management in cloud.
CO4. Develop applications using AWS cloud services.
CO5. Distinguish different storage models in cloud computing.
CO6. Elucidate security mechanisms required at various levels in implementation of cloud.

LIST OF EXPERIMENTS

Week-6

Create Virtual machines using Open-source software: VM Ware/ Oracle Virtual Box.

Week-7

Use Amazon EC2 to create a Virtual machine.

Week-8

Use Amazon S3 to create bucket and upload objects.

Week-9

Install the Simple Notification Service on Ubuntu.
Use Amazon Cloud front to create Distribution and Use Amazon Route53 to create a domain (example: .com, .in).

Week-10

Study and Implement Cloud Security management by VPC.

Week-11

Building a “Hello world” app for the cloud by using AWS Lambda.

Week-12

Installing and configuring python/java/PHP platform by using Google App Engine.

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20CS41L08 – DEEP LEARNING LAB

B.Tech. CSE (AIML) - IV Year, I Sem.

L	T	P/D	C
-	-	2	1

Prerequisite(s): None

Course Objectives

Develop ability to

The main objectives of this course are:

1. Understand various learning models.
2. Learn feed forward neural networks for learning.
3. Learn to use auto encoders and regularization.
4. Understand Convolution Neural Networks for learning.
5. Understand Recurrent Neural Networks for learning.

Course Outcomes (COs)

At the end of the course, student would be able to

CO1. Explain the underlying concepts of classical feed forward neural networks
CO2. Apply the concepts of auto encoders and regularization in the design of Neural Networks
CO3. Design convolutional neural networks, recurrent neural networks for training deep networks

LIST OF EXPERIMENTS

Week-1

Demonstrate normalization of input data, basic activation functions such as the softmax, sigmoid,dsigmoid, etc.

Week-2

Build a neural network for logistic regression to minimize the cost function and update the parameters.

Week-3

Implement backward propagation neural network for a two-class classification with a single hiddenlayer, non-linear activation function like tanh and compute the cross-entropy loss.

Week-4

Build a deep neural network with more than one hidden layer, non-linear functions like ReLU.

Week-5

Build deep neural network to any classification problem and compare its accuracy to logistic regression.

Week-6

Apply Regularization techniques in deep learning model with backward propagation.

Week-7

Implement mini batch optimization technique to improve the performance of deep learning model.

Week-8

Demonstrate Convolutional Neural Network with various Convolution functions and Pooling functions.

Week-9

Develop a Residual Network for image classification.

Week-10

Build a bidirectional Recurrent Neural Network for any one application.

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20CS42007-IOT ANALYTICS
(PROFESSIONAL ELECTIVE-V)

B.Tech. CSE (AIML) - IV Year, II Sem.

L	T	P/D	C
3	-	-	3

Prerequisite(s): None

Course Objectives
Develop ability to
1. Basic understanding required to perform IoT analytics, revise statistical method used in IoT Analytics.
2. Mathematical foundation of regression, understanding of dimensionality reduction and analysis technique.
3. Learn time series forecasting techniques for real time IoT data.
4. Basic clustering techniques to analyses unstructured IoT data.
5. Learn classification and ML model to deal with structural data.

Course Outcomes (CO's)
At the end of the course, student would be able to
CO1. Explain the working of IoT systems in different applications and the role of machine learning in analyzing IoT data.
CO2. Apply regression methods and dimensionality reduction techniques to the given data.
CO3. Use time series forecasting data models for a given problem instance.
CO4. Identify and Apply appropriate learning algorithms for a given problem instance.

UNIT-I
The Internet of Things (IoT), IoT Application Domains, IoT reference model, Performance evaluation and modelling of the IoT Systems, Machine Learning and Statistical techniques for IoT.

UNIT-II
Simple linear regression, Multivariable linear regression, polynomial regression, confidence and prediction interval. Ridge, Lasso, and Elastic net Regression.
Dimensionality Reduction: A review of eigen values and eigen vectors, Principal Component Analysis, Linear and multiple discriminant analysis.

UNIT-III
Time series forecasting techniques, Stationary time series, moving average (MA(q)) model, the autoregressive model, ARIMA model, Decomposition models, Forecast accuracy, Prediction Interval, Vector Autoregression,

UNIT-IV
Clustering Techniques-Distance matrices, Hierarchical clustering, k-means algorithm, The fuzzy c-means algorithm, Gaussian mixture decomposition, The DBSCAN algorithm.

UNIT-V
Classification Techniques- The K-nearest neighbor (K-NN) method, The Naïve Bayes classifier, Decision trees, Logistic regression, Support Vector machine.

TEXT BOOK(S)
1. An Introduction to IoT Analytics, by Harry G. Perros, Chapman and Hall/CRC; 1st edition, 2021.

REFERENCE BOOK(S)
1. John Soldatos, "Building Blocks for IoT Analytics", River Publishers,2016.
2. John E. Rossman, "The Amazon way on IoT", Volume 2, John E. Rossman publication, 2016.

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20CS42004-SOFTWARE PROJECT MANAGEMENT
(PROFESSIONAL ELECTIVE-V)

B.Tech. CSE (AIML) - IV Year, II Sem.

L	T	P/D	C
3	-	-	3

Prerequisite(s): None

Course Objectives
Develop ability to
1. To understand the specific roles within a software organization as related to project and process management.
2. To illustrate the basic infrastructure competences required for project management and its problem solving skills.
3. To apply the principles of software engineering and elaborate lifecycle phases.
4. To identify various project and process metrics.
5. To design the basic steps of project planning, project and process management, quality assurance and their relationships.

Course Outcomes(COs)
At the end of this course, student would be able to
CO1. Explain the fundamental principles of software project management.
CO2. Analyze the current software development process and suggest measures to improve software economics
CO3. Explain the importance of the artifacts produced at each phase of the development lifecycle.
CO4. Apply appropriate checkpoints, methods and models for the development of software solutions.
CO5. Explain software quality metrics such as cost, benefits, schedule, and risk.

UNIT-I
Conventional Software Management
The waterfall model, conventional software Management performance. Evolution of Software Economics: Software Economics. Pragmatic software cost estimation.

UNIT–II
Improving Software Economics
Reducing Software product size, improving software processes, improving team effectiveness, improving automation, Achieving required quality, peer-inspections.
The old way and the new: The principles of conventional software Engineering, principles of modern software management, transitioning to an iterative process.

UNIT–III
Life cycle phases
Engineering and production stages, inception. Elaboration, construction, transition phases.
Artifacts of the process
The artifact sets. Management artifacts, Engineering artifacts, programmatic artifacts.
Model based software architectures: A Management perspective and technical perspective. Work Flows of the process: Software process workflows, Iteration workflows.

UNIT–IV

Checkpoints of the process

Major mile stones, Minor Milestones, Periodic status assessments.

Iterative Process Planning

Work breakdown structures, planning guidelines, cost and schedule estimating, Iteration planning process, Pragmatic planning.

Project Organizations and Responsibilities: Line-of-Business Organizations, Project Organizations, evolution of Organizations.

Process Automation: Automation Building blocks, The Project Environment.

UNIT-V

Project Control and Process instrumentation

The seven core Metrics, Management indicators, quality indicators, life cycle expectations, pragmatic Software Metrics, Metrics automation.

Tailoring the Process

Process discriminants.

Future Software Project Management

Modern Project Profiles, Next generation Software economics, modern process transitions.

TEXT BOOK(S)

1.Software Project Management, Walker Royce: Pearson Education, 2nd edition,2005.

REFERENCE BOOK(S)

1. Software Project Management, Bob Hughes and Mike Cotterell: Tata McGraw-Hill Edition,3rdedition,2004.
2. Software Project Management, Joel Henry, Pearson Education.1st edition,2004

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20CS42011-MACHINE LEARNING FOR CYBER SECURITY
(PROFESSIONAL ELECTIVE-V)

B.Tech. CSE (AIML) - IV Year, II Sem.

L	T	P/D	C
3	-	-	3

Prerequisite(s):
20CS32005-MACHINE LEARNING
20CS31M03-INTRODUCTION TO CYBER SECURITY

Course Objectives
Develop ability to
1. To familiarize various types of Cyber Threat and Machine Learning in Security.
2. To give an overview of different problem approaches in Machine Learning.
3. To study how to detect Anamoly detection using machine Learning.
4. To Learn about Malware Threat detection.
5. To familiarize concepts of machine learning algorithm for abuse Network problem.

Course Outcomes (COs)
At the end of the course, student would be able to
CO1. Explain the need of using Machine Learning in Cyber security.
CO2. Apply different classification and clustering algorithms to a given problem.
CO3. Apply Machine Learning approaches to the problem of anomaly detection and malware analysis.
CO4. Apply Machine Learning concepts towards the protection of consumer web.

UNIT-I
Why Machine Learning and Security: Cyber Threat Landscape, The Cyber Attacker's Economy, Marketplace for Hacking Skills, Indirect Monetization, The Upshot.
What Is Machine Learning, What Machine Learning Is Not, Adversaries Using Machine Learning, Real-World Uses of Machine Learning in Security, Spam Fighting: An Iterative Approach, Limitations of Machine Learning in Security.

UNIT-II
Classifying and Clustering: Machine Learning: Problems and Approaches, Machine Learning in Practice: A Worked Example , Training Algorithms to Learn ,Model Families ,Loss Functions, Optimization , Supervised Classification Algorithms , Logistic Regression ,Decision Trees , Decision Forests , Support Vector Machines , Naive Bayes ,Nearest Neighbors, Neural Networks :Practical Considerations in Classification , Selecting a Model Family ,Training Data Construction , Feature Selection , Overfitting and Underfitting , Choosing Thresholds and Comparing Models ,Clustering , Clustering Algorithms , Evaluating Clustering .

UNIT-III
Anomaly Detection: When to Use Anomaly Detection Versus Supervised Learning , Intrusion Detection with Heuristics, Data-Driven Methods , Feature Engineering for Anomaly Detection, Host Intrusion Detection , Network Intrusion Detection , Web Application Intrusion Detection ,Anomaly Detection with Data and Algorithms , Forecasting (Supervised Machine Learning) ,Statistical Metrics ,Goodness-of-Fit , Unsupervised Machine Learning Algorithms, Density-Based Methods , Challenges of Using Machine Learning in Anomaly Detection , Response and Mitigation, Practical System

Design Concerns Optimizing for Explainability, Maintainability of Anomaly Detection Systems, Integrating Human Feedback, Mitigating Adversarial Effects.

UNIT-IV

Malware Analysis: Understanding Malware, Defining Malware Classification, Malware: Behind the Scenes Feature Generation, Data Collection, Generating Features, Feature Selection, From Features to Classification, How to Get Malware Samples and Labels. Network Track Analysis: Theory of Network Défense, Access Control and Authentication, Intrusion Detection, Detecting In-Network Attackers, Data-Centric Security, Honeypots, Machine Learning and Network Security, From Captures to Features, Threats in the Network, Botnets and You. Building a Predictive Model to Classify Network Attacks, Exploring the Data, Data Preparation, Classification, Supervised Learning, Semi-Supervised Learning, Unsupervised Learning.

UNIT-V

Protecting the Consumer Web, Monetizing the Consumer Web, Types of Abuse and the Data That Can Stop Them, Authentication and Account Takeover, Account Creation, Financial Fraud, Bot Activity, Supervised Learning for Abuse Problems, Labelling Data, Cold Start Versus Warm Start, False Positives and False Negatives , Multiple Responses, Large Attacks, Clustering Abuse ,Example: Clustering Spam Domains, Generating Clusters ,Scoring Clusters , Further Directions in Clustering .

TEXT BOOK(S)

1. Machine Learning and Security Protecting Systems with Data and Algorithms, Clarence Chio and David Freeman, 2018.

REFERENCE BOOK(S)

1. Cybersecurity: The Beginner's Guide A Comprehensive Guide to Getting Started in cyber security. By Erdal Ozkaya, 1st Edition, 2019.
2. Hands-On Artificial Intelligence for Cybersecurity: Implement smart AI systems for preventing cyber-attacks and detecting threats and network anomalies. By Alessandro Parisi, 1st Edition 2019.

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20CS42003-HUMAN COMPUTER INTERACTION
(PROFESSIONAL ELECTIVE-V)

B.Tech. CSE (AIML) - IV Year, II Sem.

L	T	P/D	C
3	-	-	3

Prerequisites:
20CS22004-WEB TECHNOLOGIES

Course Objectives
Develop ability to
1. Demonstrate an understanding of guidelines, principles, and theories influencing human computer interaction.
2. Recognize how a computer system may be modified to include human diversity.
3. Understand mobile HCI.
4. Learn the guidelines for user interface.
5. Develop meaningful user interface.

Course Outcomes(COs)
At the end of the course, student would be able to
CO1. Explain the fundamental issues in the design of Human-Computer Interaction.
CO2. Apply principles of interactive design and software engineering to develop a user friendly interface for a given application.
CO3. Design appropriate HCI solutions for a given scenario by using various cognitive, communication and collaborative models.
CO4. Identify components of the mobile ecosystem and use necessary tools to design interface for mobile application.
CO5. Explain various issues involved in web user interface design.

UNIT-I
Foundations of HCI
The Human: I/O channels – Memory – Reasoning and problem solving; The computer: Devices – Memory – processing and networks; Interaction: Models – frameworks – Ergonomics – styles – Elements – interactivity – Paradigms.

UNIT-II
Design & Software Process
Interactive Design basics – process – scenarios – navigation – screen design – Iteration and prototyping. HCI in software process – software life cycle – usability engineering – Prototyping in practice – design rationale. Design rules – principles, standards, guidelines, rules. Evaluation Techniques – Universal Design.

UNIT-III
Models And Theories
Cognitive models – Socio - Organizational issues and stake holder requirements – Communication and collaboration models – Hypertext, Multimedia, World Wide Web.

UNIT-IV

Mobile HCI

Mobile Ecosystem: Platforms, Application frameworks, Types of Mobile Applications: Widgets, Applications, Games-Mobile Information Architecture, Mobile 2.0, Mobile Design: Elements of Mobile Design, Tools.

UNIT-V

Web Interface Design

Designing Web Interfaces – Drag & Drop, Direct Selection, Contextual Tools, Overlays, Inlays and Virtual Pages, Process Flow.

TEXT BOOK(S)

1. Human Computer Interaction, Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale, Third Edition, Pearson Education, 2004(UNIT 1,2,3)
2. Mobile Design and Development, Brian Fling, First Edition, O‟Reilly Media Inc., 2009(Unit-4)
3. Designing Web Interfaces, Bill Scott and Theresa Neil, First Edition, O‟Reilly, 2009.(Unit-5)

REFERENCE BOOK(S)

1. The art of Human-Computer Interface Design, Laurel, B , S. Joy Mountford, Addison-Wesley Publishing Company, Inc., 2007.
2. Human-computer interaction, Jenny Preece, Helen Sharp, David Benyon, Simon Holland and Tom Carey, Addison-Wesley Publishing Company, Inc 1994.
3. The essential guide to User Interface Design, Wilbert O Galitz, Wiley Dream Tech, 2007.
4. Human Computer Interaction, D.R. Olsen, Cengage Learning, 2009.
5. Designing the User interface – Third Edition, Ben Shneidermann, Pearson Education Asia, 1998.

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20CE42081 – DISASTER MANAGEMENT
(OPEN ELECTIVE-III)

B.Tech. CSE (AIML) - IV Year, II Sem.

L	T	P/D	C
3	-	-	3

Prerequisite(s): None

Course objectives
Develop ability to
1. Acquire knowledge on disaster and assess their impact.
2. Comprehend the monitoring techniques of disasters.
3. Understand the issues and policies involved in the disaster management.
4. Evaluate the pre-disaster risk and vulnerability reduction strategies.
5. Assess the role of NGO's, Government bodies and Public in the disaster mitigation and management.

Course Outcomes (COs)
At the end of the course, student would be able to

CO1. Explain Environmental and Man-made Hazards happening in India and globally.

CO2. Differentiate between Hazards & Disasters, such as endogenous, exogenous, planetary hazards.

CO3. Describe the causes and effects of hazards, identify safety measures.

CO4. Apply special measures to rebuild the environment using disaster management techniques.

UNIT-I
Introduction: Meaning and Concept of Environmental hazards, Environmental Disasters and Environmental stress. Different approaches and relation with human Ecology – Landscape Approach – Ecosystem Approach – Perception approach – Human ecology and its application in geographical researches.

UNIT-II
Types of Environmental Hazards & Disasters: Natural and Man induced. Natural Hazards – Planetary Hazards/Disasters – Extra Planetary Hazards/ Disasters – Planetary Hazards – Endogenous Hazards – Exogenous Hazards.

UNIT-III
Endogenous Hazards/ Disasters: Volcanoes – Earthquakes – Landslides – Earthquake Hazards/ Disasters – Causes of Earthquakes – Distribution of Earthquakes – Hazardous effects of Earthquakes – Earthquake Hazards in India - Human adjustment, perception & mitigation of earthquake.

UNIT-IV
Exogenous Hazards/ Disasters: Infrequent events – Cumulative atmospheric hazards/ disasters. Infrequent events: Cyclones – Lightening – Hailstorms. Cyclones: Tropical cyclones & Local storms – Destruction by tropical cyclones & local storms (causes, distribution, human adjustment, perception

& mitigation) Cumulative Atmospheric Hazards/ Disasters: Floods – Droughts – Cold waves – Heat waves.
Floods: Causes of floods – Flood hazards – Flood control measures (Human adjustment, perception & mitigation). Droughts: Impact of droughts – Drought hazards in India – Drought control measures. Extra Planetary Hazards/ Disasters: Man induced hazards/ Disasters – Physical Hazards/ Disasters – Soil Erosion. Soil Erosion: Mechanics & forms of soil erosion – Factors & causes of soil erosion – conservation measures of soil erosion.
Chemical Hazards/ Disasters: Release of toxic chemicals, nuclear explosion – Sedimentation processes: Global sedimentation problems – Regional sedimentation problems – Sedimentation & Environmental problems – Corrective measures of Erosion & Sedimentation. Biological Hazards/ Disaster: Population Explosion.

UNIT-V

Emerging approaches in Disaster Management – Three Stages

1) Pre- Disaster Stage (Preparedness)
2) Emergency Stage
3) Post Disaster Stage – Rehabilitation

TEXT BOOK(S)

1. Manual on National Disaster Management Plan, National Disaster Management Authority Ministry of Home Affairs, Government of India. (http://ndma.gov.in/images/policyplan/dmplan/National%20Disaster%20Management%20Plan%20May%202016.pdf)
2. Disaster Management, Dr. Mrinalini Pandey, Wiley India Pvt Ltd., 2014.
3. Disaster Science and Management, Tushar Bhattacharya, McGraw Hill Education, 2015.

REFERENCE BOOK(S)

1. Disaster Mitigation: Experiences and Reflections, Pardeep Sahni, PHI Learning, 2010.
2. Natural Hazards and Disasters, Donald Hyndman and David Hyndman, Cengage Learning, 2013.
3. Disaster Management Global Challenges and Local Solutions, Rajib, S and Krishna Murthy, R.R, University Press Hyderabad, 2009.
4. Earth and Atmospheric Disaster Management: Nature and Manmade, Navale Pandharinath & C. K. Rajan, B.S. Publications, Hyderabad, 2009.
5. Disaster Risk Reduction in South Asia, Sahni and Pardeep, PHI learning Pvt Ltd, 2003.

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20EE42082 – MICRO-ELECTRO-MECHANICAL-SYSTEMS
(OPEN ELECTIVE-III)

B.Tech. CSE (AIML) - IV Year, II Sem.
Prerequisite(s): None

L	T	P/D	C
3	-	-	3

Course objectives
Develop ability to
1. To introduce to basics of Micro-electro-mechanical systems
2. To understand properties of materials involved in MEMS
3. To pertain fabrication methods involved in MEMS manufacturing
4. To apply the concepts for various applications

Course Outcomes (COs)
At the end of the course, student would be able to
CO1. Explain the basic concepts involved in MEMS technologies
CO2. Describe the properties of various materials involved in MEMS technologies
CO3. Apply the concepts and technologies involved in designing of MEMS
CO4. Explain different manufacturing processes involved in the fabrication of MEMS
CO5. Explain the functional aspects of various MEMS structures and devices.

UNIT-I
Introduction to MEMS
What is MEMS, Historical Background, classification, Micro-engineering, importance of micro-engineering. Technological advancements in MEMS, advantages and disadvantages of MEMS.

UNIT-II
MEMS materials
Materials used in MEMS. Material properties: electrical, mechanical, thermal, chemical, biological, optical and processing. Reliability issues of materials

UNIT-III
Designing of MEMS
Design and analysis process for MEMS. Initial design process, structured design process. Commonly used design flow, structured design flow. Design flow for MEMS cad design. Design and verification flow for integrated MEMS.

UNIT-IV
MEMS fabrication Techniques
Photolithography, materials for micromachining, bulk micromachining Surface micromachining, High aspect-ration-micromachining, assembly and system integration.

UNIT-V
MEMS structures and devices
Mechanical sensors, mechanical actuators, micro-fluidic devices, optical/photonic micro-systems, biological transducers.

TEXT BOOK(S)
1. Adams TM, Layton RA., "Introductory MEMS: Fabrication and applications", 2010.
2. Tobergte DR, Curtis S., "An Introduction to Micro-electro-mechanical Systems Engineering" Second Edition. vol. 53. 2013.

REFERENCE BOOK(S)
1. Kreith F, Kreider JF., "The MEMS Handbook‖ CRC Press 2002.
2. Reza Ghodssi, Pinyen Lin, "MEMS Materials and Processes Handbook" Springer 2013.
3. Gad-el-Hak M, "MEMS applications" 2nd edition, CRC press 2006.

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20ME42083 – PRINCIPLES OF AUTOMOBILE ENGINEERING
(OPEN ELECTIVE-III)

B.Tech. CSE (AIML) - IV Year, II Sem.

L	T	P/D	C
3	-	-	3

Prerequisite(s): None

Course Objectives
Develop ability to
1. Introduction to Engineering analysis of the automobiles and their sub systems.
2. Applications of engineering principles to automotive design.
3. Improves ability to understand the different types of engines and automobile bodies.
4. Familiarization with the automotive industry and its terminology.
5. Develops an idea of utilization of resources duly reducing emission levels for achieving eco-friendly environment.

Course Outcomes(COs)
At the end of the course, student would be able to

CO1. Explain evolution and terminology of automobiles.
CO2. Describe fuel supply systems, ignition systems and cooling systems of an automobile.
CO3. Illustrate transmission system, lubrication system, braking system, and steering system of an automobile

UNIT-I
Introduction
History of Automobiles, Classification of Automobiles. Chassis and body building, Engine Terminology, Classification of Engines

UNIT-II
Fuel System
spark Ignition Engines-Fuel tank, fuel filter, fuel pump, air cleaner/filter, carburetor types, injection of petrol engines. Compression Ignition engines, Fuel Injection System- air & solid injection system, Pressure charging of engines, super charging and turbo charging
Cooling System
Cooling Requirements, Air Cooling, Liquid Cooling, Thermo, water and Forced Circulation System, Radiators, Cooling Fan - water pump, thermostat, evaporating cooling, pressure sealed cooling, antifreeze solutions.

UNIT-III
Ignition System
Function of an ignition system, constructional features of storage, battery, auto transformer, contact breaker points, condenser and spark plug – Magneto coil ignition system, Battery ignition system

UNIT-IV
Transmission System
Clutch principle, types, cone clutch, single plate clutch, multi plate clutch, magnetic and centrifugal clutches, gear boxes, types. Propeller shaft, Hotch Kiss drive, Torque tube drive, universal joint, differential, live and dead axles, wheels and tyres.

Braking System
Mechanical brake system, Hydraulic brake system, Master cylinder, wheel cylinder, tandem master cylinder, Requirement of brake fluid, Pneumatic and vacuum brakes.

UNIT-V
Steering System
Types of steering mechanism, Ackerman steering mechanism, Davis steering mechanism.

TEXT BOOK(S)

1. Kirpal Singh, Automobile Engineering, Vol.1 and 2, Standard Publishers, New Delhi, 2003.
2. A Text Book of Automobile Engineering by R K Rajput. Laxmi Publications.

REFERENCE BOOK(S)

1. Automotive Engines / Srinivasan
2. A Text Book of Automobile Engineering By Khalil U Siddiqui New Age International
3. Automobile Engineering / William H Crouse
4. A Text Book Automobile Engineering–Manzoor,. Nawazish Mehdi & .Yosuf Ali, Frontline Publications.

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20EC42084 – BIOMEDICAL INSTRUMENTATION
(OPEN ELECTIVE-III)

B.Tech. CSE (AIML) - IV Year, II Sem.

L	T	P/D	C
3	-	-	3

Prerequisite(s): None

Note: No detailed mathematical treatment is required and only elementary treatment is sufficient.

Course Objectives
Develop ability to
1. Learn the basics of human physiology
2. Understand the basics of bio-medical transducers and recorders.
3. Understand the applications of measuring, recording and monitoring instruments.
4. Understand the concepts of various medical instruments and supporting systems.

Course Outcomes (COs)
At the end of the course, student would be able to
CO1. Describe the functioning of different human physiological systems.
CO2. Analyze the operations of transducers and recorders used for bio-medical applications.
CO3. Describe the functionality of medical imaging systems.
CO4. Illustrate the working principles of monitoring instruments used for bio-medical applications.
CO5. Describe the need for biomedical supporting instruments.

UNIT-I
Human Physiology
Introduction to generalized medical instrumentation system, components of instrumentation system, physiological system of human body, cardiovascular system. Respiratory system, Nervous system, generation of bioelectric potentials, Action potential, resting potential, Neuronal communication.

UNIT-II
Bio- Potential Electrodes, Transducers and Recorders
The electrode – electrolyte interface, Polarization, Ag/Agcl Electrodes, Body surface electrodes, Internal Electrodes. Transducers in general, Pressure Transducers, Temperature transducers, pulse sensors, Basic recording systems.

UNIT-III
Medical Imaging Systems
Basics of medical imaging systems, block diagrams and applications of - X-ray machine, Computer Tomography, Magnetic Resonance Imaging systems, Ultrasonic Imaging systems.

UNIT-IV
Monitoring Systems
Basic principles of -Stethoscope, BP measuring Instrument, Electrocardiography(ECG), Electroencephalography(EEG) and Electromyography(EMG) recorders,

UNIT-V

Supporting Systems

Basic principles of Pacemaker system, Transcutaneous Electrical Nerve stimulation (TENS), surgical diathermy, Heart lung machine, Hemo Dialysis, Lithotripsy.

TEXT BOOK(S)

1. Cromwell, "Bio-Medical Instruments and Measurements", Prentice Hall of India, 1990.
2. Dr.Arumugam, "Bio-Medical Instrumentation", Anuradha Agencies, 1994.

REFERENCE BOOK(S)

1. Prof.Venkataram.S.K, "Bio-Medical Electronics & Instrumentation", Galgotia Publications, 2000.
2. John. Can. Brown, "Introduction to Bio Medical Equipment Technology", Pearson Education of ASIA, 2001.
3. Khandpur.R.S, "Hand book of Bio-Medical Instrumentation", Tata McGraw –Hill, 1987.

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20MB42086 – ENTREPRENEURSHIP
(OPEN ELECTIVE-III)

B.Tech. CSE (AIML) - IV Year, II Sem.

L	T	P/D	C
3	-	-	3

Prerequisite(s): None

Course Objectives
Develop ability to
1. Understand the mindset of the entrepreneurs.
2. Analyze the financial aspects of establishing an enterprise.
3. Learn entrepreneurial activities and determine strategies for launching.
4. Identify the challenges of entrepreneurship and develop an idea on the entrepreneurial framework.
5. Apply strategic perspectives in entrepreneurship.

Course Outcomes (COs)
At the end of the course, student would be able to
CO1. Identify and apply the concepts of entrepreneurship.
CO2. Evaluate and use the concepts of IPR and opportunities to launch new ventures.
CO3. Justify the nature of the creativity process and innovation as an entrepreneur.
CO4. Evaluate entrepreneurial challenges and analyze new ventures.
CO5. Develop strategic plans for business and entrepreneurship.
CO6. Design and develop strategies for entrepreneurial sustainability.

UNIT-I
Introduction to entrepreneurship
meaning, importance, entrepreneurship characteristics, women entrepreneurs, classifications of entrepreneurs, myths of entrepreneurship, qualities of entrepreneurship, competencies, attitude function and nature of forms of entrepreneurship.

UNIT-II
Promotion and financial aspects of entrepreneurship
Idea generation- opportunities- SWOT analysis, patents and trademark, intellectual property rights, source of capital, debt capital, seed capital, venture capital- informal agencies in financing entrepreneurs. Government grants and subsidies, types of investors and private offerings.

UNIT-III
Launching entrepreneurial ventures
opportunities identification- entrepreneurial imagination and creativities – the nature of the creativity process innovation and entrepreneurial- methods to initiate venture creating, new ventures-acquiring and established entrepreneurial venture, franchising hybrid-disadvantage of franchising.

UNIT-IV
Legal challenges of entrepreneurship
Intellectual property protection patents, copy rights-trademarks and trade secret. Avoiding pitfalls-formulation of the entrepreneurial plan-the challenges of new venture startups-poor financial understanding-critical factors for new venture development, the evaluation process, feasibility criteria approach.

UNIT-V

Strategic perspectives in entrepreneurship

Strategic planning-strategic actions-strategic positioning-business stabilization-building the adoptive firms-understanding the growth stage unique managerial concern of growing ventures.

TEXT BOOK(S)

1. D F Kuratko and T V Rao "Entrepreneurship- A South - Asian Perspective "Cengage Learning, 1/e, 2012.
2. Vasanth Desai "Small Scale industries and entrepreneurship" Himalaya Publishing 2012.

REFERENCE BOOK(S)

1. Stuart Read, Effectual Entrepreneurship, Routledge, 2013.
2. Nandan H, Fundamentals of Entrepreneurship, PHI, 2013.

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20MB42005 – PROJECT MANAGEMENT AND FINANCE

B.Tech. CSE (AIML) - IV Year, II Sem.

L	T	P/D	C
3	-	-	3

Prerequisite(s): None

Course Objectives

Develop ability to

1. To understand the Fundamentals of Project Management and Financial considerations involved in it.
2. Estimate the slack-time and cost of the project.
3. Analyze the project risks.
4. Analyze the financial sources.
5. Configuring the venture capital sources.

Course outcomes (COs)

At the end of the course, student would be able to

CO1. Define project management process, classification of costs, types of risks, and sources of finance.
CO2. Apply the concepts of PERT and capital structure theories in project management.
CO3. Integrate financial risk assessment and project risk analysis.
CO4. Assess project financing structure to ensure project success.

UNIT-I

Introduction to Project Management and Selection Criteria

Project definition, Program, Portfolio, Project life cycle cum phases. Importance of Project management. Project management process and classification. Project selection- Project Portfolio Management system, selection methods.

UNIT-II

Estimating times and cost

Factors influencing quality of estimates, estimation methods, types of cost, developing network, constructing project network, activity on node, network computation. PERT.

UNIT-III

Managing Risk

Risk management process- contingency planning, change control. Project risk management, resourse allocation. Analysis of project risks, Market risk, Firm risk.

UNIT-IV

Financing of Projects

Capital structure, methods of offering, equity capital, preference capital, debenture. Methods of offering term loans, working capital advances. Project financing structure.

UNIT-V

Financing infrastructure projects and Venture capital

Typical project configuration, key project parties. Project contracts, infrastructure financing scenario in India. Venture capital investor, venture capital investment, raising venture capital.

TEXT BOOK(S)

1. Project management- The managerial process, Clifford F Gray, Erik W Larsom, Gautam V. Desai, 4ed, THM.
2. Project- Planning, analysis, selection, financing, implementation and review, Prasanna Chandra, 6ed, TMH.
3. Project Management- Achieving competitive advantage, Jeffrey K Pinto, 1st ed, PHP.