JBIET Academic Regulations –R24

Applicable to

B.Tech Regular Four Year Degree Programme

(For the Batches admitted from the Academic Year 2024- 25)

&

B.Tech (Lateral Entry Scheme)

(For the Batches admitted from the Academic Year 2025-26)

R-24 CSE(DS)

J.B. INSTITUTE OF ENGINEERING AND TECHNOLOGY

(UGC AUTONOMOUS)

Bhaskar Nagar, Yenkapally (V), Moinabad (M), Hyderabad – 500075,
Telangana, India

J.B. INSTITUTE OF ENGINEERING AND TECHNOLOGY

(UGC Autonomous)

JBIET Academic Regulations - R24

Applicable to

B.Tech Regular Four Year Degree Programme

(For the Batches admitted from the Academic Year 2024- 25)

&

B.Tech (Lateral Entry Scheme)

(For the Batches admitted from the Academic Year 2025- 26)

Offered under **Choice Based Credit System (CBCS)**

J. B. Institute of Engineering and Technology (hereinafter referred to as JBIET) academic regulations JB-R24 are given here under. These regulations approved by the Academic Council shall be in force and applicable from the academic year 2024-25 onwards.

1.0 Under-Graduate Degree Programme in Engineering & Technology

J. B. Institute of Engineering and Technology (JBIET) offers a 4-Year (8 Semesters) Bachelor of Technology (B. Tech) Degree Programme for regular students under Choice Based Credit System (CBCS) in the following branches of Engineering with effect from the academic year 2024-25.

S. No.	Branch Code	Branch Name
1	**01**	Civil Engineering (CE)
2	**02**	Electrical and Electronics Engineering (EEE)
3	**03**	Mechanical Engineering (ME)
4	**04**	Electronics and Communication Engineering (ECE)
5	**05**	Computer Science and Engineering (CSE)
6	**12**	Information Technology (IT)
7	**19**	Electronics and Computer Engineering (ECM)
8	**66**	Computer Science and Engineering (Artificial Intelligence and Machine Learning)-CSE(AI&ML)
9	**67**	Computer Science and Engineering (Data Science)-CSE(DS)
10	**72**	Artificial Intelligence and Data Science (AI&DS)
11	**73**	Artificial Intelligence and Machine Learning (AI&ML)

2.0 Eligibility for Admission

2.1. Admission to the undergraduate (UG) programme shall be made either on the basis of the merit rank obtained by the qualified student in entrance test conducted by the Telangana State Government (EAPCET) or the University or on the basis of any other order of merit approved by the College, subject to reservations as prescribed by the government from time to time.

2.2. The medium of instruction for the entire Undergraduate Programme in Engineering &Technology is English only.

3.0 B. Tech Programme Structure

3.1 Semester Scheme*:* Each Undergraduate (**UG**) Programme is of 4 Academic Years (8 Semesters) with the Academic Year divided into two Semesters of 22 weeks (≥90 instructional days) each. Each Semester is having "**Continuous Internal Evaluation (CIE)**" and "**Semester End Examination (SEE)**" under Choice Based Credit System (CBCS) and Credit Based Semester System (CBSS) as indicated by UGC. The guidelines issued by JNTUH, AICTE and NEP-2020 are followed while designing curriculum / course structure.

3.2 Choice Based Credit System (CBCS): Choice Based Credit System (CBCS) is introduced in line with UGC guidelines in order to promote:

- Student centred learning
- Students to learn courses of their choice
- Interdisciplinary learning

A student has a choice of registering for courses comprising program core, professional electives, open electives, value added, skill-oriented courses etc. Besides, choice is also offered to students for registering courses to earn Minor in Engineering / Honours degree.

3.3 Minimum Duration: The minimum (normal) duration of the B. Tech. Programme for the student securing admission under Regular mode is Four Academic Years (8 Semesters) and for the student admitted under Lateral Entry Scheme is Three Academic Years (6 Semesters) starting from the commencement of the First Year First Semester.

3.4 Maximum Duration: A student admitted under Regular mode shall complete the B. Tech Programme in a maximum period of Eight Academic Years (16 Semesters) and the student admitted under Lateral Entry Scheme shall complete the B. Tech Programme in a maximum period of Six Academic Years (12 Semesters) starting from the date of commencement of First Year First Semester. failing which student shall forfeit seat in B.Tech course. Each student shall secure 160 credits for regular students and 120 credits for Lateral Entry students (with CGPA ≥ 5) for the completion of the undergraduate programme and award of the B.Tech. degree.

4.0 Course Classification

The curriculum for B. Tech Programme includes various curricular components like Foundation Courses (BS, HS and ES), Core Courses (PC, PW), Elective Courses (PE & OE), Audit Courses (AC), Mandatory Courses (MC) etc. The details of these courses and typical breakup of credits for each category is mentioned in the tables given below.

4.1 Classification

S. No.	Broad Course Classification	Course Group/ Category	Course Description
1	Foundation Courses (FnC)	BS – BasicSciences	Includes Mathematics, Physics and Chemistrysubjects
2		ES- Engg. Sciences	Includes fundamental engineering subjects
3		HS – Humanities and Social sciences	Includes subjects related to Humanities, Socialsciences and Management
4	Core Courses (CoC)	PC– Professional Core	Includes core subjects related to the parent Discipline/ department/ branch of Engineering.
5		PW- Project Work	B. Tech project or UG project or UG major project or Project Stage I & II
6		Industry Training/ Internship/ Industry Oriented Mini-project/ Mini- Project/ Skill Development Courses	Industrial training/ Summer Internship/ Industry Oriented Mini-project/Mini-project
7	Elective Courses(ElC)	PE – Professional Electives	Includes elective subjects related to the parent discipline/ department/ branch of Engineering.
8		OE – OpenElectives	Elective subjects which include inter-disciplinary subjects or subjects in an

			area outside the parent discipline/ department/ branch of Engineering.
9	Seminar	Seminar	Seminar/ Colloquium based on core contents related to parent discipline/ department/ branchof Engineering.
10	Minor Courses	-	1 or 2 Credit Courses (subset of HS)
11	Audit courses (AC)	-	Value Added Course / Audit Courses (Non-Credit)
12	Mandatory Courses (MC)	-	Mandatory Courses (Non-credit)

4.2 Typical Breakup of Credits for each Category:

S.No	Category	Breakup of Credits
1	Humanities and Social Sciences (HS)- including Management.	**10**
2	Basic Sciences (BS)- Courses including Mathematics, Physics and Chemistry.	**22**
3	Engineering Sciences (ES)-Courses including Workshop, Drawing, Basics of Electrical / Electronics /Mechanical / Computer Engineering.	**22**
4	Professional Core (PC)-Courses relevant to the chosen specialization / branch.	**59**
5	Professional Electives (PE)-Courses relevant to the chosen specialization / branch.	**18**
6	Open Elective (OE) - Courses from other technical and / or emerging subject areas.	**12**
7	Mini-project / Project Work / Internship / Industrial training / Seminar	**17**
8	Mandatory Courses / Audit Courses.	**Non-Credit**
TOTAL		**160**

5.0 Credit System

5.1 The student has to register for all the courses offered in a Semester. The credits assigned for each course are indicated in an L: T: P: C (Lecture periods: Tutorial periods: Practical periods: Credits) pattern as follows:

- Theory Courses: One Lecture Hour (L) per week in a semester: 01 Credit
- Practical Courses: One Practical Hour (P) Per week in a semester: 0.5 Credit
- Tutorial: One Tutorial Hour (T) Per week in a semester: 01 Credit
- Mandatory Courses: No CREDIT is awarded.
- Audit Courses: No CREDIT is awarded.

6.0 Course Registration

6.1. A faculty advisor or mentor shall be assigned to a group of 20 students, who can advise the students about the Programme, it's course structure and curriculum, choice/option for subjects/ courses, based on their competence, progress, pre-requisites and interest.

6.2 Before the commencement of every semester, all the students shall register for the courses offered in that semester through online registration process

6.3 A student can apply for registration, only after obtaining the 'written approval' from faculty advisor, which should be submitted to the college academic section through the Head of the Department. A copy of it shall be retained with the Head of the Department, faculty advisor and the student.

6.4 If any student fails to register courses in a semester, he/she shall undergo the courses as per the course structure decided by the Head of the Department.

6.5 A student may be permitted to register for all the subjects/ courses in a semester as specified in the course structure with maximum additional subject(s)/course(s) limited to 6 Credits (any 2 elective subjects), based on progress and SGPA/ CGPA, and completion of the 'pre-requisites' as indicated for various subjects/ courses, in the department course structure and syllabus contents.

6.6 Choice for 'additional subjects/courses', not more than any 2 elective subjects in any Semester, must be clearly indicated, which needs the specific approval and signature of the Faculty Advisor/Mentor/HOD.

6.7 If any student submits ambiguous choices or multiple options or erroneous entries during registration for the subject(s) / course(s) under a given / specified course group / category as listed in the course structure, the subject / courses decided by the Head of the Department will be final.

6.8 After registering for a course, a student shall attend the classes, to satisfy the attendance requirements, earn Continuous Internal Evaluation (CIE) Marks and appear in Semester End Examinations (SEE).

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

6.10 Dropping of subjects/ courses may be permitted, only after obtaining prior approval from the faculty advisor/ counselor within a period of 15 days from the beginning of the current semester.

6.11 Open Electives: The students have to choose requisite number of open electives (as prescribed in the course structure) from the list of open electives. However, the student can opt for an Open Elective subject offered by his/her own (parent) department, if the student has not registered and not studied that subject under any category (Professional Core, Professional Electives, Mandatory Courses etc.) offered by parent department in any semester. Open Elective subjects already studied should not repeat/should not match with any category (Professional Core, Professional Electives, Mandatory Courses etc.) of subjects even in the forthcoming semesters.

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

6.13 Subjects/ courses to be offered (Professional Electives and Open Electives) shall be offered to the students if a minimum of 30 students register for that course.

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

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

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

7.0. Academic Requirements

7.1 Attendance Requirements

7.1.1 A student shall be eligible to appear for the Semester End Examinations, if the student acquires a minimum of 75% of attendance in aggregate of all the subjects / courses (including attendance in Mandatory Courses and Audit Courses) for that semester. Two periods of attendance for each theory subject shall be considered if the student appears for the mid-term examination of that subject.

7.1.2 Shortage of attendance in aggregate up to 10% (65% and above, and below 75%) in each semester may be condoned by the College Academic Committee (CAC) on genuine and valid grounds, based on the student's representation with supporting evidence.

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

7.1.4 A stipulated condonation fee as decided by the CAC is payable for condoning shortage of attendance.

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

7.1.6 A student detained in a semester due to shortage of attendance may be readmitted in the same semester as and when offered in the forthcoming academic years for fulfilment of academic requirements. **The academic regulations under which a student has been readmitted shall be applicable.**

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

7.2 Course Passing Standards

The following academic requirements have to be satisfied, in addition to the attendance requirements mentioned in Item No. 7.1.

7.2.1 A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course, if student secures not less than 35% (14 marks out of 40 marks) in the Continuous Internal Evaluation (CIE), not less than 35% (21 marks out of 60 marks) in the semester end examinations (SEE), and a minimum of 40% (40 marks out of 100 marks) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together; in terms of letter grades, this implies securing 'C' grade or above in that subject/ course.

7.2.2 A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to Real-time Research Project (or) Field Based Research Project (or) Industry Oriented Mini Project (or) Internship (or) Seminar, if the student secures not less than 40% marks (i.e. 40 out of 100 allotted marks) in each of them. The student is deemed to have failed, if he (i) does not submit a report on Industry Oriented Mini Project/Internship, or (ii) not make a presentation of the same before the evaluation committee as per schedule, or (iii) secures less than 40% marks in Real-time Research Project (or) Field Based Research Project (or) Industry Oriented Mini Project (or) Internship evaluations.

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

7.2.4 Recounting/Revaluation: Students shall be permitted to apply for Recounting /Revaluation of the Semester End Examination answer scripts within a stipulated period after payment of the prescribed fee. After completion of the process of Recounting /Revaluation, the records are updated with changes if any, and the student shall be issued a revised grade sheet. If there are no changes, the same will be shown in the student examination portal.

7.3 Promotion Rules:

Promotion Rules for Regular/Lateral Entry Students

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 yea first semester	**Regular Students:** Regular course of study o first year second semester and must have secured at least 20 credits out of 40 credits i.e. 50% credits up to first year second semeste 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 firs semester	**Regular Students:** Regular course of study o second year second semester and must have secured at least 48 credits out of 80 credits i.e. 60% credits up to second year second semester from all the relevant regular and supplementary examinations, whether the student takes those examinations or not.
		Lateral Entry Students: Regular course o study of second year second semester and must have secured at least 24 credits out of 40 credits i.e., 60% credits up to second yea second semester from all the relevant regula and supplementary examinations, whether the student takesthose 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 yea first semester	**Regular Students:** Regular course of study c third year second semester and must have secured at least 72 credits out of 120 credits i.e., 60% credits up to third year second semester from all the relevant regular and supplementary examinations, whether the student takes those examinations or not.
		Lateral Entry Students: Regular course c study of third year second semester and mus have secured at least 48 credits out of 80 credits i.e., 60% credits up to third year second semester from all the relevant regular and supplementary examinations, whether the student takes those examinations or not.
7	Fourth year first semester to fourth year second semester	Regular course of study of fourth year first semester.

7.4 Credit Requirements

The following credit requirements must be satisfied, in addition to the attendance requirements mentioned in item No. 7.1.

7.4.1 A student should earn credits allotted for each of the course by securing minimum marks designated as passing standard for that course.

7.4.2 A student shall be admitted under regular scheme, register for all 160 credits offered and has to earn all the credits (A student admitted under Lateral entry scheme shall register for all 122 credits offered and all the credits). However, the student shall be eligible to avail the benefits that the JNTUH University announces such as exemption of subjects and grace marks for batches admitted during the academic years same as these students.

7.4.3 A student shall register for all mandatory courses mentioned in the curriculum and get minimum pass marks (i.e., 40% of total marks) to get the degree. Grade points obtained in these courses will not be considered for awarding class.

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

8.0. Evaluation-Distribution and Weightage of marks

8.1 The performance of a student in all theory and Laboratory courses shall be evaluated for 100 marks each, with **40 marks** allotted for **Continuous Internal Evaluation (CIE)** and **60 marks** for **Semester End-Examination (SEE).**

The details of course-wise allotment of marks are given below.

S. No.	Course	Marks	
		CIE	SEE
1	Theory courses	40	**60**
2	Laboratory courses	40	**60**
3	Mandatory courses	100	--
4	Audit Courses	--	--
5	Internship- I	50	--
6	Internship- II	50	--
7	Mini Project	50	--
8	Project Stage - I	50	--
9	Seminar	50	--
10	**Project Stage - II**	**40**	**60**

8.2 Continuous Internal Evaluation (CIE)

8.2.1 Theory Courses: For theory courses, during the semester there shall be 2 **mid-term examinations** (**internal exams of 30 marks each**), **2 assignments carrying 5 marks each and Subject Viva-Voce/PPT/Poster Presentation/ Case Study on a topic in the concerned subject for 5 marks.**

S. No	Component	Frequency of Evaluation	Marks for Eachtest	Final Marks (Average)
1	Mid Examinations	2	30	30
2	Assignments	2	5	5
3	Viva-Voce/PPT/Poster Presentation/ Case Study	1		5
			Tota	40

Mid-term Examinations (30 marks): 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:

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 Mid-I shall be conducted after first spell of instructions covering the syllabus of Modules I and II. The Mid-II shall be conducted after second spell of instructions covering the syllabus of Modules III, IV and V.

Assignments (5 marks): There shall be two assignments for 5 marks each. Assignment-1 shall be submitted before I-mid examinations covering the topics from Module-1 and Module-2, and the Assignment-2 shall be submitted before II-mid examinations covering the topics from Module-3, Module-4 and Module-5. The assignments are used to test the student in Bloom's higher order thinking skills. The average of the two assignments shall be taken as the final marks for assignment (for 5 marks).

Viva-Voce/ PPT /Poster Presentation/ Case Study (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.

8.2.2 If a student is absent for any mid-term Examination on medical grounds / due to any emergency / unavoidable circumstances, the student may be permitted to apply for makeup examinations within a week after completion of Mid-Term Examinations. A sub-committee with the following composition will look into such cases. Student shall pay Rs.200 per subject as registration fee in which he/she is appearing for re-examination.

S. No	Faculty Member	Designation
1	Concerned Head of the Department	Chairman
2	Faculty nominated by Principal	Member
3	Senior faculty member of the concerned Department	Member
4	Class Teacher of the class/section	Member

8.2.3 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.

8.2.4 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.

8.2.5 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 Semester End Examinations (SEE)

8.3.1 Theory Courses

The Semester End Examinations (SEE), for theory subjects, will be conducted for 60 marks consisting of two parts viz. **i) Part- A for 10 marks, ii) Part - B for 50 marks.**

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

8.3.2 Laboratory Courses

Continuous Internal Evaluation (CIE): The continuous internal evaluation for laboratory courses during the semester is evaluated for 40 marks and 60 marks for Semester End Examination. Out of the 40 marks for internal evaluation:

i. 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

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

iii. The remaining 10 marks are for Laboratory Report/Project and Presentation, which consists of the Design (or) Software / Hardware Model Presentation (or) App Development (or) Prototype Presentation submission which shall be evaluated after completion of laboratory course and before semester end practical examination.

iv. Internal laboratory examination (ILE) for 10 marks shall be conducted by the faculty member handling the laboratory. ILE shall be conducted after Second spell of instructions.

S.No	Component	Marks
1	Day-to-Day Evaluation	30
2	Internal Examination	10
	Total	40

8.3.3 Semester End Examination for Laboratory Courses The performance of the student in laboratory courses shall be evaluated for **60 marks** jointly by Internal and External Examiners for 3 hours duration. The total 60 marks are divided and allocated as shown below:

- 10 marks for write-up
- 15 for experiment/program
- 15 for evaluation of results

- 10 marks for presentation on another experiment/program in the same laboratory course and
- 10 marks for viva-voce on concerned laboratory course.

8.3.4 Evaluation of Elements of CE/ME/EEE/ECE/CSE etc course: The internal evaluation is for 50 marks, and it shall take place during I Mid-Term examination and II Mid-Term examination. The average marks of two Mid-Term examinations is the final for 50 marks. Student shall have to earn 40%, i.e 20 marks out of 50 marks from average of the two examinations. There shall be NO external evaluation. The student is deemed to have failed, if he (i) is absent as per schedule, or (ii) secures less than 40% marks in this course.

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

Part A: Objective/quiz paper is set with multiple choice, fill-in the blanks and match the following type of questions for a total of 20 marks. Part B: Descriptive paper shall contain 6 full questions out of which, the student has to answer 4 questions, each carrying 5 marks.

The remaining 10 marks of Continuous Internal Evaluation are for Assignment (5 marks) and Subject Viva-Voce/PPT/Poster Presentation/ Case Study (5 marks) and the evaluation pattern will remain same as for other theory subjects.

CE/ME/EEE/ECE branches: the Continuous Internal Evaluation (CIE) will be for 50 marks. Out of the 50 marks for internal evaluation:

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

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

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

d) The remaining 15 marks are for Laboratory Report/Project and Presentation, which consists of the Design (or) Software / Hardware Model Presentation (or) App Development (or) Prototype Presentation submission which shall be evaluated after completion of laboratory course and before semester end practical examination.

8.4 Internship: Students should undergo two Internships. Internship-I shall be carried out under the guidance of professors from Science and Basic Engineering Subjects, with topics having some social relevance. The Internship-I is to be taken up during the summer vacation after I Year II Semester Examination and it will be evaluated in II Year I semester for 50 marks. However, the process might be initiated before the end of I Year II Semester by the concerned department. The students admitted under Lateral Entry Scheme (LES) shall carry out internship in the area of their Diploma specialization under the guidance of a faculty member of that department immediately in the first month, after their joining of the course.

The Internship-II is to be taken up during the summer vacation after II Year II Semester examination and it will be evaluated in III Year I semester for 50 marks. However, the

process might be initiated before the end of II Year II Semester by the concerned department.

For both the Internships, the student shall submit a report on the training undergone. The internships shall be evaluated by a three-member committee constituted by the Head of Department to assess the student performance on the following parameters. There shall be no Semester End Examinations for the Internships.

Parameter	Marks
Internship report	15
Quality of work	15
Presentation	15
Viva-Voce	5
Total	50

8.5 Industry Oriented Mini Project: A student is required to undergo a Mini Project of his/her choice during the vacation after III Year II Semester Examination by applying theoretical concepts to develop a practical component /element/system that includes design/ testing/ analysis. The performance of a student in the Mini Project shall be evaluated in IV Year I Semester by a three-member committee constituted by the HoD as per the following parameters:

Parameter	Marks
Mini Project report	15
Quality of work	15
Presentation	15
Viva-Voce	5
Total	50

The performance of a student in Mini Project shall be evaluated based on two reviews, each carrying 50 marks. The average marks of these two reviews will be awarded. **There shall be no Semester End Examination** for the Industry Oriented Mini Project.

8.6 Seminar: There is a seminar in IV Year II Semester for 50 Marks. The student shall deliver a seminar on any emerging topic of his / her choice from the core technical domain. The student shall submit a duly-certified seminar report. A three-member committee constituted by the HoD will evaluate the seminar report submitted by the student. **There shall be no Semester End Examination**.

If a student is absent for seminar on medical grounds / due to any emergency / unavoidable circumstances, the student may be permitted to reappear within a month.

8.7 Project Work: The student is required to undertake a Project Work by using the knowledge acquired by him / her during the course of study. The student is expected to

design and build a complete system or subsystem on his / her area of interest. The Project Work consists of two parts namely, Project Stage -I (Project Survey) and Project Stage – II (Project Implementation). Project Stage – I is carried out during IV Year I Semester and the Project Stage – II during IV Year II Semester. A project work shall be taken up by a batch of students not exceeding 4 members under the guidance of a faculty supervisor.

For Project Stage – I, the Project Review Committee (PRC) consisting of the Head of the Department, Project Coordinator, Project supervisor and one senior faculty member shall evaluate the Project Work for 50 marks before II Mid Examination of IV-I Semester. **There shall be no End Semester Evaluation for Project Phase-I**. The student is deemed to have failed, if he

(i) does not submit a report on Project Stage - I or does not make a presentation of the same before the evaluation committee as per schedule

(ii) Secures less than 40% marks in the CIE.

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

For Project Stage – II, Project Review Committee (PRC) consisting of the Head of the Department, Project supervisor, Project Coordinator and a senior faculty member **shall evaluate for 40 marks as continuous evaluation**. The External Examiner shall **evaluate the Project work for 60 marks as Semester End Examination**. Out of 40 internal marks, the departmental committee consisting of Head of the Department, Project Supervisor and a Senior Faculty Member shall evaluate the project work for 20 marks and Project Supervisor shall evaluate for 20 marks.

The student is deemed to have failed, if he (i) does not submit a report on Project Stage - II, or does not make a presentation of the same before the External Examiner as per schedule, or (ii) Secures less than 40% marks in the sum total of the CIE and SEE taken together. The student is deemed to have failed, if he

(i) does not submit a report on Project Stage - II, or does not make a presentation of the same before the external examiner as per schedule.

(ii) Secures less than 40% marks in the sum total of the CIE and SEE taken together.

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

For conducting Viva-Voce of Project Stage – II, the principal selects the External Examiner from the list of experts in the relevant branch of engineering submitted by the concerned Head of the Department.

8.8 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 Viva-voce/ 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.

8.8 Mandatory Courses (MC)

Mandatory courses carry "ZERO" credit. There shall be NO Semester-end examination. However, attendance in Mandatory Curses shall be considered while calculating aggregate attendance in a semester. The Continuous Internal Evaluation (CIE) shall be conducted and evaluated for 40 marks similar to the theory courses. In addition to this an internal Examination for 60 marks covering the syllabus from all five modules is conducted. The student shall be declared to have passed the mandatory courses only when he/she secures 40% marks in the internal evaluation carried out for 100 marks. If the student fails, a re-examination shall be conducted for such candidates in the following semester before the supplementary examinations. The performance of the student shall be indicated in the grade sheets "PASS" (or) "FAIL" only. The student should pass all the mandatory courses, for the award of B.Tech degree.

8.9 Audit Courses (AC)

Audit courses carry **zero** credits. There shall be No mid-term and Semester End Examination. However, attendance in audit courses shall be considered while calculating aggregate attendance in a semester. The student should study all the audit courses. No credits will be assigned to these courses. A separate certificate will be issued by the Head of the institution on satisfactory completion of Audit Courses.

The student may be permitted to register Mandatory courses and Audit courses as MOOCs offered by SWAYAM / NPTEL / EdX / Coursera / Udacity / Udemy /upgrad/ Khan Academy / Edureka / QEEE etc. The student shall submit weekly assessment report to the faculty coordinator as mentioned in 9.1 and the same shall be considered for internal marks and attendance.

9.0 Massive Open Online Courses (MOOCs)

A student shall be permitted to register BOS approved list of online / self-study course in lieu of the Professional Electives; Open Electives from Massive Open Online Courses (MOOCs) offered by SWAYAM / NPTEL / EdX / Coursera / Udacity / Udemy /upgrad/ Khan Academy / Edureka / QEEE etc. However, the syllabus of the MOOC course shall be approved by the concerned BOS. No formal lectures will be delivered for a self-study course.

9.1 One faculty member for each course shall be nominated as coordinator by the Department to monitor the progress made by the student. The coordinator needs to carry out the conversion of grades awarded to the student in internal and external examinations by the MOOCs offering institution into corresponding grades of JBIET. If any student fails

to successfully complete the MOOC course in the first attempt, he/she shall complete it in the supplementary examination conducted by the college in the subsequent semesters. The question paper pattern and evaluation process for the examination of such subjects for MOOC courses will be similar to that of any other theory course offered under R24.

10.0. Grading Procedure

10.1 Grades will be awarded to indicate the performance of students in each Theory subject, Laboratory / Practical, Seminar, Industry Oriented Mini Project, and Project Stage - I & II. Based on the percentage of marks obtained (Continuous Internal Evaluation plus Semester End Examination, both taken together) as specified in item 8 above, a corresponding letter grade is given.

10.2 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 is followed:

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

Credit Points (CP) = Grade Point (GP) x Credits …. for a course

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

10.3 The Semester Grade Point Average (SGPA) is calculated by dividing the sum of Credit Points ($\sum$ CP) secured from all subjects/ courses registered in a semester, by the total number of Credits registered during that semester. SGPA is rounded off to two decimal places. SGPA is thus computed as given below:

$$SGPA = \frac{\sum_{i=1}^{N} C_i G_i}{\sum_{i=1}^{N} Ci} \quad \text{for each Semester}$$

where ‘i’ is the subject indicator index (takes into account all subjects in a semester), ‘N’ is the no. of subjects ‘registered’ for the semester (as specifically required and listed under the course structure of the parent department), C_i is the no. of credits allotted to the ith subject, and G_i represents the grade points (GP) corresponding to the letter grade awarded for that i^{th} subject.

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

$$CGPA = \frac{\sum_{j=1}^{M} C_j G_j}{\sum_{j=1}^{M} C_j} \quad \text{for all S number of semesters registered}$$

(i.e., up to and inclusive of S semesters, S ≥ 2),
where ‘M’ is the total no. of subjects (as specifically required and listed under the course structure of the parent department) the student has ‘registered’ i.e., from the 1st semester onwards up to and inclusive of the 8th semester, ‘j’ is the subject indicator index (takes into account all subjects from 1 to 8 semesters), C_j is the no. of credits allotted to the jth subject, and G_j represents the grade points (GP) corresponding to the letter grade awarded for that j^{th} subject. After registration and completion of I Year I Semester, the SGPA of that semester itself may be taken as the CGPA, as there are no cumulative effects.

Illustration of calculation of SGPA:

Course/Subject	Credits	Letter Grade	Grade Points	Credit Points
Course 1	4	A	8	4 x 8 = 32
Course 2	4	O	10	4 x 10 = 40
Course 3	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
	21			152

$$SGPA = \frac{152}{21} = 7.24$$

Illustration of calculation of CGPA up to 3rd semester:

Semester	Course/ SubjectTitle	Credits Allotted	Letter Grade Secured	Corresponding Grade Point (GP)	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

$$CGPA \bullet \frac{518}{69} \bullet 7.51$$

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

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

10.6 SGPA and CGPA of a semester will be mentioned in the semester Memorandum of Grades if all subjects of that semester are passed in first attempt. Otherwise the SGPA and CGPA is mentioned only on the Memorandum of Grades in which sitting the student passed his/her last exam in that semester. However, Mandatory Courses will not be taken into consideration.

11.0 Award of Degree

A student is declared to have 'qualified' for the award of B. Tech. degree by JNTUH, in the chosen branch of Engineering selected at the time of admission, if he/she fulfills the following conditions.

11.1 The student shall pursue a programme of study for not less than four academic years and not more than eight academic years. In case of lateral entry students, student shall pursue a programme of study for not less than three academic years and not more than six academic years.

11.2 The student shall register for 160 credits and has to secure all 160 credits (122 credits in case of lateral entry students). Marks obtained in all 160 credits shall be considered for the award of the class based on aggregate of grades. Also, the student should appear and complete all mandatory courses prescribed.

11.3 However, the students are eligible to avail the benefits such as exemption of credits that degree awarding University (JNTUH) announces to the students admitted during this period

12.0 Award of Class

12.1 A student who qualifies for the award of the degree as is placed in the following classes. A student with final CGPA (at the end of the undergraduate programme) > 8.00, and fulfilling the following conditions - shall be placed in '**First Class with Distinction**'. However, he

- **(i) Should have passed all the subjects/courses in 'First Appearance' within the first 4 academic years (or 8 sequential semesters) from the date of commencement of first year first semester.**
- (ii) **Should not have been detained or prevented from writing the semester end examinations in any semester due to shortage of attendance or any other reason**.

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

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

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

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

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

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

13.1 A student is declared to have 'qualified' for the award of **2-Year B.Tech. Diploma Certificate** by JNTUH, in the chosen branch of Engineering selected at the time of admission if he/she fulfils the following conditions.

1. When a student wants to exit from 4-Year B. Tech. programme, he/she has to fulfil all the academic requirements and earn all the registered 80 credits (within 4 years from the date of admission) up to B. Tech. – II Year – II Semester to be eligible for **2-Year UG Diploma Certificate**.
2. The student once opted and awarded 2-Year UG Diploma Certificate, the student will be permitted to join in B. Tech. III Year I Semester and continue for completion of remaining years of study for 4-Year B. Tech. Degree ONLY in the next academic year along with next batch students. However, if any student wishes to continue the study after opting for exit, he/she should register for the subjects/courses in III Year I Semester before commencement of classwork for that semester.

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

13.3 Lateral Entry students are not eligible for 2-Year B. Tech. Diploma Certificate

13.4 Multiple Entry and Multiple Exit: As a part of the National Education Policy (NEP) 2020, the students are allowed to enter and exit their academic programs at various stages with recognized certifications. If a student wishes to exit from 4-Year B. Tech. programme after I Year, then a certificate will be issued by the principal indicating all the subjects studied during I Year provided he/she has to fulfil all the academic requirements and earn all the registered 40 credits within 2 years from the date of admission.

14.0 Break of Study from a Programme (Gap Year)

14.1 A student is permitted to go on break of study for a maximum period of two years either as two breaks of one year each or a single break of two years after completion of II-year II semester.

14.2 In case, a student wishes to extend the gap year for one more consecutive year, he/she shall be permitted with the prior approval of the Principal on the recommendations of the Head of the Department prior to the beginning of the semester in which he/she has taken break of study.

14.3 The student shall apply for break of study in advance, in any case, not later than the last date of the first assessment period in a semester. The gap year concept is introduced for start-up (or) incubation of an idea, National/International Internships, and professional volunteering. Student taking break of study shall submit an application to the Principal through the Head of the department. A committee shall be appointed by the Principal in this regard. Based on the recommendations of the committee, the Principal shall decide whether to permit the student to avail the gap year or not.

14.4 Students permitted to rejoin the programme after break of study shall be governed by the Curriculum and Regulations in force at the time of rejoining. The students rejoining in new regulations shall apply to the Principal in the prescribed format through the Head of the Department, at the beginning of the readmitted semester for registering additional / equivalent courses to comply with the curriculum in-force.

14.5 The period of break of study shall be counted in the maximum period of graduation (i.e the maximum period of graduation is 8 years for Regular admitted students and 6 years for Lateral Entry admitted students availing Gap Year).

14.6 If a student has not reported to the college after completion of the approved period of break of study he is deemed to be detained in that semester. Such students are eligible for readmission into the semester when offered next.

15.0 Transitory Regulations:

The transitory guidelines are applicable to the students

15.1 Who have been detained due to lack of attendance in any semester, shall be permitted the join the corresponding semester.

15.2 Students detained due to shortage of credits, shall be promoted to the next semester only after acquiring the required credits as per the corresponding regulations of his / her admission

15.3 Students who have discontinued and wish to continue the Programme, are eligible for admission into the unfinished semester.

15.4 If a student readmitted to JB-R24 Regulations, has already studied any subject with 80% of syllabus common in his / her previous regulations, that particular subject in JB-R24 Regulations will be substituted by another subject to be suggested by the BOS concerned. If the readmitted student has not studied the pre-requisite subjects for any subject offered in JB-R24 regulations, remedial classes shall be arranged by the concerned HoD.

16. 0 Transfer of Students from other Colleges / Universities

Transfer of students from other Colleges or Universities are permitted subject to the rules and regulations of Telangana State Council for Higher Education (Technical Education Department) and JNTUH in vogue.

17.0 Malpractices Rules

Disciplinary Action For / Improper Conduct in Examinations

	Nature of Malpractices/Improper conduct	Punishment
	If the student:	
1.(a)	Possesses any item accessible in the examination hall like paper, note book, programmable calculators, cell phones, pager, palm computers or any other form of material concerned with or related to the subject of the examination (theory or practical) in which student is appearing but has not made use of (material shall include any marks on the body of the student which can be used as an aid in the subject of the examination)	Expulsion from the examination hall and cancellation of the performance in that subject only.
(b)	Gives assistance or guidance or receives it from any other student orally or by any nonverbal cues or communicates through cell phones with any student or persons in or outside the exam hall in respect of any matter.	Expulsion from the examination hall and cancellation of the performance in that subject only of all the students involved. In case of an outsider, he will be handed over to the police and a case is registered against him.
2.	Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the subject of the examination (theory or practical) in which the student is appearing.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the student has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the subjects of that semester/year.
3.	Smuggles in the answer book or additional sheet or takes out or arranges to send out the question paper during the examination or answer book or additional sheet, during or after the examination.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the student has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The student is also debarred for two consecutive semesters from class work and all End examinations. The continuation of the course by the student is subject to the academic regulations in connection with

		forfeiture of seat.
4.	Uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks.	Cancellation of the performance in that subject.
5.	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 is expelled from examination halls and cancellation of their performance in that subject and all other subjects the student(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the subjects of that Semester/year. The students also are debarred and forfeit their seats. In case of outsiders, they will be handed over to the police and a Police case is registered against them.
6.	Leaves the exam hall taking away answer script or intentionally tears off the script or any part thereof inside or outside the examination hall.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the student has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that Semester/year. The student is also debarred for two consecutive semesters from class work and all End examinations. The continuation of the course by the student is subject to the academic regulations in connection with forfeiture of seat.
7.	Possesses any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the student has already appeared

		including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The student is also debarred and forfeits the seat.
8.	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.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the student has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The student is also debarred and forfeits the seat. Person(s) who do not belong to the college will be handed over to police and, a police case will be registered against them.
9.	Comes in a drunken condition to the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the student has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year
10.	Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny.	Cancellation of the performance in that subject and all other subjects the student has appeared including practical examinations and project work of that semester/year examinations.

- *If any malpractice is detected which is not covered in the above clauses 1 to 10 shall be referred to the Malpractice Committee for further action and to impose suitable punishment.*

Academic Regulations for *B. Tech. with Honours programme*

1. Objectives

The key objectives of offering B. Tech. with Honours programme are:

- To expand the domain knowledge of the students laterally and vertically to cope up with Education 4.0.
- To enhance the employability of undergraduate students as per Industry 4.0 standards.
- To provide an opportunity to students to pursue their higher studies in wider range ofspecializations.

2. Academic Regulations for B. Tech. Honours degree

1) The weekly instruction hours, internal & external evaluation and award of grades are on par with regular 4-Years B. Tech. programme.
2) For B. Tech with Honours programme, a student needs to earn additional 20 credits (over and above the required 160 credits for B. Tech degree). The broad guidelines for the courses of Honours programme, their respective credits weightage and semester-wise break-up of the course are enclosed as Annexure. **All these 20 credits need to be completed in III year I Semester to IV year I Semester only.**
3) After registering for the Honours programme, **if a student is unable to pass all courses in first attempt and earn the required 20 credits, he/she shall not be awarded Honours degree**. However, if the student earns all the required 160 credits of B. Tech., he/she will be awarded only B. Tech degree in the concerned branch.
4) There is no transfer of credits from courses of Honours programme to regular B. Tech. degreecourse & vice versa.
5) These 20 credits are to be earned from the additional courses offered by the host department in the college or from a closely related department in the college as well as from the MOOCS platform.
6) **Guidelines for courses selected under MOOCs platform :**
   a) Prior to registration of MOOCS courses, formal approval of the courses, by the Head of the Department is essential. Head of the Department before the issue of approval considers the parameters like the institute / agency which is offering the course, syllabus, credits, duration of the programme and mode of evaluation etc.
   b) Department wise MOOCs finalized are to be consolidated and needs to be

approved by BOS before commencement of the semester.

c) Minimum credits for a MOOCS course must be equal to or more than the credits specified in the Honours course structure provided by the JBIET.

d) Only Pass-grade/marks or above shall be considered for inclusion of grades in the Honours grade memo.

e) Any expenses incurred for the MOOCS courses are to be met by the students only.

7) The **choice to opt/take the Honours programme is purely on the choice of the students**.

8) The student shall be given a **choice of withdrawing all the courses registered and/or the credits earned for Honours programme at any time**; and in that case the student will be awardedonly B. Tech. degree in the concerned branch on earning the required credits of 160.

9) The students of every branch can choose Honours programme in their respective branches if they are eligible for the Honours program**. A student who chooses an Honours programme is not eligible to choose a Minor programme and vice-versa.**

10) Students can register for the Honours programme only if they fulfill the **eligibility criteria.**

11) A student can graduate with Honours if he/she fulfils the requirements for his/her regular B. Tech. programme as well as fulfils the requirements for Honours programme.

12) The record of students registered and pursuing their Honours programs branch-wise is sent to JNTUH once the enrolment process is complete.

13) The department shall prepare the time-tables for each Honours programme offered at their respective departments without any overlap/clash with other courses of study in therespective semesters.

3. Eligibility conditions of the students for the Honours degree

a) A student can opt for B.Tech. degree with Honours, if she/he passed all subjects in first attempt in all the semesters till the results announced and **maintaining 7.5 or moreCGPA.**

b) **If a student fails in any registered course of either B. Tech. or Honours in any semester of four years programme, he/she will not be eligible for obtaining Honours degree**. He willbe eligible for only B. Tech. degree

c) Prior approval of mentor and Head of the Department for the enrolment into Honours programme, before commencement of III year I Semester (V Semester), is mandatory.

d) If more than 30% of the students in a branch fulfil the eligibility criteria (as stated above), the number of students given eligibility is limited to 30%. The criteria to be followed for choosing 30% candidates in a branch may be the **CGPA secured bythe students till II year I semester.**

e) Successful completion of 20 credits earmarked for honours programme with at least 7.5 CGPA along with successful completion of 160 credits earmarked for

regular B. Tech. Programme with at least 7.5 CGPA and passing all subjects in first attempt gives the eligibility for the award of B. Tech. (Honours) degree.

f) For CGPA calculation of B. Tech. course, the 20 credits of Honours programme will not beconsidered.

4. Registration for the course in Honours programme

a) At the beginning of each semester, just before the commencement of classes, students shall register for the courses which they wish to take in that semester.

b) The students should choose a course from the list against each semester (from Honours course structure) other than the courses they have studied/registered for regular B.Tech programme. No course should be identical to that of the regular B. Tech. course. The students should take the advice of faculty mentors while registering for a course atthe beginning of semester.

c) The maximum No. of courses for the Honours is limited to two in a semester along with regular semester courses.

d) The students need to register the Honours degree by paying an registration fee of Rs. 1000/- per one credit.

e) A fee for late registration will be imposed as per the norms of JNTUH.

-oOo-

Academic Regulations for Honours degree in B. Tech. programs

S. No.	Year / Semester	Course to be chosen from/studied	Mode of Learning	No. of Credits
1	III-I	PE-1	Blended/Conventional	4
2	III-I	PE-2	Blended/Conventional	4
3	III-II	PE-3	Blended/Conventional	4
4	III-II	MOOC Platform (PE-4 or an Inter disciplinary subject)	MOOCS	2
5	IV-I	PE-5	Blended/Conventional	4
6	IV-I	MOOC Platform (PE-6 or an Inter disciplinary subject)	MOOCS	2
	Total Credits			**20**

Note:

- The attendance and evaluation scheme for Honours degree courses will be same as the regular B. Tech. courses.
- If the blended course option is chosen, for the subjects in any semester, the learning should be partially in online mode and partially in offline mode. The Continuous Internal Evaluation (CIE) and Semester End Examination (SEE) shall be carried out by JBIET.

****

Academic Regulations for *B. Tech. with Minors programme*

1. Objectives

The key objectives of offering B. Tech. with Minor programme are:

- To expand the domain knowledge of the students in one of the other branches ofengineering.
- To increase the employability of undergraduate students keeping in view of betteropportunity in interdisciplinary areas of engineering & technology.
- To provide an opportunity to students to pursue their higher studies in the inter-disciplinaryareas in addition to their own branch of study.
- To offer the knowledge in the areas which are identified as emerging technologies/thrustareas of Engineering.

2. Academic Regulations for B. Tech. Minors degree

- The weekly instruction hours, internal & external evaluation and award of grades are on par with regular 4-Years B. Tech. programme.
- For B. Tech with Minors programme, a student needs to earn additional 20 credits (over andabove the required 160 credits for B. Tech degree). The broad guidelines for the courses of Minors programme, their respective credits weightage and semester-wise break-up of thecourse are enclosed as Annexure. **All these 20 credits need to be completed in III year I Semester to IV year I Semester only.**
- After registering for the Minors programme, **if a student is unable to pass all courses in first attempt and earn the required 20 credits, he/she shall not be awarded Minors degree**.However, if the student earns all the required 160 credits of B. Tech., he/she will be awarded only B. Tech degree in the concerned branch.
- There is no transfer of credits from courses of Minors programme to regular B. Tech. degreecourse & vice versa.
- These 20 credits are to be earned from the additional courses offered by the host department in the college or from a closely related department in the college as well as from the MOOCS platform.

3. Guidelines for courses selected under MOOCs platform :

a. Prior to registration of MOOCS courses, formal approval of the courses, by the Head of the Department is essential. Head of the Department before the issue of approval considers the parameters like the institute / agency which is offering the course, syllabus, credits, duration of the programme and mode of evaluation etc.

b. Department wise MOOCs finalized are to be consolidated and needs to be approved by BOS before commencement of the semester.
c. Minimum credits for a MOOCS course must be equal to or more than the credits specified in the Minors course structure provided by the JBIET.
d. Only Pass-grade/marks or above shall be considered for inclusion of grades in the Minors grade memo.
e. Any expenses incurred for the MOOCS courses are to be met by the students only.

4. The **choice to opt/take the Minors programme is purely on the choice of the students**.

5. The student shall be given a **choice of withdrawing all the courses registered and/or the credits earned for Minors programme at any time**; and in that case the student will be awarded only B. Tech. degree in the concerned branch on earning the required credits of 160.
6. The students of every branch can choose Minors programme in different branches if they are eligible for the Minors programme**. A student who chooses an Minors programme is not eligible to choose a Honours program and vice-versa.**
7. Students can register for the Minors programme only if they fulfill the **eligibility criteria.**
8. A student can graduate with Minors if he/she fulfils the requirements for his/her regular B. Tech. programme as well as fulfils the requirements for Minors programme.

9. The record of students registered and pursuing their Minors programs branch-wise is sent to JNTUH once the enrolment process is complete.
10. The department shall prepare the time-tables for each Minors programme offered at their respective departments without any overlap/clash with other courses of study in therespective semesters.

11. Eligibility conditions of the students for the Minors degree

g) A student can opt for B.Tech. degree with Minors, if she/he passed all subjects in first attempt in all the semesters till the results announced and **maintaining 7.5 or moreCGPA.**

h) **If a student fails in any registered course of either B. Tech. or Minors in any semester of four years programme, he/she will not be eligible for obtaining Minors degree**. He willbe eligible for only B. Tech. degree

i) Prior approval of mentor and Head of the Department for the enrolment into Minors programme, before commencement of III year I Semester (V Semester), is mandatory.

j) If more than 30% of the students in a branch fulfil the eligibility criteria (as stated above), the number of students given eligibility is limited to 30%. The criteria to be followed for choosing 30% candidates in a branch may be the **CGPA secured bythe students till II year I semester.**

k) Successful completion of 20 credits earmarked for Minors programme with at least 7.5 CGPA along with successful completion of 160 credits earmarked for regular B. Tech. Programme with at least 7.5 CGPA and passing all subjects in first attempt gives the eligibility for the award of B. Tech. (Minors) degree.

l) For CGPA calculation of B. Tech. course, the 20 credits of Minors programme will not beconsidered.

12. Registration for the course in Minors programme

f) At the beginning of each semester, just before the commencement of classes, students shall register for the courses which they wish to take in that semester.

g) The students should choose a course from the list against each semester (from Minors course structure) other than the courses they have studied/registered for regular B.Tech programme. No course should be identical to that of the regular B. Tech. course. The students should take the advice of faculty mentors while registering for a course atthe beginning of semester.

h) The maximum No. of courses for the Minors is limited to two in a semester along with regular semester courses.

i) The students need to register the Minors degree by paying an registration fee of Rs. 1000/- per one credit.

j) A fee for late registration will be imposed as per the norms of JNTUH.

-oOo-

Academic Regulations for Minors degree in B. Tech. programs

S. No.	Year / Semester	Course to be chosen from/studied	Mode of Learning	No. of Credits
1	III-I	PE-1	Blended/Conventional	4
2	III-I	PE-2	Blended/Conventional	4
3	III-II	PE-3	Blended/Conventional	4
4	III-II	MOOC Platform (PE-4 or an Inter disciplinary subject)	MOOCS	2
5	IV-I	PE-5	Blended/Conventional	4
6	IV-I	MOOC Platform (PE-6 or an Inter disciplinary subject)	MOOCS	2
	Total Credits			**20**

Note:

- The attendance and evaluation scheme for Minors degree courses will be same as the regular B. Tech. courses.

- If the blended course option is chosen, for the subjects in any semester, the learning should be partially in online mode and partially in offline mode. The Continuous Internal Evaluation (CIE) and Semester End Examination (SEE) shall be carried out by JBIET.

****

JBIET-R24	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech – CSE(DS)
	B. Tech Course Structure	

I Year I Semester									
S. No.	Code	Course Title	L	T	P	C	Category	Common Subject (Y / N)	Approving BOS
1.	M110A	Matrices and Calculus	3	1	0	4	BS	Y	Mathematics
2.	M110B	Applied Physics	3	1	0	4	BS	Y	Physics
3.	M112A	Basic Electrical Engineering	3	0	0	3	ES	Y	EEE
4.	M115A	Elements of Computer Science & Engineering	0	0	2	1	ES	N	CSE
5.	M115B	Programming for Problem Solving	3	0	0	3	ES	Y	CSE
6.	M1101	Physics Laboratory	0	0	2	1	BS	Y	Physics
7.	M1121	Basic Electrical Engineering Lab	0	0	2	1	ES	Y	EEE
8.	M1151	Programming for Problem Solving Lab	0	0	2	1	ES	Y	CSE
9.	M1131	Engineering Workshop and Digital Fabrication Practices	1	0	3	2.5	ES	Y	MECH
10.	M11AC1	Cambridge Lingua Skills	2	0	0	0	AC	Y	English
		Total	15	2	11	20.5			

I Year II Semester									
S. No.	Code	Course Title	L	T	P	C	Category	Common Subject (Y / N)	Approving BOS
1.	M120A	Differential Equations and Vector Calculus	3	1	0	4	BS	Y	Mathematics
2.	M120D	Engineering Chemistry	3	1	0	4	BS	Y	Chemistry
3.	M120C	English For Skill Enhancement	3	0	0	3	HS	Y	English
4.	M125B	Python Programming	3	0	0	3	PC	Y	CSE
5.	M12A51	Python Programming Lab	0	0	2	1	PC	Y	CSE
6.	M1232	Computer Aided Engineering Graphics	1	0	3	2.5	ES	Y	MECH
7.	M1203	English Language and Communication Skills Lab	0	0	2	1	HS	Y	English
8.	M1202	Chemistry Laboratory	0	0	2	1	BS	Y	Chemistry
9.	M12AC2	Human Values and Professional Ethics	2	0	0	0	AC	Y	MBA
		Total	15	2	9	19.5			

B. Tech Course Structure

II Year I Semester

S. No.	Code	Course Title	L	T	P	Credits	Category	Common Subject (Y / N)	Approving BOS
1.	M210A	Probability and Statistics	3	1	0	4	BS	Y	Mathematics
2.	M21DA	Data Structures using C	3	0	0	3	PC	Y	CSE
3.	M216D	Database Systems	3	0	0	3	PC	Y	IT
4.	M316C	Software Engineering	3	0	0	3	PC	Y	IT
5.	M21DA	Java Programming	2	0	0	2	PC	N	AI&DS
6.	M21DD	Introduction to Artificial Intelligence	2	0	0	2	PC	Y	AI&DS
7.	M1252	Data Structures using C Lab	0	0	2	1	PC	Y	CSE
8.	M2162	Database Systems Lab	0	0	2	1	PC	N	IT
9.	M21D2	Java Programming Lab	0	0	2	1	PC	Y	AI&DS
10.	M21D3	Internship-1	0	0	2	1	PW	Y	AI&DS
		Total	16	1	8	21			

II Year II Semester

S. No.	Code	Course Title	L	T	P/D	Credits	Category	Common Subject (Y / N)	Approving BOS
1.	M220C	Essential Mathematics for Machine Learning and Data Science	3	0	0	3	ES	Y	Mathematics
2.	M225F	Operating Systems	3	0	0	3	PC	Y	CSE
3.	M22DA	Machine Learning for Data Science	3	0	0	3	PC	Y	AI&ML
4.	M225E	Computer Networks	3	0	0	3	PC	Y	CSE
5.	M22DB	Data Visualization using R	2	0	0	2	PC	Y	AI&DS
6.	M2252	Operating Systems Lab	0	0	3	1.5	ES	Y	CSE
7.	M22D1	Machine Learning Lab	0	0	2	1	HS	Y Y	AI&ML
8.	M22D2	Data Visualization using R Lab	0	0	3	1.5	BS	Y	AI&DS
9.	M22D3	Skill Development using POWER-BI	0	0	2	1	PC	Y	AI&DS
10.	M22MC1	Environmental Science	2	0	0	0	MC	Y	Chemistry
		Total	16	0	10	19			

III Year I Semester									
S. No.	Code	Course Title	L	T	P	Credits	Category	Common Subject (Y / N)	Approving BOS
1.	M31EA	Business Economics and Financial Analysis	3	1	0	4	HS	Y	MBA
2.	M315C	Design and Analysis of Algorithms	3	0	0	3	PC		AI&DS
3.	M31DB	Big Data Analytics	3	1	0	4	PC		
4.	M315D	Computer Organization Architecture	3	0	0	3	PE	Y	AI&DS
5.	M31OG	Introduction to Natural language Processing	3	0	0	3	OE	Y	ECM
6.	M3153	Design and Analysis of Algorithms Lab	0	0	2	1	PC	Y	AI&DS
7.	M31D2	Big Data Analytics Lab	0	0	2	1	PC	Y	AI&DS
8.	M3101	Life Skills and Professional Skills Lab	0	0	3	2	HS	Y	ENGLISH
9.	M31MC2	Gender Sensitization	2	0	0	0	MC	Y	English
10.	M31AC3	Indian Constitution	2	0	0	0	AC	Y	MBA
11.	M31D4	Internship-II	3	0	0	1	PW	Y	AISDS
Total			19	2	7	22			

III Year II Semester									
S. No.	Code	Course Title	L	T	P/D	Credits	Category	Common Subject (Y / N)	Approving BOS
1.	M32AA	Deep learning	3	0	0	3	PC	N	AI&DS
2.	M325H	Automata Theory and Compiler Design	3	0	0	3	PC	N	AI&DS
3.	BTAIDE2	PE-2	3	0	0	3	PE		
4.	BTAIDE3	PE-3	4	0	0	3	PE	Y	AI&ML
5.	BTAIDO2	OE-2	3	0	0	3	OE	Y	CSE
6.	M32A1	Deep learning Lab	0	0	2	1	PC	Y	AI&ML
7.	M3256	Compiler Design Lab	0	0	2	1	PC	Y Y	CSE
8.	BTAID	PE-3 Lab	0	0	2	1	PE	Y	AI&DS
9.	M32MC4	Cyber Security	3	0	0	0	AC	Y	AI&DS
10.	M32AC4	Foundations of Entrepreneurship	3	0	0	0	MC	Y	MBA
Total			22	0	6	18			

Professional Elective-I									
S. No	**Code**	**Course Title**	**L**	**T**	**P**	**Credits**	**Category**	**Common Subject (Y / N)**	**Approving BOS**
1.	M315D	Computer Organisation & Architecture	3	0	0	3	PE	Y	IT
2.	M314F	Digital Image Processing	3	0	0	3	PE	Y	CSE
3.	M31DC	Natural Language Processing	3	0	0	3	PE	Y	AI&DS

Professional Elective-II									
S. No	**Code**	**Course Title**	**L**	**T**	**P**	**Credits**	**Category**	**Common Subject (Y / N)**	**Approving BOS**
1.	M325K	Data Warehousing And Data Mining	3	0	0	3	PE	Y	AI&DS
2.	M326C	Software Project Management	3	0	0	3	PE	Y	IT
3.	M32DA	Pattern Recognition	3	0	0	3	PE	Y	AI&DS

Professional Elective-III									
S. No	**Code**	**Course Title**	**L**	**T**	**P**	**Credits**	**Category**	**Common Subject (Y / N)**	**Approving BOS**
1.	M326F	Object Oriented Analysis Design	3	0	0	3	PE	Y	CSE
2.	M325G	Cloud Computing	3	0	0	3	PE	Y	CSE
3.	M32DB	Mobile Application Development	3	0	0	3	PE	Y	AI & DS

Open Elective - I									
S. No	**Code**	**Course Title**	**L**	**T**	**P**	**Credits**	**Category**	**Common Subject (Y / N)**	**Approving BOS**
1.	M31DOJ	Introduction to Data Science	3	0	0	3	OE	Y	AI&DS
2.	M31DOK	Data Science for Health Care	3	0	0	3	OE	Y	CSE (DS)

Open Elective - II									
S. No	**Code**	**Course Title**	**L**	**T**	**P**	**Credits**	**Category**	**Common Subject (Y / N)**	**Approving BOS**
1.	M32DOJ	Fundamentals of Cloud Computing	3	0	0	0	OE	Y	AI&DS
2.	M32DOK	Basics of R Programming	3	0	0	0	OE	Y	CSE(DS)

AY: 2024-25 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech CSE(DS) I-Year-I Sem			
Course Code: **M110A**	**MATRICES AND CALCULUS** (COMMON TO: CE, EEE, ME, ECE, CSE, IT, ECM, CSE(DS), CSE(AIML), AIML, AIDS & MIE)	L	T	P	C
		3	**1**	**0**	**4**

Pre-Requisites: Mathematical Knowledge at pre-university level

Module 1: Matrices and system of equations [10L]

Types of Matrices, Symmetric, Skew-symmetric, rank of a matrix by Echelon form and Normal form, Gauss elimination, Inverse of non-singular matrices by Gauss-Jordan method. System of linear equations, solving system of Homogeneous and Non-Homogeneous equations.

Module 2: Eigen values, Eigen Vectors [8 L]

Eigen values, Eigen vectors and their properties, Diagonalization of matrix. Calculation of powers of Matrix, Cayley - Hamilton theorem (without proof), Inverse and powers of a matrix using Cayley - Hamilton theorem.

Module 3: Quadratic Forms [8 L]

Definitions of Hermitian, Skew-Hermitian, orthogonal matrices, Unitary Matrices, Linear Transformation and Orthogonal Transformation, Quadratic forms, rank and nature of the quadratic forms, index and signature, reduction of quadratic forms into canonical form using Linear Transformation and Orthogonal Transformations.

Module 4: Mean value theorems and Functions of Multi variables [12 L]

Mean value theorems: Rolle's theorem, Lagrange's Mean value theorem with their Geometrical Interpretation and applications, Cauchy's Mean value Theorem. Taylor's Series

Functions of Multi variables: Limits, Continuity, Partial differentiation, partial derivatives of first and second order, Jacobian, Taylor's theorem of two variables (without proof). Maxima and Minima of two variables, Lagrange's method of undetermined Multipliers.

Module 5: Improper and Multiple Integrals [12L]

Definition of Improper Integrals, Beta functions: Properties and other forms of beta functions (statements only) and problems, Gamma functions: Properties of Gamma functions (statements only), Relation between the Beta and Gamma functions (without proofs) and Evaluation of improper integrals using Beta and Gamma functions Evaluation of double integrals, change of order of integration, change of variables, evaluation of triple integrals, change of variables.

Text Books

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 2015
2. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons,2006.
3. R.K.Jain & S.R.K. Iyengar, Advanced Engineering Mathematics, Narosa Publications, 5th Edition, 2019.

Reference Books

1. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.
2. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi,11thReprint, 2010.

E-Resources

https://nptel.ac.in/courses/111/108/111108098/
https://en.wikipedia.org/wiki/Eigenvalues_and_eigenvectors
https://nptel.ac.in/courses/111/107/111107108/
https://www.cheric.org/files/education/cyberlecture/e200303/e200303-301.pdf
https://www.whitman.edu/mathematics/calculus_online/chapter16.html

Course Objectives:

To learn
- Types of matrices and their properties.
- Concept of a rank of the matrix and applying this concept to know the consistency and solving the system of linear equations.
- Concept of eigenvalues and eigenvectors and to reduce the quadratic form to canonical form Geometrical approach to the mean value theorems and their application to the mathematical problems
- Evaluation of surface areas and volumes of revolutions of curves.
- Evaluation of improper integrals using Beta and Gamma functions.
- Partial differentiation, concept of total derivative
- Finding maxima and minima of function of two and three variables.
- Evaluation of multiple integrals and their applications

Course outcomes:

After learning the contents of this paper, the student must be able to
- Write the matrix representation of a set of linear equations and to analyse the solution of the system of equations
- Find the Eigenvalues and Eigen vectors
- Reduce the quadratic form to canonical form using orthogonal transformations.
- Solve the applications on the mean value theorems.
- Evaluate the improper integrals using Beta and Gamma functions
- Find the extreme values of functions of two variables with/ without constraints

CO-PO/PSO Mapping

Course Outcomes	Program Outcomes (POs)/Program Specific Outcomes (PSOs)													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO4	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Average	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Correlation: 3–Strong; 2–Medium; 1-Weak

AY: 2024-25 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech CSE(DS) I-Year-I Sem			
Course Code: **M110B**	**APPLIED PHYSICS** (COMMON TO: CE, EEE, ME, ECE, CSE, IT, ECM, CSE(AIML), CSE(DS), AIDS, AIML, CSC)	L	T	P	C
		3	**1**	**0**	**4**

Pre-Requisites: 10+2 Physics

Course Objectives:

The students should be able to

1. Study the characteristics of lasers and optical fibres.
2. Understand the basic principles of quantum mechanics and band theory of solids.
3. Understand the underlying mechanism involved in construction and working principles of various semiconductor devices.
4. Study the fundamental concepts related to the dielectric, magnetic and energy materials.
5. Identify the importance of nanoscale, quantum confinement and various fabrications techniques.

Unit-1: LASERs and Optical fibers [10L]

Module I: LASERs [5L]

Introduction, Properties of laser beam- Monochromaticity, coherence, directionality and brightness; Einstein co-efficients, Population inversion, Types of Lasers: Ruby laser, He-Ne laser, Semiconductor laser, Applications of lasers.

Module II: Optical fibers [5L]

Introduction, Principle and construction of an optical fiber, Total Internal reflection, Acceptance angle, Numerical aperture, Types of optical fibers (Single mode, multimode, step index, graded index), losses in optical fibers, Optical fiber communication system with block diagram and Applications of optical fibres.

Unit-2: Fundamentals of Quantum Mechanics and Band theory of solids [10L]

Module I: Fundamentals of Quantum Mechanics [6L]

Introduction to quantum physics, Black body radiation, Planck's radiation law, Photoelectric effect, de-Broglie hypothesis, Davisson and Germer's experiment, Concept of wave function, Heisenberg uncertainty principle, Time independent Schrödinger wave equation, Particle in one dimensional infinite potential well.

Module II: Band theory of solids: [4L]

Free electron theory (Drude & Lorentz, Sommerfeld) (Qualitative), Bloch's theorem, Kronig-Penney model (Qualitative), E-K diagram, Effective mass of electron, Origin of energy bands- classification of solids.

Unit-3: Semiconductor Physics and Devices [9L]

Module I: Semiconductor Physics [5L]

Density of states, Intrinsic semiconductor, Intrinsic carrier concentration, Extrinsic semiconductors (Qualitative), Fermi level and its temperature dependence, Hall effect-Hall coefficient, Applications of Hall effect.

Module II: Semiconductor Devices [4L]

Direct and indirect bandgap semiconductor, Formation of PN junction, Working of PN junction diode in forward and reverse bias, V-I Characteristics, Zener diode, LED, Photo diode and Solar cell, their structure, working principle and characteristics.

Unit-4: Dielectric, Energy and Magnetic materials [10L]

Module I: Dielectric and Energy materials [5L]

Introduction, Types of polarizations-electronic, ionic and orientation polarizations; Internal field and Clausius-Mossotti, Piezoelectricity, Pyroelectricity and Ferroelectricity and their applications. Energy materials-Materials and electrolytes for super capacitors-Rechargeable ion batteries-Lithium ion and sodium ion batteries, solid fuel cells.

Module II: Magnetic materials [5L]

Introduction, Origin of magnetic moment, Bohr magneton, Classification of dia, para and ferro magnetic materials on the basis of magnetic moment, Hysteresis curve based on domain theory, Soft and hard magnetic materials, Properties of antiferro and ferri magnetic materials.

Unit-5: Nanoscience and Characterization techniques [9L]

Module I: Nanoscience [5L]

Introduction of nanomaterials, Surface area to Volume ratio, Quantum confinement, Top-down fabrication: Ball milling and Chemical Vapor Deposition (CVD) methods, Bottom-up fabrication: Sol-Gel and Combustion methods.

Module II: Characterization techniques [4L]

X- Ray Diffraction (XRD), Scanning Electron Microscope (SEM), Transmission Electron Microscope (TEM), Scanning Tunnelling Microscope (STM), Applications of nanomaterials.

Text Books

1. M.N. Avadhanulu and P.G. Kshirsagar, TVS Aruna Murthy "A Text Book Engineering Physics", S. Chand, 2019.
2. P. K. Palanisamy, "Engineering Physics", Scitech Publications.
3. Essentials of Nanoscience & Nanotechnology by Narasimha Reddy Katta, Typical Creatives NANO DIGEST, 1st Edition, 2021.
4. Wahab M A, 'Solid state physics-Structure and properties of materials' Narosa publication.
5. R.L.Singhal, " Solid state physics", KNRN publication.
6. Elementary Solid State Physics , S.L. Gupta and V. Kumar, pragati prakashan, 2019.
7. A.K. Bhandhopadhya-Nano materials, New age international, 1 st edition, 2007.

Reference Books

3. P. Bhattacharya, "Semiconductor Optoelectronic Devices", Prentice Hall of India (1997).
4. S.O. Pillai, "Solid State Physics", New Age International Publishers
5. J. Singh, "Semiconductor Optoelectronics", Physics and Technology, McGraw-Hill Inc. (1995).
6. Introduction to Solid State Physics, Charles Kittel, Wiley Eastern, 2019.

E-Resources

1. http://nptel.ac.in/courses/113104012/
2. http://www.springer.com/physics/journal/340 .
3. https://www.researchgate.net/publication/259574083 Lecture Notes on Engineering Physics
4. https://www.researchgate.net/publication/292607115_Applied Physics.

Course Outcomes

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

CO1. Describe the working of various types of lasers and explain the fundamentals of fiber optics.
CO2. Apply Schrodinger time independent wave equation to show energy of a particle in 1D potential box is quantized.
CO3. Explain the working of p-n junction diode in forward bias and reverse bias.
CO4. Classify the magnetic materials into hard and soft magnetic materials based on hysteresis loop area.
CO5. Prepare nanomaterials for applications in various fields of engineering.

CO-PO/PSO Mapping

Course Outcomes	Program Outcomes(POs)/Program Specific Outcomes(PSOs)													
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO1**	**PSO2**
CO1	2	2	1	-	-	-	-	-	-	-	-	-	1	-
CO2	3	1	2	-	-	-	-	-	-	-	-	-	1	-
CO3	2	1	2	-	-	-	-	-	-	-	-	-	1	-
CO4	2	2	1	-	-	-	-	-	-	-	-	-	1	-
CO5	2	2	1	-	-	-	-	-	-	-	-	-	2	-
Average	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**		**-**

Correlation: 3–Strong; 2–Medium; 1-Weak

AY: 2024-25 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech CSE(DS) I-Year-I Sem I Year-I Sem			
Course Code:**M112A**	**BASIC ELECTRICAL ENGINEERING (Common to AIML, CSM, AIDS, CSD, CSE(CS), CE & ME)**	L	T	P	C
		3	**0**	**0**	**3**

Pre-Requisites: Mathematics and Physics

COURSE OBJECTIVES

The students will

COB1:	Apply Kirchhoff's laws to analyse complex DC circuits, demonstrating comprehension and application skills in electrical engineering.
COB2:	Analyse the behaviour of AC circuits, showcasing evaluation skills in understanding electrical phenomena, including resonance.
COB3:	Explain the principles of transformer operation and analyse their behaviour, applying concepts of electromagnetic induction.
COB4:	Select and operate suitable DC motors and three-phase induction motors for various industrial applications, synthesizing motor principles effectively.
COB5:	Demonstrate proficiency in basic electrical installations and the use of fundamental measurement instruments for practical electrical applications, ensuring strict adherence to safety protocols and standards.

UNIT 1: DC CIRCUITS AND CIRCUIT ELEMENTS [10 L]

MODULE -I: D.C CIRCUIT CONCEPTS AND CIRCUIT ELEMENTS

Voltage – current – power and energy – active and passive elements – voltage and current sources – source conversions – open circuit – short circuit – statement of Ohm's law - Kirchhoff's Laws – loop current method – node voltage method of solving the electrical network – resistance – laws of resistance – temperature coefficient of resistance – resistors in series and parallel – uses of resistor.

MODULE -II: ENERGY STORING ELEMENTS

Inductor – inductance – V-I relation – power – energy stored in inductor – inductors in series and parallel – uses of Inductors – capacitor – capacitance – V-I relation – power – energy stored in capacitor – capacitor in series and parallel – uses of capacitor.

UNIT 2: AC CIRCUITS [10 L]

MODULE -I: SINGLE PHASE AC CIRCUITS

Alternating quantity – cycle – time period – frequency – Amplitude – RMS – average value – form and peak factors – phase and phase difference – AC through R, L, C, RL, RC and RLC series circuits – resonance in series RLC circuit.

MODULE -II: THREE PHASE AC CIRCUITS

Phase sequence – three phase connections – relationship between line and phase value of voltage and current in star and delta connections – power in three phase circuit.

UNIT 3: STATIC ELECTRIC MACHINE [8 L]

MODULE -I: FUNDAMENTALS OF SINGLE-PHASE TRANSFORMER

Single phase transformer – Principle – constructional details – parts – types (core and shell type) – equivalent circuit - EMF equation.

MODULE -II: TRANSFORMER PERFORMANCE AND APPLICATIONS

Losses – efficiency – regulation – applications.

UNIT 4: DC AND AC MACHINES [8 L]

MODULE -I: DC MOTOR

D.C Motor – principle – constructional details – DC series – DC shunt motor – torque current and speed current characteristics – applications.

MODULE -II: THREE-PHASE INDUCTION MOTOR

Three-phase induction motor – principle – construction – generation of rotating magnetic field – torque slip characteristics.

UNIT 5: ELECTRICAL INSTALLATIONS AND MEASURING INSTRUMENTS [9 L]

MODULE -I: ELECTRICAL INSTALLATIONS: Components of LT switchgear: Switch fuse unit (SFU) – MCB – MCCB – earthing.

MODULE -II: MEASURING INSTRUMENTS: Construction – working principle of PMMC and MI type instruments – advantages – disadvantages – applications.

TEXT BOOKS

T1:	D.P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill, 4th Edition, 2019.
T2:	V.K. Mehta and Rohit Mehta, "Principles of Electrical Engineering and Electronics", S. Chand & Company Ltd, 2012.
T3:	L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press, 2011.
T4:	A.K.Sawhney, "A course in Electrical and Electronics Measurements and Instrumentation", Dhanapath Rai and Sons., 10th Edition, 2007.

REFERENCE BOOKS

R1:	Dr. Ramana Pilla, Dr. M. Suryakalavathi, "Basic Electrical Engineering", S. Chand & Company Ltd, 2018.
R2:	V. D. Toro, "Electrical Engineering Fundamentals", Prentice Hall India, 1989.

E-RESOURCES

E1:	https://onlinecourses.swayam2.ac.in/nou21_ee02/preview
E2:	https://nptel.ac.in/courses/108/108/108108076/
E3:	https://www.electrical4u.com

COURSE OUTCOMES

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

CO1:	Analyse and solve complex DC circuits using Kirchhoff's laws.
CO2:	Calculate and analyse the behaviour of single-phase and three-phase AC circuits, including resonance phenomena.
CO3:	Understand the principles of operation and applications of transformers in electrical systems.
CO4:	Expertise in the principles and applications of DC motors and three-phase induction motors, enabling them to select and operate suitable machines for various industrial purposes.
CO5:	Develop foundational skills in basic electrical installations and using fundamental measurement instruments for practical electrical applications.

CO - PO & PSO MAPPING

CO/PO & PSO	POs												PSOs	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	3	3	2	1	1	1	-	-	-	-	1	2	1
CO2	3	3	3	2	1	1	1	-	-	-	-	1	2	1
CO3	3	3	3	2	1	1	1	-	-	-	-	1	2	1
CO4	3	3	3	2	1	1	1	-	-	-	-	1	2	1
CO5	3	3	3	2	1	1	1	-	-	-	-	1	2	1

AY: 2024-25 Onwards	J.B.INSTITUTEOFENGINEERINGANDTECHNOLOGY (UGC Autonomous)	B. Tech CSE(DS) I-Year-I Sem			
Course Code:**M115A**	**Elements of Computer Science and Engineering (Common to all CSE allied departments)**	L	T	P	C
		2	**0**	**0**	**1**

Course Objectives:
The students should be able to provide an overview of the subjects of computer science and engineering

Module 1:
Basics of a Computer – Hardware, Software, Generations of computers. Hardware - functional units, Components of CPU, Memory – hierarchy, types of memory, disks, primary and secondary memory, processor, operating system, compilers, compiling and executing a program etc., Number systems. Input and output devices.
Software –systems software, application software, packages, frameworks, IDEs.

.

Module 2:
Software development – waterfall model, Agile, Types of computer languages – Programming, markup, scripting Program Development – steps in program development, flowcharts, algorithms, data structures – definition, types of data structures

Module 3:
Operating systems: Functions of operating systems, types of operating systems, Device & Resource Management
Database Management Systems: Data models, RDBMS, SQL, Database Transactions, data centers, cloud services

Module 4:
Computer Networks: Advantages of computer networks, LAN, WAN, MAN, internet, WiFi, sensor networks, vehicular networks, 5G communication.
World Wide Web – Basics, role of HTML, CSS, XML, Tools for web designing, Social media, Online
social networks.
Security – information security, cyber security, cyber laws

Module 5: Autonomous Systems: IoT, Robotics, Drones, Artificial Intelligence – Learning, Game Development,
natural language processing, image and video processing.
Cloud Basics

Textbooks

1. Invitation to Computer Science, G. Michael Schneider, Macalester College, Judith L. Gersting University of Hawaii, Hilo, Contributing author: Keith Miller University of Illinois, Springfield.
2. Elements of computer science, Cengage

Reference Books

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

Course Outcomes

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

CO1. Know the working principles of functional units of a basic Computer

CO2 . Understand program development, the use of data structures and algorithms in problem solving.

CO3 Know the need and types of operating system, database systems.

CO4. Understand the significance of networks, internet, WWW and cyber security.

CO5 Understand Autonomous systems, the application of artificial intelligence

AY: 2024-25 Onwards	J.B.INSTITUTEOFENGINEERINGANDTECHNOLOGY (UGC Autonomous)	B. Tech CSE(DS) I-Year-I Sem			
Course Code: **M115B**	**PROGRAMMING FOR PROBLEM SOLVING** (Common to all)	L	T	P	C
		3	**0**	**0**	**3**

Pre-Requisites:

1. Mathematical Knowledge.
2 Analytical Skills.

Course objectives:

The Student will:

1. Learn the fundamentals of computers.
2. Understand the various steps in program development.
3. Understand the syntax and semantics of C programming language.
4. Learn the usage of structured programming approach in solving problems.
5. Gain the knowledge on searching and sorting methods.

Module 1:

Introduction to Algorithms: steps to solve logical and numerical problems. Representation of Algorithm, Flowchart/Pseudo code with examples, Program design and structured programming. **Introduction to C Programming Language**: Basic concepts of a C program, Declaration, Assignment & Print statement, Types of operators and expressions, Programming examples and exercise. variables (with data types and space requirements),

Syntax and Logical Errors in compilation, object and executable code, Operators, expressions and precedence, Expression evaluation, Storage classes (auto, extern, static and register), type conversion, The main method and command line arguments

Bitwise operations: Bitwise AND, OR, XOR and NOT operators Conditional Branching and Loops: Writing and evaluation of conditionals and consequent branching with if, if-else, switchcase, ternary operator, goto, Iteration with for, while, do- while loops.I/O: Simple input and output with scanf and printf, formatted I/O, Introduction to stdin, stdout and stderr.

.

Module 2:

ARRAYS, STRINGS, STRUCTURES AND PREPROCESSOR:

Arrays: one and two dimensional arrays, creating, accessing and manipulating elements of arrays. **Strings**: Introduction to strings, handling strings as array of characters, basic string functions available in C (strlen, strcat, strcpy, strstr etc.), arrays of strings Structures: Defining structures, initializing structures, unions, Array of structures. **Preprocessor**: Commonly used Preprocessor commands like include, define, undef, If, ifdef, ifndef.

Module 3:

POINTERS AND FILE HANDLING IN C:

Pointers: Idea of pointers, defining pointers, Pointers to Arrays and Structures, Use of Pointers in self-referential structures, usage of self-referential structures in linked list (no implementation) Enumeration data type. Array of pointers,

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

Module 4:
FUNCTION AND DYNAMIC MEMORY ALLOCATION:
Functions: Designing structured programs, declaring a function, Signature of a function, Parameters and return type of a function, passing parameters to functions, call by value, passing arrays to functions, passing pointers to functions, idea of call by reference, Some C standard functions and libraries.
Recursion: Simple programs, such as Finding Factorial, Fibonacci series etc., Limitations of Recursive functions.
Dynamic memory allocation: Allocating and freeing memory, Allocating memory for arrays of different data types.
Dynamic allocations methods- malloc(), calloc(), realloc(),free(),

Module 5:
INTRODUCTION TO ALGORITHMS:
Basic searching algorithms (linear and binary search techniques), Basic sorting algorithms (Bubble, Insertion, Quick, Merge and Selection sort algorithms) Basic concept of order of complexity through the example programs

Textbooks

1. Ream Thareja, Programming in C, Oxford university press.
2. B.A. Forouzan and R.F. Gilberg, C Programming and Data Structures, Cengage Learning, (3rdEdition).

Reference Books

3. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India.
4. R.G. Dromey, How to solve it by Computer, Pearson (16thImpression)
5. Stephen G. Kochan, Programming in C, Fourth Edition, PearsonEducation.
6. 4. Herbert Schildt, C: The Complete Reference, McGraw Hill, 4thEdition
7. 5. Byron Gottfried, Schaum"sOutline of Programming with C,McGraw-Hil

E - Resources:

1. https://fresh2refresh.com/c-programming/
2. https://www.studytonight.com/c/
3. https://beginnersbook.com/2014/01/c-tutorial-for-beginners-with examples/
4. https://www.programiz.com/c-programming
5. http://www.gtucampus.com/uploads/studymaterials/Degree%20EngineeringSandipFundaments_of_C.pdf
6. http://cs.indstate.edu/~cbasavaraj/cs559/the_c_programming_language_2.pdf

Course Outcomes

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

CO1. Design the algorithms/flowcharts of C-programs

CO2 . Write the Code and test a given logic in C programming language

CO3 Decompose a problem into functions and to develop modular reusable code.

CO4. Make Use of arrays, pointers, strings and structures to write C Programs.

CO5 Apply searching and sorting algorithms

Pre-Requisites: 10+2 Physics basic concepts.

List of Experiments:

1:Energy gap of P-N junction diode

To determine the energy gap of a semiconductor diode.

2. Solar Cell:

To study the V-I Characteristics of solar cell.

3. Light emitting diode and Laser Diode:

Plot V-I characteristics of light emitting diode and Laser diode.

4. Optical fiber:

Determination of Numerical Aperture of an optical fibre.

5. Hall effect:

To determine Hall co-efficient of a given semiconductor.

6. Photoelectric effect

To determine work function of a given material.

7. Dielectric Constant

To determine the Dielectric constant of the given material.

8. LCR Circuit

To determine the Quality factor of LCR Circuit (Series & Parallel).

9. R-C Circuit

To determine the time constant of R-C circuit (Growth and Decay).

10. Melde's Experiment

To determine the frequency of a vibrating bar or turning fork using Melde's arrangement.

11. Torsional Pendulum

To determine the rigidity modulus of the material of the given wire using torsional pendulum.

12. Sonometer

To determine the frequency of AC Supply sonometer.

Note: Any 10 experiments are to be performed.

Text Books

1. Dr. Narendra, L. Mathakari,"Experiments in Applied Physics" (Physics Lab Manual 4th edition) ,
2. " Engineering Physics Lab Resources" By Department of Physics JBIET.

Course Outcomes

At the end of the course, students will be able to

1. Learn the experimental concepts on in LED, Electric and Electronics materials.
2. Get the knowledge of fundamentals of Semiconductor physics.
3. Design, characterization and study of properties of material help the students to prepare new materials for various engineering applications.
4. Be exposed to the phenomena of waves, oscillations and optics.
5. Lasers and fiber optics enable the students to apply to various systems like communications, solar cell, photo cells and so on.

AY: 2024-25 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech CSE(DS) I-Year-I Sem			
Course Code: **M1121**	**BASIC ELECTRICAL ENGINEERING LAB (Common to AIML, CSM, AIDS, CSD, CSE(CS), CE & ME)**	L	T	P	C
		0	**0**	**2**	**1**

Pre-Requisites: Mathematics and Physics

COURSE OBJECTIVES

The students will

COB1:	Proficiently apply fundamental electrical principles, including Ohm's Law and circuit analysis techniques, to determine the values of unknown resistances.
COB2:	Demonstrate mastery in validating circuit behaviours through the application of Kirchhoff's Voltage Law and Kirchhoff's Current Law.
COB3:	Showcase understanding of time-dependent behaviour in electrical components by investigating the transient responses of series RL and RC circuits to DC excitation.
COB4:	Explore resonance phenomena in series RLC circuits, identifying the frequency at which impedance is minimized and current is maximized, thus exhibiting proficiency in frequency-domain analysis.
COB5:	Equip students to evaluate the performance characteristics of DC shunt motors and single-phase transformers, enabling them to assess their suitability for specific applications in electrical systems.

List of Experiments

1. Verification of Ohms Law.
2. Determination of unknown resistance.
3. Verification of KVL and KCL.
4. Transient response of series RL and RC circuits using DC excitation.
5. Transient response of RLC series circuit using DC excitation.
6. Resonance in series RLC circuit.
7. Calculations and verification of impedance and current of RL, RC and RLC series circuits.
8. Measurement of voltage, current and real power in primary and secondary circuits of a single phase transformer.
9. Performance Characteristics of a DC Shunt Motor.
10. Load test on single phase transformer (Calculate Efficiency and Regulation).

COURSE OUTCOMES

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

CO1:	Apply Ohm's Law and circuit analysis techniques to determine the value of unknown resistances, showcasing proficiency in fundamental electrical principles.
CO2:	Validate principles of circuit behaviour using Kirchhoff's Voltage Law and Kirchhoff's Current Law.
CO3:	Investigate the transient responses of series RL and RC circuits to DC excitation, demonstrating an understanding of time-dependent behaviour in electrical components.
CO4:	Explore resonance phenomena in series RLC circuits, identifying the frequency at which impedance is minimized and current is maximized, showcasing proficiency in frequency-domain analysis.
CO5:	Evaluate the performance characteristics of DC shunt motors and single-phase transformers, to assess their suitability for specific applications in electrical systems.

CO - PO & PSO MAPPING

CO/PO & PSO	POs												PSOs	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	3	3	2	1	1	1	1	1	-	-	1	2	1
CO2	3	3	3	2	1	1	1	1	1	-	-	1	2	1
CO3	3	3	3	2	1	1	1	1	1	-	-	1	2	1
CO4	3	3	3	2	1	1	1	1	1	-	-	1	2	1
CO5	3	3	3	2	1	1	1	1	1	-	-	1	2	1

AY: 2024-25 Onwards	J.B.INSTITUTEOFENGINEERINGANDTECHNOLOGY (UGC Autonomous)	B. Tech CSE(DS) I-Year-I Sem			
Course Code: **M1151**	**PROGRAMMING FOR PROBLEM SOLVING LAB** (Common to all)	L	T	P	C
		0	**0**	**2**	**1**

Pre-Requisites:

1. Mathematical Knowledge.
2 Analytical Skills.

Course objectives:

The Student will:

1. Work with an IDE to create, edit, compile, run and debug programs
2. Analyse the various steps in program development.
3. Develop programs to solve basic problems by understanding basic concepts in C like operators, control statements etc.
4. Develop modular, reusable, and readable C Programs using the concepts like functions, arrays etc.
5. Write programs using the Dynamic Memory Allocation concept, files

Lab Experiments:

1. a) Write a program to find the max and min from the three numbers.
b) Write a program to read marks from keyboard and your program should display equivalent grade according to following table (if else ladder)
Marks Grade
100 – 80 Distinction
79 – 60 First Class
59 – 40 Second Class
< 40 Fail
2. Write a C program, which takes two integer operands and one operator from the user, performs the operation, and then prints the result. (Consider the operators +,-,*, /, % and use Switch Statement)
3. Write a program that finds if a given number is a prime number
4. Write a C program to generate the first n terms of the sequence
5. Write a C program to find the minimum, maximum and average in an array of integers.
6. Write a C program to find Addition and Multiplication of Two Matrices
7. Write a C program to count the number of times a character occurs in a text file. The file name and the character are supplied as command line arguments.
8. Write a C program to determine if the given string is a palindrome or not (Spelled same in both directions with or without a meaning like madam, civic, noon, abcba, etc.)
9. a) Write a C program to implement binary search algorithm.
b) Write a C program to implement linear search algorithm.
10. a) Write a C program that implements the Bubble sort method.
b) Write a C program that implements the Insertion sort method.
11. Write a C program that implements the Quick sort method.

12. Write a C program that implements the Merge sort method.
13. Recursion: factorial, Fibonacci, GCD.

Case Studies:

1. Implement Hotel Management system in C with the following requirements.
Requirements:
-Provide the information on reserving rooms, book an event, check the features
- Give the login for both admin and user for proper login validation
-Add/View/Edit/Delete user records
-Calculate the bill after checkout of customers
2. Implement Library management system in C with the following requirements.
Requirements:
-To add Book Information
- Display Book Information
-List all the books of the given author
-List the title of the specified Book
-List the count of books in the library

Course Outcomes

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

CO1 Formulate the algorithms for simple problems
CO2 Examine syntax errors as reported by the compilers
CO3 Define and manipulate data with arrays, strings, and structures
CO4 Make use of pointers with different function types
CO5 Create, read, and write to and from simple text and binary files

AY: 2024-25 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech CSE(DS) I-Year-I Sem			
Course Code:**M1131**	**ENGINEERING WORKSHOP AND DIGITAL FABRICATION** (COMMON TO ALL)	L	T	P	C
		1	**0**	**4**	**2.5**

Pre-Requisites: Basic knowledge about tools and different trades

List of Experiments

1. To make a Half Lap joint from the given Wooden pieces.
2. To make a Dovetail joint from the given Wooden pieces.
3. To make a Rectangular Scoop using the given Sheet metal.
4. To make a Hooper using the given Sheet metal.
5. To perform Parallel and Series wiring connection.
6. To perform Stair case wiring connection.
7. To make a Square rod from a given round rod.
8. To make a S- hook from a given round rod.
9. To prepare a sand mould for the given single piece pattern.
10. To prepare a sand mould for the given Split-piece pattern.
11. To make a Straight fitting from the given metal pieces.
12. To make a V- shape fitting from the given metal pieces

Demonstration

13. 3D Printing of modeled component by varying Layer thickness.
14. 3D Printing of modeled component by varying Orientation.
15. 3D Printing of modeled component by varying Infill.

Text Books

1. K. C. John, "Mechanical Workshop Practice", PHI Publishers, 2nd Edition,2010.
2. Ben Redwood, "The 3D Printing Handbook", 3D HUBS, 2018.

Course Outcomes

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

CO1. know the importance of general safety precautions on different shop floors.

CO2. identify the basic tools and equipments used in fitting, carpentry, sheet metal, machine shop, welding and smithy.

CO3. familiarize with the production of simple models in carpentry, sheet metal, machine, welding and smithy trades.

CO4. Gain the knowledge on different 3D Printing techniques.

CO5: Perform the printing of the different components using FDM 3D printer.

CO-PO/PSO Mapping

Course Outcomes	Program Outcomes(POs)/Program Specific Outcomes(PSOs)													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	-	-	-	-	-	-	-	-	2	2	2	3	3	3
CO2	-	-	-	-	-	-	-	-	2	2	2	3	3	1
CO3	-	-	-	-	-	-	-	-	2	2	2	3	3	3
CO4	-	-	-	-	-	-	-	-	2	2	2	3	3	3
CO5	-	-	-	-	-	-	-	-	2	2	2	3	3	2
Average	-	-	-	-	-	-	-	-	2	2	2	3	3	2.4

Correlation: 3–Strong; 2–Medium; 1-Weak

AY: 2024-25 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech CSE(DS) I-Year-I Sem			
Course Code:**M11AC1**	**LINGUASKILL FOR PROFESSIONALS** (COMMON TO CE,ME,AIML, AIDS, CSM, CSD,CSC)	L	T	P	C
		2	**0**	**0**	**0**

Pre-Requisite: A2 level (CEFR)

COURSE OBJECTIVES:

To enable students

1. Acquire an extensive range of vocabulary related to diverse topics.
2. Enhance pronunciation skills, focusing on specific sounds and intonation patterns
3. Improve the use of various grammar concepts
4. Strengthen listening, speaking, reading, and writing skills across different proficiency levels
5. Develop practical language skills for everyday communication scenarios

Module 1(6L)

UNIT-1

Grammar: Subject-Object, Present Tense

Vocabulary: Words about friendship, communication, work and technology

Pronunciation: Word stress, sentence stress

UNIT-2

Everyday English: Opinions and suggestions

- **Listening:** Listening Activity 1, Listening Activity 2
- **Reading:** Reading Activity 1, Reading Activity 2
- **Speaking:** Speaking Activity 1, Speaking Activity 2

Writing: Guide, Email giving news

Module 2 (6L)

UNIT-1

Grammar: Modals, Phrases of ability, Articles, *used to* and *usually*

Vocabulary: Words about relationship and ability

Pronunciation: Linking sounds, Intonation in question tags

UNIT -2

Everyday English: Telling a story; Offering and asking for help

- **Listening:** Listening Activity 1, Listening Activity 2
- **Reading:** Reading Activity 1, Reading Activity 2
- **Speaking:** Speaking Activity 1, Speaking Activity 2

Writing: About someone's life, online advertisement

Module 3 (6L)

UNIT-1

Grammar: Future forms, zero and first conditionals, comparatives and superlatives

Vocabulary: Words about the natural world, environmental issues and food

Pronunciation: Sound and spelling 'a', /ʃ/, /tʃ/

UNIT-2

Everyday English: Giving reasons, results and examples; Asking and giving recommendations

- **Listening:** Listening Activity 1, Listening Activity 2
- **Reading:** Reading Activity 1, Reading Activity 2
- **Speaking:** Speaking Activity 1, Speaking Activity 2

Writing: Discussion essay, Review of a restaurant or cafe

Module 4(6L)

UNIT-1

Grammar: Quantifiers, Reported speech

Vocabulary: Words about buildings and sharing information

Pronunciation: Sounds */t//d//k//g//h//w/*

UNIT-2

Everyday English: Offers, request, permission; generalising and being vague

- **Listening:** Listening Activity 1, Listening Activity 2
- **Reading:** Reading Activity 1, Reading Activity 2
- **Speaking:** Speaking Activity 1, Speaking Activity 2

Writing: A note with useful information, an email summary of a news story

Module 5 (6L)

UNIT-1

Grammar: Passive, Relative clause, Second and third conditionals

Vocabulary: Words about music and sport; expressions with *do, make* and *take*

Pronunciation: -ed ending words, mostly confused words

UNIT-2

Everyday English: Recommending, Discussing problems and reassuring

- **Listening:** Listening Activity 1, Listening Activity 2
- **Reading:** Reading Activity 1, Reading Activity 2
- **Speaking:** Speaking Activity 1, Speaking Activity 2

Writing: Article, Email with advice

Text Books

8. Doff, Adrian, et al. *Empower Second Edition Student's Book with Digital Pack: B1+ Intermediate*. Cambridge University Press, 2022.

Reference Books

7. Cullen, Pauline, et al. The Official Cambridge Guide to IELTS for Academic and General Training: Student's Book with Answers. with DVD-ROM. Cambridge Univ. Press, 2014.

E-Resources

1. Cambridge English
2. English with Cambridge - YouTube
3. BBC Learning English - Learn English with BBC Learning English - Homepage
4. https://englishonline.britishcouncil.org/

Course Outcomes

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

CO1. Demonstrate a diverse vocabulary repertoire, facilitating better expression and comprehension.

CO2. Exhibit inteligible pronunciation skills, ensuring clearer oral communication.

CO3. Utilise various grammar concepts accurately and coherently.

CO4. Strengthened language skills across listening, speaking, reading, and writing.

CO5. Apply practical language skills effectively in everyday communication scenarios.

CO-PO/PSO Mapping

Course Outcomes	Program Outcomes(POs)/Program Specific Outcomes(PSOs)													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	-	-	-	-	-	-	-	-	2	2	-	3	-	-
CO2	-	-	-	-	-	-	-	-	2	2	-	3	-	-
CO3	-	-	-	-	-	-	-	-	2	2	-	3	-	-
CO4	-	-	-	-	-	-	-	-	2	2	-	3	-	-
CO5	-	-	-	-	-	-	-	-	2	2	-	3	-	-
Average	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**2**	**-**	**3**	**-**	**-**

Correlation: 3–Strong; 2–Medium; 1-Weak

AY: 2024-25 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech CSE(DS) I Year-II Sem			
Course Code: **M120A**	**DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS** (COMMON TO: CE, EEE, ME, ECE, CSE, IT, ECM, CSE(DS), CSE(AIML), AIML, AIDS & MIE)	L	T	P	C
		3	**1**	**0**	**4**

Pre-Requisites: Mathematical Knowledge at pre-university level

Module 1: First Order, First Degree ODE and its Applications [10L]

Differential equations of first order and first degree - Exact differential equation, Linear and Bernoulli differential equation, applications of differential equations of first order and first degree - Newton's law of cooling, Law of natural growth and decay, orthogonal trajectories.

Module 2: Second and Higher order ODE with Constant Coefficients: [10L]

Second order linear differential equations with constant coefficients: Solution of Homogenous, nonhomogeneous differential equations, non-Homogeneous terms of the type □□□, sin(ax), cos (ax), polynomials in □□, □□□ V(x), xV(x). Method of variation of parameters; Equations reducible to linear ODE with constant Coefficients: Euler-Cauchy equation, Legendre's equation

Module 3: Laplace Transforms: [10L]

Laplace transforms, Existence condition, Laplace transform of Elementary functions, Properties of Laplace transforms (Without Proofs), Laplace transform of special functions (Unit step function, Dirac delta function and Periodic function). Inverse Laplace transform and its properties, Convolution theorem (without proof) and its applications, solving linear differential equations with constant coefficients using Laplace transform.

Module 4: vector differential calculus: [9L]

Scalar and vector fields, vector differentiation, level surfaces, gradient of a scalar field, directional derivative, divergence and curl of a vector field, Scalar potential energy, Tangent plane and normal line. Vector Identities (without proofs).

Module 5: Vector integral calculus: [9L]

Line, surface and volume integrals. Green's theorem in a plane, Gauss-Divergence theorem and Stokes theorem(without proofs).

Text Books

9. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010
10. R.K. Jain and S.R.K. Iyengar, Advanced Engineering Mathematics, Narosa Publications, 5 th Edition, 2019.

Reference Books

8. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006
9. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002
10. H. K. Dass and Er. Rajnish Verma, Higher Engineering Mathematics, S Chand and Company Limited, New Delhi
11. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.

E-Resources

5. https://nptel.ac.in/courses/111108098
6. https://www.math.hkust.edu.hk/~machas/differential-equations.pdf
7. https://engineeringmath.online
8. https://www.cheric.org
9. https://www.whitman.edu/mathematics/calculus_online

Course Objectives:

To learn

- Methods of solving the differential equations of first and higher order.
- Concept, properties of Laplace transforms
- Solving ordinary differential equations using Laplace transforms techniques.
- The physical quantities involved in engineering field related to vector valued functions
- The basic properties of vector valued functions and their applications to line, surface and volume integrals

Course Outcomes:

After learning the contents of this paper, the student must be able to

- Identify whether the given differential equation of first order is exact or not

• Solve higher differential equation and apply the concept of differential equation to real world problems. • Use the Laplace transforms techniques for solving ODE's.

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

CO-PO/PSO Mapping

Course Outcomes	Program Outcomes (POs)/Program Specific Outcomes(PSOs)													
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO1**	**PSO2**
CO1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO4	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Average	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

Correlation: 3–Strong; 2–Medium; 1-Weak

Pre-Requisites:

Course Objectives:
The students should be able

- To know the suitablility of water for domestic and industrial purposes.
- To acquire knowledge about different types of batteries and to understand the concepts of corrosion.
- To facilitate successful pursuit of advanced degrees to support interdisciplinary ideas in engineering or other related fields
- Gain the knowledge of chemical reactions those are used in the synthesis of molecules.

Module 1: Water and Its Treatment [11L]

Introduction – hardness of water – Causes of hardness - Types of hardness- temporary and permanent hardness – Units of hardness of water - Numerical problems – Estimation of hardness of water by complexometric method. Boiler troubles: scale and sludge, causes and effects. Potable water and Industrial water its specifications. Softening of water -Internal treatment of boiler feed water– Calgon conditioning, Phosphate conditioning and Colloidal conditioning. External treatment of water – Ion exchange process. Desalination of brackish water – Reverse osmosis. Steps involved in potable water treatment – Disinfection of water by chlorination, Breakpoint chlorination and Ozonization.

Module 2: Battery and Corrosion [12L]

Batteries [7L]
Introduction– Classification of batteries - Primary (Li-MnO_2 cell) and secondary batteries (Lithium ion battery)- Applications

Fuel cells – Methanol - Oxygen fuel cell – Engineering applications

Solar cells –Principle and applications of solar cells

Corrosion[5L]
Causes and effects of corrosion–chemical and electrochemical corrosion – mechanism of electrochemical corrosion by hydrogen evolution method, types of corrosion-galvanic and waterline corrosion. Factorsinfluencing rate of corrosion - Corrosion control methods- Cathodic protection – Sacrificial anodic and impressed current cathodic methods - Hot dipping (Galvanizing and Tinning).

Module 3: Chemical Fuels [9L]
Fuels: Definition, Classification, Characteristics of a good fuel - Types of Calorific value (CV) – CalculationofCV using Dulong's formula, Numericals.
Soild Fuels: Coal - Composition - Proximate & Ultimate Analysis - Significance.

Liquid Fuels: Gasoline and its Composition, Cracking: Fixed bed catalytic cracking method – Knocking, Anti- Knocking agents and its significance, Octane number, Cetane number.

Gaseous Fuels: Composition, characteristics and applications of natural gas, LPG and CNG.

Module 4: Polymers [10L]

Polymers: Definition–Monomer, Polymer, Polymerization. Types of polymerization – addition and condensation polymerization with examples.

Plastics: Definition - thermoplastic and thermosetting plastics, compounding and fabrication of plastics (compression and injection moulding). Preparation, Properties and Engineering Applications of PVC. Urea-Formaldehyde.

Fibers: Preparation, Properties and engineering applications of Nylon-6, 6.

Conducting Polymers- Definition, Classification, Applications.

Module 5: Engineering Materials & Drugs [8L]

Nanomaterials

Introduction, Synthesis of Sol-gel method, General Applications of Nanomaterials.

Carbon Nanotubes - Properties and applications.

Portland Cement: Chemical constituents, Manufacturing of Portland cement, Setting and Hardening and applications of cement.

Drugs: Antipyretic (Paracetamol) – Medicinal Applications

Text Books

1. Engineering Chemistry: Prof. Jaya Shree Anireddy, Wiley Publications.
2. Engineering Chemistry: P. C. Jain & M. Jain, Dhanpat Rai Publications, New Delhi.
3. Engineering Chemistry: Shashi Chawla, Dhanpat Rai Publications (2019), New Delhi.

Reference Books

12. Engineering Chemistry by M. Thirumalachary and E. Laxminarayana, Scitech Publications.
13. Text Book of Engineering Chemistry by Cengage Learning, B. Rama Devi, Ch. Venkata Ramana Reddy and Prasanth Rath.
14. Engineering Chemistry (NPTEL Web-book) by B.L. Tembe, Kamaluddin and M.S.Krishnan

E-Resources

1. https://www.imnh.isu.edu/digitalatlas/hydr/basics/main/chmtxt.
2. https://chem.libretexts.org/Core/.../Electrochemistry/Basics_of_Electrochemistry
3. https://www2.chemistry.msu.edu/faculty/reusch/virttxtjml/polymers.htm
4. https://www.youtube.com/watch?v=W0-CvvAGtEM
5. https://sengerandu.wordpress.com/tutorials/physical-metallurgy/engineering-materials

Course Outcomes

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

CO1. Recognize and select the domestic and industrial problems caused by hard water and also learn about the municipal water treatment using various methods.

CO2. Understand and interpret the important fundamental concepts of electrochemical procedures related to corrosion and its control.

CO3. Rate the fuels and suggest methods for enhancement of the quality of fuels for the required output.

CO4. Identify & recognize the role of polymers in everyday life.

CO5. Apply the Knowledge of engineering materials and drugs in daily life.

CO-PO/PSO Mapping

Course Outcomes	Program Outcomes(POs)/Program Specific Outcomes(PSOs)													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	-	-	-	-	3	2	-	-	-	-	3	-	-
CO2	3	-	-	-	-	3	2	-	-	-	-	3	-	-
CO3	3	2	-	-	-	3	3	-	-	-	-	3	-	-
CO4	1	2	-	-	-	3	2	-	-	-	-	2	-	-
CO5	3	-	-	-	-	2	3	-	-	-	-	1	-	-
Average	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

Correlation: 3–Strong; 2–Medium; 1-Weak

Pre-Requisites: NIL

Course Objectives:
To enable students in

1. Enhancing understanding of key concepts related to language structures and language usage.
2. Ensuring the ability to write grammatically correct and diverse sentences, free from punctuation and spelling errors.
3. Improving students' proficiency in English required for technical education.
4. Building academic competence and confidence to use language effectively.
5. Developing life skills to tackle different challenges.

Module 1 (10L)

Lesson: 'Toasted English' by R. K. Narayan
Vocabulary: The Concept of Word Formation -The Use of Prefixes and Suffixes - Acquaintance with Prefixes and Suffixes from Foreign Languages to form Derivatives - Synonyms and Antonyms
Grammar: Identifying Common Errors in Writing with Reference to Articles and Prepositions.
Reading: Reading and Its Importance- Techniques for Effective Reading.
Writing: Sentence Structures -Use of Phrases and Clauses in Sentences- Importance of Proper Punctuation- Techniques for writing precisely – Paragraph Writing – Types, Structures And Features of a Paragraph - Creating Coherence-Organizing Principles of Paragraphs in Documents.

Module 2(9L)

Lesson: 'Appro JRD' by Sudha Murthy
Vocabulary: Words Often Misspelt - Homophones, Homonyms and Homographs
Grammar: Identifying Common Errors in Writing with Reference to Noun-pronoun Agreement and Subject-verb Agreement.
Reading: Sub-Skills of Reading – Skimming and Scanning – Exercises for Practice
Writing: Nature and Style of Writing- Defining /Describing People, Objects, Places and Events – Classifying- Providing Examples or Evidence.

Module 3 (8L)

Lesson: Elon Musk
Vocabulary: Words Often Confused - Words from Foreign Languages and their Use in English.
Grammar: Identifying Common Errors in Writing with Reference to Misplaced Modifiers and Tenses.
Reading: Sub-Skills of Reading – Intensive Reading and Extensive Reading – Exercises for Practice.
Writing: Format of a Formal Letter-Writing Formal Letters E.g.., Letter of Complaint, Letter of Requisition, Email Etiquette, Job Application with CV/Resume.

Module 4(8L)

Lesson: Art and Literature by Dr. Abdul Kalam
Vocabulary: Standard Abbreviations in English
Grammar: Redundancies and Clichés in Oral and Written Communication.
Reading: Survey, Question, Read, Recite and Review (SQ3R Method) - Exercises for Practice
Writing: Writing Practices- Essay Writing-Writing Introduction and Conclusion -Précis Writing.

Module 5(8L)

Lesson: Go, Kiss the World' by Subroto Bagchi
Vocabulary: Technical Vocabulary and their Usage
Grammar: Common Errors in English (Covering all the other aspects of grammar which were not covered in the previous units)
Reading: Reading Comprehension-Exercises for Practice
Writing: Technical Reports- Introduction – Characteristics of a Report – Categories of Reports Formats- Structure of Reports (Manuscript Format) -Types of Reports - Writing a Report.

Text Books

11. *"English: Language, Context and Culture"* by Orient BlackSwan Pvt. Ltd, Hyderabad. 2022. Print.

Reference Books

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

E-Resources

10. https://sharmadkm.wordpress.com/2022/12/11/toasted-english-by-r-k-narayan/
11. https://sharmadkm.wordpress.com/2022/12/20/apro-jrd-summary/
12. Cambridge English
13. BBC Learning English - Learn English with BBC Learning English - Homepage

Course Outcomes

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

CO1. Expand their vocabulary through mastery of word roots, prefixes, and suffixes.

CO2. Demonstrate proficiency in grammar fundamentals, including sentence structure and parts of speech.

CO3. Exhibit competence in reading and writing skills for effective communication in diverse contexts.

CO4. Apply critical thinking and analytical skills to analyse texts and synthesize information.

CO5. Express themselves confidently and coherently through oral presentations, discussions, and written compositions.

CO-PO/PSO Mapping

Course Outcomes	Program Outcomes (POs)/Program Specific Outcomes (PSOs)													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	-	-	-	-	-	-	-	-	2	2	-	3	-	-
CO2	-	-	-	-	-	-	-	-	2	2	-	3	-	-
CO3	-	-	-	-	-	-	-	-	2	2	-	3	-	-
CO4	-	-	-	-	-	-	-	-	2	2	-	3	-	-
CO5	-	-	-	-	-	-	-	-	2	2	-	3	-	-
Average	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**2**	**-**	**3**	**-**	**-**

Correlation: 3–Strong; 2–Medium; 1-Weak

AY 2024-25 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech CSE(DS) I Year – II Sem			
Course Code: M125B	PYTHONPROGRAMMING (Common to AI&DS, CSE(AI&DS))	L	T	P	C
		3	0	0	3

Pre-Requisites: NIL

Course objectives:

The student will:

1. Design and program Python applications.
2. Use lists, tuples, and dictionaries in Python programs.
3. Learn to identify Python object types, Components, decision statements, pass arguments in Python.
4. Build and package Python modules for reusability, design object-oriented programs with Python classes, use class inheritance in Python for reusability.
5. Use exception handling in Python applications for error handling.

Module 1:

Programming paradigms; Structured programming vs object-oriented programming, OOPs fundamentals- class, object, abstraction, encapsulation, polymorphism, and inheritance.

Introduction to Python: Getting started to Python- an interpreted high-level language, interactive mode, and script mode. Variables, Expressions and Statements Values and types, Variables and keywords, statements, evaluating expressions, operators and operands, order of operations, composition. Function's function calls, type conversion, type coercion, pre-defined functions, composition, user define functions, flow of execution, passing parameters, function parameters and scope. Conditionals and recursion modulus operator, Boolean expression, logical operators, conditional execution, alternative execution, chained and nested conditionals, return statement, Recursion, infinite recursion.

Module 2:

Python data structures: Strings Creating, initializing, and accessing the elements; String operators, comparing strings using relational operators; String functions and methods. **Lists:** Concept of mutable lists, creating, initializing, and accessing the elements, traversing, appending, updating, and deleting elements; List operations; List functions and Methods, list parameters, nested lists, Matrices.

Dictionaries: Concept of key-value pair, creating, initializing, and accessing the elements in a dictionary, dictionary operations traversing, appending, updating, and deleting elements, Dictionary functions and methods.

Tuples: Mutability and tuples, Immutable concept, creating, initializing, and accessing the elements in a tuple, Tuple functions.

Set: operations and methods**, Frozenset**: operations and methods

Module 3:

Object oriented programming using Python: creating python classes, classes, and objects: user defined compound types, objects are mutable, copying; Access modifiers, classes and functions: pure function, modifiers, Classes and methods: object-oriented features, optional arguments, initialization method, operator overloading and polymorphism.

Inheritance: Basic Inheritance: extending built-ins, overriding and super; Multiple inheritance: the diamond problem.

Module 4:

Exceptions: raising exceptions, handling exceptions, exception hierarchy.

Regular Expressions, match, search & replace function, Regular Expression modifiers, Special Character Classes, Repetition Cases, Non-greedy repetition grouping with Parentheses Back-references Anchors.

Module 5:

Files handling and Exceptions: Text files, writing variables, Directories, Pickling.

Database Programming in Python: Connection module, connect MySQL Data base, perform DDL, DML and DQL operations.

Introduction to Machine Learning with Python: Tasks in Machine Learning Using Python, Applications of Python Machine Learning.

Text Books:

1. **Python 3 Object Oriented Programming,** Dusty Phillips, Packet Publishing, 2010.
2. **Programming in Python 3** - A complete Introduction to the Python Language- Second Edition, Mark Summerfield, Addison-Wesley 2010.
3. Introduction to Machine Learning with Python: A Guide for Data Scientists Book by Andreas C. Müller and Sarah Guido Publisher(s): O'Reilly Media, Inc.

Reference Books:

1. **Programming Python- 4th Edition**, Mark Lutz, O'Reilly, 2011.
2. **Object-Oriented Programming in Python**, Michael H, Goldwasser, David Letscher, Pearson Prentice Hall, 2008.

E - Resources:

1. https://www.youtube.com/watch?v=MLP1v80yU14
2. https://pythonprogramming.net/functions-python-3-basics-tutorial/

3. https://www.youtube.com/watch?v=QGLNQwfTO2w
4. https://www.youtube.com/watch?v=ZDa-Z5JzLYM
5. https://www.youtube.com/watch?v=M-t4ILRHnxE

AY 2024-25 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech CSE(DS) I Year – II Sem			
Course Code:M1251	PROGRAMMING WITH PYTHON LAB	L	T	P	C
	Common to AI&DS, CSE(AI&DS)	0	0	2	1

Pre-Requisites:

1. Need basic knowledge about how to operate computer.

2. Need Basic understanding of how to write code for Programming language.

Course objectives:

The student will:

1. Implement Basic input /output operations with various Data Types supported by python.
2. Develop functions for code reusability and experiment string manipulation operations with the use of inbuilt functions.
3. Create a python program for experimenting list, tuple, and dictionary
4. Demonstrate Class and objects to make use of object-oriented programming concepts.
5. Implement File handling operations to access the contents of file

LIST OF EXPERIMENTS

Experiment 1.

i. Write a python program to obtain user input data (int, float, string) and display.
ii. Write a python program to find the roots of a quadratic equation
iii. Write a python program to perform arithmetic operations (+, -, *, /, %) for given input values and printout the result values.

Experiment 2.

i. Write a python program that use both recursive and non-recursive functions to find the factorial of a given integer
ii. Operators and Operands in Python: (Arithmetic, relational and logical operators), operator precedence, Expressions and Statements.
iii. (Assignment statement); Taking input (using raw input () and input ()) and displaying output (print statement); Putting Comments.

Experiment 3.

i. Write python programs to perform operation on Strings using following functions: len, capitalize, find, isalnum, isalpha, isdigit, lower, islower, isupper, upper, lstrip, rstrip, isspace, istitile, partition, replace, join, split, count, decode, encode, swapcase.
ii. Enter the details of 5 **Student** and display the details sequentially.

Experiment 4.

i. Write python programs to perform List operators: (joining, list slices)
ii. Write python programs to perform List functions: len, insert, append, extend, sort, remove, and reverse, pop.
iii. Write python programs to check whether the string is palindrome or not?

Experiment 5.

i. Write python programs to perform Tuple functions: cmp(), len(), max(), min(), tuple()
ii. Write python programs to check whether the word is present in the tuple or not?
iii. Write python programs to Take a string as ("1234567890") and create a pair {(1,2), (3,4),(5,6),(7,8),(9,0)} using tuple.

Experiment 6.

i. Write python programs to perform Dictionary functions & Methods: cmp, len, clear (), get (), has_key (), items (), keys (), update (), values ().
ii. Write python programs to Create a list of animals using dictionary variable "animal" and find out if the specific animal present in the list or not?

Experiment 7.

i. Write a python program to create a class, its objects and accessing attributes.
ii. Create a customer class and check the balance and withdraw and deposit some amount.

Experiment 8:
Write a Python script to implement robust exception handling.
i. Verify whether the input number is a float or not.
ii. Handle exceptions that occur during file operations such as opening a non-existent file.

Experiment 9:
Write a Python script to demonstrate polymorphism.

Experiment 10:
Write a Python script to perform advanced file handling operations.
Open, close, read, append, move.

Experiment 11:
i. Write a Python script to connect to a database and perform various DDL operations.
ii. Create a table, update table schema, and list all tables in the database.

Experiment 12:
Write a Python script to connect to a database and execute multiple DML and DQL operations.
Insert data, update records, delete records, and perform complex queries.

Case Study:
Design and implement a robust Student Management System using Python, incorporating exception handling, inheritance, file handling, and database operations to efficiently manage student records and related functionalities.

Textbooks:

1. **Programming in Python 3-** A complete Introduction to the Python Language- Second Edition, Mark Summerfield, Addison-Wesley 2010.
2. **Programming Python-** 4th Edition, Mark Lutz, O'Reilly, 2011.

Reference books:

1. **Object-Oriented Programming in Python**, Michael H, Goldwasser, David Letscher, Pearson Prentice Hall, 2008.

E - Resources:

1. https://www.tutorialspoint.com/python3/python_strings.htm
2. https://www.youtube.com/watch?v=yCH9CUiXrP0
3. https://www.youtube.com/watch?v=RSl87lqOXDE
4. https://www.youtube.com/watch?v=bSZtsYYwFS0

Course outcomes:

The Student will be able to:

1. Apply Basic input /output operations for working with different data types in python.
2. Design functions for achieving code reusability and string manipulations.
3. Create a python program for implementing list, tuple dictionary.
4. Categorize Class and objects.
5. Implement the various File handling operations.

AY: 2024-25 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech CSE(DS) I Year – II Sem			
Course Code:**M1232**	**COMPUTER AIDED ENGINEERING GRAPHICS** (COMMON TO ALL)	L	T	P	C
		1	**0**	**3**	**2.5**

Pre-Requisites: Engineering Mathematics.

Module 1: Principles of Engineering Drawing, Conic Sections, Curves, Scales [12L]

Unit-I: [3L] Introduction to Engineering Graphics: Principles of Engineering Graphics and their Significance. Construction of Plane, Diagonal Scales.

Unit-II: [6L] Conic Sections including the Rectangular Hyperbola – General method only, Cycloid, Epicycloid and Hypocycloid.

Unit-III: [3L] Introduction to Computer aided drafting – views, commands and conics.

Module 2: Orthographic Projections [12L]

Unit-I: [3L] Principles of Orthographic Projections – Conventions.

Unit-II: [3L] Projections of Points and Lines, Projections of Plane regular geometric figures – Circle, Square, Rectangle, Triangle, Pentagon, Hexagon.

Unit-III: [6L] Computer aided orthographic projections – points, lines and planes.

Module 3: Projections of Solids [12L]

Unit-I: [6L] Projections of Right Regular Solids – Prisms and Pyramids of Square, Pentagon, Hexagon;

Unit-II: [6L] Projections of Generated Solids – Cone, Cylinder. Computer aided projections of solids.

Module 4: Sections of Solids, Development of Surfaces of Solids [12L]

Unit-I: [3L] Sectional View of Right Regular Solids – Prisms and Pyramids of Pentagon, Hexagon; Generated solids – Cylinder and Cone.

Unit-II: [6L] Development of Surfaces of Right Regular solids – Prism, cylinder pyramid and cone.

Unit-III: [3L] Computer aided sectional views, Development of surfaces.

Module 5: Isometric Projections, Orthographic Views [12L]

Unit-I: [9L] Principles of Isometric Projections, Isometric Scale, Isometric Views of Simple and Compound Solids; Conversion of Orthographic Views of simple objects to Isometric Views and Vice-versa.

Unit-II: [3L] Conversion of orthographic projection into isometric view using computer aided drafting.

Text Books

1. Bhatt N.D., Panchal V.M. & Ingle P.R., "Engineering Drawing", Charotar Publishing 2014.
2. Engineering Drawing and graphics Using AutoCAD Third Edition, T. Jeyapoovan, Vikas: S. Chand and company Ltd.
3. K. Venugopal & V. Prabhu Raja, "Engineering Drawing + Auto CAD", New Age International Publishers. Fifth Edition, 2011.

Reference Books

1. Narayana, K.L. & P Kannaiah, "Text book on Engineering Drawing", Scitech Publish, 2008
2. Agrawal B. & Agrawal C. M., "Engineering Graphics", TMH Publn, 2012.

E-Resources

1. https://nptel.ac.in/courses/112/103/112103019/
2. https://urlzs.com/fLJ3T
3. https://urlzs.com/zky46

Course Outcomes

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

CO1. Apply computer aided drafting tools to create 2D and 3D objects
CO2. Sketch conics and different types of solids
CO3. Appreciate the need of Sectional views of solids and Development of surfaces of solids
CO4. Read and interpret engineering drawings
CO5. Conversion of orthographic projection into isometric view and vice versa manually and by using computer aided drafting

CO-PO/PSO Mapping

Course Outcomes	Program Outcomes(POs)/Program Specific Outcomes(PSOs)													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	3	2	1	2	-	-	-	-	-	-	3	1	1
CO2	3	3	2	1	2	-	-	-	-	-	-	3	2	1
CO3	3	3	2	1	2	-	-	-	-	-	-	3	2	1
CO4	3	3	3	1	2	-	-	-	-	-	-	3	2	2
CO5	3	3	3	1	2	-	-	-	-	-	-	3	2	3
Average	3	3	2.4	1	2	-	-	-	-	-	-	3	1.8	1.6

Correlation: 3–Strong; 2–Medium; 1-Weak

AY: 2024-25 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech AI&DS I Year-I Sem.			
Course Code: **M1203**	**ENGLISH LANGUAGE & COMMUNICATION SKILLS LAB** (COMMON TO AI&DS, CSE(AI&DS) ,IT, ECM, ECE,EEE)	L	T	P	C
		0	**0**	**3**	**1**

Pre-Requisites: NIL

COURSE OBJECTIVES:

To train students:

1. To use accurate and appropriate pronunciation through the practice of phonetic sounds, symbols, word accent and into nation.
2. To improve their fluency in spoken English and neutralize their mother tongue influence through JAM Sessions, Role-play, etc.
3. To comprehend the speech of people of various regions through Listening practice exercises. To enable students to transfer information verbally with the right usage of Body language through individual and group activities.
4. To understand nuances of English language by practicing various exercises at Multi-media lab.

English Language and Communication Sills Lab (ELCS) will have two divisions:

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

Module 1: (9L)

CALL Lab:

General Indian English (GIE) and Interference of Mother Tongue (MTI) -Differences in British and American Pronunciation. Introduction to Phonetics – Speech Sounds – Vowels and Consonants; Minimal Pairs

ICS Lab:

Ice-Breaking Activity and JAM Session- Situational Dialogues -Greetings-Taking Leave - Introducing Oneself and Others.

Module 2: (9L)

CALL Lab:

The Phoneme: The Syllable.

ICS Lab:

Features of Good Conversation - Non-verbal Communication- Telephone Etiquette-Role Plays.

Module 3: (9L) CALL Lab:

Stress-Word and Sentence Stress- Stress Shift- Strong and Weak Forms.

ICS Lab:

Introduction to a structured talk, Presentations Skills-Formal Presentations.

Module 4: (9L)

CALL Lab:

Intonation-Errors in Pronunciation- Neutralizing MTI

ICS Lab:

Introduction to Group Discussion - Mock GD.

Module 5: (9L)

CALL Lab:

Listening for Specific Details-Listening Comprehension Tests.

ICS Lab:

Introduction to Interview Skills-Mock Interviews.

Text Books

1. ELCS Lab Manual: A Workbook for CALL & ICS Lab Activities; Orient Black Swan.

Reference Books

1. Balasubramanian. T (2009), A Textbook of English Phonetics for Indian Students. Macmillan.
2. Bansal. R.K, Harrison J.B. (2008). Spoken English. Orient Black Swan.
3. Ashraf Rizvi M (2010). Effective Technical Communication. McGraw-Hill.

E-Resources

1. https://bbamantra.com/listening/
2. https://en.wikipedia.org/wiki/Phonetics#:~:text=Phonetics%20is%20a%20branch%20of,the%20physical%20properties%20of%20speech.
3. https://www.innovativeteachingideas.com/blog/10-great-activities-to-break-the-ice-with-your-students
4. http://kjtenglishnotes.blogspot.com/2015/10/how-i-became-public-speaker.html
5. https://www.learngrammar.net/english-grammar

Course Outcomes

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

Neutralize the mother tongue influence in day to communication

CO1. Differentiate the speech sounds in English and demonstrate accurate pronunciation

CO2. Comprehend and respond to the given texts appropriately.

CO3. Improve their effective and empathetic listening ability

CO4. Communicate confidently and effectively in various contexts and different cultures.

CO5. Listen actively, speak fluently and write accurately

CO / PO / PSOs Mapping

Correlation: 3–Strong; 2–Medium; 1-Weak

Course Outcomes	Program Outcomes (POs)/Program Specific Outcomes (PSOs)													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	-	-	-	-	-	-	-	-	**3**	**3**	-	**2**	-	-
CO2	-	-	-	-	-	-	-	-	**3**	3	-	**2**	-	-
CO3	-	-	-	-	-	-	-	-	**3**	3	-	**2**	-	-
CO4	-	-	-	-	-	-	-	-	3	3	-	**2**	-	-
CO5	-	-	-	-	-	-	-	-	**3**	3	-	**2**	-	-
Average	-	-	-	-	-	-	-	-	**3**	**3**	-	**2**	-	-

AY: 2024-25 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech CSE(DS) I Year-II Sem			
Course Code: **M1202**	**CHEMISTRY LABORATORY** **(**COMMON TO: CE,ME,CSM,CSD,AID,AIM & CSE(CS) **)**	L	T	P	C
		0	**0**	**2**	**1**

Pre-Requisites:

List of experiments(Any 10-12 experiments)

Volumetric Analysis:

1. Preparation of standard solution of oxalic acid and standardisation of NaOH.
2. Determination of total hardness of water by complexometric method using EDTA.
3. Determination of chloride content of water by Argentometry.
4. Estimation of Ferrous ion in Mohr's salt using Permanganomerty.
5. Estimation of ferrous ion in Mohr's salt by Dichrometry.

Determination of Physico-Chemical Properties:

6. Determination of viscosity of a given liquid by using Ostwald's viscometer.
7. Determination of surface tension of a given liquid using stalagmometer.
8. Determination of partition coefficient of acetic acid between n-butanol and water.

Instrumental methods of Analysis:

9. Estimation of strength of HCl by Conductometric titrations using NaOH.
10. Estimation of strength of HCl by Potentiometric titrations using NaOH.
11. Estimation of Cu^{+2} in a given sample by Colorimetry.
12. Estimation of Mn^{+2} in given sample by Colorimetry.

Synthesis of Nanomaterials, Polymers and drug molecules:

13. Synthesis of Iron Nanoparticles
14. Synthesis of Polymer-Bakelite.
15. Synthesis of drug molecule Aspirin.

Text Books

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 & D.S. Sharma, (Vikas publishing, N. Delhi)
3. "Text book of practical organic chemistry", Vogel's ,5th edition.
4. "Text book on Experiments and calculations in engineering chemistry", S.S. Dara.

Course Outcomes

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

1. Identify the basic chemical methods to analyse the substances quantitatively & qualitatively.
2. Calculate the concentration and amount of various substances using instrumental techniques.

3. Synthesize the engineering materials like nanomaterials, polymers and drug molecules.
4. Determine the physic-chemical properties like partition co-efficient, surface tension and viscosity.
5. Determine the partition coefficient of organic compound in two immiscible liquids.

AY 2024-25 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech CSE(DS) I Year – I Sem			
Course Code: M12AC2	HUMAN VALUES AND PROFESSIONAL ETHICS (Common For All Branches)	L	T	P	C
		2	0	0	0

Pre-Requisites:

1. Positive bent of mind.
2. Zeal to know the essence of human existence and Nature.
3. Interest to know the Scientific and philosophical approach for identification of 'I'.
4. Sensitivity towards social and environmental issues.

COURSEOBJECTIVES

- To enable students appreciate the essential complementarily between 'VALUES' and 'SKILLS'to ensure sustained happiness and prosperity which are the core aspirations of all human beings.
- To facilitate the development of a Holistic perspective among students towards life, profession and happiness, based on a correct understanding of the Human reality and the rest of existence. Such a holistic perspective forms the basis of Value based living in a natural way.
- To highlight plausible implications of the above Holistic understanding in terms of ethical human conduct, trustful and mutually satisfying human behaviour and mutually enriching interaction with Nature.

Module I:

Course Introduction - Need, Basic Guidelines, Content and Process for Value Education: Understanding the need, basic guidelines, content and process for Value Education. Self Exploration–what is it? - its content and process; 'Natural Acceptance' and Experiential Validation- as the mechanism for self exploration. Continuous Happiness and Prosperity- A look at basic Human Aspirations. Right understanding, Relationship and Physical Facilities- the basicrequirements for fulfillment of aspirations of every human being with their correct priority. Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario. Method to fulfill the above human aspirations: understanding and living in harmony at various levels.

Module II:

Understanding Harmony in the Human Being - Harmony in Myself! : Understanding human being as a co-existence of the sentient 'I' and the material 'Body'. Understanding the needs of Self ('I') and 'Body' - Sukh and Suvidha. Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer). Understanding the characteristics and activities of 'I' and harmony in 'I'.Understanding the harmony of I with the Body: Sanyam and Swasthya; correct appraisal of Physical needs, meaning of Prosperity in detail. Programs to ensure Sanyam and Swasthya.

Module III:

Understanding Harmony in the Family and Society- Harmony in Human - Human Relationship : Understanding harmony in the Family- the basic unit of human interaction. Understanding values in human-human relationship; meaning of Nyaya and program for its fulfillment to ensure Ubhay-tripti; Trust (Vishwas) and Respect (Samman) as the foundational values of relationship. Understanding the meaning of Vishwas; Difference between intention and competence. Understanding the meaning of Samman, Difference between respect and differentiation; the other salient values in relationship. Understanding the harmony in the society (society being an extension of family): Samadhan, Samridhi, Abhay, Sah-astitva as comprehensive Human Goals. Visualizing a universal harmonious order in society- Undivided Society (Akhand Samaj), Universal Order (Sarvabhaum Vyawastha)- from family to world family!

Module IV:

Understanding Harmony in the Nature and Existence - Whole existence as Co-existence : Understanding the harmony in the Nature. Interconnectedness and mutual fulfillment among the four orders of nature-recyclability and self- regulation in nature. Understanding Existence as Co- existence (Sah-astitva) of mutually interacting units in all-pervasive space. Holistic perception of harmony at all levels of existence.

Module V:

Implications of the above Holistic Understanding of Harmony on Professional Ethics : Natural acceptance of human values. Definitiveness of Ethical Human Conduct. Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order. Competence in professional ethics:

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

Case studies of typical holistic technologies, management models and production systems. Strategy for transition from the present state to Universal Human Order: At the level of individual: as socially and ecologically responsible engineers, technologists and managers At the level of society: as mutually enriching institutions and organizations

TEXT BOOKS

R R Gaur, R Sangal, G P Bagaria, 2009, A Foundation Course in Human Values and Professional Ethics.

Prof. KV Subba Raju, 2013, Success Secrets for EngineeringStudents, Smart Student Publications,3rd Edition.

REFERENCE BOOKS

Ivan Illich, 1974, Energy & Equity, The Trinity Press, Worcester, and HarperCollins, USA

E.F. Schumacher, 1973, Small is Beautiful: a study of economics asif people mattered, Blond & Briggs, Britain.

A Nagraj, 1998, Jeevan Vidya ek Parichay, Divya Path Sansthan, Amarkantak.

Sussan George, 1976, How the Other Half Dies, Penguin Press. Reprinted 1986, 1991 PL

Dhar, RR Gaur, 1990, Science and Humanism, Commonwealth Purblishers.

A.N. Tripathy, 2003, Human Values, New Age International Publishers.

Subhas Palekar, 2000, How to practice Natural Farming, Pracheen(Vaidik) Krishi Tantra Shodh, Amravati.

Donella H. Meadows, Dennis L. Meadows, Jorgen Randers, William

W. Behrens III, 1972, Limits to Growth – Club of Rome's report, Universe Books.

E G Seebauer & Robert L. Berry, 2000, Fundamentals of Ethics for Scientists & Engineers, Oxford University Press

M Govindrajran, S Natrajan & V.S. Senthil Kumar, Engineering Ethichs (including Human Values), Eastern Economy Edition, Prentice Hall of India Ltd.

Relevant CDs, Movies, Documentaries & Other Literature:

Value Education website, http://www.uptu.ac.in

Story of Stuff, http://www.storyofstuff.com

Al Gore, An Inconvenient Truth, Paramount Classics, USA Charlie

Chaplin, Modern Times, United Artists, USA

IIT Delhi, Modern Technology – the Untold Story

COURSE OUTCOMES

- The students identify the importance of human values and skills for sustained happiness.
- The students strike a balance between profession and personal happiness/goals.
- The students realize/explain the significance of trust, mutually satisfying human behavior and enriching interaction with nature.
- The students develop/propose appropriate technologies and management patterns to create harmony in professional and personal life.

AY: 2024-25 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech CSE(DS) II Year - I Sem			
Course Code: **M210A**	**PROBABILITY AND STATISTICS** (Common to CE,CSE, IT, ECM, MIE,AI&ML & AI&DS)	L	T	P	C
		3	**1**	**0**	**4**

Pre-Requisites:

Module 1: Single Random variables **[10L]**

Introduction to probability, Random Variables, Discrete and Continuous. Probability distributions, mass function/ density function of a probability distribution, mathematical expectation, moments about origin, central moments. Moment generating function of probability distribution.

Module 2: Probability Distributions **[12L]**

Binomial, Poisson, Normal, exponential distributions and their Properties. moment generating functions of the above distributions and hence finds the mean and variance.

Module 3: Correlation & Regression Sampling Distributions **[10L]**

Correlation: Types of correlation, coefficient of correlation, the rank correlation, Covariance of two random variables. Regression- Regression coefficient, the lines of regression.

Sampling: Definitions of population, sampling, statistic, and parameter. Types of sampling, Expected values of Sample mean and variance, sampling distribution, Standard error, Sampling distribution of means, sampling distribution of variance and sampling distribution of proportions, Parameter estimation- Point estimation and interval estimation.

Module 4: Testing of Hypothesis-I **[8L]**

Testing of hypothesis: Null hypothesis, Alternate hypothesis, Type I& Type II errors – critical region, confidence interval, and Level of significance. One sided test, two sided test.

Large sample tests:

(i) Test of Equality of means of two samples, equality of sample mean and population mean (cases of known variance & unknown variance, equal and unequal variances)

(ii) Tests of significance of difference between sample S.D and population S.D.

(iii) Tests of significance difference between sample proportion and population proportion, difference between two sample proportions.

Module 5: Testing of Hypothesis-II **[8L]**

Student t-distribution, its properties and applications, test of significance sample mean and population mean, difference between means of two small samples. Snedecor's F- distribution and its properties. Test of equality of two population variances. Chi-square distribution, its properties, Chi-square test of goodness of fit, Chi-square test for independence & applications of attributes.

Text Books

1. S.C.Gupta and V.K.Kapoor : Fundamentals of Mathematical Statistics, 2006

2. Kantiswarup, P.K.Gupta and Manmohan Singh : Operations Research, S.Chand & Co, 2010

Reference Books

1. R. A. Johnson: Miller and Freund's Probability and Statistics for Engineers, Pearson Publishers,9th Edition, 2017
2. Freund: Modern elementary statistics, PHI, 2006
3. Probability and Statistics for Engineers by Richard Arnold Johnson, Irwin Miller and John E.Freund, New Delhi, Prentice Hall

E-resources

1. https://nptel.ac.in/courses/111/108/111108098/
2. https://en.wikipedia.org/wiki/Probability_distribution
3. http://www.randomservices.org/random/sample/Covariance.html
4. https://www.nptel.ac.in/_content/storage2/courses/103106120/Lecture_Notes/Lec3_1.pdf
5. https://www.smartbugmedia.com/blog/hypotheses-worth-testing-on-your-website

Course Outcomes

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

CO1. Understand the concept of probability and statistics

CO2. Find the mean and variance of a given probability distribution

CO3. Find the coefficient of correlation and lines of regression.

CO4. Test the hypothesis for large samples.

CO5. Test the hypothesis for small samples

CO-PO/PSO Mapping

Course Outcomes	Program Outcomes(POs)/Program Specific Outcomes(PSOs)													
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO10**	**PO11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	3	1	2	2	-	-	-	-	-	-	-	1	-	-
CO2	3	1	2	2	-	-	-	-	-	-	-	1	-	-
CO3	3	1	2	2	-	-	-	-	-	-	-	1	-	-
CO4	3	1	2	2	-	-	-	-	-	-	-	1	-	-
CO5	3	1	2	2	-	-	-	-	-	-	-	1	-	-
Average	3	1	2	2	-	-	-	-	-	-	-		-	-

Correlation: 3–Strong; 2–Medium; 1-Weak

AY 2024-25 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech – CSE(DS) II Year I Sem			
Course Code: M21DA	**DATA STRUCTURES USING C** (Common to AI&DS, CSE(DS))	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

Pre-Requisites:

1. C programming language.

Course objectives:

The student will:

1. Define the basic data structures like linked list.
2. Understand the fundamentals and applications of linked list, stacks and queues.
3. Classify different types of tree data structures
4. Understand the concepts of graph data structures.
5. Know the fundamentals of basic searching, sorting and pattern matching algorithms.

Module 1:

Basic concepts - Algorithm Specification, Performance analysis - time complexity and space complexity, Asymptotic Notation - Big O, Omega and Theta notations, Introduction to Linear and Non Linear data structures.

Linear list – singly linked list implementation, insertion, deletion and searching operations on linear list, circular linked list implementation, doubly linked list implementation, insertion, deletion and searching operations. Applications of linked lists.

Module 2:

Stacks-Operations, array and linked representations of stacks, stack applications-infix to postfix conversion, postfix expression evaluation, recursion implementation.

Queues-operations, array and linked representations. Circular Queue operations, Dequeue, applications of queue.

Module 3:

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, Binary Heap-Properties, Max and Min Heap, Operations-Insertion and Deletion, Heap sort.

Search Trees-Binary Search tree, Tree traversals, AVL tree – operations

Module 4:

Graphs-Terminology, sequential and linked representation, graph traversals: Depth First Search & Breadth First Search implementation.

Pattern matching: Introduction, Brute force, the Boyer –Moore algorithm, Knuth-Morris-Pratt algorithm

Module 5:

Hashing-Hash table, Hash table representations, hash functions, collision resolution techniques- separate chaining, open addressing-linear probing, quadratic probing, double hashing, Re hashing, Extendible hashing.

Textbooks:

1. Data Structures Using C, ReemaThareja, Oxford University Press, 2011 Learning.
2. Introduction to Algorithms, TH Cormen, PHI

Reference Books:

1. Data Structures & Algorithm Analysis in C++, Mark Allen Weiss, Pearson Education.
2. Design methods and analysis of Algorithms, SK Basu, PHI.
3. Fundamentals of Computer Algorithms, 2nd Edition, Ellis Horowitz, SartajSahni, SanguthevarRajasekaran, Universities Press.

E - Resources:

1. http://masterraghu.com/subjects/Datastructures/ebooks/rema%20thareja.pdf.
2. https://www.slideshare.net/adisesha12/data-structure-ppt-138483078
3. https://lecturenotes.in/subject/81/data-structure-using-c-ds
4. http://www.tutorialspoint.com/data_structures_algorithms
4. http://www.geeksforgeeks.org/data-structures/
5. http://www.coursera.org/specializations/data-structures-algorithms

Course outcomes:

The student will be able to:

1. Demonstrate operations like searching, insertion, deletion, traversing mechanism using linked list.
2. Use linear and non-linear data structures like stacks, queues etc.
3. Implement different types of tree data structures.
4. Implement the concepts of graph data structures.
5. Apply the basic searching, sorting and pattern matching Techniques.

CO-PO/PSO Mapping

Course Outcomes	Program Outcomes(POs)/Program Specific Outcomes(PSOs)													
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO10**	**PO11**	**PO12**	**PSO 1**	**PSO 2**
CO1	2	2	-	-	-	-	-	-	-	-	-	-	-	2
CO2	3	2	-	-	-	-	-	-	-	-	-	-	-	2
CO3	3	1	-	-	-	-	-	-	-	-	-	-	-	2
CO4	3	1	-	-	-	-	-	-	-	-	-	-	-	2
CO5	3	1	-	-	-	-	-	-	-	-	-	-	-	2
Average	**2.8**	**1.4**	-	-	-	-	-	-	-	-	-	-	-	**2.0**

Correlation: 3–Strong; 2–Medium; 1-Weak

AY: 2024-25 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech – CSE(DS) II Year - I Sem			
Course Code: M21DB	DATABASE SYSTEMS (Common to AI&DS, CSE (DS))	L	T	P	C
		3	0	0	3

Pre-Requisites: A course on "Data Structures".

Module 1:

Database System Applications: A Historical Perspective, File Systems versus a DBMS, the Data

Model, Levels of Abstraction in a DBMS, Data Independence, Structure of a DBMS Introduction to Database Design: Database Design and ER Diagrams, Entities, Attributes, and Entity Sets, Relationships and Relationship Sets, Additional Features of the ER Model, Conceptual Design with the ER Model.

Module2:

Introduction to the Relational Model: Integrity constraint over relations, enforcing integrity constraints, querying relational data, logical database design, introduction to views, destroying/altering tables and views. Relational Algebra, Tuple relational Calculus, Domain relational calculus.

Module3:

SQL: QUERIES, CONSTRAINTS, TRIGGERS: form of basic SQL query, UNION, INTERSECT, and EXCEPT, Nested Queries, aggregation operators, NULL values, complex integrity constraints in SQL, triggers and active databases.

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

Module4:

Transaction Concept, Transaction State, Implementation of Atomicity and Durability, Concurrent Executions, Serializability, Recoverability, Implementation of Isolation, Testing for serializability, lock Based Protocols, Timestamp Based Protocols, Validation- Based Protocols, Multiple Granularity, Recovery and Atomicity, Log–Based Recovery, Recovery with Concurrent Transactions.

Module 5:

Data on External Storage, File Organization and Indexing, Cluster Indexes, Primary and Secondary Indexes, Index data Structures, Hash Based Indexing, Tree based Indexing, Comparison of File Organizations, Indexes- Intuitions for tree Indexes, Indexed Sequential Access Methods (ISAM).

TEXT BOOKS:

1. Database System Concepts, Silberschatz, Korth, McGraw hill, V edition.3rd Edition

2. Database Management Systems, Raghurama Krishnan, Johannes Gehrke, Tata Mc Graw Hill

REFERENCE BOOKS:

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

2. Fundamentals of Database Systems, Elmasri Navrate, Pearson Education

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

4. Oracle for Professionals, The X Team, S.Shah and V. Shah, SPD.

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

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

E-Resources

1. https://nptel.ac.in/noc/courses/noc18/SEM1/noc18-cs15/
2. https://www.alljntuworld.in/download/database-management-system-dbms-materials-notes/

CourseOutcomes

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

CO1. Describe basic concepts of database system.

CO2. Design a data model and schemas in RDBMS

CO3. Use RDBMS for developing industry applications.

CO4. Be competent in use of structured query language SQL.

CO5. Analyze functional dependencies for designing a robust database

CO-PO/PSO Mapping

Course Outcomes	Program Outcomes(POs)/Program Specific Outcomes(PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	-	3	2	-	-	-	-	-	-	-	-	3	-
CO3	-	2	3	2	-	-	-	-	-	-	-	-	-	-
CO4	-	2	-	3	3	-	-	-	-	-	-	-	-	-
CO5	3	-	-	-	3	-	-	-	-	-	-	-	3	-
Average	**2.5**	**2.0**	**3.0**	**2.3**	**3.0**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3.0**	**-**

Correlation: 3–Strong; 2–Medium; 1-Weak

AY 2024-25 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech – CSE(DS) II Year I Sem			
Course Code: M316C	**SOFTWARE ENGINEERING** (Common to AI&DS, CSE(DS))	L	T	P	C
		3	0	0	3

Pre-Requisites:
Knowledge of Object-Oriented Principles
Course Objectives:
The students should be able to
1. Understand different process models of Software Engineering.
2. collect requirements from client and analyse the collected requirements.
3. Understand the concepts of designing and implementing the Software Product or Project.
4. Understand software metrics and measures.
5. Understand different testing strategies and assess the software product quality.

Module 1:
Introduction to Software Engineering: The evolving role of software, changing nature of software, software myths. **A Generic view of process:** Software engineering- a layered technology, a process framework, the capability maturity model integration (CMMI). **Process models:** The waterfall model, Spiral model and Agile methodology.

Module 2:
Software Requirements: Functional and non-functional requirements, user requirements, system requirements, interface specification, the software requirements document.
Requirements engineering process: Feasibility studies, requirements elicitation and analysis, requirements validation, requirements management.

Module 3:
Design Engineering: Design process and design quality, design concepts, the design model. Creating an architectural design: software architecture, data design, architectural styles and patterns, architectural design, conceptual model of UML, basic structural modeling, class diagrams, sequence diagrams, collaboration diagrams, use case diagrams, component diagrams.

Module 4:
Testing Strategies: A strategic approach to software testing, test strategies for conventional software, black-box and white-box testing, validation testing, system testing, the art of debugging.
Metrics for Process and Products: Software measurement, metrics for software quality.

Module 5:
Risk management: Reactive Vs proactive risk strategies, software risks, risk identification, risk projection, risk refinement, RMMM. **Quality Management:** Quality concepts, software quality assurance, software reviews, formal technical reviews, statistical software quality assurance, software reliability, the ISO 9000 quality standards.

Text Books

1. Roger S. Pressman. Software Engineering A Practitioner's Approach. Mc Graw Hill, 8 edition, 2014. ISBN 9780078022128.
2. Software Engineering, Ian Somerville, 7th edition, Pearson education

Reference Books

1. The Unified Modeling Language, User Guide by Grady Booch, James Rambaugh, Ivar Jaccobson.
2. Software Engineering, A Precise Approach, Pankaj Jalote, Wiley India, 2010.
3. Software Engineering: A Primer, Waman S Jawadekar, Tata McGraw-Hill, 2008

E-Resources

1. https://onlinecourses.nptel.ac.in/noc20_cs68/preview
2. https://lecturenotes.in/subject/104/software-engineering-se
3. https://www2.cs.siu.edu/~mengxia/Courses%20PPT/435/435ppt.htm

Course Outcomes

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

CO1. Compare and analyse the different Process models.

CO2. Analyse the Requirement Engineering process and System Modelling

CO3. Apply the systematic procedure for Software design.

CO4. Integrate software metrics in the development process.

CO5. Evaluate Projects with various Quality standards.

AY 2024-25 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech – CSE(DS) II Year I Sem			
Course Code: M21DC	**JAVA PROGRAMMING** (Common to AI&DS, CSE(DS))	L	T	P	C
		2	0	0	2

Course Objectives

- To Understand the basic object-oriented programming concepts and apply them in problem solving.
- To Illustrate inheritance concepts for reusing the program.
- To Demonstrate multitasking by using multiple threads and event handling
- To Develop data-centric applications using JDBC.
- To Understand the basics of java console and GUI based programming
- Understand the technologies used in Web Programming.

MODULE - I

OOP concepts. History of Java, Java buzzwords, data types, variables, scope and lifetime of variables, arrays, operators, expressions, control statements, type conversion and casting, simple java program, concepts of classes, objects, constructors, methods, access control, this keyword, garbage collection, overloading methods and constructors, method binding, parameter passing, recursion, nested and inner classes, exploring string class, string handling.

MODULE - II

Inheritance, Packages and Interfaces – Hierarchical abstractions, Base class object, subclass, subtype, substitutability, forms of inheritance specialization. Member access rules, super uses, using final with inheritance, polymorphism- method overriding, abstract classes, the Object class. Defining, Creating and Accessing a Package, Understanding CLASSPATH, importing packages, defining an interface, implementing and applying interfaces.

MODULE - III

Exception handling and Multithreading-- Concepts of exception handling, benefits of exception handling, Termination or resumptive models, exception hierarchy, usage of try, catch, throw, throws and finally, built in exceptions, creating own exception subclasses. Thread life cycle, creating threads, thread priorities, synchronizing threads, inter thread communication, thread groups, daemon threads.

MODULE - IV

Event Handling: Events, Event sources, Event classes, Event Listeners, event delegation model, handling mouse and keyboard events, Adapter classes. The AWT class hierarchy, user interface components- labels, button, canvas, scrollbars, text components, check box, checkbox groups, choices, lists panels – scrollpane, dialogs, menubar, graphics, layout manager – layout manager types – border, grid, flow, card and grid bag.

MODULE - V

HTML- Basic Tags- List, Tables, Images, Forms, Frames, CSS JAVA Script - Web page Designing using HTML, Scripting basics- Client side and server side scripting. Java ScriptObject, names, literals,

operators and expressions- statements and features- events - windows - documents - frames - data types - built-in functions- Browser object model - Verifying forms.-HTML5- CSS3- HTML 5 canvas - Web site creation using tools.

TEXT BOOKS:

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

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

3. Harvey Deitel, Abbey Deitel, Internet and World Wide Web: How To Program 5th Edition.

REFERENCE BOOKS:

1. An Introduction to programming and OO design using Java, J.Nino and F.A. Hosch, John wiley & sons.

2. An Introduction to OOP, third edition, T. Budd, Pearson education.

3. Introduction to Java programming, Y. Daniel Liang, Pearson education.

4. An introduction to Java programming and object-oriented application development, R.A. Johnson- Thomson.

5. Object Oriented Programming with Java, R.Buyya, S.T.Selvi, X.Chu, TMH.

Course Outcomes

- Demonstrate the behavior of programs involving the basic programming constructs like control structures, constructors, string handling and garbage collection.
- Demonstrate the implementation of inheritance (multilevel, hierarchical and multiple) by using extend and implement keywords
- Use multithreading concepts to develop inter process communication.
- Understand the process of graphical user interface design and implementation using AWT or swings.
- Develop applets that interact abundantly with the client environment and deploy on the server.
- Design web pages.
- Use technologies of Web Programming.

AY 2024-25 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech – CSE(DS) II Year I Sem			
Course Code: M21DD	INTRODUCTION TO ARTIFICIAL INTELLIGENCE (Common to AI&DS, CSE(DS))	L	T	P	C
		2	0	0	2

Prerequisite: Knowledge on Data Structures.
Course Objectives:

- To learn the distinction between optimal reasoning Vs. human like reasoning.
- To understand the concepts of state space representation, exhaustive search, heuristic
- search together with the time and space complexities.
- To learn different knowledge representation techniques.
- To understand the applications of AI, namely game playing, theorem proving, and machine learning.

Course Outcomes:

- Learn the distinction between optimal reasoning Vs human like reasoning and formulate an efficient problem space for a problem expressed in natural language. Also select a search algorithm for a problem and estimate its time and space complexities.
- Apply AI techniques to solve problems of game playing, theorem proving, and machine learning.
- Learn different knowledge representation techniques.
- Understand the concepts of state space representation, exhaustive search, heuristic search together with the time and space complexities.
- Comprehend the applications of Probabilistic Reasoning and Bayesian Networks.
- Analyze Supervised Learning Vs. Learning Decision Trees

Module 1:
Introduction to AI - Intelligent Agents, Problem-Solving Agents, Searching for Solutions - Breadth-first search, Depth-first search, Hill-climbing search, simulated annealing search, Local Search in Continuous Spaces.

Module 2:
Games - Optimal Decisions in Games, Alpha–Beta Pruning, Defining Constraint Satisfaction Problems, Constraint Propagation, Backtracking Search for CSPs, Knowledge-Based Agents, Logic Propositional Logic, Propositional Theorem Proving: Inference and proofs, Proof by resolution, Horn clauses and definite clauses.

Module 3:
First-Order Logic - Syntax and Semantics of First-Order Logic, Using First Order Logic, Knowledge Engineering in First-Order Logic. Inference in First-Order Logic: Propositional vs. First-Order Inference, Unification, Forward Chaining, Backward Chaining, Resolution.
Knowledge Representation: Ontological Engineering, Categories and Objects, Events.

Module 4:
Planning - Definition of Classical Planning, Algorithms for Planning with State Space Search, Planning Graphs, other Classical Planning Approaches, Analysis of Planning approaches. Hierarchical Planning.

Module 5:
Probabilistic Reasoning: Acting under Uncertainty, Basic Probability Notation Bayes' Rule and Its Use, Probabilistic Reasoning, Representing Knowledge in an Uncertain Domain, The Semantics of Bayesian Networks, Efficient Representation of Conditional Distributions, Approximate Inference in Bayesian Networks, Relational and First- Order Probability.

TEXT BOOK:

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

REFERENCE BOOKS:

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

E - Resources:

1. https://www.tutorialspoint.com/artificial_intelligence/artificial_intelligence_pdf_version.htm
2. https://www.alljntuworld.in/download/artificial-intelligence-ai-materials-notes/
3. https://drive.google.com/file/d/1mPiI4jy6YkJRDiCT21xgzN0VDNkrW23X/view
4. https://nptel.ac.in/courses/106/105/106105077/

AY 2024-25 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech – CSE(DS) II Year I Sem			
Course Code: M21D1	DATA STRUCTURES USING C LAB (Common to AI&DS, CSE(DS))	L	T	P	C
		0	0	2	1

Pre-Requisites:

1. C programming language.

Course objectives:

The Student will:

1. Implement the basic data structures like linked list.
2. Implement the operations of stacks and queues.
3. Classify different types of tree data structures
4. Understand the concepts of graph data structures.
5. Apply hashing and pattern matching techniques.

Experiment 1:
Write a C program that uses functions to perform the following operations on singly linked list:
I) Creation II) Insertion III) Deletion IV) Traversal V) merge two single linked lists

Experiment 2:
Write a C program that uses functions to perform the following operations on doubly linked list.
I) Creation II) Insertion III) Deletion IV) Traversal

Experiment 3:
Write a C program that implement stack operations using
I) Arrays II) Linked Lists

Experiment 4:
I) Write a C program to convert infix expression to postfix expression using stack
II) Write a C program to evaluate postfix expression
III) Write a C program to convert infix expression to prefix expression using stack

Experiment 5:
Write a C program to implement linear queue using
I) Arrays II) Linked Lists

Experiment 6:
Write a C program to perform following operations on a circular Queue
I) Insertion II) deletion III) search and count

Experiment 7:
Write a C Program to implement binary tree traversals

Experiment 8:
Write a C Program to implement AVL tree operations

Experiment 9:
IMPLEMENTATION OF HEAP USING PRIORITY QUEUES

Experiment 10:
Implementation of a Graph representation using Adjacency Matrix

Experiment 11:

I) Implementation of Graph traversals using BFS
II) Implementation of Graph traversals using DFS

Experiment 12:

I) Write a program to implement KMP Pattern matching algorithm.
II) Write a program to implement Boyer Moore Algorithm for Pattern Searching.

Experiment 13:

Implementation of hash functions and collision resolution technique

Textbooks:

1. Data Structures Using C, ReemaThareja, Oxford University Press, 2011 Learning.
2. Introduction to Algorithms, TH Cormen, PHI

E - Resources:

1. http://masterraghu.com/subjects/Datastructures/ebooks/rema%20thareja.pdf.
2. https://www.slideshare.net/adisesha12/data-structure-ppt-138483078
3. https://lecturenotes.in/subject/81/data-structure-using-c-ds
4. http://www.tutorialspoint.com/data_structures_algorithms
5. http://www.geeksforgeeks.org/data-structures/
6. http://www.coursera.org/specializations/data-structures-algorithms

Course outcomes:

The student will be able to:

1. Demonstrate operations like searching, insertion, deletion, traversing mechanism using linkedlist.
2. Use linear and non-linear data structures like stacks, queues etc.
3. Implement different types of tree data structures.
4. Implement the concepts of graph data structures.
5. Apply the basic searching, sorting and pattern matching Techniques.

AY 2024-25 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech – CSE(DS) II Year I Sem			
Course Code: M21D2	**DATABASE SYSTEMS LAB** (Common to AI&DS, CSE(DS))	L	T	P	C
		0	0	2	1

Pre-requisites: "Database Management Systems"

Course Objectives:

Introduce ER data model, database design and normalization

Learn SQL basics for data definition and data manipulation

Course Outcomes:

- Design database schema for a given application and apply normalization
- Acquire skills in using SQL commands for data definition and data manipulation.
- Develop solutions for database applications using procedures, cursors and triggers

List of Experiments:

1. Concept design with E-R Model
2. Relational Model
3. Normalization
4. Practicing DDL commands
5. Practicing DML commands
6. A. Querying (using ANY, ALL, UNION, INTERSECT, JOIN, Constraints etc.)

   B. Nested, Correlated subqueries
7. Queries using Aggregate functions, GROUP BY, HAVING and Creation and dropping of Views.
8. Triggers (Creation of insert trigger, delete trigger, update trigger)
9. Procedures
10. Usage of Cursors

TEXT BOOKS:

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

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

REFERENCE BOOKS:

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

2. Fundamentals of Database Systems, Elmasri Navrate, Pearson Education

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

4. Oracle for Professionals, The X Team, S. Shah and V. Shah, SPD.

AY 2024-25 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech – CSE(DS) II Year I Sem			
Course Code: M21D3	**JAVA PROGRAMMING LAB** (Common to AI&DS, CSE(DS))	L	T	P	C
		2	0	0	1

EXPERIMENT 1. Write java programs that implement the following

a) Constructor b) Parameterized constructor

c) Method overloading d) Constructor overloading.

EXPERIMENT 2.a) Write a java program to implement method overriding

b) Write a java program to implement dynamic method dispatch.

c) Write a Java program to implement multiple inheritance.

d) Write a java program that uses access specifiers

EXPERIMENT 3. a) Write a Java program that reads a file name from the user, then displays information about whether the file exists, whether the file is readable, whether the file is writable, the type of file and the length of the file in bytes.

b) Write a Java program that reads a file and displays the file on the screen, with a line number before each line.

c) Write a Java program that displays the number of characters, lines and words in a text file

EXPERIMENT 4. a)Write a Java program for handling Checked Exceptions.

b) Write a Java program for handling Unchecked Exceptions

EXPERIMENT 5. a) Write a Java program that creates three threads. First thread displays "Good Morning" every one second, the second thread displays "Hello" every two seconds and the third thread displays "Welcome" every three seconds.

b) Write a Java program that correctly implements producer consumer problem using the concept of inter thread communication

EXPERIMENT 6. a) Develop an applet that displays a simple message.

b) Develop an applet that receives an integer in one text field, and computes its factorial value and returns it in another text field, when the button named "Compute" is clicked

EXPERIMENT 7. Write a Java program that works as asimple calculator. Use a grid layout to arrange button for the digits and for the +, -,*, % operations. Add a text field to display the result

EXPERIMENT 8.a) Write a Java program for handling mouse events.

b) Write a Java program for handling key events.

EXPERIMENT 9. Write a program that creates a user interface to perform integer divisions. The user enters two numbers in the text fields Num1 and Num 2. The division of Num1 and Num2 is displayed in the Result field when the Divide button is clicked. If Num1or Num2 were not an integer, the program would throw Number Format Exception. If Num2 were Zero, the program would throw an Arithmetic Exception and display the exception in a message dialog box.

EXPERIMENT 10.

a) Write a html program for Creation of web site with forms, frames, links, tables etc

b) Design a web site using HTML and DHTML. Use Basic text Formatting, Images

EXPERIMENT 11.

a) Create a script that asks the user for a name, then greets the user with "Hello" and the user name on the page
b) Create a script that collects numbers from a page and then adds them up and prints them to a blank field on the page.

AY: 2024-25 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech –CSE(DS) II Year-II Sem			
Course Code: **M220C**	**ESSENTIAL MATHEMATICS FOR MACHINE LEARNING and DATA SCIENCE** (COMMON TO: CSE(AIML),CSE(DS), AIDS & AIML)	L	T	P	C
		3	**0**	**0**	**3**

Pre-Requisites: Basic knowledge of Calculus, Matrix Algebra and Probability.

Module 1: Linear Algebra – I: [8L]

Vector space, sub space, Dimension, Basis, Linear Maps, Metric Spaces, Normed Spaces, and Inner Product spaces, Orthogonality Projections: Gram-Schmidt Orthogonalization and QR decomposition.

Module 2: Linear Algebra-II: [8L]

Singular Value Decomposition, Low rank approximation, Principal Component Analysis and Linear discriminant.

Module 3: Multivariate calculus: [8L]

Review of gradient and its properties, Hessian, Gradient of vector valued function, Gradient of matrices. Local/global maxima and minima, convex sets, convex functions, gradient descent algorithms- Learning rate, momentum, stochastic. Constrained optimization (Lagrange Multiplier method), convex optimization.

Module 4: Linear Programming Problems: [8L]

Basic concepts, problem formulation, canonical and standard forms of Linear Programming Problem, Solutions to Linear Programming Problem by Simplex Method, Artificial variables technique- Big-M method.

Module 5: Basic Statistics: [8L]

Definition of Statistics, Scope and limitations of Statistics, Statistical investigation, Stages in conducting survey, primary data v/s secondary data, classification, tabulation and presentation of data diagram.

Text Books

1. Linear algebra and it's applications, David C. Lay, third edition, Pearson publications.
2. Kanti Swarup, P.K. Gupta and Man Mohan, Operations Research, 13th edition, Sultan Chand and Sons, 2007.
3. Applied Statistics and Probability for Engineers, Sixth Edition, Douglas C. Montgomery, George C.Runger, JohnWiley&Sons,Inc2008.

Reference Books

1. "Mathematics for Machine Learning", Peter Deisenroth, A. Aldo Faisal, and Cheng Soon Ong, Published by Cambridge University Press., 2020.
1. Introduction to linearalgebra,5th Edition, Gilbert Strang.
2. Operations Research: An introduction, Taha H.A., 7th edition, Pearson Prentice Hall, 2002.
3. Mathematics for Machine Learning, Garrett Thomas- https://gwthomas.github.io/docs/math4ml.pdf

Course Objectives:

- Important classes of spaces which apply to data and operations on them: Vector Spaces, Metric Spaces, Normed spaces, and Inner Product Spaces
- Use Calculus to build approximations to functions.
- Minimizing a cost function and Optimization techniques.
- Tools for collecting and modelling with interpreting the data.

Course Outcomes:

After completion of the course the student is able to

CO-1: Applying knowledge of vectors, inner products, and linear transformations for solving real world situations.

CO-2: Apply optimization techniques in industrial optimization problems

CO-3: Recognize the role of statistical tools to interpret the data.

CO-PO/PSO Mapping

Course Outcomes	Program Outcomes (POs)/Program Specific Outcomes(PSOs)													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	2	1	-	-	1	1	-	-	-	-	1	-	-
CO2	3	2	2	-	-	1	1	-	-	-	-	1	-	-
CO3	3	2	2	-	-	1	1	-	-	-	-	1	-	-
CO4	3	2	1	-	-	1	1	-	-	-	-	1	-	-
CO5	3	2	1	1	-	1	1	-	-	-	-	1	-	-
Average	**3**	**2**	**1.4**	**1**	-	**1**	**1**	-	-	-	-	**1**	-	-

Correlation: 3–Strong; 2–Medium; 1-Weak

AY 2024-25 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech – CSE(DS) II Year II Sem			
Course Code: M225F	**OPERATING SYSTEMS** (Common to AI&DS, CSE(DS))	L	T	P	C
		3	0	0	3

Pre-Requisites:

1. Programming for Problem solving, Data structures and Algorithms (not mandatory).
2. Computer Organization

Course objectives:

The Student will:

1. Understand the basic concepts and functions of computer operating systems.
2. Apply the concurrency control among the operating system programs execution.
3. Demonstrate the techniques used to manage the memory during program execution.
4. Explain the various storage management methods and functions of operating systems.
5. Design the security features against attacks on operating system.

Module 1:

Basic Concepts

Overview: OS Introduction, Computer Systems Organization, Computer System Architecture, Operating System Architecture, Resource Management, Virtualization, Distributed Systems, Open-source operating system.

Operating System Structures: Systems Calls, System services, Linkers and Loaders, Operating System Design and Implementation, Operating System structure, Building and Booting an Operating System.

Module 2:

Process Management

Process Concepts: Introduction, Process Scheduling, Interprocess Communication, Communication in Client- Server systems, Thread concepts, Multithreading Model, Scheduling Criteria, Scheduling Algorithms, Algorithm Evaluation.

Process Synchronization: Critical-Section Problem, Peterson's Solution, Synchronization Hardware, Semaphores, Mutex Locks, Semaphores, Monitors, Classic Problems of Synchronization, System Model, Deadlock Characterization, Deadlock Prevention, Detection and Avoidance, Recovery from Deadlock.

Module 3:

Memory Management

Main Memory: Background, Contiguous Memory Allocation, Paging, Page-Table Structure, Swapping, Segmentation.

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

Module 4:

Storage Management

File system Management: File Concepts, Access Methods and Directory Structure, File Protection, File System Structure, File System Operations, Directory Implementation, Allocation Methods, Free-Space Management, Efficiency and Performance, Recovery

Mass-Storage Structure: Overview, Disk Scheduling, Storage Device Management, Swap-Space Management, Storage Attachment, RAID Structure.

Module 5:

Security and Protection

Security: Security Problem, Program Threats, System and Network Threats, Cryptography as a Security Tool, User Authentication, Implementing Security Defenses, Case Studies: Windows 10.

Protection: Goals of Protection, Principles of Protection, Protection Rings, Domain of Protection, Access Matrix, Implementation of Access Matrix, Revocation of Access Rights, Role-based Access Control, Capability-Based Systems, Language Based Protection.

Text Books:

1. **Operating System Concepts-Abraham Silberchatz**, Peter B. Galvin, Greg Gagne, 7th Edition, John Wiley.
2. **Operating Systems a Concept based Approach**-D.M.Dhamdhere, 2nd Edition, TMH.

Reference Books:

1. **Principles of Operating Systems-NareshChauhan,** Oxford Higher Education.
2. **Operating System A Design Approach**-Crowley, TMH.
3. **Modern Operating Systems**-Andrew S Tanenbaum, 2nd Edition Pearson, PHI.

E - Resources:

1. https: // www.tutorialspoint .com/operating_system/
2. https: // www.studytonight.com/operating-system/
3. https: // learn.saylor.com/course/view.php?id=948&sectioned=967
4. https: //nptel.ac.in/courses/106/105/106105214/
5. https://www.edx.org/course/computer-hardware-and-operating-systems

Course outcomes:

The student will be able to:

1. Compare differing structures of operating systems including process management.
2. Apply different CPU scheduling algorithms and various Memory management techniques.
3. Illustrate the use of Bankers algorithm for deadlock avoidance and File system organization.
4. Demonstrate various mass storage management techniques.
5. Analyze different aspects of protection and security concepts.

AY 2024-25 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech – CSE(DS) II Year II Sem			
Course Code: M22DA	MACHINE LEARNING FOR DATA SCIENCE (Common to AI&DS, CSE(DS))	L	T	P	C
		3	0	0	3

Pre-Requisites:

- Knowledge on Probability and Statistics, Data Structures.
- Knowledge on Mathematics for Machine Learning and Data Science, Artificial Intelligence

Course Objectives:

- To introduce students to the basic concepts and techniques of Machine Learning.
- To have a thorough understanding of the Supervised and Unsupervised learning techniques
- To study the various probability-based learning techniques

Module 1 – Basics and Metrics Evaluation

What is Machine Learning? Need –History – Definitions – Applications - Advantages, Disadvantages & Challenges -Types of Machine Learning Problems

Metrics Evaluation: Bias/Variance Tradeoff, Bootstrapping & Cross Validation, Class Evaluation Measures, Confusion matrix, ROC curve, MDL.

Module 2- Regression and Supervised Learning

Linear Discriminant Analysis, Logistic regression, Support Vector Machines, Decision trees, Random Forest tree, K-Nearest Neighbours, Naïve Bayes Classifier.

Linear regression, ridge regression, Lasso, Bayesian regression, support vector regression, random forest regression, and decision tree regression.

Module 3- Unsupervised Learning

Principal Component Analysis, Partitional Clustering - k-means, k-medoids; Hierarchical Clustering - Agglomerative, Divisive, Distance measures; Density based clustering - DBScan;

Module 4- Neural Networks

Structure of a brain - Artificial Neural Network, Perceptron. Activation function: Sigmoid Relu Tanh. Multilayer perceptron: Feed forward propagation, Back propagation - Training process in neural network Loss function - Gradient descent - Tuning the network size - Learning rate -Initialization, Training & Validation.

Ensemble Methods - Bagging, Committee Machines and Stacking, Boosting

Module 5- Reinforcement Learning and Probabilistic Learning

Reinforcement Learning – Overview – Getting Lost Example

Markov Chain Monte Carlo Methods – Sampling – Proposal Distribution – Markov Chain Monte Carlo – Graphical Models – Bayesian Networks – Markov Random Fields – Hidden Markov Models – Tracking Methods

TEXT BOOK:

1. Pattern Recognition and Machine Learning Christopher M. Bishop
2. Introduction to Machine Learning with Python by Andreas C. Müller and Sarah Guido
3. Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow by Aurélien Géron.

4. Deep Learning by Ian Goodfellow, Yoshua Bengio, and Aaron Courville
5. Reinforcement Learning: An Introduction by Richard S. Sutton and Andrew G. Barto

REFERENCE BOOK:

1. Machine Learning: An Algorithmic Perspective, Stephen Marshland, Taylor & Francis.
2. Data Science and Predictive Analytics by Dr. Thomas W. Miller
3. Neural Networks and Deep Learning by Charu Aggarwal
4. Machine Learning: A Probabilistic Perspective by Kevin P. Murphy

Course Outcomes:

• Distinguish between, supervised, unsupervised and semi-supervised learning

• Understand algorithms for building classifiers applied on datasets of non-linearly separable classes

• Understand the principles of evolutionary computing algorithms

• Design an ensembler to increase the classification accuracy

AY 2024-25 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech – CSE(DS) II Year II Sem			
Course Code: M225E	COMPUTER NETWORKS (Common to AI&DS, CSE(DS))	L	T	P	C
		3	0	0	3

Pre-Requisites:

- Knowledge on Data Structures.

Course objectives:

The Student will:

1. Recognize various layering approaches for networking and understand the functionalities of physical layer.
2. Identify the data link layer protocols, multi access protocols, Ethernet technologies and various internetworking devices.
3. Examine design issues of network layer, services provided to above layer and routing, and congestion control protocols.
4. Examine IP protocol, addressing, various protocols like CIDR, ICMP, ARP and RARP of internet Layer and examination of transport layer services.
5. Examine Transport layer protocols like TCP, UDP, RPC and various congestion controlling mechanisms, including application layer services, protocols like HTTP, FTP, and E-Mail etc.

Module 1:

Overview of the Internet: Protocol, Layering Scenario, TCP/IP Protocol Suite: The OSI Model, Internet history standards and administration; Comparison of the OSI and TCP/IP reference model.

Physical Layer: Guided transmission media, wireless transmission media.

Module 2:

Data Link Layer: design issues, Framing, Error Detection and Error Correction, Block Coding, Hamming Distance, CRC, Flow control and error Control, Stop and wait , Sliding window Protocols.

Connecting Devices: Repeaters, Hubs, Switches, Gateways and Bridges - Learning and Spanning tree bridges.

Multi Access protocols- Random access - ALOHA, CSMA, CSMA/CD and CSMA/CA, Ethernet IEEE 802.11

Module 3:

Network Layer: Network layer design issues, Store and forward packet switching, connection less and connection oriented network services.

Internetworking: Protocols-IPV4 and IPV6**,** Logical Addressing-IPV4, IPV6, Tunneling and Packet Fragmentation.

Address Mapping: Address Resolution Protocol (ARP), Reverse Address Resolution

Protocol (RARP), Dynamic Host Configuration Protocol (DHCP), Internet Control Message Protocol (ICMP) and Internet Group Management Protocol (IGMP).

Routing Algorithms: Shortest Path Finding and Distance Vector Routing Algorithms.

Module 4:

Transport Layer: Process to Process Communication, User Datagram Protocol (UDP), Transmission Control Protocol (TCP), The TCP Connection Establishment, The TCP Connection Release.

Crash recovery, The TCP sliding window, The TCP congestion control, Improving Quality of Service Techniques: Leaky Bucket Algorithm.

Module 5:

Application Layer: Introduction, services, Application layer paradigms.

Applications: Domain Name System (DNS), World Wide Web (WWW), Hypertext Transfer Protocol (HTTP), File Transfer Protocol(FTP),Electronic Mail(E-MAIL), TELNET, Simple Network Management Protocol(SNMP), Secure Shell(SSH).

Text Books:

1. Data Communications and Networking - Behrouz A. Forouzan, Fifth Edition TMH, 2013.
2. Computer Networks - Andrew S Tanenbaum, 4th Edition, Pearson Education.

Reference Books:

1. ComputerNetworks, 5E, Peterson, Davie, Elsevier
2. Introduction to Computer Networks and Cyber Security, Chawan-HwaWu, Irwin, CRC Publications.
3. Computer Networks and Internets with Internet Applications, Comer.

E - Resources:

2. https://lecturenotes.in/subject/2234/Computer_Network
3. http://nptel.ac.in/courses/106102234/
4. https://www.iitg.ernet.in/dgoswami/CN-Notes.pdf
5. http://ocw.mit.edu/index.htm.

Course outcomes:

The Student will be able to:

1. Demonstrate the networking concepts, various Layering approaches, functionalities and some protocols of Link layer.
2. Operate with Data link Layers.
3. Apply fragmentation, assigning of logical address and judge on routing and congestion.
4. Apply the working of IP Protocol, other protocols of internet layer and services of transport layer.
5. Demonstrate the services of Application Layer while using popular applications

AY 2024-25 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech – CSE(DS) II Year II Sem			
Course Code: M22DB	DATA VISUALIZATION USING R (Common to AI&DS, CSE(DS))	L	T	P	C
		3	0	0	3

Course Objectives:

- Learn concepts, techniques and tools they need to deal with various facets of data science practice, including data collection and integration
- Understand the basic types of data and basic statistics
- Identify the importance of data reduction and data visualization techniques

Module 1:

Introduction to R, Basics of R, Variables in R, Data Types in R, Control statements if and else, switch, loops, Matrices, Arrays and Lists Matrix Operations – Adding and Deleting Rows and Columns – Higher Dimensional Arrays – Lists – General List Operations – Accessing List Components and Values

Module 2:

Data Frames Creating Data Frames – Matrix-like Operations on a Data Frame – Merging Data Frames – Applying functions to Data Frames, Factors and Tables – Common Functions used with Factors – Working with Tables

Module 3:

Reading and writing CSVs, Text Data, Excel Data. Base Graphs, ggplot2, Comparisons between Base Graphs and ggplot2, Basic Plotting, Line plot - Bar plot - Pie Chart - Scatter Plot - Histogram - Stacked Bar Charts

Module 4:

Sub Plots - Matplotlib, Sear born, Plotly - Seaborne Styles Applied Visualizations Box plot - Density Plot - Area Chart - Heat map - Tree map - Graph Networks

Module 5:

Interactive Visualizations and Animations, Dynamic charts - Dynamic maps - Animation types - 2D, 3D, Motion Animation - Animation Principles - Altair Package - Statistical Visualizations

Text books:

1. Hands on programming with R by Garrett Grolemund,Shroff/O'Reilly; Firstedition

2. Modern Data Visualization with R by Robert Kabacoff

3. Visualizing Data with R by Christine Monnier

4. R for Data Science" by Hadley Wickham and Garrett Grolemund

Reference books:

1. Applied Data Visualization with R and ggplot2 by Dr. Tania Moulik

2. Data Analysis and Visualization in R by Stefan Leach

Course Outcomes:

- Understand basic terms of statistical modeling and data science
- Implementation of R programming concepts
- utilize R elements for data visualization and prediction
- Apply statistical methods for Data visualization

AY 2024-25 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech – CSE(DS) II Year II Sem			
Course Code: M2252	**OPERATING SYSTEMS LAB** (Common to AI&DS, CSE(DS))	L	T	P	C
		0	0	2	1

Pre-Requisites:

1. C Programming

Course objectives:

1. This course will introduce the basic principles in Operating System
2. It will cover all the management modules present in the OS like process management, Memory management, File management, Disk management, Network management, I/O management.

Experiment 1: Simulate the following CPU scheduling algorithms
a) FCFS b) SJF
Experiment 2: Simulate the following CPU scheduling algorithms
a) Priority b) Round Robin
Experiment 3: Simulate Bankers Algorithm for Dead Lock Avoidance
Experiment 4: Simulate Bankers Algorithm for Dead Lock Prevention
Experiment 5 Simulate all file allocation strategies
a) Sequential b) Indexed c) Linked
Experiment 6 Simulate MVT and MFT
Experiment 7: Simulate all File Organization Techniques
a) Single level directory b) Two level
Experiment 8: Simulate all File Organization Techniques
a) Hierarchical b) DAG
Experiment 9: Simulate all page replacement algorithms
a) FIFO b) LRU c) Optimal
Experiment 10: Simulate disk scheduling algorithms.
a) FCFS. b) SSTF
Experiment 11: Simulate disk scheduling algorithms.
a) CSCAN. b) CLOOK
Experiment 12: Experiments on fork, shared memory and semaphores.

Text Books:

1. Principles of Operating Systems-NareshChauhan, Oxford Higher Education.
2. Operating Systems A Design Approach-Crowley, TMH.

E - Resources:

1. https://www.tutorialspoint.com/web_developers_guide/web_basic_concepts.htm
2. https://courses.lumenlearning.com/computerapps/chapter/reading-the-internet /
3. https: // www.tutorialspoint .com/operating_system/
4. https: // www.studytonight.com/operating-system/
5. https: // learn.saylor.com/course/view.php?id=948&sectioned=967
6. https://www.edx.org/course/computer-hardware-and-operating-systems

AY 2024-25 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech – CSE(DS) II Year II Sem			
Course Code: M22D1	MACHINE LEARNING FOR DATA SCIENCE LAB (Common to AI&DS, CSE(DS))	L	T	P	C
		0	0	2	1

Course Objective:
- The objective of this lab is to get an overview of the various machine learning techniques and can demonstrate them using python.

Course Outcomes:
- Understand modern notions in predictive data analysis
- Select data, model selection, model complexity and identify the trends
- Understand a range of machine learning algorithms along with their strengths and weaknesses
- Build predictive models from data and analyze their performance

List of Experiments

1. Using python write a NumPy program to compute the
a) Expected Value
b) Mean
c) Standard deviation
d) Variance
e) Covariance
f) Covariance Matrix of two given arrays.

2 PREPROCESSING CONTINUOUS AND CATEGORICAL DATA
For a given set of training data examples stored in a .CSV file, demonstrate Data Preprocessing in Machine learning with the following steps
a) Getting the dataset.
b) Importing libraries.
c) Importing datasets.
d) Finding Missing Data.
e) Finding Outliers
f) Splitting dataset into training and test set.
g) Feature scaling.

3. a) Write a Python program to implement Simple Linear Regression
b) Implementation of Multiple Linear Regression for House Price Prediction using sklearn Implement a Linear Regression with a Real Dataset (https://www.kaggle.com/harrywang/housing). Experiment with different features in building a model. Tune the model's hyperparameters.

4. Write a program to construct a Regression tree for cost estimation by assuming any numerical dataset.
5. Implement a binary classification model using SVM. That is, answers a binary question such as "Are houses in this neighborhood above a certain price?"(use data from https://www.kaggle.com/harrywang/housing). Modify the classification threshold and determine how that modification influences the model. Experiment with different classification metrics to determine your model's effectiveness.
6. Classification with Nearest Neighbours. In this question, you will use the scikit-learn's KNN classifer to classify real vs. fake news headlines. The aim of this question is for you to read the

scikit-learn API and get comfortable with training/validation splits. Use California Housing Dataset.

7. Implementation of Decision tree using sklearn and its parameter tuning and evaluate using performance metrics.

8. Implement the k-means algorithm using https://archive.ics.uci.edu/ml/datasets/Codon+usage dataset

9. Implement a single neural network and test for different logic gates.

10. Build an Artificial Neural Network by implementing the Backpropagation algorithm and test the same using appropriate data sets.

11. Implementation of Metropolis-Hastings Algorithm for Sampling from Complex Distributions using MCMC

12. Performance analysis of Classification Algorithms on a specific dataset (Mini Project)

TEXT BOOK:

- Machine Learning – Tom M. Mitchell, - MGH.
- Aurelien Géron - Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow, 2nd ESeptember 21019, O'Reilly Media, Inc., ISBN: 9781492032649.

REFERENCE BOOK:

- Machine Learning: An Algorithmic Perspective, Stephen Marshland, Taylor & Francis.

AY 2024-25 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech – CSE(DS) II Year II Sem			
Course Code: M22D2	**DATA VISUALIZATION USING R LAB** (Common to AI&DS, CSE(DS))	L	T	P	C
		0	0	2	1

COURSE OBJECTIVES:

Students will be able to

1. Understand the importance of data visualization for business intelligence and decision making.
2. Know approaches to understand visual perception
3. Learn about categories of visualization and application areas
4. Familiarize with the data visualization tools
5. Gain knowledge of effective data visuals to solve workplace problems

1. a) Using R program to add, sub, mul, divn. (calculator)
   b) to check given no is even or odd
   c) while and for loops

2 a) Using R program execute a) switch b) find a factorial using Recursion

3. Execute R demo Programs a) array B) matrix and C) list
4. Execute R demo program on a) Data frames b) Common functions used with factor
5. Execute R demo program to read and write csv, excel data, basic plots.
6. Execute R programs Pie chart, histogram, line plot
7. Introduction to various Data Visualization tools
8. Basic Visualization in R
9. Connecting to Data and preparing data for visualization in R
10. Data Aggregation and Statistical functions in R
11. Data Visualizations in R
12. Creating custom charts, cyclical data and circular area charts, Dual Axis charts.

REFERENCE BOOKS:

1. Microsoft Power BI cookbook, Brett Powell, 2nd edition.
2. R Programming for Data Science by Roger D. Peng (References)
3. The Art of R Programming by Norman Matloff Cengage Learning India
4. Data Visualization with R: 111 Examples by Thomas Rahlf, Springer, 2020

COURSE OUTCOMES:

At the end of the course, Students will be able to:

1. understand the basics of R programming
2. Use R for data visualization
3. Apply data visuals to convey trends in data over time
4. Construct effective data visuals to solve workplace problems
5. Explore and work with different plotting libraries
6. Learn and create effective visualizations

AY 2024-25 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech – CSE(DS) II Year II Sem			
Course Code: M22D3	**SKILL DEVELOPMENT USING POWER BI** (Common to AI&DS, CSE(DS))	L	T	P	C
		0	0	2	1

Objective: To gain practical experience in using Power BI for data visualization, enabling students to import data, understand data structures, create various visualizations, build interactive dashboards, and communicate insights effectively.

1. Power BI Basics: Interface navigation and importing data from files.
2. Data Structures: Understanding fields, measures, and dimensions in Power BI.
3. Basic Charts: Creating bar, line, and pie charts for initial data representation.
4. Tables and Matrices: Building and formatting detailed data tables and summaries.
5. DAX Calculations: Introduction to calculated columns and basic DAX functions.
6. Visual Formatting: Enhancing visualizations with formatting and styling options.
7. Data Manipulation: Sorting, filtering, and pivoting data within Power BI.
8. Interactive Visuals: Using slicers and drill-through for data exploration.
9. Dashboard Design: Principles of layout and creating an initial dashboard.
10. Dashboard Interactivity: Adding actions and navigation elements to dashboards.
11. Database Connection (Simulated/Actual): Connecting to and importing data from a (simulated or actual) database source.
12. Database Exploration & Visualization: Exploring the schema of the connected database and creating visualizations from the imported data.

Reference books:

1. Microsoft Power BI Cookbook (3rd Edition) by Brett Powell

2. Mastering Power BI (2nd Edition) by Chandraish Sinha

3. Advanced Analytics with Power BI and Excel by Dejan Sarka, Jernej Rihar, Klemen Vončina

AY: 2024 -25 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech –CSE(DS) II Year II Sem			
Course Code: M22MC1	ENVIRONMENTAL SCIENCE	L	T	P	C
		2	0	0	0

Pre-Requisites: Nil.

Course Objectives:

This course will enable students to:

1. Study about the different natural resources available and how to use them.
2. Explain about biodiversity.
3. Discuss about Global Environmental Problems and Global Efforts.
4. Identify the global environmental problems.
5. Explain about sustainable development.

Module 1:

Unit-I: Ecosystem and Natural Resources

Concept, Classification of Resources: Water resources, Land resources, land degradation, Forest resources, Mineral resources, Energy resources. Concept of ecosystem, Classification of ecosystem, Functions of ecosystem. Biodiversity, Level, values, hotspots of biodiversity, Threats to Biodiversity, Conservation of Biodiversity.

Module 2:

Unit-I: Global Environmental Problems and Global Efforts

Deforestation, Greenhouse effect, Global Warming, Sea level rise, Ozone depletion. International conventions/protocols: green-belt-development, Concept of Green Building, Clean Development Mechanism (CDM).

Unit-2: Environmental Impact Assessment (EIA) And Environmental Management Plan Definition of Impact, classification of impacts, methods of baseline data acquisition. Impacts on different components: such as human health resources, air, water, flora, fauna and society, impact assessment methodologies. Environmental management plan (EMP).

Module 3:

Unit-1: Environmental Policy, Legislation, Rules and Regulations

Environmental Protection Act: Air (Prevention and control of pollution) Act-1981, Water (Prevention and control of pollution) Act-1974, Forest Conservation Act**.**

Unit-2: Towards Sustainable Future:

Concept of Sustainable Development, Threats to Sustainability, Strategies for achieving Sustainable development, Environmental Ethics, Environmental Economics, Concept of Green Computing.

Text Books:

1. "Textbook of Environmental Science And Technology" by M Anji Reddy, BS Publications, 2007.
2. "Principles of Environmental Science and Engineering" by Rao P. Venugopala, Prentice Hall India Learning Private Limited (1 January 2006)

Reference Books:

1. "Environmental Studies" by Benny Joseph, McGraw Hill Education 2008.
2. "Textbook of Environmental Studies for Undergraduate Courses" by Erach Bharucha 2005, University Grants Commission, University Press

E-Resources

1. https://nptel.ac.in/courses/120/108/120108004/#

Course Outcomes:

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

1. **Compare** the different natural resources available and how to use them.
2. **Describe** about biodiversity.
3. **Analyze** the Global Environmental Problems and Global Efforts.
4. **Categorize** the global environmental problems.
5. **Prioritize** the Sustainable development

CO-PO/PSO Mapping Chart

(3/2/1 indicates strength of correlation)

3 – Strong; 2 – Medium; 1 - Weak

Course Outcomes (COs)	Program Outcomes (POs)												Program Specific Outcomes*	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	2	2	-	-	1	-	-	-	-	1	2	1
CO2	-	-	-	-	-	3	3	-	-	-	-	2	1	1
CO3	3	3	2	2	-	-	1	-	-	-	-	1	2	1
CO4	3	3	2	2	-	-	1	-	-	-	-	1	2	1
CO5	-	-	-	-	-	3	3	-	-	-	-	2	2	1
Average	1.8	1.8	1.2	1.2	-	1.2	1.8	-	-	-	-	1.4	1.8	1

AY 2024-25 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech CSE(DS) III Year – I Sem			
Course Code: M31EA	BUSINESS ECONOMICS AND FINANCIAL ANALYSIS	L	T	P	D
Credits: 4		3	1	0	0

Course objectives:

The Student will:

1. Understand the market dynamics namely Business, economics, trends in market.
2. Understand the demand elasticity of demand and supply in different market conditions.
3. Learn how organisations make important investment and financing decisions respective to production, cost, and pricing in different markets.
4. Analyze a company's financial statements and come to a reasoned conclusion about the financial situations of the company.
5. Acquire the basics of how to analyze and interpret the financial statements through ratio analysis.

UNIT 1:

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 2:

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 3:

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, Monopolistic Competition.

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

UNIT 4:

Financial Accounting: Accounting concepts and Conventions, Accounting Equation, Double-Entry system of Accounting, Rules for maintaining Books of Accounts, Journal, Posting to Ledger, Preparation of Trial Balance, Elements of Financial Statements, Preparation of Final Accounts.

UNIT 5:

Financial Analysis through Ratios: Concept of Ratio Analysis, Liquidity Ratios, Turnover Ratios, Profitability Ratios, Proprietary Ratios, Solvency, Leverage Ratios (simple problems). Introduction to Fund Flow and Cash Flow Analysis (simple problems).

Textbooks:

1. D.D. Chaturvedi, S.L.Gupta, Business Economics-TheoryandApplications, International Book House Pvt. Ltd. 2013.
2. Dhanesh K Khatri, Financial Accounting, Tata McGrawHill,2011.
3. Geethika Ghosh, Piyali Gosh, Purba Roy Choudhury, Managerial Economics, 2e, Tata McGraw Hill Education Pvt. Ltd. 2012.

Reference Books:

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

Web Resources:

1. https://nptel.ac.in/courses/110/101/110101005/
2. https://sites.google.com/site/economicsbasics/

Course Outcomes:

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

CO 1: Understand the Business Environment of the Economy.

CO 2: Understand microeconomic factors in related to demand analysis and its forecasting

CO 3: Apply the theory of production function and Cost concepts to determine the Break Even Analysis.

CO 4: Remember different market structures, pricing strategies and different forms business organization

CO 5: Interpret the financial statement by using Fundamental accounting concepts and Ratio analysis.

AY 2024-25 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech CSE(DS) III Year – I Sem			
Course Code: M315C	DESIGN AND ANALYSIS OF ALGORITHMS	L	T	P	D
Credits: 3		3	0	0	3

Pre-Requisites:

1. Knowledge on data structures.

Course objectives:

The Student will:

1. Know about on time and space complexity and learning asymptotic notations
2. Understand union and find algorithms, connected components and bi-connected components.
3. Gain knowledge in divide and conquer methods
4. Familiar with greedy method and dynamic programming
5. Understand the back tracking and can application

Module 1:

Introduction to algorithms

Algorithm, Pseudo Code for expressing Algorithms, Performance Analysis: Space Complexity, Time Complexity, asymptotic Notations: Big-oh Notation, Omega Notation, Theta Notation, Little- oh Notation.

Disjoint Sets: Disjoint Set Operations, Union and Find Algorithms, Spanning Trees, Connected Components and Biconnected Components.

Module 2:

Divide and Conquer

General Method, Applications: Binary Search, Quick Sort, Merge Sort, Stassen's Matrix Multiplication.

Greedy Method

General Method Applications: Job Sequencing with Deadlines, 0/1 Knapsack Problem, Minimum Cost Spanning Trees: Prim's and Kruskal's Algorithms, Single Source Shortest Path Problem, Huffman Codes.

Module 3:

Dynamic Programming

General Method, Principle of Optimality, Applications: Multistage Graphs, Matrix Chain Multiplication, Optimal Binary Search Trees, 0/1 Knapsack Problem, All Pairs Shortest Path Problem, Travelling Sales Person Problem, Reliability Design.

Module 4:

Backtracking

General Method, Applications: Nqueen Problem, Recursive Permutation Generator, Sum of Subsets Problem, Graph Coloring, Hamiltonian Cycles.

Module 5:

Branch and Bound

General Method, Applications: Travelling Sales Person Problem, 0/1 Knapsack Problem, LC Branch and Bound Solution, FIFO Branch and Bound Solution.

NP-Hard and NP-Complete Problems: Basic Concepts, Non-Deterministic Algorithms, NP-Hard and NP-Complete Classes, Cook's Theorem.

Text Books:

1. Fundamentals of Computer Algorithms-Ellis Horowitz, SatrajSahni and Rajasekharam, Galgotia Publications Pvt. Ltd.
2. Introduction to Algorithms-T.H.Cormen, C.E.Leiserso, R.L.Rivest and C.Stein, 2nd Edition, Pearson Education, PHI Pvt. Ltd.

Reference Books:

1. Algorithm Design: Foundations, Analysis and Internet Examples-M.T.Goodrich and R.Tomassia, John Wiley and Sons.
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. Design and analysis of Algorithms-S. Sridhar, Oxford Higher Education.

E - Resources:

1. https://nptel.ac.in/courses/106/106/106106131/
2. https://onlinecourses.nptel.ac.in/noc19_cs47/preview
3. http://www.cse.iitd.ernet.in/~ssen/csl356/notes/root.pdf
4. https://www.tutorialspoint.com/design_and_analysis_of_algorithms/design_and_analysis_of_algorithms_tutorial.pdf

Course outcomes:

The Student will be able to:

1. Analyze time complexity and space complexity as well as asymptotic notations for a given algorithm, union and find algorithms, connected components and bi-connected components.
2. Apply divide and conquer method for solving sorting and searching problems and greedy method to solve variety of problems.
3. Make use of dynamic programming to solve a collection of problems.
4. Utilize back tracking to solve different types of problems.
5. Choose branch and bound to unravel diverse forms of predicaments.

AY 2024-25 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech CSE(DS) III Year – I Sem			
Course Code: M3153	DESIGN AND ANALYSIS OF ALGORITHMS LAB	L	T	P	D
Credits: 1		0	0	2	0

Experiments:

1. A) Implement Selection sort and find how many steps are required to sort 10 elements.
   B) Implement Insertion Sort and analyses the time complexity.
2. A) Given two strings, find the minimum number of edits required to convert one string to another.
   B) Sort a given set of elements using the quick sort method 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.
3. A) Apply Greedy method to compress the given data using Huffman encoding.
   B) Implement fractional knapsack problem using Greedy Strategy.
4. Apply dynamic programming methodology to implement 0/1 Knapsack problem.
5. Solve the longest common subsequence problem using dynamic programming.
6. Find the length of the longest subsequence in a given array of integers such that all elements of the subsequence are sorted in strictly ascending order.
7. Apply dynamic programming methodology to find all pairs shortest path of a directed graph using Floyd's algorithm.
8. Implement matrix chain multiplication and find the optimal sequence of parentheses.
9. Implement N-Queens problem using backtracking.
10. Implement graph coloring problem using backtracking.
11. Find the solution of the 0/1 Knapsack Problem using LC Branch and Bound.
12. Find the solution to the Travelling Salesman Problem. Repeat the experiment for a graph having total number of nodes (n) = 4, 8, 12, 16, 20 and note the time required to find the solution. Plot the graph taking n on the x-axis and time on y-axis and analyze the graph to determine whetexponential or not.

AY: 2024-25 Onwards	J.B. INSTITUTE OF ENGINEERING AND TECHNOLOGY (UGC Autonomous)	B. Tech-CSE(DS) III Year- I Sem			
Course Code: M32DB	BIG DATA ANALYTICS (Professional Elective-II) Common to CSE, AI&ML,AI&DS and CSE(DS)	L	T	P	C
		3	0	0	3

Pre-Requisites:
Database Management Systems, Cloud Computing.

Course Objectives:
The students should be able to

1. Understand the basics of Big Data and Big data Platform.
2. Attain the knowledge of Big Data analytics, Approaches and Tools
3. Describe Map Reduce fundamentals and HDFC File system.
4. Differentiate between Hadoop and RDBMS concepts.
5. Apply analytics on Structured and Unstructured Data

Module 1:

Big Data Analytics: What is big data, History of Data Management; Structuring Big Data ; Elements of Big Data ; Big Data Analytics; Distributed and Parallel Computing for Big Data;

Big Data Analytics: What is Big Data Analytics, What Big Data Analytics Isn't, Why this sudden Hype Around Big Data Analytics, Classification of Analytics, Greatest Challenges that Prevent Business from Capitalizing Big Data; Top Challenges Facing Big Data; Why Big Data Analytics Important; Data Science; Data Scientist; Terminologies used in Big Data Environments; Basically Available Soft State Eventual Consistency (BASE); Open source Analytics Tools

Module 2:

Understanding Analytics and Big Data: Comparing Reporting and Analysis, Types of Analytics; Points to Consider during Analysis; Developing an Analytic Team; Understanding Text Analytics;

Analytical Approach and Tools to Analyze Data: Analytical Approaches; History of Analytical Tools; Introducing Popular Analytical Tools; Comparing Various Analytical Tools.

Module 3:

Understanding MapReduce Fundamentals and HBase : The MapReduce Framework; Techniques to Optimize MapReduce Jobs; Uses of MapReduce; Role of HBase in Big Data Processing; Storing Data in Hadoop

Introduction of HDFS: Architecture, HDFS Files, File system types, commands, org.apache.hadoop.io package, HDF, HDFS High Availability; Introducing HBase, Architecture, Storing Big Data with HBase , Interacting with the Hadoop Ecosystem; HBase in Operations-Programming with HBase; Installation, Combining HBase and HDFS

Module 4:

Big Data Technology Landscape and Hadoop : NoSQL, Hadoop; RDBMS versus Hadoop; Distributed Computing Challenges; History of Hadoop; Hadoop Overview; Use Case of Hadoop; Hadoop Distributors;

HDFC (Hadoop Distributed File System): HDFC Daemons, read,write, Replica Processing of Data with Hadoop; Managing Resources and Applications with Hadoop YARN

Module 5:

Social Media Analytics and Text Mining: Introducing Social Media; Key elements of Social Media; Text mining; Understanding Text Mining Process; Sentiment Analysis, Performing Social Media Analytics and Opinion Mining on Tweets;

Mobile Analytics: Introducing Mobile Analytics; Define Mobile Analytics; Mobile Analytics and Web Analytics; Types of Results from Mobile Analytics; Types of Applications for Mobile Analytics; Introducing Mobile Analytics Tools

Text Books

1. BIG DATA and ANALYTICS, Seema Acharya, Subhasinin Chellappan, Wiley publications.
2. BIG DATA, Black Book™ , DreamTech Press, 2015 Edition.
3. BUSINESS ANALYTICS 5e , BY Albright |Winston

Reference Books

1. Rajiv Sabherwal, Irma Becerra- Fernandez," Business Intelligence –Practice, Technologies and Management", John Wiley 2011.
2. Lariss T. Moss,ShakuAtre, " Business Intelligence Roadmap", Addison-Wesley It Service.
3. Yuli Vasiliev, " Oracle Business Intelligence : The Condensed Guide to Analysis and Reporting", SPD Shroff, 2012.

E-Resources

1. https://www.coursera.org/learn/big-data-introduction
2. https://www.tutorialspoint.com/big_data_analytics/index.htm
3. www.upgrad.com/Big-Data
4. https://www.javatpoint.com/what-is-big-data

Course Outcomes

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

CO1. Identify the basics of Big Data and its environment.

CO2. Use Big Data analytics Tools and its Approaches.

CO3. Define Map Reduce fundamentals and HDFC Architecture

CO4. Distinguish between Hadoop and RDBMS concepts.

CO5. Illustrate analytics on Structured and Unstructured Data

AY 2024-25 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech CSE(DS) III Year – I Sem			
Course Code: M31D2	BIG DATA ANALYTICS LAB	L	T	P	D
Credits: 1		0	0	4	2

Course Objectives:

- Provide knowledge of Big data Analytics principles and techniques.
- Designed to give an exposure of the frontiers of Big data Analytics

List of Experiments:

1. Install Apache Hadoop
2. Create a Hadoop cluster
3. Implement a simple map-reduce job that builds an inverted index on the set of input documents (Hadoop)
4. Implement a MapReduce program that processes a dataset.
5. Process big data in HBase
6. Store and retrieve data in Pig
7. Perform data analysis using MongoDB
8. Using Power Pivot (Excel) Perform the following on any dataset a. Big Data Analytics b. Big Data Charting
9. Use R-Project to carry out statistical analysis of big data
10. Use R-Project for data visualization

TEXTBOOKS:

1. Big Data Analytics, Seema Acharya, SubhashiniChellappan, Wiley 2015.
2. Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Business, Michael Minelli, Michehe Chambers, 1st Edition, AmbigaDhiraj, Wiley CIO Series, 2013.
3. Hadoop: The Definitive Guide, Tom White, 3rd Edition, O"Reilly Media, 2012.
4. Big Data Analytics: Disruptive Technologies for Changing the Game, ArvindSathi, 1st Edition, IBM Corporation, 2012.

Course Outcomes:

- Use Excel as an Analytical tool and visualization tool.
- Ability to program using HADOOP and Map reduce
- Ability to perform data analytics using ML in R.
- Use MongoDB to perform data analytics

AY 2024-25 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech CSE(DS) III Year – I Sem			
Course Code: M3101	LIFE SKILLS & PROFESSIONAL SKILLS LAB	L	T	P	D
Credits: 2		0	0	4	0

Course Objectives:
Students will learn to:
• Understand importance of self-assessment and awareness.
• Recognize the emotional needs of themselves and others.
• Define social skills and need of positive vibe.
• Employ Leadership Traits and skills in day to day life.
• Quantify the importance of Thinking out of Box, Creativity and Innovation.

Module 1: Self-Introduction and Practice Session-Importance of Communication Skills-Advance communication skills needed for effective Communication-Self-assessment and self-awareness with required tools and Activity based approach.

Module 2: Empathy Practice Sessions & Role-plays -Assertive Behaviour-Emotional Intelligence-Conflict Resolution and Anger Management.

Module 3: Social skills and how to handle Criticism-Social Interaction Skills – Role-plays- Diversity & Social Responsibility- Positive Attitude- Power of Positive Energy.

Module 4: Leadership-Traits & Skill-Activities – Case Studies-Assessments - Team Building skills – Activities –Case studies on Interaction with industry people.

Module 5: Thinking Out-of-the Box – Case-study & Activity Based- Creativity & Innovation-Developing a Vision & Action plan - Thinking Skills – Various Types of Thinking - Power of Questioning Skills– Practice Sessions & Role plays

Reference Books:
1. Butterfield, Jeff. Soft Skills for Everyone. Delhi: Cenege., 2010.
2. Raman, Meenakshi and Sangeeta Sharma. Technical Communication-Principles and Practice. Third Edition, New Delhi: UP., 2015.
3. Rizvi, M Ashraf. Effective Technical-Communication. New Delhi: Tata McGraw-Hill., 2005.
Course Outcomes:
On completion of the course, the students will be able to:
1. Recognize importance of self-awareness and assessment.
2. Translate the needs of others and themselves.
3. Practice being social and possess positive energy.
4. Employ leadership Traits and skills in day to day life.
5. Understand the importance of Thinking- out- of - the-Box.

AY 2024-25 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech CSE(DS) III Year – I Sem			
Course Code: M21MC2	GENDER SENSITISATION	L	T	P	D
Credits: 0		0	0	4	2

Module 1:
UNDERSTANDING GENDER AND BIOLOGY-1
Gender: Why Should We Study It? (*Towards a World of Equals*: Unit -1) Socialization: Making Women, Making Men (*Towards a World of Equals*: Unit -2)
Introduction. Preparing for Womanhood. Growing up Male. First lessons in Caste. Different Masculinities.

Module 2:
UNDERSTANDING GENDER AND BIOLOGY-2
Missing Women: Sex Selection and Its Consequences (*Towards a World of Equals*: Unit -4)
Declining Sex Ratio. Demographic Consequences.

Gender Spectrum: Beyond the Binary (*Towards a World of Equals*: Unit -10)
Two or Many? Struggles with Discrimination.

Module 3:
GENDER AND LABOUR
Housework: The Invisible Labour (*Towards a World of Equals*: Unit -3)
"My Mother doesn't Work." "Share the Load."

Women's Work: Its Politics and Economics (*Towards a World of Equals*: Unit -7)
Fact and Fiction. Unrecognized and Unaccounted work. Additional Reading: Wages and Conditions ofWork.

Module 4:
ISSUES OF VIOLENCE-1
Sexual Harassment: Say No! (*Towards a World of Equals*: Unit -6)
Sexual Harassment, not Eve-teasing- Coping with Everyday Harassment- Further Reading: "*Chupulu".*

Domestic Violence: Speaking Out (*Towards a World of Equals*: Unit -8)
Is Home a Safe Place? -When Women Unite [Film]. Rebuilding Lives. Additional Reading: New Forumsfor Justice.

Thinking about Sexual Violence (*Towards a World of Equals*: Unit -11)
Blaming the Victim- "I Fought for my Life…." - Additional Reading: The Caste Face of Violence.

Module 5:

JUST RELATIONSHIPS: BEING TOGETHER AS EQUALS
Mary Kom and Onler, love and acid just do not mix, love letters, mothers and fathers- further reading:Rosa Parks-The brave heart.

Course Outcomes

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

CO1. Students will have developed a better understanding of important issues related to gender incontemporary India.

CO2. Students will be sensitized to basic dimensions of the biological, sociological, psychological and legal aspects of gender. This will be achieved through discussion of materials derived from research, facts, everyday life, literature and film..

CO3. Students will attain a finer grasp of how gender discrimination works in our society and how to counter it..

CO4. Students will acquire insight into the gendered division of labor and its relation to politics and economics.

CO5. Men and women students and professionals will be better equipped to work and live together as equals.

AY 2024-25 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech CSE(DS) III Year – II Sem			
Course Code: M325H	AUTOMATA AND COMPILER DESIGN	L	T	P	D
Credits: 3		3	0	0	0

Course Objectives:
At the end of the course, students will:
1. Illustrating different phases of compilation.
2. Describe the steps and algorithms used by language translators and features.
3. Enumerating top down and bottom up parsing techniques used in compilation process.
4. Introducing the syntax directed translation and type checking and learning the effectiveness of optimization.

Module 1:
UNIT – IFormal Language and Regular Expressions: Languages, Definition Language regular expressions, Finite Automata-DFA, NFA.
UNIT – II
Conversions: Conversion of regular expression to NFA, NFA to DFA, Applications of Finite Automata to lexical analysis-lex tools.

Module 2:
UNIT I
Context Free grammars and parsing: Context free grammars, derivation, parse trees, ambiguity LL (K) Grammars and LL (1) parsing.
UNIT – II
To learn to develop algorithms to generate code for a target machine.
Bottom up parsers: Bottom up ambiguous grammars, YACC Programming specification parsing handle pruning LR Grammar Parsing, LALR Parsing, Parsing

Module 3:
UNIT – I
Semantics: Syntax directed translation, S-attributed and L-attributed grammars, and Intermediate code,abstract syntax tree, translation of simple statements and control flow statements.
UNIT – II
Type checking: Type checking, type conversions, equivalence of type expressions, overloading of functions and operations. Context sensitive features- Chomsky hierarchy of languages and recognizers

Module 4:
UNIT – I
Run time storage: Storage organization, storage allocation strategies scope access to now local names, parameters, language facilities for dynamics storage allocation.
UNIT – II
Code optimization: Principal sources of optimization of basic blocks, peephole optimization, flow graphs, data flow analysis of flow graphs.

Module 5:
UNIT – I
Code generation: Machine dependent code generation, object code forms, generic code generation algorithm.
UNIT – II
register allocation and assignment using DAG representation of Block.

TEXT BOOK:
1. Compilers Principles, Techniques & Tools, Alfred V. Aho, Monica S. Lam, Ravi Sethi and Jeffery D. Ullman, Pearson Addison Wesley Education, Second Edition.
Modern Compiler Implementation in C, Andrew N. Appel, Cambridge University 5.

REFERENCE BOOKS:

1. 1Lex&yacc , John R. Levine, Tony Mason, Doug Brown, O"reilly
2. Modern Compiler Design, Dick Grune, Henry E. BAL, Cariel T. H. Jacobs, Wiley dreamtech.
3. Engineering a Compiler, Cooper & Linda, Elsevier.
4. Compiler Construction, Louden, Thomson.
5. Modern Compiler Implementation in C, Andrew N. Appel, Cambridge University 5.
5.SystemsProgramming and Operating Systems, D

Course Outcomes:

1. At the end of the course, students will be able to:
2. Analyze phases of compilation, particularly lexical analysis, parsing, semantic analysis and code generation.
3. Construct parsing tables for different types of parsing techniques.
4. Classify the Semantic Analysis and Intermediate code generation phase.
5. Apply code optimization techniques to different programming languages.
6. Generate object code for natural language representations.

AY 2024-25 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech CSE(DS) III Year – II Sem			
Course Code: M3254	COMPILER DESIGN LAB	L	T	P	D
Credits: 1		0	0	3	0

Course objectives:
The Student will : 1. Acquire the concept of lexical analyzer.
2. Construct ll(1) parser ,lalr parser and recursive descent parser.
3. Construct an NFA from given regular expression.
4. Compute first and follow of non-terminals.
5. Generate machine code from abstract syntax tree generated by parser.

Experiment 1.
a) Write a C program to test whether a given identifier is valid or not.
b) Write a C program to identify whether a given line is a comment or not.
Experiment 2.
a) Write a C program to recognize strings under 'a*' ,'a*b+', 'abb'.
b) Write a C program to count number of constants, blank spaces and lines in a sentence.
Experiment 3.
Write a C program to design a lexical analyzer.
Experiment 4.
Write a C program for constructing an NFA from given regular expression.
Experiment 5.
a) Write a program to check whether a grammar is left recursive and remove left recursion.
b) Write a program to remove left factoring.
Experiment 6.
Write a program to compute FIRST of non-terminals.
Experiment 7.
Write a program to compute FOLLOW of non-terminals.
Experiment 8.
Write a C program for implementing the functionalities of predictive parser.
Experiment 9.
Write a C program for constructing of LL(1) parsing
Experiment 10.
Write a C program for constructing recursive descent parsing.
Experiment 11.
Write a C program to implement LALR parsing.
Experiment 12
Write a C program to generate Syntax tree for a given code.

Course outcomes:
The Student will be able to:
1. Design a lexical analyzer using c program.
2. Implement different types of parsers.
3. Design an NFA from given regular expression.
4. Compute first and follow of non terminals using a c program.
5. Generate machine code from abstract syntax tree generated by parser.

AY 2024-25 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech CSE(DS) III Year – IISem		
Course Code: M32AA	DEEP LEARNING	L	T	P
Credits: 3		3	0	0

Pre-Requisites:

Probability Statistics, linear algebra. Machine learning .

Course Objectives:

The Student will:

1. Get introduced to various learning techniques of machine learning and understand differences between machine learning and deep learning
2. Understand and analyse optimization techniques and improvements in learning methods
3. Appreciate, understand and apply neural networks as tools for complete learning problems
4. Investigate and deploy/club multi-layer neural networks for learning related to images, text and speech sequences.
5. Appreciate, understand and implement Deep learning in real world practical problems

Module 1:

Introduction to Deep Learning

Introduction to Deep Learning, Brief History of Deep Learning, AI, Machine Learning and Deep Learning, Statistical Learning,

Bayesian Learning, Decision Surfaces, Success stories of Deep Learning

Module 2:

Linear Classifiers

Linear Classifiers, Linear Machines with Hinge Loss, Optimization Techniques, Gradient Descent, Batch Optimization,

Revisiting Gradient Descent, Momentum Optimizer, RMS Prop, Adam.

Module 3:

Neural Network

Introduction to Neural Network, Multilayer Perceptron, Back Propagation Learning, Unsupervised Learning with Deep Network, Auto encoders, Convolutional Neural Network, Building blocks of CNN, Transfer Learning, LSTM Networks, NN in python

Module 4:

Deep Neural Net

Effective training in Deep Net- early stopping, Dropout, Batch Normalization, Instance Normalization, Group Normalization,

Recent Trends in Deep Learning Architectures, Residual Network, Skip Connection Network, Fully Connected CNN, CNN in Python

Module 5:

Practical areas of Deep Learning

Classical Supervised Tasks with Deep Learning, Image Denoising, Semantic Segmentation, Object Detection, Generative Modeling with Deep Learning,

Variational Auto encoder, Generative Adversarial Network, Object recognition with Python.

Text Books:

1. Deep Learning- Ian Goodfelllow, YoshuaBenjio, Aaron Courville, The MIT Press
2. Pattern Classification- Richard O. Duda, Peter E. Hart, David G. Stork, John Wiley & Sons

Inc.

Reference Books:

1. Deep Learning: A Practitioner's Approach by Josh Patterson & Adam Gibson, OReilly Press
2. Python Deep Learning: Exploring deep learning techniques and neural network architectures with PyTorch, Keras, and TensorFlow, 2nd Edition by Ivan Vasilev, Pakt Publication.

E - Resources:

1. https://nptel.ac.in/courses/106/105/106105215/
2. https://www.slideshare.net/LuMa921/deep-learning-a-visual-introduction
3. https://yiqiaoyin.files.wordpress.com/2018/02/deep-learning-notes.pdf

Course Outcomes:

The student will be able to:

1. Identify tools of machine learning and deep learning, appropriate to any problems
2. Apply optimization techniques to improve the quality of various learning solutions.
3. Apply and investigate, neural network for complete learning problems.
4. Deploy deep learning methods in the area of multidimensional and sequential inputs.
5. Investigate the scope of implementation of various deep learning techniques in any real world problem.

AY 2024-25 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech CSE(DS) III Year – II Sem		
Course Code: M32A1	DEEP LEARNING LAB	L	T	P
Credits: 1		0	0	2

Pre-Requisites:

1. Python Programming
2. Mathematics for Machine Learning
3. Machine Learning

Course objectives:
The student will:

1. Understand and implement fundamental deep learning models such as linear classifiers, neural networks, and CNNs.
2. Explore dimensionality reduction and generative approaches using Autoencoders and VariationalAutoencoders.
3. Apply deep learning architectures like RNNs, LSTMs, Transfer Learning, and ResNet to real-world tasks.
4. Investigate the role of optimization and regularization techniques in improving deep learning model performance.
5. Visualize learned representations and apply segmentation models for solving advanced computer vision problems.

Lab Experiments:

1. Implement linear classifiers namely SVM and KNN on CIFAR-10 dataset for classification.
2. Analyze decision surfaces and the effect of hyperparameters on classification performance.
3. Develop a three-layer Neural Network with backpropagation for CIFAR-10 classification.
4. Construct an Autoencoder for dimensionality reduction and reconstruction using an image dataset.
5. Build a VariationalAutoencoder (VAE) for data generation.
6. Implement a Convolutional Neural Network (CNN) on the CIFAR-10 dataset.
7. Apply Transfer Learning using a pre-trained CNN model (e.g., VGG, ResNet).
8. Perform text sequence modeling with RNN and LSTM.
9. Examine the effect of Batch Normalization, Dropout, and Early Stopping in Deep Networks.
10. Implement a Residual Network (ResNet) or Skip Connection based model.
11. Visualize learned features using Saliency maps and Class Visualization.
12. Perform image segmentation using U-Net.

<u>Software And Hardware Requirements:</u>

- SOFTWARE: Python pre-installed, Anaconda Navigator with all python libraries, Online Google collab.
- HARDWARE: Desktop Computers with 4 GB RAM, Minimum 80 GB Hard disk with Windows System.

Course outcomes:
The student will be able to:

1. Implement and compare linear classifiers, neural networks, and CNNs for classification tasks.
2. Develop Autoencoders and VariationalAutoencoders for feature extraction, dimensionality reduction, and data generation.
3. Apply advanced architectures such as RNNs, LSTMs, Transfer Learning, and ResNet for

image and sequence modeling.

4. Analyze the impact of Batch Normalization, Dropout, and Early Stopping on deep learning model performance.
5. Visualize hidden layer features and perform image segmentation using U-Net.

AY 2024-25 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech CSE(DS) III Year – II Sem		
Course Code: M32MC4	CYBER SECURITY	L	T	P
Credits: 0		3	0	0

Course Objectives:
The students should be able to
1. Recognized by cyber crimes and how they are explained.
2. Identify the vulnerabilities of mobile and wireless devices.
3. Examine the crimes in mobile and wireless devices and Acts. 4. Understand about Computer Forensics.
5. Explored to Cyber Security -Organizational Implications.

Module 1:
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 defence, Security Models, risk management,Cyber Threats-Cyber Warfare, Cyber Crime, Cyber terrorism, Cyber Espionage, etc., ComprehensiveCyber SecurityPolicy..
Module 2:
Cyberspace and the Law & CyberForensics: Introduction, CyberSecurity Regulations, Roles of International Law. The INDIAN Cyberspace, National Cybersecurity Policy.
Introduction, Historical background of Cyber forensics, Digital Forensics Science, TheNeed 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.
Module 3:
Cybercrime: Mobile and Wireless Devices: Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Creditcard 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 ComputingEra,Laptops.
Module 4:
Cyber Security: Organizational Implications: Introduction cost of cybercrimes and IPRissues, 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 ofhackers and other cybercriminals.
Module 5:
Privacy Issues: Basic Data Privacy Concepts: Fundamental Concepts, Data PrivacyAttacks, 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 Books

1. Nina Godbole and SunitBelpure, Cyber Security Understanding Cyber Crimes,ComputerForensicsandLegalPerspectives,Wiley.

2 B. B. Gupta, D. P. Agrawal, Hoaxing Wang, Computer and Cyber Security :Principles,Algorithm,Applications,andPerspectives,CRCPress ,ISBN9780815371335, 2018.

Reference Books

1. CyberSecurity Essentials, JamesGraham ,RichardHoward and RyanOtson, CRC Press.
2. Introduction to Cyber Security, Chwan-Hwa(john) Wu,J. David Irwin, CRC Press T&FGroup

E-Resources1.https://lecturenotes.in/subject/611/cyber-security. 2. https://www.slideshare.net/AvaniPatel61/ppt-on-cyber-security. 3. https://onlinecourses.swayam2.ac.in/ugc19_hs25/preview

Course Outcomes

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

CO1. Demonstrate cybercrimes and how they are planned.

CO2. Develop a framework to secure Mobile and wireless devices.

CO3. Interpret crimes and Acts related to mobile and wireless devices.

CO4. Memorize Computer Forensics and it’s related matters

CO5. Identify CyberSecurity-Organizational Implications

AY 2024-25 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech CSE(DS) III Year – II Sem			
Course Code: M32AC4	FOUNDATIONS OF ENTREPRENEURSHIP	L	T	P	D
Credits: 0		2	0	0	0

Course Objective:

e) To implore an understanding of the dimensions and traits required to become an entrepreneur.
e) To understand the Entrepreneurial process and also inspire themto be Entrepreneurs
e) To understand the Entrepreneurship and its role in the society
e) To understand the process of Entrepreneurship & preparing business plans
e) To gain knowledge about the Entrepreneurship Development Institutions of Government

Course Outcomes:

Upon successful completion of the course, the students should be able to

e) Understand the need and significance of Entrepreneurship in the Economy
e) Develop Entrepreneurial Competencies
e) Develop Business Plan with the required contents.
e) Understand contribution of family business and Social Entrepreneurship in the Economy.
e) Plan Strategic perspectives in entrepreneurship

.

UNIT - I:

Understanding Entrepreneurial Mindset- The revolution impact of entrepreneurship- Theevolution of entrepreneurship - Functions of Entrepreneurs – types of entrepreneurs -Approaches to entrepreneurship- Process approach- Role of entrepreneurship in economic development- Twenty first century trends in entrepreneurship.

UNIT - II:

The Individual Entrepreneurial Mind-Set and Personality- The entrepreneurial journey-Stress and the entrepreneur - the entrepreneurial ego - Entrepreneurial motivations- Motivational cycle – Entrepreneurial motivational behavior – Entrepreneurial competencies.

Corporate Entrepreneurial Mindset, the nature of corporate entrepreneur- conceptualization of corporate entrepreneurship Strategy-sustaining corporate entrepreneurship.

UNIT - III:

Launching Entrepreneurial Ventures - opportunities identification- Finding gaps in themarket place – techniques for generating ideas- entrepreneurial Imagination and Creativity- the nature of the creativity process - Innovation and entrepreneurship. Methods to initiate Ventures- Creating new ventures-Acquiring an Established entrepreneurial venture- Franchising- advantage and disadvantages of Franchising.

UNIT - IV:

Legal Challenges of Entrepreneurship - Intellectual property protection - Patents,Copyrights - Trademarks and Trade secrets - Avoiding trademark pitfalls

Feasibility Analysis - Industry and competitor analysis - Formulation of the entrepreneurial Plan- The

challenges of new venture start-ups, developing an effective business model – Sources of finance - Critical factors for new venture development - The Evaluation process.

UNIT - V:

Strategic Perspectives in Entrepreneurship - Strategic planning - Strategic actions-strategic positioning- Business stabilization - Building the adaptive firms - Understanding the growth stage – Internal growth strategies and external growth strategies, Unique managerial concern of growing ventures. Initiatives by the Government of India to promote entrepreneurship, Social and women entrepreneurship -T-hub, J-hub

Suggested Readings:

- D F Kuratko and T V Rao, Entrepreneurship- A South-Asian Perspective, Cengage Learning, 2012.
- Bruce R. Barringer/ R. Duane Ireland, Entrepreneurship Successfully launching new ventures, 4e, Pearson, 2015
- S. S.Khanka, Entrepreneurship Development, S. Chand Publications, 2015. Stuart Read, Effectual Entrepreneurship, Routledge, 2013.
- Rajeev Roy, Entrepreneurship, 2e, Oxford publications, 2012
- Nandan .H, Fundamentals of Entrepreneurship, PHI, 2013
- MadhurimaLalShikhaSahai – Entrepreneurship, Excel Books.
- S.K Mohanthy, Fundamentals of Entrepreneurship, Prentice Hall of India, New Delhi.

AY 2024-25 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech CSE(DS) III Year – I Sem			
Course Code: BTAIDE1	COMPUTER ORGANIZATION AND ARCHITECTURE (PROFESSINAL ELECTIVE-I)	L	T	P	D
Credits: 3		0	0	3	0

Course objectives:
The student will:
1. The purpose of the course is to introduce principles of computer organization and the basic architectural concepts.
2. It begins with basic organization, design, and programming of a simple digital computer and introduces simple register transfer language to specify various computer operations.
3. Topics include computer arithmetic, instruction set design, microprogrammed control unit, pipelining and vector processing, memory organization and I/O systems, and multiprocessors

MODULE - I
Digital Computers: Introduction, Block diagram of Digital Computer, Definition of Computer Organization and Computer Architecture. Central Processing Unit: General Register Organization. Basic Computer Organization and Design: Instruction codes, Computer instructions, Timing and Control, Instruction cycle, Formats, Memory Reference Instructions, Addressing modes, Data Transfer and Manipulation.

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

MODULE - III
Data Representation: Data types, Complements, Fixed Point Representation, Floating Point Representation. Computer Arithmetic: Addition and subtraction, multiplication Algorithms, Division Algorithms, Floating – point Arithmetic operations. Decimal Arithmetic unit, Decimal Arithmetic operations.

MODULE - IV
Input-Output Organization: Input-Output Interface, Asynchronous data transfer, Modes of Transfer, Priority Interrupt Direct memory Access.
Concept of Memory, RAM, ROM memories, memory hierarchy, cache memory and Mapping, secondary storage.

MODULE - V
Reduced Instruction Set Computer: CISC Characteristics, RISC Characteristics.
Pipelining: Basic Concepts, Data Hazards, Instruction Hazards, Influence on Instruction sets, Data path and control considerations, Super Scalar Operation

TEXT BOOK:
1. Computer System Architecture – M. Morris Mano, Third Edition, Pearson/PHI.

REFERENCE BOOKS:

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

Course outcomes:

The student will be able to:

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

AY 2024-25 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech CSE(DS) III Year – I Sem			
Course Code: BTAIDE1	DIGITAL IMAGE PROCESSING (PROFESSIONAL ELECTIVE –I)	L	T	P	D
Credits: 3		3	0	0	0

Module I:
Introduction - Origin - Steps in Digital Image Processing - Components - Elements of Visual Perception - Image Sensing and Acquisition - Image Sampling and Quantization - Relationships between pixels - color models, Two-dimensional mathematical preliminaries, 2D transforms – DFT

Module II:
IMAGE ENHANCEMENT
Spatial Domain: Gray level transformations - Histogram processing - Basics of Spatial Filtering- Smoothing and Sharpening Spatial Filtering - Frequency Domain: Introduction to Fourier Transform- Smoothing and Sharpening frequency domain filters - Ideal, Butterworth and Gaussian filters.

Module III:
IMAGE RESTORATION AND SEGMENTATION
Noise models - Mean Filters - Order Statistics - Adaptive filters - Band reject Filters - Band pass Filters – Notch Filters - Optimum Notch Filtering - Inverse Filtering - Wiener filtering Segmentation: Detection of Discontinuities-Edge Linking and Boundary detection - Region based segmentation Morphological processing- erosion and dilation

Module IV:
WAVELETS AND IMAGE COMPRESSION
Wavelets - Sub band coding - Multi resolution expansions - Compression: Fundamentals - Image Compression models - Error Free Compression - Variable Length Coding - Bit Plane Coding - Lossless Predictive Coding -
Lossy Compression - Lossy Predictive Coding - Compression Standards.

Module V:
IMAGE REPRESENTATION AND RECOGNITION
Boundary representation - Chain Code - Polygonal approximation, signature, boundary segments - Boundary
description - Shape number - Fourier Descriptor, moments Regional Descriptors - Topological feature, Texture -Patterns and Pattern classes - Recognition based on matching.

AY 2024-25 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech CSE(DS) III Year – II Sem			
Course Code: BTAIDE1	NATURAL LANGUAGE PROCESSING (Professional Elective-I)	L	T	P	D
Credits: 3		0	0	4	0

COURSE OBJECTIVES

1. To understand the theoretical foundations of Natural Language Processing.
2. To familiarize with text corpora, lexical resources, and linguistic structures.
3. To process raw text and apply various preprocessing and feature extraction techniques.
4. To explore machine learning and deep learning methods for NLP tasks.
5. To apply NLP techniques for real-world applications such as sentiment analysis, topic modeling, and recommendation systems.

UNIT I – Foundations of NLP

Introduction to NLP – Levels of NLP: Morphological, Lexical, Syntactic, Semantic, Discourse and Pragmatic, Applications of NLP – Computing with Language: Texts and Words – Accessing Text Corpora and Lexical Resources – WordNet – Conditional Frequency Distributions – Simple Statistics with Text – Regular Expressions – Text Normalization and Segmentation – Working with Text, HTML, XML, JSON and PDF files.

UNIT II – Text Processing and Representation

Text Preprocessing using NLTK, SpaCy, TextBlob – Tokenization – Stemming – Lemmatization – Stopword Removal – POS Tagging – Named Entity Recognition – Phrase Matching – Text Feature Extraction using Scikit-Learn – Bag of Words – Vector Space Model – Term Frequency and Document Frequency – TF-IDF – Word Embeddings: Word2Vec and Doc2Vec – Text Similarity Measures.

UNIT III – Categorization, Tagging and Classification

Categorizing and Tagging Words – N-Gram Tagging – Transformation-based Tagging – Supervised Classification – Decision Trees – Naïve Bayes Classifier – Maximum Entropy Classifier – Evaluation of Classifiers – Learning Linguistic Patterns – Text Classification – Text Clustering – Text Summarization – Case Studies in Document Categorization.

UNIT IV – Information Extraction and Syntax Analysis

Information Extraction – Chunking – Developing and Evaluating Chunkers – Named Entity Recognition – Relation Extraction – Parsing Techniques – Context-Free Grammar – Dependency Grammar – Grammar Development – Introduction to Topic Modeling – Latent Dirichlet Allocation – Case Studies and Applications in Information Retrieval and Knowledge Extraction

UNIT V – Advanced NLP and Applications

Sentiment Analysis – Building NLP Pipelines for Text Mining (Social Media, Web Data) – Transformers and Transfer Learning – BERT, GPT Overview – Language Modeling – Feature-based Grammars – Propositional and First-Order Logic – Semantics of English Sentences – Discourse Semantics – Applications: Recommendation Systems, Conversational Agents, Intelligent Information Systems.

Textbooks

1. Steven Bird, Ewan Klein, and Edward Loper, Natural Language Processing with Python: Analyzing Text with the Natural Language Toolkit, O'Reilly Media, 2009.
2. Christopher D. Manning and HinrichSchütze, Foundations of Statistical Natural Language Processing, MIT Press, 1999.
3. Daniel Jurafsky and James H. Martin, Speech and Language Processing, 3rd Edition (Draft), Pearson / Prentice Hall, 2023.
4. PalashGoyal, Sumit Pandey, and Karan Jain, Deep Learning for Natural Language Processing, Apress, 2018.

Reference Books

1. Jacob Eisenstein, Introduction to Natural Language Processing, MIT Press, 2019. (Balanced intro with modern techniques)
2. Delip Rao and Brian McMahan, Natural Language Processing with PyTorch: Build Intelligent Language Applications Using Deep Learning, O'Reilly Media, 2019.
3. SiddharthPatwardhan, Practical Natural Language Processing with Python, BPB Publications, 2021.
4. Tanveer Siddiqui and U.S. Tiwary, Natural Language Processing and Information Retrieval, Oxford University Press, 2008.

Course Outcomes

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

1. Apply fundamental text processing and normalization techniques.
2. Perform tagging, classification, and clustering for text data.
3. Extract features and represent text using statistical and embedding-based methods.
4. Analyze syntax and semantics using parsing and logic-based approaches.

Implement NLP applications such as sentiment analysis, topic modeling, and recommendation systems.

AY 2024-25 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech CSE(DS) III Year – I Sem			
Course Code: BTAIDE2	DATA WAREHOUSING AND DATA MINING (PROFESSIONAL ELECTIVE –II)	L	T	P	D
Credits: 3		3	0	0	0

Pre-Requisites:
Basic knowledge in DBMS Course

Course Objectives:
The students should be able to

1. Introduce the basic concepts and techniques in building a Data Warehouse.
2. Apply pre-processing techniques for any given raw data.
3. Implement and apply basic algorithms for finding frequent patterns in transactional databases.
4. Implement and apply basic algorithms for supervised and unsupervised learning.
5. Discuss an overview of mining complex types of data.

Module 1: Introduction:
Fundamentals of data mining, Data Mining Functionalities, Classification of Data Mining systems, Data Mining Task Primitives, Integration of a Data Mining System with a Database or a Data Warehouse System, Major issues in Data Mining.

Data Preprocessing:
Need for preprocessing the Data, Data Cleaning, Data Integration and Transformation, Data Reduction, Discretization and Concept Hierarchy Generation.

Module 2: Data Warehouse and OLAP Technology for Data Mining:
Data Warehouse, Multidimensional Data Model, Data Warehouse Architecture, Data Warehouse Implementation, From Data Warehousing to Data Mining.

Data Cube Computation and Data Generalization:
Efficient Methods for Data Cube Computation and Data Generalization, Attribute-Oriented Induction.

Module 3: Mining Frequent Patterns:
Basic Concepts, Efficient and Scalable Frequent Item set Mining Methods

Associations and Correlations:
Mining various kinds of Association Rules, From Association Mining to Correlation Analysis, Constraint-Based Association Mining

Module 4: Classification:
Issues Regarding Classification and Prediction, Classification by Decision Tree Induction, Bayesian Classification, Rule-Based Classification, Classification by Back propagation, Support Vector Machines.

Prediction:
Simple linear regression, Logistic Regression, Accuracy and Error measures, evaluating the accuracy of a Classifier or a Predictor, Ensemble Methods.

Module:5 Cluster Analysis Introduction:

Types of Data in Cluster Analysis, A Categorization of Major Clustering Methods, Partitioning Methods, Hierarchical Methods, Density-Based Methods, Grid-Based Methods, Model-Based Clustering Methods, Outlier Analysis.

Mining Complex Types of Data:

Mining Spatial Databases, Mining Multimedia Databases, Mining Time-Series and Sequence Data, Mining Text Data and Mining the World Wide Web.

Applications and Trends in Data Mining: Data Mining Applications, Data Mining System Products and Research Prototypes

Textbook:

1. Data Mining – Concepts and Techniques - Jiawei Han &MichelineKamber, MorganKaufmann Publishers, Elsevier,2nd Edition, 2006.
2. Introduction to Data Mining – Pang-Ning Tan, Michael Steinbach and VipinKumar,Pearson education

Reference Books :

Data Mining Techniques – Arun K Pujari,2nd edition, Universities Press.

1. Data Warehousing in the Real World – Sam Aanhory& Dennis Murray Pearson EdnAsia.
2. Insight into Data Mining, K.P.Soman, S.Diwakar, V.Ajay, PHI, 2008.

E-Resources

1. **https://onlinecourses.nptel.ac.in/noc18**
2. **www.vssut.ac.in/lecture_notes/lecture1428550844.pdf**
3. **www.vssut.ac.in/lecture_notes/lecture1428550844.pdf**

Course Outcomes

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

CO1. Assess raw input data and process it to provide suitable input for a range of data mining algorithms.

CO2. Identify a data warehouse for an organization.

CO3. Apply Data mining techniques such as characterization, comparison, association.

CO4. Apply an appropriate data Mining algorithms for classification and clustering from large databases.

CO5. Demonstrate knowledge on mining complex types of data.

AY 2024-25 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech CSE(DS) III Year – I Sem			
Course Code: BTAIDE2	PATTERN RECOGNITION (PROFESSIONAL ELECTIVE-II)	L	T	P	D
Credits: 3		0	0	4	0

Pre-requisites:

- Programming for problem solving
- Computer Oriented Statistical Methods

Course Objectives:

Introducing fundamental concepts, theories, and algorithms for pattern recognition and machine learning.

UNIT - I

Introduction: Pattern Recognition, Data Sets for Pattern Recognition, Different Paradigms for Pattern Recognition. Representation: Data Structures for Pattern Representation, Representation of Clusters, Proximity Measures, Size of Patterns, Abstractions of the Data Set, Feature Extraction, Feature Selection, Evaluation of Classifier, Evaluation of Clustering.

UNIT - II

Nearest Neighbor Based Classifier: Nearest Neighbor Algorithm, Variants of the NN Algorithm, use of the Nearest Neighbor Algorithm for Transaction Databases, Efficient Algorithms, Data Reduction, Prototype Selection. Bayes Classifier: Bayes Theorem, Minimum Error Rate Classifier, Estimation of Probabilities, Comparison with the NNC, Naïve Bayes Classifier, Bayesian Belief Network.

UNIT - III

Hidden Markov Models: Markov Models for Classification, Hidden Morkov Models, Classification using HMMs. Decision Trees: Introduction, Decision Tree for Pattern Classification, Construction of Decision Trees, Splitting at the Nodes, Overfitting and Pruning, Examples of Decision Tree Induction.

UNIT - IV

Support Vector Machines: Introduction, Learning the Linear Discriminant Functions, Neural Networks, SVM for Classification. Combination of Classifiers: Introduction, Methods for Constructing Ensembles of Classifiers, Methods for Combining Classifiers.

UNIT - V

Clustering: Importance of clustering, Hierarchical Algorithms, Partitional Clustering, Clustering Large Data Sets. An Application-Handwritten Digit Recognition: Description of the Digit Data, Preprocessing of Data, Classification Algorithms, Selection of Representative Patterns, Results.

TEXTBOOK:

1. Pattern Recognition: An Algorithmic Approach: Murty, M. Narasimha, Devi, V. Susheela, Spinger Pub, 1st Ed.

REFERENCE BOOKS:

1. Machine Learning - McGraw Hill, Tom M. Mitchell.
2. Fundamentals of Speech Recognition: Lawrence Rabiner and Bing- Hwang Juang. Prentice Hall Pub.

Course Outcomes:

- Understand the importance of pattern recognition and its representation
- Analyse the variants of NN algorithm
- Understand the necessity of Hidden markov models, decision tree and SVM for classification
- Understand different types of clustering algorithms

AY 2024-25 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech CSE(DS) III Year – II Sem			
Course Code: BTAIDE2	SOFTWARE PROJECT MANAGEMENT (PROFESSIONAL ELECTIVE-II)	L	T	P	D
Credits: 3		4	0	0	0

Pre-Requisites: Software Engineering

Course Objectives:
The students should be able to
1. Identify the different project contexts and suggest an appropriate management strategy.
2. Practice the role of professional ethics unsuccessful software development.
3. Identify and describe the key phases of project management.
4. Determine an appropriate project management approach through an evaluation of the business context and scope of the project.
5. Determine the modern project transition.

Module 1:
Conventional Software Management: The waterfall model, conventional software Management performance.
Improving Software Economics: Reducing Software product size, improving software processes, improving team effectiveness, improving automation, Achieving required quality, peer inspections.

Module 2:
The old way and the new way: The principles of conventional software Engineering, principles of modern software management, transitioning to an iterative process.
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.

Module 3:
Work Flows of the process: Software process workflows, Iteration workflows. 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.

Module 4:
Process Automation: Automation Building blocks.
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.

Module 5:
Project Organizations and Responsibilities: Line-of-Business Organizations Future Software Project Management: Modern Project Profiles, Next generation Software economics, modern process transitions.
Case Study: The command Center Processing and Display system- Replacement (CCPDS-R) 151.

Text Books
1. Software Project Management, Walker Royce: Pearson Education, 2005.
2. Software Project Management, Joel Henry, Pearson Education.

Reference Books
1. Software Project Management, Bob Hughes and Mike Cotterell: Tata McGraw- Hill Edition.
2. Software Project Management in practice, PankajJalote, Pearson Education.2005.

E-Resources 1. https://www.javatpoint.com/software-project-management 2. https://www.geeksforgeeks.org/software-engineering-software-project-management-spm/

Course Outcomes

At the end of the course, the student will be able to:
CO1. Identify the different project contexts and suggest an appropriate management strategy.
CO2. Practice the role of professional ethics unsuccessful software development.
CO3. Identify and describe the key phases of project management.
CO4. Determine an appropriate project management approach through an evaluation of the business context and scope of the project.
CO5. Determine the modern project transition.

AY 2024-25 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech CSE(DS) III Year – II Sem			
Course Code: BTAIDE3	Object Oriented Analysis and Design (Professional Elective-III)	L	T	P	D
Credits: 3		0	0	0	0

UNIT - I Introduction to UML:
Importance of modeling, principles of modelling, object-oriented modeling, conceptual model of the UML, Architecture, and Software Development Life Cycle.
UNIT - II Basic Structural Modeling:
Classes, Relationships, common Mechanisms, and diagrams. Advanced Structural Modeling: Advanced classes, advanced relationships, Interfaces, Types and Roles, Packages.
UNIT - III Class & Object Diagrams:
Terms, concepts, modeling techniques for Class & Object Diagrams.
UNIT - IV Basic Behavioral Modeling-I:
Interactions, Interaction diagrams Use cases, Use case Diagrams, Activity Diagrams
UNIT - V Advanced Behavioral Modeling:
Events and signals, state machines, processes and Threads, time and space, state chart diagrams. Architectural Modeling: Component, Deployment, Component diagrams and Deployment diagrams.

TEXT BOOKS
1. Grady Booch, James Rumbaugh, IvarJacobson : The Unified Modeling Language User Guide, Pearson Education**.**
2. Craig Larman, "Applying UML and Patterns: An Introduction to Object Oriented Analysis and Design and Iterative Development", Pearson Education, 3rd Edition, 2005.

Reference Books:
1. MeilirPage-Jones: Fundamentals of Object Oriented Design in UML, Pearson Education, 1st Edition, 2006.
2. Hans-Erik Eriksson, Magnus Penker, Brian Lyons, David Fado, "UML 2 Toolkit", WILEY-Dreamtech India Pvt. Ltd., Pearson Education, 3rd Edition, 2005.
Course Outcomes:
After the completion of the course, students should be able to:
CO 1: Select the basic elements of modeling such as Things, Relationships and Diagrams depending on the views of UML Architecture and SDLC.
CO 2. Apply basic and Advanced Structural Modeling Concepts for designing real time applications.
CO 3. Design Class and Object Diagrams that represent Static Aspects of a Software System

AY 2024-25 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech CSE(DS) III Year – II Sem			
Course Code: M3255	Object Oriented Analysis and Design Lab (Professional Elective-III)	L	T	P	D
Credits: 1		0	0	0	0

COURSE OBJECTIVE:

- Understand and define problem statements for real-world systems
- Model system behavior using UML Use Case and Activity diagrams
- Design system structure with UML Class and Package diagrams
- Visualize object interactions using UML Sequence and Collaboration diagrams
- Represent dynamic behavior using State Chart diagrams

List of Experiments:

To design the suggested Case Scenarios by following the exercises listed below.
1. To develop a problem statement.
2. Identify Use Cases and develop the Use Case model.
3. Identify the business activities and develop an UML Activity diagram.
4. Identity the conceptual classes and develop a domain model with UML Class diagram.
5. Using the identified scenarios find the interaction between objects and represent them using UML Interaction diagrams.
6. Draw the State Chart diagram.
7. Draw the partial layered, logical architecture diagram with UML package diagram notation.

Case Scenarios
1. Passport automation system.
2. Book bank
3. Exam Registration
4. Stock maintenance system.
5. Online course reservation system
6. E-ticketing
7. Software personnel management system
8. Credit card processing
9. e-book management system
10. Recruitment system
11. Foreign trading system
12. Conference Management System
13. BPO Management System

Course Outcomes

- Develop complete UML models for given problem domains
- Translate requirements into structured design artifacts
- Demonstrate object-oriented principles through diagrammatic modeling
- Apply layered architecture concepts using UML notation
- Analyze and simulate system behavior across various scenarios

AY 2024-25 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech CSE(DS) III Year – II Sem			
Course Code: BTAIDE3	CLOUD COMPUTING (PROFESSIONAL ELECTIVE-III)	L	T	P	D
Credits: 3		4	0	0	0

Pre-Requisites:
1. A course on "Computer Networks".
2. A course on "Operating Systems".
3. A course on "Data base management systems

Course Objectives:
The students should be able to
1. Understand the fundamentals of the Cloud Computing and strategies in the New Economy.
2. Provide a fundamental understanding of different types of cloud computing applications.
3. Provide insights to implement virtualization techniques.
4. Understand the design of cloud and its architecture.
5. Outlines the security and legal issues in Cloud Computing

Module 1:
Principles of Parallel and Distributed Computing, Introduction to cloud computing, Cloud computing Architecture,
Cloud concepts and technologies, cloud services and platforms, Cloud models, cloud as a service, cloud solutions, cloud offerings, introduction to Hadoop and MapReduce.

Module 2:
Cloud Platforms in the Industry, Understanding Scientific Applications for Cloud Environments, cloud applications. Healthcare and education, Scientific Applications, Business and Consumer Applications

Module 3:
Virtualization, cloud virtualization technology, deep dive: cloud virtualization, migrating in to cloud computing. Virtual Machines Provisioning and Virtual Machine Migration Services, On the Management of Virtual Machines for cloud Infrastructure, Comet cloud, T-Systems.

Module 4:
Enterprise cloud computing Paradigm, Federated cloud computing Architecture,
SLA Management in Cloud Computing, Developing the cloud: cloud application Design.

Module 5:
Cloud management, Organizational Readiness and change management in the cloud age, Cloud Security, Data security in the cloud, Legal Issues in the Cloud, Achieving Production Readiness for the cloud Services.

Text Books

1. Cloud Computing: Raj Kumar Buyya , James Broberg, andrzejGoscinski, 2013 Wiley.
2. Cloud computing: Dr Kumar Saurab Wiley India 2011.

Reference Books

1. Cloud Computing: ArshdeepBahga, Vijay Madisetti, 2014, University Press.
2. Mastering Cloud Computing: Raj Kumar buyya, Christian Vecchiola,selvi-2013.

E-Resources

1. https://nptel.ac.in/courses/106/105/106105167/
2. https://sjceodisha.in/wp-content/uploads/2019/09/CLOUD-COMPUTINGPrinciples-and-Paradigms.pdf
3. https://www.alljntuworld.in/download/cloud-computing-cc-materials-notes/
4. https://www.slideshare.net/jeetraj17/cloud-computing-it703-unit-1-5

Course Outcomes

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

CO1. Identify different elements of cloud computing.

CO2. Analyze the impact of Cloud Computing on organizations and strategy.

CO3. . Analyze the different types of virtualization.

CO4. . Design cloud based application.

CO5. Identify security and legal issues in the cloud management.

AY 2024-25 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech CSE(DS) III Year – II Sem			
Course Code: M3256	CLOUD COMPUTING LAB (PROFESSIONAL ELECTIVE-III)	L	T	P	D
Credits: 1		4	0	0	0

Course Objectives

- Learn virtualization using VirtualBox/VMware
- Set up compilers and run code in virtual machines
- Develop and deploy apps on Google App Engine
- Simulate cloud environments using CloudSim
- Configure Hadoop for big data processing

LIST OF EXPERIMENTS

1. Install Virtualbox/VMware Workstation with different flavours of linux or windows OS on top of windows7 or 8.
2. Install a C compiler in the virtual machine created using virtual box and execute Simple Programs.
3. Install Google App Engine. Create hello world app and other simple web applications using python/java.
4. Use GAE launcher to launch the web applications.
5. Simulate a cloud scenario using CloudSim and run a scheduling algorithm that is not present in CloudSim.
6. Find a procedure to transfer the files from one virtual machine to another virtual machine.
7. Find a procedure to launch virtual machine using trystack (Online Openstack Demo Version)
8. Install Hadoop single node cluster and run simple applications like wordcount.

Course Outcomes

- Create and manage virtual machines
- Compile and execute programs in cloud-ready setups
- Deploy web apps using cloud platforms
- Implement custom scheduling algorithms in CloudSim
- Run data tasks on Hadoop single-node cluster

AY 2024-25 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech CSE(DS) III Year – II Sem			
Course Code: BTAIDE3	MOBILE APPLICATION AND DEVELOPMENT (Professional Elective-III)	L	T	P	D
Credits: 3		0	0	0	0

Module 1:
Introduction to Android Operating System: Android OS design and Features – Android development framework, SDK features, Installing and running applications on Android Studio, Creating AVDs, Types of Android applications, Best practices in Android programming, Android tools
Android application components – Android Manifest file, Externalizing resources like values, themes, layouts, Menus etc, Resources for different devices and languages, Runtime Configuration Changes Android Application Lifecycle – Activities, Activity lifecycle, activity states, monitoring state changes

Module 2:
Android User Interface: Measurements – Device and pixel density independent measuring UNIT - s Layouts – Linear, Relative, Grid and Table Layouts
User Interface (UI) Components – Editable and non-editable TextViews, Buttons, Radio and Toggle Buttons, Checkboxes, Spinners, Dialog and pickers
Event Handling – Handling clicks or changes of various UI components
Fragments – Creating fragments, Lifecycle of fragments, Fragment states, Adding fragments to Activity, adding, removing and replacing fragments with fragment transactions, interfacing between fragments and Activities, Multi-screen Activities

Module 3:
Intents and Broadcasts: Intent – Using intents to launch Activities, Explicitly starting new Activity, Implicit Intents, Passing data to Intents, Getting results from Activities, Native Actions, using Intent to dial a number or to send SMS
Broadcast Receivers – Using Intent filters to service implicit Intents, Resolving Intent filters, finding and using Intents received within an Activity
Notifications – Creating and Displaying notifications, Displaying Toasts

Module 4:
Persistent Storage: Files – Using application specific folders and files, creating files, reading data from files, listing contents of a directory Shared Preferences – Creating shared preferences, saving and retrieving data using Shared Preference

Module 5:
Database –Introduction to SQLite database, creating and opening a database, creating tables, inserting retrieving and etindelg data, Registering Content Providers, Using content Providers (insert, delete, retrieve and update)

TEXT BOOKS:

1. Professional Android 4 Application Development, Reto Meier, Wiley India, (Wrox), 2012
2. Android Application Development for Java Programmers, James C Sheusi, Cengage Learning, 2013

REFERENCE:

1. Beginning Android 4 Application Development, Wei-Meng Lee, Wiley India (Wrox), 2013

AY 2024-25 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech CSE(DS) III Year – II Sem			
Course Code: M3257	MOBILE APPLICATION AND DEVELOPMENT LAB (Professional Elective-III)	L	T	P	D
Credits: 1		0	0	0	0

Course Outcomes
1. Student understands the working of Android OS Practically.
2. Student will be able to develop Android user interfaces
3. Student will be able to develop, deploy and maintain the Android Applications.

Course Objective:
1. To understand the components and structure of mobile application development frameworks for Android and windows OS based mobiles.
2. Learn the basic and important design concepts and issues of development of mobile applications

LIST OF EXPERIMENTS
1 .Develop an application that uses GUI components, Font and Colours
2. Develop an application that uses Layout Managers and event listeners.
3. Develop a native calculator application.
4. Write an application that draws basic graphical primitives on the screen.
5. Develop an application that makes use of database.
6. Develop an application that makes use of RSS Feed.
7. Implement an application that implements Multi-threading
8. Develop a native application that uses GPS location information.
9. Implement an application that writes data to the SD card.
10. Implement an application that creates an alert upon receiving a message.
11. Develop a mobile application to send an email

Course Outcomes:
1. Develop mobile applications using GUI and Layouts.
2. Develop mobile applications using Event Listener.
3. Develop mobile applications using Databases.
4. Analyse and discover own mobile app for simple needs.

AY 2024-25 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech CSE(DS) III Year – I Sem			
Course Code: BTAIDO1	INTRODUCTION TO DATA SCIENCE (Open Elective-I)	L	T	P	D
Credits: 3		0	0	4	2

COURSE OBJECTIVES:

1. An understanding of the data operations
2. An overview of simple statistical models and the basics of machine learning techniques of regression
3. An understanding good practices of data science
4. Skills in the use of tools such as python, IDE
5. Understanding of the basics of the supervised learning

UNIT –I

Introduction, Toolboxes: Python, fundamental libraries for data Scientists. Numeric and Scientific Computation: NumPy and SciPy , SCIKIT-Learn: Machine Learning in Python PANDAS: Python Data Analysis Library- Data Science Ecosystem Installation- Integrated development environment (IDE).Web Integrated Development Environment (WIDE): Jupyter- Python for Data Scientists- Data operations: Reading, selecting, filtering, manipulating, sorting, grouping, rearranging, ranking, and plotting

UNIT –II

Descriptive statistics, data preparation. Exploratory Data Analysis data summarization, data distribution, measuring asymmetry. Sample and estimated mean, variance and standard score. Statistical Inference frequency approach, variability of estimates, hypothesis testing using confidence intervals, using p- values

UNIT –III

Supervised Learning : First Step learning curves Training, Validation and Test Two Learning Models Generalities Concerning Learning Models , Support Vector Machines, Random Forest, Ending the Learning Process Example

UNIT –IV

Regression Analysis: Linear Regression: Simple Linear Regression, Multiple Linear Regression and Polynomial, Regression, Sparse Model, Logistic Regression, Unsupervised Learning, Clustering, Similarity and Distances, Metrics to Measure Clustering Quality, Taxonomies of Clustering Techniques, Case Study

UNIT – V

Network Analysis, Basic Definitions in Graphs , Social Networks, Basics in NetworkX centrality, drawing centrality of Graphs, PageRank, Ego-Networks, community Detection

TEXT/REFERENCES BOOK:

1. Introduction to Data Science a Python approach to concepts, Techniques and Applications, Igual, L;Seghi', S. Springer, ISBN:978-3-319-50016-4
2. Data Analysis with Python A Modern Approach, David Taieb, Packt Publishing, ISBN-9781789950069
3. Python Data Analysis, Second Ed., Armando Fandango, Packt Publishing, ISBN: 9781787127487

COURSE OUTCOMES:

1. Describe what Data Science is and the skill sets needed to be a data scientist
2. Explain the significance of exploratory data analysis (EDA) in data science
3. Ability to learn the supervised learning, SVM
4. Apply basic machine learning algorithms (Linear Regression)
5. Explore the Networks, PageRank

AY 2024-25 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech CSE(DS) III Year – I Sem			
Course Code: BTAIDO1	Data Science for Health Care (Open Elective-I)	L	T	P	D
Credits: 3		0	0	0	0

Module 1:

Unit I: Introduction to Healthcare Data Analytics, Electronic Health Records, Components of Health care, Benefits of health care data analytics, how to use Health care analysis.

Unit II: Benefits of Electronic Health Recorder, Barrier to Adopting, Challenges, Phenotyping Algorithms, the role of health care analyst.

Module 2:

Unit 1: Image Analysis Biomedical Image Analysis, Mining of Sensor Data in Healthcare, Biomedical Signal Analysis

Unit II: Genomic Data Analysis for Personalized Medicine, steps involved in Genomic data analysis, different type of genomic analysis, different tools.

Module 3:

Unit I: Data Analytics Natural Language Processing and Data Mining for Clinical Text, Mining the Biomedical Social Media Analytics for Healthcare

Unit II: Advanced Data Analytics for Healthcare, Review of Clinical Prediction Models, Temporal Data Mining for Healthcare Data, Visual Analytics for Healthcare, Predictive Models for Integrating Clinical and Genomic Data.

Module 4:

Unit I: Information Retrieval for Healthcare- Data Publishing Methods in Healthcare Applications and Practical Systems for Healthcare.

Unit II: Data Analytics for Pervasive Health Fraud Detection in Healthcare, Applications and Practical Systems for Healthcare Data Analytics for Pharmaceutical Discoveries, Clinical.

Module 5:

Unit I: Data Confidentially, Data Integrity, Data Protection, Security awareness, Emergent threats: Autonomous, IoT heterogeneity and ubiquity, Physical environment

Unit II: Decision Support Systems- Computer-Assisted Medical Image Analysis Systems- Mobile Imaging and Analytics for Biomedical Data. Emerging Technologies for Health and Medicine Virtual Reality, Augmented Reality, Artificial Intelligence, Robotics, Industry 4.0.

TEXTBOOKS

- Chandan K. Reddy and Charu C Aggarwal, “Healthcare data analytics”, Taylor & Francis,2018 Edition
- Dac-Nhuong Le, Emerging Technologies for Health and Medicine: Virtual Reality, Augmented Reality, Artificial Intelligence, Internet of Things, Robotics, Industry 4.0

REFERENCE BOOKS

1. Hui Yang and Eva K. Lee, “Healthcare Analytics: From Data to Knowledge to Healthcare Improvement, Wiley, 2016.

AY 2024-25 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech CSE(DS) III Year – IISem			
Course Code: BTAIDO2	Basics for R Programming (Open Elective-II)	L	T	P	D
Credits: 3		0	0	0	0

Module 1:
Introduction Introduction to R – Help Functions in R – Vectors – Vectorized Operations – Functions in R – Packages in R.

Module 2:
Matrices, Arrays and Lists Matrix Operations – Adding and Deleting Rows and Columns – Higher Dimensional Arrays – Lists – General List Operations – Accessing List Components and Values – Applying functions to Lists.

Module 3:
Data Frames Creating Data Frames – Matrix-like Operations on a Data Frame – Merging Data Frames – Applying functions to Data Frames – Factors and Tables – Common Functions used with Factors – Working with Tables.

Module 4:
OOP: S3 Classes – S4 Classes – Managing the Objects – Input/Output – Accessing Keyboard and Monitor – Reading and Writing Files – accessing the Internet – String Manipulation.

Module 5:
Data Visualization Introduction to GGPlot2 – Factors – Aesthetics – Plotting with Layers – Overriding Aesthetics – Mapping vs Setting – Histograms – Density Charts – Statistical Transformation – Facets – Coordinates – Themes.

Reference Books
1. Norman Matloff , “The Art of R Programming: A Tour of Statistical Software Design”, No Starch Press, 2011.
2. Jared P. Lander, “R for Everyone: Advanced Analytics and Graphics”, Addison-Wesley Data & Analytics Series, 2013.
3. Mark Gardener, “ Beginning R – The Statistical Programming Language”, Wiley, 2013
4. Robert Knell, “ Introductory R: A Beginner's Guide to Data Visualisation, Statistical
5. Analysis and Programming in R”, Amazon Digital South Asia Services Inc, 2013.

AY 2024-25 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech CSE(DS) III Year – IISem			
Course Code: BTAIDO2	FUNDAMENTALS OF CLOUD COMPUTING (Open Elective-II)	L	T	P	D
Credits: 3		0	0	4	2

Course objectives:
The Students will:
1. Understand the fundamentals of Cloud Computing and strategies in the New Economy.
2. Provide a fundamental understanding of different types of cloud computing applications.
3. Provide insights to implement virtualization techniques.
4. Understand the design of cloud and its architecture.
5. Outlines the categories and multimedia in Cloud Computing.

Module 1: Cloud Computing Overview- Origins of Cloud computing cloud components - Essential characteristics - On-demand self-service Broad network access Location independent resource pooling Rapid elasticity, Measured service.

Module 2: Cloud scenarios - Benefits: scalability. Simplicity, vendor'ssecurity. Limitations - Sensitive information application development - Security concerns - privacy concern with a third party - security level of third party - security benefits Regularity issues: Government policies.

Module 3: Cloud architecture: Cloud delivery model - SPI framework SPI evolution, SPI vs.traditional IT Model and Software as a Service (SaaS):SaaS service providers - Google App Engine, Salesforce. Coin, google plat form - Benefits - operational benefits Economic benefits - Evaluating SaaS Platform as a service (PaaS): PaaS service providers - Right Scale - Salesforce. Coin, Rackspace- Force .com, Services and Benefits

Module 4: Infrastructure as a Service (IaaS): IaaS service providers - Amazon EC2, GoGrid Microsoft soft implementation and support - Amazon EC service level agreement – Recent developments - Benefits Cloud deployment model: Public clouds - Private clouds - Community clouds - Hybrid clouds - Advantages of cloud computing.

Module 5: Virtualization: Virtualization and cloud computing - Need of virtualization – cost, administration. last deployment, reduce infrastructure cost - limitations Types of hardware virtualization: Full virtualization - partial virtualization - para virtualization Desktop virtualization: Software virtualization - Memory virtualization - Storage virtualization - Data virtualization - Network virtualization Micro soft Implementation: Microsoft Hyper V - Vmware features and infrastructure - Virtual Box.

Text Books:
1. Cloud computing a practical approach - Anthony T.Velte, Toby J. Velte Robert Elsenperer TATA McGraw- Hill, New Delhi – 2010.
2. Cloud Computing: Web-Based Application s That Change the Way You Work and Collaborate Online - Michael Miller - Que 2008.

Reference Books: 1. Cloud Computing: ArshdeepBahga, Vijay Madisetti, 2014, University Press. 2. Mastering Cloud Computing: Raj Kumar buyya, Christian Vecchiola,selvi-2013.

E - Resources:
1. https://nptel.ac.in/courses/106/105/106105167/
2. https://sjceodisha.in/wp-content/uploads/2019/09/CLOUD-COMPUTING-Principlesand-

Paradigms.pdf
3. https://www.alljntuworld.in/download/cloud-computing-cc-materials-notes/
4. https://www.slideshare.net/jeetraj17/cloud-computing-it703-unit-1-5

Course outcomes:
The Student will be able to:
1. Identify different elements of cloud computing.
2. Examine the essential processes of a Cloud Computing system.
3. Analyze the impact of Cloud Computing on organizations and strategy.
4. Learns the various marketing strategies for an online business.
5. Explain the infrastructure and multimedia concepts

Open Elective-I & II

Open Elective-I					
S. No	**Code**	**Course Title**	**L**	**Credits**	**Approving BOS**
1	M311OA	Elements of Civil Engineering	**3**	**3**	CE
2	M312OB	Energy Engineering	**3**	**3**	EE
3	M313OC	Basics of Robotics	**3**	**3**	ME
4	M314OD	Mathematical Programming for Engineers	**3**	**3**	ECE
5	M315OE	Introduction to Computer Networks	**3**	**3**	CSE
6	M316OF	Introduction to Data Structure Through Python	**3**	**3**	IT
7	M317OG	Introduction To Natural Language Processing	**3**	**3**	ECM
8	M31AOH	Introduction to Machine Learning	**3**	**3**	AIML
9	M31AOH	Introduction to Machine Learning	**3**	**3**	CSE(AIML)
10	M31DOJ	Introduction to Data Science	**3**	**3**	AIDS
11	M31DOK	Data Science for Health Care	**3**	**3**	AIDS

Open Elective-II					
S. No	**Code**	**Course Title**	**L**	**Credits**	**Approving BOS**
1	M321OA	Construction Management, Contracts and valuation	**3**	**3**	CE
2	M322OB	Sensors and Transducers	**3**	**3**	EE
3	M323OC	Basics of Robotics	**3**	**3**	ME
4	M324OD	Quantum Computing	**3**	**3**	ECE
5	M325OE	Principles of Operating Systems	**3**	**3**	CSE
6	M326OF	Database Management System	**3**	**3**	IT

7	M327OG	Introduction To Mobile Application Development	**3**	**3**	ECM
8	M32AOH	Introduction to Neural Networks	**3**	**3**	AIML
9	M32AOH	Introduction to Neural Networks	**3**	**3**	CSE(AIML)
10	M32DOJ	Basics of R-Programming	**3**	**3**	AIDS
11	M32DOK	Fundamentals Of Cloud Computing	**3**	**3**	AIDS

AY: 2022-23 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech CE III Year-I Sem			
Course Code: **M311OA**	**ELEMENTS OF CIVIL ENGINEERING (Open Elective – I)**	L	T	P	C
		3	**0**	**0**	**3**

Course Objective

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

1. Explain the basic requirements of civil engineering components.
2. Evaluate area for irregular shaped bodies.
3. Explain the various building materials.
4. Plan the building against the fire.
5. Discuss the highway development in India.

Module 1:

Unit-1: Introduction:

History of the civil engineering, sub – disciplines of civil engineering.

Module2

Unit-1: Surveying

Introduction, divisions of surveying, classification of surveying, principles of surveying. Linear measurements and errors–introduction, methods of linear measurements, chaining instruments, types of error and correction. Compass surveying – introduction, angular measurement using compass, whole circle bearing and reduced bearing, fore bearing, and back bearing. Traverse surveying –introduction, chain, and compass traversing, closing error and adjustments. Levelling–introduction, types of levelling instruments, dumpy level, adjustment of level, levelling staff

Module 3: Unit-1: Building Materials and Construction

Materials: Introduction to construction materials like ferrous and nonferrous metals, alloys, Stones, Bricks, Lime, Cement, Timber, Sand, Aggregates, Mortar, Concrete, and bitumen. Construction: Types of building, different loads considered in building design, types of foundation in building, other developments, and constructions of buildings

Module 4: Unit-1: Fire and Earthquake Protection in Building:

Introduction, fire protection in building, structural and architectural safety requirements of resistive structures, fire resistive properties of building materials, fire exit requirements, force and acceleration on building due to earthquake, building response characteristics, building drift

Module 5: Unit-1: Water Supply, Sanitary and Electrical Works in Building:

Introduction, water supply system, water supply layout of a building, house drainage, traps, electrical works in building.

Unit-2: Highway Engineering:

Introduction, historical background of road or highway, classification of roads, pavements androads, traffic control mechanism.

Text Books :

1. "Elements of Civil Engineering" by Mimi Das Saikia, Bhargab Mohan Das and Madan Mohan Das, PHI Learning Private Limited New Delhi.
2. Elements of Civil Engineering" by Dr. R.K. Jain and Dr. P.P. Lodha, McGraw Hill Education,India Pvt. Ltd.
3. "Surveying Vol. I" by Dr. B. C. Punmia, Ashokkumar Jain, Arunkumar Jain16th Edition Publisher: Laxmi Publication Delhi.

Reference Books

1. "Surveying Theory and Practice" by James M Anderson and Edward M Mikhail McGraw Hill Education, India Pvt. Ltd. (7th Edition).
2. "Surveying and Leveling" by R. Subramanian, Oxford University.
3. "Building drawing" by M.G.Shah, C.M.Kale and S.Y.Patki,Tata McGraw Hill.
4. "Civil Engg. Drawing" by S. C. Rangwala, Charotar Pub. House Anand.

E-Resources:

1. https://nptel.ac.in/courses/105/106/105106201/

Course Outcomes

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

1. Explain the ba sic requirements of civil engineering components.
2. Evaluate area for irregular shaped bodies.
3. Explain the various building materials.
4. Plan the building against the fire.
5. Discuss the highway development in India.

CO-PO/PSO Mapping Chart
(3/2/1 indicates strength of correlation)
3 – Strong; 2 – Medium; 1 - Weak

Course Outcomes(COs)	Program Outcomes (POs)												Program Specific Outcomes*	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	1	-	-	-	1	-	-	-	-	-	-	-	-
CO2	2	1	-	-	-	1	-	-	-	-	-	-	-	-
CO3	2	1	-	-	-	1	-	-	-	-	-	-	-	-
CO4	2	1	-	-	-	1	-	-	-	-	-	-	-	-
CO5	2	1	-	-	-	1	-	-	-	-	-	-	-	-
Average	2	1	-	-	-	1	-	-	-	-	-	-	-	-

AY: 2025-26 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech-EEE III Year-I Sem			
Course Code: **M312OB**	**ENERGY ENGINEERING (Open Elective – I)**	L	T	P	C
		3	**0**	**0**	**3**

Pre-Requisites: Power Systems

COURSE OBJECTIVES

COB1: To understand the concepts of energy consumption, classification of energy resources, and the energy scenario in India.
COB2: To analyze the working principles and layouts of conventional power plants including thermal, gas, nuclear, and hydroelectric plants.
COB3: To examine the fundamental principles and applications of renewable energy sources such as solar, wind, tidal, OTEC, geothermal, biomass, and fuel cells.
COB4: To evaluate environmental pollution types, their regional and global impacts, and methods of pollution control.
COB5: To apply principles of energy conservation and management, including energy policy, planning, and the role of energy managers.

UNIT 1: FUNDAMENTALS OF ENERGY [10 L]

Energy consumption and standard of living, Classification of energy resources, Consumption trend of primary energy resources, importance and salient features of conventional energy sources and non-conventional energy sources, Energy scenario in India.

UNIT 2: ENERGY SOURCES-I :(ELEMENTARY ASPECTS)[10 L]

Coal fired steam thermal power plant – layout, working, Gas turbine power plant, Nuclear power plants, Hydro Electric plants

UNIT 3: ENERGY SOURCES-II :(ELEMENTARY ASPECTS)[8 L]

Solar energy, OTEC, Wind power plants, Tidal power plants and geothermal resources, Biomass, Fuel cell.

UNIT 4:ENVIRONMENTAL POLLUTION AND CONTROL [8 L]

Overview of Environmental Concepts: Global Warming - Ozone Layer & UV Radiations - Deforestation Pollution Control: Air Pollution, Solid Waste, Water Pollution, Influence of pollution regionally and globally.

UNIT 5: ENERGY CONSERVATION AND MANAGEMENT [9 L]

Principle of energy conservation, electrical energy conservation opportunities, Definition and Objectives of Energy Management, Energy Management System, Top management support, Energy policy purpose, Roles and responsibilities of energy manager.

TEXT BOOKS

T1: S.Rao and Dr.B.B.Parulekar, "Energy Technology", Khanna pub., Third edition, 1999.
T2: Non-conventional energy resources by B.H.Khan, TMH, 2006.
T3: Desai,AV, "Energy Demand: Analysis, Management and Conservation", Wiley Eastern Limited,1990.

REFERENCE BOOKS

R1: Management of Energy Environment Systems, W.K.Foell, John Wiley and Sons.
R2: Environmental Impact Analysis Handbook, J.G.Rau, D.C.Wood, Mc Graw Hill.

E-RESOURCES

E1: http://nptel.ac.in/courses/112105051/
E2: https://www.youtube.com/watch?v=Ota2_LUuar0
E3: https://www.youtube.com/watch?v=3dJAtHaSQ98

COURSE OUTCOMES

CO1: To explain the relationship between energy consumption and standard of living and classify conventional and non-conventional energy sources.

CO2: To describe the layout, operation, and performance characteristics of thermal, gas, nuclear, and hydroelectric power plants.

CO3: To illustrate the working and applications of renewable energy systems including solar, wind, tidal, OTEC, geothermal, biomass, and fuel cells.

CO4: To assess environmental issues like global warming, ozone depletion, deforestation, and pollution, and suggest appropriate control measures.

CO5: To demonstrate energy conservation techniques, implement energy management strategies, and define the roles of energy managers in organizations.

CO - PO & PSO MAPPING

COs/POs & PSOs	POs											PSOs		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**1**	**2**	**3**
CO1	2	-	-	-	-	-	-	1	1	-	-	2	-	2
CO2	2	-	2	-	-	-	1	1	1	-	-	3	1	2
CO3	2	-	2	-	-	-	1	1	1	-	-	3	1	3
CO4	2	-	-	-	-	-	-	2	3	-	-	2	-	2
CO5	2	-	2	2	-	1	2	2	2	1	-	3	1	3

AY: 2024-25 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech: III Year-I Sem			
Course Code: **M313OC**	**BASICS OF 3D PRINTING (Open Elective – I)**	L	T	P	C
		3	**0**	**0**	**3**

Pre-Requisites: Basic Design Knowledge

Course Objectives:

The objectives of the course is to make the students

1. Impart fundamentals of 3D printing technology
2. Learn how to convert part file into STL format
3. Understand the method of manufacturing liquid based, powder based and solid based technologies
4. Understand numerous applications of 3D printing technology in various field
5. Learn the fundamentals of DFM in manufacturing and Technology

Module 1: Introduction to 3D printing: [10L]

History of 3D printing, Materials and costs involved, 3D printing eco system, future scope of 3D printing, Generic 3D Printing Process, Benefits of 3D Printing, Distinction Between 3D Printing and CNC Machining, Other Related Technologies.

Development of 3D Printing Technology: Introduction, Computers, Computer-Aided Design Technology, Other Associated Technologies, Milestones in 3D Printing Development, 3D Printing around the World

Module 2: 3D Printing Technologies I: [08L]

Basics of various 3D printing technologies, types. Introduction to Liquid Based 3D Printing: Stereo lithography apparatus (SLA): Models and specifications, process, photopolymers, photo polymerization, layering technology, laser and laser scanning, applications, advantages and disadvantages.

Module 3: 3D Printing Technologies II [10L]

Introduction to Laminated object manufacturing (LOM): Models and specifications, Process, Applications, Advantages and disadvantages, Case studies. Fused Deposition Modeling (FDM): Models and specifications, Process, Working principle, Applications, Advantages and disadvantages

Module 4: 3D Printing Design and Required Tools [10L]

Design for 3D Printing - Design for Manufacturing and Assembly, basics of DFM for 3D Printing Concepts and Objectives, Design Tools for 3D Printing. Guidelines for Process Selection - Selection Methods for a Part, Challenges of Selection, Preliminary Selection, Production Planning and Control.

Module 5: Applications & Future Directions for 3d Printing: [10L]

Medical Applications for 3D Printing - Use of 3D Printing to Support Medical Applications, Software Support for Medical Applications, Limitations of 3D Printing for Medical Applications, Further Development of Medical 3D Printing Applications.

Reference Books

1. Ian Gibson, David W Rosen, Brent Stucker., "Additive Manufacturing Technologies: Rapid Prototyping to Direct Digital Manufacturing", Springer, 2010

2. Chua C.K., Leong K.F. and LIM C.S Rapid prototyping: Principles an Applications, World Scientific publications, 3rdEd., 2010
3. Terry Wohlers, " Wholers Report 2000", Wohlers Associates, 2000
4. Paul F. Jacobs, " Rapid Prototyping and Manufacturing"–, ASME Press, 1996
5. D.T. Pham, S.S. Dimov, Rapid Manufacturing: The Technologies and Applications of Rapid Prototyping and Rapid Tooling, Springer 2001.
6. Ali K. Kamrani, Emand Abouel Nasr, "Rapid Prototyping: Theory & Practice", Springer, 2006.

Course Outcomes:

After learning the contents of this paper, the student must be able to

1. Apply 3D printing techniques for various Industrial needs
2. Use software tools for 3D printing
3. Know how to prepare 3D printed modules
4. Learn how to construct products using LOM and FDM technologies
5. Analyze various processes in 3D printing to properly choose for varied applications

CO-PO/PSO Mapping

Course Outcomes	Program Outcomes (POs)/Program Specific Outcomes(PSOs)													
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO1**	**PSO2**
CO1	2	3	1	3	2			-	-	-	-	-	-	-
CO2	2	3	2	3	2			-	-	-	-	-	-	-
CO3	2	3	1	3	2			-	-	-	-	-	-	-
CO4	2	3	2	3	2			-	-	-	-	-	-	-
CO5	2	3	2	3	2			-	-	-	-	-	-	-
Average	**2**	**3**	**1.6**	**3**	**2**	-	-	-	-	-	-	-	-	-

Correlation: 3–Strong; 2–Medium; 1-Weak

AY: 2025-26 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech -ECE III Year- I Sem			
Course Code: **M314OD**	**Mathematical Programming for Engineers (Open Elective – I)**	L	T	P	C
		3	**0**	**0**	**3**

Course Objectives:

1. To introduce the basic environment and interface of MATLAB, including its windows, file types, and built-in help system.
2. To develop proficiency in MATLAB basics such as variables, arrays, vectors, matrices, and script/function file creation and execution.
3. To build programming skills using MATLAB, including understanding data types, control structures, loops, and debugging techniques.
4. To enable students to generate 2D and 3D plots and visualizations, using MATLAB's wide range of graphic functions and solving mathematical and engineering problems such as numerical integration, linear algebra, interpolation, and root finding.

UNIT - I: Introduction:

Basics of MATLAB, MATLAB windows, Advantages of MATLAB, on-line help, file types.
MATLAB Basics: Variables and Constants –Vectors and Matrices- Arrays - manipulation- Built-in MATLAB Functions. Creating and printing simple plots, Creating, Saving and Executing a Script File, Creating and Executing a function file.

UNIT - II: Basic Logical Operations and Data types

Programming Basics: Data types-Operators – Hierarchy of operations, Relational and logical operators, if-end structure, if-else-end structure, if-elseif-else-end structure, switch-case statement, for-end loop, while-end loop, break and continue commands.

UNIT - III: Scripts and Functions

Script Files, Function Files, Debugging methods in MATLAB. Graphics: Basic 2D plots: Printing labels- grid and axes box- Entering text in a box- Axis control-Style options-Multiple plots-subplots-specialized 2D plots: stem-,bar, hist, pi, stairs, loglog, semilog, polar, comet 3D plots: Mesh, Contour, Surf, Stem3, ezplot.

UNIT - IV: Numerical Methods Using MATLAB

Numerical Differentiation, Numerical integration- Newton-Cotes integration formulae, Multi-step application of Trapezoidal rule, MATLAB functions for integration. Linear Equations- Linear algebra in MATLAB, Solving a linear system, Gauss Elimination, Finding eigen values and eigen vectors, Matrix factorizations.

UNIT - V: Nonlinear Equations

System of Non-linear equations, Solving System of Equations Using MATLAB function fsolve, Interpolation-Lagrange Interpolation, Two dimensional Interpolation.
Solution of Ordinary differential Equations (ODEs)-ODE Solvers in MATLAB, Solving First-order equations using ODE23 and ODE45

Text Books

1. Getting started with MATLAB "A quick introduction for scientist and engineers by Rudra Pratap, Oxford publications.

Reference Books

1. Advanced Guide to MATLAB-Practical Examples in Science and Engineering by S.N.Alam, S.Islam, S.K. Patel-I.K. International Publishing House Pvt. Ltd.
2. Stephen J. Chapman-"MATLAB Programming for Engineers"- 5th Edition- Cengage Learning-2015. Getting started with MATLAB (Version 9) The Math works.
3. An Introduction to MATLAB® Programming and Numerical Methods for Engineers 1st Edition by Timmy Siauw Alexandre Bayen, Elsevier-18th April 2014.
4. https://nptel.ac.in/courses/103106118/2
5. https://www.udemy.com/numerical-methods/

Course Outcomes

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

CO1: Demonstrate familiarity with the MATLAB environment, file handling, and basic operations including help utilities.

CO2: Create and manipulate matrices, vectors, and arrays using built-in functions and scripts in MATLAB.

CO3: Write and debug MATLAB programs using control structures, loops, and logical operations.

CO4: Generate and customize 2D and 3D plots for data visualization and analysis and solve mathematical problems using MATLAB, including linear and nonlinear equations, interpolation, differentiation, and numerical integration.

AY: 2025-26 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech: CSE III Year – I Sem			
Course Code: **M315OE**	**INTRODUCTION TO COMPUTER NETWORKS (Open Elective-I)**	L	T	P	C
		3	**0**	**0**	**3**

Pre-Requisites:

1. Knowledge on "Digital Logic Design". & Knowledge on "Computer Organization".

Course Objectives:

The students should be able to

1. Recognize various layering approaches for networking and understand the functionalities of physical layer.
2. Identify the data link layer protocols, multi access protocols and various internetworking devices.
3. Examine design issues of network layer, services provided to above layer and routing, and congestion control protocols.
4. Examine IP protocol, addressing, various protocols like CIDR, ICMP, ARP and RARP of internet Layer and examination of transport layer services.
5. Examine Transport layer protocols like TCP, UDP and various congestion controlling mechanisms, including application layer services, protocols like HTTP, FTP, E-Mail etc.

Module 1:

Overview of the Internet: Protocol, Layering Scenario, TCP/IP Protocol Suite: The OSIModel, Comparison of the OSI and TCP/IP reference model.

Physical Layer: Guided transmission media, wireless transmission media.

Connecting Devices: Repeaters, Hubs, Switches, Gateways and Bridges

Module 2:

Data Link Layer: Design issues, Framing, Error Detection and Error Correction,Hamming Distance, CRC, Flow control and error Control.

Protocols: Noiseless Channels, Noisy Channels,

Multi Access protocols- Random access - ALOHA, CSMA, CSMA/CD and CSMA/CA,Controlled access, Channelization.

Module 3:

Network Layer: Network layer design issues, Store and forward packet switching,connection less and connection oriented network services.

Internetworking: Protocols-IPV4 and IPV6**,** Logical Addressing-IPV4, IPV6, Tunnelingand Packet Fragmentation.

Address Mapping: ARP, RARP, DHCP, ICMP and IGMP.

Routing Algorithms: Shortest Path Finding and Distance Vector Routing Algorithms.

Module 4:

Transport Layer: Process to Process Communication, User Datagram Protocol (UDP), Transmission Control Protocol (TCP), The TCP Connection Establishment, The TCP Connection Release, The TCP sliding window, The TCP congestion control

Module 5:

Application Layer: Introduction, services, Application layer paradigms.

Applications: DNS, WWW, HTTP, FTP, E-MAIL, TELNET, SNMP, SSH.

Text Books

1. ComputerNetworks,5E,Peterson,Davie,Elsevier
2. Introduction to Computer Networks and CyberSecurity, Chawan -HwaWu, Irwin,CRC Publications.
3. Computer Networks and Internets with Internet Applications, Comer

Reference Books

1. Data Communications and Networking - Behrouz A. Forouzan, Fifth EditionTMH, 2013.
2. Computer Networks - Andrew S Tanenbaum, 4th Edition, Pearson Education

E-Resources

1. https://lecturenotes.in/subject/2234/Computer_Network
2. http://nptel.ac.in/courses/106102234/
3. https://www.iitg.ernet.in/dgoswami/CN-Notes.pdf
4. http://www.coursera.org/http://ocw.mit.edu/index.htm.

Course Outcomes

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

CO1: Demonstrate the networking concepts, various Layering approaches and theirfunctionalities

CO2: **Understand** the protocols of Data Link layer, how a medium can be sharedamong multiple devices and internetworking devices used.

CO3: **Work** on fragmentation, assigning of logical address and judge on routing,congestion.

CO4: **Demonstrate** the working of IP Protocol, other protocols of internet layer andservices of transport layer.

CO5: **Explain** the transport layer and application layer protocols, their working

AY 2024-25 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech -IT III Year – I Sem.			
Course Code: M316OF	INTRODUCTION TO DATA STRUCTURES THROUGH PYTHON (OPEN ELECTIVE-I)	L	T	P	C
		3	0	0	3

Pre-requisite: Programming in C

Course Objectives:

1. Understand fundamentals of programming.
2. Adapt Basic taxonomy of python.
3. Familiarize with OOP.
4. Understand Data Structure in Python.
5. Design with OOP Paradigm.

Module 1: Introduction

Relationship between computers and programs, Basic principles of computers, File systems, Using the Python interpreter, Introduction to binary computation, Input / Output.

Module 2: Data types and control structures

Operators (unary, arithmetic, etc.), Data types, variables, expressions, and statements, Assignment statements, Strings and string operations, Control Structures: loops and decision

Module 3: Modularization and Classes

Standard modules, Packages, Defining Classes, Defining functions, Functions and arguments.

Module 4: Data Structures and Exceptions

Data Structures (array, List, Tuples and Dictionary), Error processing, Exception Raising and Handling.

Module 5: Object oriented design

Programming types, Object Oriented Programming, Object Oriented Design, Inheritance and Polymorphism.

Text Books:

1. Data Structures and Algorithms in Python. Michael T. Goodrich , Roberto Tamassia , Michael H. Goldwasser, Wiley, 2013.

Reference Books:

1. Data Structures and Algorithms Using Python Rance D. Necaise, JOHN WILEY &SONs
2. "Starting Out with Python plus MyProgrammingLab with Pearson eText --Access CardPackage (3rd Edition) Tony Gaddis ISBN-13: 978-0133862256"

Web Resources:

1. https://onlinecourses.nptel.ac.in/noc19_cs40/preview

AY: 2024-25 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech ECM III Year-I Sem			
Course Code: **M317OG**	**INTRODUCTION TO NATURAL LANGUAGE PROCESSING (Open Elective – I)**	L	T	P	C
		3	**0**	0	**3**

Pre-Requisites: Data structures and compiler design

Course Objectives:

1. Introduction to some of the problems and solutions of NLP and their relation to linguistics and statistics.

UNIT - I

Finding the Structure of Words: Words and Their Components, Issues and Challenges, Morphological Models

Finding the Structure of Documents: Introduction, Methods, Complexity of the Approaches, Performances of the Approaches, Features

UNIT - II

Syntax I: Parsing Natural Language, Treebanks: A Data-Driven Approach to Syntax, Representation of Syntactic Structure, Parsing Algorithms

UNIT – III

Syntax II: Models for Ambiguity Resolution in Parsing, Multilingual Issues

Semantic Parsing I: Introduction, Semantic Interpretation, System Paradigms, Word Sense

UNIT - IV

Semantic Parsing II: Predicate-Argument Structure, Meaning Representation Systems

UNIT - V

Language Modeling: Introduction, N-Gram Models, Language Model Evaluation, Bayesian parameter Estimation , Language Model Adaptation, Language Models- class based, variable length, Bayesian

topic based, Multilingual and Cross Lingual Language Modeling

TEXT BOOKS:

1. Multilingual natural Language Processing Applications: From Theory to Practice – Daniel M. Bikel and Imed Zitouni, Pearson Publication.

REFERENCE BOOK:

1. Speech and Natural Language Processing - Daniel Jurafsky & James H Martin, Pearson Publications.
2. Natural Language Processing and Information Retrieval: Tanvier Siddiqui , U.S. Tiwary.

Course Outcomes:

CO1. Show sensitivity to linguistic phenomena and an ability to model them with formal grammars.

CO2. Understand and carry out proper experimental methodology for training and evaluating empirical NLP systems

CO3. Manipulate probabilities, construct statistical models over strings and trees, and estimate parameters using supervised and unsupervised training methods.

CO4. Design, implement, and analyze NLP algorithms

CO5. Design different language modeling Techniques.

AY: 2025-26 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech: AIML & CSM III Year – I Sem			
Course Code: **M31AOH**	**INTRODUCTION TO MACHINE LEARNING (Open Elective-I)**	L	T	P	C
		3	**0**	**0**	**3**

Pre-Requisites:
1. Data Structures
2. Design and Analysis of Algorithms
3. Python Programming
4. Mathematics for Machine Learning

Course Objectives:
The students should be able to
1. To introduce the fundamental concepts of machine learning and its applications.
2. To learn the classification, clustering, regression-based machine learning algorithms
3. To understand the deep learning architectures.
4. To understand the methods of solving real life problems using the machine learning techniques.
5. Understand the limitations of machine learning algorithms.

Module 1:
Introduction: Programming Vs Learning-Types of Learning- Statistical Decision Theory – Regression-Classification- Bias Variance.

Linear Regression- Multivariate Regression- Subset Selection- Shrinkage Methods

Module 2:
Principal Component Regression- Partial Least squares- Linear Classification- Logistic Regression- Linear Discriminant Analysis-Support Vector Machines
Neural Networks-Introduction- Early Models- Perceptron Learning- Backpropagation- Initialization- Training & Validation- Parameter Estimation

Module 3:
Decision Trees- Regression Trees- Stopping Criterion & Pruning loss functions- Categorical Attributes- Multiway Splits- Missing Values- Decision Trees – Instability Evaluation Measures

Instance Based learning- K- Nearest Neighbour Learning – Locally weighted Regression – Radial Basis Functions – Case Based Learning.

Module 4:

Ensemble Learning-Bootstrapping & Cross Validation-Class Evaluation Measures- ROC curve- Minimum Description Length- Ensemble Methods – Bagging- Committee Machines and Stacking- Boosting

Random Forests- AdaBoost- Gradient Boosting- Extreme Gradient Boost (XG Boost)

Module 5:
Undirected Graphical Models- Hidden Markov Model- Variable Elimination-Belief Propagation- Partitional Clustering- Hierarchical Clustering

BIRCH (Balanced iterative reducing and clustering using hierarchies) Algorithm- CURE (Clustering Using Representatives) Algorithm-Density-based Clustering- Gaussian Mixture Models- Expectation Maximization

AY: 2025-26 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech -AID III Year- I Sem			
Course Code: M31DOJ	INTRODUCTION TO DATA SCIENCE (Open Elective-I)	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

1. An understanding of the data operations
2. An overview of simple statistical models and the basics of machine learning techniques of regression
3. An understanding good practices of data science
4. Skills in the use of tools such as python, IDE
5. Understanding of the basics of the supervised learning

UNIT –I

Introduction, Toolboxes: Python, fundamental libraries for data Scientists. Numeric and Scientific Computation: NumPy and SciPy , SCIKIT-Learn: Machine Learning in Python PANDAS: Python Data Analysis Library- Data Science Ecosystem Installation- Integrated development environment (IDE).Web Integrated Development Environment (WIDE): Jupyter- Python for Data Scientists- Data operations: Reading, selecting, filtering, manipulating, sorting, grouping, rearranging, ranking, and plotting

UNIT –II

Descriptive statistics, data preparation. Exploratory Data Analysis data summarization, data distribution, measuring asymmetry. Sample and estimated mean, variance and standard score. Statistical Inference frequency approach, variability of estimates, hypothesis testing using confidence intervals, using p- values

UNIT –III

Supervised Learning : First Step learning curves Training, Validation and Test Two Learning Models Generalities Concerning Learning Models , Support Vector Machines, Random Forest, Ending the Learning Process Example

UNIT –IV

Regression Analysis: Linear Regression: Simple Linear Regression, Multiple Linear Regression and Polynomial, Regression, Sparse Model, Logistic Regression, Unsupervised Learning, Clustering, Similarity and Distances, Metrics to Measure Clustering Quality, Taxonomies of Clustering Techniques, Case Study

UNIT – V

Network Analysis, Basic Definitions in Graphs , Social Networks, Basics in NetworkX centrality, drawing centrality of Graphs, PageRank, Ego-Networks, community Detection

TEXT/REFERENCES BOOK:

1. Introduction to Data Science a Python approach to concepts, Techniques and Applications, Igual, L;Seghi', S. Springer, ISBN:978-3-319-50016-4

2. Data Analysis with Python A Modern Approach, David Taieb, Packt Publishing, ISBN-9781789950069

3. Python Data Analysis, Second Ed., Armando Fandango, Packt Publishing, ISBN: 9781787127487

COURSE OUTCOMES:

1. Describe what Data Science is and the skill sets needed to be a data scientist
2. Explain the significance of exploratory data analysis (EDA) in data science
3. Ability to learn the supervised learning, SVM
4. Apply basic machine learning algorithms (Linear Regression)
5. Explore the Networks, PageRank

AY: 2025-26 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech-CSD III Year- I Sem			
Course Code: M31DOK	DATA SCIENCE FOR HEALTH CARE (Open Elective-I)	L	T	P	C
		3	0	0	3

Pre-Requisites:

UNIT - I:

Unit I: Introduction to Healthcare Data Analytics, Electronic Health Records, Components of Health care, Benefits of health care data analytics, how to use Health care analysis.

Unit II: Benefits of Electronic Health Recorder, Barrier to Adopting, Challenges, Phenotyping Algorithms, the role of health care analyst.

UNIT - II:

Unit 1: Image Analysis Biomedical Image Analysis, Mining of Sensor Data in Healthcare, Biomedical Signal Analysis

Unit II: Genomic Data Analysis for Personalized Medicine, steps involved in Genomic data analysis, different type of genomic analysis, different tools.

UNIT - III:

Unit I: Data Analytics Natural Language Processing and Data Mining for Clinical Text, Mining the Biomedical Social Media Analytics for Healthcare

Unit II: Advanced Data Analytics for Healthcare, Review of Clinical Prediction Models, Temporal Data Mining for Healthcare Data, Visual Analytics for Healthcare, Predictive Models for Integrating Clinical and Genomic Data.

UNIT - IV:

Unit I: Information Retrieval for Healthcare- Data Publishing Methods in Healthcare Applications and Practical Systems for Healthcare.

Unit II: Data Analytics for Pervasive Health Fraud Detection in Healthcare, Applications and Practical Systems for Healthcare Data Analytics for Pharmaceutical Discoveries, Clinical.

UNIT - V:

Unit I: Data Confidentially, Data Integrity, Data Protection, Security awareness, Emergent threats: Autonomous, IoT heterogeneity and ubiquity, Physical environment

Unit II: Decision Support Systems- Computer-Assisted Medical Image Analysis Systems- Mobile Imaging and Analytics for Biomedical Data. Emerging Technologies for Health and Medicine Virtual Reality, Augmented Reality, Artificial Intelligence, Robotics, Industry 4.0.

Text Books

1. Chandan K. Reddy and Charu C Aggarwal, "Healthcare data analytics", Taylor & Francis,2018 Edition
2. Dac-Nhuong Le, Emerging Technologies for Health and Medicine: Virtual Reality, Augmented Reality, Artificial Intelligence, Internet of Things, Robotics, Industry 4.0

Reference Books

1. Hui Yang and Eva K. Lee, "Healthcare Analytics: From Data to Knowledge to Healthcare Improvement, Wiley, 2016.

Course Outcomes

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

AY: 2024-25 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech-CE III Year-II Sem			
M321OA	CONSTRUCTION MANAGEMENT, CONTRACTS AND VALUATION (Open Elective -II)	L	T	P	C
		3	0	0	3

Pre-Requisites: Construction Technology and Project Management, Estimation and Costing.
Course Objectives

At the end of the course, the student will be able to:
1. To study the different approaches for successful handling of the project
2. To study different plans and schedules for the development of the project.
3. To study the importance of safety management in construction industry.
4. To study different tenders and contract document for a construction project.
5. To study the different types of reports for different construction projects

Module 1: Unit-I: Concept of a Project

Characteristic features – Project Life cycle – Phases – Project Management – tools and techniquesfor project management – role of project managers.

Module 2: Unit-I: Project management plan and objectives

Programming – scheduling – project organization – organization and project team – role ofcommunication in project management – controlling systems.

Module 3: Unit-I: Safety Management Function

Importance of safety in construction industry, Line versus staff authority, Safety responsibility and accountability in construction industry, Safety organizations, Role of various parties, duties, responsibilities of top management, site managers, supervisors etc., Role of safety officers, Responsibilities of general employees, Safety administration.

Module 4: Unit-I: Types of contract documents

Essentials of contract agreement – legal aspects, penal provisions on breach of contract. Definition of the terms – Tender, earnest money deposit, security deposit, tender forms, documents, and types. Acceptance of contract documents. Termination of contract, completion certificate, quality control, right of contractor, refund of deposit. Administrative approval – Technical sanction. Nominal muster roll, measurement books – procedure for recording and checking measurements – preparation of bills.

Module 5: Unit-I: Valuation

Types of value, purposes of valuation factors affecting value. Different methods of valuation for

different types of assets such as land and building, horticulture, historical places. Valuation Report,contents, standard formats, Case study of any one Report.

Text Books

1. "Construction Technology" by Subira K. Sarkar, Subhajit Saraswathi / Oxford UniversityPress, 3rd edition, Apr 2009.
2. "Project management- strategic Financial Planning, Evaluation and Control" by B M Patel,Vikas Publishing House Pvt. Ltd. New Delhi, 2nd edition oct 2000.

Reference Books

1. "Total Construction Project Management" by George J.Ritz , McGraw-Hill Inc, 2nd editionJan 2013.
2. "Construction Project Management Planning, Scheduling and Control" by K K Chitkara

E-Resources

1. https://nptel.ac.in/courses/105/103/105103093/
2. https://nptel.ac.in/courses/105/103/105103023/

Course Outcomes

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

1. **Describe** the different approaches for successful handling of the project
2. **Apply** different plans and schedules for the development of the project.
3. **Describe** the importance of safety management in construction industry.
4. **List** out the different tenders and contract document for a construction project.
5. **Evaluate** the different types of reports for different construction projects

CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 - Weak														
Course Outcomes(COs)	**Program Outcomes (POs)**												**Program Specific Outcomes ***	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	2	1	-	-	2	1	-	-	2	-	3	1	1	-
CO2	2	1	2	-	-	-	-	-	-	-	2	2	2	-
CO3	2	1	-	-	-	3	-	-	-	-	-	1	1	-
CO4	2	1	-	-	-	2	-	-	-	-	3	-	1	-
CO5	2	2	-	-	-	-	-	-	-	-	2	-	1	-
Average	2	1.4	0.4	-	0.4	1.2	-	-	0.4	-	2	0.8	1.4	-

*AY: 2025-26 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech-EEE III Year-II Sem			
Course Code:	SENSORS AND TRANSDUCERS (Open Elective -II)	L	T	P	D
Credits: **3**		**3**	**0**	**0**	**0**

Pre-Requisites: Nil

COURSE OBJECTIVES

COB1: To understand the fundamentals of measurements, standards, and error analysis in instrumentation.

COB2: To analyze static and dynamic characteristics of transducers through mathematical modelling.

COB3: To apply knowledge of resistive transducers for measurement of physical quantities.

COB4: To examine inductive and capacitive transducers for displacement and signal measurement.

COB5: To explore advanced and modern transducers including piezoelectric, smart, MEMS, and nano sensors.

UNIT 1: Measurements and Instrumentation of Transducers

Measurements – Basic method of measurement –Generalized scheme for measurement systems – Units and standards – Errors– Classification of errors, error analysis – Statistical methods – Sensor – Transducer – Classification of transducers – Basic requirement of transducers.

UNIT 2: Characteristics of Transducers

Characteristics of Transducers: Static characteristics – Dynamic characteristics – Mathematical model of transducer – Zero, first order and second order transducers – Response to impulse, step, ramp and sinusoidal inputs.

UNIT 3: Resistive Transducers

Potentiometer –Loading effect – Strain gauge – Theory, types, temperature compensation – Applications – Torque measurement – Proving Ring – Load Cell
– Resistance thermometer – Thermistors materials – Constructions, Characteristics – Hot wire anemometer.

UNIT 4: Inductive and Capacitive Transducer

Self-inductive transducer – Mutual inductive transducers – Linear Variable Differential Transformer – LVDT Accelerometer – RVDT – Synchros – Microsyn – Capacitive transducer – Variable Area Type – Variable Air Gap type – Variable Permittivity type – Capacitor microphone**.**

UNIT 5: Miscellaneous Transducers

Piezoelectric transducer – Hall Effect transducers – Smart sensors – Fiber optic sensors – Film sensors – MEMS – Nano sensors, Digital transducers.

TEXT BOOKS

T1: Sawhney. A.K, "A Course in Electrical and Electronics Measurements and Instrumentation", 18th Edition, Dhanpat Rai & Company Private Limited, 2007.

T2: Patranabis. D, "Sensors and Transducers", Prentice Hall of India, 2003.

REFERENCE BOOKS

R1: nganathan. S, "Transducer Engineering", Allied Publishers, Chennai, 2003.

R2: ebelin. E.A, "Measurement Systems – Applications and Design", Tata McGraw-Hill, New York, 2000.

E-RESOURCES

E1: http://cas.ee.ic.ac.uk/people/dario/files/E302/1-Sensors.pdf
E2: https://www.electrical4u.com

COURSE OUTCOMES

CO1: To explain the principles of measurement systems, units, standards, and classification of errors.

CO2: To differentiate static and dynamic characteristics of transducers and model their responses to various inputs.

CO3: To apply resistive transducers such as strain gauges, potentiometers, and resistance thermometers in measurement applications.

CO4: To utilize inductive and capacitive transducers including LVDT, RVDT, and microphones for practical measurement systems.

CO5: To evaluate the performance of advanced transducers such as piezoelectric, Hall effect, smart sensors, and MEMS-based devices.

CO - PO & PSO MAPPING

CO/PO & PSO	POs											PSOs		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**1**	**2**	**3**
CO1	3	2	-	2	1	-	-	-	-	1	-	-	1	-
CO2	3	3	1	2	1	-	-	-	-	1	-	-	1	-
CO3	2	2	3	2	2	-	-	-	1	1	-	2	3	2
CO4	2	2	3	2	2	-	-	-	1	1	-	2	3	2
CO5	2	3	1	3	3	-	2	-	1	1	1	-	1	-

AY: 2024-25 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech: -MEC III Year-II Sem			
Course Code: **M323OC**	**BASICS OF ROBOTICS (Open Elective – II)**	L	T	P	C
		3	**0**	**0**	**3**

Pre-Requisites: Engineering Physics, Engineering Mathematics

Module 1

Unit 1: Introduction: Robotics-Introduction-classification with respect to geometrical configuration (Anatomy), Controlled system & chain type: Serial manipulator & Parallel Manipulator.

Unit 2: Components of Industrial robotics - precession of movement - resolution, accuracy & repeatability – Dynamic characteristics- speed of motion, load carrying capacity & speed of response

Module 2

Unit 1: Grippers - End effectors: Mechanical gripper – Magnetic – Vacuum cup and other types of grippers.

Unit2: Industrial robots specifications. Selection based on the Application.

Module 3:

Unit 1: Rotation Matrix, Homogenous TransformationMatrix, transformation matrix problems.

Unit 2: Kinematics**-**Manipulators Kinematics, D-H method of assignment of frames. Direct and Inverse Kinematics for industrial robots.

Module 4:

Unit 1: Trajectory planning: Joint space scheme- Cubic polynomial fit-Obstacle avoidance in operation space-cubic polynomial fit with via point, blending scheme.

Unit 2: Types of motion: Slew motion – joint interpolated motion – straight line motion – problems.

Module 5:

Unit 1: Sensors-Internal sensors: Position sensors & Velocity sensors, External sensors: Proximity sensors, Tactile Sensors, & Force or Torque sensors.

Unit 2: Programming of Robots and Vision System-Lead through programming methods- Teach pendent- overview of various textual programming languages like VAL etc.

Text books

1. Industrial Robotics / Groover M P /McGraw Hill
2. Introduction to Robotics / John J. Craig/ Pearson

Reference books

1. Theory of Applied Robotics / Jazar/Springer.H. Asada and J. J. E. Slotine, ―Robot Analysis and Intelligence‖, Wiley Inter-Science. 1986.

E- Resources

1. https://rb.gy/dw0rkv https://rb.gy/iayh9d
2. https://nptel.ac.in/courses/112/105/112105249/
3. https://nptel.ac.in/courses/112/101/112101098/

Course outcome

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

CO1: Apply the basic components of robots

CO2: Differentiate types of robots and robot grippers.

CO3: Model forward and inverse kinematics of robot manipulators.

CO4: Analyze the path planning of the robot.

CO5: Program a robot to perform tasks in differential applications.

CO-PO/PSO Mapping

Course Outcomes	Program Outcomes(POs)/Program Specific Outcomes(PSOs)													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	1	2	3	3	-	-	-	-	-	-	3	3	3
CO2	3	3	2	3	3	-	-	-	-	-	-	3	3	3
CO3	3	2	2	3	3	-	-	-	-	-	-	3	3	3
CO4	3	2	2	3	3	-	-	-	-	-	-	3	3	3
CO5	1	2	2	3	3	-	-	-	-	-	-	1	3	3
Average	2.6	2	2	3	3	-	-	-	-	-	-	2.6	3	3

Correlation: 3–Strong; 2–Medium; 1-Weak

AY: 2024-25 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech-ECE III Year-I Sem			
Course Code: **M324OD**	**Quantum Computing (Open Elective-II)**	L	T	P	C
		3	**0**	**0**	**3**

Course Objectives: A basic introduction to quantum mechanics, linear algebra and familiarity with the Dirac notation is provided first to get one's quantum moorings right. This is then followed by an introductory treatment of quantum computation and quantum information covering aspects of quantum entanglement, quantum algorithms, quantum channels. Rudimentary quantum computing is introduced using the IBM quantum computer and associated simulators

UNIT - I:

Introduction: Elementary quantum mechanics, linear algebra for quantum mechanics, Quantum states in Hilbert space, The Bloch sphere, Density operators, generalized measurements, no-cloning theorem.

UNIT - II: Quantum Mechanics

Quantum correlations: Bell inequalities and entanglement, Schmidt decomposition, super- dense coding, teleportation.

UNIT - III: Quantum Computing

Quantum cryptography: quantum key distribution

UNIT - IV: Magnetic and Dielectric Materials

Quantum gates and algorithms: Universal set of gates, quantum circuits, Solovay-Kitaev theorem, Deutsch-Jozsa algorithm, factoring

UNIT - V: Laser and Fibre Optics

Programming a quantum computer: The IBMQ, coding a quantum computer using a simulator to carry out basic quantum measurement and state analysis.

Text Books

2. Phillip Kaye, Raymond Laflamme et. al., An introduction to Quantum Computing, Oxford University press, 2007.
3. Chris Bernhardt, Quantum Computing for Everyone, The MIT Press, Cambridge, 2020
4. David McMahon-Quantum Computing Explained-Wiley-Interscience , IEEE Computer Society (2008)

Reference Books

6. Quantum Computation and Quantum Information, M. A. Nielsen & I.Chuang, Cambridge University Press (2013).
7. Quantum Computing, A Gentle Introduction, Eleanor G. Rieffel and Wolfgang H. Polak

8. MIT press (2014)
9. Electronic Communication Systems–Kennedy and Davis, TMH, 4thedition, 2004.
10. Communication Systems Engineering-John. G. Proakis and Masoud Salehi, PHS,2nd ed. 2004.

Course Outcomes

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

CO1:

AY: 2025-26 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech: CSE III Year – II Sem			
Course Code: **M325OE**	**PRINCIPLES OF OPERATING SYSTEMS (Open Elective-II)**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

Pre-Requisites: Programming for Problem solving, Data structures and Algorithms (not mandatory). Computer Organization

Course Objectives:

The students should be able to

1. Understand the basic concepts and functions of computer operating systems.
2. Apply the concurrency control among the operating system programsexecution.
3. Demonstrate the techniques used to manage the memory during programexecution.
4. Explain the various storage management methods and functions of operatingsystems.
5. Design the security features against attacks on operating system

Module 1:

Basics of operating systems: Generations, Types, Structure, Services, System Calls, System Boot, System Programs, Protection and Security.

Process management: Process Concepts, Process States, Process Control Block, Scheduling-Criteria, Scheduling Algorithms and their Evaluation, Threads, Threading Issues.

.

Module 2:

Process synchronization: Background, Critical-Section Problem, Peterson's Solution, Synchronization Hardware, Semaphores, Classic Problems of Synchronization, Monitors.
Deadlock: System Model, Deadlock Characterization, Deadlock Prevention, Detection and Avoidance, Recovery form Deadlock.

Module 3:

Memory management: Main Memory, Swapping, Contiguous Memory Allocation,
Paging, Structure of Page Table, Segmentation, Virtual Memory, Demand Paging, Page Replacement Algorithms, Allocation of Frames, Thrashing.

Module 4:

Storage management: Mass-Storage Structure, Disk Structure, Disk Attachment, Disk Scheduling, RAID Structure.

Module 5:

File system interface: File Concept, Access Methods, Directory Structure, File System Structure Allocation Methods, and Free-Space Management.
System Protection: Goals, Principles, Domain of Protection, Access Matrix, Access Control.

Text Books

1. Operating System Concepts-A. Silberschatz, Peter B. Galvin, Greg Gagne, 10th Edition, John Wiley& Sons inc.
2. Operating Systems Internals and Design Principles – William Stallings, 7thEdition, Prentice Hall.

Reference Books

1. Principles of Operating Systems-Naresh Chauhan, Oxford Higher Education.
2. Operating System A Design Approach-Crowley, TMH.

3. Modern Operating Systems-Andrew S Tanenbaum, 2nd Edition Pearson, PHI.

E-Resources

1. https: // www.tutorialspoint .com/operating_system/
2. https: // www.studytonight.com/operating-system/
3. https: // learn.saylor.com/course/view.php?id=948&sectioned=9674.
4. https: //nptel.ac.in/courses/106/105/106105214/
5. https://www.edx.org/course/computer-hardware-and-operating-systems

Course Outcomes

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

CO1: Compare differing structures of operating systems including process management

CO2: **Apply** different CPU scheduling algorithms and various Memory managementtechniques

CO3: **Illustrate** the use of Bankers algorithm for deadlock avoidance and File system organization.

CO4: **Demonstrate** various mass storage management techniques

CO5: **Analyze** different aspects of protection and security concepts.

AY: 2024-25 Onwards	J.B.INSTITUTEOFENGINEERINGANDTECHNOLOGY (UGC Autonomous)	B. Tech-IT III Year- II Sem			
Course Code: **M3260F**	**Introduction to Database Management System (Open Elective-II)**	L	T	P	C
		3	**0**	**0**	**3**

Pre-Requisites: Programming for Problem Solving

Module 1:

Introduction, Need for a Database Management System, The file based system, Limitations of file based system, The Database Approach , The Logical DBMS Architecture, Three level architecture of DBMS or logical DBMS architecture, Mappings between levels and data independence The need for three level architecture, Physical DBMS Architecture, DML Precompiler, DDL Compiler File Manager, Database Manager, Query Processor, Database Administrator, Data files indices and Data Dictionary, Commercial Database Architecture, Data Models

Module 2:

The Relational Model, Domains, Attributes Tuple and Relation, Super keys Candidate keys and Primary keys for the Relations, Relational Constraints, Domain Constraint, Key Constraint, Integrity Constraint, Update Operations and Dealing with Constraint Violations, Relational Algebra, Basic Set Operation, Cartesian Product, Relational Operations, Entity Relationship (ER) Model, Entities, Attributes, Relationships, More about Entities and Relationships, Defining Relationship for College Database, E-R Diagram, Conversion of E-R Diagram to Relational Database

Module 3:

Relational Database Integrity, The Keys, Referential Integrity, Entity Integrity, Redundancy and Associated Problems, Single-Valued Dependencies, Single-Valued Normalisation, The First Normal Form, The Second Normal Form, The Third Normal Form, Boyce Codd Normal Form, Desirable Properties of Decomposition, Attribute Preservation, Lossless-join Decomposition, Dependency Preservation, Lack of redundancy, Rules of Data Normalisation, Eliminate Repeating Groups, Eliminate Redundant Data, Eliminate Columns Not Dependent on Key

Module 4:

Introduction of SQL, characteristics of SQL, Basic Structure, DDL Commands, DML, DQL, SELECT Statement, WHERE Clause, Useful Relational Operators, Aggregate Functions, SUM Function, AVG Function Compound Conditions and Logical Operators, AND Operator, OR Operator, Combining AND and OR Operators, IN Operator, BETWEEN Operator, NOT Operator, Order of Precedence for Logical Operators, LIKE Operator, Concatenation Operator, Alias Column Names, ORDER BY Clause, Handling NULL Values, DISTINCT Clause, Dynamic SQL , PL/SQL

Module 5:

Transaction concepts, properties of transactions, serializability, testing for serializability, Transaction Isolation and Atomicity, Transaction isolation levels, Implementation of isolation levels, Lock based protocols, Deadlock handling, Timestamp based protocols, two- phase locking protocol.

Textbooks:

1. Data Fundamentals of Database Systems, Elmasri Navrate Pearson Education

Reference Books:

1. Introduction to Database Systems, C.J.Date Pearson Education.
2. Data base System Concepts, Silberschatz, Korth, McGraw hill, V edition.

E - Resources:

Course Outcomes

A0t the end of the course, the student will be able to:

CO1. Construct an Entity-Relationship (E-R) model from specifications and transform it to a relational model.

CO2. Design databases and apply normalization constraints.

CO3. Design databases and apply normalization constraints.

CO4. Construct queries in SQL or Relational Algebra to perform Create, Retrieve, Update and Delete operations on database.

CO5. Apply the principles of database transaction management,

AY: 2024-25 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech ECM III Year-II Sem			
Course Code: **M327OG**	**INTRODUCTION TO MOBILE APPLICATION DEVELOPMENT (OPEN ELECTIVE –II)**	L	T	P	C
		3	**0**	**0**	**3**

Pre-Requisites: 1. Acquaintance with JAVA programming & A Course on DBMS

Course Objectives

1. To demonstrate their understanding of the fundamentals of Android operating systems
2. To improves their skills of using Android software development tools
3. To demonstrate their ability to develop software with reasonable complexity on mobile platform
4. To demonstrate their ability to deploy software to mobile devices
5. To demonstrate their ability to debug programs running on mobile devices

UNIT – I

Introduction to Android Operating System: Android OS design and Features – Android development framework, SDK features, Installing and running applications on Android Studio, Creating AVDs, Types of Android applications, Best practices in Android programming, Android tools Android application components – Android Manifest file, Externalizing resources like values, themes, layouts, Menus etc, Resources for different devices and languages, Runtime Configuration Changes, Android Application Lifecycle – Activities, Activity lifecycle, activity states, monitoring state changes.

UNIT - II

Android User Interface: Measurements – Device and pixel density independent measuring unit – s Layouts – Linear, Relative, Grid and Table Layouts User Interface (UI) Components –Editable and non-editable Text Views, Buttons, Radio and Toggle Buttons, Checkboxes, Spinners, Dialog and pickers Event Handling – Handling clicks or changes of various UI components Fragments – Creating fragments, Lifecycle of fragments, Fragment states, Adding fragments to Activity, Adding, removing and replacing fragments with fragment transactions, interfacing between fragments and Activities, Multi-screen Activities

UNIT – III

Intents and Broadcasts: Intent – Using intents to launch Activities, Explicitly starting new Activity, Implicit Intents, Passing data to Intents, Getting results from Activities, Native Actions, using Intent to dial a number or to send SMS Broadcast Receivers – Using Intent filters to service implicit Intents, Resolving Intent filters, finding and using Intents received within an Activity Notifications – Creating and Displaying notifications, Displaying Toasts

UNIT – IV

Persistent Storage: Files – Using application specific folders and files, creating files, reading data from files, listing contents of a directory Shared Preferences – Creating shared preferences, saving and retrieving data using Shared Preference

UNIT – V

Database – Introduction to SQLite database, creating and opening a database, creating tables, inserting retrieving and etindelg data, Registering Content Providers, Using content Providers (insert, delete, retrieve and update)

TEXT BOOK:

1. Professional Android 4 Application Development, Reto Meier, Wiley India, (Wrox), 2012

REFERENCE BOOKS:

1. Android Application Development for Java Programmers, James C Sheusi, Cengage Learning, 2013
2. Beginning Android 4 Application Development, Wei-Meng Lee, Wiley India (Wrox), 2013

CO-PO/PSO Mapping

Course Outcomes	Program Outcomes(POs)/Program Specific Outcomes (PSOs)													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1														
CO2														
CO3														
CO4														
CO5														
Average														

Correlation: 3–Strong; 2–Medium; 1-Weak

AY: 2024-25 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech: AI ML &CSM III Year -II Sem			
Course Code: **M32AOH**	**INTRODUCTION TO NEURAL NETWORKS (Open Elective-II)**	L	T	P	C
		3	**0**	**0**	**3**

Pre-Requisites:
1. Data Structures
2. Design and Analysis of Algorithms
3. Python Programming
4. Mathematics for Machine Learning

Course Objectives:
The students should be able to
1. Become familiar with the fundamental concepts of Neural Networks and its applications.
2. Learn various learning strategies for solving real world problems.
3. Demonstrate various architectures of Artificial neural networks.
4. Summarise the limitations of the perceptron model
5. Understand the paradigms of associative memories

Module 1:
INTRODUCTION TO NEURAL NETWORKS
Introduction, Humans and Computers, Organization of the Brain, Biological Neuron, Biological and Artificial Neuron Models, Characteristics of Artificial Neural Networks(ANN)

McCulloch-Pitts Model, Historical Developments, Potential Applications of Artificial Neural Networks (ANN).

Module 2:
ESSENTIALS OF ARTIFICIAL NEURAL NETWORKS
Artificial Neuron Model, Operations of Artificial Neuron, Types of Neuron Activation Function, ANN Architectures, Classification Taxonomy of ANN

Connectivity, Learning Strategy (Supervised, Unsupervised, Reinforcement), Learning Rules.

Module 3:
SINGLE LAYER FEED FORWARD NETWORKS
Introduction, Perceptron Models: Discrete, Continuous and Multi-Category

Training Algorithms: Discrete and Continuous Perceptron Networks, Limitations of the Perceptron Model.

Module 4:
MULTI- LAYER FEED FORWARD NETWORKS
Credit Assignment Problem, Generalized Delta Rule, Derivation of Backpropagation (BP) Training, Summary of Backpropagation Algorithm

Kolmogorov Theorem, Learning Difficulties, and Improvements.

Module 5:
ASSOCIATIVE MEMORIES
Paradigms of Associative Memory, Pattern Mathematics, Hebbian Learning, General Concepts of Associative Memory, Bidirectional Associative Memory (BAM) Architecture, BAM Training Algorithms: Storage and Recall Algorithm, BAM Energy Function.

Architecture of Hopfield Network: Discrete and Continuous versions, Storage and Recall Algorithm, Stability Analysis. Neural network applications: Process identification, control, fault diagnosis.

Text Books

1. Laurene Fausett, "Fundamentals of Neural Networks" , Pearson Education,2004..
2. Simon Haykin, "Neural Networks- A comprehensive foundation", Pearson Education, 2003.
3. S.N.Sivanandam, S.Sumathi,S. N. Deepa "Introduction to Neural Networks using MATLAB 6.0", TATA Mc Graw Hill, 2006

Reference Books

11. S. Rajasekharan and G. A. Vijayalakshmi pai, "Neural Networks, Fuzzy logic,
12. Genetic algorithms: synthesis and applications", PHI Publication, 2004.
13. Timothy J. Ross, " Fuzzy Logic with Engineering Applications", Tata McGraw- Hill Inc. 2000

Course Outcomes

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

CO1: Analyze Neural Networks and its applications

CO2: Apply learning strategies for solving real world problems

CO3: Implement various architectures of Artificial neural networks

CO4: Narrate the limitations of the perceptron model

CO5: Develop the paradigms of associative memories.

AY: 2024-25 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech-AID III Year-II Sem			
Course Code: **M32DOJ**	**Basics for R Programming (Open Elective-II)**	L	T	P	C
		3	**0**	**0**	**3**

Pre-Requisites:
Course Objectives:
The students should be able to

UNIT - I:
Introduction Introduction to R – Help Functions in R – Vectors – Vectorized Operations – Functions in R – Packages in R.

UNIT - II:
Matrices, Arrays and Lists Matrix Operations – Adding and Deleting Rows and Columns – Higher Dimensional Arrays – Lists – General List Operations – Accessing List Components and Values – Applying functions to Lists.

UNIT - III:
Data Frames Creating Data Frames – Matrix-like Operations on a Data Frame – Merging Data Frames – Applying functions to Data Frames – Factors and Tables – Common Functions used with Factors – Working with Tables.

UNIT - IV:
OOP: S3 Classes – S4 Classes – Managing the Objects – Input/Output – Accessing Keyboard and Monitor – Reading and Writing Files – accessing the Internet – String Manipulation

UNIT - V:
Data Visualization Introduction to GGPlot2 – Factors – Aesthetics – Plotting with Layers – Overriding Aesthetics – Mapping vs Setting – Histograms – Density Charts – Statistical Transformation – Facets – Coordinates – Themes.

Reference Books

1. Norman Matloff , "The Art of R Programming: A Tour of Statistical Software Design", No Starch Press, 2011.
2. Jared P. Lander, "R for Everyone: Advanced Analytics and Graphics", Addison-Wesley Data & Analytics Series, 2013.
3. Mark Gardener, " Beginning R – The Statistical Programming Language", Wiley, 2013
4. Robert Knell, " Introductory R: A Beginner's Guide to Data Visualisation, Statistical
5. Analysis and Programming in R", Amazon Digital South Asia Services Inc, 2013.

AY: 2024-25 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech-CSD III Year-II Sem			
Course Code: **M32DOK**	**FUNDAMENTALS OF CLOUD COMPUTING (Open Elective-II)**	L	T	P	C
		3	**0**	**0**	**3**

Pre-Requisites:

Course Objectives:

The students should be able to

1. Understand the fundamentals of Cloud Computing and strategies in the New Economy.
2. Provide a fundamental understanding of different types of cloud computing applications.
3. Provide insights to implement virtualization techniques.
4. Understand the design of cloud and its architecture.
5. Outlines the categories and multimedia in Cloud Computing.

Module 1:

Cloud Computing Overview- Origins of Cloud computing cloud components - Essential characteristics - On-demand self-service Broad network access Location independent resource pooling Rapid elasticity, Measured service.

Module 2::

Cloud scenarios - Benefits: scalability. Simplicity, vendor'ssecurity. Limitations - Sensitive information application development - Security concerns - privacy concern with a third party - security level of third party - security benefits Regularity issues: Government policies.

Module 3:

Cloud architecture: Cloud delivery model - SPI framework SPI evolution, SPI vs.traditional IT Model and Software as a Service (SaaS):SaaS service providers - Google App Engine, Salesforce. Coin, google plat form - Benefits - operational benefits Economic benefits - Evaluating SaaS Platform as a service (PaaS): PaaS service providers - Right Scale - Salesforce. Coin, Rackspace-Force .com, Services and Benefits

Module 4:

Infrastructure as a Service (IaaS): IaaS service providers - Amazon EC2, GoGrid Microsoft soft implementation and support - Amazon EC service level agreement – Recent developments - Benefits Cloud deployment model: Public clouds - Private clouds - Community clouds - Hybrid clouds - Advantages of cloud computing.

Module 5:

Virtualization: Virtualization and cloud computing - Need of virtualization – cost, administration. last deployment, reduce infrastructure cost - limitations Types of hardware virtualization: Full virtualization - partial virtualization - para virtualization Desktop virtualization: Software virtualization - Memory virtualization - Storage virtualization - Data virtualization - Network virtualization Micro soft Implementation: Microsoft Hyper V - Vmware features and infrastructure - Virtual Box.

Text Books

1. Cloud computing a practical approach - Anthony T.Velte, Toby J. Velte Robert Elsenperer TATA McGraw- Hill, New Delhi – 2010.
2. Cloud Computing: Web-Based Application s That Change the Way You Work and Collaborate Online - Michael Miller - Que 2008.

Reference Books:

1. Cloud Computing: ArshdeepBahga, Vijay Madisetti, 2014, University Press.
2. Mastering Cloud Computing: Raj Kumar buyya, Christian Vecchiola,selvi-2013.

E - Resources:

1. https://nptel.ac.in/courses/106/105/106105167/
2. https://sjceodisha.in/wp-content/uploads/2019/09/CLOUD-COMPUTING-Principlesand-Paradigms.pdf

3. https://www.alljntuworld.in/download/cloud-computing-cc-materials-notes/
4. https://www.slideshare.net/jeetraj17/cloud-computing-it703-unit-1-5

Course Outcomes

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

CO1: Identify different elements of cloud computing.
CO2: Examine the essential processes of a Cloud Computing system
CO3: Analyze the impact of Cloud Computing on organizations and strategy.
CO4: Learns the various marketing strategies for an online business
CO5: Explain the infrastructure and multimedia concepts