ACADEMIC REGULATIONS

COURSE STRUCTURE AND

DETAILED SYLLABUS

ELECTRICAL AND ELECTRONICS ENGINEERING

B.TECH FOUR YEAR UG COURSE

(Applicable for the batches admitted from 2022-2023)

REGULATION: R22
(I & II Year Syllabus)

J.B. INSTITUTE OF ENGINEERING ANDTECHNOLOGY
(UGCAUTONOMOUS)
BhaskarNagar,Yenkapally(V),Moinabad (M),Hyderabad –500075,Telangana, India

DEPARTMENT - VISION AND MISSION

VISION:

To be a Center for State-of-the Art Learning and Research in the Area of Electrical and Electronics Engineering, where the Stakeholders could Explore, Experiment and Exhibit their Expertise with an Industrial Outlook.

MISSION:

M1: To **equip** the student with advanced learning skills in the field of Electrical and Electronics Engineering as well as the professional skills necessary to face the challenges of the future.

M2: To **engineer** the student to engage in research activities leading to innovative applications of technology for the benefit of society.

M3: To **enable** the student with the qualities of leadership and social responsibility.

The Program Educational Objectives (PEOs) of Electrical and Electronics Engineering Department are as follows**:**

Table 1.2.1. Program Educational Objectives (PEOs)

PEO No.	Program Educational Objectives Statements (PEOs)
PEO1	To create an excellent academic learning environment by providing awareness on lifelong learning, apply the technical knowledge in the field of Electrical and Electronics Engineering to pursue higher studies or in their professional career.
PEO2	To demonstrate technical knowledge to analyze, design, develop, optimize, and implement complex electrical systems, gain multidisciplinary knowledge through projects and industrial training, providing a sustainable competitive edge in R&D and meeting industrial needs in the field of Electrical and Electronics Engineering.
PEO3	To possess professional and ethical attitudes with effective communication skills, entrepreneurial thinking and an ability to relate engineering issues to the broader social context. Also, develop requisite skills to excel in their chosen profession with an awareness of contemporary issues and the need for life -long learning.

PROGRAMME OUTCOMES (POs)

After the completion of Electrical and Electronics Engineering Program, the students will be able to have the following Program Outcomes:

Table B.2.1.1.1 Details of Programme Outcomes

PO	Programme Outcomes (POs)
PO1	**Engineering Knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2	**Problem analysis**: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3	**Design/Development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations
PO4	**Conduct investigations of Complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5	**Modern Tool Usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO6	**The Engineer and Society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice
PO7	**Environment and Sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO8	**Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9	**Individual and Teamwork**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10	**Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, give and receive clear instructions.
PO11	**Project Management and Finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO12	**Life-long learning**: Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PSO (Programme Specific Outcomes):

Table B.2.1.1.2 Details of Programme Specific Outcomes

PSO	**Programme Specific Outcomes**
PSO1	**Modeling and Analysis** – An ability to mathematically model and analyse the performance of Electrical Machines, Power Electronic systems, Control & Instrumentation systems, Electrical Power systems.
PSO2	**Design and Development** – An ability to Design the hardware and software requirements for the Development of Electric drives & Control, Conventional & Renewable Energy and Automation.

JBIET Academic Regulations - R22

Applicable to

B.Tech Regular Four Year Degree Programme

(For the Batches admitted from the Academic Year 2022- 2023)

&

B.Tech (Lateral Entry Scheme)

(For the Batches admitted from the Academic Year 2023- 2024)

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&

B.Tech (Lateral Entry Scheme)

(For the Batches admitted from the Academic Year 2023- 2024)

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

JB Institute of Engineering and Technology (hereinafter referred to as JBIET) academic regulations **JBIET - R22** are given here under. These regulations approved by the Academic Council shall be in force and applicable from the academic year 2022-23 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 2022-23.

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	**25**	Mining Engineering (MIE)
9	**66**	Computer Science and Engineering (Artificial Intelligence and Machine Learning)-CSE(AI&ML)
10	**67**	Computer Science and Engineering (Data Science)-CSE(DS)
11	**72**	Artificial Intelligence and Data Science(AI&DS)
12	**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 (EAMCET) 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 instructions for the entire Undergraduate Programme in Engineering &Technology is English only.

3.0 Duration of the UG Program

Each Under Graduate (**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.

3.1 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.

3.2 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.

3.3 However, student is permitted to appear in the supplementary examinations for ***two* more** academic years after the Maximum Duration of course work as mentioned in **3.2** to complete backlog subjects for fulfilling the academic requirements for the completion of the programme, failing which he/she shall forfeit his / her seat in B.Tech course.

4.0 B. Tech Programme Structure

The curriculum 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 Subject/ Course Classification

S. No.	Broad Course Classification	Course Group/ Category	Course Description
1	Foundation Courses (FnC)	BS – Basic Sciences	Includes Mathematics, Physics and Chemistry subjects
2		ES- Engg. Sciences	Includes fundamental engineering subjects
3		HS – Humanities and Social sciences	Includes subjects related to Humanities, Social sciences and Management
4	Core Courses (CoC)	PC– Professional Core	Includes core subjects related to the parent Discipline/ department/ branch of Engineering.
5		PW- Project Work	B. Tech project or UG project or UG major project or Project Stage I & II
6		Industrial training / Mini- project	Industrial training/ Summer Internship/ Industry Oriented Mini-project/Mini-project
7	Elective Courses (EIC)	PE – Professional Electives	Includes elective subjects related to the parent discipline/ department/ branch of Engineering.
8		OE – Open Electives	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/ branch of Engineering.
10	Audit courses (AC)	-	Value Added Course / Audit Courses (Non-Credit)
11	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.	**23**
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.	**57**
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.	**15**
7	Mini-project / Project Work / Internship / Industrial training / Seminar	**15**
8	Mandatory Courses / Audit Courses.	**Non-Credit**
TOTAL		**160**

5.0 Credit System: 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/D: C (Lecture periods: Tutorial periods: Practical/Drawing 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.

For Internship and Project Work credits are assigned based on the complexity of the work to be carried out.

The four-year curriculum of any B. Tech Program of study shall have a total of 160 credits. However, the curriculum for students admitted under lateral entry shall have a total of 122 credits.

6.0 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.

7.0 Course Registration

7.1. 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.

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

7.3 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 Head of the Department, faculty advisor and the student.

7.4 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.

7.5 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.

7.6 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).

7.7 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.

7.8 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 cannot opt for an open elective subject offered by his own (parent) department, if it is already listed under any category of the subjects offered by parent department in any semester.

7.9 Professional Electives: The students have to choose requisite number of professional electives (as prescribed in the course structure) from the list of professional electives.

7.10 Elective Courses (Professional Electives and Open Electives) shall be offered by a Department if a minimum of 30 students register for that course.

8.0. Academic Requirements

8.1 Attendance Requirements

8.1.1 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 (excluding attendance in Mandatory Courses and Audit Courses) for that semester. The attendance of Mandatory and Audit Non-Credit Courses should be maintained separately. Two periods of attendance for each theory subject shall be considered if the student appears for the mid-term examination of that subject.

8.1.2 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.

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

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

8.1.5 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. They will not be promoted to the next semester.

8.1.6 Students will not be promoted to the next semester and no grade allotments or SGPA / CGPA calculations will be done for such students for the entire semester in which they have been detained.

8.1.7 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.

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

8.2 Credit Requirements

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

8.2.2. 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.

8.2.3. 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.

9.0 Break of Study from a Program (Gap Year)

9.1 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*.

9.2 In case, a student wishes to extend the gap year for one more consecutive year, he 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 has taken break of study.

9.3 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, Principal shall decide whether to permit the student to avail the gap year or not.

9.4 The students permitted to rejoin the program 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 Head of the Department, at the beginning of the readmitted semester for registering additional / equivalent courses to comply with the curriculum in-force.

9.5 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).

9.6 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.

10.0. Evaluation-Distribution and Weightage of marks

10.1 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	100	--
9	Seminar	50	--
10	**Project Stage - II**	**30**	**70**

10.2. Continuous Internal Evaluation (CIE)

10.2.1 Theory Courses: For theory courses, during the semester there shall be 2 **mid-term examinations** (***internal exams of 20 marks each***), **2 quizzes *of 5 marks each***), ***4 Unit tests of 10 marks each*** and ***2 assignments carrying 5 marks each***.

S. No	Component	Frequency of Evaluation	Marks for Each test	Final Marks (Average)
1	Mid Examinations	2	20	
2	Quiz Test	2	5	
3	Unit Tests	4	10	
4	Assignments	2	5	
Total			40	40

(a) **Quiz Examinations (5 marks):**

Each quiz examination will be of 20 minutes duration consisting of objective questions for 5 marks. The objective question paper is set with 20 questions of multiple choice, fill-in the blanks and matching type of questions. The Quiz examination shall be conducted after each spell of instructions.

(b) **Mid-term Examinations (20 marks):**

Each mid-term examination will be of 1 hour 20 minutes consisting of descriptive questions (long answer) for 20 marks. The descriptive paper is four questions of 5 marks each with either / or choice. 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.

(c) **Unit Tests (10 Marks):**

The Unit Tests shall be conducted by the faculty member handling the subject. The duration of Unit Test shall be 1 hour. The question paper of Unit Test shall be of descriptive type with 3 questions each of 5 marks out of which student shall answer any two. Unit Test-1 and 2 shall be conducted before I Mid Term Examination covering the syllabus of Module-1, Module-2 respectively. Unit Test-3 and 4 shall be before II Mid Term Examination covering the syllabus of Module-3, Module-4 and

Module-5 respectively. The average of marks obtained from 1,2 and the average of marks obtained 3,4 is to be considered for CIE-I and CIE-II respectively.

(d) **Assignments (5 marks):**

There shall be two assignments for 5 marks each. Assignment-1 shall be submitted before First mid examinations covering the topics from Module-1 and Module-2, and the Assignment-2 shall be submitted before Second 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.

(e) If a student is absent for any Mid-Term Examinations 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

10.2.2 Laboratory Courses

Continuous Internal Evaluation (CIE): The continuous internal evaluation for laboratory courses is based on the following parameters:

There shall be Day-to-Day Evaluation for 30 marks which includes day to day Attendance (5 Marks), observation writing(5 Marks), Experimental setup/Program writing(5 Marks), Experiment conduction/Program Execution(5 Marks), Record writing(5 Marks), Viva Voce(5 Marks).

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

10.3 Semester End Examinations (SEE)

10.3.1 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.

10.3.2 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.

10.4 Internship

The students should undergo two Internships. Internship-I shall be carried out under the guidance of professors from Science, 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

10.5 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.

10.6 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.

10.7 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 Head of the Department, Project Coordinator, Project supervisor and one senior faculty member

shall evaluate the Project Work for 50 marks. **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 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**. 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 has to reappear for the same in the next subsequent semester, as and when it is scheduled.

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

10.8 Mandatory Courses (MC)

Mandatory courses carry "ZERO" credits. There shall be NO Semester-end examination. However, attendance in Mandatory courses shall be considered while calculating aggregate attendance in a semester. The Continuous Internal Evaluation (CIE) shall be conducted and evaluated for 30 marks similar to the Theory courses. In addition to this an internal Examination for 70 marks covering the syllabus of from all five modules. 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.

10.9 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 13.1 and the same shall be considered for internal marks and attendance.

11.0 Passing Standards

11.1 A student shall be deemed to have satisfied the minimum academic requirements and earned the credits allotted to each subject/ course/ Laboratories/ Project Stage-II etc. which are having both CIE and SEE, only if he/she secures not less than ***35% of marks (21 out of 60 marks)*** in the semester end examination and a **minimum of 40% of marks (**40 marks out of 100**) in the sum total** of the *continuous internal evaluation (CIE) and semester end examination (SEE)* taken together.

11.2 A student is deemed to have fulfilled the minimum academic requirements and earned the credits allotted to subjects having only internal evaluation (CIE), such as Internships / Industry Oriented Mini Project / Seminar / Project Stage - I if the student secures not less than 40% marks in each of them. However, a student who fails to secure minimum 40% marks or abstains from such subjects, he / she will be permitted to appear in the re-examination which shall be conducted before completion of Semester End Examinations. If the student fails in such re-examination he/she has to reappear for the same in the next subsequent semester, as and when it is scheduled.

11.3 The student shall deemed to have failed to earn the credits allotted to subjects having only internal evaluation (CIE), if he (i) does not submit a report on Industrial Oriented Mini Project/Summer Internships, Project Stage-I or does not make a presentation of the same before the evaluation committee as per schedule, or (ii) does not present the seminar or (iii) secures less than 40% marks in Industrial Oriented Mini Project/Summer Internship and seminar evaluations.

11.4 Such failed students 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.

11.5 Recounting/Revaluation/Challenging Evaluation: Students shall be permitted to apply for Recounting /Revaluation/ Challenging Evaluation 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/Challenging Evaluation, 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.

11.6 Supplementary Examinations:

The supplementary examinations Odd semester shall be conducted during even semester regular/supplementary examinations and even semester supplementary examinations during Odd semester regular supplementary examinations.

Advance supplementary examinations shall be conducted to the students failed in the IV B.Tech - II Semester Regular Examinations. A notification Advance supplementary examinations shall be released after the announcement of regular results.

12.0 Promotion Rules

The students shall be deemed to have promoted to higher classes i.e. from I Year to II year , II year to III Year and III year to IV Year only after earning the below mentioned credits from theory and laboratory courses registered by him/her. The tables given in 10.1, 10.2 provide the details of the credits to be earned by the student (admitted under Regular and Laterally Entry Scheme respectively) to get promoted to higher classes.

12.1 Promotion Rules for Regular 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 year first semester	(i) Regular course of study of first year second semester.
		(ii) Must have secured at least 19 credits out of 38 credits i.e., 50% credits up to first year second semester from all the relevant regular and supplementary examinations, whether the student takes those examinations or not.
3.	Second year first semester to second year second semester	Regular course of study of second year first semester.
4	Second year second semester to third year first semester	(i) Regular course of study of second year second semester.
		(ii) Must have secured at least 40 credits out of 80 credits i.e., 50% credits up to second year second semester from all the relevant regular and supplementary examinations, whether the student takes those examinations or not.
5	Third year first semester to third year second semester	Regular course of study of third year first semester.

6	Third year second semester to fourth year first semester	(i) Regular course of study of third year second semester.
		(ii) Must have secured at least 61 credits out of 122 credits i.e., 50% 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.

12.2 Promotion Rules for Lateral Entry Students

S. No	Promotion	Conditions to be fulfilled
1	Second year first semester to second year second semester	Regular course of study of second year first semester.
2	Second year second semester to third year first semester	**(i)** Regular course of study of second year second semester.
		(ii) Must have secured at least 21 credits out of 42 credits i.e., 50% credits up to second year second semester from all the relevant regular and supplementary examinations, whether the student takes those examinations or not.
3	Third year first semester to third year second semester	Regular course of study of third year first semester.
4	Third year second semester to fourth year first semester	(i) Regular course of study of third year second semester.
		(ii) Must have secured at least 42 credits out of 84 credits i.e., 50% credits up to third year second semester from all the relevant regular and supplementary examinations, whether the student takes those examinations or not.
5	Fourth year first semester to fourth year second semester	Regular course of study of fourth year first semester

13.0 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.

13.1 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 in successfully completing the MOOC course in the first attempt, he/she shall successfully 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 R22.

13.2 Mandatory Massive Open Online Courses (MOOCs)

A student has to undergo one mandatory MOOC course (Professional Elective-V) of 3 credit from the online MOOC platforms listed in 13.0 during IV-I semester. The department has to finalize the electives offered on MOOC platform at the end of III-I semester and take prior approval from the BOS for the MOOC course (including syllabus) to be registered by the student.

14.0 Awarding Grace Marks

A student who fails in two theory courses falling short of a few marks is eligible for 0.15% of total marks as Grace Marks.

- Grace marks addition is applicable for maximum of 2 subjects.
- Grace marks can be added only for external examinations.
- Among all the external examinations appeared by the student in a specific subject, the highest marks are considered for adding Grace Marks.
- The provision of Grace Marks is also extended for class change.

The Description of class change is given below:

i. Class Change from 49.85 % to 50 % for Pass Class to Second Class
ii. Class Change from 59.85 % to 60 % for Second Class to First Class
iii. Class Change from 69.85 % to 70 % for First Class to First Class with distinction

Note: Grace marks cannot be added to internal marks.

15.0 Internal improvement examination

Student is permitted to appear for improvement of internal marks of all papers of the B. Tech in which the candidate has not passed due to the shortage of Internal Marks. Students who secured internal marks less than specified marks are only eligible to write the Internal Improvement Examination. The specified marks can be computed using the following formula.

- For B. Tech Course: 0.4*Total-marks - 0.35*External-marks

- Students who have completed all semesters of their, B. Tech course work can only avail this option.
- This internal improvement option is extended up to double the duration of the course work.
- In case of Students who secure less marks in internal improvement examination than his/her previous internal marks or if the student is has registered for Internal Improvement but has not appeared / absent, the old marks will be retained.
- A separate notification shall be released by the JBIET examination branch for conduction of this examination and the students shall register for this option at the time of this notification.

16.0 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.

16.1 The student shall pursue a program 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 program of study for not less than three academic years and not more than six academic years.

16.2 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.

16.3 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

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

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. program, 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 for 2-Year UG Diploma Certificate will not be permitted to Re-join in B. Tech. III Year – I Semester and continue for completion of remaining years of study for 4-Year B. Tech. Degree.

16.5 Award of Class

A student who qualifies for the award of the degree as is placed in the following classes.

i. Students with final CGPA (at the end of the under graduate programme) ≥ 7.50 shall be placed in '**first class with distinction'**.

ii. Students with final CGPA (at the end of the under graduate program me) ≥ 6.50 but < 7.50, shall be placed in '**first class'**.

iii. Students with final CGPA (at the end of the under graduate program me) ≥ 5.50 but < 6.50, shall be placed in '**second class'**.

iv. All other students who qualify for the award of the degree, with final CGPA (at the end of the undergraduate programme) ≥ 5.00 but < 5.50, shall be placed in '**pass class**'.

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

17.0 Transitory Regulations:

The transitory guidelines are applicable to the students

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

17.2 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

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

Students readmitted under conditions mentioned 16.1, 16.2 and 16.3 shall satisfy all the eligibility requirements as mentioned in 3.0

If a student readmitted to R22 Regulations, has already studied any subject with 80% of syllabus common in his / her previous regulations, that particular subject in R22 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 R22 regulations, remedial classes shall be arranged by the concerned HoD.

18.0. Grading Procedure

18.1 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.

18.2 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).

18.3 The Semester Grade Point Average (SGPA) is calculated by dividing the sum of Credit Points (Σ 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:

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

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.

18.4 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.

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

(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/ Subject Title	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

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

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.

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

18.6 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 he passed his last exam in that semester. However, Mandatory Courses will not be taken into consideration.

19. 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.

20.0 Malpractices Rules

Disciplinary Action For / Improper Conduct in Examinations

	Nature of Malpractices/Improper conduct	**Punishment**
	If the student:	

1. (a)	Possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, cell phones, pager, palm computers or any other form of material concerned with or related to the subject of the examination (theory or practical) in which 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 other body language methods 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.
	Smuggles in the answer book or additional sheet or takes out or arranges to send out the question paper during the examination or	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the student has already

3.	answer book or additional sheet, during or after the examination.	appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the 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	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.

	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	
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 student 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 award suitable punishment.*

ANNEXURE-I

J.B.INSTITUTE OF ENGINEERING AND TECHNOLOGY

(UGC Autonomous)

Accredited by NBA & NAAC, Approved by AICTE & Permanently affiliated to JNTUH

Yenkapally(V), Moinabad(M), P.O. Himayat Nagar, R.R. District, Hyderabad-500075

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

1. Objectives

The key objectives of offering B. Tech. with Honours program 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. program.
2) For B. Tech with Honours program, 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 program, 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 program 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 program 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 program 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.

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

10) Students can register for the Honours program 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. program as well as fulfils the requirements for Honours program.

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 program offered at their respective departments without any overlap/clash with other courses of study in the respective 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 more CGPA.**

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

c) Prior approval of mentor and Head of the Department for the

enrolment into Honours program, 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 by the students till II year I semester.**

e) Successful completion of 20 credits earmarked for honours program with at least 7.5 CGPA along with successful completion of 160 credits earmarked for regular B. Tech. Program 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 program will not be considered.

4. Registration for the course in Honours program

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 at the 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.

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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.

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ANNEXURE-II

J.B.INSTITUTE OF ENGINEERING AND TECHNOLOGY

(UGC Autonomous)

Accredited by NBA & NAAC, Approved by AICTE & Permanently affiliated to JNTUH

Yenkapally(V), Moinabad(M), P.O. Himayat Nagar, R.R. District, Hyderabad-500075

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

5. Objectives

The key objectives of offering B. Tech. with Minor program 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 better opportunity in interdisciplinary areas of engineering &

technology.

- To provide an opportunity to students to pursue their higher studies in the inter-disciplinary areas in addition to their own branch of study.
- To offer the knowledge in the areas which are identified as emerging technologies/thrust areas of Engineering.

6. Academic Regulations for B. Tech. Minors degree

14) The weekly instruction hours, internal & external evaluation and award of grades are on par with regular 4-Years B. Tech. program.

15) For B. Tech with Minors program, 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 Minors program, 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.**

16) 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.

17) There is no transfer of credits from courses of Minors program to regular B. Tech. degree course & vice versa.

18) 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.

19) 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.

20) The **choice to opt/take the Minors program is purely on the choice of the students**.

21) The student shall be given a **choice of withdrawing all the courses registered and/or the credits earned for Minors program 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.

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

23) Students can register for the Minors program only if they fulfill the **eligibility criteria.**

24) A student can graduate with Minors if he/she fulfils the requirements for his/her regular B. Tech. program as well as fulfils the requirements for Minors program.

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

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

7. 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 program, he/she will not be eligible for obtaining Minors degree**. He will be eligible for only B.

Tech. degree

i) **Prior approval of mentor and Head of the Department for the enrolment into Minors program, 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 by the students till II year I semester.**

k) Successful completion of 20 credits earmarked for Minors program with at least 7.5 CGPA along with successful completion of 160 credits earmarked for regular B. Tech. Program 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 program will not be considered.

8. Registration for the course in Minors program

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 at the 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.

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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.

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JBIET-R22	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech-EEE
B. Tech Course Structure		

I Year I Semester
(3 weeks mandatory induction Program at the start of semester)

S. No	Code	Course Title	L	T	P / D	Credits	Category	common Subject (Y/N)	Approving BOS
1.	**L110A**	Differential Equations and Calculus	3	1	0	4	BS	Y	**Maths**
2.	**L110D**	Engineering Chemistry	3	0	0	3	BS	Y	**Chemistry**
3.	**L112A**	Basic Electrical and Electronics Engineering	3	1	0	4	ES	Y	**EEE& ECE**
4.	**L1103**	Chemistry Lab	0	0	2	1	BS	Y	**Chemistry**
5.	**L1121**	Basic Electrical and Electronics Engineering Lab	0	0	4	2	ES	Y	**EEE**
6.	**L1131**	Engineering Drawing	1	0	4	3	ES	Y	**ME**
7.	**L1133**	Engineering Workshop/Manufacturing Practices	1	0	4	3	ES	Y	**ME**
8.	**L11M1**	Functional English	2	0	0	0	AC	Y	**English**
Total			**13**	**2**	**14**	**20**			

I Year II Semester

S. No	Code	Course Title	L	T	P / D	Credits	Category	common Subject (Y/N)	Approving BOS
1.	**L120A**	Linear Algebra and Advanced Calculus	3	1	0	4	BS	Y	**Maths**
2.	**L120B**	English	3	0	0	3	HS	Y	**English**
3.	**L120C**	Applied Physics	3	0	0	3	BS	Y	**Physics**
4.	**L125A**	Programming for Problem Solving	3	1	0	4	ES	Y	**CSE**
5.	**L1202**	Physics Lab	0	0	2	1	BS	Y	**Physics**
6.	**L1201**	English Language and Communication Skills Lab	0	0	2	1	HS	Y	**English**
7.	**L1251**	Programming for Problem Solving Lab	0	0	4	2	ES	Y	**CSE**
8.	**L12M2**	Human Values and Professional Ethics	2	0	0	0	AC	Y	**MBA**
Total			**14**	**2**	**8**	**18**			

II Year I Semester

S. No	Code	Course Title	L	T	P / D	Credits	Category	common Subject (Y/N)	Approving BOS
1.	**L210B**	Complex Variables and Special Functions	3	1	0	4	BS	Y	**Maths**
2.	**L212A**	Electrical Circuit Analysis	3	0	0	3	PC	N	**EEE**
3.	**L212B**	Electrical Machines – I	3	0	0	3	PC	N	**EEE**
4.	**L212C**	Power Systems-I	3	0	0	3	PC	N	**EEE**
5.	**L212D**	Electromagnetic Fields	3	0	0	3	PC	N	**EEE**
6.	**L2121**	Electrical Circuits & Simulation Lab	0	0	4	2	PC	N	**EEE**
7.	**L2122**	Electrical Machines Lab – I	0	0	4	2	PC	N	**EEE**
8.	**L2123**	Internship - I	0	0	2	1	PW	Y	**EEE**
9.	**L21M1**	Gender Sensitization	2	0	0	0	MC	Y	**English**
Total			**17**	**1**	**10**	**21**			

II Year II Semester

S. No	Code	Course Title	L	T	P / D	Credits	Category	common Subject (Y/N)	Approving BOS
1.	**L220A**	Integral Transforms	3	0	0	3	BS	Y	**Maths**
2.	**L222A**	Digital Electronics	3	0	0	3	ES	Y	**ECE**
3.	**L222B**	Electrical Machines-II	3	1	0	4	PC	N	**EEE**
4.	**L222C**	Control Systems	3	1	0	4	PC	N	**EEE**
5.	**L222D**	Power Systems-II	3	1	0	4	PC	N	**EEE**
6.	**L2221**	Digital Electronics Lab	0	0	2	1	ES	Y	**ECE**
7.	**L2222**	Control Systems Lab	0	0	4	2	PC	N	**EEE**
8.	**L22M2**	Environmental Science	2	0	0	0	MC	Y	**Civil**
Total			**17**	**2**	**6**	**21**			

III Year I Semester

S. No	Code	Course Title	L	T	P/D	Credits	Category	common Subject (Y/N)	Approving BOS
1.	L31EA	Managerial Economics and Management Science	3	1	0	4	HS	Y	**MBA**
2.	L312A	Electrical Machines – III	3	0	0	3	PC	N	**EEE**
3.	L312B	Power Electronics	3	0	0	3	PC	N	**EEE**
4.	BTEEEE1	PROFESSIONAL ELECTIVE - I	3	0	0	3	PE	N	**EEE**
5.	BTEEE01	OPEN ELECTIVE – I	3	0	0	3	OE	Y	**EEE**
6.	L3121	Electrical Machines Lab – II	0	0	3	1.5	PC	N	**EEE**
7.	L3122	Power Electronics Lab	0	0	3	1.5	PC	N	**EEE**
8.	L3123	Internship-II	0	0	2	1	PW	Y	**EEE**
9.	L31M1	Artificial Intelligence	2	0	0	0	MC	Y	**CSE**
10.	L31T1	Employability Skills	2	0	0	0	AC	Y	**English**
Total			**19**	**1**	**8**	**20**			

III Year II Semester

S. No	Code	Course Title	L	T	P/D	Credits	Category	common Subject (Y/N)	Approving BOS
1.	L322A	Computer Aided Power System Analysis	3	0	0	3	PC	N	**EEE**
2.	L322B	Switch Gear and Protection	3	0	0	3	PC	N	**EEE**
3.	BTEEEE2	PROFESSIONAL ELECTIVE – II	3	0	0	3	PE	N	**EEE**
4.	BTEEEE3	PROFESSIONAL ELECTIVE – III	3	0	0	3	PE	N	**EEE**
5.	BTEEE02	OPEN ELECTIVE – II	3	0	0	3	OE	Y	**EEE**

6.	BTEEE03	OPEN ELECTIVE – III	3	0	0	3	OE	Y	**EEE**
7.	L3221	Power Systems & Simulation Lab	0	0	4	2	PC	N	**EEE**
8.	L3201	Life Skills & Professional Skills Lab	0	0	4	2	HS	Y	**English**
9.	L32M2	Cyber Security	2	0	0	0	MC	Y	**IT**
10.	L32T2	Foundations of Entrepreneurship	2	0	0	0	AC	Y	**MBA**
Total			**22**	**0**	**8**	**22**			

IV Year I Semester

S. No	Code	Course Title	L	T	P/D	Credits	Category	common Subject (Y/N)	Approving BOS
1.	L412A	Electrical Measurements	3	0	0	3	PC	N	**EEE**
2.	L414D	Microprocessors and Applications	3	0	0	3	PC	N	**ECE**
3.	BTEEEE5	PROFESSIONAL ELECTIVE – V(MANDATORY MOOC)	3	0	0	3	PE	N	**EEE**
4.	BTEEE04	OPEN ELECTIVE – IV	3	0	0	3	OE	Y	**EEE**
5.	BTEEEE4	PROFESSIONAL ELECTIVE – IV	3	0	0	3	PE	N	**EEE**
6.	L4121	Electrical Measurements Lab	0	0	4	2	PC	N	**EEE**
7.	L4122	Microprocessors and Applications Lab	0	0	4	2	PC	N	**ECE**
8.	L4123	Mini Project	0	0	4	2	PW	Y	**EEE**
9.	L4124	Project Stage-I	0	0	4	2	PW	Y	**EEE**
10.	L41M3	Electrical Safety and Safety Management	2	0	0	0	MC	N	**EEE**
Total			**15**	**0**	**16**	**23**			

IV Year II Semester

S. No	Code	Course Title	L	T	P/D	Credits	Category	common Subject (Y/N)	Approving BOS
1.	BTEEEE6	PROFESSIONAL ELECTIVE – VI	3	0	0	3	PE	N	**EEE**
2.	BTEEE05	OPEN ELECTIVE – V	3	0	0	3	OE	Y	**EEE**
3.	L4221	Seminar	0	0	2	1	PW	Y	**EEE**
4.	L4222	Project Stage-II	0	0	16	8	PW	Y	**EEE**
Total			**6**	**0**	**18**	**15**			

Grand Total Credits: 160

PROFESSIONAL ELECTIVE – I

S. No	Code	Course Title	L	T	P/D	Credits	Category	common Subject (Y/N)	Approving BOS
1.	L312E	Power Quality	3	0	0	3	PE	N	**EEE**
2.	L312F	Modern Control Theory	3	0	0	3	PE	N	**EEE**
3.	L312G	Digital Control Systems	3	0	0	3	PE	N	**EEE**

PROFESSIONAL ELECTIVE – II

S. No	Code	Course Title	L	T	P/D	Credits	Category	common Subject (Y/N)	Approving BOS
1.	L322E	Analysis of Power Converters	3	0	0	3	PE	N	**EEE**
2.	L322F	Power Semiconductor Drives	3	0	0	3	PE	N	**EEE**
3.	L322G	Flexible AC Transmission systems	3	0	0	3	PE	N	**EEE**

PROFESSIONAL ELECTIVE – III

S. No	Code	Course Title	L	T	P/D	Credits	Category	common Subject (Y/N)	Approving BOS
1.	L322H	Power System Operation and Control	3	0	0	3	PE	N	**EEE**
2.	L322I	Electrical Machine Design	3	0	0	3	PE	N	**EEE**
3.	L322J	Advanced Control Systems	3	0	0	3	PE	N	**EEE**

PROFESSIONAL ELECTIVE – IV

S. No	Code	Course Title	L	T	P/D	Credits	Category	common Subject (Y/N)	Approving BOS
1.	L412E	EHV AC Transmission	3	0	0	3	PE	N	**EEE**
2.	L412F	High Voltage Engineering	3	0	0	3	PE	N	**EEE**
3.	L412G	Utilization of Electrical Energy	3	0	0	3	PE	N	**EEE**

PROFESSIONAL ELECTIVE – V (Mandatory MOOC)

S. No	Code	Course Title	L	T	P/D	Credits	Category	common Subject (Y/N)	Approving BOS
1.	L412H	**MOOC I**	3	0	0	3	PE	N	**EEE**
2.	L412I	**MOOC II**	3	0	0	3	PE	N	**EEE**
3.	L412J	**MOOC III**	3	0	0	3	PE	N	**EEE**

PROFESSIONAL ELECTIVE – VI

S. No	Code	Course Title	L	T	P / D	Credits	Category	common Subject (Y/N)	Approving BOS
1.	L422A	Power Electronics for Renewable Energy Systems	3	0	0	3	PE	N	**EEE**
2.	L422B	HVDC Transmission	3	0	0	3	PE	N	**EEE**
3.	L422C	Restructured Power Systems	3	0	0	3	PE	N	**EEE**

Open Elective-I

S. No	Code	Course Title	L	Credits	Approving BOS
1	L31OA	Elements of CIVIL Engineering	**3**	**3**	CE
2	L31OB	Introduction to Computer Networks	**3**	**3**	CSE
3	L31OC	Introduction to Machine Learning	**3**	**3**	AI&ML
4	L31OD	Fundamentals Of Data Science	**3**	**3**	AI&DS
5	L31OE	Principles of Communications	**3**	**3**	ECE
6	L31OF	Fundamentals of Digital Logic Design	**3**	**3**	ECM
7	L31OG	Energy Engineering	**3**	**3**	EEE
8	L31OH	Open Source Software's	**3**	**3**	IT
9	L31OI	Automotive Technology	**3**	**3**	MECH
10	L31OJ	Introduction to Mining Technology	**3**	**3**	MINING
11	L31OK	Entrepreneurship for Micro, Small and Medium Enterprises	**3**	**3**	MBA

12	L31OL	Numerical Solution of Ordinary Differential Equations	**3**	**3**	Maths
13	L31OM	Nano materials	**3**	**3**	Physics
14	L31ON	Chemistry of Engineering materials	**3**	**3**	Chemistry
15	L31OO	Technical writing skills	**3**	**3**	English
16	L31OP	Indian Constitution	**3**	**3**	English

Open Elective-II					
S. No	**Code**	**Course Title**	**L**	**Credits**	**Approving BOS**
1	L32OA	Construction Management, Contracts and valuation	**3**	**3**	CE
2	L32OB	Principles of Operating Systems	**3**	**3**	CSE
3	L32OC	Introduction to Predictive Analytics	**3**	**3**	AI & ML
4	L32OD	Business Data Analytics	**3**	**3**	AI & DS
5	L32OE	Basics of IC Technology	**3**	**3**	ECE
6	L32OF	Introduction to Micro Processor and Micro Controllers	**3**	**3**	ECM
7	L32OG	Hybrid Electric Vehicles	**3**	**3**	EEE
8	L32OH	Distributed Systems	**3**	**3**	IT
9	L32OI	Fundamentals of Operations Research	**3**	**3**	MECH
10	L32OJ	Introduction to Surface Mining	**3**	**3**	MINING
11	L32OK	Intellectual Property Rights	**3**	**3**	MBA
12	L32OL	Numerical Solution of Partial Differential Equations	**3**	**3**	Maths

13	L32OM	Advanced physics for Engineers	**3**	**3**	Physics
14	L32ON	Nano Chemistry	**3**	**3**	Chemistry
15	L32OO	Teamwork and Team Building	**3**	**3**	English
16	L32OP	Essence of Indian Traditional Knowledge	**3**	**3**	English

Open Elective-III					
S. No	**Code**	**Course Title**	**L**	**Credits**	**Approving BOS**
1	L32OQ	Road Safety Engineering	**3**	**3**	CE
2	L32OR	Introduction to Java Programming	**3**	**3**	CSE
3	L32OS	Introduction to Neural Networks	**3**	**3**	AI&ML
4	L32OT	Health Care Data Analytics	**3**	**3**	AI&DS
5	L32OU	MATLAB Programming Language	**3**	**3**	ECE
6	L32OV	Introduction to Sensors and Its Applications	**3**	**3**	ECM
7	L32OX	Non-Conventional Energy Sources	**3**	**3**	EEE
8	L32OY	Soft Computing	**3**	**3**	IT
9	L32OZ	Basics of Robotics	**3**	**3**	MECH
10	L32O1	Basic Mining Geology	**3**	**3**	MINING
11	L32O2	Digital Marketing	**3**	**3**	MBA
12	L32O3	Number Theory and Cryptography	**3**	**3**	Maths
13	L32O4	NDT and Vaccum Technology	**3**	**3**	Physics
14	L32O5	Chemistry for Engineers	**3**	**3**	Chemistry

15	L32O6	Technical communication skills	**3**	**3**	English

Open Elective-IV					
S. No	**Code**	**Course Title**	**L**	**Credits**	**Approving BOS**
1	L41OA	Environmental Impact Assessment	3	3	CE
2	L41OB	Introduction to Python Programming	3	3	CSE
3	L41OC	Introduction to Deep Learning	3	3	AI&ML
4	L41OD	Fundamentals of Big Data	3	3	AI&DS
5	L41OE	Consumer Electronics	3	3	ECE
6	L41OF	Introduction to Embedded Systems	3	3	ECM
7	L41OG	Special Electrical Machines	3	3	EEE
8	L41OH	Object Oriented Analysis and Design	3	3	IT
9	L41OI	Basics of MINE Environment	3	3	MINING
10	L41OJ	Rural Marketing	3	3	MBA

Open Elective-V					
S. No	**Code**	**Course Title**	**L**	**Credits**	**Approving BOS**
1	L42OA	Energy Audit & Green buildings	**3**	**3**	CE
2	L42OB	Introduction to Big Data Analytics	**3**	**3**	CSE
3	L42OC	Introduction to Generative Adversarial Networks	**3**	**3**	AI&ML
4	L42OD	Cloud Computing	**3**	**3**	AI&DS

5	L42OE	Principles of Sensors and their Application	**3**	**3**	ECE
6	L42OF	Introduction to Electronic Instrumentation	**3**	**3**	ECM
7	L42OG	Instrumentation	**3**	**3**	EEE
8	L42OH	Cyber Laws & Ethics	**3**	**3**	IT
9	L42OI	Fundamentals to Rock Mechanics	**3**	**3**	MINING
10	L42OJ	Customer Relationship management	**3**	**3**	MBA

I Year I Semester
AY: 2022-23

AY: 2022-23 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech I Year-I Sem			
Course Code: L110D	**ENGINEERING CHEMISTRY** (COMMON TO: AIML, CE, ME, ECE, EEE and MIE)	L	T	P	D
Credits: **3**		**3**	**0**	**0**	**0**

Pre-Requisites: Nil

Module 1: Molecular Structure and Theories of Bonding [9L]

Atomic and Molecular orbitals-Molecular orbital theory-LCAO – bonding in homo and heteronuclear diatomic molecules, molecular orbital energy level diagrams of homo nuclear di atomic molecules(N_2, O_2 and F_2), hetero nuclear di atomic molecules(CO and NO). Crystal Field Theory (CFT), Salient Features of CFT – Crystal Field Splitting of transition metal ion d- orbitals in Tetrahedral, Octahedral complexes. Magnetic and colour properties of complexes. Band theory of solids – band diagrams for conductors, semiconductors and insulators, effect of doping on conductance.

Module 2: Water and Its Treatment [10L]

Introduction – hardness of water – Causes of hardness - Types of hardness- temporary and permanent – units of hardness-numerical problems – Estimation of hardness of water by complex metric method. Potable water and its specifications. Steps involved in potable water treatment – Disinfection of water by chlorination and ozonization-Break-point chlorination. Boiler feed water- scale and sludge formation--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.

Module 3: Electrochemistry and Corrosion [12L]

Electrochemistry[7L]
Introduction-electrode potential, standard electrode potential, Electrochemical cell-Galvanic cell – Nernst equation derivation-applications, Numerical problems. Types of electrodes – calomel, Quinhydrone and glass electrode. determination of pH of a solution by using quinhydrone and glass electrode. Electrochemical series and its applications. Batteries – Primary (Li-MnO_2 cell) and secondary batteries (Lead – acid storage battery and Lithium ion battery).
Corrosion[5L]
Causes and effects of corrosion – chemical and electrochemical corrosion – mechanism of electrochemical corrosion, types of corrosion-galvanic, pitting and waterline corrosion-factors influencing rate of corrosion-Corrosion control methods- Cathodic protection – Sacrificial anode and impressed current cathodic methods-Surface coatings-Hot dipping(Galvanizing and Tinning).

Module 4: Chemical Fuels [8L]

Fuels: Definition, classification, characteristics of a good fuel, Calorific value(CV)-HCV and LCV. Calculation of CV using Dulong's formula, numericals.
Solid Fuels: Coal-proximate &ultimate analysis-significance.
Liquid Fuels: Composition and CV of gasoline, cracking: Fixed bed catalytic cracking method. Knocking and its significance, octane number, cetane number.

Module 5: Polymers and Nanomaterials[12L]

Polymers [8L]
Definition – Types of polymerization – addition and condensation polymerization with examples. Plastics: Definition and characteristics- thermoplastic and thermosetting plastics, compounding and fabrication of plastics (compression and injection moulding). Preparation, Properties and engineering applications of PVC, Nylon-6, 6 and Bakelite. Conducting Polymers-conduction in polyacetylene.
Nanomaterials[4L]

Introduction, Synthesis: Top down and bottom up approaches. Sol-gel and Chemical Vapour Deposition(CVD) methods. Properties and applications of fullerenes, carbon nanotubes.Medical applications of nanomaterials.

Text Books

1. Engineering Chemistry: P. C. Jain & M. Jain, DhanpatRai Publications, New Delhi.
2. Engineering Chemistry: ShashiChawla, Dhanapathrai Publications (2019), New Delhi.

Reference Books

1. Engineering Chemistry, M. Thirumalachary and Laxminarayana, Scitech Publications.
2. Text Book of Engineering Chemistry, Cengage Learning,B.Rama Devi, Ch. VenkataRamana Reddy and PrasanthRath.
3. Engineering Chemistry (NPTEL Web-book)by B.L. Tembe, Kamaluddin andM.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. Analyze microscopic chemistry in terms of atomic and molecular orbitals.
CO2. Identify the suitability of water for domestic and industrial purposes.
CO3. Apply the basic principle of electro chemistry.
CO4. Distinguish the ranges of the electromagnetic spectrum used for exciting different molecular energy levels in various spectroscopic techniques.
CO5. Prepare the drug molecules.

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	3			3										
CO2	3			3		3						2		
CO3	3			3		3						2		
CO4	3			2										
CO5	3			2	2									
Average	**3.0**			**2.6**	**2.0**	**3.0**						**2.0**		

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

AY: 2022-23 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech I Year-I Sem			
Course Code: L110A	**DIFFERENTIAL EQUATIONS AND CALCULUS** (Common to all Branches)	L	T	P	D
Credits: **4**		**3**	**1**	**0**	**0**

Pre-Requisites:

Module 1:First Order, First Degree ODE and it Applications [9L]

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, non homogeneous differential equations, non-homogeneous terms of the type e^{ax}, sin (ax), cos (ax), polynomials in x, e^{ax}.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: Sequences and Fourier series [10L]

Definition of a Sequence, limit, Convergent, Divergent and Oscillatory sequences.

Series, Convergent, Divergent and Oscillatory Series, Series of positive terms,P-test, Comparison test, Alternating series, Leibnitz test, Absolute and Conditionally Convergence.

Determination of Fourier coefficients, Fourier series of even and odd functions, Fourier series in an arbitrary interval, even and odd periodic continuation, Half-range Fourier sine and cosine expansions.

Module 4: Calculus and Improper integrals[9L]

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

Definition of Improper Integrals, Beta functions, Properties of beta functions, Gamma functions, Properties of Gamma functions, Relation between the Gamma and Beta functions, evaluation of improper integrals using Beta and Gamma functions.

Module 5: Functions of Multivariable's [10L]

Limits, Continuity, Partial differentiation, partial derivatives of first and second order,homogeneous function, Euler's theorem, total derivative, Chain rule,Jacobian, Taylor's theorem of two variables (without proof). Maxima and Minima of two variables, Lagrange's method of undeterminedmultipliers.

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, 2015.

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/111106100
https://www.math.ust.hk/~machas/differential-equations.pdf
https://en.wikipedia.org/wiki/Fourier_series
https://www.khanacademy.org/math/ap-calculus-bc/bc-integration-new/bc-6-13/a/improper-integrals-review
https://onlinecourses.nptel.ac.in/noc20_ma15/preview

Course Outcomes

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

CO1. Solve the First order linear differential equations.

CO2. Apply the concepts of higher order linear differential equations with constant coefficients solving physical problems arising in engineering.

CO3. Determine Fourier series expansion of a given function.

CO4. Analyse the improper integrals.

CO5. Find the maxima and minima of multivariable functions.

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**	**PO1 0**	**PO1 1**	**PO1 2**	**PSO 1**	**PSO 2**
CO1	3	3	2	3								3	3	1
CO2	3	3	2	3								3	3	1
CO3	3	2	3	3								2	2	
CO4	3	3	2	3								2	1	
CO5	3	3	2	2								2	1	2
Average	**3.0**	**2.8**	**2.2**	**2.8**								**2.4**	**2.0**	**1.3**

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

AY: 2022-23 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech EEE I Year-I Sem			
Course Code: L112A	BASIC ELECTRICAL AND ELECTRONICS ENGINEERING (Common to AIML, ECE & EEE)	L	T	P	D
Credits: **4**		**3**	**1**	**0**	**0**

Pre-Requisites: Physics

Module 1: DC and AC Circuits [10L]

Unit-I: DC Circuits [6L]

Electrical quantities - resistors - inductors - capacitors - Ohm's Law - Kirchhoff's Laws - series and parallel circuits - analysis of DC circuits - mesh, nodal - simple problems.

Unit-II: AC Circuits [4L]

Sinusoidal functions - phasor representation - RMS and Average values - form and peak factors - RLC series circuits - power and power factor-concept of three phase system.

Module 2: DC and AC Electrical Machines [9L]

Unit-I: DC Electrical Machines [5L]

Construction and principle of operation of DC machines – DC generator – EMF equation – Types – DC motor – Types.

Unit-II: AC Electrical Machines [4L]

Single phase transformer – Construction and operation – EMF equation - Three phase induction motor – Construction and operation.

Module 3: Measuring Instruments and Electrical Installation [8L]

Unit-I: Measuring Instruments [4L]

PMMC and MI Instruments - Construction and operation – Torque Equation - advantages and disadvantages.

Unit-II: Electrical Installation [4L]

Electrical Installation: Components of LT Switchgear - Switch Fuse Unit (SFU) –MCB – MCCB – Earthing.

Module 4: Diodes and Applications [12L]

Unit-I: P-N junction diode Principle of operation and characteristics of a P-N junction diode static and dynamic resistance of a diode , ideal diode, Zener Diode, Avalanche and Zener Breakdown mechanisms, V-I characteristics of Zener Diode

Unit-II: Rectifiers & Filters Diode as a Rectifier Half Wave Rectifier, Full Wave Rectifier, Bridge Rectifier, rectifier with Capacitor filter and π- Section filter, zener diode as a voltage regulator

Module 5: Transistor Characteristics [12L]

Unit-I: :Bi-Polar Junction Transistor (BJT) Principle of operation of Bi-Polar Junction Transistor (BJT), current components in a junction Transistor, V-I characteristics in CB, CE,CC configurations, determination of " α" and " β " of a transistor from the V-I characteristics.

Unit-II: Field Effect Transistors (FET) Comparison of BJT & JFET, Construction & Operation of JFET, V-I Characteristics of JFET, Determination of FET Parameters from the V-I characteristics. MOSFET Construction & Operation in Enhancement and Depletion modes, V-I Characteristics of MOSFET.

Text Books

1. V.K. Mehta, "Principles of Electrical Engineering and Electronics", S. Chand & Company Ltd, 2012
2. L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press, 2011.
3. A. K. Sawhney, "A course in Electrical and Electronics Measurements and Instrumentation", Dhanapath Rai and Sons., 10th Edition, 2007.
4. Electronic Devices & Circuits :Millman & Halkias Mcgraw Hill
5. Integrated Electronics : Millman & Halkias Mcgraw Hill

Reference Books

4. Dr. Ramana Pilla, Dr. M. Suryakalavathi, "Basic Electrical Engineering", S. Chand, 2018.
5. V. D. Toro, "Electrical Engineering Fundamentals", Prentice Hall India, 1989.

E-Resources

1. https://onlinecourses.swayam2.ac.in/nou21_ee02/preview
2. https://nptel.ac.in/courses/108/108/108108076/
3. https://www.electrical4u.com

Course Outcomes

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

CO 1. Apply the basic laws of electricity in DC and AC circuits.

CO 2. Identify the operation of electrical machines and its construction.

CO 3. Explain the functioning of measuring instruments and components of LT Switchgear.

CO 4. Analyze PN junction diode operation, characteristics and applications.

CO 5. Acquire the Knowledge of characteristics of BJT & FET in various modes of operation.

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**	**PSO1**	**PSO2**
CO1	3	3	3									3	3	
CO2	3	3	3									3	3	
CO3	3	3	3									3	3	
CO4	3	3	3											
CO5	2		3											
Average	**2.8**	**3.0**	**3.0**									**3.0**	**3.0**	

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

AY: 2022-23 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech EEE I Year-I Sem			
Course Code: L1133	**Engineering Workshop/Manufacturing Practices**	L	T	P	D
Credits: **3**		**1**	**0**	**4**	**0**

Pre-Requisites: Basic knowledge about tools and different trades

List of experiments (Any 10-12 experiments)

Experiments for Practice

1. To make a Half Lap joint from the given two reapers.
2. To make a Dovetail joint from the given two reapers.
3. To make a straight fitting from the given two MS pieces.
4. To make a V- fitting from the given two MS pieces.
5. To make a Rectangular Scoop using the given Sheet metal.
6. To make a Hooper using the given Sheet metal.
7. To perform Parallel and Series wiring connection
8. To perform stair case wiring connection
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 Square rod and S- hook from a given round rod

Demonstration

12. To make a Lap and Butt joint using the given two M.S pieces by arc welding
13. To perform Plain and Step turning operation on lathe machine.
14. To perform Taper turning and Thread cutting operation on lathe machine.
15. To perform a simple Milling operation on given workpiece.

Text Books

1. P.N.Rao, "Manufacturing Technology",TataMcGrawHill,4th Edition,2013.
2. K. C. John, "Mechanical Workshop Practice", PHI Publishers, 2nd Edition,2010.

Course Outcomes

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

CO1. Identify gauging skills.

CO2. Apply skills of Black smithy.

CO3. Apply skills of fabrication in design analysis.

CO4. Produce wooden patterns for casting.

CO5. Apply skills of fabrication in Welding.

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	3	2	2				2							
CO2	2	2	2				2							
CO3	3	3	2				3							
CO4	2	3	3				2							
CO5	3	3	2				2							
Average	**2.6**	**2.6**	**2.2**				**2.2**							

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

AY: 2022-23 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech EEE I Year-I Sem			
Course Code: L1131	**ENGINEERING DRAWING**	L	T	P	D
Credits: **3**		**1**	**0**	**4**	**0**

Pre-Requisites: Engineering Mathematics.

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

Unit-I: [2L]

Introduction to Engineering Drawings, Significance, Introduction to AutoCAD.

Unit-II: [4L]

Ellipse – Eccentric Method, Arcs Method, Concentric, Circle Method, Rectangular Method; Parabola – Eccentric Method, Rectangular Method.

Unit-III: [3L]

Cycloid – Epicycloid, Hypocycloid, Involute of Circles.

Unit-IV: [3L]

Construction of Plane, Diagonal Scales.

Module 2: Principles of Orthographic Projections, Projections of Points, Line, Planes [9L]

Unit-I: [3L]

Introduction to Orthographic Projections, Conventions.

Unit-II: [3L]

Projections of Points in four Quadrants, Projection of Lines in first quadrant, Inclined to both Principle Planes.

Unit-III: [3L]

Projections of Planes in first quadrant and inclined to both Principle Planes for Regular Geometrical Figures – Circle, Square, Rectangle, Triangle, Pentagon, Hexagon.

Module 3: Projections of Solids [8L]

Unit-I: [5L]

Projections of Right Regular Solids – Prisms and Pyramids of Square, Pentagon, Hexagon;

Unit-II: [3L]

Projections of Generated Solids – Cone, Cylinder.

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

Unit-I: [6L]

Sectional and Auxiliary Views of Right Regular Solids – Prisms and Pyramids of Pentagon, Hexagon; Generated solids – Cylinder and Cone.

Unit-II: [6L]

Surfaces of Right Regular solids – Prism, cylinder pyramid and cone

Module 5: Isometric Projections, Orthographic Views [9L]

Unit-I: [5L]

Principles of Isometric Projections, Isometric Scale, Isometric Views of Simple and Compound Solids; Conversion of Orthographic Views of simple objects to Isometric Views.

Unit-II: [4L]

Conversion of Isometric Views to Orthographic Views.

Text Books

1. Bhatt N.D., Panchal V.M. & Ingle P.R., "Engineering Drawing", Charotar Publishing House,2014.
2. 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. Equipped with the basic knowledge of using the drawing instruments and dimension practice.
CO2. Represent any three-dimensional object with two-dimensional drawings and exposed to the visual aspects of lines and planes.
CO3. Visualize of solids inclined to both the planes.
CO4. Visualization of sections of solids and their developments.
CO5. Representation of 3D objects through isometric and orthographic views

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	3	3	3		3									
CO2	3	3	2		2		2							
CO3	3	3			3		2							
CO4	3	3		3	2		3			3				
CO5	3	3		3	3					3				
Average	**3.0**	**3.0**	**2.5**	**3.0**	**2.6**		**2.3**			**3.0**				

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

AY: 2022-23 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech I Year-I Sem			
Course Code: L1103	**CHEMISTRY LAB** (COMMON TO: AIML, CE, ME, ECE, EEE and MIE)	L	T	P	D
Credits: **1**		**0**	**0**	**2**	**0**

Pre-Requisites: Nil

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 complex metric method using EDTA.
3. Determination of chloride content of water by Argentometry.
4. Estimation of Fe^{2+} in Mohr's salt using permanganomerty.
5. Estimation of ferrous iron by dichrometry.

Instrumental methods of Analysis:

6. Estimation of an HCl by Conductometric titrations using NaOH.
7. Estimation of Acetic acid by Conductometric titrationsusing NaOH.
8. Estimation of HCl by Potentiometric titrationsusing NaOH.
9. Estimation of Fe^{2+} by Potentiometry using $KMnO_4$.

Determination of Physico-Chemical Properties:

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

Synthesis of Nanomaterials, Polymers and drug molecules:

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

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.

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	3					2			3			2		
CO2	3								3					
CO3	3								3					
CO4	3								3					
CO5	3								3					
Average	**3.0**					**2.0**			**3.0**			**2.0**		

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

AY: 2022-23 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech EEE I Year-I Sem			
Course Code: L1121	BASIC ELECTRICAL AND ELECTRONICS ENGINEERING LAB (Common to AIML, ECE & EEE)	L	T	P	D
Credits: **2**		**0**	**0**	**4**	**0**

Pre-Requisites:

List of Experiments

1. Verification of Ohms Law.
2. Determination of unknown resistance.
3. Verification of KVL and KCL.
4. Resonance in series RLC circuit.
5. Calculations and verification of impedance and current of RL, RC and RLC series circuits.
6. Measurement of voltage, current and real power in primary and secondary circuits of a single phase transformer.
7. Performance Characteristics of a DC Shunt Motor.
8. Performance Characteristics of a Three-phase Induction Motor.
9. Characteristics of PN Junction Diode & Zener diode
10. Characteristics of Transistor in CB Configuration.
11. Characteristics of Transistor in CE Configuration.
12. Half Wave Rectifier & Full Wave Rectifier without & with capacitor filter
13. FET characteristics
14. Frequency Response of CE Amplifier.

Course Outcomes

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

1. Analyze DC Circuits using basic Laws.
2. Determine the impedance and current of RL, RC and RLC series circuits.
3. Analyze the performance characteristics of DC and AC Electrical machines.
4. Describe the principle and characteristics of semiconductor diode.
5. Analyze various transistor configurations and rectifiers.

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	3	2	2						3			3	2	
CO2	3	2	2						3				2	
CO3	3	2	2						3			3	2	
CO4	2								3					
CO5	2								3					
Average	**2.6**	**2.0**	**2.0**						**3.0**			**3.0**	**2.0**	

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

AY: 2022-23 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech EEE I Year-I Sem			
Course Code: L11M1	**FUNCTIONAL ENGISH** (Audit Course-I) COMMON TO: ALL	L	T	P	D
Credits: 0		**2**	**0**	**0**	**0**

Pre-Requisites:

Module 1: FUNCTIONAL ENGLISH[6L]

Introduction - Functional Spoken English; Listening – Speaking**:** Do's and Don'ts; Expressing: Ability/ Admiration/ Agreement/ Anger/ Annoyance/ Appreciation/ Pleasure/ Sarcasm/ Satisfaction/ Surprise/ Approval/ Capability/ Certainty/ Condolences/ Doubt/ Fear/ Gratitude/ Possibility/ Worry; Asking for: Advice/Clarification/Direction/Information/ Permission/ Predictions/ Recommendation.

Module 2: VOCABULARY BUILDING[6L]

Vocabulary for Day-to-day Conversations; Introduction: Vegetables/ Groceries/ Fruits/ Weather; Parts of Human body/ Dresses/ Furniture/ Relations; Birds/ Cries of Animals; Food/ Hospitality/ Houses/ Rooms/ Tools; Airport/ News Paper/ Books/ Gems; Corporate Vocabulary/ Jobs/ Occupations; Diseases; Slang Words and Technical Jargon.

Module 3: FUNCTIONAL GRAMMAR - I[6L]

Introduction: Parts of Speech;Verb Forms; Phrases and Clauses; Tenses; Speeches; Voices; Degrees of Comparison;Simple, Complex and Compound Sentences.

Module 4: FUNCTIONAL GRAMMAR - II [6L]

Sentence Making for Effective Communication; Sentence Structure – 'Wh' Questions - How to Frame Questions and Give Answers; Question Tags; Spotting Errors.

Module 5:COMMUNICATION SKILLS [6L]

Polite, Courteous and Diplomatic Terms; Useful Daily Expressions; Courtesy, Good Manners and Etiquettes; Conversation Techniques; Story Telling.

Text Books

1.L. Adinarayana and V. Prakasam, *Spoken English*, Neelkamal Publications Pvt. Ltd., New Delhi, 2008.
2.Ram Bhasker Raju, *The Complete Book on Spoken English*, Goutham Buddha Publications, Hyderabad, 2002.

Reference Books

1.Sabina Pillai, *Spoken English for My World,* Oxford University Press, New Delhi, 2016.
2.K. R. Lakshminarayanan, *Speak in English,*Scitech Publications, Chennai, 2009.

E-Resources

- https://www.britishcouncil.in/programmes/english-partnerships/state/skills-projects/AP-English-Skills.
- https://www.fluentu.com/blog/english/websites-to-learn-english/

Course Outcomes

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

CO1. Demonstrate knowledge of grammar and vocabulary in writing effective formal letters and e-mails.
CO2. Communicate effectively by applying appropriate speaking and writing techniques by examining and applying functional English.
CO3. Learn the transformation of sentences and use them effectively.
CO4. Use Small sentences in daily colloquial situation.
CO5. Learn the useful communication expression and use them in day-to-day life.

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**	**PO1 0**	**PO1 1**	**PO1 2**	**PSO 1**	**PSO 2**
CO1								2		3		3		
CO2								2		3		3		
CO3								2		3		3		
CO4								3		3		3		
CO5								2		3		3		
Average								**2.2**		**3.0**		**3.0**		

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

I Year II Semester
AY: 2022-23

AY: 2022-23 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech EEE I Year-II Sem			
Course Code: L120B	**ENGLISH** (Common to CE,EEE,ME,ECE,MIE & AIML)	L	T	P	D
Credits: 3		**3**	**0**	**0**	**0**

Pre-Requisites:

Module 1: [8L]

The Model Millionaire-Oscar Wilde from the prescribed textbook 'Forging Ahead' published by Orient Black Swan.
Listening: The Listening Process-Hearing and Listening; Types of Listening.
Speaking: Narrating Personal Experiences, Expressing Opinions.
Reading: Reading for Summarizing and Paraphrasing, Facts versus Opinions.
Writing Skills: Note-making, Summarizing; Writing Formal Letters.
Vocabulary and Grammar: Subject-Verb Agreement, Noun-Pronoun Agreement; Collocations.

Module 2: [8L]

The Lotos-Eaters (extract)-**Alfred Tennyson** from the prescribed textbook 'Forging Ahead' published by Orient Black Swan.
Listening: Listening for Style-Communicative Purpose, Degree of Formality, Choice of Vocabulary Pronunciation and Syntax; Listening for Structure-Introduction, Body and Conclusion.
Speaking: Making Presentation-Preparing a Presentation, Structuring Content, Delivering the Presentation.
Reading: Reading for Meaning;Reading for Pleasure; Making Inferences; Reading Between the Lines.
Writing Skills: Writing an Appreciation of a Poem; Paraphrasing; Note-Taking.
Vocabulary And Grammar: Word Roots and Affixes; Tenses; Correcting Errors in Punctuation.

Module 3: [8L]

Continuous Transformation-Azim Premji from the prescribed textbook 'Forging Ahead' published by Orient Black Swan.
Listening: Listening with a Purpose-Barriers to Listening.
Speaking: Agreeing and Disagreeing with, and Defending Opinions.
Reading: Reading Methods-SQ3R Reading Technique.
Writing Skills: Writing Argumentative Essays.
Vocabulary and Grammar: Active and Passive Voice, Academic Vocabulary.

Module 4: [8L]

Steve Jobs-Steven Paul Jobs from the prescribed textbook 'Forging Ahead' published by Orient Black Swan.
Listening: Effective Listening Strategies-Ten Thumb Rules for Good Listening.
Speaking: What is a Group Discussion? GD Strategies-Type of GDs-Dos and Don'ts.
Reading: Reading Strategies-Scanning and Skimming Skills.
Writing Skills: Writing Job Application Letters and CVs.
Vocabulary and Grammar: Phrasal Verbs, Phrasal Prepositions; Technical Vocabulary.

Module 5: [8L]

How I Became a Public Speaker (extract) – **George Bernard Shaw** from the prescribed textbook 'Forging Ahead' published by Orient Black Swan.
Listening: Listening for Explicit and Implicit Information.
Speaking: Making Presentations as a Team.
Reading: Reading Strategies-Extensive and Intensive Reading Skills.
Writing Skills: Report Writing-Formats of Reports, Types of Reports.
Vocabulary and Grammar: Improving Vocabulary-Avoiding Cliches, Redundancies; Correcting Common Errors.

Text Books

1. Chitra. V.B. G.M. Sundaravalli, D.S. Kesava Rao. Ed. *Forging Ahead A Course Book for B. Tech Students:* Orient Black Swan: Hyderabad, 2022.
2. Ashraf Rizvi. M. *Effective Technical Communication*. McGraw-Hill: New Delhi, 2010.

Reference Books

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

E-Resources

1. https://poemanalysis.com/alfred-tennyson/the-lotos-eaters/
2. https://degmateng.wordpress.com/2019/11/27/ls-6-the-model-millionaire-oscar-wilde-summary/
3. https://www.google.com/search?q=Continuous+Transformation-+Azim+Premji+&rlz=1C2CHBD_enIN915IN915&sxsrf=APq-WBs4xyvTdVhFoCE_EIk0ydf4s65pmw%3A1650947439347&ei=b3VnYo7lFJqf4-EP9fqTIA&ved=0ahUKEwjO2Ki98rD3AhWazzgGHXX9BAQQ4dUDCA4&uact=5&oq=Continuous+Transformation-+Azim+Premji+&gs_lcp=Cgdnd3Mtd2l6EAMyBQghEKABMgUIIRCgATIFCCEQoAFKBAhBGABKBAhGGABQAFgAYLs1aAFwAXgAgAHyAYgB8gGSAQMyLTGYAQCgAQKgAQHAAQE&sclient=gws-wiz
4. https://www.britannica.com/biography/Steve-Jobs
5. http://kjtenglishnotes.blogspot.com/2015/10/how-i-became-public-speaker.html
6. https://www.learngrammar.net/english-grammar

Course Outcomes

At the end of the course, the student will be able to:
CO1. Use English Language effectively in spoken and written forms.
CO2. Comprehend the given texts and respond appropriately.
CO3. Use the proper vocabulary and grammatically correct sentences.
CO4. Communicate confidently in various contexts and different cultures.
CO5. Acquire basic proficiency in English including reading and listening comprehension, writing and speaking skills.

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**	**PO1 0**	**PO1 1**	**PO1 2**	**PSO 1**	**PSO 2**
CO1								2		3		3		
CO2								2		3		3		
CO3								2		3		3		
CO4								3		3		3		
CO5								2		3		3		
Average								**2.2**		**3.0**		**3.0**		

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

AY: 2022-23 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech EEE I Year-II Sem			
Course Code: L120A	**Linear Algebra and Advanced Calculus** (Common to all Branches)	L	T	P	D
Credits: **4**		**3**	**1**	**0**	**0**

Pre-Requisites:

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

Types of Matrices, Symmetric, Skew-symmetric, Hermitian, Skew-Hermitian, orthogonal matrices, Unitary Matrices, 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 and Quadratic Forms[12L]

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

Definitions of Linear Transformation and Orthogonal Transformation, Quadratic forms, rank and nature of the quadratic forms ,index and signature, reduction of quadratic forms into canonical formusing Linear Transformation and OrthogonalTransformations.

Module 3: Multiple Integrals[10L]

Evaluation of double integrals, change of order of integration, change of variables,evaluation of triple integrals, change of variables.

Applications: Findingareas and volumes, centre of gravity.

Module 4: vector differential calculus [8L]

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 [8L]

Line, surface and volume integrals.

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

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, 2015.

Reference Books

1. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, LaxmiPublications, 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 Outcomes

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

CO1. Solve the consistent system of linear equations.
CO2. Apply orthogonal congruent Transformations to a quadratic form.
CO3.Evaluate multiple integrals in various coordinate system.
CO4. Apply the concept of gradient, divergence and curl to formulate engineering problems.

CO5. Convert line integrals to surface integrals and surface integrals to volume integrals.

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**	**PO1 0**	**PO1 1**	**PO1 2**	**PSO 1**	**PSO 2**
CO1	3	3	3	3								2	3	2
CO2	3	3	3	3								3	3	2
CO3	3	3	3	3								3		
CO4	3	3	3	3								2	3	2
CO5	3	3	3	3								3		
Average	**3.0**	**3.0**	**3.0**	**3.0**								**2.6**	**3.0**	**2.0**

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

AY: 2022-23 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech EEE I Year-II Sem			
Course Code: L120C	APPLIED PHYSICS (COMMON TO EEE, ECE, CSE, IT, ECM,CSE(AI&ML),CSE(DS), AI&ML&AI&DS)	L	T	P	D
Credits: **3**		**3**	**0**	**0**	**0**

Pre-Requisites: Fundamentals of Physics.

Module-1: Quantum Mechanics [9L]

Introduction to Quantum mechanics, Black body radiation, Planck's law, Compton effect, Photoelectric effect -Einstein's photoelectric equation. de Broglie's concept of matter waves, Davisson and Germer's experiment, Heisenberg's Uncertainty Principle, Schrödinger's Time dependent and Independent Wave Equation; Physical Significance of the Wave Function, Energy of a particle in One Dimensional Infinite Potential well.

Module-2: Band Theory of Solids& Semiconductors [9L]

Band Theory of Solids: Free electron theory, Density of energy states, Quantum theory of free electron, Bloch's theorem, Kronig-Penny model (Qualitative treatment), E-K diagram, Effective mass of electrons, origin of energy bands, Classification of materials on the basis of energy bands.

Semiconductors: Intrinsic and extrinsic semiconductors, Carrier concentration, Dependence of Fermi level on carrier concentration and temperature, Hall effect.

Module–3: Light-Semiconductor Devices [9L]

Direct and indirect band gap semiconductors, Carrier generation and Recombination, Drift and Diffusion, P-N junction diode: I-V Characteristics, Zener diode: I-V Characteristics, Bipolar Junction Transistor (BJT): Construction and Principle of operation. PIN, Avalanche photodiode, LED – working principle and characteristics, Solar Cell and Photo diode.

Module–4: Lasers & Fiber Optics [9L]

Lasers: Introduction, absorption, spontaneous emission, Stimulated emission, calculation of Einstein co-efficient of A &B, Population inversion, Pumping, Lasing action, Types of Lasers: Ruby laser, He-Ne laser, Semiconductor laser, Applications of laser.

Fiber Optics: Principle and construction of an optical fiber, 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 fibers.

Module-5: Electromagnetism & Dielectric Properties [9L]

Electromagnetism: Laws of electrostatics, Electric current and the continuity equation, Ampere's and Faraday's laws, Maxwell's equations.

Dielectric Properties: Electric dipole, dipole moment, dielectric constant, polarizability, electric susceptibility, displacement vector, electronic,ionic and orientation polarizations (quantitative treatment), Internal fields in a solid, Clausius-Mossotti equation, Ferro-electricity and Piezo electricity.

Text Books

1.Engineering Physics, B.K. Pandey, S. Chaturvedi - Cengage Learing.
2.Physics, Halliday and Resnick, - Wiley.

3.A textbook of Engineering Physics, Dr.TVS Arun Murthy , Dr. M.N. Avadhanulu, Dr. P.G. Kshirsagar – Chand.

Reference Books

1. Richard Robinett, Quantum Mechanics.
2. Semiconductor Optoelectronics: Physics and Technology, J.Singh, Mc Graw-Hill inc. (1995).
3. Online Course: "Optoelectronic Materials and Devices" by Monica Katiyar and Deepak Guptha on NPTEL.

4. P.K.Palanisamy, "Engineering Physics", Scitech Publications, Fourth edition.

E-Resources

1.https://www.researchgate.net/publication/259574083 Lecture Notes on Engineering Physics.
2. https://www.researchgate.net/publication/292607115_Applied Physics.
3. http://www.springer.com/physics/theoretical%2C+mathematical+%26+computational +physics/journal/40094
4. http://www.springer.com/physics/journal/340 .
5. http://nptel.ac.in/courses/113104012/
6. https://www.youtube.com/watch?v=jnjjWI1s9_s&list=PLzJaFd3A7DZse2tQ2qUFCh SiCj7jBidO0.
7. https://www.youtube.com/watch?v=4a0FbQdH3dY.

Course Outcomes

After completion of this course the student is able to

1. Realize the concept of uncertainty principle and to compute quantized energy levels.
2. Analyze the formation the bands thereby classification of materials on the basis of transport properties.
3. Identify the semiconductors for engineering applications.
4. Analyze working principle of lasers and to summarize its applications.
5. Formulate and solve the engineering problems on electromagnetism and dielectrics.

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**	**PO1 0**	**PO1 1**	**PO1 2**	**PSO 1**	**PSO 2**
CO1	3	2	2									3		
CO2	3	2	2									3		
CO3	3	2	2									2		
CO4	3	2	2									2		
CO5	3	2	2									2		
Average	**3.0**	**2.0**	**2.0**									**2.4**		

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

AY: 2022-23 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech EEE I Year-II Sem			
Course Code: L125A	PROGRAMMING FOR PROBLEM SOLVING	L	T	P	D
Credits: **4**		**3**	**1**	**0**	**0**

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 PROGRAMMING:

Introduction to components of a computer system: disks, primary and secondary memory, processor, operating system, compilers, creating, compiling and executing a program etc., Number systems.

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: 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, switch-case, ternary operator, goto, Iteration with for, while, do- while loops.I/O: Simple input and output with scanf and printf, formatted I/O, 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.

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.

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

Text Books:

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:

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

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:

The student will be able to:

1. Design the algorithms/flowcharts of C-programs.
2. Write the Code and test a given logic in C programming language.
3. Decompose a problem into functions and to develop modular reusable code.
4. Use arrays, pointers, strings and structures to write C Programs.
5. Apply searching and sorting algorithms.

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	2							3					
CO2	3	2							3					
CO3	3	2							3					
CO4	3	2							2					
CO5	3	2							2					
Average	**3.0**	**2.0**							**2.6**					

AY: 2022-23 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech EEE I Year-II Sem			
Course Code: L1202	**PHYSICS LAB**	L	T	P	D
Credits: **1**	**(**COMMON TO: All branches**)**	**0**	**0**	**2**	**0**

Pre-Requisites: Intermediate 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 fibre:
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. LASER
To study the Wave length of LASER Source.

8. Dielectric Constant
To determine the Dielectric constant of the given material.

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

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

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

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

13.Newton's Rings
To determine the radius of curvature of the lens by forming Newton's rings.

14.Diffraction Grating
To determine the number of lines per inch of the grating.

15.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 4thedition) ,
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 Electronic 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. Expose to the phenomena of electromagnetism and also to have exposure on magnetic materials and dielectric materials.

5. Apply Lasers and fibre optics to various systems like communications, solar cell, photo cells and so on.

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**	**PO1 0**	**PO1 1**	**PO1 2**	**PSO 1**	**PSO 2**
CO1	3	3		2					3					
CO2	3	3		2					3					
CO3	3	2	2	2					3					
CO4	3	2	2	2					3					
CO5	3	2	2	2					3					
Average	**3.0**	**2.4**	**2.0**	**2.0**					**3.0**					

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

AY: 2022-23 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech EEE I Year-II Sem			
Course Code: L1201	**ENGLISH LANGUAGE COMMUNICATION SKILLS LAB** (Common to CE,EEE,ME,ECE,MIE & AIML)	L	T	P	D
Credits: 1		**0**	**0**	**2**	**0**

Pre-Requisites:

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

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

Module 1: [9L]

CALL Lab:
Introduction to Phonetics – Speech Sounds – Vowels and Consonants, Minimal Pairs, Pronunciation Patterns.

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.

Module 3: [9L]

CALL Lab:
Stress-Word and Sentence Stress-Stress Shift-Strong and Weak Forms.

ICS Lab:
Presentations Skills-Formal Presentations.

Module 4: [9L]

CALL Lab:
Intonation-Errors in Pronunciation-the Influence of Mother Tongue (MTI)-Common Indian Variants in Pronunciation – Differences in British and American Pronunciation.

ICS Lab:
Group Discussion skills-mock GDs

Module 5: [9L]

CALL Lab:
Listening for Specific Details-Listening Comprehension Tests.

ICS Lab:
Interview Skills-Mock Interviews.

Text Books

1. ELCS Lab Manual: A Workbook for CALL & ICS Lab Activities; Prepared for JNTUH; 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

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

CO1. Develop correct pronunciation.

CO2. Use stress and intonation properly while speaking and writing.

CO3. Develop listening skills.

CO4. Acquire public speaking skills and structured talks.

CO5. Acquire debating and oral presentation skills.

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									3	3		3		
CO2									3	3		3		
CO3									3	3		3		
CO4									3	3		3		
CO5									3	3		3		
Average									**3.0**	**3.0**		**3.0**		

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

AY: 2022-23 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech EEE I Year-II Sem			
Course Code: L1251	PROGRAMMING FOR PROBLEM SOLVING LAB	L	T	P	D
Credits: **2**		**0**	**0**	**4**	**0**

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 for 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 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.

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:

The student will be able to:

1. Formulate the algorithms for simple problems.
2. Examine syntax errors as reported by the compilers.
3. Define and manipulate data with arrays, strings, and structures.
4. Make use of pointers with different function types.
5. Create, read, and write to and from simple text and binary files.

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	2							3					
CO2	3	2							3					
CO3	3	2							3					
CO4	3	2							2					
CO5	3	2							2					
Average	**3.0**	**2.0**							**2.6**					

AY: 2022-23 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech EEE I Year-II Sem			
Course Code: L12M2	AUDIT COURSE – II (HUMAN VALUES AND PROFESSIONAL ETHICS) (CE, ECE, EEE, ME, MIE, AIML)	L	T	P	D
Credits: **0**		**0**	**0**	**2**	**0**

Objectives: This introductory course input is intended

- To help the students appreciate the essential complementarity between 'VALUES'and'SKILLS'toensuresustainedhappinessandprosperitywhicharethecoreaspirationsofallhumanbeings.
- 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 such a Holistic understanding in terms of ethical human conduct, trustful and mutually satisfying human behavior 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 processor Value Education. Self Exploration–what is it? - its content and process; 'Natural Acceptance' and Experiential Validation- as the mechanism for selfexploration.ContinuousHappinessandProsperity-AlookatbasicHumanAspirations.Rightunderstanding, Relationship and Physical Facilities-the basic requirements 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'- Sukhand Suvidha.
Understanding the Body as an instrument of 'I' (I being the doer, seer andenjoyer). Understanding the characteristics and activities of 'I' andharmony in 'I'.Understanding the harmony of I with the Body: Sanyam and Swasthya; correct appraisal of Physical needs, meaning of Prosperity indetail. Programs to ensure Sanyamand 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)andRespect(Samman)asthefoundationalvaluesofrelationship.**
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 and eco-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 of 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

TEXTBOOKS

1. R R Gaur, R Sangal, G P Bagaria, 2009, A Foundation Course in Human Values and Professional Ethics.
2. Prof. K V Subba Raju, 2013, Success Secrets for Engineering Students, Smart Student Publications,3rdEdition.

REFERENCEBOOKS

1. Ivan Illich, 1974, Energy & Equity, The Trinity Press, Worcester, and Harper Collins, USA
2. E. F. Schumacher, 1973, Small is Beautiful: a study of economics as if people mattered, Blond & Briggs, Britain.
3. A Nagraj, 1998, Jeevan Vidyaek Parichay, Divya Path Sansthan, Amarkantak.
4. Sussan George, 1976, How the Other Half Dies, Penguin Press. Reprinted1986,1991
5. PL Dhar, RRGaur, 1990, Science and Humanism, Common wealth Publishers.
6. A. N. Tripathy, 2003, HumanValues, New Age International Publishers.
7. Subhas Palekar, 2000, How to practice Natural Farming, Pracheen (Vaidik) Krishi Tantra Shodh, Amravati.
8. DonellaH. Meadows, Dennis L. Meadows, Jorgen Randers, William
9. W.BehrensIII,1972, Limits to Growth–Club of Rome's report, Universe Books.

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

11. M Govindrajran, S Natrajan & V. S. SenthilKumar, Engineering Ethics (including Human Values), Eastern Economy Edition, Prentice Hall of India Ltd.

Relevant CDs, Movies, Documentaries & Other Literature:

Value Education website, http://www.uptu.ac.inStoryofStuff,http://www.storyofstuff.com
Al Gore, An Inconvenient Truth, Paramount Classics, USA Charlie Chaplin , Modern Times, United Artists, USA
IITDelhi, Modern Technology–the Untold Story

Course Outcomes:

The student will be able to:

1. Use of ethical values and attitudes in their life.
2. Practice professional etiquettes in the profession.
3. Apply the different types of professional ethical codes in their organization.
4. Demonstrate human values, attitude and harmony in life through ethical living.
5. Solve the issues related to various ethics and risks.

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		
CO2								3				3		
CO3								3				3		
CO4								3				3		
CO5								3				3		
Average								**3.0**				**3.0**		

II Year I Semester
AY: 2022-23

AY: 2022-23 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech EEE II Year-I Sem			
Course Code: L210B	**INTEGRAL TRANSFORMS (Common to EEE &ECE)**	L	T	P	D
Credits:**3**		**3**	**0**	**0**	**0**

Pre-Requisites:

Module 1:Introduction **[8L]**

Basic Introduction of the course using precise examples like periodic functions, signal propagation, solving mathematical models corresponding to Electrical Circuits.

Module 2: Laplace Transforms **[12L]**

Laplace Transform (LT) – Definition, linearity property of LT, Existence Theorem, First and Second Translation theorems. Change of scale property. LT of derivatives, LTs: multiplication by t and division by t,Initial and Final Value theorems.

Inverse Laplace Transforms: Definition , standard forms,first and second shifting theorems. Change of scale property, Use of partial fractions, Multiplication by powers of S, division by S. Inverse transform of derivatives. Heavisideexpansion theorem. Inverse Laplace Transform of integrals, definition of convolution, Convolution theorem.

Module 3: Fourier Transforms **[10L]**

Fourier Transforms ,Fourier integral formula, Inverse Theorem for Fourier Transform, Fourier Sine Transform, Inverse formula for Fourier Sine Transform, Fourier Cosine Transform, Inverse formula for Fourier Cosine Transform, linearity property, change of scale property, shifting property, Modulation Theorem

Module 4: Z-Transforms **[9L]**

Definition and properties of Z-Transform, Standard functions of Z-Transform, Unit step Function. Unit Impulse function, Initial value Theorem and Final value Theorem, Inverse Z-Transform, Partial fraction method, Difference Equation using Z-Transforms.

Module 5: Henkel Transforms **[9L]**

Henkel Transforms,Henkel Transform of the derivatives of a function, Application

of Henkel Transforms in boundary value problems, The finite Henkel Transform.

Text Books

1. A.R.Vashista, Dr. R.K.Gupta, Integral transforms - Krishna Prakasham Mandir urray
2. .R.Spiegel, Theory and problems of Laplace transforms - Shamus Outline Series Tata Mac Grawhill

Reference Books

1. Brian Daries, Integral Transforms & their applications - Springers
2. L Debnath , D Bhatta, Integral Transforms & their Applications – Chapman & Hall/CRC

3. Chorafas, Integral Transforms & their Applications

E-Resources

1. https://nptel.ac.in/content/storage2/courses/112104158/lecture8.pdf
2. https://tutorial.math.lamar.edu/classes/de/inversetransforms.aspx
3. http://www.thefouriertransform.com/
4. http://dsp-book.narod.ru/TAH/ch06.pdf

5. https://www.henkel-adhesives.com/in/en.html

Course Outcomes

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

CO1. Understand the concepts of integral transform
CO2. Determine Laplace transform of a function and understand the fundamental properties and apply Laplace transform in solving ODEs.
CO3. Determine Fourier and inverse Fourier transform of a function and understand the fundamental properties and apply Fourier transform in solving ODEs.
CO4. Apply the Z transforms techniques to solve second-order ordinary difference equations.
CO5. Apply the Henkel transform in the infinite 2-dimensional plane

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**	**PO1 0**	**PO1 1**	**PO1 2**	**PSO 1**	**PSO 2**
CO1	3	3	2	3	-	-	-	-	-	-	-	2	-	-
CO2	3	3	2	3	-	-	-	-	-	-	-	2	-	-
CO3	3	3	2	3	-	-	-	-	-	-	-	2	-	-
CO4	3	3	2	3	-	-	-	-	-	-	-	2	-	-
CO5	3	3	2	3	-	-	-	-	-	-	-	2	-	-
Average	3	3	2	3	-	-	-	-	-	-	-	2	-	-

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

AY: 2022-23 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech EEE II Year-I Sem			
Course Code: L212A	ELECTRICAL CIRCUIT ANALYSIS	L	T	P	D
Credits: **3**		**3**	**0**	**0**	**0**

Pre-Requisites: Basic Electrical Engineering

Module 1: INTRODUCTION OF A.C. CIRCUITS & A.C. NETWORK THEOREMS [10L]

Unit-I: [6L]

Sinusoidal steady state analysis: Representation of sine function as rotating phasor, phasor diagrams, impedances and admittances, AC circuit analysis, effective or RMS values, average power and complex power.

Unit-II: [4L]

Network Theorems: Superposition theorem, Thevenin theorem, Norton theorem, Maximum power transfer theorem, Reciprocity theorem, Compensation theorem. Analysis with dependent current and voltage sources, Node and Mesh Analysis, Concept of duality and dual networks.

Module 2: TRANSIENT RESPONSE ANALYSIS [9L]

Solution of First and second order networks: Solution of first and second order differential equations for Series and parallel R-L, R-C, RL-C circuits. Initial and final conditions in network elements, forced and free response, time constants, steady state and transient state response in case of step, impulse & Sinusoidal inputs.

Module 3: THREE-PHASE CIRCUITS & COUPLED CIRCUITS [9L]

Unit-I: [5L]

Three-phase circuits: Star and delta connections, three-phase three wire and three phase four-wire systems, Analysis of balanced and unbalanced star and delta connected loads, Power in three-phase circuits. Measurement of power by two wattmeter method for balanced and Unbalanced load, Numerical problems.

Unit-II: [4L]

Coupled Circuits: Mutual coupled circuits, Dot convention in coupled circuits, Ideal Transformer.

Module 4: LAPLACE TRANSFORMS FOR ELECTRICAL CIRCUITS [10L]

Electrical Circuit Analysis Using Laplace Transforms: Review of Laplace Transform, Analysis of electrical circuits using Laplace Transform for standard inputs, convolution integral, inverse Laplace transform, transformed network with initial conditions. Transfer function representation, Poles and Zeros, Frequency response (magnitude and phase plots), series and parallel resonances.

Module 5: TWO PORT NETWORK PARAMETERS [9L]

Two Port Network and Network Functions: Two Port Networks, terminal pairs, relationship of two port variables, impedance parameters, admittance parameters. Transmission Parameters and hybrid parameters, interconnections of two port networks.

Text Books

1. W. H. Hayt and J. E. Kemmerly, "Engineering Circuit Analysis", McGraw Hill Education, 2013.
2. M. E. Van Valkenburg, "Network Analysis", Prentice Hall, 2006.
3. C. K. Alexander and M. N. O. Sadiku, "Electric Circuits", McGraw Hill Education, 2004.

Reference Books

1. D. Roy Choudhury, "Networks and Systems", New Age International Publications, 1998.
2. A.Chakrabarti, "Circuit Theory (Analysis and Synthesis)"-Dhanpat Rai & Co.,2013
3. K. V. V. Murthy and M. S. Kamath, "Basic Circuit Analysis", Jaico Publishers, 1999.

E-Resources

1. https://www.khanacademy.org/science/electrical-engineering/ee-circuit-analysis-topic
2. https://www.allaboutcircuits.com
3. https://sites.google.com/site/eeenotes2u/courses/network-analysis
4. https://www.sciencedirect.com/topics/engineering/circuit-theory
5. https://www.electronics-tutorials.ws/

6. http://dl.booktolearn.com/ebooks2/engineering/electrical/9781119284932_Introduction_to_Electrica l_Circuit_Analysis_71f7.pdf
7. https://www.electrical4u.com/electrical-engineering-articles/circuit-theory/

Course Outcomes

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

CO 1. Apply Network Theorems for solving AC circuit equations.

CO 2. Evaluate first and second order networks.

CO 3. Analyse three-phase and mutually coupled circuits.

CO 4. Practice Laplace transforms on electrical circuits.

CO 5. Develop two port Network parameters for electrical circuits.

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	**3**	**3**	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**3**	**3**
CO2	**3**	**3**	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**3**	**3**
CO3	**3**	**3**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**3**	**3**
CO4	**3**	**3**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**3**	**3**
CO5	**3**	**3**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**3**	**3**
Average	**3**	**3**	**2**	**2.4**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**3**	**3**

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

AY: 2022-23 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech EEE II Year-I Sem			
Course Code: L212B	ELECTRICAL MACHINES – I	L	T	P	D
Credits: **3**		**3**	**0**	**0**	**0**

Pre-Requisites: Basic Electrical Engineering

Module 1: ELECTROMECHANICAL ENERGY CONVERSION [8L]

Electromechanical Energy conversion – forces and torque in magnetic field systems – energy balance – energy and force in a singly excited magnetic field system, determination of magnetic force - co-energy – multi excited magnetic field systems, Torque Expression.

Module 2: D.C. GENERATORS [14L]

Construction & Operation D.C. Generators – Principle of operation – Action of commutator - constructional features – DC Armature Windings – lap and wave windings – simplex and multiplex windings – use of laminated armature – E. M.F Equation**.** Classification of Dc Generators- Self Excited, Separately Excited. Open Circuit Characteristics, Critical Resistance & Speed. Causes of Failure Of Self Excitation & Their Remedies – Problems.

Module 3: ARMATURE REACTION IN D.C. GENERATOR [10L]

Armature reaction –Effects –Distribution Of Field MMF & Armature MMF– Cross magnetizing and de-magnetizing AT/pole – compensating winding – commutation – reactance voltage – methods of improving commutation. Generator Characteristics-Power Stages-Losses-Efficiency-Parallel Operation-Problem.

Module 4: D.C. MOTORS [14L]

D.C Motors – Principle of operation – Back E.M.F. - VOLTAGE &Torque equation – characteristics and application of shunt, series and compound motors – Armature reaction and commutation. Condition For Maximum Mechanical Power Developed. Power Stages. Efficiency –Condition for Maximum Efficiency-Problems.

Module 5: SPEED CONTROL OF D.C. MOTORS [12L]

Speed control of D.C. Motors: Armature voltage and field flux control methods. Ward- Leonard system. Principle of 3 point and 4 point starters – protective devices. Testing of d.c. machines: Losses – Constant & Variable losses – calculation of efficiency – condition for maximum efficiency Methods of Testing – direct, indirect and regenerative testing – brake test – Swinburne‘s test – Hopkinson‘s test – Field‘s test – Retardation test – separation ofstray losses in a d.c. motor test.

Text Books

1. E. Fitzgerald and C. Kingsley, "Electric Machinery", New York, McGraw HillEducation, 2013.
2. E. Clayton and N. N. Hancock, "Performance and design of DC machines", CBSPublishers, 2004.
3. M. G. Say, "Performance and design of AC machines", CBS Publishers, 2002.

Reference Books

1. P. S. Bimbhra, "Electrical Machinery", Khanna Publishers, 2011.
2. J. Nagrath and D. P. Kothari, "Electric Machines", McGraw Hill Education, 2010.
3. B L Theraja and A K Theraja, "A Text Book on Electrical Technology" Vol-2,S Chand Publications

E-Resources

1. https://nptel.ac.in/courses/108/105/108105155/
2. https://nptel.ac.in/courses/108/105/108105017/
3. https://nptel.ac.in/courses/108/102/108102146/

Course Outcomes

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

CO 1. Recollect magnetic field and magnetic circuit.

CO 2. Explain the construction and operation of DC Machine.

CO 3. Derive the EMF equation, Torque equation, Armature circuit equation for motoring and generation.

CO 4. Demonstrate the various characteristics of DC Machines.
CO 5. Summarize the speed control methods OF DC MOTOR.

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	**3**	**1**	**1**	**2**	-	**1**	-	-	-	-	-	-	**1**	
CO2	**3**	**2**	**3**	**1**	-	**1**	-	-	-	-	-	-	-	**2**
CO3	**3**	**3**	**3**	**2**	-	**2**	-	-	-	-	-	-	-	**2**
CO4	**3**	**2**	**1**	**1**	-	**1**	-	-	-	-	-	-	-	**2**
CO5	**3**	**2**	**1**	**2**	-	**1**	-	-	-	-	-	-	**2**	-
Average	**3**	**2**	**1.8**	**1.6**	-	**1.2**	-	-	-	-	-	-	**0.6**	**1.2**

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

AY: 2022-23 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech EEE II Year-I Sem			
Course Code: L212C	POWER SYSTEMS – I	L	T	P	D
Credits: **3**		**3**	**0**	**0**	**0**

Pre-Requisites: Basic Electrical Engineering

Module 1: Power Stations Thermal [10L]

Unit-I: [6L]

Power Stations

Line diagram of Thermal Power Station (TPS) showing paths of coal, steam, water, air, ash and flue gasses. Brief description of TPS components: -Economizers, Boilers, Super heaters, Turbines, Condensers, Chimney and cooling towers.

Hydel Power Stations- Schematic Arrangement, Brief description of Hydraulic Structures, Water turbines.

Unit-II: [4L]

Nuclear Power Stations- Nuclear Fission and Chain reaction, Nuclear fuels, Principle of operation of Nuclear reactor, Reactor Components- Moderators, Control rods, Reflectors and Coolants, Radiation hazards- Shielding and Safety precautions, Types of Nuclear reactors and brief description of PWR, BWR and FBR.

Gas Power Stations- Principle of Operation and Components (Block Diagram Approach Only).

Module 2: D.C. & A.C Distribution Systems [9L]

Unit-I: [5L]

D.C Distribution Systems - Classification of Distribution Systems - Comparison of DC vs. AC and Under-Ground vs. Over - Head Distribution Systems- Requirements and Design features of Distribution Systems- Voltage, Drop Calculations (Numerical Problems in D.C Distributors for the following cases: Radial D.C Distributor fed one end and at the both the ends (equal/unequal voltages) and Ring Main Distributor.

Unit-II: [4L]

A.C Distribution Systems - Voltage Drop Calculations (Numerical Problems) in A.C. Distributors for the following cases: Power Factors referred to receiving end voltage and with respect to related load voltages.

Module 3: Air Insulated Substation (AIS) & Gas Insulated (GIS) Substation [8L]

Unit-I: [4L]

Classification of Substations: - Indoor & Outdoor substations: Substations layout showing the location of all the substation equipment.

Bus Bar Arrangements in the Sub-Stations: Simple arrangements like single bus bar, sectionalized single bus bar, main and transfer bus bar system with relevant diagrams.

Unit-II: [4L]

Gas Insulated Substations (GIS)-Advantages of Gas insulated substations, different types of gas insulated substations, single line diagram of gas insulated substations, busbar, construction aspects of GIS, Comparison of Air insulated substations and Gas insulated substations.

Module 4: Power Factor [10L]

Unit-I: [5L]

Causes of low power factor -Methods of Improving power factor -Phase advancing and generation of reactive KVAR using static Capacitors - Most economical power factor for constant KW load and constant KVA type loads, Numerical Problems.

Unit-II: [5L]

Voltage Control- Dependency of Voltage on Reactive Power flow. - Methods of Voltage Control: Shunt Capacitors, Series Capacitors, Synchronous Capacitors, Tap changing and Booster Transformers.

Module 5: Economic Aspects of Power Generation & Tariff [9L]

Unit-I: [5L]

Load curve, load duration and integrated load duration curves-load, demand, diversity, capacity, utilization and plant use factors- Numerical Problems.

Unit-II: [4L]

Tariff Methods: Costs of Generation and their division into Fixed, Semi-fixed and Running Costs.

Desirable Characteristics of a Tariff Method-Tariff Methods: Flat Rate, Block- Rate, two-part, three-part, and power factor tariff methods and Numerical Problems.

Text Books

1. A.Chakrabarthi, M.L.Soni, P.V.Gupta and M.I Soni, Dhanpath Rai and Sons "A Text Book on Power System Engineering."
2. C.L.Wadhwa, New Age International, "Generation, Distribution and Utilization of Electrical Energy"
3. V.K.Mehta and Rohit Mehta, S.Chand Company Pvt. Ltd , "Principles of Power Systems".
4. J.B.Gupta, S.K.Kataria& Sons. "A course in Power Systems"

Reference Books

1. R.K. Rajput, "A Text book of Power system Engineering," Laxmi Publications (P) Limited.
2. S.N.Singh', "EIectrical Power Generation,Transmission and Distribution," PHI.
3. C.L.Wadhawa "Eletrical Power Systems" New Age International (P) Limited, Publishers.
4. Dr. B.R. Gupta,"Generation of Electrical Energy," S. Chand Publications

E-Resources

1. https://www.mechanicaltutorial.com/power-system-objective-type-questions-and-answers
2. https://lecturenotes.in/subject/471/power-system-1-ps-1

Course Outcomes

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

CO 1. Understand the concepts of generating stations, substations, tariff systems.

CO 2. Apply concepts in distribution systems to solve problems.

CO 3. Analyze economics of power generation and Power factor correction.

CO 4. Evaluate the power tariff methods.

CO 5. Know the importance of Power factor improvement and voltage control.

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	**3**	**3**	**2**	**3**	**2**	-	-	-	-	-	-	-	**3**	**2**
CO2	**3**	**3**	**2**	**2**	**2**	-	-	-	-	-	-	-	**3**	**2**
CO3	**3**	**2**	**2**	**2**	**2**	-	-	-	-	-	-	-	**3**	-
CO4	**3**	**3**		**2**	**2**	-	-	-	-	-	-	-	**2**	-
CO5	**3**	**3**	**3**	**3**	**1**	-	-	-	-	-	-	-	**2**	-
Average	**3**	**2.8**	**1.8**	**2.4**	**1.8**	-	-	-	-	-	-	-	**2.6**	**0.8**

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

AY: 2022-23 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech EEE II Year-I Sem			
Course Code: L212D	ELECTROMAGNETIC FIELDS	L	T	P	D
Credits: 3		3	0	0	0

Pre-Requisites: Semiconductor Physiscs

Module 1: ELECTROSTATIC FIELD [10L]

Introduction - Coulomb's law – Electric field intensity – electric fields due to point, line, surface and volume charge distributions – Electric flux density – Gauss law – Electric potential – potentialgradient – Divergence and divergence theorem – Poisson's and Laplace equations.

Module 2: ELECTROSTATIC APPLICATIONS [9L]

Field due to dipoles – dipole moment – Current and current density – Conductors and Dielectrics - Boundary conditions – capacitance – Dielectric interface – Capacitance of system of conductors – Dielectric constant and Dielectric strength - Energy stored in capacitor – Energy density.

Module 3: STEADY ELECTRO-MAGENTIC FIELDS [8L]

Introduction – Biot - Savart Law – Ampere's Circuital Law – Applications – Curl – Stoke's theorem – Magnetic flux – Magnetic flux density – The Scalar and Vector magnetic potentials – Force on a moving charge and current elements – Force and Torque on closed circuit.

Module 4: MAGNETO STATICS AND APPLICATIONS [10L]

Introduction to magnetic materials – Magnetization and Permeability – Magnetic boundaryconditions – Magnetic circuit – Potential energy and forces on Magnetic materials – Inductance and mutual inductance – Inductance of solenoids, toroids, and transmission lines – Faraday's Law – Time varying magnetic field.

Module 5: ELECTROMAGNETIC FIELDS AND WAVE PROPAGATION [9L]

Conduction current and Displacement current – Maxwell's equation in point and integral forms – Wave propagation in free space – Wave propagation in Dielectrics – Power and the Poynting Vector - Propagation in good conductors – Wave polarization.

Text Books

1. William Hayt," Engineering Electromagnetics", McGraw Hill, New york, 7th edition,2005.
2. K.A.Gangadhar, "Field theory", Khanna publishers, New Delhi, 15th edition,2004.

Reference Books

1. David K Cheng, "Field and Wave Electromagnetics", Pearson Education, 2nd edition,2004.
2. John D. Kraus, "Electromagnetics" McGraw Hill, 5th Edition,1999.
3. N. NarayanaRao, "Elements of Engg. Electro Magnetics", Prentice Hall of India, 6rd
4. Edition, 2008.
5. T.V.S. Arun Murthy, "Electromagnetic Fields", S.Chand, 2008.
6. David J Griffiths, "Introduction to Electrodynamics, PHI, 3rd edition, 2008.

E-Resources

1. https://nptel.ac.in/content/storage2/courses/108105053/pdf/(TB)(EMF)%20((EE)NPTEL).pdf
2. https://nptel.ac.in/content/storage2/courses/108105053/pdf/(TB)(EMF)%20((EE)NPTEL).pdf

Course Outcomes

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

CO 1. Understand the basic mathematical concepts related to electromagnetic vector fields.

CO 2. Summarize the concepts of electrostatic fields, electrical potential, energy density and theirapplications.

CO 3. Explain the concepts of Magneto static fields, magnetic flux density, vector potential and itsapplications.

CO 4. Explain the concepts of different methods of E.M.F generation and Maxwell's equations.

CO 5. Understand the concepts of Electromagnetic waves and characterizing parameters.

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	**3**	**3**	**2**	**-**	**-**	**3**	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**2**
CO2	**3**	**2**	**3**	**-**	**-**	**2**	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**3**
CO3	**3**	**2**	**3**	**-**	**-**	**3**	**3**	**3**	**-**	**-**	**-**	**-**	**-**	**2**
CO4	**3**	**3**	**3**	**-**	**-**	**3**	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**3**
CO5	**3**	**2**	**3**	**-**	**-**	**2**	**3**	**3**	**-**	**-**	**-**	**-**	**-**	**2**
Average	**3**	**2.4**	**2.4**	**-**	**-**	**2.8**	**2.8**	**2.8**	**-**	**-**	**-**	**-**	**-**	**2.4**

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

AY: 2022-23 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech EEE II Year-I Sem			
Course Code: L2121	ELECTRICAL CIRCUITS & SIMULATION LAB	L	T	P	D
Credits: 2		0	0	4	0

Pre-Requisites: Basic Electrical Engineering Lab

Total ten experiments to be conducted from the list of following experiments.

1. Verification of Mesh and Nodal analysis.
2. Verification of Super Position theorem.
3. Verification of Thevenin's & Norton's theorem.
4. Verification of Maximum Power Transfer theorem.
5. Verification of Reciprocity theorem.
6. Verification of Compensation theorem.
7. Verification of Milliman's theorem.
8. Determination of transient response of current in RL and RC circuits.
9. Determination of self, mutual inductances and coefficient of coupling.
10. Frequency response of Series and Parallel resonance circuits.
11. Determination of Z and Y parameters.
12. Determination Transmission and hybrid parameters.

Course Outcomes:

The student will be able to:

1. Impart hands on experience in verification of circuit laws and theorems
2. Use different meters and instruments for the measurement of common electrical quantities
3. Apply the theorem statements concepts in the design of electrical circuits
4. Measure the network parameters in any electrical circuit
5. Make use of simulation packages for simple programs circuit design methods

CO-PO/PSO Mapping

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	3	-	2	-	-	-	2	-	-	-	2	3
CO2	3	3	3	-	3	-	-	-	2	-	-	-	2	2
CO3	3	2	3	-	2	-	-	-	2	-	-	-	2	3
CO4	3	3	3	-	3	-	-	-	2	-	-	-	2	2
CO5	3	3	3	-	2	-	-	-	2	-	-	-	2	3
Average	3	2.8	3	-	2.4	-	-	-	2	-	-	-	2	2.6

AY: 2022-23 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech EEE II Year-I Sem			
Course Code: L2122	ELECTRICAL MACHINES LAB – I	L	T	P	D
Credits: 2		0	0	4	0

Pre-Requisites: Basic Electrical Engineering Lab

Total ten experiments to be conducted from the list of following experiments.

1. Magnetization characteristics of DC shunt generator. Determination of critical fieldresistance and critical speed.
2. Load test on DC shunt generator. Determination of characteristics.
3. Load test on DC series generator. Determination of characteristics.
4. Load test on DC compound generator. Determination of characteristics.
5. Hopkinson's test on DC shunt machines. Predetermination of efficiency.
6. Brake test on DC shunt motor. Determination of performance curves.
7. Swinburne's test and speed control of DC shunt motor. Predetermination of efficiencies.
8. Brake test on DC compound motor. Determination of performance curves.
9. Fields test on DC series machines. Determination of efficiency.
10. Retardation test on DC shunt motor. Determination of losses at rated speed.
11. Separation of losses in DC shunt motor.

Course Outcomes:

The Student will be able to

1. Understand the familiarity with the types of DC machines and their basic characteristics.
2. Study the methods to predetermine the efficiency of DC machines.
3. Knowledge of methods and measuring devices for determination of variouscharacteristics and parameters of DC machines.
4. Understand the operation of DC machines in load sharing.
5. Demonstrate the ability to work effectively in groups to troubleshoot and analyze DC machines

CO-PO/PSO Mapping

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	2	1	2	-	3	-	-	-	-	-	-	2	-
CO2	3	2	1	3	-	2	-	-	-	-	-	-	-	2
CO3	3	2	3	2	-	2	-	-	-	-	-	-	3	-
CO4	3	2	3	3	-	2	-	-	-	-	-	-	-	2
CO5	2	3	1	1	-	1	-	-	-	-	-	-	2	-
Average	2.8	2.2	1.8	2.2	-	2	-	-	-	-	-	-	1.4	0.8

AY: 2022-23 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech EEE II Year-I Sem			
Course Code: L21M1	**GENDER SENSITIZATION** (Mandatory Course) COMMON TO: ALL	L	T	P	D
Credits: 0		**2**	**0**	**0**	**0**

Pre-Requisites:

Module 1:UNDERSTANDING GENDER[6L]

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: GENDER AND BIOLOGY[6L]

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[6L]

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 of Work.

Module 4: ISSUES OF VIOLENCE-I[6L]

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 Forums for Justice.

Module 5ISSUES OF VIOLENCE-II[6L]

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.

Text Books

1. ***"Towards a World of Equals: A Bilingual Textbook on Gender"*** written by A.Suneetha, Uma Bhrugubanda, DuggiralaVasanta, Rama Melkote, Vasudha Nagaraj, Asma Rasheed, GoguShyamala, DeepaSreenivas and Susie Tharu.

Reference Books

1. Raj Paul Singh, Anupama Singh. Gender Sensitization: Issues and Challenges: Raj Publications: 2019.

E-Resources

- https://www.medicalnewstoday.com/articles/232363
- https://web.stanford.edu/~eckert/PDF/Chap1.pdf
- https://open.lib.umn.edu/sociology/chapter/11-1-understanding-sex-and-gender/

Course Outcomes

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

CO1. develop a better understanding of important issues related to gender in contemporary India.

CO2. sensitize 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. attain a finer grasp of how gender discrimination works in our society and how to counter it.

CO4. acquire insight into the gendered division of labour and its relation to politics and economics.

CO5. be better equipped to work and live together as equals.

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	-	**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

II Year II Semester
AY: 2022-23

AY: 2022-23 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech EEE II Year-II Sem			
Course Code: L220A	**Complex Variables and Special Functions (COMMON TO: EEE & ECE)**	L	T	P	D
Credits: **4**		**3**	**1**	**0**	**0**

Pre-Requisites:

Module –I Special functions- Bessel function-Legendre function: [9L]

Bessel functions, Recurrence relations, properties. Generating function and orthogonal properties, Legendre polynomials, recurrence relations, Rodrigue's formula,

Module 2: Functions of Complex Variables [10L]

Functions of a complex variable, Continuity, Differentiability, Analyticity, Singular point, Cauchy-Riemann equations in Cartesian and polar coordinates, Harmonic and conjugate harmonic functions, Milne-Thompson method. Analyticity of Exponential, trigonometric, hyperbolic functions and their properties.

Module 3: Complex Integration and Power Series [9L]

Line integral, evaluation along a path and by indefinite integration, Cauchy's integral theorem, Cauchy's integral formula, generalized integral formula (with proofs).

Radius of convergence, Expansion in Taylor's series, Maclaurin's series and Laurent series.

Module 4: Contour Integration [10L]

Singular point, types of singularity, Residues Evaluation of residues by using Laurent's series & Residue theorem.

Evaluation of integrals of the type

(a) Improper real integrals $\int_{-\infty}^{\infty} f(x)dx$, (b) $\int_{0}^{2\pi} f(\cos\theta, \sin\theta)d\theta$

Module 5: Conformal Mapping [10L]

Transformation by e^z, lnz, z^2, z^n (n positive integer), Sinz, cosz, z + a/z, translation, rotation, inversion and bilinear transformation , fixed point , properties of cross ratio , invariance of circles , determination of bilinear transformation mapping three given points.

Text Books

1. B.S. Grewal: Higher Engineering Mathematics, Khanna Publications, 2017
2. R.K.Jain & S.R.K. Iyengar, Advanced Engineering Mathematics, Narosa Publications, 5th Edition, 2015.
3. R.V. Churchill, Complex variables and its applications, McGraw Hill, 2009.

Reference Books.

1. W.W. Bell, Special Functions for Scientists and Engineers, Dover Publications, 2004
2. Erwin Kreyszig: Advanced Engineering Mathematics, John Wiley and Sons, 8th Edition, 2008. 4

E-Resources

1. **http://scipp.ucsc.edu/~dine/ph212/212_special_functions_lecture.pdf**
2. **https://nptel.ac.in/courses/111/107/111107056/**
3. **https://www.math.arizona.edu/~faris/methodsweb/complex.pdf**
4. **https://www.researchgate.net/publication/256194654_Conformal_mappings_and_spaces_of_analytic_functions**
5. **https://www.youtube.com/watch?v=ZaaeInBsRfo**

Course Outcomes

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

CO1. Learn and use properties of Bessel's and Legendre functions.
CO2. Understand the concept of Analytic functions.
CO3. Use power series and solve the ordinary differential equations.
CO4. Understand the use of complex variables and evaluation of real integrals.

CO5. Convert complicated regions to simpler regions using the conformal mapping.

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**	**PO1 0**	**PO1 1**	**PO1 2**	**PSO 1**	**PSO 2**
CO1	3	2	1	-	-	-	-	-	-	-	-	2	-	-
CO2	3	2	1	-	-	-	-	-	-	-	-	2	-	-
CO3	3	2	1	-	-	-	-	-	-	-	-	2	-	-
CO4	3	2	1	-	-	-	-	-	-	-	-	2	-	-
CO5	3	2	1	-	-	-	-	-	-	-	-	2	-	-
Average	3	2	1	-	-	-	-	-	-	-	-	2	-	-

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

AY: 2022-23 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech EEE II Year-II Sem			
Course Code: L222A	**DIGITAL ELECTRONICS** (EEE)	L	T	P	D
Credits: **3**		**3**	**0**	**0**	**0**

Pre-Requisites: NIL

Module 1: Digital Fundamentals [9L]

Unit-I: Number Systems [6L]

Analogue Versus Digital, Binary, Octal, Decimal and Hexa decimal Number systems and their conversions. Number Representation in Binary- Sign bit Magnitude, 1's and 2's Complement. Floating Point Numbers- Range of Numbers and Precision, Number formats.

Unit-II: Binary Codes [3L]

BCD, Excess-3, Gray code and their Conversions with binary. Parity bit, Hamming code.

Module 2: Name of the Module [9L]

Unit-I: Basic Digital Circuits [4L]

Logic gates, Universal gates, Boolean Algebra - Fundamental Postulates, Properties and Boolean theorems, Switching Functions - Sum of products and product of sums, Canonical/ Standard forms, Minterms and Maxterms.

Unit-II: Minimization of Switching Functions [5L]

Karnaugh Map Method- Two, Three, Four and Five variable, don't care combinations, Quine Mc-cluskey Tabular Method, Prime –Implicant chart, Simplification rules.

Module 3: Combinational Logic Design [8L]

Unit-I: Arithmetic Circuits [4L]

Basic Building Blocks-Adders, Subtractors, BCD Adder, Serial adder, parallel adder, magnitude comparator

Unit-II: Multiplexers and Demultiplexers[4L]

Multiplexer, Demultiplexer /Decoders, Encoder, Priority Encoder

Module 4: Sequential Circuits [10L]

Unit-I: Synchronous Sequential Circuits [6L]

Flip-Flops- SR, JK, D, T, Master-Slave JK FF operation, Excitation tables, Flip flop conversions, counters design.

Unit-II: Finite State Machines [4L]

Classification, Design – Moore/Mealy models, Capabilities and Limitations of FSMs.

Module 5: Memories and Programmable Logic [7L]

Unit-I: Memory organization [4L]

ROM, PROM, EPROM, EEPROM, Internal Structure and operation of RAM- Static and Dynamic

Unit-II: Programmable Logic Devices [3L]

Realization of Switching functions using PLD's-ROM, PLA and PAL

Text Books

3. Switching & Finite Automata theory – Zvi Kohavi, 2 ed., TMH.
4. Digital Design – Morris Mano, 3 ed., 2006, PHI.

Reference Books

6. R.P. Jain, "Modern digital Electronics", Tata McGraw Hill, 4th edition, 2009.

7. An Engineering Approach to Digital Design – Fletcher, PHI.
8. Digital Electronics, Principles, Practices and Applications-Anil k Maini- Wiley, 2007

E-Resources

1. http://www.inf.fu-berlin.de/lehre/WS00/19504-V/Chapter1.pdf
2. https://nptel.ac.in/courses/108/105/108105113/

Course Outcomes

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

CO1. Understand conversions of Number systems and Number formats

CO2. Apply fundamental postulates and methods for Minimization of Switching Functions

CO3. Design Combinational logic circuits

CO4. Design Sequential circuits with Mealy and Moore models

CO5. Understand Memory operations and design using PLDs.

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**	**PO1 0**	**PO1 1**	**PO1 2**	**PSO 1**	**PSO 2**
CO1	3	1	-	-	-	-	-	-	-	-	-	-	1	-
CO2	1	2	-	-	-	-	-	-	-	-	-	-	1	-
CO3	1	2	3	-	-	-	-	-	-	-	-	-	3	-
CO4	2	2	3	-	-	-	-	-	-	-	-	-	3	-
CO5	3	1	3	-	-	-	-	-	-	-	-	-	3	-
Average	**2**	**1.6**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2.2**	**-**

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

AY: 2022-23 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech EEE II Year-II Sem			
Course Code: L222B	ELECTRICAL MACHINES-II	L	T	P	D
Credits: **4**		**3**	**1**	**0**	**0**

Pre-Requisites: Electrical Machines - I

Module 1: Transformers (Part-I) [11L]

Transformer principle-Need of Transformer-construction-types of transformers-EMF equation- core losses- Ideal Transformer, practical transformer on No-load-phasor diagram- Excitation phenomenon, practical Transformer on load-phasor diagrams Equivalent circuit - Inrush currents.

Module 2: Transformers (Part-II) [17L]

Voltage Regulation-Dependency of voltage Regulation on load power factor-losses Efficiency- Condition for maximum efficiency- Testing of Transformers- Polarity Test - OC Test-SC Test- Sumpner's Test - Auto transformer- Power and Distribution Transformers differences-All day efficiency.

Module 3: Parallel Operation and Three Phase Transformers [9L]

Parallel operation – conditions - problems - construction of three phase transformer Poly-phase connections Y/Y, Y/Δ, Δ /Y, Δ / Δ and open Δ, Zig-Zag Connections -Third harmonics in phase voltages-three winding transformers- Scott connection - On load tap changer, OFF load tap changer - cooling of a transformer.

Module 4: Poly Phase Induction Motors (Part-I) [10L]

Three phase induction motors - construction – Types of rotors – Rotating Magnetic field – Principle of operation – Slip – Rotor frequency – Rotor Equivalent Circuit – Rotor Input – Mechanical Power developed- Complete equivalent circuit –Phasor 76 diagrams at starting and running conditions – Losses and power flow –Efficiency Torque Equation – Starting and maximum torque – Torque Slip Characteristics – Deep bar and double cage rotors.

Module 5: Poly Phase Induction Motors (Part-II) [10L]

Circle diagram: No load and Blocked rotor tests-Performance Analysis from circle diagram – starting of Induction motors – Different Starters – Speed control – Control from stator and rotor sides – Crawling and cogging -Induction Generator.

Text Books

1. P.S.Bhimbra**, "Electrical machines"**, Khanna Publishers.
2. A.E. Fritzgerald, C.Kingsley and S.Umans**, "Electric machinery"**, Mc Graw Hill Companies, 5th edition.
3. B L Theraja and A K Theraja, "A Text Book on Electrical Technology" Vol-2, S Chand Publications.

Reference Books

1. M.G.Say **"Performance and Design** of AC Machines" BPB Publishers
2. Langsdorf **"Theory of Alternating Current Machinery"** Tata McGraw-Hill Companies, 2nd edition.
3. I.J.Nagrath and D.P.Kothari **, "Electric Machines"**,Tata Mc Graw Hill, 7th Edition.2005.

E-Resources

1. https://nptel.ac.in/courses/108/106/108106072/
2. https://nptel.ac.in/courses/108/105/108105131/
3. https://nptel.ac.in/courses/108/102/108102146/

Course Outcomes

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

CO 1. Analyze the performance of a transformer under different operating conditions and recognize the various losses & drops inside a transformer and discuss about transformer.

CO 2. Evaluate the performance of single-phase transformer by estimating its efficiency, regulation.

CO 3. Apply parallel operation of single-phase and three-phase transformers to meet the maximum

demand.

CO 4. Describe the working principle of induction motors based on basic theories of electromagnetic induction and analyze the motor from its speed-time characteristics.

CO 5. Analyze the performance by Constructing circle diagram of an induction motor.

CO-PO/PSO Mapping

Course Outcomes	Program Outcomes(POs)/Program Specific Outcomes(PSOs)													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO1 0**	**PO1 1**	**PO1 2**	**PSO 1**	**PSO 2**
CO1	**3**	**2**	**1**	**2**	**-**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	
CO2	**3**	**2**	**1**	**3**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**
CO3	**3**	**2**	**3**	**2**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	
CO4	**3**	**2**	**3**	**3**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**
CO5	**2**	**3**	**1**	**1**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**
Average	**2.8**	**2.2**	**1.8**	**2.2**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**1. 4**	**0. 8**

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

AY: 2022-23 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech EEE II Year-II Sem			
Course Code: L222C	**CONTROL SYSTEMS**	L	T	P	D
Credits: **4**		**3**	**1**	**0**	**0**

Pre-Requisites: Electrical Circuit Analysis

Module 1: INTRODUCTION [10L]

Introduction to control systems – Control theory concepts - Open loop and feedback control systems-Different examples of control systems-Mathematics modeling of control systems - Translational and rotational mechanical systems– Analysis of control systems using Laplace transforms-Block diagram reduction techniques – Signal flow graphs reduction using Mason's gain formula.

Module 2: TIME RESPONSE ANALYSIS [9L]

Standard test signals, Analysis of transient and steady state behavior of control systems – Time response of first order and higher order systems –Time domain specifications, steady state response-steady state error and error constants –effects of proportional derivative, proportional integral systems.

Module 3: STABILITY & ROOT LOCUS TECHNIQUES [8L]

Concept of Stability-Routh-Hurwitz Criterion-Relative Stability analysis-Root-Locus technique. Construction of Root-loci-Effects of adding poles and zeros to G(s)H(s) on the root loci.

Module 4: STABILITY ANALYSIS IN FREQUENCY DOMAIN [10L]

Frequency domain specifications- Relationship between time and frequency response-Bode diagrams-Determination of frequency domain specifications and transfer function from the Bode diagram- Phase and Gain margin- stability analysis from Bode plots- Polar plots- Nyquist plots and applications of Nyquist criterion to find the stability.

Module 5: STATE SPACE ANALYSIS OF LINEAR CONTINUOUS SYSTEMS [9L]

Concepts of state- state variables and state vector-derivative of state model from transfer function-Derivative of transfer function from state model- diagonalization- Eigen values and Eigen Vectors-solving the time invariant state equations- state transition matrix and its properties- Controllability and Observability.

Text Books

1. I.J.Nagrath and M.Gopal, "Control systems Engineering", 5th edition, New Age International (P) Limited, New Delhi, 2007.
2. A. Anand Kumar , "Control Systems" , 2nd edition, PHI Learning Private Limited
3. A. NagoorKani, "Control Systems", RBA Publications, 2006

Reference Books

1. K. Ogata, "Modern control engineering", Pearson Education, 4th edition, 2004.
2. Richard C. Dorf and Robert H. Bishop , "Modern Control Systems," Pearson Education, 2021
3. B. C. Kuo, "Automatic Control System" Prentice Hall, 1995

E-Resources

1. https://nptel.ac.in/courses/107/106/107106081/
2. https://ocw.mit.edu/courses/mechanical-engineering/2-04a-systems-and-controls-spring-2013/lecture-notes-labs/

Course Outcomes

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

CO 1. Summarize the basic elements and structures of feedback control systems.
CO 2. Evaluate the time response, steady state response, errors of control systems.
CO 3. Analyze stability of control systems using time domain specifications.
CO 4. Develop frequency response plots to analyze control systems
CO 5. Apply State Space Analysis for linear time invariant control systems and test controllability and observability of control systems.

CO-PO/PSO Mapping

Course Outcomes	Program Outcomes(POs)/Program Specific Outcomes(PSOs)													
	PO1	**PO2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO1**	**PSO 2**
CO1	**3**	**2**	**-**	**3**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**
CO2	**3**	**3**		**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**3**	**-**
CO3	**3**	**3**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**3**	**-**
CO4	**3**	**3**	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**3**	**-**
CO5	**3**	**2**		**3**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**
Average	**3**	**2.6**	**2.5**	**2.6**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**2**	**2.8**	**-**

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

AY: 2022-23 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech EEE II Year-II Sem			
Course Code: L222D	POWER SYSTEMS – II	L	T	P	D
Credits: **4**		**3**	**1**	**0**	**0**

Pre-Requisites: Power System -I

Module 1: TRANSMISSION LINE PARAMETERS [10L]

Unit-I: [6L]

Types of conductors, Calculation of resistance for solid conductors, Calculation of inductance for single and three phase transmission lines, concept of GMR and GMD, symmetrical and asymmetrical conductor configuration with and without transposition - Skin and Proximity effects - Numerical Problems.

Unit-II: [4L]

Calculation of capacitance for 2 wire and 3 wire systems, effect of ground on capacitance, capacitance calculations for symmetrical and asymmetrical single and three phase transmission lines,
- Numerical Problems.

Module 2: PERFORMANCE OF TRANSMISSION LINES [9L]

Development of equivalent circuits for short, medium and long lines - efficiency and regulation. Attenuation constant and phase constant - surge impedance loading - Surge Impedance and SIL, Wave Length and Velocity of Propagation of Waves (numerical problems).

Module 3: CORONA, TRANSMISSION LINE INSULATORS, SAG AND TENSION CALCULATIONS [8L]

Unit-I: [4L]

Corona - Description of the phenomenon, factors affecting corona, critical voltages and power-loss, Radio Interference - Numerical Problems.
Types of Insulators, String efficiency and Methods of improvement- Capacitance grading and Static Shielding - Numerical Problems.

Unit-II: [4L]

Sag and Tension Calculations with equal and unequal heights of towers, Effect of Wind and Ice on weight of Conductor, Numerical Problems - Stringing chart and sag template and its applications.

Module 4: UNDERGROUND CABLES [10L]

Unit-I: [5L]

Types of Cables, Construction, Types of Insulating materials, Calculations of Insulation resistance and stress in insulation, Numerical Problems.

Unit-II: [5L]

Capacitance of Single and 3-Core belted cables, Numerical Problems. Grading of Cables - Capacitance grading, Numerical Problems, Description of Inter-sheath grading.

Module 5: RECENT TRENDS IN TRANSMISSION [9L]

Design of rural distribution, planning and design of town electrification schemes – comparison of EHVAC & HVDC system – economic distance for HVDC – terminal equipment for HVDC systems – description of DC transmission system – planning advantages- interconnection of HVDC & AC systems – Introduction to FACTS technology.

Text Books

1. V.K. Mehta and Rohit Mehta, "Principles of Power System", S.Chand Publishers, Fourth Revised Edition, 2008.
2. **S**.N.Singh, 'Electric Power Generation , Transmission and Distribution', Prentice Hall of IndiaPvt.Ltd, New Delhi, 2008.
3. B.R.Gupta,' Power System Analysis and Design', S.Chand, New Delhi, Fifth Edition 2005-08.
4. R.K.Rajput, 'Power System Engineering' Laxmi Publications (P) Ltd, New Delhi, 2006.

Reference Books

1. D.P.Kothari, I.J.Nagarath, 'Power System Engineering' Tata Mc Graw -Hill Publishing Company limited, New Delhi, 2007.
2. C.L.Wadhwa, 'Electrical Power Systems', New Academic Science Ltd, 2009.
3. Luces M.Fualken berry, Walter Coffer, 'Electrical Power Distribution and Transmission' Pearson Education, 2007.
4. Hadi Saadat, 'Power System Analysis, 'PSA Publishing; Third Edition, 2010.

E-Resources

1. https://www.sanfoundry.com/power-systems-multiple-choice-questions-answers/
2. https://lecturenotes.in/subject/471/power-system-2-ps-2

Course Outcomes

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

CO 1. Ability to compute line parameters for different configurations.

CO 2. Ability to model transmission line and to determine the performance of line.

CO 3. Ability to do mechanical design of transmission line.

CO 4. Ability to choose various insulators and cables for transmission line.

CO 5. Ability to understand structure of recent trends in transmission.

CO-PO/PSO Mapping

Course Outcomes	Program Outcomes(POs)/Program Specific Outcomes(PSOs)													
	PO 1	**PO 2**	**PO3**	**PO4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PS O1**	**PS O2**
CO1	**3**	**3**	**2**	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**2**
CO2	**3**	**3**	**2**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**2**
CO3	**3**	**2**	**2**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**
CO4	**3**	**3**		**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**
CO5	**3**	**3**	**3**	**3**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**
Average	**3**	**2.8**	**1.8**	**2.4**	**1.8**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2.6**	**0.8**

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

AY: 2022-23 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech EEE II Year-II Sem			
Course Code: L2221	DIGITAL ELECTRONICS LAB	L	T	P	D
Credits: **1**		**0**	**0**	**2**	**0**

Pre-Requisites: Nil

List of Experiments:

1. To study basic logic gates and verify truth tables of: AND, OR, NOT, NAND, NOR, EX-OR, EXNOR for 2 Inputs.
2. Verify truth tables of AND, OR, NOT using NAND and NOR gates
3. To realize SOP, POS expressions.
4. To realize Half Adder/Subtractor and Full Adder/ Subtractor circuits using NAND,NOR gates and verify the truth tables
5. To study BCD to Excess-3 and vice-versa and verify truth table
6. To study binary to gray and gray to binary converter using gates and verify truth tables.
7. To design and implement encoder and decoder using logic gates and study of corresponding ICs.
8. To design and verify truth table of 4 to 1 multiplexer and 1 to 4 demultiplexer and study of corresponding ICs.
9. Realize 2 bit comparator using gates and 4 bit Comparator IC.
10. Design and construct basic flip flops RS, JK, D and T using gates and verify truth table.
11. Design and construct JK Master-Slave Flip-Flop using gates
12. Realize Asynchronous divide by 4 and Decade counter
13. Realize synchronous Decade Up/Down Counter.
14. Realize RAM (16X4) - Perform read and write operations.

Course Outcomes

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

CO1. Learn the basics of gates and design simple logic circuits
CO2. Design different combinational circuits and verify their functionalities.
CO3. Design sequential circuits

AY: 2022-23 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech EEE II Year-II Sem			
Course Code: L2222	CONTROL SYSTEMS LAB	L	T	P	D
Credits: 2		0	0	4	0

Pre-Requisites: Control Systems

Total ten experiments to be conducted from part A & part B
PART A:
Any Eight of the following experiments are to be conducted:

1. Time response of Second order system.
2. Characteristics of Synchro.
3. Programmable logic controller – Study and verification of truth tables of logic gates, simple Boolean expressions and application of speed control of motor.
4. Effect of feedback on DC servo motor.
5. Transfer function of DC motor.
6. Effect of P, PD, PI, PID Controller on a second order systems.
7. Lag and lead compensation – Magnitude and phase plot.
8. Transfer function of DC generator.
9. Temperature controller using PID controller.
10. Characteristics of Magnetic amplifiers.
11. Characteristics of AC servo motor.

PART B:
Any two simulation experiments are to be conducted:

1. Simulation of Op-Amp based Integrator and Differentiator circuits.
2. Simulation of Linear system (Time domain analysis, Error analysis).
3. Simulation of Stability (Bode, Root Locus, Nyquist) of Linear Time Invariant system.
4. Simulation of State space model for classical transfer function and verification.

Course Outcomes:
The students will be able to:

1. Make use of simulation packages for simple control system programs.
2. Analyze the stability analysis using root locus and bode plots.
3. Determine the transfer function of DC motor/generator.
4. Design the lead and lag compensators and Discuss the performance of servomotor and PID controller.
5. Illustrate the characteristics of synchros.

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	2	3	3	3	-	-	-	2	-	-	-	3	-
CO2	3	3	2	3	-	-	-	-	2	3	-	-	2	-
CO3	2	3	3	3	-	-	-	-	2	-	-	-	2	-
CO4	2	3	3	3	3	-	-	-	2	-	-	-	3	-
CO5	2	3	3	3	-	-	-	-	2	-	-	-	2	-
Average	2.2	2.8	2.8	3	3	-	-	-	2	3	-	-	2.4	-

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

AY: 2022-23 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech EEE II Year-II Sem			
Course Code: L22M2	**Environmental Science (Mandatory Course – II)**	L	T	P	D
Credits: **0**		**2**	**0**	**0**	**0**

Pre-Requisites: Nil.

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: 2022-23 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech EEE III Year-I Sem			
Course Code: L31EA	**Business Economics and Financial Analysis**	L	T	P	D
Credits: **4**		**3**	**1**	**0**	**0**

Pre-Requisites:

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.

Module 1:

Introduction to Business and Economics:

Unit – 1: 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.

Unit – 2: 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.

Module 2:

Demand and Supply Analysis:

Unit – 1: 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.

Unit – 2: Supply Analysis: Determinants of Supply, Supply Function & Law of Supply.

Module 3:

Production, Cost, Market Structures & Pricing:

Unit – 1: Production Analysis: Factors of Production, Production Function, Production Function with one variable input, two variable inputs, Returns to Scale, Different Types of Production Functions.

Unit – 2: Cost analysis: Types of Costs, Short run and Long run Cost Functions.

Unit – 3: Market Structures: Nature of Competition, Features of Perfect competition, Monopoly, Oligopoly, Monopolistic Competition.

Unit – 4: Pricing: Types of Pricing, Product Life Cycle based Pricing, Break Even Analysis, Cost Volume Profit Analysis.

Module 4:

Unit – 1: 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.

Module 5:

Unit – 1: Financial Analysis through Ratios: Concept of Ratio Analysis, Liquidity Ratios, Turnover Ratios, Profitability Ratios, Proprietary Ratios, Solvency, Leverage Ratios (simple problems).

Unit – 2: Introduction to Fund Flow and Cash Flow Analysis (simple problems).

Text Books:

1. D.D.Chaturvedi,S.L.Gupta,BusinessEconomics-TheoryandApplications,International Book House Pvt. Ltd. 2013.
2. DhaneshKKhatri,FinancialAccounting,TataMcGrawHill,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,SunilKMaheshwari, Sharad KMaheshwari, 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.

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**	**PSO 1**	**PSO 2**
CO1	-	1	-	-	-	-	-	-	-	-	3	-	-	-
CO2	-	1	-	-	-	-	-	1	-	-	-	-	-	1
CO3	-	-	-	-	-	-	-	1	-	-	-	-	-	1
CO4	-	1	-	-	-	-	-	-	3	-	3	-	-	1
CO5	-	1	-	-	-	-	-	-	-	-	3	-	-	-
Average	-	-	-	-	-	-	-	-	-	-	-	-	-	-

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

AY: 2022-23 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech EEE III Year-I Sem			
Course Code: L312A	Electrical Machines – III	L	T	P	D
Credits: **3**		**3**	**0**	**0**	**0**

Pre-Requisites: Basic Electrical Engineering

Module 1: Fundamentals of Synchronous Generators [10L]

Constructional Features of round rotor and salient pole machines – Armature windings - Integral slot and fractional slot windings; Distributed and concentrated windings – distribution, pitch and winding factors – E.M.F Equation. Harmonics in generated e.m.f. - Suppression of harmonics – armature reaction - leakage reactance, synchronous reactance and impedance –phasor diagram – load characteristics.

Module 2: Regulation of Synchronous Generators [12L]

Regulation by synchronous impedance method, M.M.F. method, Z.P.F. method and A.S.A methods – salient pole alternators – two reaction analysis – experimental determination of X_d and X_q (Slip test) Phasor diagrams – Regulation of salient pole Alternators.

Module 3: Parallel Operation of Synchronous Generators [10L]

Synchronization of Alternators with infinite bus – Methods of Synchronization- synchronizing power and torque –Parallel operation and load sharing – Numerical Problems –Effect of change of excitation and mechanical power input. Short circuit Analysis – determination of sub- transient, transient and steady state reactance's.

Module 4: Synchronous Motors [12L]

Construction and types of Synchronous Motors – Methods of Starting – Synchronous induction Motor. Variation of current and power factor with excitation control – phasor diagrams – V and Inverted V Curves. Synchronous condenser – Applications - Problems - Mathematical analysis for power developed. Excitation and power circles – hunting and its suppression.

Module 5: Single Phase Motors-Constructional features [10L]

Single phase induction motor – Double field revolving theory – split-phase – Capacitor start – Capacitor run motors - shaded pole motors. Principle and performance of A.C. Series motor- Universal motor, Stepper Motor.

Text Books

1. I.J.Nagrath and D.P.Kothari**, Electric Machines**, Tata McGraw Hill Publishers, 7th Edition 2005.
2. P.S. Bimbra**, Electrical Machines**, Khanna Publishers
3. B L Theraja and A K Theraja, "A Text Book on Electrical Technology" Vol-2,S Chand Publications

Reference Books

1. M.G.Say, ELBS and Ptiman and Sons, **The Performance and Design of A.C.Machines**
2. Langsdorf**, Theory of Alternating Current Machinery ,** Tata McGraw-Hill, 2nd edition.

E-Resources

1. https://www.sciencedirect.com/topics/engineering/synchronous-machine
2. https://electrical-engineering-portal.com/synchronous-motors-basics
3. https://electrical-engineering-portal.com/single-phase-motors

Course Outcomes

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

CO1. Determine the EMF generated in alternator
CO2. Estimate the regulation of alternator
CO3. Evaluate the performance of Alternators with infinite bus
CO4. Analyse the performance of Synchronous Motor
CO5. Analyse the performance of A.C. Series motor- Universal motor

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**	**PO1 0**	**PO1 1**	**PO1 2**	**PSO 1**	**PSO 2**
CO1	3	2	1	2	-	3	-	-	-	-	-	-	2	-
CO2	3	2	1	3	-	2	-	-	-	-	-	-	-	2
CO3	3	2	3	2	-	2	-	-	-	-	-	-	3	-
CO4	3	2	3	3	-	2	-	-	-	-	-	-	-	2
CO5	2	3	1	1	-	1	-	-	-	-	-	-	2	-
Average	2.8	2.2	1.8	2.2	-	2	-	-	-	-	-	-	1.4	0.8

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

AY: 2022-23 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech EEE III Year-I Sem			
Course Code: L312B	POWER ELECTRONICS	L	T	P	D
Credits: 3		3	0	0	0

Pre-Requisites:

Module 1: Power switching devices [8L]

Diode, Thyristor, MOSFET, IGBT: I-V Characteristics; Firing circuit for thyristor.
Voltage and current commutation of a thyristor; Gate drive circuits for MOSFET and IGBT.

Module 2: Thyristor Rectifiers [12L]

Single-phase half-wave and full-wave rectifiers, Single-phase full-bridge thyristor rectifier with R-load and highly inductive load.
Three-phase full-bridge thyristor rectifier with R-load and highly inductive load; Input current wave shape and power factor.

Module 3: DC-DC Buck Converter [10L]

Elementary chopper with an active switch and diode, concepts of duty ratio and average voltage.
Power circuit of a buck converter, analysis and waveforms at steady state, duty ratio control of output voltage.

Module 4: Single-Phase Voltage Source Inverter [10L]

Power circuit of single-phase voltage source inverter, switch states and instantaneous output voltage, square wave operation of the inverter.
Concept of average voltage over a switching cycle, bipolar sinusoidal modulation and unipolar sinusoidal modulation, modulation index and output voltage.
Three-phase voltage source inverter: Power circuit of a three-phase voltage source inverter.
Switch states, instantaneous output voltages, average output voltages over a sub-cycle, three-phase sinusoidal modulation.

Module 5: AC-AC Converters [10L]

AC voltage controllers – Single phase two SCR's in anti-parallel – With R and RL loads – modes of operation of Triac – Triac with R and RL loads – Derivation of RMS load voltage, current and power factor wave forms – Firing circuits -Numerical problems .
Frequency Changers (Cyclo-Converters): Cyclo converters – Single phase mid-point cyclo converters with Resistive and inductive load (Principle of operation only) – Bridge configuration of single phase cyclo converter (Principle of operation only) – Waveforms.

Text Books

1. M. H. Rashid, "Power electronics: circuits, devices, and applications", Pearson Education India, 2009.
2. N. Mohan and T. M. Undeland, "Power Electronics: Converters, Applications and Design", John Wiley & Sons, 2007.

Reference Books

1. R. W. Erickson and D. Maksimovic, "Fundamentals of Power Electronics", Springer Science & Business Media, 2007.
2. L. Umanand, "Power Electronics: Essentials and Applications", Wiley India, 2009.

E-Resources

1. https://nptel.ac.in/courses/108/102/108102145/
2. https://nptel.ac.in/courses/108/105/108105066/
3. https://nptel.ac.in/courses/108/101/108101038/
4. https://nptel.ac.in/courses/108/101/108101126/

Course Outcomes

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

CO 1. Understand the differences between signal level and power level devices

CO 2. Analyse controlled rectifier circuits

CO 3. Understand the operation of DC-DC Converters.

CO 4. Analyse the operation of voltage source inverters.

CO 5. Understand the operation of AC-AC Converters.

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	3	3	2	3	1	-	2	-	2	-	-	3	-
CO2	2	3	3	2	2	3	-	2	-	3	-	-	3	-
CO3	1	3	2	2	3	3	-	3	-	1	-	-	3	-
CO4	3	2	2	2	3	3	-	2	-	2	-	-	2	-
CO5	3	2	1	1	2	2	-	2	-	3	-	-	3	-
Average	2.2	2.6	2.2	1.8	2.6	2.4	-	2.2	-	2.2	-	-	2.8	-

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

AY 2022-23 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech EEE III Year – I Sem			
Course Code: L312E	POWER QUALITY (PROFESSIONAL ELECTIVE - I)	L	T	P	D
Credits: 3		3	0	0	0

Prerequisite: Power Systems and Power Electronics

Module 1: INTRODUCTION [8L]

Unit-I: [4L]
Introduction of the Power Quality (PQ) problem, Terms used in PQ: Voltage, Sag, Swell, Surges, Harmonics, over voltages, spikes, Voltage fluctuations.
Unit-II: [4L]
Transients, Interruption, overview of power quality phenomenon, Remedies to improve power quality, power quality monitoring.

Module 2: LONG & SHORT INTERRUPTIONS [10L]

Unit-I: [5L]
Long interruptions – Definition – Difference between failures, outage, Interruptions – causes of Long interruptions – Origin of interruptions – Limits for the Interruption frequency – Limits for the interruption duration – Costs of Interruption – Overview of reliability evaluation to power quality, Comparison of observations and reliability evaluation.
Unit-II: [5L]
Short interruptions: Definition, Origin of short interruptions, Basic principle, Fuse saving, Voltage magnitude events due to re-closing, Voltage during the interruption, Monitoring of short interruptions, Difference between medium and low voltage systems. Multiple events, Single phase tripping – Voltage and current during fault period, Voltage and current at post fault period, Stochastic prediction of short interruptions.

Module 3: 1 & 3-PHASE VOLTAGE SAG CHARACTERIZATION [10L]

Unit-I: [6L]
Voltage sag – Definition, Causes of voltage sag, Voltage sag magnitude, and monitoring, Theoretical calculation of voltage sag magnitude, Voltage sag calculation in non-radial systems, Meshed systems, and voltage sag duration.
Unit-II: [4L]
Three phase faults, Phase angle jumps, Magnitude and phase angle jumps for three phase unbalanced sags, Load influence on voltage sags.

Module 4: POWER QUALITY CONSIDERATIONS IN INDUSTRIAL POWER SYSTEMS [10L]

Unit-I: [6L]
Voltage sag – Equipment behavior of power electronic loads, Induction motors, Synchronous motors, computers, Consumer electronics, Adjustable speed AC drives and its operation.

Unit-II: [4L]
Mitigation of AC Drives, Adjustable speed DC drives and its operation, Mitigation methods of DC drives.

Module 5: MITIGATION OF INTERRUPTIONS & VOLTAGE SAGS [10L]

Unit-I: [6L]
Overview of mitigation methods from fault to trip, reducing the number of faults, reducing the fault clearing time changing the power system, installing mitigation equipment, Improving equipment immunity, Different events and mitigation methods. System equipment interface –Voltage source converter, Series voltage controller, Shunt controller, combined shunt and series controller.

Unit-II: [4L]
PQ and EMC standards: Introduction to standardization, IEC electromagnetic compatibility standards, European voltage characteristics standards, PQ surveys.

Text Books

1. Math H J Bollen, "Understanding Power Quality Problems" Wiley Publications, Volume 5, 2000.
2. C. Sankaran, "Power Quality", CRC Presss, First Edition, 2002.
3. Alexander Kusko, Marc Thompson, "Power Quality in Electrical Systems", Tata McGraw Hill Publishing Co. Ltd., New Delhi, First Edition, 2007.
4. Surajit Chattopadhyay, Madhuchhanda Mitra, Samarjit Sengupta, "Electric Power Quality", Springer, First Edition, 2007.

Reference Books

1. R. Sastry Vedam MulukutlaS.Sarma, "Power Quality VAR Compensation in Power Systems", CRC Press, First Edition, 2008.
2. Roger C. Dugan , Mark F. McGranaghan, SuryaSantoso, H. Wayne Beaty, "Electrical Power Systems Quality", Tata McGraw Hill Education Private Ltd, New Delhi, Second Edition, 2003.

E-Resources

1. https://nptel.ac.in/courses/108/106/108106025/
2. https://nptel.ac.in/courses/108/107/108107157/
3. https://nptel.ac.in/content/storage2/courses/108106025/Course%20content%20and%20details.pdf

Course Outcomes

The student will be able to:

CO 1. Know the severity of power quality problems in distribution system.
CO 2. Understand the concept of voltage sag transformation from up-stream (higher voltages) to down-stream (lower voltage).
CO 3. Compute the concept of improving the power quality to sensitive load by various mitigating custom power devices.
CO 4. Analyze voltage sag problems and suggest preventive techniques
CO 5. Identify the harmonic sources and the effects of harmonic distortion

CO-PO/PSO Mapping

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	2	1	2	-	3	-	-	-	-	-	-	2	-
CO2	3	2	1	3	-	2	-	-	-	-	-	-	-	2
CO3	3	2	3	2	-	2	-	-	-	-	-	-	3	-
CO4	3	2	3	3	-	2	-	-	-	-	-	-	-	2
CO5	2	3	1	1	-	1	-	-	-	-	-	-	2	-
Average	2.8	2.2	1.8	2.2	-	2	-	-	-	-	-	-	1.4	0.8

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

AY: 2022-23 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech EEE III Year-I Sem			
Course Code: **L312F**	**Modern Control Theory (PROFESSIONAL ELECTIVE - I)**	L	T	P	D
Credits: **3**		**3**	**0**	**0**	**0**

Pre-Requisites: Control Systems

Module 1: State variable analysis [8L]

The concept of state – State equations for dynamic systems– Time invariance and linearity – non-uniqueness of state model – State diagrams for continuous - Time state models. Linear continuous time models for physical systems – Existence and uniqueness of solutions to continuous-Time state equations – Solutions of linear time invariant continuous - Time state equations – State transition matrix and its properties.

Module 2: State variable analysis &design [12L]

General concept of controllability – General concept of observability – Controllability tests for continuous-Time invariant systems – Observability tests for continuous-Time invariant systems – Controllability and observability of state model in Jordan Canonical form – Controllability and observability canonical forms of state model.

Module 3: Non - linear systems [10L]

Introduction – Non-linear systems - Types of non-linearities – Saturation – Dead-Zone - Backlash – Jump phenomenon etc;– Singular points – Introduction to linearization of non-linear systems, Properties of non-linear systems – Describing function–Describing function analysis of non-linear systems – Stability analysis of non-linear systems through describing functions.

Module 4: Phase plane methods [10L]

Introduction to phase-plane analysis, Method of isoclines for constructing trajectories, Singular points, Phase-plane analysis of non-linear control systems.

Module 5: Stability analysis [10L]

Stability in the sense of Lyapunov, Lyapunov's stability and Lypanov's instability theorems -Stability analysis of the linear continuous time invariant systems by Lyapunov second method – Generation of Lyapunov functions – Variable gradient method – Krasooviski's method. State feedback controller design through pole assignment – State observers: Full order and reduced order.

Text Books

1. M.Gopal, "Modern Control System Theory", New Age International, Revised Second Edition, 1993.
2. OgataKatsuhiko, "Modern Control Engineering", Pearson Education Publication, Fifth Edition,2010.

Reference Books

1. Richard C. Dorf, Robert H. Bishop "Modern Control Systems", Prentice Hall Publications, Second Edition, 2001.

2.A. Nagoorkani,"Advanced Control Theory" RBA Publications,Second Edition, 1999.

E-Resources

1. http://eacademic.ju.edu.jo/alhusari/Material/ModernControlNotes.pdf
2. http://sharif.edu/~salarieh/Downloads/Modern%20Control%20Engineering%205th%20Edition.pdf

Course Outcomes

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

CO 1. Apply the knowledge of basic and modern control system for the real time analysis.

CO 2. Design the real time control systems.

CO 3. Understand the concepts of state variables analysis.

CO 4. Analyse the concept of stability of nonlinear systems.

CO 5. Get the knowledge on phase plane methods.

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	**3**	**3**	**2**	**3**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**3**
CO2	**3**	**3**	**2**	**3**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**2**	**3**	**3**
CO3	**3**	**3**	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**3**	**3**
CO4	**3**	**3**	**3**	**2**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**2**	**3**	**3**
CO5	**3**	**3**	**3**	**3**	**-**	**3**	**-**	**-**	**-**	**-**	**-**	**2**	**2**	**3**
Average	**3**	**3**	**2.6**	**2.6**	**-**	**2.3**	**-**	**-**	**-**	**-**	**-**	**2**	**2.8**	**3**

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

AY: 2022-23 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech EEE III Year-I Sem			
Course Code: **L312G**	**DIGITAL CONTROL SYSTEMS (PROFESSIONAL ELECTIVE - I)**	L	T	P	D
Credits: **3**		**3**	**0**	**0**	**0**

Pre-Requisites: Control Systems

Module 1: SAMPLING AND RECONSTRUCTION [8L]

Introduction, Examples of Data control systems – Digital to Analog conversion and Analog to Digital conversion, sample and hold operations.

The Z – Transforms: Introduction, Linear difference equations, pulse response, Z – transforms, Theorems of Z – Transforms, the inverse Z – transforms, Modified Z- Transforms.

Z-Plane Analysis of Discrete-Time Control System: Z-Transform method for solving difference equations; Pulse transforms function, block diagram analysis of sampled – data systems, mapping between s-plane and z-plane.

Module 2: STATE SPACE ANALYSIS [12L]

State Space Representation of discrete time systems, Pulse Transfer Function Matrix solving discrete time state space equations, State transition matrix and it's Properties, Methods for Computation of State Transition Matrix, Discretization of continuous time state – space equations.

Controllability and Observability: Concepts of Controllability and Observability, Tests for controllability and Observability. Duality between Controllability and Observability, Controllability and Observability conditions for Pulse Transfer Function.

Module 3: STABILITY ANALYSIS [10L]

Mapping between the S-Plane and the Z-Plane – Primary strips and Complementary Strips – Constant frequency loci, Constant damping ratio loci, Stability Analysis of closed loop systems in the Z-Plane. Jury stability test – Stability Analysis by use of the Bilinear Transformation and Routh Stability criterion.

Module 4: DESIGN OF DISCRETE TIME CONTROL SYSTEM BY CONVENTIONAL METHODS [10L]

Transient and steady – State response Analysis – Design based on the frequency response method – Bilinear Transformation and Design procedure in the w-plane, Lead, Lag and Lead-Lag compensators and digital PID controllers.

Module 5: STATE FEEDBACK CONTROLLERS AND OBSERVERS [10L]

Design of state feedback controller through pole placement – Necessary and sufficient conditions, Ackerman's formula. State Observers – Full order and Reduced order observers.

Text Books

1. Discrete-Time Control systems – K. Ogata, Pearson Education/PHI, 2nd Edition.

2. Digital Control Systems, Kuo, Oxford University Press, 2nd Edition, 2003.

Reference Books

1. Digital Control and State Variable Methods by M.Gopal, TMH.
2. Digital Control Systems, **Isermann,** Rolf,Volume 1: Fundamentals, Deterministic Control.

E-Resources

1. http://www.gvpcew.ac.in/LN-CSE-IT-22-32/EEE/4-Year/DCS.pdf
2. http://www.ece.mtu.edu/faculty/shiyan/EE4262Spring17/DigitalControlTextBook.pdf

Course Outcomes

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

CO 1. To understand mathematical models of linear discrete-time control systems using transfer functions and state-space models.

CO 2. To analyse transient and steady state behaviours of linear discrete time control systems.

CO 3. To determine whether performance of linear discrete time control systems meet specified design criteria.

CO 4. To design controllers and observers for linear discrete-time control systems so that their performance meets specified design criteria.

CO 5. To design the PID controllers in discrete time intervals

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	**3**	**3**	**2**	**3**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**2**
CO2	**3**	**2**	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**3**	**2**
CO3	**3**	**3**	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**3**	**3**
CO4	**3**	**3**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**3**	**3**
CO5	**3**	**2**	**2**	**3**	**-**	**3**	**-**	**-**	**-**	**-**	**-**	**2**	**2**	**2**
Average	**3**	**2.6**	**2.2**	**2.6**	**-**	**2.5**	**-**	**-**	**-**	**-**	**-**	**2**	**2.8**	**2.4**

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

AY: 2022-23 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech EEE III Year-I Sem			
Course Code: L3121	**ELECTRICAL MACHINES LAB – II**	L	T	P	D
Credits: **1.5**		**0**	**0**	**3**	**0**

Pre-Requisites: Electrical Circuits

List of Experiments

1. O.C. & S.C. Tests on Single phase Transformer.
2. Sumpner's test on a pair of single phase transformers.
3. Brake test on three phase Induction Motor.
4. No-load & Blocked rotor tests on three phase Induction motor.
5. Regulation of a three phase alternator by synchronous impedance & m.m.f. methods.
6. V and Inverted V curves of a three phase synchronous motor.
7. Equivalent Circuit of a single phase induction motor.
8. Determination of Xd and Xq of a salient pole synchronous machine.
9. Separation of core losses of a single phase transformer.
10. Regulation of three-phase alternator by Z.P.F. and A.S.A methods.
11. Parallel operation of Single phase Transformer.
12. Scott connection of transformer.
13. Efficiency of a three-phase alternator.
14. Measurement of sequence impedance of a three-phase alternator.

Course Outcomes

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

CO 1. Analyse performance of the single phase transformer at No load and full load.
CO 2. Analyse performance of three phase induction motor
CO 3. Determine regulation of alternator and performance of single phase induction motor
CO 4. Set up testing strategies and select proper instruments to evaluate performance characteristics of electrical machines
CO 5. Develop testing and experimental procedures on different types of electrical machines and analyse their operation under different loading conditions

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	**3**	**2**	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**3**	**-**
CO2	**3**	**2**	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**3**	**-**
CO3	**2**	**3**	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**3**	**-**
CO4	**3**	**2**	**3**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**3**	**-**
CO5	**3**	**3**	**3**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**3**	**-**
Average	**2.8**	**2.4**	**3**	**2.4**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**3**	**-**

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

AY: 2022-23 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech EEE III Year-I Sem			
Course Code: L3122	POWER ELECTRONICS LAB	L	T	P	D
Credits: 1.5		0	0	3	0

Pre-Requisites:

List of Experiments

1. Study of Characteristics of SCR, MOSFET & IGBT.
2. Gate firing circuits for SCR's.
3. Single Phase AC Voltage Controller with R and RL Loads.
4. Single Phase fully controlled bridge converter with R and RL loads.
5. Forced Commutation circuits (Class A, Class B, Class C, Class D & Class E).
6. DC Jones chopper with R and RL Loads.
7. Single Phase Parallel, inverter with R and RL loads.
8. Single Phase Cyclo converter with R and RL loads.
9. Single Phase Half controlled converter with R load.
10. Three Phase half-controlled bridge converter with R-load.
11. Single Phase series inverter with R and RL loads.
12. Single Phase MC Murry Bed fort inverter.
13. Simulation of single-phase full converter using RLE loads and single-phase AC voltage controller using RLE loads.
14. Simulation of resonant pulse commutation circuit and Buck chopper.
15. Simulation of single phase Inverter with PWM control.

Course Outcomes

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

CO 1. Design and conduct simulation and experiments.
CO 2. Use the techniques, skills and modern engineering tools necessary for engineering practice.
CO 3. Identify, formulate and sole engineering problems with simulation.
CO 4. Simulate characteristics of SCR, MOSFET, and IGBT
CO 5. Simulate Cyclo-Converter and calculate harmonics.

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	3	2	3	-	2	3.0	-	-	-	-	-	3	3	3.0
CO2	3	2	3	-	2	3.0	-	-	-	-	-	3	3	3.0
CO3	2	3	3	-	2	3.0	-	-	-	-	-	3	3	3.0
CO4	3	2	3	-	2	3.0	-	-	-	-	-	3	3	3.0
CO5	3	3	3	-	2.0	3.0	-	-	-	-	-	3	3	3.0
Average	2.8	2.4	3	-	2	3	-	-	-	-	-	3	3	3

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

AY: 2022-23 Onwards	J. B. INSTITUTE OF ENGINEERING AND TECHNOLOGY (UGC Autonomous)	B. Tech III Year- I Sem			
Course Code: L31M1	ARTIFICIAL INTELLIGENCE	L	T	P	D
Credits: **0**		**2**	**0**	**0**	**0**

Pre-Requisites:

1. Mathematics, Probability and statistics
2. Knowledge in programming Language

Course Objectives:

The students should be able to

1. Know the AI based problems.
2. Illustrate AI techniques for representing the basic problem.
3. Illustrate Advanced AI techniques to solve the problem.
4. Define Learning and explain various learning techniques.
5. Understand the usage expert system

Module 1:

Introduction: AI problems, Agents and Environments, Structure of Agents, Problem Solving Agents.

Basic Search Strategies: Problem Spaces, Uninformed Search (Breadth-First, Depth- First Search, Depth-first with Iterative Deepening), Heuristic Search (Hill Climbing, Generic Best-First, A*), Constraint Satisfaction (Backtracking, Local Search)

Module 2:

Advanced Search: Constructing Search Trees, Stochastic Search, A* Search Implementation, Minimax Search, Alpha-Beta Pruning.

Basic Knowledge Representation and Reasoning: Propositional Logic, First Order Logic, Forward Chaining and Backward Chaining, Introduction to Probabilistic Reasoning, Bayes Theorem.

Module 3:

Advanced Knowledge Representation and Reasoning: Knowledge Representation Issues, Non-monotonic Reasoning, and Other Knowledge Representation Schemes.

Reasoning Under Uncertainty: Basic probability, acting under Uncertainty, Bayes' Rule, Representing Knowledge in an Uncertain Domain, Bayesian Networks.

Module 4:

Learning: What Is Learning? Rote Learning, Learning by Taking Advice, Learning in Problem Solving, Learning from Examples, Winston's Learning Program, Decision Trees.

Module 5:

Expert Systems: Representing and Using Domain Knowledge, Shell, Explanation, Knowledge Acquisition.

Text Books

1. Russell, S. and Norvig, P, Artificial Intelligence: A Modern Approach, Third Edition, Prentice- Hall, 2010

Reference Books

1. Artificial Intelligence, Elaine Rich, Kevin Knight, Shivasankar B. Nair, The McGraw Hill publications, Third Edition, 2009.
2. George F. Luger, Artificial Intelligence: Structures and Strategies for Complex Problem Solving, Pearson Education, 6th ed., 2009.

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/

Course Outcomes

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

CO1. Identify the AI based problems.
CO2. Apply AI techniques for representing the basic problem.
CO3. Apply Advanced AI techniques to solve the problem.
CO4. Analyse Learning and explain various learning techniques.
CO5. Illustrate the use of expert system.

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	3	3	-		-	-	-	-	-	-	-	-	3	-
CO2	3	3	3		-	-	-	-	-	-	-	-	3	3
CO3	3	3	-		-	-	-	-	-	-	-	-	3	-
CO4	3	3	3		-	-	-	-	-	-	-	-	3	-
CO5	3	3	-		-	-	-	-	-	-	-	-	3	3
Average	**3.0**	**3.0**	**3.0**	**2.2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3.0**	**3.0**

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

AY: 2022-23 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech EEE III Year-I Sem			
Course Code: L31T1	**EMPLOYABILITY SKILLS** (Audit Course-III) COMMON TO: AI &ML, CE, EEE, ME, ECE, and MIE	L	T	P	D
Credits: 0		**2**	**0**	**0**	**0**

Pre-Requisites:

Module 1: SOFT SKILLS [6L]

Introduction - What are Soft Skills? - Importance of Soft Skills - Marketing Your Soft Skills - Negotiating - Exhibiting Your Soft Skills - Identifying Your Soft Skills - Improving Your Soft Skills - Top 60 Soft Skills.

Know Thyself/ Self – Discovery - Process of Knowing Yourself - SWOT Analysis.

Module 2: CAREER PLANNING [6L]

Introduction - Benefits of Career Planning - Guidelines for choosing a career - Myths about choosing a career goal - Final thoughts on career planning - Things one should know while starting career and during his/her career.

Module 3: ART OF SPEAKING [6L]

Introduction - What Makes Communication Important? - Defining Communication - Process of Communication - Channels of Communication - Formal and Informal Communication Network - Barriers to Communication - Tips for Effective Communication - Art of Public Speaking.

Module 4: ART OF WRITING [6L]

Introduction - Importance of Writing - Creative Writing - Writing Tips - Drawbacks of Written Communication - Letter Writing and Resume Writing.

Module 5: ETIQUETTES AND MANNERS [6L]

Introduction - Modern Etiquettes - Benefits of Etiquettes - Classification of Etiquettes.

Introduction - Practicing Good Manners - Manners at the Wheel - Professional Manners - Social Skills (Manners) - Getting Along with People - Corporate Grooming Tips.

Text Books

1. Dr. Alex. K. Soft Skills: *Know yourself and Know the World*. S. Chand & Company Pvt. Ltd: New Delhi: 2014.

Reference Books

1. Ashraf Rizvi. M. *Effective Technical Communication*. McGraw-Hill: New Delhi: 2010
2. K. R. Lakshminarayanan, *Speak in English,* Scitech Publications, Chennai, 2009.

E-Resources

1. https://en.wikipedia.org/wiki/Soft_skills
2. https://www.mbaskool.com/business-concepts/human-resources-hr-terms/1779-career-development.html

Course Outcomes

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

CO1. Learn the importance of soft skills and knowing thyself.

CO2. Understand how to build their (students) career.

CO3. Communicate effectively by applying appropriate speaking techniques.

CO4. Write letters and resumes effectively by applying appropriate writing techniques.

CO5. Learn the good manners and social etiquettes.

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**	**PSO 1**	**PSO 2**
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: 2022-23 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech EEE III Year-II Sem			
Course Code: L322A	Computer Aided Power System Analysis	L	T	P	D
Credits: 3		3	0	0	0

Pre-Requisites: Power Systems

MODULE – I: POWER SYSTEM NETWORK MATRICES [12L]

Graph Theory: Definitions, Bus Incidence Matrix, Y_{bus} formation by Direct and Singular Transformation Methods, Numerical Problems.

Formation of Z_{Bus}: Partial network, Algorithm for the Modification of Z_{Bus} Matrix for addition element for the following cases: Addition of element from a new bus to reference, Addition of element from a new bus to an old bus, Addition of element between an old bus to reference and Addition of element between two old busses (Derivations and Numerical Problems).-Modification of Z_{Bus} for the changes in network.

MODULE – II: POWER FLOW STUDIES [12L]

Necessity of Power Flow Studies – Data for Power Flow Studies – Derivation of Static load flow equations – Load flow solutions using Gauss Seidel Method: Acceleration Factor, Load flow solution with and without P-V buses, Algorithm and Flowchart. Numerical Load flow Solution for Simple Power Systems (Max. 3-Buses): Determination of Bus Voltages, Injected Active and Reactive Powers (Sample One Iteration only) and finding Line Flows/Losses for the given Bus Voltages.

METHODS OF POWER FLOW STUDIES

Newton Raphson Method in Rectangular and Polar Co-Ordinates Form: Load Flow Solution with or without PV Busses- Derivation of Jacobian Elements, Algorithm and Flowchart.

Decoupled and Fast Decoupled Methods. - Comparison of Different Methods – DC load Flow.

MODULE – III: SHORT CIRCUIT ANALYSIS: [12L]

Per-UNIT - System of Representation. Per-UNIT - equivalent reactance network of a three phasePower System, Numerical Problems.

Symmetrical fault Analysis: Short Circuit Current and MVA Calculations, Fault levels, Applicationof Series Reactors, Numerical Problems.

Symmetrical Component Theory: Symmetrical Component Transformation, Positive, Negative and Zero sequence components: Voltages, Currents and Impedances.

Sequence Networks: Positive, Negative and Zero sequence Networks, Numerical Problems. Unsymmetrical Fault Analysis: LG, LL, LLG faults with and without fault impedance, Numerical Problems.

MODULE – IV: POWER SYSTEM STEADY STATE STABILITY ANALYSIS [10]

Elementary concepts of Steady State, Dynamic and Transient Stabilities. Description of: Steady State Stability Power Limit, Transfer Reactance, Synchronizing Power Coefficient, Power Angle Curve and Determination of Steady State Stability and Methods to improve steady state stability.

MODULE – V: POWER SYSTEM TRANSIENT STATE STABILITY ANALYSIS [10]

Derivation of Swing Equation. Determination of Transient Stability by Equal Area Criterion, Application of Equal Area Criterion, Critical Clearing Angle Calculation.- Solution of Swing Equation: Point-by-Point Method. Methods to improve Stability - Application of Auto Reclosing and Fast Operating Circuit Breakers.

TEXT BOOKS

1. Abhijit Chakrabarthi, Sunita Haldar "Power system Analysis Operation and control", 3rd edition, PHI, 2010.
2. I.J.Nagrath& D.P.Kothari "Modern Power system Analysis" Tata McGraw-Hill Publishingcompany, 2nd edition

REFERENCE BOOKS

1. M.A.Pai, "Computer Techniques in Power System Analysis",-TMH Publications.
2. Grainger and Stevenson "Power System Analyses", Tata McGraw Hill.
3. K.Umarao, I.K.International "Computer techniques and models in power systems".

E-RESOURCES:

1. https://nptel.ac.in/content/storage2/courses/108105053/pdf/(TB)(CMPS)%20((EE)NPTEL).pdf
2. https://nptel.ac.in/content/storage2/courses/108105053/pdf/(TB)(CMPS)%20((EE)NPTEL).pdf

Course Outcomes

The Student will be able to:

CO 1. Demonstrate analyse of the nature of the modern power system, including the behaviour of theconstituent components and sub-systems.
CO 2. Describe the construction, operation and equivalent circuit of three-phase transformers.
CO 3. Apply load flow analysis to an electrical power network and interpret the results of the analysis.
CO 4. Analyze a network under both balanced and unbalanced fault conditions and interpret the results.
CO 5. Demonstrate and analyze the role of protection in modern power systems and to describe theoperation of a range of protection schemes.

CO-PO/PSO Mapping

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	3	-	2	3	2	-	-	-	-	2	2	-
CO2	3	2	2	-	3	2	3	-	-	-	-	3	3	-
CO3	3	2	3	-	3	3	3	-	-	-	-	3	2	-
CO4	3	3	2	-	3	3	3	-	-	-	-	3	3	-
CO5	3	2	3	-	3	2	3	-	-	-	-	3	2	-
Average	3	2.4	2.8	-	2.4	2.8	2.8	-	-	-	-	2.8	2.4	-

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

AY 2022-23 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech EEE III Year – II Sem			
Course Code: L322B	SWITCH GEAR AND PROTECTION	L	T	P	D
Credits: 3		3	0	0	0

Pre-requisite: Power Systems

Module 1: CIRCUIT BREAKERS [10L]

UNIT 1: CIRCUIT BREAKER - 1: Elementary principles of arc interruption, Restriking Voltage and Recovery voltages: Restriking Phenomenon, Average and Max. RRRV, Numerical Problems - Current Chopping and Resistance Switching - CB ratings and Specifications: Types and Numerical Problems – Auto reclosures.
UNIT 2: CIRCUIT BREAKERS - 2: Description and Operation of Minimum Oil Circuit breakers, Air Blast Circuit Breakers, Vacuum and SF6 circuit breakers.

Module 2: ELECTROMAGNETIC AND STATIC RELAYS [10L]

UNIT 1: ELECTROMAGNETIC RELAYS: Principle of Operation and Construction of Attracted armature, Balanced Beam, Moving Coil, Induction Disc and Induction Cup relays. Relays Classification: Instantaneous, DMT and IDMT types.
UNIT 2: APPLICATION OF RELAYS AND STATIC RELAYS: Over current/ Under voltage relays, Direction relays, Differential Relays and Percentage Differential Relays. Universal torque equation, Distance relays: Impedance, Reactance and Mho and Off-Set Mho relays, Characteristics of Distance Relays and Comparison. Static Relays: Static Relays verses Electromagnetic Relays.

Module 3: GENERATOR AND TRANSFORMER PROTECTION [10L]

UNIT 1: GENERATOR PROTECTION: Protection of generators against Stator faults, Rotor faults, and Abnormal Conditions. Restricted Earth fault and Inter-turn fault Protection. Numerical Problems on percentage Winding Unprotected.
UNIT 2: TRANSFORMER PROTECTION: Protection of transformers: Percentage Differential Protection, Numerical Problem on Design of CTs Ratio, Buchholz relay Protection.

Module 4: FEEDER, BUS-BAR PROTECTION AND NEUTRAL GROUNDING [10L]

UNIT 1: FEEDER AND BUS-BAR PROTECTION: Protection of Lines: Over Current, Carrier Current and Three-zone distance relay protection using Impedance relays. Translay Relay, Protection of Bus bars – Differential protection.
UNIT 2: NEUTRAL GROUNDING: Grounded and Ungrounded Neutral Systems: Effects of Ungrounded Neutral on system performance. Methods of Neutral Grounding: Solid, Resistance, Reactance - Arcing Grounds and Grounding Practices.

Module 5: PROTECTION AGAINST OVER VOLTAGES: [8L]

Generation of Over Voltages in Power Systems. Protection against Lightning Over Voltages - Valve type and Zinc-Oxide Lighting Arresters - Insulation Coordination - BIL, Impulse Ratio, Standard Impulse Test Wave, Volt-Time Characteristics.

Text Books

1. V.K.Metha & Rohit Metha, "Principles of Power System", S.Chand, 2005.
2. Sunil S. Rao, "Protection and Switchgear", Khanna Publishers, New Delhi, 2006.
3. Badari Ram, D.N Viswakarma, "Power System Protection and Switchgear" TMH Publications, 2011.

Reference Books

1. Y.G. Paithankar, "Transmission network Protection" Taylor and Francis, 2009.
2. Bhuvanesh Oza, "Power system protection and switch gear" TMH, 2010.
3. Wadhwa, C.L., "Electrical Power Systems", New Age International, New Delhi, 2005.

E-Resources

1. https://nptel.ac.in/courses/108/107/108107167/
2. https://nptel.ac.in/courses/108/101/108101039/#
3. http://www.cdeep.iitb.ac.in/webpage_data/nptel/Electrical%20Engineering/Power%20System%20Protection/Course_home_L24.html

Course Outcomes

The students will be able to:

CO 1. Analyse different types of faults and their effects on the power system and understand the practical significance of protection zones.

CO 2. Understand the principles, construction, selection and problems associated with different types of circuit breaker.

CO 3. Understand the basic principles, construction and characteristics of different types of relays.

CO 4. Analyse and protect different power equipment's like transformer, generator etc., against various electrical faults.

CO 5. Understand different aspects of feeder protection and protection against over voltages.

CO-PO/PSO Mapping

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	3	2	-	-	-	-	-	-	-	-	-	3	-
CO2	3	2	2	-	-	-	-	-	-	-	-	-	2	-
CO3	3	1	1	-	-	-	2	-	-	-	-	-	2	-
CO4	2	3	2	-	-	-	3	-	-	-	2	-	2	-
CO5	3	1	1	-	-	-	2	2	-	-	2	-	2	-
Average	2.6	2.0	1.6	-	-	-	2.3	2	-	-	2	-	2.2	-

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

AY: 2022-23 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech EEE III Year-II Sem			
Course Code: L322E	ANALYSIS OF POWER CONVERTERS (Professional Elective –II)	L	T	P	D
Credits: **3**		**3**	**0**	**0**	**0**

Pre-Requisites:

Module 1: SINGLE PHASE AC VOLTAGE CONTROLLERS [9]

Single phase AC voltage controllers with Resistive, Resistive-inductive and Resistive-inductive-induced e.m.f. loads - ac voltage controllers with PW Control - Effects of source and load inductances - Synchronous tap changers - Applications - numerical problems.

Module 2: THREE PHASE AC VOLTAGE CONTROLLERS [12]

Three phase AC voltage controllers - Analysis of controllers with star and delta Connected Resistive, Resistive-inductive loads - Effects of source and load Inductances - applications - numerical problems. Cycloconverters: Single phase to single phase cycloconverters - analysis of midpoint and bridge Configurations - Three phase to three phase cycloconverters - analysis of Midpoint and bridge configurations - Limitations - Advantages - Applications- numerical problems.

Module 3: SINGLE PHASE CONVERTERS [12]

Single phase converters - Half controlled and Fully controlled converters -Evaluation of input power factor and harmonic factor - continuous and Discontinuous load current - single phase dual converters - power factor Improvements - Extinction angle control - symmetrical angle control - PWM -single phase sinusoidal PWM - single phase series converters - Applications -Numerical problems. Three Phase Converters: Three phase converters - Half controlled and fully controlled converters - Evaluation of input power factor and harmonic factor - continuous and Discontinuous load current - three phase dual converters - power factor Improvements - three phase PWM - twelve pulse converters - applications - Numerical problems.

Module 4: D.C. TO D.C. CONVERTERS [10]

Analysis of step-down and step-up dc to dc converters with resistive and Resistive-inductive loads - Switched mode regulators - Analysis of Buck Regulators - Boost regulators - buck and boost regulators - Cuk regulators - Condition for continuous inductor current and capacitor voltage - comparison of regulators –Multi output boost converters - advantages - applications - Numerical problems.

Module 5: PULSE WIDTH MODULATED INVERTERS (SINGLE PHASE) [10]

Principle of operation - performance parameters - single phase bridge inverter -evaluation of output voltage and current with resistive, inductive and Capacitive loads - Voltage control of single phase inverters - single PWM - Multiple PWM - sinusoidal PWM - modified PWM - phase displacement Control - Advanced modulation techniques for improved performance - Trapezoidal, staircase, stepped, harmonic injection and delta modulation - Advantage - application - numerical problems.

Text Books

1. Mohammed H. Rashid, "Power Electronics", Pearson Education -Third Edition - First Indian reprint 2004.
2. Ned Mohan, Tore M. Undeland and William P. Robbins, Power Electronics, John Wiley and Sons - Second Edition

Reference Books

1. Daniel W. Hart, "Power Electronics".
2. R.W. Erickson, "Fundamentals of Power Electronics", 2nd Edition.
3. Timothy, L. Skvarenina, Purdue University, "The power electronics Hand Book".

E-Resources

1. https://nptel.ac.in/courses/108/107/108107128/
2. https://nptel.ac.in/courses/108/102/108102157/
3. https://nptel.ac.in/courses/108/102/108102145/

Course Outcomes

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

CO 1. Understand the basic principles of switch mode power conversion

CO 2. Understand the operating principles and models of different types of power electronic converters including dc-dc converters, PWM rectifiers and inverters

CO 3. Choose appropriate power converter topologies and design the power stage and feedback controllers for various applications

CO 4. Use power electronic simulation packages for analysing and designing power converters

CO 5. Analyse various single phase and three phase power converter circuits and understand their applications.

CO-PO/PSO Mapping

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	3	3	2	3	1	-	2	-	2	-	-	3	-
CO2	2	3	3	2	2	3	-	2	-	3	-	-	3	-
CO3	1	3	2	2	3	3	-	3	-	1	-	-	3	-
CO4	3	2	2	2	3	3	-	2	-	2	-	-	2	-
CO5	3	2	1	1	2	2	-	2	-	3	-	-	3	-
Average	2.2	2.6	2.2	1.8	2.6	2.4	-	2.2	-	2.2	-	-	2.8	-

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

AY: 2022-23 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech EEE III Year-II Sem			
Course Code:L322F	**POWER SEMICONDUCTOR DRIVES (Professional Elective –II)**	L	T	P	D
Credits: **3**		**3**	**0**	**0**	**0**

Pre-Requisites: Electrical Machines

Module 1: Control of DC Motors by Single Phase Converters: [8L]

Introduction to Thyristor controlled Drives, Single Phase semi and Fully controlled converters connected to DC separately excited and DC series motors – continuous current operation – output voltage and current waveforms – Speed and Torque expressions – Speed – Torque Characteristics- Problems on Converter fed DC motors.

Module 2: Control of DC Motors by Three Phase Converters [8L]

Three phase semi and fully controlled converters connected to DC separately excited and DC series motors – output voltage and current waveforms – Speed and Torque expressions – Speed – Torque characteristics – Problems.

Module 3: Four Quadrant Operation of DC Drives [12L]

Introduction to Four quadrant operation – Motoring operations, Electric Braking – Plugging, Dynamic and Regenerative Braking operations. Four quadrant operation of D.C motors by single phase and three phase dual converters.
Control of DC Motors by Choppers: Single quadrant, two quadrants and four quadrant chopper fed dc separately excited and series motors – Continuous current operation – Output voltage and current wave forms – Speed and torque expressions – speed-torque characteristics – Problems on Chopper fed D.C Motors – Closed Loop operation (Block Diagram Only).

Module 4: Control of Induction Motor through Stator Voltage and Stator Frequency: [12L]

Variable voltage Characteristics-Control of Induction Motor by Ac Voltage Controllers – Waveforms – speed torque characteristics. Variable frequency Characteristics-Variable frequency control of induction motor by Voltage source and current source inverter and cyclo converters- PWM control – Comparison of VSI and CSI operations – Speed torque characteristics – numerical problems on induction motor drives – Closed loop operation of induction motor drives (Block Diagram Only).
Rotor Side Control of Induction Motor: Static rotor resistance control – Slip power recovery – Static Scherbius drive – Static Kramer Drive – their performance and speed torque characteristics – advantages, applications, problems.

Module 5: Control of Synchronous Motors [9L]

Separate control and self-control of synchronous motors – Operation of self-controlled synchronous motors by VSI, CSI and Cycloconverters. Load commutated CSI fed Synchronous Motor – Operation – Waveforms – speed torque characteristics – Applications – Advantages and Numerical Problems – Closed Loop control operation of synchronous motor drives (Block Diagram Only), variable frequency control – Cyclo-converter, PWM based VSI & CSI.

Text Books

1. B.K.Bose, "Modern Power Electronics and AC Drives" PHI.
2. S K Pillai "A First course on Electrical Drives" –New Age International (P) Ltd. 2nd Edition.
3. G K Dubey, "Fundamentals of Electric Drives"-Narosa Publications.
4. M.H.Rashid, "Power Electronic Circuits, Devices and applications" PHI.

Reference Books

1. P.C.Sen, "Thyristor DC Drives"-Wiley-Blackwell, 1981.
2. R.Krishnan "Electric motor drives - modeling, Analysis and control", Prentice Hall PTR, 2001.

E-Resources

1. https://www.digimat.in/nptel/courses/video/108108077/L01.html
2. http://www.digimat.in/nptel/courses/video/108108077/L16.html
3. https://nptel.ac.in/courses/108/104/108104011/

Course Outcomes

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

CO 1. Able to design controlled converter for speed control operation of DC drives.

CO 2. Develop the circuits for chopper control drive for speed control of DC Motor.

CO 3. Analyze the multi quadrant operation of dual converter with breaking plugging operation.

CO 4. Design the AC voltage controllers to control the speed of an Induction motor.

CO 5. Develop the Variable frequency controllers of Induction Motor by VSI, CSI, Cyclo converters & PWM Control.

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	**3**	**2**	**-**	**-**	**-**	**2.0**	**3.0**	**-**	**2**	**2**	**-**	**3**	**3**	**2.0**
CO2	**3**	**3**	**2**	**2**	**-**	**3.0**	**3.0**	**-**	**1**	**2**	**-**	**2**	**3**	**1.0**
CO3	**3**	**3**	**-**	**2**	**2**	**-**	**-**	**2**	**-**	**-**	**-**	**3**	**3**	**2.0**
CO4	**3**	**2**	**3**	**2**	**-**	**-**	**2.0**	**1**	**-**	**2**	**-**	**3**	**3**	**2.0**
CO5	**3**	**3**	**3**	**2**	**2.0**	**3.0**	**2.0**	**-**	**-**	**-**	**-**	**2**	**3**	**2.0**
Average	**3**	**2.6**	**2.6**	**2**	**2**	**2.6**	**2.5**	**1.5**	**1.5**	**2**	**-**	**2.6**	**3**	**1.8**

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

AY: 2022-23 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech EEE III Year-II Sem			
Course Code:L322G	**Flexible AC Transmission Systems (Professional Elective –II)**	L	T	P	D
Credits: **3**		**3**	**0**	**0**	**0**

Pre-Requisites: Power Electronics

Module 1: FACTS Concepts

Unit 1 [6L]
Transmission interconnections, power flow in an AC system, loading capability limits, Dynamic Stability considerations, importance of controllable parameters.
Unit 2 [4L]
Basic types of FACTS controllers, Benefits from FACTS controllers, comparison of HVDC and FACTS.

Module 2: Static Shunt Compensation

Unit 1 [5L]
Objectives of shunt compensation - variable impedance type static VAR generators – TCR, TSR, TSC & FC-TCR Configurations and Operating characteristics.
Unit 2 [5L]
STATCOM – operation and V-I Characteristics, applications – comparison of SVC and STATCOM.

Module3: Static Series Compensators

Unit 1 [5L]
Objectives of Series Compensation – Variable impedance type series compensators – GCSC, TSSC, and TCSC configurations and operating characteristics.
Unit 2 [5L]
Control schemes for GSC, TSSC and TCSC - SSSC – operation and V-I Characteristics, applications

Module4: Static Voltage and Phase Angle Regulators

Unit 1 [5L]
Objectives of Voltage and Phase Angle Regulators – voltage and phase angle regulation, power flow control by phase angle regulation, Transient Stability improvement and power oscillation damping with phase angle regulators.
Unit 2 [5L]
Approaches to TCVRs and TCPARs – Switching converter based Voltage and Phase angle regulators – Hybrid Phase angle Regulators

Module5: Combined Compensators

Unit 1 [5L]
Unified Power Flow controller (UPFC) – Basic operating principles, conventional transmission control capabilities, independent real and reactive power flow control, basic control system for P & Q control.
Unit 2 [5L]
Interline Power Flow Controller (IPFC) – Basic operating Principles and characteristics, control structure.

Text Books

1. Narain G. Hingorani, Laszio. Gyugyl, "Understanding FACTS Concepts and Technology of Flexible AC Transmission System", Standard Publishers, Delhi, First Edition, 2001.
2. Mohan Mathur, R., Rajiv. K. Varma, "Thyristor – Based Facts Controllers for Electrical Transmission Systems", IEEE press and John Wiley & Sons, First Edition, 2002

Reference Books

1. A.T.John, "Flexible AC Transmission System", Institution of Electrical and Electronic Engineers (IEEE), First Edition, 1999.
2. V.K.Sood, "HVDC and FACTS controllers- Applications of Static Converters in Power System", Kluwer Academic Publishers, First Edition, 2004.
3. K.R.Padiyar, "FACTS Controllers in Power Transmission and Distribution", New Age International Publishers, New Delhi, Reprint, 2008.

E-Resources

1. https://www.sciencedirect.com/topics/engineering/flexible-ac-transmission-systems
2. https://www.electricaltechnology.org/2020/06/facts-flexible-ac-transmission-system.html
3. https://www.electrical4u.com/facts-on-facts-theory-and-applications

Course Outcomes

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

CO 1. Classify the Various FACTS Controllers.

CO 2. Analyze the operating characteristics of SVC and STATCOM.

CO 3. Analyze the operating characteristics of various series compensators.

CO 4. Understand the objectives of static Voltage and Phase Angle Regulators and its approaches.

CO 5. Summarize the operating Principles and characteristics of UPFC and IPFC.

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	-	-	3	-	-	-	-	-	2	-
CO2	3	-	1	3	-	-	2	-	-	-	-	-	3	-
CO3	3	-	3	2	-	-	2	-	-	-	-	-	3	-
CO4	2	-	3	2	-	-	1	-	-	-	-	-	3	-
CO5	1	-	2	3	-	-	2	-	-	-	-	-	2	-
Average	2.2	-	2.2	2.4	-	-	2	-	-	-	-	-	2.6	-

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

AY 2022-23 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech: EEE III Year – II Sem			
Course Code: L322H	POWER SYSTEM OPERATION AND CONTROL (PROFESSIONAL ELECTIVE-III)	L	T	P	D
Credits: 3		3	0	0	0

Prerequisite: Power Systems - I & Power Systems - II

Module 1: LOAD –FREQUENCY CONTROL [10L]

UNIT-I:- [5L]
Basics of speed governing mechanism and modelling – speed load characteristics – load sharing between two synchronous machines in parallel. Control area concept LFC control of a single-area system. Static and dynamic analysis of uncontrolled and controlled cases.
UNIT-II:- [5L]
Integration of economic dispatch control with LFC. Two area system – modelling - static analysis of uncontrolled case - tie line with frequency bias control of two-area system - state variable model.

Module 2: REACTIVE POWER – VOLTAGE CONTROL [10L]

Unit-I:- [5L]
Basics of reactive power control - Excitation systems – modeling. Static and dynamic analysis - stability compensation - generation and absorption of reactive power.Relation between voltage, power and reactive power at a node.
Unit-II:- [5L]
Method of voltage control - tap-changing transformer. System level control using generator voltage magnitude setting, tap setting of OLTC transformer and MVAR injection of switched capacitors to maintain acceptable voltage profile and to minimize transmission loss.

Module 3: ECONOMIC LOAD DISPATCH [7L]

Statement of economic dispatch problem – cost of generation – incremental cost curve.Co-ordination equations without loss and with loss, solution by direct method and λ-iteration method.

Module 4: UNIT COMMITMENT [10L]

Unit-1:- [5L]
Statement of Unit Commitment problem – constraints; spinning reserve, thermal unit constraints, hydro constraints, fuel constraints and other constraints.
Unit-II:- [5L]
Solution methods - Priority-list methods - forward dynamic programming approach. Numerical problems on priority-list method using full-load average production cost and Forward DP method.

Module 5: COMPUTER CONTROL OF POWER SYSTEMS [10L]

Unit-1:- [5L]
Need of computer control of power systems. Concept of energy control centre (or) load dispatch centre and the functions - system monitoring - data acquisition and control.
Unit-II:- [5L]
System hardware configuration – SCADA and EMS functions. Network topology – Importance of Load Forecasting and simple techniques of forecasting.

Text Books

1. D. P. Kothari and I. J. Nagrath, 'Modern Power System Analysis', Third Edition, Tata McGraw Hill Publishing Company Limited, New Delhi, 2003.
2. Olle. I. Elgerd, 'Electric Energy Systems Theory – An Introduction', Tata McGraw Hill Publishing Company Ltd, New Delhi, 30th reprint, 2007.

Reference Books

1. Chakrabarti & Haldar, "Power System Analysis: Operation and Control", Prentice Hall of India, 2004

Edition.
2. P. Kundur, Neal J. Balu, 'Power System Stability & Control', IEEE, 1998.
3. C. L. Wadhwa , 'Power System Analysis', New Age International-6th Edition, 2010, ISBN : 978-81-224-2839-1
4. Robert Miller, James Malinowski, 'Power System Operation', Tata McGraw Hill Publishing Company Ltd, New Delhi, 3rd Edition 2009

E-Resources

1. https://pdf.wecabrio.com/power-system-operation-and-control-objective-questions.pdf
2. https://lecturenotes.in/subject/120/power-system-operation-and-control-psoc

Course Outcomes

The student will be able to:

CO 1. Analyze Load Frequency Control of single-area and two-area systems
CO 2. Analyze different methods to control reactive power and voltage
CO 3. Solve economic dispatch problem by direct method and λ-iteration method
CO 4. Solve Unit Commitment by Priority-list methods - forward dynamic programming approach
CO 5. Summary the need and operation of real time control of power

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	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	-	-	3	3	-	-	-	3	3	-	-	3	-
CO2	2	-	-	3	3	-	-	-	3	3	-	-	3	-
CO3	1	-	-	3	3	-	-	-	3	3	-	-	3	-
CO4	2	-	-	3	3	-	-	-	3	3	-	-	3	-
CO5	3	-	-	3	3	-	-	-	2	2	-	-	3	-
Average	2.2	-	-	3	3	-	-	-	2.8	2.8	-	-	3	-

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

AY: 2022-23 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech EEE III Year-II Sem			
Course Code: L322I	**ELECTRICAL MACHINE DESIGN**	L	T	P	D
Credits: **3**	**(PROFESSIONAL ELECTIVE-III)**	**3**	**0**	**0**	**0**

Pre-Requisites: Electrical Machines

Module 1: INTRODUCTION [10L]

Principles of electrical machine design - General design considerations - Specifications of machines- Limitation in design- Recent trends in design – CAD – Flow chart methods - Review of properties of materials used in electrical machines - Magnetic circuit calculations- Introduction to Finite element method - mathematical formulation - magnetic field calculations.

Module 2: DC MACHINES [10L]

Constructional details- Output equation - Choice of specific electric and magnetic loadings - Separation of D and L for rotating machines. Estimation of number of conductors / turns - Coils - armature Slots - Conductor dimension - Slot dimension. Choice of number of poles - Length of air gap - Design of field system, Interpoles, Commutator and Brushes.

Module 3: TRANSFORMERS [10L]

Constructional details-Classification – output equation - Core section - Window dimensions - Yoke dimension - Overall dimension - Determination of number of turns and length of mean turns of windings- Resistance of windings- Leakage reactance- No load current calculation – Regulation, losses and efficiency.

Module 4: INDUCTION MOTORS [12L]

UNIT 1: THREE PHASE INDUCTION MOTOR: Constructional details - Output equation - Choice of specific loadings - Design of stator, squirrel cage rotor, windings and slots - Calculation of circuit parameters - No load current - efficiency and temperature rise from design data.

UNIT 2: SINGLE PHASE INDUCTION MOTOR: Design of running and starting windings for capacitor start induction motor.

Module 5: ALTERNATORS [12L]

Constructional details – Output equation – Choice of specific electric and magnetic loadings- Estimation of D and L – Stator slots- Length of airgap- Conductors/turn- Stator yoke design- Design of damper windings- Design of field windings- Rotor design of turbo alternator.

Text Books

1. Sawhney, A.K., A Course in Electrical Machine Design, Dhanpat Rai & Co, 2015.
2. Agarwal, R.K., Principles of Electrical Machine Design, Kataria, S.K. & Sons, 2010.

Reference Books

1. Clayton, A.E. & Hancock, H.H., The Performance and Design of DC Machines, CBS, 2004.
2. Say, M.G., The Performance and Design of AC Machines, CBS, 2005.
3. Shanmugasundram, A., Gangadhar, G. and Palani, R., Electrical Machine Design Data Book, New Age International, 2015

E-Resources

1. http://nptel.vtu.ac.in/econtent/courses/EEE/06EE63/index.php
2. https://nptel.ac.in/courses/108/106/108106023/
3. https://sist.sathyabama.ac.in/sist_coursematerial/uploads/SEEA1601.pdf
4. https://www.youtube.com/watch?v=jLJ3fJRLcOU

Course Outcomes

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

CO 1. Understand the basics of design considerations for rotating and static electrical machines.
CO 2. Design of armature and field of DC machines.
CO 3. Design of transformers.
CO 4. Design of induction motors.
CO 5. Design of alternators.

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	**3**	**2**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**1**
CO2	**3**	**2**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**1**
CO3	**2**	**3**	**3**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**2**
CO4	**2**	**3**	**3**	**3**	**-**	**-**	**-**	**-**	**-**	**-**		**-**	**3**	**2**
CO5	**2**	**3**	**3**	**3**	**3**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**3**	**2**
Average	**2.4**	**2.6**	**2.6**	**2.6**	**3**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**2.2**	**1.6**

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

AY: 2022-23 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech EEE III Year-II Sem			
Course Code: **L322J**	**ADVANCED CONTROL SYSTEMS (PROFESSIONAL ELECTIVE - III)**	L	T	P	D
Credits: **3**		**3**	**0**	**0**	**0**

Pre-Requisites: Control Systems

Module 1: STATE SPACE ANALYSIS [8L]

State Space Representation, Solution of State Equation, State Transition Matrix, Canonical Forms – Controllable Canonical Form, Observable Canonical Form, Jordan Canonical Form.

Module 2: CONTROLLABILITY AND OBSERVABILITY [12L]

Tests for controllability and Observability for continuous time systems – Time varying case, minimum energy control, time invariant case, Principle of Duality, Controllability and Observability form Jordan canonical form and other canonical forms.

Module 3: DESCRIBING FUNCTION ANALYSIS [10L]

Introduction to nonlinear systems, Types of nonlinearities, describing functions, describing function analysis of nonlinear control systems.

Phase-Plane Analysis: Introduction to phase-plane analysis, Method of Isoclines for Constructing Trajectories, singular points, phase-plane analysis of nonlinear control systems.

Module 4: STABILITY ANALYSIS [10L]

Stability in the sense of Lyapunov, Lyapunov's stability and Lypanov's instability theorems. Direct method of Lypanov for the Linear and Nonlinear continuous time autonomous systems.

Calculus Of Variations: Minimization of functionals of single function, Constrained minimization. Minimum principle. Control variable inequality constraints. Control and state variable inequality constraints. Euler Lagrangine Equation.

Module 5: MODAL CONTROL [9L]

Effect of state feedback on controllability and observability, Design of State Feedback Control through Pole placement. Full order observer and reduced order observer.

Optimal Control: Formulation of optimal control problem. Minimum time, Minimum energy, minimum fuel problems. State regulator problem. Output regulator problem. Tracking problem, Continuous-Time Linear Regulators

Text Books

4. Modern Control System Theory – by M. Gopal, New Age International Publishers, 2nd edition, 1996.
5. Modern Control Engineering – by K. Ogata, Prentice Hall of India, 3rd edition, 1998.

Reference Books

1. Control Systems Engineering by I.J. Nagarath and M.Gopal, New Age International (P) Ltd.
2. Digital Control and State Variable Methods – by M.Gopal, Tata McGraw-Hill Companies, 1997.
3. Systems and Control by Stainslaw H. Zak, Oxford Press, 2003.

E-Resources

1. http://www.nptelvideos.in/2012/11/advanced-control-system-design_27.html
2. https://nptel.ac.in/courses/108/103/108103007/

Course Outcomes

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

CO 1. Demonstrate non-linear system behavior by phase plane and describing function methods

CO 2. Perform the stability analysis nonlinear systems by Lyapunov method develop design skills in optimal control problems

CO 3. Derive discrete-time mathematical models in both time domain (difference equations, state equations) and z domain (transfer function using z-transform).

CO 4. Predict and analyze transient and steady-state responses and stability and sensitivity of both open-loop and closed-loop linear, time-invariant, discrete-time control systems.

CO 5. Acquire knowledge of state space and state feedback in modern control systems, pole placement, design of state observers and output feedback controllers

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	**3**	**-**	**-**	**3**	**3**	**-**	**-**	**-**	**3**	**3**	**-**	**-**	**3**	**-**
CO2	**2**	**-**	**-**	**3**	**3**	**-**	**-**	**-**	**3**	**3**	**-**	**-**	**3**	**-**
CO3	**1**	**-**	**-**	**3**	**3**	**-**	**-**	**-**	**3**	**3**	**-**	**-**	**3**	**-**
CO4	**2**	**-**	**-**	**3**	**3**	**-**	**-**	**-**	**3**	**3**	**-**	**-**	**3**	**-**
CO5	**3**	**-**	**-**	**3**	**3**	**-**	**-**	**-**	**2**	**2**	**-**	**-**	**3**	**-**
Average	**2.2**	**-**	**-**	**3**	**3**	**-**	**-**	**-**	**2.8**	**2.8**	**-**	**-**	**3**	**-**

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

AY: 2022-23 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech EEE III Year-II Sem			
Course Code: L3221	POWER SYSTEMS AND SIMULATION LAB	L	T	P	D
Credits: **2**		**0**	**0**	**4**	**0**

Pre-requisite: Power Systems

Course Objectives:

This course will enable students to:

1. Introduces the computational aspects of the power system analysis
2. description of the computer algorithms for analysis of any general power transmissionsystem
3. Deals with computer algorithms for contingence analysis,state estimation and phase domainfault analysis method of any general power transmission system.
4. Design models for power systems and power electronics.
5. Understand the solution methods and techniques used in power system studies

List of Experiments

1. Determination of line performance when loaded at receiving end.
2. Formation of bus Admittance matrix.
3. Load flow Solution using Gauss Seidel Method.
4. Load flow solution using Newton Raphson method in Rectangular Coordinates.
5. Unsymmetrical Fault Analysis.
6. Z-bus Building Algorithm.
7. Obtain Symmetrical components of a set of unbalanced currents.
8. Obtain the original unbalanced phase voltages from Symmetrical Components.
9. Short Circuit Analysis of 14 bus system.
10. Load Frequency control of a single area system.
11. Load frequency control of a two-area system.
12. Transient Response of an RLC Circuit.

Course Outcomes:

The student will be able to :

CO 1. Develop his own program for such pourposes and feel more confident while usingcommercial software in the field.

CO 2. Understand the computer algorithms for contingence analysis,state estimation and phasedomain fault analysis method

CO 3. Understand the solution methods and techniques used in power system studies

CO 4. Models of power systems and power electronics.

CO 5. Analyze computer algorithms for analysis of any general power transmission system

CO-PO/PSO Mapping

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	2	-	-	-	-	2	-	-	2	
CO2	3	2	2	2	2	-	-	-	-	2	-	-	2	
Average	3	3	2	2	2	-	-	-	-	2	-	-	2	

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

AY: 2022-23 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech EEE III Year-II Sem			
Course Code: L3201	LIFE SKILLS AND PROFESSIONAL SKILLS LAB COMMON TO: ALL	L	T	P	D
Credits: 2		0	0	4	0

Pre-Requisites:

Module 1: COMMUNICATION SKILLS [8L]

Introduction- Channel of communication, Process of communication, Language as a tool of communication, levels of communication, the flow of communication, communication networks, Barriers to Communication; Body language – Eye contact, facial expressions, gestures, posture, and body movements.

Module 2: PRESENTATION SKILLS [8L]

Nature and Importance of Oral Presentation; Planning the Presentation-Define the Purpose, Analyze the Audience, Analyze the Occasion and Choose a suitable title; Preparing the Presentation-Develop the Central Idea, Develop the Main Ideas, Gather Supporting Material and Plan Visual Aids; Organizing the Presentation-Introduction, Body, Conclusion; Rehearsing the Presentation; Improving Delivery and Choosing Delivery Methods; Handling the Stage Fright.

Module 3: GROUP DISSCUSSIONS [8L]

Nature of GD- What is a GD? GD and Debate, Importance of GD skills; Characteristics of successful GDs-Subject knowledge, Oral Communication skills, Leadership skills, Team Management; GD Strategies-Getting the GD Started, Contributing Systematically, Creating a Friendly Cooperative Atmosphere, Moving the Discussion along, Promoting Optimal Participation, Handling Conflict and Effecting Closure; Techniques for Individual Contribution- Topic Analysis, Discussing Problems, Discussing Case Studies; Group Interaction Strategies-Exchanging Opinions, Exchanging Suggestions and Proposals.

Module 4: INTERVIEW SKILLS [8L]

The Interview process; Characteristics of the Interview- Planning, Purpose, Conversation, Two-way Interaction and Informality; Pre-interview Preparation Techniques-Self-analysis, Research the Organization, Job Analysis, Revise your Subject Knowledge, Develop the Interview File; Interview Questions- Types of Interview Questions, Answering Strategies; FAQs and Practice; Projecting a positive image; Alternative Interview formats.

Module 5: PROFESSIONAL WRITING SKILLS [8L]

Resumes -Resume Design, Parts of Resume, Resume style; Job Applications-opening, body, and closing; E-mail writing-Format, Standard E-mail practices and E-mail writing strategies; Report writing-nature and significance, types of reports, formats of reports; Proposals- types of Proposals, structure of Formal Proposals, parts of a formal Proposals; Technical Articles-types of Technical Articles, Journal articles and Research papers-Review and Research Articles, Elements of Technical Articles and Writing Strategies.

Reference Books

1. Ashraf Rizvi. M. *Effective Technical Communication*. McGraw-Hill: New Delhi: 2010
2. K. R. Lakshminarayanan, *Speak in English,* Scitech Publications, Chennai, 2009. Print.
3. Dr. Alex. K. Soft Skills: *Know yourself and Know the World*. S. Chand & Company Pvt. Ltd: New Delhi: 2014. Print.
4. Raman Meenakshi and Sangeeta Sharma. *Technical Communication: Principles and Practice.* Oxford University Press: New Delhi: 2007.Print.

E-Resources

https://www.skillsyouneed.com/ips/communication-skills.html
https://www.skillsyouneed.com/presentation-skills.html
https://www.coursera.org/articles/presentation-skills
https://www.javatpoint.com/group-discussion
https://hbr.org/1964/01/strategies-of-effective-interviewing
https://en.wikipedia.org/wiki/Professional_writing

Course Outcomes

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

CO1. Learn the importance of communication skills.

CO2. Understand how to give the presentation.

CO3. Participate in GDs by applying appropriate speaking techniques.

CO4. Know the required skills to face interviews.

CO5. Write letters and resumes effectively by applying appropriate writing 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**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
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: 2022-23 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech EEE III Year- II Sem			
Course Code: L32T2	**Foundations of Entrepreneurship**	L	T	P	D
Credits: 0		**2**	**0**	**0**	**0**

Pre-Requisites:

Course Objective:

a) To implore an understanding of the dimensions and traits required to become an entrepreneur.
b) To understand the Entrepreneurial process and also inspire them to be Entrepreneurs
c) To understand the Entrepreneurship and its role in the society
d) To understand the process of Entrepreneurship & preparing business plans
e) To gain knowledge about the Entrepreneurship Development Institutions of Government

MODULE: I
UNIT - 1:
Understanding Entrepreneurial Mindset- The revolution impact of entrepreneurship- The evolution of entrepreneurship - Functions of Entrepreneurs – types of entrepreneurs –
UNIT - 2:
Approaches to entrepreneurship- Process approach- Role of entrepreneurship in economic development- Twenty first century trends in entrepreneurship.

MODULE: II
UNIT: 1
The Individual Entrepreneurial Mind-Set and Personality- The entrepreneurial journey-Stress and the entrepreneur - the entrepreneurial ego - Entrepreneurial motivations-
UNIT: 2
Motivational cycle – Entrepreneurial motivational behaviour – Entrepreneurial competencies.
Corporate Entrepreneurial Mindset, the nature of corporate entrepreneur- conceptualization of corporate entrepreneurship Strategy-sustaining corporate entrepreneurship.

MODULE: III
UNIT - 1:
Launching Entrepreneurial Ventures - opportunities identification- Finding gaps in the market place – techniques for generating ideas- entrepreneurial Imagination and Creativity- the nature of the creativity process - Innovation and entrepreneurship.
UNIT -2:
Methods to initiate Ventures- Creating new ventures-Acquiring an Established entrepreneurial venture- Franchising- advantage and disadvantages of Franchising.

MODUL IV:
UNIT - 1:
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-
UNIT - 2:
The challenges of new venture start-ups, developing an effective business model – Sources of finance - Critical factors for new venture development - The Evaluation process.
MODULE:V
UNIT - 1:
Strategic Perspectives in Entrepreneurship - Strategic planning - Strategic actions-strategic positioning- Business stabilization - Building the adaptive firms .

UNIT - 2:

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.

Text Books

1. S. S.Khanka, Entrepreneurship Development, S. Chand Publications, 2015. Stuart Read, Effectual Entrepreneurship, Routledge, 2013.
2. Rajeev Roy, Entrepreneurship, 2e, Oxford publications, 2012

Reference Books

1. D F Kuratko and T V Rao, Entrepreneurship- A South-Asian Perspective, Cengage Learning, 2012.
2. Bruce R. Barringer/ R. Duane Ireland, Entrepreneurship Successfully launching new ventures, 4e, Pearson, 2015
3. Nandan .H, Fundamentals of Entrepreneurship, PHI, 2013
4. Madhurima Lal Shikha Sahai – Entrepreneurship, Excel Books.

E-Resources

- http://surl.li/ksbxy
- http://surl.li/ksbxs
- http://surl.li/ksbxh

Course Outcomes

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

CO1. Understand the need and significance of Entrepreneurship in the Economy

CO2. Develop Entrepreneurial Competencies

CO3. Develop Business Plan with the required contents.

CO4. Understand contribution of family business and Social Entrepreneurship in the Economy.

CO5. Plan Strategic perspectives in entrepreneurship

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	-	1	-	2	2	-	3	-	-	-
CO2	-	2	2	2	-	-	-	-	-	-	-	-	-	-
CO3	-	-	-	-	1	-	-	-	1	-	3	-	-	-
CO4	-	-	-	-	2	-	2	-	2	-	2	-	-	-
CO5	-	-	2	-	-	-	-	-	-	-	2	2	-	-
Average	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

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

AY: 2022-23 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech EEE IV Year-I Sem			
Course Code:L412A	**Electrical Measurements**	L	T	P	D
Credits: **3**		**3**	**0**	**0**	**0**

Pre-Requisites: Electromagnetic Fields

Module 1: Analog Ammeters, Voltmeters and Instrument Transformers

Unit 1 [6L]
Classification of analog instruments–PMMC and MI Instruments: Principle, construction, Torque equation, Range Extension, Effect of temperature, Errors, advantages and disadvantages.
Unit 2 [6L]
Current Transformer and Potential Transformer: Construction, theory, Phasor diagram, Errors, testing and applications.

Module 2: Wattmeter, Power Factor Meter And Frequency Meters

Unit 1 [6L]
Electro dynamo meter type Wattmeter: Construction, Theory, errors–Low power factor wattmeter–Three phase wattmeter – Measurement of active and reactive power in single phase and three phases.
Unit 2 [6L]
Single phase and three phase electro dynamometer type and MI type power factor meters – Electrical resonance and Weston type frequency meters.

Module 3: Energy Meter and Potentiometers

Unit 1 [6L]
Single phase induction type energy meter: Construction, theory, operation, errors, compensations, Maximum demand indicators–Measurement of VAH, VARh.
Unit 2 [6L]
Basic Potentiometer–Standardization–Crompton‘s Potentiometer–Polar type and coordinate type AC potentiometers–Applications of DC& AC potentiometer.

Module 4: DC & AC Bridges

Unit 1 [8L]
Classification of resistances–Wheatstone bridge–Sensitivity of Wheatstone bridge– Limitations–Carey foster slide wire bridge–Kelvin‘s Double bridge–Difficulties in measurement of high resistances–loss of charge method–Megohm bridge method.
Unit 2 [6L]
Measurement of Inductance and capacitances: Maxwel‘s Bridge–Anderson ‘s Bridge–Hays Bridge–Owen ‘s Bridge–Desauty’s Bridge–Schering bridge – Measurement of frequency: Wien ‘s Bridge.

Module 5: Magnetic Measurements

Unit 1 [5L]
D’Arsonval galvanometer, Ballistic and flux meters: Construction, Theory, Operation. Ballistic Tests.
Unit 2 [5L]
Measurement of flux density, magnetizing force–Determination of B-H Curve– Hysteresis loop.

Text Books

1. A. K. Sawhney, “A course in Electrical and Electronics Measurements and Instrumentation”, Dhanapath Rai and Sons., 10th Edition, 2007.
2. W.Golding & F.C.Widdis, “Electrical Measurements & Measuring Instruments”, A.H. Wheeler & Co, Fifth Edition, 2001.

Reference Books

1. J.B. Gupta," A course in Electronics and Electrical Measurements and Instrumentation", S. K. Kataria & Sons, 2009.
2. H.S. Kalsi," Electronic Instrumentation", Tata McGraw Hill, 2004.
3. U. A. Bakshi, A. V. Bakshi "Electrical Measurements and Instrumentation", Technical Publications, 2009

E-Resources

1. https://nptel.ac.in/courses/108/105/108105153/
2. https://nptel.ac.in/courses/112/106/112106138/
3. https://nptel.ac.in/courses/112/107/112107242/

Course Outcomes

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

CO 1. Compare performance of MC & MI Instruments and Compute the errors in CTs and PTs.

CO 2. Understand operating principles of Electro dynamo type instruments and frequency meters.

CO 3. Understand operating principles of Induction type instruments and comparison instruments.

CO 4. Determine the circuit parameters using AC and DC bridges.

CO 5. Identify instruments for typical magnetic measurements.

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**	**PO1 0**	**PO1 1**	**PO1 2**	**PSO 1**	**PSO 2**
CO1	2	-	2	2	-	-	3	-	-	-	-	-	2	-
CO2	3	-	1	3	-	-	2	-	-	-	-	-	3	-
CO3	3	-	3	2	-	-	2	-	-	-	-	-	3	-
CO4	2	-	3	2	-	-	1	-	-	-	-	-	3	-
CO5	1	-	2	3	-	-	2	-	-	-	-	-	2	-
Average	2.2	-	2.2	2.4	-	-	2	-	-	-	-	-	2.6	-

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

AY: 2022-23 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech EEE IV Year-I Sem			
Course Code: L412E	EHVAC TRANSMISSION	L	T	P	D
Credits: **3**		**3**	**0**	**0**	**0**

Pre-Requisites:

Module 1: E.H.V.A.C. Transmission line [10L]

E.H.V.A.C. Transmission line trends and preliminary aspect standard transmission voltages – Estimation at line and ground parameters-Bundle conductor systems1Inductance and Capacitance of E.H.V. lines – positive, negative and zero sequence impedance – Line Parameters for Modes of Propagation.

Module 2: Electrostatic field and voltage gradients [10L]

Electrostatic field and voltage gradients – calculations of electrostatic field of AC lines – effect of high electrostatic field on biological organisms and human beings - surface voltage gradients and maximum gradients of actual transmission lines – voltage gradients on sub conductor.

Module 3: Electrostatic induction in unenergized lines [12L]

Electrostatic induction in unenergized lines – measurement of field and voltage gradients for three phase single and double circuit lines – un energized lines. Power Frequency Voltage control and over-voltages in EHV lines: No load voltage – charging currents at power frequency-voltage control – shunt and series compensation – static VAR compensation.

Module 4: Corona in E.H.V. lines [10L]

Corona in E.H.V. lines – Corona loss formulae- attention of traveling waves due to Corona – Audio noise due to Corona, its generation, characteristic and limits. Measurements of audio noise radio interference due to Corona - properties of radio noise – frequency spectrum of RI fields – Measurements of RI and RIV.

Module 5: Design of EHV lines [8L]

Design of EHV lines based on steady state and transient limits - EHV cables and their characteristics.

Text Books

1. 1. R. D. Begamudre ,—EHVAC Transmission Engineering‖, New Age International (p) Ltd. 3rd Edition.
2. 2. K.R. Padiyar, —HVDC Power Transmission Systems‖ New Age International (p) Ltd. 2nd revised Edition, 2012..

Reference Books

1. S. Rao —EHVAC and HVDC Transmission Engg. Practice‖ Khanna publishers.
2. Arrillaga.J — High Voltage Direct Current Transmission‖ 2nd Edition (London) peter Peregrines, IEE, 1998.
3. Padiyar.K.R, — FACTS Controllers in Power Transmission and Distribution‖ New Age Int. Publishers, 2007.

E-Resources

1. https://ieeexplore.ieee.org/document/8387379
2. https://nptel.ac.in/courses/108/108/108108099/
3. https://nptel.ac.in/courses/108/104/108104013/

Course Outcomes

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

CO 1. Learn about the trends in EHV AC Transmission and can calculate Line inductance and capacitances of bundled conductors.

CO 2. Calculate voltage gradient of bundled conductors and calculate electrostatic field of EHV AC lines.

CO 3. Analyze compensated devices for voltage control.

CO 4. Understand the effects of corona like Audible noise and Radio Interference.

CO 5. Design EHV cables and understands their characteristics

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	**3**	**2**	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**3**	**3**
CO2	**3**	**3**	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**3**	**3**
CO3	**3**	**3**	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**3**	**3**
CO4	**3**	**3**	**3**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**3**	**3**
CO5	**3**	**3**	**3**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**3**	**3**
Average	**3**	**2.8**	**3**	**2.4**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**3**	**3**

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

AY: 2022-23 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech EEE IV Year-I Sem			
Course Code: L412F	HIGH VOLTAGE ENGINEERING	L	T	P	D
Credits: **3**	(PROFESSIONAL ELECTIVE-IV)	**3**	**0**	**0**	**0**

Pre-Requisites: Power Systems, EMF

Module 1: Introduction To High Voltage Technology And Applications [10L]

Electric Field Stresses, Gas / Vacuum as Insulator, Liquid Dielectrics, Solids and Composites, Estimation and Control of Electric Stress, Numerical methods for electric field computation, Surge voltages, their distribution and control, Applications of insulating materials in transformers, rotating machines, circuit breakers, cable power capacitors and bushings

Module 2: Break Down In Gaseous and Liquid Dielectrics [12L]

Gases as insulating media, collision process, Ionization process, Townsend's criteria of breakdown in gases, Paschen's law. Liquid as Insulator, pure and commercial liquids, breakdown in pure and commercial liquids.

Break Down In Solid Dielectrics: Intrinsic breakdown, electromechanical breakdown, thermal breakdown, breakdown of solid dielectrics in practice, Breakdown in composite dielectrics, solid dielectrics used in practice.

Module 3: Generation Of High Voltages And Currents [12L]

Generation of High Direct Current Voltages, Generation of High alternating voltages, Generation of Impulse Voltages, Generation of Impulse currents, Tripping and control of impulse generators.

Measurement Of High Voltages And Currents

Measurement of High Direct Current voltages, Measurement of High Voltages alternating and impulse, Measurement of High Currents-direct, alternating and Impulse, Oscilloscope for impulse voltage and current measurements.

Module 4: Over Voltage Phenomenon And Insulation Co-Ordination[8L]

Natural causes for over voltages – Lightning phenomenon, Overvoltage due to switching surges, system faults and other abnormal conditions, Principles of Insulation Coordination on High voltage and Extra High Voltage power systems.

Module 5: Non-Destructive Testing Of Material And Electrical Apparatus[10L]

Measurement of D.C Resistivity, Measurement of Dielectric Constant and loss factor, Partial discharge measurements.

High Voltage Testing Of Electrical Apparatus: Testing of Insulators and bushings, Testing of Isolators and circuit breakers, Testing of cables, Testing of Transformers, Testing of Surge Arresters, and Radio Interference measurements.

Text Books

1. M.S.Naidu and V. Kamaraju, **High Voltage Engineering**– TMH Publications, 3rd Edition.
2. E.Kuffel, W.S.Zaengl, J.Kuffel by Elsevier, **High Voltage Engineering: Fundamentals** 2nd Edition.

Reference Books

1. C.L.Wadhwa, **High Voltage Engineering.** New Age Internationals (P) Limited, 1997.

2. Ravindra Arora, Wolfgang Mosch, **High Voltage Insulation Engineering**, New Age International (P) Limited, 1995.
3. Mazen Abdel Salam, Hussein Anis, Ahdan El-Morshedy, Roshdy Radwan , Marcel Dekker

E-Resources

1. **https://nptel.ac.in/courses/108/104/108104048/**
2. **https://nptel.ac.in/courses/108/104/108104013/**

Course Outcomes

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

CO 1. Know conduction and breakdown will occur in gases, liquids and solids dielectrics, and different applications of the insulating materials in electrical power apparatus.
CO 2. Explain the insulation testing of various components in power systems for different types of voltages, namely power frequency A.C, high frequency, switching or lightning impulses, for which generation of high voltages in laboratories is essential.
CO 3. Knowledge of generation and measurement of DC, AC and impulse voltages.
CO 4. Interpret the necessity to measure the voltages and currents accurately, ensuring perfect safety to the personnel and equipment.
CO 5. Detect the necessary condition for all the electrical equipment which are capable of withstanding the over voltages which met in service like natural causes lightning or system originated ones switching or power frequency transient voltage.

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	**3**	**2**	**-**	**-**	**2**	**3**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**3**
CO2	**2**	**-**	**3**	**-**	**3**	**3**	**-**	**3**	**-**	**-**	**-**	**-**	**-**	**3**
CO3	**2**	**-**	**2**	**-**	**2**	**3**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**3**
CO4	**3**	**3**	**3**	**-**	**3**	**-**	**-**	**3**	**-**	**-**	**-**	**-**	**-**	**3**
CO5	**2**	**3**	**3**	**-**	**3**	**-**	**-**	**3**	**-**	**-**	**-**	**-**	**-**	**3**
Average	**2.4**	**1.6**	**2.2**	**-**	**2.6**	**1.8**	**-**	**2.6**	**-**	**-**	**-**	**-**	**-**	**3**

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

AY 2022-23 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech: EEE IV Year – I Sem			
Course Code: L412G	UTILIZATION OF ELECTRICAL ENERGY (PROFESSIONAL ELECTIVE –IV)	L	T	P	D
Credits: 3		3	0	0	0

Prerequisite: Electrical Machines

Module 1: ILLUMINATION [8L]

Production of light – Determination of MHCP and MSCP – Polar curves of different types of sources – Rousseau's construction – Lighting schemes and calculations – Factory lighting – Flood lighting – Electric lamps – Gaseous discharge – High pressure and low pressure.

Module 2: ELECTRIC HEATING AND WELDING [10L]

Resistance, Inductance and Arc furnaces – Construction and fields of application – Losses in oven and efficiency - High frequency - Dielectric heating – Characteristics of carbon and metallic arc welding – butt welding – spot welding.

Module 3: ELECTRIC DRIVES AND CONTROL [10L]

Group drive – Individual drive – selection of motors – starting and running characteristics – Running characteristics - Mechanical features of electric motors – Drives for different industrial applications - Choice of drives – power requirement calculation – power factor improvement.

Module 4: ELECTRIC TRACTION [10L]

Traction system – Speed time characteristics – Series and parallel control of D.C motors - Open circuited, shunt and bridge transitions – Tractive effort calculation – Electric braking – Tramways and trolley bus – A.C traction and recent trend.

Module 5: ELECTROLYTIC PROCESSES [8L]

Electrolysis – polarization factor – preparation work for Electro plating – Tanks and other equipment's – Calculation of energy requirements – Methods of charging and maintenance – Ni-iron and Ni- cadmium batteries -Components and materials – Capacity rating of batteries. Energy Auditing – Energy Conservation techniques for domestic and industrial applications.

Text Books

1. Uppal S.L, "Electric Power", Khanna Publishers,2002.
2. Chakrabarti. A, Soni M I, Gupta P V, "Textbook on power system engineering", Dhanpat Rai & Co, 2008.

Reference Books

1. N.V.Suryanarayanan, "Utilization of Electric Power", Wiely Eastern Ltd., 2001.
2. G.C.Garg, "Utilization of Electric Power and Electric Traction", Khanna Publishers, 2006.

E-Resources

1. https://youtu.be/cvQ5tss5sfA
2. https://www.youtube.com/watch?v=BYNtuUAmRhE

Course Outcomes

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

CO 1. Ability to choose suitable electric drives for different applications.
CO 2. Ability to design the illumination systems for energy saving.
CO 3. Ability to understand the utilization of energy for heating and welding purposes.

CO 4. Ability to choose suitable electric drives for different applications.
CO 5. Ability to know the effective usage of batteries.

CO-PO/PSO Mapping

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	2	3	-	-	-	-	-	-	-	2	3		3
CO2	3	2	2	-	-	-	-	-	-	-	2	2		2
CO3	3	2	3	-	-	-	-	-	-	-	3	3	3	3
CO4	3	3	2	-	-	-	-	-	-	-	2	2		2
CO5	3	3	2	-	-	-	-	-	-	-	2	3		3
Average	3	2.4	2.4	-	-	-	-	-	-	-	2.2	2.6	3	2.6

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

AY: 2022-23 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech EEE IV Year – II Sem			
Course Code: L4121	**ELECTRICAL MEASUREMENTS LAB**	L	T	P	D
Credits: **2**		**0**	**0**	**4**	**0**

Pre-Requisites: Basic Electrical Engineering, Network analysis

LIST OF EXPERIMENTS:

1. Calibration and testing of 1- Φ Energy meter.
2. Calibration of dynamometer type Power Factor meter.
3. Measurement of Unknown voltage by DC Crompton potentiometer.
4. Measurement of Low resistance by using Kelvin's double bridges.
5. Measurement of Iron losses by using Lloyd, Fisher magnetic method.
6. Measurement of unknown capacitance by using Schering bridge.
7. Measurement of Inductance by using Anderson bridge.
8. Measurement of 3-Φ reactive power with volt ampere method.
9. Measurement of parameters of choke coil using three voltmeter and three Ammeter methods.
10. Linear variable differential transformer (LVDT) trainer and capacitance pickup Characteristics and calibration.
11. Measurement of unknown inductance by using Maxwell's bridge.
12. Resistance strain guage.
13. PT testing by comparison.
14. CT testing using mutual inductor.
15. Performance of oil by dielectric oil test method.

Course Outcomes

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

CO 1. Measure various electrical parameters with accuracy, precision, resolution.
CO 2. Make use of AC and DC bridges for relevant parameter measurement.
CO 3. Test current transformers and dielectric strength of oil.
CO 4. Ability to balance Bridges to find unknown values.
CO 5. Demonstrate & Calibrate LVDT and resistance strain gauge.

CO-PO/PSO Mapping

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	-	2	-	-	3	-	-	-	-	2	-	2	-
CO2	3	-	1	-	-	2	-	-	-	-	3	-	3	-
CO3	3	-	3	-	-	2	-	-	-	-	2	-	4	-
CO4	2	-	3	-	-	1	-	-	-	-	2	-	3	-
CO5	1	-	2	-	-	2	-	-	-	-	3	-	2	-
Average	2.2	-	2.2	-	-	2	-	-	-	-	2.4	-	2.8	-

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

AY: 2022-23 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech EEE IV Year-I Sem			
Course Code: **L41M3**	**ELECTRICAL SAFETY AND SAFETY MANAGEMENT**	L	T	P	D
Credits: **MC**		**2**	**0**	**0**	**0**

Pre-Requisites: Basic Electrical and Electronics Engineering

Module 1: INTRODUCTION [8L]

General Background-Objectives of safety and security measures-Hazards associated with electric current and voltage-principles of electrical safety- Approaches to Prevent Accidents. Fire Prevention and Fire Fighting-Objectives and scope of IE act and IE rules-General requirements for electrical safety as per IE rules

Module 2: ELECTRICAL SHOCKS AND THEIR PREVENTION [12L]

Primary and Secondary Electric Shocks- Occurrence of Electric Shock -Shocks Due to Flashovers/Spark-overs- Lightning Strokes on Overhead Transmission Lines and Outdoor Substations.

Safety Precautions in Small LV Installations, Residential Buildings, Shops -Safety Procedures in Electrical Plant Installation and description of Earthing System- Equipment Earthing - Substation Earthing.

Module 3: FIRST AID [10L]

Introduction- Removal of Contac with Live Conductor- First Principles of Actions after Electric Shock - Artificial Respiration - Schafer's Prone Pressure Method- Silvester's Method- Nielson's Arm-lift Back-pressure Method- Mouth to Mouth Method.Use of Artificial Resuscitator- External Cardiac Massage- Cardiac Pulmonary Resuscitation-First aid treatment of Heat Exhaustion and heat stroke.

Module 4: ELECTRICAL SAFETY IN HAZARDOUS AREAS [10L]

Introduction-Classification of Hazardous zones-causes of sparks and flashovers in electrical plants and machines-functional requirements of electrical equipment and installations for hazardous area/zones-classification of equipment/enclosure for hazardous locations.

Module 5: ELECTRICAL SAFETY MANAGEMENT [9L]

Introduction-Principles of safety management-management's safety policy-safety organization-organization charts for construction phase of a project, maintenance mode of a plant and for safety department – safety auditing-training and supervision-annual reports - motivation to managers, supervisors and employees.

Text Books

1. Dr. Abhijit Chakrabarti, "Circuit Theory", Dhanpat Rai & Co. (Pvt.) Ltd. Educational & Technical Publications.
2. M. E. Van Valkenburg, "Network Analysis", Prentice Hall, 2006.
3. Shyam Mohan , Sudhakar Electric Circuits Tata Mcgraw hill 5e.
4. John D Ryder , Network lines & Fields.

Reference Books

1. J. Cadick, D. Neitzel and A. Winfield, "Electrical Safety Hand Book", McGraw Hill Education, 2012.
2. J. Maxwell Adams, "Electrical Safety- A Guide to the Causes and Prevention of Electric Hazards", The Institution of Electric Engineers, 3rd Reprint, 2009.

3. Martha J. Boss and Gayle Nicoll, "Electrical Safety - Systems, Sustainability and Stewardship", CRC Press, 2015.

E-Resources

1. https://mrcet.com/downloads/digital_notes/ECE/II Year/31082020/NETWORK ANALYSIS &TRANSMISSION LINES.pdf
2. https://www.vssut.ac.in/lecture_notes/lecture1423722706.pdf
3. https://www.iare.ac.in/sites/default/files/IARE_NA_LECTURE_NOTES.pdf
4. https://archive.nptel.ac.in/courses/108/105/108105159/

Course Outcomes

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

CO 1. Learn about Electrical safety, IE act and IE rules

CO 2. Understand Electrical shocks and their prevention

CO 3. Acquire knowledge about various first aid measures.

CO 4. Familiarize with electrical safety in hazardous areas.

CO 5. Get introduced to safety management.

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	**3**	**-**	**3**	**-**	**3**	**3**	**-**	**-**	**2**	**-**	**-**	**-**	**2**	**-**
CO2	**3**	**-**	**2**	**-**	**3**	**2**	**-**	**-**	**3**	**-**	**-**	**-**	**2**	**-**
CO3	**3**	**-**	**2**	**-**	**3**	**3**	**-**	**-**	**2**	**-**	**-**	**-**	**3**	**-**
CO4	**3**	**-**	**2**	**-**	**3**	**2**	**-**	**-**	**2**	**-**	**-**	**-**	**2**	**-**
CO5	**3**	**-**	**2**	**-**	**3**	**2**	**-**	**-**	**2**	**-**	**-**	**-**	**2**	**-**
Average	**3**	**-**	**2.2**	**-**	**3**	**2.4**	**-**	**-**	**2.2**	**-**	**-**	**-**	**2.2**	**-**

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

AY: 2022-23 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech IV Year-II Sem			
Course Code: L422A	**Power Electronics for Renewable Energy Systems (PROFESSIONAL ELECTIVE – VI)**	L	T	P	D
Credits:**3**		**3**	**0**	**0**	**0**

Course Objectives:

This course will enable students:

1. To familiarize the students about the Renewable Energy generation.
2. To provide basic knowledge about IG, DFIG, PMSG, SCIG and their applications.
3. To provide the significance control concept of Converter.
4. To Gain the knowledge of WIND turbines and PV system.
5. To Learn the Hybrid Renewable System.

Module 1: Introduction [10L]

Environmental aspects of electric energy conversion: impacts of renewable energy generation on environment (cost-GHG Emission) –Qualitative study of different renewable energy resources: Geothermal, ocean and Biomass. Solar PV Systems - Equivalent Circuit model, Performance Characteristics, Charge Controllers, Types of Solar PV Systems and Applications. Wind Energy System-Important terms-TSR, Cp, SRC, Performance Characteristics of Wind turbine-Control System and strategy, Safe operating area.

Module 2: Electrical Machines for Renewable Energy Conversion [10L]

Reference theory fundamentals-principle of operation and analysis: IG, PMSG, SCIG and DFIG.

Module 3: Power Converters [12L]

Solar: Principle of operation: line commutated converters (inversion-mode) - Boost and buck-boost converters- selection of inverter, battery sizing, array sizing Wind: Three phase AC voltage controllers-AC-DC-AC converters: uncontrolled rectifiers, PWM Inverters, Grid Interactive Inverters-matrix converters.

Module 4: Analysis of Wind and PV System [9L]

Standalone operation of fixed and variable speed wind energy conversion systems - Grid integrated PMSG, SCIG Based WECS, Standalone and grid Integrated solar system- Grid connection Issues.

Module 5: Hybrid Renewable Energy System [9L]

Need for Hybrid Systems- Range and type of Hybrid systems- Case studies of Wind-PV Maximum Power Point Tracking (MPPT).

Text Books

1. S. N. Bhadra, D.Kastha, S.Banerjee, "Wind Electrical Systems", Oxford University Press, 2005.

Reference Books

1. Bimal K. Bose, "Power Electronics in Renewable Energy Systems and Smart Grid", John Wiley & Sons, Aug-2019.
2. Haitham Abu-Rub, Mariusz Malinowski, Kamal Al-Haddad, "Power Electronics for Renewable Energy Systems, Transportation and Industrial Applications", John Wiley & Sons, Ltd, 30 May 2014
3. Rashid .M. H, "Power Electronics Hand book", Academic Press, 2001.
4. Rai. G.D, "Non- conventional energy sources", Khanna Publishers, 1993.
5. Gray, L. Johnson, "Wind energy system", Prentice Hall of India, 1995.

E-Resources

1. https://ieeexplore.ieee.org/document/4778368
2. https://onlinelibrary.wiley.com/doi/book/10.1002/9781118755525
3. https://www.fuelcellstore.com/blog-section/power-electronics-for-renewable-energy-systems
4. https://www.mdpi.com/1996-1073/12/10/1852
5. https://www.wingrid.org/wp-content/uploads/2021/06/Frede-Blaabjerg-Introduction-to-renewables-systems.pdf

Course Outcomes

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

CO 1. Understand the use of power converters in PV applications.
CO 2. Develop analytical techniques for IG, PMSG, SCIG and DFIG.
CO 3. Design important elements of a power converter system.
CO 4. Understand the use of power converters in wind turbines.
CO 5. Understand the concept of maximum power point tracking

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	-	3	-	-	-	-	-	2	-	-	2
CO2	3	-	1	-	2	-	-	-	-	-	3	-	-	3
CO3	3	-	3	-	2	-	-	-	-	-	2	-	-	3
CO4	2	-	3	-	1	-	-	-	-	-	2	-	-	3
CO5	1	-	2	-	2	-	-	-	-	-	3	-	-	2
Average	2.2	-	2.2	-	2	-	-	-	-	-	2.3	-	-	2.4

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

AY 2022-23 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech: EEE IV Year – II Sem			
Course Code: L422B	HVDC TRANMISSION (PROFESSIONAL ELECTIVE –VI)	L	T	P	D
Credits: 3		3	0	0	0

Prerequisite: Power System

Course Objectives:

This course will enable students to:

1. Evaluation of technical and economical aspects of HVDC transmission.
2. Development of HVDC converter analysis.
3. Know about VSC HVDC control.
4. Impact of AC system performance on DC system.
5. Analysis of harmonics and their rectification.

Module 1: Introduction [9]

Introduction: General consideration, Power handling capabilities of HVDC Lines, Basic Conversion principles, Static converter configuration.

Module 2: Static power converters [10]

Static power converters: 3-pulse, 6-pulse, and 12-pulse converters, Converter station and Terminal equipment, Commutation process, Rectifier and inverter operation, Equivalent circuit for converter – Special features of converter transformers. Harmonics in HVDC Systems, Harmonic elimination, AC and DC filters.

Module 3: Control of HVDC converters and Systems [10]

Control of HVDC converters and Systems: Constant current, Constant extinction angle and constant ignition angle control, Individual phase control and equi-distant firing angle control DC power flow control. Interaction between HV AC and DC systems – Voltage interaction, Harmonic instability problems and DC power modulation.

Module 4: MTDC systems & over voltages [9]

MTDC systems & over voltages: Series parallel and series parallel systems their operation and control. Over voltages due to disturbances on DC side, Over voltages due to DC and AC side line faults.

Module 5: Converter faults & protection [9]

Converter faults & protection: Converter faults, Over current protection – Valve group, and DC line protection over voltage protection of converters, Surge arresters.

Text Books

1. E.W. Kimbark, "Direct Current Transmission", Wiley Inter Science, New York, Volume 1, 1971.
2. KR Padiyar,"High Voltage Direct current Transmission", New Age International Publishers, First Edition Reprint, 1992.

Reference Books

1. J. Arillaga,"HVDC Transmission", Institution of Electrical Engineers, Second Edition, 1998..
2. E. Uhlman, "Power Transmission by Direct Current", Springer Verlag, Berlin Helberg, First Edition, 1985.

E-Resources

1. https://nptel.ac.in/courses/108/104/108104013/
2. http://www.nptelvideos.in/2012/11/high-voltage-dc-transmission.html
3. https://www.coursebuffet.com/course/827/nptel/high-voltage-dc-transmission-iit-kanpur

Course Outcomes

The student will be able to:

CO 1. Compare the differences between HVDC and HVAC transmission.
CO 2. Analyze the rectifier and inverter commutating circuits.
CO 3. Identification of valve firing control schemes.
CO 4. Estimate the requirement of HVDC filters.
CO 5. Address the role of AC system faults on HVDC system and know about VSC transmission advantages.

CO-PO/PSO Mapping

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	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	-	2	-	-	-	-	-	2	-	2	-
CO2	2	3	3		2	-	-	-	-	-	3	-	3	-
CO3	2	2			2	-	-	-	-	-	3	-	3	-
CO4	3	3	2	3	-	-	-	-	-	-	2	-	2	-
CO5	2	3	2	2	-	-	-	-	-	-	-	-		-
Average	2.4	2.8	2.5	2.5	2	-	-	-	-	-	2.5	-	2.5	-

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

AY 2022-23 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech: EEE IV Year – II Sem			
Course Code: L422C	RESTRUCTURED POWER SYSTEMS (PROFESSIONAL ELECTIVE –VI)	L	T	P	D
Credits: 3		3	0	0	0

Prerequisite: Power System

Module 1: INTRODUCTION TO RESTRUCTURING [9L]

Reasons for restructuring of power industry-Vertically Integrated Utilities and Power Pools-Different Entities involved-Market models-Benefits from a Competitive Electricity Market-Worldwide Movement of Power Industry Restructuring.

Module 2: POWER SYSTEM OPERATION IN COMPETITIVE ENVIRONMENT [10L]

Unit-I:- [4L]
Role of the Independent System Operator (ISO)- Operational Planning Activities of ISO- The ISO in Pool Markets- The ISO in Bilateral Markets- Operational Planning Activities of a Genco-
Unit-II:- [4L]
The Genco in Pool Markets- The Genco in Bilateral Markets- Market Participation Issues- Competitive Bidding.

Module 3: TRANSMISSION OPEN ACCESS AND PRICING [10L]

Unit-I:- [4L]
Power Wheeling- Transmission Open Access- Types of Transmission Services in Open Access- Cost Components in Transmission
Unit-II:- [4L]
Pricing of Power Transactions- Embedded Cost Based Transmission Pricing- Incremental Cost Based Transmission Pricing.

Module 4: ANCILLARY SERVICES MANAGEMENT [10L]

General Description of Some Ancillary Services-Frequency control-Reserves services-Reactive power and voltage control service-Black start capability service- Scheduling and Dispatch Services- Synchronous Generators as Ancillary Service Providers.

Module 5: POWER SYSTEM ANALYSIS IN MARKET ENVIRONMENT [10L]

Electricity Price Forecasting- Issues of Electricity Pricing and Forecasting- Factors Considered in Price Forecasting- Performance Evaluation of Price Forecasting- Price Based Unit Commitment (PBUC)- PBUC Formulation- System Constraints- Unit Constraints- PBUC Solution- Electricity Market Analysis using AC Optimal Power Flow and Economic Load Dispatch.

Text Books

1. K. Bhattacharya,M. Bollen, J.E. Daalder, "Operation of Restructured Power Systems", Kluwer Academic Publishers, 2001.
2. S.C. Srivastava and S.N. Singh, "Operation and Management of Power System in Electricity Market", Alpha Science, 2015.

Reference Books

1. Mohammad Shahidehpour and MuwaffaqAlomoush, "Restructured Electric Power System Operation Trading and Volatility", Marcel Dekker Inc., 2001.
2. Loi Lei Lai, "Power System Restructuring and Deregulation", John Wiley & Sons Ltd, England, 2001.
3. Xiao-Ping Zhang, "Restructured Electric Power Systems: Analysis of Electricity Markets with Equilibrium Models", John Wiley & Sons, 2010.

E-Resources

1. https://crescent.education/wp-content/uploads/2019/02/RESTRUCTURED-POWER-SYSTEMS.pdf
2. https://lecturenotes.in/download/material/43055-note-of-restructured-power-system-by-ramesh-mahria

Course Outcomes

The student will be able to:

CO 1. Understand the difference between traditional and restructured power systems.
CO 2. Acquire knowledge about various entities involved in power markets
CO 3. Familiarize with electricity pricing and ancillary services.
CO 4. Learn about the new dimensions associated with the power system analysis
CO 5. Learn Analysis using AC Optimal Power Flow and Economic Load Dispatch.

CO-PO/PSO Mapping

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	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	-	2	-	-	-	-	-	2	-	2	-
CO2	2	3	3	-	2	-	-	-	-	-	3	-	3	-
CO3	2	2	-	-	2	-	-	-	-	-	3	-	3	-
CO4	3	3	2	3	-	-	-	-	-	-	2	-	2	-
CO5	2	3	2	2	-	-	-	-	-	-	-	-	-	-
Average	2.4	2.8	2.5	2.5	2	-	-	-	-	-	2.5	-	2.5	-

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

OPEN ELECTIVE-I

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 and roads, 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: 2022-23 Onwards	J. B. INSTITUTE OF ENGINEERING AND TECHNOLOGY (UGC Autonomous)	B. Tech-CSE III Year- I Sem			
Course Code: **L31OB**	**Introduction to Computer Networks (Open Elective -I)**	L	T	P	D
Credits: **3**		**3**	**0**	**0**	**0**

Pre-Requisites: Knowledge on Programming for Problem Solving

Course Objectives:

The students should be able to

1. Understand importance of Internet, Computer networks, and their elements
2. Identify the data link layer design Issues and protocols.
3. Examine design issues of network layer and corresponding protocols.
4. Identify the transport layer services and demonstrate the working of its protocols.
5. Identify the application layer services, protocols like HTTP, FTP, E-Mail etc.

Module 1:

Overview of the Internet: Protocol, Layering Scenario, TCP/IP Protocol Suite: The OSI Model, 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, Block Coding, 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, Tunnelling and 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.

Textbooks

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. Computer Networks,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:

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/
5. 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, functionalities and internetworking devices used and some protocols of Link layer.

CO2. Identify how error control, flow control can be achieved, and a medium can be shared among multiple devices,

CO3. Identify how to do fragmentation, assigning of logical address and judge on routing, congestion.

CO4. Illustrate the working of IP Protocol, other protocols of internet layer and services of transport layer.

CO5. Demonstrate the transport layer and application layer protocols, their working.

AY 2022-23 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech: AI&ML III Year / I Sem			
Course Code: **L310C**	**INTRODUCTION TO MACHINE LEARNING (Open Elective I)**	**L**	**T**	**P**	**D**
Credits: 3		**3**	**0**	**0**	**0**

Pre-Requisites: Data Structures, Design and Analysis of Algorithms, Python Programming & Mathematics for Machine Learning

Course objectives:

The student will:

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

Principal Component Regression- Partial Least squares- Linear Classification- Logistic Regression- Linear Discriminant Analysis-Perceptron- Support Vector Machines

Module 2:

Neural Networks-Introduction- Early Models- Perceptron Learning- Backpropagation- Initialization- Training & Validation- Parameter Estimation – MLE- MAP-Bayesian Estimation

Decision Trees- Regression Trees- Stopping Criterion & Pruning loss functions- Categorical Attributes- Multiway Splits- Missing Values- Decision Trees – Instability Evaluation Measures

Module 3:

Ensemble Learning-Bootstrapping & Cross Validation-Class Evaluation Measures- ROC curve- MDL- Ensemble Methods – Bagging- Committee Machines and Stacking- Boosting

Gradient Boosting- Random Forests- Multi-class Classification- Naive Bayes- Bayesian Networks

Module 4:

Undirected Graphical Models- HMM- Variable Elimination-Belief Propagation- Partitional Clustering, Hierarchical Clustering

Birch Algorithm, CURE Algorithm, Density-based Clustering- Gaussian Mixture Models Expectation Maximization

Module 5:

Deep Learning Architectures and Applications: Convolution neural networks (CNN) - Layers in CNN - CNN architectures.

Recurrent Neural Network. Applications: Speech-to-text conversion- image classification-time series prediction. Recent trends in various learning techniques of machine learning and classification methods for solving real world problems.

Text Books:

1. The Elements of Statistical Learning, by Trevor Hastie, Robert Tibshirani, Jerome H. Friedman (2009). Springer-Verlag.
2. Pattern Recognition and Machine Learning, by Christopher Bishop, Springer 2006
3. Richard S. Sutton and Andrew G. Barto, "Reinforcement learning: An introduction", Second Edition, MIT Press, 2019
4. Ethem Alpaydin, "Introduction to Machine Learning", MIT Press, Third Edition, 2014.

Reference Books:

1. Kevin P. Murphy, "Machine Learning: A Probabilistic Perspective", MIT Press, 2012.
2. Francois Chollet, "Deep Learning with Python, Manning Publications, Shelter Island, New York, 2018.
3. Navin Kumar Manaswi, Deep Learning with Applications using Python, Apress, New York, 2018.

Course outcomes:

The student will be able to:

1. Identify the basic concepts of machine learning.
2. Predict the various classification, clustering, and regression algorithms.
3. Apply the deep learning architectures for real world problems.
4. Implement a method for solving real life problem using a suitable machine learning technique.
5. Prioritize the various Machine Learning algorithms.

AY 2022-23 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech: AI&DS III Year –I Sem			
Course Code: L310D	OPEN ELECTIVE – I FUNDAMENTALS OF DATA SCIENCE	L	T	P	D
Credits: 3		3	0	0	0

Module I: Introduction to Data Science & Big Data

Unit 1:

Evolution of Data Science, Data Science Roles, Stages in a Data Science Project, Applications of Data Science in various fields, Data Security Issues.

Unit 2:

Introduction to Big Data, Elements of Big Data, Big Data Classification, Structured, Un Structured and Semi Structured Data

Module II: Data Collection and Data Pre processing

Unit 1: Data Collection Strategies, Data Pre-Processing Overview

Unit 2: Data Cleaning, Data Integration and Transformation, Data Reduction, Data Discretization

Module III: Exploratory Data Analytics

Unit 1:

Introduction to Exploratory Data Analytics, Visualization the data (Histogram, bar plot, box plot, pie chart, scatter plots)

Unit 2:

Descriptive Statistics, Mean, Standard Deviation, Skewness and Kurtosis, Box Plots, Pivot Table, Correlation Statistics, ANOVA

Module IV: Model Development

Unit 1:

Introduction to Regression, Simple and Multiple Regression, Model Evaluation using Visualization

Unit 2:

Residual Plot, Distribution Plot, Polynomial Regression and Pipelines, Measures for In-sample Evaluation, Prediction and Decision Making.

Module V: Model Evaluation

Unit I:

Generalization Error, Out-of-Sample Evaluation Metrics, Cross Validation, Overfitting, Under Fitting and Model Selection.

Unit II:

Prediction by using Ridge Regression, Testing Multiple Parameters by using Grid Search.

REFERENCES:

1. Jojo Moolayil, "Smarter Decisions: The Intersection of IoT and Data Science", PACKT, 2016.
2. Cathy O'Neil and Rachel Schutt , "Doing Data Science", O'Reilly, 2015.
3. David Dietrich, Barry Heller, Beibei Yang, "Data Science and Big Data Analytics", EMC 2013
4. Raj, Pethuru, "Handbook of Research on Cloud Infrastructures for Big Data

Analytics", IGI Global.

Course outcomes:

1. Analyze the fundamental concepts of Data Science.
2. Evaluate the Data analysis and Data Science Process and Linear Regression.
3. Analyze the various methods of Data Analysis.
4. Apply the Basics of R in its Environment
5. Evaluate the Data Science analysis using R programming and Data Visualization

AY: 2022-23 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech:ECE III Year-I Sem			
Course Code: **L31OE**	**PRINCIPLES OF COMMUNICATIONS** (OE-01)	L	T	P	D
Credits: **3**		**3**	**1**	**0**	**0**

Pre-Requisites: Basic electronics and Electricals

Course Objectives: Distinguish analog and digital Modulation techniques used in various Communication systems.

Module 1: Introduction [10L]

Unit-I: [6L]

Block diagram of Electrical communication system, Radio communication: Types of communications, analog, pulse and digital types of signals, Introduction to Modulation, Need for Modulation,

Unit-II: [4L]

Amplitude Modulation: Ordinary Amplitude Modulation – Modulation index, Side bands, AM Power, Double Side Band Suppressed Carrier Modulation, Single Side Band Modulation, Vestigial Side Band Modulation, AM demodulation, Applications of AM.

Module 2: Angle Modulation [9L]

Unit-I: [5L]

Angle Modulation: Phase Modulation fundamentals, Frequency Modulation – Modulation index and sidebands, Narrowband FM, Wideband FM, Comparison of Phase Modulation and Frequency Modulation verses Amplitude Modulation, FM demodulation, Applications of FM.

Unit-II: [4L]

Types of noise, sources of noise, calculation of noise in Linear systems and noise figure.

Module 3: Pulse Modulations [8L]

Unit-I: [4L]

Signal Sampling and Analog Pulse Communication:

Sampling, Nyquist rate of sampling, sampling theorem for Band limited signals, PAM, regeneration of base band signal, PWM and PPM.

Unit-II: [4L]

Time Division Multiplexing, Frequency Division Multiplexing, Asynchronous Multiplexing.

Module 4: Digital Communication [10L]

Unit-I: [5L]

Advantages, Block diagram of PCM, Quantization, and effect of quantization, quantization error, Base band digital signal, DM, ADM, DPCM and comparison.

Unit-II: [5L]

Transmission of Binary Data in Communication Systems: ASK, FSK, PSK, DPSK, QPSK demodulation, coherent and incoherent reception,

Module 5: Information Theory [9L]

Unit-I: [5L]

Concept of information, rate of information and entropy, Source coding for optimum rate of information, coding efficiency,

Unit-II: [4L]

Shanon-Fano and Huffman coding and its problems

Text Books

1. Communication Systems Analog and Digital – R.P. Singh and SD Sapre, TMH, 20th reprint, 2004.
2. Principles of Communications – H. Taub and D. Schilling, TMH, 2003.

Reference Books

1. Electronic Communication Systems – Kennedy and Davis, TMH , 4th edition, 2004.
2. Communication Systems Engineering -John. G. Proakis and MasoudSalehi, PHS, 2nd ed.2004.

E-Resources

1. https://nptel.ac.in/courses/Nanoelectronics/ IIT Madras/ab1011/102/111102111/

Course Outcomes

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

CO1. **Illustrate** the main concepts of analog and digital communication systems.

CO2. **Analyze** the AM and FM modulator/demodulator

CO3. **Explain**, discuss, and compare different binary digital modulation techniques.

CO4. **Distinguish** different types of noise and explain the effects of noise on communication system.

CO5. **Use** the basic concepts of information theory.

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	3	1	-	-	-	-	-	-	-	-	-	1	1	-
CO2	2	2	1	-	-	-	-	-	-	-	-	-	2	-
CO3	1	1	-	-	-	-	-	-	-	-	-	-	1	-
CO4	1	1	-	-	-	-	-	-	-	-	-	-	2	-
CO5	2	2	-	-	-	-	-	-	-	-	-	-	1	-
Average	**2.0**	**2.0**	**1.0**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1.0**	**1.2**	**-**

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

AY: 2022-23 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech ECM III Year-I Sem			
Course Code: **L31OF**	**FUNDAMENTALS OF DIGITAL LOGIC DESIGN (Open Elective -I)**	L	T	P	D
Credits: **3**		**3**	**0**	**0**	**0**

Pre-Requisites: Basics of Boolean algebra

Course Objectives:

Students will learn to

1. Understand basic tools for the design of digital circuits and fundamental concepts used in the design of digital systems.
2. Understand common forms of number representation in digital electronic circuits and to be able to convert between different representations.
3. Implement simple logical operations using combinational logic circuits.
4. Design combinational logic circuits, sequential logic circuits.
5. Impart the concepts of sequential circuits, enabling them to analyze sequential systems in terms of state machines.

Module 1:

Unit 1: Binary Systems:

Digital systems, binary numbers, number base conversions, octal and hexadecimal numbers, complements, signed binary numbers, binary codes, binary storage and registers, binary logic.

Module 2:

Unit-I: Boolean Algebra And Logic Gates

Basic definitions, axiomatic definition of boolean algebra, basic theorems and properties of boolean algebra, boolean functions canonical and standard forms, other logic operations, digital logic gages, integrated circuits.

Module 3:

Unit-I: Gate – Level Minimization

The map method, four-variable map, five-variable map, product of sums simplification don't-care conditions, nand and nor implementation other two-level implementnations, exclusive – or function, hardward description language (hdl).

Module 4:

Unit-I: Combinational Logic

Combinational circuits, analysis procedure design procedure, binary adder-subtractor decimal adder, binary multiplier, magnitude comparator, decoders, encoders, multiplexers, hdl for combinational circuits.

Module 5:

Unit-I:

Registers, shift registers, ripple counters synchronous counters, other counters, hdl for registers and counters.

Text Books

1. Digital design – third edition ,m.morrismano, pearson education/phi.
2. Fundamentals of logic design, roth, 5th edition,thomson.

Reference Books

1. Switching and finite automata theory by zvi. Kohavi, tatamcgraw hill.
2. Switching and logic design, c.v.s. rao, pearson education
3. Digital principles and design – donaldd.givone, tatamcgraw hill, edition.
4. Fundamentals of digital logic & micro computer design , 5th edition, m. Rafiquzzaman john wiley

E-Resources

1. https://nptel.ac.in/courses/106/105/106105185/
2. https://www.coursera.org/learn/digital-systems

Course Outcomes

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

CO1. Manipulate numeric information in different forms, e.g. different bases, signed integers, various codes such as ASCII, gray, and BCD.

CO2. Build Boolean expressions using the theorems and postulates of Boolean algebra and to minimize combinational functions.

CO3. Design and analyze small combinational circuits and to use standard combinational functions/building blocks to build larger more complex circuits.

CO4. Analyze small sequential circuits and devices and to use standard sequential functions/building blocks to build larger more complex circuits.

CO5. Construct digital systems by Algorithmic State Machine Charts

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	-	-	-	-	-	-	-	-	2	2	-
CO2	3	2	-	-	1	-	-	-	-	-	-	2	1	2
CO3	3	-	2	2	1	-	-	-	-	-	-	-	2	2
CO4	3	2	2	2	1	-	-	-	-	-	-	-	2	-
CO5	2	2	2	1	1	-	-	-	-	-	-	-	-	2
Average	2.4	2	1.75	1.67	1	-	-	-	-	-	-	-	1.75	2

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

AY: 2022-23 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech: EEE III Year-I Sem			
Course Code: **L31OG**	**Energy Engineering (OPEN ELECTIVE-I)**	L	T	P	D
Credits: 3		**3**	**0**	**0**	**0**

MODULE-I: Fundamentals of Energy: [10L]

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.

MODULE-II: Energy Sources-I: :(Elementary Aspects) [10L]

Coal fired steam thermal power plant – layout, working, Gas turbine power plant, Nuclear power plants, Hydro Electric plants.

MODULE-III: Energy Sources-II :(Elementary Aspects): [10L]

Solar energy, OTEC, Wind power plants, Tidal power plants and geothermal resources, Biomass, Fuel cell.

MODULE-IV: Environmental Pollution and Control: [10L]

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.

MODULE-V: Energy Conservation And Management: [10L]

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

1. S.Rao and Dr.B.B.Parulekar, "Energy Technology", Khanna pub., Third edition, 1999.
2. Non-conventional energy resources by B.H.Khan, TMH, 2006.
3. Desai,AV, "Energy Demand: Analysis, Management and Conservation", Wiley Eastern Limited,1990.

Reference Books

1. Management of Energy Environment Systems, W.K.Foell, John Wiley and Sons.
2. Environmental Impact Analysis Handbook, J.G.Rau, D.C.Wood, Mc Graw Hill.
3. Energy & Environment, J.M. Fowler, Mc Graw Hill.
4. Power Plant Engineering, P.K.Nag / Tata McGraw Hill.
5. G.D.Rai, "Non-conventional energy sources", Khanna pub. Fourth Edition, 2002.
6. Energy Management Handbook, John Wiley & Sons, Wayne C.Turner.

E-Resources

1. http://nptel.ac.in/courses/112105051/
2. https://www.youtube.com/watch?v=Ota2_LUuar0
3. https://www.youtube.com/watch?v=3dJAtHaSQ98
4. https://www.youtube.com/watch?v=xokHLFE96h8
5. http://www.tatapower.com/businesses/renewable-energy.aspx
6. http://www.cleanlineenergy.com/technology/wind-and-solar

Course Outcomes

The students will be able to:

CO 1. Collect and organize information on renewable energy technologies as a basis for further analysis

CO 2. Describe the challenges and problems associated with the use of various energy sources, including fossil fuels, with regard to future supply and the impact on the environment.

CO 3. List and describe the primary renewable energy resources and technologies.

CO 4. Understand effect of using these sources on the environment and climate.

CO 5. To quantify energy demands and make comparisons among energy uses, resources, and technologies

CO-PO/PSO Mapping

Course Outcomes	Program Outcomes (POs)/Program Specific Outcomes (PSOs)													
	PO 1	**PO 2**	**PO 3**	**PO4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO1**	**PSO 2**
CO1	**-**	**-**	**2**	**-**	**-**	**3**	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**2**
CO2	**-**	**-**	**3**	**-**	**-**	**2**	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**3**
CO3	**-**	**-**	**3**	**-**	**-**	**3**	**3**	**3**	**-**	**-**	**-**	**-**	**-**	**2**
CO4	**-**	**-**	**3**	**-**	**-**	**3**	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**3**
CO5	**-**	**-**	**3**	**-**	**-**	**2**	**3**	**3**	**-**	**-**	**-**	**-**	**-**	**2**
Average	**-**	**-**	**2.8**	**-**	**-**	**2.6**	**2.8**	**2.6**	**-**	**-**	**-**	**-**	**-**	**2.4**

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

AY: 2022-23 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech:IT III Year - I Sem			
Course Code: **L31OH**	(Open Elective-I) **Open Source Software's**	L	T	P	D
Credits: **3**		**3**	**0**	**0**	**0**

Unit I introduction to Open-Source:

Open Source, Need and Principles of OSS, Open-Source Standards, Requirements for Software, OSS success, Free Software, Examples, Licensing, Free Vs. Proprietary Software, Free Software Vs. Open-Source Software, Public Domain. History of free software, Proprietary Vs Open-Source Licensing Model, use of Open- Source Software, FOSS does not mean no cost. History: BSD, The Free Software Foundation and the GNU Project.

Unit II Open-Source Principles and Methodology:

Open-Source History, Open- Source Initiatives, Open Standards Principles, Methodologies, Philosophy, Software freedom, Open-Source Software Development, Licenses, Copyright vs. Copy left, Patents, Zero marginal cost, Income-generation Opportunities, Internationalization.

Unit III Understanding Open-Source Ecosystem:

Open-Source Operating Systems: GNU/Linux, Android, Free BSD, Open Solaris. Open-Source Hardware, Virtualization Technologies, Containerization Technologies: Docker, Development tools, IDEs, Debuggers, Programming languages, LAMP, Open-Source Database technologies.

Unit IV Open-Source Ethics and Social Impact:

Open source vs. closed source, Open-source Government, Ethics of Open-source, Social and Financial impacts of open-source technology, shared software, Shared source, Open Source as a Business Strategy

Unit V Case Studies:

Example Projects-Mozilla (Firefox), Wikipedia, GitHub, Open Office, LibreOffice.

Course Outcomes:

CO 1: Differentiate between Open Source and Proprietary software and Licensing.

CO 2: Recognize the applications, benefits and features of Open-Source Technologies

CO 3: Gain knowledge to start, manage open-source projects

AY: 2022-23 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech: ME III Year - I Sem			
Course Code: **L31OI**	**AUTOMOTIVE TECHNOLOGY** (Open Elective-I)	L	T	P	D
Credits: **3**		**3**	**0**	**0**	**0**

Pre-Requisites: Engineering Physics.

Module 1:

Unit-1: Structural Systems of Automobile– Chassis and Body, Power unit, Transmission System, Rear wheel drive, Front wheel drive, 4-wheel drive.

Unit-2: Other systems of Automobile- Ignition systems, Fuel System, Cooling System, Electrical System.

Module 2:

Unit-1: Fuels: Types of Fuels – Gasoline fuels, CNG, Biofuels, Hydrogen as a fuel for IC Engines, advantages and limitations.

Unit-2: Steering, Suspension and Braking Systems: Terminology in Steering geometry, Ackerman steering mechanism, Davis steering mechanism, steering linkages. Objects of suspension systems – Rigid axle suspension system. Mechanical brake system, Hydraulic brake system –Requirement of brake fluid. Pneumatic and Vacuum brakes.

Module 3:

Unit-1: Fuel Cell and Solar Vehicles: Fuel cell vehicle – Operating principle, types of fuel cells, fuel cell options for fuel cell vehicle and fuel cell hybrid vehicle. Solar vehicle - Solar photovoltaic cell, solar array, solar car electrical system and drive train.

Unit-2: Electric and Hybrid Vehicles: Electric vehicles - Layout of an electric vehicle, performance, energy consumption, advantage and limitations. Hybrid electric vehicles - Concepts, types of hybrid drive train architecture, merits and demerits.

Module 4:

Unit-1: Telematics Systems: Global positioning system, geographical information systems, navigation system.

Unit-2: Comfort Systems: Automotive vision system, active suspension system, power steering and power windows.

Module 5:

Unit-1: Safety Systems: Active and passive safety, airbags, seat belt tightening system, collision warning systems, anti-lock braking systems, traction control system.

Unit-2: Emission and noise control regulations- Pollution standards, National and international – Pollution Control – Techniques – Noise Pollution & control.

Text Books

1. William B Riddens, "Understanding Automotive Electronics", 5th edition, Butter worth Heinemann Woburn, 1998.
2. Mehrdad Ehsani, Yimin Gao, Sebastien E. Gay and Ali Emadi, "Modern

Electric, Hybrid Electric, and Fuel Cell Vehicles: Fundamentals, Theory and Design", CRC Press, 2005.
3. Kripal Singh, "Automobile Engineering", Standard Publishers, Vol. 1 & 2, 2007

Reference Books

1. Automotive Hand Book" Robert Bosch, SAE, 5th edition, 2000.
2. Ljubo Vlacic, Michel Parent and Fumio Harashima, "Intelligent Vehicle Technologies", Butterworth-Heinemann publications, Oxford, 2001.
3. Iqbal Husain, "Electric and Hybrid Vehicles: Design Fundamentals, CRC Press, 2003.
4. "Navigation and Intelligent Transportation Systems – Progress in Technology", Ronald K Jurgen, Automotive Electronics Series, SAE, USA, 1998.

E-Resources

1. https://rb.gy/zm8le8
2. https://rb.gy/ceck4k
3. https://nptel.ac.in/courses/107/106/107106088/
4. https://nptel.ac.in/courses/108/102/108102121/

Course Outcomes

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

CO1: Outline the overview of automobile engineering

CO2: Identify the different fuels and control systems

CO3: Develop the concepts and drive train configurations of electric and hybrid-electric vehicles

CO4: Apply the use of intelligent vehicle technologies like navigation in automobiles

CO5: Aware of safety, security and regulations

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	3	-	3	3	3	-	-	-	-	-	-	2	3	3
CO2	3	-	3	3	3	-	-	-	-	-	-	2	3	3
CO3	3	-	3	3	3	-	-	-	-	-	-	2	3	3
CO4	3	-	3	3	3	-	-	-	-	-	-	2	3	3
CO5	3	-	3	3	3	-	-	-	-	-	-	2	3	3
Average	3	-	3	3	3	-	-	-	-	-	-	2	3	3

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

AY: 2022-23 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech -MIE III Year-I Sem			
Course Code: **L31OJ**	**INTRODUCTION TO MINING TECHNOLOGY (OPEN ELECTIVE – I)**	L	T	P	D
Credits: **3**		**3**	**0**	**0**	**0**

Pre-Requisites: Nil

Course Objectives

This course will enable students to:

1. To introduce about distribution of mineral deposits in India
2. To acquaint with different stages of mining process
3. To get idea about Drilling and its machinery
4. To get idea about Explosives and blasting in mines
5. To know about shaft sinking methods, precaution & lining during shaft sinking

Module 1

Introduction: Distribution of mineral deposits in India and other countries, mining contributions to civilization, mining terminology.

Module 2

Stages in the life of the mine - prospecting, exploration, development, exploitation, and reclamation. Access to mineral deposit- selection, location, size, and shape (incline, shaft and Adit), brief overview of underground and surface mining methods.

Module 3

Drilling: Types of drills, drilling methods, electric, pneumatic, and hydraulic drills, drill steels and bits, drilling rigs, and jumbos.

Module 4

Explosives: Classification, composition, properties and tests, fuses, detonators, blasting devices and accessories, substitutes for explosives, handling and storage, transportation of explosives.; Rock blasting: Mechanism of rock blasting, blasting procedure, and pattern of shot holes.

Module 5

Shaft sinking: Ordinary and special methods, problems, and precautions, shaft supports and lining.

Textbooks

1. R. P. Pal, Rock blasting effect and operation, A. A. Balkema, 1st Ed, 2005.
2. D. J. Deshmukh, Elements of mining technology, Vol. 1, Central techno, 7th Ed, 2001.

Reference Books

1. C. P. Chugh, Drilling technology handbook, Oxford and IBH, 1st Ed, 1977.
2. R. D. Singh, Principles and practices of modern coal mining, New age international, 1st Ed, 1997.

Course Outcomes

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

CO1: Learn about distribution of mineral deposits in India
CO2: Learn about stages on mining process
CO3: Learn about drilling and its machinery
CO4: Understand about explosives, blasting and blasting mechanism
CO5: Understand about shaft sinking methods, precautions, and lining of shafts

AY: 2022-23 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech -**MBA** III Year-I Sem			
Course Code: **L31OK**	Open Elective-I **Entrepreneurship for Micro, Small and Medium Enterprises**	L	T	P	D
Credits: **3**		**3**	**0**	**0**	**0**

Course Objective:

To understand the setting up and management of MSMEs and initiatives of Government and other institutions support for growth and development of MSMEs.

UNIT-I:

Introduction for Small and Medium Entrepreneurship (SME): Concept & Definition, Role of Business in the modern Indian Economy SMEs in India, Employment and export opportunities in MSMEs. Issues and challenges of MSMEs

UNIT-II:

Setting of SMEs': Identifying the Business opportunity, Business opportunities in various sectors, formalities for setting up an enterprise - Location of Enterprise – steps in setting up an enterprise – Environmental aspects in setting up, Incentives and subsidies, Rural entrepreneurship – Women entrepreneurship.

UNIT-III:

Institutions supporting MSMEs: –Forms of Financial support, Long term and Short term financial support, Sources of Financial support, Development Financial Institutions, Investment Institutions, Central level institutions, State level institutions, Other agencies, Commercial Bank – Appraisal of Bank for loans. Institutional aids for entrepreneurship development – Role of DST, SIDCO, NSIC, IRCI, NIDC, SIDBI, SISI, SIPCOT, Entrepreneurial guidance bureaus

UNIT-IV:

Management of MSME: Management of Product Line; Communication with clients - Credit Monitoring System - Management of NPAs - Restructuring, Revival and Rehabilitation of MSME, Problems of entrepreneurs – sickness in SMI – Reasons and remedies –– Evaluating entrepreneurial performance.

UNIT-V:

Role of Government in promoting Entrepreneurship: MSME policy in India, Agencies for Policy Formulation and Implementation: District Industries Centers (DIC), Small Industries Service Institute (SISI), Entrepreneurship Development Institute of India (EDII), National Institute of Entrepreneurship & Small Business Development (NIESBUD), National Entrepreneurship Development Board (NEDB).

Course Outcomes: Students will be able to understand

a) Issues and Challenges in MSMEs

b) Setting up of MSMEs

c) Management of MSMEs
d) Institution and Government support.

Suggested Readings:

1. Vasant Desai, Small Scale Industries and Entrepreneurship, Himalaya Publishing House, 2003.
2. Poornima M Charanthimath, Entrepreneurship Development Small Business Enterprises, Pearson, 2006.
3. Paul Burns & Jim Dew Hunt, Small Business Entrepreneurship, Palgrave Macmillan publishers, 2010.
4. Suman Kalyan Chaudhury, Micro Small and Medium Enterprises in India Hardcover, Raj Publications, 2013.
5. Aneet Monika Agarwal, Small and medium enterprises in transitional economies", challenges and opportunities, DEEP and DEEP Publications.

AY: 2022-23 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech SH III Year-I Sem			
Course Code: **L31OL**	**Open Elective-I Numerical Solution of Ordinary Differential Equations**	L	T	P	D
Credits: **3**		**3**	**0**	**0**	**0**

Pre-Requisites:

Module –I Solution of Equations and Eigen value Problems [10L]

Solution of algebraic and transcendental equations - Fixed point iteration method – Newton Raphson method- Solution of linear system of equations - Gauss elimination method – Pivoting - Gauss Jordan method – Iterative methods of Gauss Jacobi and Gauss Seidel - Matrix Inversion by Gauss Jordan method - Eigen values of a matrix by Power method.

Module 2: Interpolation and Approximation [9L]

Interpolation with unequal intervals - Lagrange's interpolation – Newton's divided difference interpolation – Cubic Splines - Interpolation with equal intervals - Newton's forward and backward difference formulae.

Module 3: Numerical Differentiation and Integration [10L]

Approximation of derivatives using interpolation polynomials - Numerical integration using Trapezoidal, Simpson's 1/3 rule – Romberg's method - Two point and three point Gaussian quadrature formulae Evaluation of double integrals by Trapezoidal and Simpson's 1/3 rules.

Module 4: Initial Value Problems for Ordinary Differential Equations[10L]

Single Step methods - Taylor's series method - Euler's method - Modified Euler's method - Fourth order Runge-Kutta method for solving first order equations - Multi step methods - Milne's and AdamsBash forth predictor corrector methods for solving first order equations**.**

Module5: Boundary Value Problems in Ordinary Differential Equations[9L]

Finite difference methods for solving two-point linear boundary value problems - Finite difference techniques for the solution of two-dimensional Laplace's and Poisson's equations on rectangular domain – One dimensional heat flow equation by explicit and implicit (Crank Nicholson) methods – One dimensional wave equation by explicit method**.**

Text Books

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 2015
2. Chapra. S.C., and Canale.R.P., "Numerical Methods for Engineers, Tata McGraw Hill, 5 th Edition, New Delhi, 2007.

Reference Books

1. R.K.Jain & S.R.K. Iyengar, Advanced Engineering Mathematics, Narosa Publications, 5th Edition, 2015.
2. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi,11thReprint, 2010.

E-Resources

1. http://www.brainkart.com/article/Solution-of-Equations-and-Eigenvalue-Problems_6462/
2. http://www.cs.nthu.edu.tw/~cchen/CS3331/ch6.pdf
3. http://www.vbspu.ac.in/wp-content/uploads/2016/02/Differentiation-and-Integration.pdf
4. https://link.springer.com/chapter/10.1007/978-1-4612-6390-6_4
5. https://www.youtube.com/watch?v=ZaaeInBsRfo

Course Outcomes

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

CO1. Understand the basic knowledge on solution of Eigen values

CO2. Use interpolation and approximation to solve engineering problems.

CO3. Discuss the numerical differentiation and integration.

CO4. Apply initial value problems for solving first order differential equation.

CO5. Apply the boundary value problems in ordinary and partial differential equations

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	3	3	2	3	-	-	-	-	-	-	-	2	-	-
CO2	3	3	2	3	-	-	-	-	-	-	-	2	-	-
CO3	3	3	2	3	-	-	-	-	-	-	-	2	-	-
CO4	3	3	2	3	-	-	-	-	-	-	-	2	-	-
CO5	3	3	2	3	-	-	-	-	-	-	-	2	-	-
Average	3	3	2	3	-	-	-	-	-	-	-	2	-	-

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

AY: 2022-23 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech -SH III Year- I Sem			
Course Code: **L31OM**	**NANOMATERIALS (Open Elective-I)**	L	T	P	D
Credits: **3**	**(**COMMON TO: All branches**)**	**3**	**0**	**0**	**0**

Pre-Requisites: Fundamentals of Physics.

Module -1: Introduction to Nanomaterials [9L]

Introduction to nanotechnology and materials, Nano materials, Introduction to nano sizes and properties comparison with the bulk materials, Different Shapes and Sizes and Morphology. Classification of nanomaterials. Fullerene, carbon, Nanotubes (CNT's), Nanoparticles. Physical, Chemical, Electrical, Optical, Magnetic and mechanical properties of nanomaterials.

Module -2: Physical and Chemical methods [9L]

Physical Methods:

Bottom-up approach and Top-down approach, Inert gas condensation, Arc Discharge, lasers ablation, laser pyrolysis, ball milling, and electro deposition.

Chemical Methods: Nanocrystals by chemical reduction, photochemical synthesis, electrochemical synthesis, Nano crystals of semiconductors.

Module–3: Synthesis of Nanomaterials [9L]

Thermolysis route – spray pyrolysis and solved metal atom dispersion, sol-gel method solvothermal and hydrothermal routes, solution combustion synthesis, CVD method, PVD method.

Module–4: Properties of Nanomaterials [9L]

Quantum Structure: 3D-Pontential Wells (Spherical & Rectangular Parallelepiped), 2D (Circular & Square, Quantum Corrals), 1D (Quantum Wires), 0D (Quantum Dots).

Module–5: X-RAY Characterization techniques [9L]

X-Ray Photoelectron Spectroscopy (XPS), Energy Dispersive X-Ray Analysis (EDAX), Principles and applications of X-Ray Diffraction, Electron Diffraction, and Electron probe microanalysis(EPMA), SEM and TEM method.

Text Books

1.C N R Rao, A Muller and A K Cheetham "The chemistry of Nano materials: Synthesis,
Properties and Applications" John Wiley, First Edition, 2004

2. Hari Singh Nalwa, "Nano structured Materials and Nanotechnology", Academic Press, First Edition, 2002.

Reference Books

1.Charles P Poole Jr "Introduction to Nanotechnology", John Willey & Sons, 1st Edition, 2003

2.C Dupas, P Houdy, M Lahmani, Nanoscience: "Nanotechnologies and Nano physics", Springer-Verlag Berlin Heidelberg, 1st Edition, 2007.

E-Resources

1. http://nptel.ac.in/courses/103103033/module9/lecture1.pdf
2.http://courses.washington.edu/overney/NME498_Material/NME498_Periods/Lect ure4-Overney- NP-Synthesis.pdf.
3. http://www.materialstoday.com/nanomaterials/journals/
4. https://www.journals.elsevier.com/nanoimpact
5. http://www.springer.com/materials/nanotechnology/journal/12274

Course Outcomes

After completion of this course the student is able to
1. Understand the properties of Nano-structured materials.
2. Get the knowledge of different physical and chemical methods of synthesis of Nano materials.
3. Apply basic knowledge on the properties and applications of few nanomaterials.
4.Understand different thermal methods of synthesis of nano materials and to learn different surface characterization techniques.
5.Acquire the different compositional and structural characterization techniques.

AY: 2022-23 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech -SH III Year-I Sem			
Course Code: **L31ON**	**Chemistry of Engineering Materials (Open Elective-I)**	L	T	P	D
Credits: **3**		**3**	**0**	**0**	**0**

Pre-Requisites: Nil

Module 1: Phase Rule and alloys [8L]

Phase Rule: Definition of terms: Phase, component, degree of freedom, phase rule equation. Phase diagrams-one component system-water system. Two component system Lead-Silver, cooling curves, heat treatment based on iron-carbon phase diagram - hardening, annealing and normalization. Introduction to alloys-fabrication of alloys-ferrous alloys-nonferrous alloys-industrial applications.

Module 2: Composites, Abrasives and Adhesives [10L]

Composites: Basics of composites, composition and characteristics-types of composites –particle and fiber reinforced composites and their applications. Abrasives- natural and artificial abrasives-grinding wheels-abrasive paper and cloth. Adhesives- classification -action of adhesives- factors influencing adhesive action development of adhesive strength.

Module 3: Cement and Concrete: [10L]

Introduction-Classification of cement-natural-chemical composition of cement-Portland cement-chemical reactions involved in setting and hardening of cement-additives for cement-mortars and concretes-pre stressed concrete-post tensioning-curing-overall scenario of cement industry-Reinforced concrete, constructions-testing and decaying of cement-prevention of cement decay.

Module 4: Glass, Ceramics and Refractories:[9L]

Structure of glass-properties-Manufacturing of glass-Types of glasses-uses Ceramics-clays-methods for fabrication of ceramic ware plasticity of clays. Ceramic products-glazes. Porcelain and vitreous enamels. Requisites of a good refractory-classification, properties and applications of refractories.

Module 5: Colloids and surfactants[9L]

Introduction to solution-types of colloids-characteristics of lyophilic and lyophobic solutions-preparation of colloids (Dispersion methods & Aggregation methods)-purification of colloids (Dialysis, Electro dialysis and Ultrafiltration).Characteristics of colloidal solutions-coagulation of colloids-origin of charge on colloids-protective colloids-emulsions-gels-applications of colloids. Introduction to surfactants-classification of surfactants-CMC (critical micelle concentration)-HLB scale-detergents-cleaning action.

Text Books

1. "A text Book of Engineering Chemistry", P.C.Jain and Monica Jain, Dhanpat Rai Publications, New Delhi, 12th Edition 2006.
2. "Text Book of Engineering chemistry", B.Rama Devi, Ch.VenkataRamana

Reddy and PrasanthaRath, Cengage Learning India Pvt. Ltd, 2016.

3. "Colloids and Interfaces with Surfactants and Polymers", J. Goodwin, 2nd Edition 2009.

Reference Books

1. "Principles of Physical Chemistry", B.R.Puri, L.R.Sharmaand M.S.Pathania, S.Nagin Chand &Co., New Delhi, 23rd Edition, 1993.
2. "Engineering Chemistry", M.ThirumalaChary and E.Laxminarayana, SciTech publications(INDIA) PVT Ltd, Third Edition,2016

E-Resources

1. https://www.acs.org/content/acs/en/careers/college-to-career/chemistry-careers/materials-science.html
2. https://www.sciencedirect.com/science/article/pii/S1369702110701875
3. https://engineering.purdue.edu/MSE/aboutus/whatsmaterials
4. https://www.engineergirl.org/32721/Difference-between-chemical-and-materials-engineering
5. https://www.webpages.uidaho.edu/catalog/2013/chemical-and-materials-engineering.htm

Course Outcomes

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

1. Interpret the vitality of phase rule in metallurgy and application of phase rule to one and two component systems.
2. Understand the concepts of abrasives, adhesives and liquid.
3. Know the importance of basic constructional material, Portland cement in Civil Engineering works.
4. Acquire the knowledge about properties and applications of glass, ceramics and refractories.
5. Understand the relationships between macroscopic material properties and microscopic structures.

AY 2022-23 onwards	J. B. INSTITUTE OF ENGINEERING AND TECHNOLOGY (UGC Autonomous)	B. Tech -SH III Year – I Sem			
Course Code: **L31OO**	**TECHNICAL WRITING SKILLS (COMMON TO ALL)**	**L**	**T**	**P**	**D**
Credits: 3		**3**	**0**	**0**	**0**

Pre-Requisites: Nil

Course Objectives: To learn

1. Know the elements of effective writing
2. Understand the letter writing and resume writing
3. Classify the types and styles of report writing
4. Understand the proposal writings
5. Examine the research papers and research articles

Module-I Elements of Effective Writing

Introduction-Characteristics of Good Writing-words, phrases, sentences and developing effective paragraphs.

Module -II Academic Writing

Letter writing and Job Application: Introduction-types of letter writing-the seven C's of letter writing- significance- purpose-structure-layout-principles-planning a letter and cover letter.

Resume writing: Introduction-Resume design- parts of a Resume-Resume Styles and final tips.

Module -III Technical Report Writing

Introduction-importance of Reports-Objectives of Reports-Categories of Reports-Formats-prewriting-structures of reports-types of reports- short reports- long reports-research and writing the report-first draft-revising, editing, and proofreading.

Module -IV Technical Proposals

Introduction-definition and purpose-types-characteristics-structure of proposals-style and appearance-evaluation of proposals.

Module -V Writing Research Papers and Articles

Introduction-writing strategies-nature and significance-types of research papers and articles-journal articles-conference papers-review and research articles and elements of articles.

References:

1. Raman, Meenakshi and Sangeeta Sharma. Technical Communication-Principles and Practice. Third Edition, New Delhi: UP., 2015.
2. Rizvi, M Ashraf. Effective Technical-Communication. New Delhi: Tata McGraw-Hill., 2005.
3. Butterfield, Jeff. Soft Skills for Everyone. Delhi: Cenege., 2010.
4. Cooper, Donald R. Pamela S Schindler. Business Research Methods. New Delhi: Tata McGraw-Hill, 2006.

Web Sources:

Course outcomes: At the end of this course students will be able to

1. Use the characteristics of good writing like words, phrases, sentences and paragraphs.
2. Understand the role of letters and resumes getting jobs.
3. Utilize the report writing skills in business environment
4. Define the style, appearance, and evaluation of proposals.
5. Write the academic and research papers and articles

CO-Articulation Matrix														
CO-PO/PSO Mapping Chart **3/2/1 indicates the strength of the calculation** **3-Strong, 2-Medium, 1-Low**														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes***	
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	..	..	..	..	..	..	..	..	**2**	3	..	3	..	..
CO2	..	..	..	..	..	..	..	..	**2**	3	..	3	..	..
CO3	..	..	..	..	..	..	..	..	**2**	3	..	3	..	..
CO4	..	..	..	..	..	..	..	..	**2**	3	..	3	..	..
CO5	..	..	..	..	..	..	..	..	2	3	..	3	..	..
Total	..	..	..	..	..	..	..	..	**2**	**3**	..	3	..	..
The above syllabus is approved														
Signature of the members:														

AY: 2022-23 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech -SH III Year-II Sem			
Course Code: **L31OP**	**Indian Constitution** (COMMON TO: All branches)	L	T	P	D
Credits: **3**		**3**	**0**	**0**	**0**

Pre-Requisites: Nil

Module 1: Evolution of the Indian Constitution

1909 Act, 1919 Act end 1935 Act. Constituent Assemtily Composition and Functions Fundamentals features of the Indian Constitution.

Module 2: Union Government

Executive: President. Prime Minister, Council of Minister

Executive: Governor, Chief Minister, Council of Minister

Local Government: Panchayat Raj Institutions, Urban Government.

Module 3: Rights and Duties

Fundamental Rights. Directive principles. Fundamental Duties.

Module 4: Relation between Federal and provincial units

Union State relations. Administrative, legislative and Financial. Inter State council. NITI Ayog Finance Commission of India

Module 5: Statutory Institutions.

Elections-Election Commission of India, National Human Rights Commission National Commission for Women.

Text Books:

1 D.D. Basu, Introduction to the constitution of India. Lexis Nexis. Now Delhi

2. Subhash Kashyap, Our Parliament, National Book Trust. New Delhi.

Reference Books:

1. Peu Ghosh Indian Government & Polities. Prentice Hell of India, New Delhi

2 B.Z. Fadia & Kuldeep Fadia, Indian Government & Polices, LexisNexis. New Delhi

Course Outcomes:

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

COI: Know the background of the present constitution of India.

CO2: Understand the working of the union, state and local levels.

CO3. Gain consciousness on the fundamental rights and duties

CO4. Be able to understand the functioning and distribution of financial resources between center and states.

Be exposed to the realty of hierarchical Indian social structure and the way the grievances the deprived sections can be addressed to raise human dignity in a democratic way

OPEN ELECTIVE-II

AY: 2022-23 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech CE III Year-II Sem			
Course Code: **L32OA**	**CONSTRUCTION MANAGEMENT, CONTRACTS AND VALUATION (OE-II)**	L	T	P	D
Credits: 3		**3**	**1**	**0**	**0**

Pre-Requisites: Construction Technology and Project Management, Estimation and Costing.

Module 1: Unit-I: Concept of a Project

Characteristic features – Project Life cycle – Phases – Project Management – tools and techniques for project management – role of project managers.

Module 2: Unit-I: Project management plan and objectives

Programming – scheduling – project organization – organization and project team – role of communication 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 University Press, 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 edition Jan 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: 2022-23 Onwards	J. B. INSTITUTE OF ENGINEERING AND TECHNOLOGY (UGC Autonomous)	B. Tech-CSE III Year- II Sem			
Course Code: **L32OB**	**Principles of Operating Systems (Open Elective -II)**	L	T	P	D
Credits: **3**		**3**	**0**	**0**	**0**

Pre-Requisites:

Knowledge on Programming for Problem Solving

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 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 computer system.

Module 1:

Overview: Basic Elements, Evolution of the Microprocessor, Instruction Execution, Interrupts, Cache Memory, Direct Access Memory.

System Structures: Computer Systems Organization, Computer System Architecture, Operating System Architecture, Systems Calls, Operating System structure, Building and Booting an Operating System.

Module 2:

Process Concepts: Introduction, Process Scheduling, Scheduling Criteria, Scheduling Algorithms, Critical-Section Problem, Peterson's Solution, Synchronization Hardware, Semaphores, Mutex Locks, Semaphores, Monitors, Classic Problems of Synchronization.

Deadlock: Deadlock Characterization, Deadlock Prevention, Detection and Avoidance, Recovery from Deadlock.

Module 3:

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:

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

File system Management: File Concepts, File System Structure, File System Operations, Directory Implementation, Allocation Methods, Free-Space Management.

Module 5:

Security Threats: Computer security concepts, Threats, Attacks and Assets, Intruders, Malicious software, Viruses, Worms, Bots, Rootkits.

Security Techniques: Authentication, Access Control, Intrusion Detection, Malware Defense, Dealing with Buffer Overflow attacks.

Textbooks

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, 7th Edition, 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://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/
5. http://ocw.mit.edu/index.htm.

Course Outcomes

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

CO1: Identify the different structures and functions of operating systems and it's components.

CO2: Apply different algorithms and methods to achieve concurrency among the operating system programs.

CO3: Analyse the memory management techniques used in the execution of operating system programs.

CO4: Implement the suitable methods to improve the efficiency of storage management devices.

CO5: Apply suitable algorithms to ensure the security of computer system.

AY 2022-23 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech: AI&ML III Year / II Sem			
Course Code: **L320C**	**INTRODUCTION TO PREDICTIVE ANALYTICS (Open Elective II)**	**L**	**T**	**P**	**D**
Credits: 3		**3**	**0**	**0**	**0**

Pre-Requisites:

Data mining, Machine Learning

Course objectives:

The student will:

1. Know the basics of predictive analytics and summarize Data, Categorize Models, and techniques
2. Know about the Decision tree, Support Vector Machine for Data Classification
3. Describe Methods such as Naïve Bayes Markov Model, Linear Regression, Neural Networks to Boost Prediction Accuracy for Data Classification.
4. Study the predictive models for various Real-Time Applications.
5. Study the Analysis and Visualized predictive Model's results using Data Visualization tools.

Module 1:

INTRODUCTION TO PREDICTIVE ANLAYTICS

Introduction – Predictive Analytics in the Wild – Exploring Data types and associated Techniques - Complexities of data - Applying Models: Models and simulation, Categorizing Models, Describing, summarizing data, and decisions – Identify similarities in Data: Data Clustering, converting Raw Data into a Matrix, Identify K-groups in Data.

Module 2:

DATA CLASSIFICATION – PART I

Background – Exploring Data classification process - Using Data Classification to predict the future: Decision tree, Algorithm for generating Decision Trees, Support Vector Machine.

Module 3:

DATA CLASSIFICATION – PART II

Ensemble Methods to Boost Prediction Accuracy: Naïve Bayes Classification Algorithm, The Markov Model, Linear Regression, Neural Networks – Deep learning.

Module 4:

DATA PREPARATION AND MODELLING

Adopt predictive analytics - Processing data: identifying, cleaning, generating, reducing dimensionality of data – Structuring Data – Build predictive model: develop and test the model.

Module 5:

FORECASTING AND TIME SERIES ANALYSIS

Forecasting- Time Series Analysis-Additive & Multiplicative models- Exponential smoothing techniques - Forecasting Accuracy - Auto-regressive and moving average models.

Text Books:

1. Anasse Bari, Mohamed Chaouchi, Tommy Jung, "Predictive Analytics For Dummies", Wiley Publisher, 2nd Edition, 2016.

Reference Books:

1. Bertt Lantz, Machine Learning with R: Expert techniques for predictive modeling to solve all your data analysis problems, Pack Publisher, 2nd Edition, 2015.
2. Aurelien,"Hands-On Machine Learning with Scikit-Learn & TensorFlow", O'Reilly Publisher, 5th Edition, 2017.
3. Max Kuhn, Kjell Johnson, " Applied Predictive Modeling" Springer, 2013.

E - Resources:

1. https://vuquangnguyen2016.files.wordpress.com/2018/03/applied-predictive-modeling-max-kuhn-kjell-johnson_1518.pdf
2. https://www.researchgate.net/publication/329873035_Prediction_Modeling_Methodology
3. https://www.coursera.org/learn/predictive-modeling-analytics
4. https://www.edx.org/course/predictive-analytics

Course Outcomes:

The student will be able to:

1. Identify the basics of predictive analytics and summarize Data, Categorize Models, and techniques
2. Apply Decision tree, Support Vector Machine for Data Classification
3. Apply Methods such as Naïve Bayes Markov Model, Linear Regression, Neural Networks to Boost Prediction Accuracy for Data Classification.
4. Construct predictive models for various Real-Time Applications.
5. Analyze and Visualize predictive Model's results using Data Visualization tools

AY 2022-23 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech: AI&DS III Year – II Sem			
Course Code: **L320D**	**OPEN ELECTIVE – II BUSINESS DATA ANALYTICS**	**L**	**T**	**P**	**D**
Credits: 3		**3**	**0**	**0**	**0**

Course Objective:

This course enables the students to have a formal introduction to Business Analytics and Fundamentals of R Programming

MODULE 1: **Introduction Business Analytics**

Unit 1:

Introduction to Business Analytics -Competing on Analytics - The New Science of Winning Business Analytics.

Unit 2:

Introduction to Market, Trends and People- The Paradigm Shift from Data to Insight and from Business.

MODULE 2: **Intelligence to Business Analytics**

Unit 1:

Intelligence to Business Analytics- Descriptive, Predictive and Prescriptive Analytics - Introduction to R programs-Running R programs.

Unit 2:

Mastering Fundamental R concepts -How to diagnose and correct syntax errors-

MODULE 3: **Data Sets &Variables**

Unit 1:

Getting familiar with R data sets- Creating R data sets- Reading data files into R - Excel, .txt, SPSS, SAS.

Unit 2:

Html-Assigning variable attributes Changing variable attributes,

MODULE 4: **Data Visualization**

Unit 1: Pixel-Oriented Visualization Techniques, Geometric Projection Visualization Techniques. Icon-Based Visualization Techniques, Hierarchical Visualization Techniques.

Unit 2: Visualizing Complex Data and Relations, Charts, Plots, Maps, Diagrams and Matrices

MODULE 5: **Visualization Patterns Unit 1:**

Visualize Patterns over Time- Visualizing Relationship- Spotting Differences- Visualizing Spatial Relationships.

Unit 2:

Data Visualization Using R, Tools, Ggplot2, Bar chart, Pie Chart, Tableau, Plotly, Histogram, Box Plot, Scatter Plot, Heat Map.

Text Books

1. Essentials of Business Analytics: Camm, Cochran, others, Cengage Learning,2016

2. R for Dummies: Andrie De Varies and Joris Mays: Wiley,2016
3. Introductory Statistics with R: Peter Dalgaard, Spr

Course Outcomes:

1. Identify the source of a quantifiable problem, recognize the issues involved and produce an appropriate action plan.
2. Translate a problem into a statistical model
3. Gather Data and Employ R Programming software to fit model to data and solve problem
4. Calculate and interpret numerous statistical values and appreciate their value to the business Manager

AY: 2022-23 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech ECE III Year-II Sem			
Course Code: **L32OE**	**Basics of IC Technology** (Open Elective)	L	T	P	D
Credits: 3		**3**	**0**	**0**	**0**

Pre-Requisites: NIL

Module 1: INTRODUCTION TO IC TECHNOLOGIES [10L]

Unit-I: [6L]

Fabrication steps for BJT Transistor, Fabrication steps for MOSFET Transistor, Comparison between BJT and MOSFET fabrication.

Unit-II: [4L]

Semiconductor Substrate-Crystal defects, Electronic Grade Silicon, Czochralski Growth, Float Zone Growth

Module 2: Wafer Preparation & Epitaxy [9L]

Unit-I: [5L]

Wafer Preparation-Silicon Shaping, Etching and Polishing, Chemical cleaning.

Unit-II: [4L]

Epitaxy. Defects in Epitaxial growth, Liquid phase Epitaxy, Vapor Phase Epitaxy and Molecular Beam Epitaxy.

Module 3: Oxidation and Diffusion [8L]

Unit-I: [4L]

Oxidation and Kinetics of oxide growth, Deal-Grove Model of oxidation, Linear, and Parabolic Rate coefficient.

Unit-II: [4L]

Diffusuion- Ficks First law and Second law of Diffusion.

Module 4: Ion Implantation and Chemical Vapour Deposition [10L]

Unit-I: [5L]

Diffusion Vs Ion Implantation, Ion Implantation system

Unit-II: [5L]

CVD for deposition of dielectric and polysilicon- a simple CVD system, Chemical equilibrium and the law of mass action

Module 5: Pattern Transfer and Etching[9L]

Unit-I: [5L]

Lithography and types. Step by step process of Photo Lithography, photo resist, Figures of Merit.

Unit-II: [5L]

Wet etching, Plasma etching, Reaction ion etching.

Text Books

1. S.M. SZE "VLSI Technology" 2nd edition
2. Plummer Deal griffin, "Silicon VLSI Technology" Pearson Publication

Reference Books

1. VLSI Design by Sujata Pandey.
2. J. Bhasker "VHDL for Beginner" Pearson

E-Resources

1. NPTEL-VLSI Design by Dr. Nandita Das Gupta, IIT Madras

Course Outcomes

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

CO1. Familiarize with IC fabrication steps.

CO2. Examine Wafer Preparation and Epitaxies.

CO3. Analyse oxidation and Diffusion Techniques.

CO4. Explain Ion Implantation and Chemical Vapour Deposition

CO5. Assess Photolithography and Etching process.

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	3	3		-	-	-	-	-	-	-	-	-	3	-
CO2	3	2		-	-	-	-	-	-	-	-	-	3	-
CO3	3	1		-	-	-	-	-	-	-	-	-	3	-
CO4	3	3		-	-	-	-	-	-	-	-	-	3	-
CO5	3	2		-	-	-	-	-	-	-	-	-	3	-
Average	**3**	**2.2**		**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**

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

AY: 2022-23 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech ECM III Year-II Sem			
Course Code: **L32OF**	**INTRODUCTION TO MICROPROCESSORS AND MICRO CONTROLLERS** **(Open Elective -II)**	L	T	P	D
Credits: **3**		**3**	**0**	**0**	**0**

Pre-Requisites: Basic of ICs

Course Objectives:

Students will learn to:

1. Study the Architecture of 8085&8086 microprocessor
2. Learn the design aspects of I/O and Memory Interfacing circuits.
3. Study the Architecture of 8051 microcontroller

Module 1

Unit-I: 8086 Introduction

8086 Architecture Functional diagrams, Register organization, memory segmentation, programming model, memory addresses, physical memory organization

Unit-II: 8086 Architecture

Architecture of 8086, signal descriptions of 8086-common function signals, Timing diagrams, interrupts of 8086.

Module 2

Unit-I: Instruction set of 8086

Instruction formats, addressing modes, instruction set, assembler directives, macros.

Unit-II: Assembly language programming of 8086

Simple programs involving logical, branch and call instructions, sorting, evaluating arithmetic expressions, string manipulations.

Module 3

Unit-I: I/O Interface

8255 PPI, Various modes of operation and interfacing to 8086, interfacing keyboard, Display, D/A and A/D converter.

Unit-II: Interfacing with advanced devices

Memory Interfacing to 8086, Interrupt Structure of 8086, Vector Interrupt Table, Interrupt Service Routine.

Module 4

Unit-I: Introduction to Microcontrollers

Overview of 8051 microcontrollers, architecture, I/O ports, memory organization.

Unit-II: Addressing Modes

Addressing modes and instruction set of 8051, simple programs.

Module 5:

Unit-I: 8051 Real Time control 1

Programming Time Interrupts, Programming External Hardware Interrupts.

Unit-II: 8051 Real Time control 2

Programming the serial communication interrupts, programming 8051 Timers and counters

Text Books

1. D.V.Hall, Microprocessors and interfacing, TMGH,2nd Edition 2006.
2. Kenneth.J.Ayala, The8051Microcontroler,3rdEd., C engage Learning

Reference Books

1. Advanced Microprocessors and peripherals-A.K.Ray and K.M Bhurchandani, TMH,2 nd Edition 2006.
2. The 8051 Microcontrollers. Architecture and programming and applications-K.Uma Rao, Andhe Pallavi, Pearson, 2009.
3. Micro computer system 8086/8088 family architecture. Programming and design-Du and GA Gibson, PHI 2nd Edition.

E-Resources

1. https://nptel.ac.in/courses/106/108/106108100/
2. https://www.youtube.com/watch?v=o6W0opScrKY&list=PLuv3GM6-gsE01L9yDO0e5UhQapkCPGnY3
3. https://www.youtube.com/watch?v=liRPtvj7bFU&list=PL0E131A78ABFBFDD0

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

CO1. Design programs on 8085 microprocessors
CO2. Implement programs on 8086 microprocessors.
CO3. Design interfacing circuits with 8086.
CO4. Design and implement 8051 microcontroller-based systems.
CO5. Understand the concepts related to I/O and memory interfacing.

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	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	2	2	-	1	-	-	-	-	-	-	-	-	-	-
CO3	2	-	2	2	-	-	-	-	-	1	1	-	-	2
CO4	2	-		2	-	-	-	-	-	-	-	-	-	-
CO5	2	-	2	1	-	-	-	-	-	-	-	-	-	-
Average	**2**	**2**	**2**	**1.5**	**-**	**-**	**-**	**-**	**-**	**1**	**1**	**-**	**-**	**2**

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

AY: 2022-23 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech EEE III Year-II Sem			
Course Code: **L32OG**	**HYBRID ELECTRIC VEHICLES (Open Elective-II)**	L	T	P	D
Credits: **3**		**3**	**0**	**0**	**0**

Pre-Requisites:

Module 1: History of hybrid and electric vehicles [12L]

History of hybrid and electric vehicles – social and environmental importance of hybrid and electric vehicles – impact of modern drive-trains on energy supplies – Basics of vehicle performance, vehicle power source characterization transmission characteristics – Mathematical models to describe vehicle performance.

Module 2: Hybrid traction [8L]

Basic concept of hybrid traction – Introduction to various hybrid drive train topologies – power flow control in hybrid drive – train Topologies-Fuel efficiency analysis.

Module 3: DC & AC Electrical Machines [14L]

Introduction to electric components used in hybrid and electric Vehicles-Configuration and control of DC motor Drives-Configuration and control of introduction motor drive configuration and control of permanent magnet motor drives configuration and control of switch reluctance- motor drives, drive system efficiency.

Module 4: Batteries [12L]

Matching the electric machine and the internal combustion engine (ICE) Sizing the propulsion motor, sizing the power electronics selection the energy storage technology – Communications, supporting subsystems.

Module 5: Energy management and their strategies [6L]

Introduction to energy management and their strategies used in hybrid and electric vehicle Classification of different energy management strategies comparison of different energy management strategies implementation issues of energy strategies.

Text Books

1. Iqbal Husain, "Electric and Hybrid Electric Vehicles", CRC Press, 2011..
2. Wei Liu, "Hybrid Electric Vehicle System Modeling and Control", Second Edition, WILEY,
3. Sira – Raminez ,R.SilvaOrtigoza, control Design techniques in power electronics Devices, Springer.
4. Siew – Chong tan, Yuk-Ming lai Chi Kong Tse, “Sliding mode control of switching power Converters”..

Reference Books

1. James Larminie and John Lowry, "Electric Vehicle Technology Explained", Second Edition 2012.
2. Christopher D Rahn, Chao-Yang Wang, "Battery Systems Engineering", Wiley, 2013.

E-Resources

1.https://nptel.ac.in/courses/108/103/108103009/
2. https://nptel.ac.in/courses/108/102/108102121/
3. https://nptel.ac.in/content/storage2/courses/108103009/download/M12.pdf
4. https://nptel.ac.in/content/storage2/courses/108103009/download/M1.pdf
5. https://nptel.ac.in/content/storage2/courses/108103009/download/M3.pdf

Course Outcomes

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

CO 1. Understand the working of different configurations of electric vehicles, hybrid vehicles and its components.

CO 2. ApplythebasicconceptsofbatteriesandMotorsinthedesignofElectricandHybrid Vehicles.

CO 3. Differentiate the modes of operation of Hybrid Vehicles.

CO 4. Analyze the performance of hybrid vehicles.

CO 5. Design the basic parameters of Electric and Hybrid Electric Vehicles.

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**	**-**	**-**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**3**	**2**
CO2	**3**	**2**	**3**	**2**	**-**	**-**	**2**	**-**	**-**	**-**	**-**	**2**	**2**	**2**
CO3	**3**	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**2**
CO4	**2**	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**3**
CO5	**2**	**3**	**3**	**-**	**-**	**-**	**-**	**2**	**-**	**-**	**-**	**-**	**2**	**2**
Average	**2.6**	**2.5**	**2.6**	**2**	**-**	**-**	**2**	**2**	**-**	**-**	**-**	**2**	**2.4**	**2.2**

AY: 2022-23 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech IT III Year-II Sem			
Course Code: **L32OH**	**Distributed Systems (Open Elective-II)**	L	T	P	D
Credits: **3**		**3**	**0**	**0**	**0**

Unit I: Characterization of Distributed Systems:

Introduction, Examples of distributed systems, Trends in distributed systems, Focus on resource sharing, Challenges

Un it II: System Models:

Introduction, Physical models, Architectural models, Fundamental models.

Unit III: Inter process Communication:

Introduction, The API for the Internet protocols, External data representation and marshalling, Multicast communication, Network virtualization: Overlay networks.

Unit IV: Remote Invocation:

Introduction, Request-reply protocols, Remote procedure call, Remote method invocation. Indirect Communication: Introduction, Group communication, Publish- subscribe systems, Message queues, Shared memory approaches.

Unit V: Distributed Objects and Components:

Introduction, Distributed objects, Case study: CORBA, From objects to components.

Text Book

1. Distributed System: Concepts and Design, Coulouris, Dollimore, Kindberg, 2006, Pearson Education.

Course Outcomes:

CO 1: Understand of the principles and foundations on which the Internet and other distributed systems are based.

CO 2: Apply different approaches for supporting distributed applications.

CO3: Analyze the role of middleware technologies in designing Distributed systems

CO 4: Analyze the sharing of data in distributed environment using various distributed algorithms

AY: 2022-23 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech: ME III Year - II Sem			
Course Code: **L32OI**	**FUNDAMENTALS OF OPERATIONS RESEARCH**	L	T	P	D
Credits: **3**	(Open Elective - II)	**3**	**0**	**0**	**0**

Pre-Requisites: Engineering Mathematics.

Module 1:

Unit 1: Introduction: Development – Definition– Characteristics and Phases – Types of models – Operations Research models – applications.

Unit 2: Allocation: Linear Programming Problem - Formulation – Graphical solution –Simplex method – Artificial variables techniques: Two–phase method, Big-M method; Duality Principle.

Module 2:

Unit 1: Transportation problem: Formulation – Optimal solution, unbalanced transportation problem – Degeneracy

Unit 2: Assignment problem: Formulation – Optimal solution - Variants of Assignment Problem; Traveling Salesman problem.

Module 3:

Unit 1: Sequencing: Introduction – Flow –Shop sequencing – n jobs through two machines – n jobs through three machines – Job shop sequencing – two jobs through "m" machines

Unit 2: Replacement: Introduction – Replacement of items that deteriorate with time – when money value is not counted and counted – Replacement of items that fail completely- Group Replacement.

Module 4:

Unit 1: Inventory: Introduction – Single item, Deterministic models – Types – Purchase inventory models with one price break and multiple price breaks – inventory models with and without shortage cost. Stochastic models – demand discrete variable or continuous variable – Single Period model with no setup cost.

Unit 2: Waiting lines: Introduction – Terminology-Single Channel – Poisson arrivals and Exponential Service times – with infinite population and finite population models– Multichannel – Poisson arrivals and exponential service times with infinite population.

Module 5:

Unit 1: Theory of Games: Introduction – Terminology – Solution of games with saddle points and without saddle points- 2 x 2 games – m x 2 & 2 x n games - graphical method – m x n games - dominance principle.

Unit 2: Dynamic programming: Introduction – Terminology- Bellman's Principle of Optimality – Applications of dynamic programming- shortest path problem – linear programming problem

Text Books

1. P. Sankara Iyer, "Operations Research", Mc Graw Hill, 2017.
2. J. K. Sharma, "Operation Research", MacMillan Publishers India Ltd, 4th Edition, 2009.
3. A.C.S Kumar, "Operations Research (Quantitative Analysis for Business decision)", Yesdee, 2015.

Reference Books

1. Maurice Saseini, Arhur Yaspanand and Lawrence Friedman, "*Operations Research: Methods and Problems",* Literary Licensing Publisher, 2013
2. A. M. Natarajan, P. Bala Subramani and A. Tamilarasi "*Operations Research*" Pearson Education, 4th *Edition*, 2009.
3. Wagner H. M, "*Principles of Operations Research",* PHI Publications, 2nd Edition, 2006.

E-Resources

1. https://rb.gy/1ckbxh
2. https://nptel.ac.in/courses/112/106/112106134/
3. https://nptel.ac.in/courses/111/107/111107128/

Course Outcomes

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

CO1: Allocate optimally the resources in any industry, to maximize the overall gain and determine the number of each item to be produced / procured, and the optimal product mix, within the framework of constraints in any organization

CO2: Find the optimal number of units to be transported such that the total transportation cost will be minimum and Assign the required men / machines to perform the given tasks in an optimal way

CO3: Schedule and sequence production runs by proper allocation of machines and men to get maximum gain or profit and Compute the economic order quantity

CO4: Decide the optimal inventory to be maintained under different situations involving different types of demand and inventory costs, find how to strike a balance between the waiting time cost and service facility cost for different waiting line models

CO5: Find how to strike a balance between the waiting time cost and service facility cost and apply the Dynamic Programming model to practical problems like finding the shortest path for a salesman, optimal solution to a linear programming problem.

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	3	2	-	-	3	-	-	-	-	-	2	2	2
CO2	3	3	3	-	-	3	-	-	-	-	-	2	3	3
CO3	2	3	2	-	-	3	-	-	-	-	-	2	2	2
CO4	3	3	2	-	-	3	-	-	-	-	-	2	3	3
CO5	2	3	1	-	-	3	-	-	-	-	-	2	2	2
Average	2.4	3	2	-	-	3	-	-	-	-	-	2	2.4	2.4

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

AY: 2022-23 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech: MIE III Year - II Sem			
Course Code: **L32OJ**	**INTRODUCTION TO SURFACE MINING (OPEN ELECTIVE – II)**	L	T	P	D
Credits: **3**		**3**	**0**	**0**	**0**

Pre-Requisites: Nil

Course Objectives:

This course will enable students to:

1. To introduce surface mining terms and applicable conditions
2. To acquaint with different machinery used in surface mining
3. To get idea about Drilling and blasting of surface ore bodies
4. To get idea about lighting, dust, and slopes in surface mines.
5. To know about ore and waste transportation.

Module 1

Definition, Terminology, Applicability and limitations of surface mining, Classification, Advantages, and dis-advantages of surface mining.

Module 2

Introduction to surface mining machinery: Equipment selection; Working with rippers, shovels, draglines, shovel-dragline combination; bucket wheel excavator. Disposal of OB/waste material

Module 3

Drilling & blasting**:** Drilling mechanism, drilling patters, Drill bits Explosives, Blasting accessories, Bulk explosives, problems in blasting.

Module 4

Basics of Mine lighting, Sources of dust in surface mining, dust control, and slope stabilization

Module 5

Methods of excavation & transportation – shovel-dumper combination, draglines, surface miner, bucket wheel excavator. Impacts on environment due to surface mining

Text Books

1. D.J. Deshmukh, Elements of Mining Technology, Vol 1, Central Techno, 7th Edition, 2001.
2. Principles & Practices of Coal Mining, R.D. Singh

Reference Books

1. Surface Mining Technology, by Prof S.K. Das, Lovely Prakashan, Dhanbad

Course Outcomes

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

CO1: Understand about surface mining terms and conditions of applicability

CO2: Learn about different machinery used in surface mining

CO3: Learn drilling and blasting in surface mining

CO4: Understand mine lighting, dust, and slopes in surface mining

CO5: Understand the transportation of ore and waste in surface mining.

AY: 2022-23 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech: MBA III Year - II Sem			
Course Code: **L32OK**	**INTELLECTUAL PROPERTY RIGHTS (Open Elective - II)**	L	T	P	D
Credits: **3**		**3**	**0**	**0**	**0**

Course Objectives:

1. The main objective of the IPR is to make the students aware of their rights for the protection of their invention done in their project work.
2. To get registration in our country and foreign countries of their invention, designs and thesis or theory written by the students during their project work and for this they must have knowledge of patents, copy right, trademarks, designs and information Technology Act.
3. Further teacher will have to demonstrate with products and ask the student to identify the different types of IPR's.

UNIT - I:

Introduction to Intellectual property: Introduction, types of intellectual property, international organizations, agencies and treaties, importance of intellectual property rights.

UNIT - II:

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

UNIT - III:

Law of copy rights: Fundamental of copy right law, originality of material, rights of reproduction, rights to perform the work publicly, copy right ownership issues, copy right registration, notice of copy right, international copy right law.
Law of patents: Foundation of patent law, patent searching process, ownership rights and transfer

UNIT - IV:

Trade Secrets: Trade secretes law, determination of trade secretes status, liability for misappropriations of trade secrets, and protection for submission, trade secretes litigation.
Unfair competition: Misappropriation right of publicity, false advertising.

UNIT - V:

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

Course outcomes:

The students once they complete their academic projects, they get awareness

of acquiring the patent and copyright for their innovative works. They also get the knowledge of plagiarism in their innovations which can be questioned legally.

Text Books:

1. Intellectual property right, Deborah, E. Bouchoux, cengage learning.
2. Intellectual property right - Unleashing the knowledge economy, prabuddhaganguli, Tata McGraw Hill Publishing Company Ltd.
3. Managing Intellectual Property-The Strategic Imperative, Second Edition by Vinod V Sople, PHI.
4. Intellectual Property –Copyrights, Trademarks and patents by Richard Stim, Cengage Learning.
5. Niraj Pandey & Khushdeep Dharani –Intellectual Property rights
6. V.K. AHUJA – Law relating to Intellectual Property

AY: 2022-23 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech -SH III Year-II Sem			
Course Code: **L32OL**	**Open Elective-II Numerical Solution of Partial Differential Equations**	L	T	P	D
Credits: 3		**3**	**1**	**0**	**0**

Pre-Requisites:

Module 1: Linear Systems of Equations [10L]

Iterative methods for solving large linear systems of algebraic equations: Jacobi, Gauss-seidel and S.O.R methods - Conditions for convergence of them - Methods for accelerating convergence: Lyusternite's & Aitken's methods - Optimum acceleration parameter for S.O.R method.

Module 2: One Dimensional Parabolic Equations [9L]

Explicit and Crank-Nicolson Schemes for - Weighted average approximation - Derivative boundary conditions - Truncation errors - Consistency, Stability and convergence - Lax Equivalence theorem.

Module 3: Matrix Norms &Two Dimensional Parabolic Equation [10L]

Vector and matrix norms - Eigen values of a common tridiagonal matrix - Gerischgorin's theorems - Stability by matrix and Fourier-series methods - A.D.I. methods.

Module 4: Hyperbolic Equations [10L]

First order quasi-linear equations and characteristics - Numerical integration along a characteristic - Lax- Wendroff explicit method - Second order quasi-linear hyperbolic equation - Characteristics - Solution by the method of characteristics.

Module 5: Elliptic Equations [10L]

Solution of Laplace and Poisson equations in a rectangular region - Finite difference in Polar coordinate Formulas for derivatives near a curved boundary when using square mesh - Discretisation error - Mixed Boundary value problems

Text Books

1. Chapra. S.C., and Canale.R.P., "Numerical Methods for Engineers, Tata McGraw Hill, 5 th Edition, New Delhi, 2007.
2. Equations", John Wiley and sons, New York, 1980.
3. Smith G.D., "Numerical Solution of P.D.E.", Oxford University Press, New 2.

Reference Books

1. Morton K.W., Mayers, D.F., "Numerical Solutions of Partial Differential Equations", Cambridge University Press, Cambridge, 2002.
2. Iserles A., "A first course in the Numerical Analysis of Differential Equations", Cambridge University press, New Delhi, 2010. xx t u u
3. Mitchel A.R. and Griffiths S.D.F., "The Finite Difference Methods in Partial Differential

E-Resources

1. https://www.purplemath.com/modules/systlin1.htm
2. https://nptel.ac.in/courses/111/107/111107063/
3. https://www.researchgate.net/publication/227760098_Numerical_solution_of_twodimensional_parabolic_equation_subject_to_nonstandard_boundary_specifications_using_the_pseudospectral_Legendre_method
4. https://link.springer.com/chapter/10.1007/978-3-662-09207-1_2
5. https://www.researchgate.net/publication/310744390_Numerical_Solutions_of_Elliptic_Partial_Differential_Equations_by_Using_Finite_Volume_Method

Course Outcomes

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

CO1. Know the knowledge of solving large number of algebraic linear equation.

CO2. Understand the knowledge of solving one dimensional parabolic equations by numerical methods

CO3. Recognize the knowledge of solving two dimensional parabolic equations by numerical methods.

CO4. Apply and understand the knowledge of solving hyperbolic equation by numerical methods

CO5. Know the knowledge of solving elliptic equations by numerical methods.

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	3	3	2	3	-	-	-	-	-	-	-	2	-	-
CO2	3	3	2	3	-	-	-	-	-	-	-	2	-	-
CO3	3	3	2	3	-	-	-	-	-	-	-	2	-	-
CO4	3	3	2	3	-	-	-	-	-	-	-	2	-	-
CO5	3	3	2	3	-	-	-	-	-	-	-	2	-	-
Average	3	3	2	3	-	-	-	-	-	-	-	2	-	-

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

AY: 2022-23 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech -SH III Year-II Sem			
Course Code: **L32OM**	**ADVANCED PHYSICS FOR ENGINEERS (Open Elective)**	L	T	P	D
Credits: **3**	(COMMON TO: All branches)	**3**	**0**	**0**	**0**

Pre-Requisites: Foundations of Mechanics & Physics

Module- 1: Special Theory of Relativity [9L]

Introduction, Concept of theory of relativity, Frames of reference-Inertial, noinertial; Galilean transformation equations, Michelson-Morley experiment, Einstein theory of relativity, Lorentz transformation of space and time, Length contraction, Time dilation, Variation of mass with velocity, Relativistic relation between energy and momentum.

Module -2: Holography [9L]

Introduction, Basic principle, Construction and Reconstruction of Hologram, Properties of Hologram, Types of Holograms, Applications- Holographic Interferometry, Acoustic Holography, Holographic Microscopy.

Module -3: Thin films Synthesis [9L]

Introduction, Deposition Techniques-Pulsed Laser Deposition (PLD), Spray Pyrolysis; Nucleation and growth of the thin films, properties (Mechanical, Electrical, Magnetic and Optical).

Module -4: Photonic Crystals [9L]

Important features of photonic crystals, Presence of photonic band gap, anomalous group velocity dispersion, Micro cavity, effects in Photonic Crystals, fabrication of photonic Crystals, Dielectric mirrors and interference filters, PBC based LEDs, Photonic crystal fibers (PCFs), Photonic crystal sensing.

Module- 5: Solar cell Physics[9L]

Single, poly and amorphous silicon, GaAs, CdS, Cu2S, CdTe; Origin of photovoltaic effect, Homo and hetero junction, working principle of solar cell, Evaluation of Solar cell parameters, I-V, C-V and C-f characteristics.

Text Books

1. R K Gaur and SL Gupta, "Engineering Physics" Dhanpat Rai Publications, 8th revised Edition, 2006.

2. B K Pandey and S Chaturvedi, "Engineering Physics" Cengage Learning India, Revised Edition, 2014.

Reference Books

1.R F Bun shah, "Hand Book of Technologies for Films and coating", Noyes publishers,1st Edition, 1996.

2.B E A Saleh and A C Tech, "Fundamentals of Photonics", John Wiley and Sons, New York, 1st Edition, 1993.

E-Resources

1.http://physics.mq.edu.au/~jcresser/Phys378/LectureNotes/SpecialRelativity Notes. pdf
2. http://www.kfupm.edu.sa/centers/CENT/AnalyticsReports/KFUPM-TFSCDec20.pdf
3. https://www.journals.elsevier.com/solar-energy-materials-and-solar-cells
4. https://www.journals.elsevier.com/journal-of-alloys-and-compounds/
5. http://aip.scitation.org/journal/apl
6. http://nptel.ac.in/courses/115101011/

Course Outcomes

After completion of this course the student is able to

1.Explain special theory of relativity and apply its concepts in various fields of physicsand engineering.

2. Analyze the basic concepts of Holography and applications.

3. Identify different concepts of film deposition.

4. Apply basic knowledge on the photonic crystals.

5. Apply the basic concepts of solar cell physics.

AY: 2022-23 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech -SH III Year-II Sem			
Course Code: **L32ON**	**Nano Chemistry** (COMMON TO: All branches)	L	T	P	D
Credits: **3**		**3**	**0**	**0**	**0**

Pre-Requisites: Nil

Module 1: Synthesis of Nano materials [8L]

Introduction -synthesis of Nanostructure materials, Bottom-up approach and Top-down approach with examples-sol-gel method-solvothermal and hydrothermal routes, Chemical Vapor Deposition and precipitation methods.

Module 2: Properties of Nano materials [10L]

Properties of Nanomaterials-Electronic properties, Energy bands and gaps in semiconductors, Fermi Surfaces-Optical properties- Fluorescence, Photoluminescence, Electroluminescence. Magnetic properties-mechanical properties-thermal properties.

Module 4: Instrumental Analysis [10L]

Characterization techniques- Principle and block diagram of Scanning Electron Microscopy (SEM), Electron Dispersion Spectroscopy(EDS). Principle and block diagram of Electron Microscopy (TEM), Dynamic Light Scattering (DLS) and Atomic Force Microscopy(AFM) -Illustrative examples.

Module 5: Carbon Nano structures and Applications [10L]

Carbon Nano structures, carbon clusters, types and preparation of carbon Nano tubes-optical and telecommunication applications, Nano structured crystals (graphite), graphene, carbon fibers, fullerenes and their applications. Nano solar cells and its applications.

Module 5: Environmental Nanotechnology [9L]

Implications of Nanotechnology & Research needs-Nanostructured Catalysts TiO_2 Nanoparticles for Water purification- Nano membranes in drinking water treatment and desalination, Nanomembranes in Sea desalination-Nano particles for treatment of Chlorinated Organic Contaminants.

Text Books

1. "Nanotechnology a gentle introduction to the next big idea",Mark A. Ratner, D. Ratner. Pearson Education Inc., Asia, 2003.
2. "Nano: The essentials-understanding Nanoscience and Nanotechnology", Pradeep.T. Tata Mc.Graw Hill, New Delhi, 2007.

Reference Books

1. "Green Chemistry: Theory and Practice", Anastas, P.; Warner, J. Oxford University Press: London, 1998.

2. "Nanomaterials: Synthesis, Characterization, and Applications", A. K. Haghi, Ajesh K. Zachariah, Nandakumar Kalariakkal. Apple Academic Press, 2013.
3. "Nanomaterials and Nanochemistry", Brechignac C., Houdy P., Lahmani M. (Eds.) (Springer,) 748p. ISBN 978-3-540-72993-8, 2007
4. "Principles of Nanotechnology", Phanikumar. SciTech Publications 2nd Edition, 2010.
5. "Environmental Nanotechnology"Preetijain, Shankar lalGarg. Lap lambert Academic publishing, 2015.

E-Resources

1. https://www.acs.org/content/acs/en/careers/college-to-career/chemistry-careers/nanochemistry.html
2. https://www.sciencedirect.com/book/9780444519566/nanochemistry
3. https://www.researchgate.net/publication/320068992_Introduction_to_Nano-chemistry_and_Nano-materials
4. https://www.kemi.dtu.dk/english/research/organic-inorganic-chemistry/nanochemistry
5. https://www.cambridge.org/core/books/engineering-chemistry/nanochemistry/D6DB35E32E530525DD927E68CED43197

Course Outcomes

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

1. Learn the different synthetic methods of the Nano materials.
2. Know the student Electronic, optical and magnetic properties of Nano materials.
3. Acquire the knowledge various instrumental methods of analysis (TEM, EDS, SEM, DLS &AFM).
4. Know the carbon nanotubes, carbon Nano fibers, Nano structured catalysts and Nano solar cells.
5. Learn usage of Nano materials in the purification of water.

AY 2022-23 onwards	J. B. INSTITUTE OF ENGINEERING AND TECHNOLOGY (UGC Autonomous)	B. Tech-SH III Year – II Sem			
Course Code: **L32OO**	**TEAMWORK AND TEAM BUILDING (COMMON TO ALL)**	**L**	**T**	**P**	**D**
Credits: 3		**3**	**0**	**0**	**0**

Pre-Requisites: Nil

Objectives:

1. Know the working experience in the group and team
2. Understand the process and role of the team
3. Apply the knowledge of team building
4. Understand the role of team leader.
5. Plan the meetings and understanding the role of meetings

Module -I Working in Groups and Teams

Introduction-defining Types of Groups and Teams- Understanding the role of Teams in Organization; Recognizing differences between group and Teams-ensuring team success-empowering teams- working with a distributed team-technology @work: virtual worlds.

Module -II Exploring Team Roles and Processes

Defining common team roles-selecting team members-choosing the optimal team size-establishing team rules-clarifying team objectives-making collective decisions etc.

Module -III Building and Developing Team

Understanding the benefits of working in teams-fostering Resistance-using team-building activities-creating a team identity-coping with conflict and ego-dealing with difficult team members and celebrating successes.

Module -IV Leading a Team

Pursuing team leadership-preparing to be a team leader-getting start with your team-taking a project management approach- managing a team diplomatically-being sensitive to intangibles and concluding team activities.

Module -V Managing Meetings

Scheduling meeting-developing meeting agenda- planning meetings-understanding the role of meetings-conducting meetings effectively-taking notes and publishing minutes-concluding meetings and creating action plans and solving common meeting problems.

Reference/text book:

1) Butterfield, Jeff. Soft Skills for Everyone. Delhi: Cenege., 2010.

Course outcomes:

1. Recognize differences between group and team, ensuring team success, and empowering teams.
2. Define common team roles, establishing team rules, selecting team members, and making collective decisions
3. Understand the benefits of working in teams, fostering Resistance, using team-building activities
4. Manage a team diplomatically, and preparing to be a good team leader.
5. Create action plans and solving common meeting problems

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***	
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	..	..	..	..	..	..	..	..	3	2	..	3	..	..
CO2	..	..	..	..	..	..	..	..	3	2	..	3	..	..
CO3	..	..	..	..	..	..	..	..	3	2	..	3	..	..
CO4	..	..	..	..	..	..	..	..	3	2	..	3	..	..
CO5	..	..	..	..	..	..	..	..	3	2	..	3	..	..
Total	..	..	..	..	..	..	..	..	3	2	..	3	..	..

AY: 2022-23 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech-SH III Year-I Sem			
Course Code: **L320P**	**Essence of Indian Traditional Knowledge** (COMMON TO: All branches)	L	T	P	D
Credits: **3**		**3**	**0**	**0**	**0**

Pre-Requisites:

Module 1: Introduction to Culture

Culture, civilization, culture and heritage, general characteristics of culture, importance of culture in human literature, Indian Culture, Ancient India, Medieval India, Modern India

Module 2: Indian Languages, Culture and Literature

Indian Languages and Literature-l the role of Sanskrit, significance of scriptures to scriptures to current society, Indian philosophies, other Sanskrit literature, literature of south India

Indian Languages and Literature-II. Northern Indian languages & literature

Module 3: Religion and Philosophy

Religion and Philosophy in ancient India Religion and Philosophy in Medieval India Religious Reform Movements in Modern India (selected movements only)

Module 4: Fine Arts in India (Art, Technology & Engineering)

Indian Painting, Indian handicrafts, Music, divisions of Indian classic music, modern Indian music, Dance and Drama, Indian Architecture (ancient medieval, and modern) Science and Technology in India, development of science in ancient medieval and modern India.

Module 5: Education System in India

Education in ancient, medieval and modern India, aims of education, subjects' languages

Science and Scientists of Ancient India, Science and Scientists of Medieval India, Scientists of Modern India.

Text Books

1. Kapil Kapoor. "Text and Interpretation: The India Tradition" ISBN: 81246013375 2005.

1. "Science in Sanskrit". Samskrita Bharti Publisher, ISBN 978-8187276731.2007

Reference Books

1.NCERT, "Position paper on Arts, Music, Dance and Theatre". ISBN 81-7450 494- 200.

Course Outcomes

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

COI: Understand philosophy of Indian culture.

CO2: Distinguish the Indian languages and literature

CO3: Learn the philosophy of ancient, medieval and modern India.

CO4: Acquire the information about the fine arts in India.

COS: Know the contribution of scientists of different eras.

Open Elective-III

AY: 2022-23 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech CE III Year-II Sem			
Course Code: **L32OQ**	**ROAD SAFETY EINGINEERING (OE-III)**	L	T	P	D
Credits: 3		**3**	**0**	**0**	**0**

Pre-Requisites: NIL

Module 1: Fundamentals of Traffic Engineering

Unit-I:

Road User Characteristics, Vehicular Characteristics, Applications of Traffic Control Devices, Traffic signs, Road Marking.

Module 2: Introduction to Road Safety

Unit-I:

Accident Situation in India, International Comparison of Accident Data, Standard Definitions by IRC, Collection of Accident Data, Collision and Condition Diagrams.

Module 3: Statistical Methods and Analysis of Accident Data

Unit-I:

Methods in Analysis of accident Data, Regression Method, Poisson Distribution, Chi- Squared Distribution, Statistical Comparisons, Black Spot Identification & Investigations.

Module 4: Road & its Effect on Accidents Unit-I:

Factors Causing Accidents, Skidding, Factors Determining Skid Resistance, Pedestrian Safety, Measures to Increase Pedestrian Safety, Safety Improvement Strategies.

Module 5: Accident Mitigation Measures

Unit-I

Accident prevention by better planning, Accident prevention by better design of roads, Highway operation and accident control measures, Highway Safety Measures during construction, Highway geometry and safety.

Text Books

1. 'Transport planning and Traffic Engineering" by Dr. L. R. Kadiyali, Khanna Publications 9th Edition (2017).
2. 'Principles of Transportation Engineering'' by Partha Chakroborty &Aminesh Das; Prentice Hall of India, 2nd edition (October 2017).

Reference Books

1. Fundamentals of Traffic Engineering, Richardo G Sigua Road Safety by NCHRP.

E- Resources

1. https://nptel.ac.in/courses/105/101/105101087/

Course Outcomes

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

1. Understand the Traffic characteristics
2. Analyze Collision and Condition Diagrams.

3. Describe Road & its Effect on Accidents
4. Understand the various Accident prevention measures.
5. Understand the statistical analysis of traffic flow variables.

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	1	1	1	-	-	-	-	-	-	-	-	-	1	1
CO2	1	1	1	-	-	3	2	-	-	-	-	-	2	2
CO3	1	1	1	-	-	3	1	-	-	2	-	2	1	1
CO4	1	1	1	-	-	2	-	-	-	-	-	2	1	2
CO5	1	1	1	-	-	2	-	-	-	-	-	2	1	1
Average	1	1	1	-	-	2	0.6	-	-	0.4	-	1.2	1.2	1.4

AY: 2022-23 Onwards	J. B. INSTITUTE OF ENGINEERING AND TECHNOLOGY (UGC Autonomous)	B. Tech-CSE III Year- II Sem			
Course Code: **L32OR**	**Introduction to Java Programming (Open Elective -III)**	L	T	P	D
Credits: **3**		**3**	**0**	**0**	**0**

Pre-Requisites:

Knowledge on Programming for Problem Solving

Course Objectives:

The students should be able to

1. Familiar with OOPs, constructors, and string handling functions
2. Understand inheritance and polymorphism.
3. Gain knowledge of with packages and interfaces
4. Understand the with exception handling and multithreading.
5. Know the applet programming, event handling and scripting.

Module 1:

Introduction: 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.

Classes and Objects: concepts of classes, objects, constructors, methods, this keyword, garbage collection, overloading methods and constructors, parameter passing, recursion.

String handling: String, String Buffer, String Tokenize.

Module 2:

Inheritance: base class object, subclass, member access rules, super uses, using final with inheritance, method overriding, abstract classes

Interfaces: defining an interface, implementing interface, differences between classes and interfaces and extending interfaces.

Packages: Defining, creating and accessing a package, importing packages, access control, exploring package - java.io

Module 3:

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

Module 4:

Multithreading: differences between multi-threading and multitasking, thread life cycle, creating threads, synchronizing threads, daemon threads, thread groups.

Applets: concepts of applets, differences between applets and applications, life cycle of applet, types of applets, creating applets, passing parameters to applets.

Module 5:

Event Handling: events, event sources, event classes, event listeners, delegation event model, handling mouse and key board events, adapter classes. The AWT class hierarchy, user interface components-labels, buttons, canvas, scrollbars, text components, checkbox, checkbox groups, choices, lists

Textbooks

1. Java The complete reference, 8th edition, Herbert Schildt, TMH.
2. Understanding OOP with Java, updated edition, T. Budd, Pears on education.

Reference Books

1. An Introduction to programming and OO design using Java, J. Nino and F.A. Hosch, John Wiley & sons.
2. An Introduction to OOP, second edition, T. Budd, Pearson education.
3. Introduction to Java programming 6th edition, Y. Daniel Liang, Pearson education.

E - Resources:

1. http://www.javasoft.com
2. http://www.w3schools.com

Course Outcomes

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

CO1: Use OOP concepts in problem solving.

CO2: Demonstrate Inheritance and Polymorphism

CO3: Create user defined Packages and Interfaces

CO4: Illustrate the concept of Exception handling and Multithreading.

CO5: Design GUI based applications using Applet Programming and Event Handling

AY 2022-23 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech: AIML III Year II Sem			
Course Code: L320S	INTRODUCTION TO NEURAL NETWORKS (Open Elective III)	L	T	P	D
Credits: 3		3	0	0	0

Pre-Requisites:

1. Data Structures
2. Design and Analysis of Algorithms
3. Python Programming
4. Mathematics for Machine Learning

Course objectives:

The student will:

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 ANN McCulloch-Pitts Model, Historical Developments, Potential Applications of 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: Linear Association, Basic Concepts of recurrent Auto associative memory: rentrieval algorithm, storage algorithm; By directional associative memory, Architecture, Association encoding & decoding, Stability.

SELF ORGANIZING NETWORKS: Unsupervised learning of clusters, winner-take-all learning, recall mode, Initialisation of weights, seperability limitations

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:

1. S. Rajasekharan and G. A. Vijayalakshmi pai, "Neural Networks, Fuzzy logic, Genetic algorithms: synthesis and applications", PHI Publication, 2004.
2. Timothy J. Ross, " Fuzzy Logic with Engineering Applications", Tata McGraw-Hill Inc. 2000

Course outcomes:

The student will be able to:

1. Analyze Neural Networks and its applications.
2. Apply learning strategies for solving real world problems.
3. Implement various architectures of Artificial neural networks.
4. Categorize the merits of various perceptron models.
5. Construct the paradigms of associative memories.

AY: 2022-23 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech : AI&DS III Year-II Sem			
Course Code: **L320T**	**Open Elective-III HEALTH CARE DATA ANALYTICS**	L	T	P	D
Credits: **3**		**3**	**0**	**0**	**0**

Module I: Introduction to Health Care Data Analytics & Electronic Health Record

Unit I: Introduction to Health care data sources and basic analytics, advanced data analytics, Applications and practical systems for health care, resources for health care data analytics,

Unit II: Electronics Health Records, Components of EHR, Coding System of EHR, Benefits of EHR- Barrier to Adopting EHR Challenges-Phenotyping Algorithms, Conclusion.

Module II: Biomedical image modalities and Mining of Sensor Data in Health Care

Unit 1: Biomedical image modalities, Object Detection**,** Image Segmentation, Image Registration, Feature Extraction, Conclusion and Feature work.

Unit II: Introduction Mining sensor data in medical informatics, scope and challenges,

Challenges in the Health care data analysis, Sensor Data Mining Applications, Non clinical Health Care Application, Summary and concluding remarks.

Module III: Biomedical Signal Analysis and Genomic data analysis

Unit I: -introduction types of biomedical signal analysis, ECG signal analysis, denoising of signals, multivariate bio medical signal analysis, cross correlation analysis.

Unit II: introduction genomic data generation, methods and standards for genomic data analysis, types of computational genomics studies towards personalized medicine, genetic and genomic study to the bed side of personalized medicine, concluding remarks.

Module IV: Natural language processing and data mining for clinical text & Biomedical literature Unit I: Introduction to Natural language processing, Mining information for clinical text,

Challenges of processing clinical reports, clinical applications, conclusions.

Unit II: Introduction terminology acquisition and management information extraction, text mining environments, applications integration with clinical text mining, conclusions.

Module V: Social media and analytics for health care and Advanced data analytics for health care Unit I: Introduction to social media analysis for detection and trapping of infectious disease outbreaks, social media analysis for public health research and analysis of social media used in health care, conclusions.

Unit II: introduction basics statistical predication model, alternative, clinical predication model, survival models, evaluation and validation and conclusion.

TEXT BOOKS

1. Chandan K. Reddy and Charu C Aggarwal, "Healthcare data analytics", Taylor & Francis,2020 Edition

REFERENCE BOOKS

1. Hui Yang and Eva K. Lee, "Healthcare Analytics: From Data to Knowledge to Healthcare Improvement, Wiley, 2016.

AY: 2022-23 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech ECE III Year-II Sem			
Course Code: **L320U**	**MATLAB PROGRAMING LANGUAGE** OE-III	L	T	P	D
Credits: **3**		**3**	**0**	**0**	**0**

Pre-Requisites:

Course Objectives:

The students will

1. To understand the basic principles of programming and of implementing mathematical concepts in MATLAB.
2. To write numerical algorithms with MATLAB Programming language.
3. To evaluate the computational results using graphical representations.
4. To gain knowledge about advanced MATLAB Programming methods.
5. To gain knowledge on Simulink used in MATLAB.

Module 1: Introduction to MATLAB [10L]

Unit-I: [6L]

Historical Background, Applications, Scope of MATLAB, Importance of MATLAB for Engineers, Features, MATLAB Windows (Editor, Work Space, Command History, Command Window).

Unit-II: [4L]

Operations with Variables, Naming and Checking Existence, Clearing Operations, Commands, Data types, Operators.

Module 2: Data Flow in MATLAB [10L]

Unit-I: [10L]

Vectors, Matrix Operations & Operators, Reshaping Matrices, Arrays, Colon Notations, Numbers, Strings, Functions, File Input-Output, Importing and Exporting of data.

Module 3: MATLAB Programming [10L]

Unit-I:

Conditional Statements, Loops, Writing Script Files, Error Correction, saving Files, Worked out Examples.

Module 4: MATLAB Advanced [10L]

Unit-I: [10L]

Plotting, Graphics, Creating Plot & Editing Plot, GUI (Graphical User Interface). Matlab-Algebra, Calculus, Differential, Integration, Polynomials, solving a system of linear equations.

Module 5: SIMULINK [9L]

Unit-I: [9L]

Introduction, Importance, Model Based Design, Tools, Mathematical Modeling, Converting Mathematical Model into Simulink Model, Running Simulink Models, Importing Exporting Data, Solver Configuration, Masking Block/Model.

Text Books

1. Getting Started WithMatlab: A Quick Introduction For Scientists And Engineers (English) by Rudra Pratap, OXFORD University Press.
2. MATLAB Programming by Y. Kirani Singh, B.B. Chaudhuri, PHI Publication.

3. Reference Books

1. MATLAB® Programming For Engineers, Fourth edition by Stephen J. Chapman.
2. Applied Numerical Methods Using MATLAB 1st Edition by Won Y. Yang Wenwu Cao, Tae-Sang Chung, John Morris.

Course Outcomes

CO1. Translate mathematical methods to MATLAB code.
CO2. Generalize results and represent data visually.
CO3. Apply computer methods for solving a wide range of engineering problems.
CO4. Utilize computer skills to enhance learning and performance in other engineering and science courses.
CO5. acquire knowledge of Advanced Matlab programming methods and Simulink.

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

AY: 2022-23 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech ECM III Year-II Sem			
Course Code: **L32OV**	**INTRODUCTION TO SENSORS AND ITS APPLICATIONS (Open Elective -III)**	L	T	P	D
Credits: **3**		**3**	**0**	**0**	**0**

Pre-Requisites: Nil

Course Objectives:

Students will learn to:

1. To understand the concepts of measurement technology.
2. To learn the different sensors used to measure various physical parameters.
3. To Acquire knowledge on Optical sensors.
4. To understand the concepts Acoustic sensors.
5. To learn the fundamentals of signal conditioning, data acquisition and communication systems used in mechatronics system development.

Module 1:

Unit-I: Introduction

Basics of Measurement – Classification of errors – Error analysis – Static and dynamic characteristics of transducers.

Unit-II: Performance measures of sensors

Classification of sensors – Sensor calibration techniques – Sensor Output Signal Types.

Module 2:

Unit-I: Motion, Proximity And Ranging Sensors

Motion Sensors – Potentiometers, Resolver, Encoders – Optical, Magnetic, Inductive, Capacitive

Unit-II:

LVDT – RVDT – Synchro – Microsyn, Accelerometer.,– GPS, Bluetooth, Range Sensors – RF beacons, Ultrasonic Ranging, Reflective beacons, Laser Range Sensor (LIDAR).

Module 3:

Unit-I: Force, Magnetic And Heading Sensors

Strain Gage, Load Cell, Magnetic Sensors–types, principle, requirement and advantages: Unit 2: Magneto resistive – Hall Effect – Current sensor Heading Sensors – Compass, Gyroscope, Inclinometers.

Module 4:

Unit-I: Optical, Pressure And Temperature Sensors

Photo conductive cell, photo voltaic, Photo resistive, LDR – Fiber optic sensors – Pressure – Diaphragm, Bellows, Piezoelectric – Tactile sensors, Temperature – IC, Thermistor, RTD.

Unit-II:

Thermocouple. Acoustic Sensors – flow and level measurement, Radiation Sensors - Smart Sensors, Film sensor, MEMS & Nano Sensors, LASER sensors.

Module 5:

Unit-I: Signal Conditioning And Daq Systems

Amplification – Filtering – Sample and Hold circuits – Data Acquisition: Single channel and multi-channel data acquisition

Unit-II:

Data logging - applications - Automobile, Aerospace, Home appliances, Manufacturing, Environmental monitoring

Text Books

1. S Ernest O Doebelin, "Measurement Systems – Applications and Design", Tata McGraw-Hill,2009.
2. Sawney A K and Puneet Sawney, "A Course in Mechanical Measurements and Instrumentation and Control", 12th edition, Dhanpat Rai & Co, New Delhi,2013.

Reference Books

1. Patranabis D, "Sensors and Transducers", 2nd Edition, PHI, New Delhi,2010.
2. 1. John Turner and Martyn Hill, "Instrumentation for Engineers and Scientists", Oxford Science Publications,1999.
3. 2. Richard Zurawski, "Industrial Communication Technology Handbook" 2nd edition, CRC Press, 2015.

E-Resources

1. https://www.sciencelearn.org.nz/resources/1602-electricity-and-sensors
2. https://predictabledesigns.com/introduction-to-electronic-sensors/

Course Outcomes

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

CO1. Expertise in various calibration techniques and signal types for sensors.

CO2. Apply the various sensors in the Automotive and Mechatronics applications.

CO3. Study the basic principles of various smart sensors..

CO4. Apply Optical and Acoustic sensors in Home Appliances..

CO5. Implement the DAQ systems with different sensors for real time 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	2	-	-	-	-	-	-	-	-	-	-	-
CO2	2	2	-	2	-	-	-	-	-	-	-	-	-	-
CO3	3	2	-	3	-	-	-	-	-	-	-	-	-	-
CO4	3	1	-		-	-	-	-	-	-	-	-	-	-
CO5	2	2	3	3	-	-	-	-	-	-	-	-	-	-
Average	2.4	2	2.5	2.67	-	-	-	-	-	-	-	-	-	-

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

AY: 2022-23 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech EEE III Year-II Sem			
Course Code: **L32OX**	**Non-Conventional Energy Sources (OPEN ELECTIVE - III)**	L	T	P	D
Credits: **3**		**3**	**0**	**0**	**0**

Course Objectives:

This course will enable students:

1. To elucidate the fundamentals of various energy sources and future energy requirement.
2. To impart a thorough knowledge about the application of solar energy.
3. To inculcate the students on feasibility and limitations of wind Energy Systems.
4. To analyse the principle and operation of Biomass energy.
5. To analyse the principle and operation of ocean energy and it's potential in india.

Module 1: Introduction [9L]

Introduction to energy Sources-Renewable and non-renewable energy sources –energy consumption as a measure of Nation's development – Strategy for meeting the future energy requirement – Global and national level energy scenarios –Prospects of renewable energy sources.

Module 2: Solar Energy [12L]

Fundamentals of Solar Energy, Solar Radiation on Earth's surface, Solar radiation geometry, Solar radiation measurements, Solar radiation data, Solar radiation on horizontal and tilted surfaces. Solar Thermal conversion: Flat plate collectors and concentrated collectors, collector efficiency. Solar applications: Heating, distillation, pumping, drying, cooking and solar electric power generation

Module 3: Wind Energy [10L]

Basic principle of wind energy conversion, site selection consideration, Betz Limit, Aerodynamics of wind turbine, basic components of wind energy conversion systems (WECS), types of WECS, applications of wind energy, safety system.

Module 4: Bio-Mass [9L]

Energy from Bio Mass: Various fuels, Conversion technologies, Aerobic digestion and anaerobic digestion, types of Bio-gas digesters, applications of bio-gas plants Factors affecting generation of bio gas, Community biogas plant, compare biomass and biogas.

Module 5: Geo-Thermal and Ocean Energy [10L]

Geothermal energy: Resources, methods of harnessing the energy, potential in India **Ocean energy:** Principle of ocean thermal energy conversion (OTEC), types: open cycle OTEC system, closed cycle and hybrid cycle, applications. Tidal and wave energy: Potential and conversion techniques.

Text Books

1. "G. D. Rai", "Non-Conventional Energy sources", Khanna publishers, 2004
2. "John Twidell & Wier", "Renewable Energy Resources", CRC Press, 2009.

Reference Books

1. "D. P .Kothari, Singal, Rakesh and Ranjan", "Renewable Energy sources and Emerging Technologies", PHI, 2009.
2. "F. C. Treble", Generating Electricity from Sun, Pergamon Press, 1st Edition 1991
3. "C. S. Solanki", "Solar Photovoltaics - Fundamentals- Principles and Applications", PHI, 2009
4. "S. P. Sukhatme", "Solar Energy Principles and Application", TMH, 2009.
5. Agarwal, M.P., 'Future Sources of Electrical Power', S.Chand & Co. Ltd, New Delhi, 1999.

E-Resources

1. https://nptel.ac.in/courses/121106014
2. https://www.energy.gov/eere/geothermal/electricity-generation
3. https://beeindia.gov.in/sites/default/files/4Ch12.pdf
4. https://www.ireda.in/home
5. https://mnre.gov.in/wind/current-status/
6. https://mnre.gov.in/solar/current-status/
7. https://mnre.gov.in/bio-energy/current-status

Course Outcomes

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

CO 1. Understand the need of utilization of alternate energy resources & fundamentals of various non-conventional energy Systems.

CO 2. Analyze solar thermal and photovoltaic systems and related technologies for energy conversion.

CO 3. Understand Wind energy conversion and devices available for it.

CO 4. Understand Biomass conversion technologies, Geo thermal resources and energy conversion principles and technologies.

CO 5. Realize Power from oceans (thermal, wave, tidal) and conversion devices

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	-	-	-	-	-	-	-	2	-	-
CO2	3	3	2	3	-	-	-	-	-	-	-	2	-	-
CO3	3	3	2	3	-	-	-	-	-	-	-	2	-	-
CO4	3	3	2	3	-	-	-	-	-	-	-	2	-	-
CO5	3	3	2	3	-	-	-	-	-	-	-	2	-	-
Average	3	3	2	3	-	-	-	-	-	-	-	2	-	-

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

AY: 2022-23 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech IT III Year-II Sem			
Course Code: **L32OY**	**Soft Computing (OPEN ELECTIVE - III)**	L	T	P	D
Credits: **3**		**3**	**0**	**0**	**0**

Unit I Soft Computing:
Introduction to soft computing, soft computing vs. hard computing, various types of soft computing techniques, applications of soft computing.

Unit II Artificial Intelligence:
Introduction, Various types of production systems, characteristics of production systems, breadth first search, depth first search techniques.

Unit III Neural Network:
Structure and Function of a single neuron: Biological neuron, artificial neuron, definition of ANN, Taxonomy of neural net, characteristic and applications of ANN.

Unit IV: Perceptron
Perceptron training algorithm, Linear separability.

Unit V Genetic algorithm:
Fundamental, basic concepts, working principle, encoding, fitness function, reproduction, Genetic modelling.

Text Books:
1. S.N. Sivanandam & S.N. Deepa, Principles of Soft Computing, Wiley Publications, 2nd Edition, 2011.
2. S, Rajasekaran & G.A. Vijayalakshmi Pai, Neural Networks, Fuzzy Logic & Genetic Algorithms, Synthesis & applications, PHI Publication, 1st Edition, 2009.

Course Outcomes: At the end of the course the student should be able to
CO 1. Learn about soft computing techniques and their applications
CO 2. Analyze various neural network architectures
CO 3. Understand perceptrons.
CO 4. Define the fuzzy systems
CO 5. Analyze the genetic algorithms and their applications

AY: 2022-23 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech: ME III Year – II Sem			
Course Code: **L32OZ**	**BASICS OF ROBOTICS** (Open Elective-III)	L	T	P	D
Credits: **3**		**3**	**0**	**0**	**0**

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 Transformation Matrix, 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. Introdu`ction 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 outcomes

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**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
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: 2022-23 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech -MIE III Year-II Sem			
Course Code: **L32O1**	**BASIC MINING GEOLOGY (OPEN ELECTIVE – III)**	L	T	P	D
Credits: **3**		**3**	**0**	**0**	**0**

Pre-Requisites: Nil

Course Objectives

This course will enable students to:

1. To introduce rock types and their physical properties
2. To acquaint with different structures occurring in rocks
3. To get idea about Ground water, and aquifers
4. To get idea about coal formation and its stages.
5. To know about minerals occurring in India.

Module 1

Introduction, Definitions, Importance of geology in mining, Types of rocks, Physical properties of rocks.

Module 2

Structural Geology: Definition, terminology, and Primary and secondary structures: Bedding, lineation, foliation, cleavage, Strike and dip. Definition of faults, folds and joints and their types, Unconformities, and its kinds.

Module 3

Ground Water: Introduction, Hydrological Cycle, origin and occurrence of groundwater, water table. Aquifers: Types of aquifers, confined and unconfined aquifers, perched aquifers.

Module 4

Coal: Stages of formation, composition, theories of formation of coal.

Module 5

Occurrence and distribution of important metallic mineral deposits in India: Iron, Copper-Lead and Zinc–Manganese– Aluminum–Chromium. Occurrence and distribution of important non-metallic mineral deposits in India: Asbestos–kyanite–Sillimanite.

Textbooks

1. Structural Geology – Billings, M.P. Prentice Hall.
2. Engineering geology –by Dr. Chennkeshavulu.

Reference Books

1. A Textbook of Geology: Mukherjee P.K., The World Press Pvt. Limited Calcutta.

Course Outcomes

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

CO1 : Understand about rocks and their properties
CO2 : Learn about different structures occurring in rocks
CO3 : Understand about ground water, water table and aquifers
CO4 : Learn about coal and its formation theories
CO5 : Distinguish metallic and non-metallic minerals.

AY: 2022-23 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech -MBA III Year-II Sem			
Course Code: **L32O2**	**Open Elective-III DIGITAL MARKETING**	L	T	P	D
Credits: **3**		**3**	**0**	**0**	**0**

Course Objective:

To understand the importance of digital marketing and its applications

1. To understand the basics of Digital Marketing
2. To understand the Channels of Digital Marketing
3. To develop the capability to form Digital Marketing strategy
4. To enable the students to use new media such as Search Engine and Social Networking

UNIT - I: Understanding Digital Marketing: Concept, Components of Digital Marketing, Need and Scope of Digital Marketing, Benefits of Digital Marketing, Digital Marketing Platforms and Strategies, Comparison of Marketing and Digital Marketing, Digital Marketing Trends, Practical Exposure towards Social Media Marketing.

UNIT - II: Channels of Digital Marketing: Digital Marketing, Website Marketing, Search Engine Marketing, Online Advertising, Email Marketing, Blog Marketing, Social Media Marketing, Audio, Video and Interactive Marketing, Online Public Relations, Mobile Marketing, Migrating from Traditional Channels to Digital Channels, Affiliate Marketing.

UNIT - II: Marketing in the Digital Era: Segmentation – Importance of Audience Segmentation, How different segments use Digital Media – Organizational Characteristics, Purchasing Characteristics, Using Digital Media to Reach, Acquisition and Retention of new customers, Digital Media for Customer Loyalty.

UNIT - III: Digital Marketing Plan: Need of a Digital Marketing Plan, Elements of a Digital Marketing Plan– Marketing Plan, Executive Summary, Mission, Situational Analysis, Opportunities and Issues, Goals and Objectives, Marketing Strategy, Action Plan, Budget, Writing the Marketing Plan and Implementing the Plan.

UNIT - IV: Search Engine Marketing and Online Advertising: Importance of SEM, understanding Web Search – keywords, HTML tags, Inbound Links, Online Advertising vs. Traditional Advertising, Payment Methods of Online Advertising – CPM (Cost-per-Thousand) and CPC (Cost-per-click), Display Ads - choosing a Display Ad Format, Landing Page and its importance.

UNIT - V: Social Media Marketing: Understanding Social Media, Social Networking with Face book, LinkedIn, Blogging as a social medium, Micro blogging with Twitter, Social Sharing with YouTube, Social Media for Customer Reach, Acquisition and Retention.

Measurement of Digital Media: Analyzing Digital Media Performance, Analyzing Website Performance, Analyzing Advertising Performance.

Course outcomes:

Upon successfully completing the course, students should be able to:

1. Apply digital marketing in the globalized market
2. Define Channels of Digital Marketing
3. Design and develop Digital marketing plan
4. Understand Search engine marketing
5. Acquainted with Online Advertising

Suggested Readings:

1. Michael Miller, B2B Digital Marketing, 1e, Pearson, 2014.
2. Vandana Ahuja, Digital marketing, Oxford University Press 2015
3. Michael R Solomon, Tracy Tuten, Social Media Marketing, Pearson, 1e, 2015. Judy Strauss & Raymond Frost, E-Marketing, Pearson, 2016
4. Richard Gay, Alan Charles worth and Rita Esen, Online marketing – A customer led approach Oxford University Press 2007.
5. Arup Varma, Pawan S. Budhwar, Angelo S. De Nisi, Digital Marketing, Wiley, 2016.
6. David Bain – Digital Marketing in 2017

AY: 2022-23 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech -S&H III Year-II Sem			
Course Code: **L32O3**	**Open Elective-III Number Theory & Cryptography**	L	T	P	D
Credits: **3**		**3**	**0**	**0**	**0**

Pre-Requisites:

Module –I Divisibility Theory And Canonical Decompositions[9L]

Division algorithm – Base – b representations – Number patterns – Prime and composite numbers – GCD – Euclidean algorithm – Fundamental theorem of arithmetic – LCM.

Module 2: Diophantine Equations And Congruence's [10L]

Linear Diophantine equations – Congruence‘s – Linear Congruence‘s – Applications: Divisibility tests – Modular exponentiation-Chinese remainder theorem – 2 x 2 linear systems.

Module 3: Classical theorems and Multiplicative functions [9L]

Wilson‘s theorem – Fermat‘s little theorem – Euler‘s theorem – Euler‘s Phi functions

Module 4: Classical Encryption Techniques [10L]

Classical encryption techniques: Symmetric chipper model – Substitution techniques – Transposition techniques – Steganography.

Module 5: Block chippers public key Encryption [10L]

Block chipper principles – block chipper modes and operations – advanced encryption standards (AES) – Public key cryptography – Principles of public key cryptosystem – The RSA algorithm – Elliptic curve arithmetic – Elliptic curve cryptosystem.

Text Books

1. Koblitz, N. "Course on Number Theory and Cryptography", Springer Verlag, 1986
2. Menezes, A, et.al. "Handbook of Applied Cryptography", CRC Press, 1996

Reference Books

1. Ivan Niven, Herbert S. Zukerman, Hugh L. Montgomery, "An Introduction to the Theory of Numbers".

E-Resources

1. https://people.maths.bris.ac.uk/~mazag/nt/lecture1.pdf
2. https://www.diva-portal.org/smash/get/diva2:530204/FULLTEXT01.pdf
3. https://en.wikipedia.org/wiki/Multiplicative_function
4. https://www.slideshare.net/PrachiGulihar/elementary-cryptography
5. https://en.wikipedia.org/wiki/Public-key_cryptography

Course Outcomes

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

CO1. Ability to think and reason about abstract mathematics

CO2. Analyze the vulnerabilities in any computing system and hence be able to design a security solutions

CO3. Evaluate security mechanisms using rigorous approaches, including theoretical

CO4. Solve problems in elementary number theory

CO5. Apply elementary number theory to cryptography

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	3	2	3	3	-	-	-	-	-	-	-	2	-	-
CO2	3	2	3	3	-	-	-	-	-	-	-	2	-	-
CO3	3	2	3	3	-	-	-	-	-	-	-	2	-	-
CO4	3	2	3	3	-	-	-	-	-	-	-	2	-	-
CO5	3	2	3	3	-	-	-	-	-	-	-	2	-	-
Average	3	2	3	3	-	-	-	-	-	-	-	2	-	-

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

AY: 2022-23 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech -S&H III Year-II Sem			
Course Code: **L32O4**	**NDT and VACUUM TECHNOLOGY (Open Elective)**	L	T	P	D
Credits: **3**	(COMMON TO: All branches)	**3**	**0**	**0**	**0**

Pre-Requisites: Nil

Module- 1: Introduction to Non-destructive testing [8L]

Introduction, Objectives of Non-destructive testing, Types of defects – Cracking, Spalling, Staining, Construction and Design defects, Honey combing, Dusting, Blistering, Rain damage.

Module -2: Methods of Non-destructive Testing [9L]

Methods of Nondestructive Testing: Liquid penetration method, Dye penetration method, Ultrasonic Inspection method, Pulse Echo method, Radiographic testing Magnetic particle testing, Eddy current Testing.

Module- 3: Vacuum Technology and Flow Meters [9L]

Vacuum Technology: Definition of vacuum, Degrees of vacuum and their ranges; Review of Kinetic theory of gases; Definitions of particle flux, mono layer formation time, pressure; Elementary gas transport phenomena; Knudsen's and Reynolds' numbers; Throughput, mass flow and conductance.

Flow meters: Molar flow, Mass flow.

Module- 4: Pressure gauges [8L]

Pressure gauges: Classification, Direct and indirect gauges, Indirect gauges – Pirani gauge, Thermocouple gauge, Ionization gauge, hot cathode gauge, Penning gauge.

Module-5 : Vacuum Pumps [9L]

Introduction, Pumping speed, Rotary vane pump, Turbo molecular pump, Diffusion pumps.

Text Books

1.B K Pandey, S Chaturvedi, "Engineering Physics", Cengage learning, 1st Edition, 2014.

2. John. F. O'Hanlon, "A User's guide to Vacuum technology", Wiley, 3rd Edition, 2003.

Reference Books

1. R Srinivasan, "Physics for Engineers", New Age international, 1st reprint, 2007.

2. R K Gaur and S L Gupta, "Engineering Physics", Dhanpat rai, Reprint, 2006.

3. Krishna Seshan, "Hand Book of Thin film deposition", Noyes, 2nd Edition, 2002.

E-Resources

1. http://www.enfm.net/catalog/catalog/enfm-usa.pdf
2. http://web.itu.edu.tr/~arana/ndt.pdf
3.http://www.issp.ac.ru/ebooks/books/open/Nondestructive_Testing_Methods

_and_New_Applications.pdf
4.http://nptel.ac.in/courses/114106035/35
5. http://nptel.ac.in/courses/112101004/37

Course Outcomes

After completion of this course the student is able to
1. Describe the Types of defects and analyze them.
2. The principles of NDT methods.
3. Analyze Vacuum technology and concepts of flow meters.
4. Apply the basic knowledge on pressure gauges.
5. Understand the concepts of different vacuum pumps.

AY: 2022-23 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech -S&H IV Year-I Sem			
Course Code: **L3205**	**Chemistry for Engineers** (COMMON TO: All branches)	L	T	P	D
Credits: **3**		**3**	**0**	**0**	**0**

Pre-Requisites: Nil

Module 1: Fibres and Rubbers [9]

Fibres-classification-Characteristics of fibres-Preparation and applications of Nylon-6, 6 and Dacron-Fibre reinforced plastics(FRP)-Applications.
Rubbers-Natural rubber and its vulcanization. Elastomers-Buna-S, Butyl rubber and Thiokol rubber.

Module 2: Polymers for Electronics[10]

Polymer resists for integrated circuit fabrication, lithography and photolithography, Electron beam, X-ray and ion sensitive resists, Conducting polymers, types, properties and applications, electroluminescence, molecular basis of electrical conductivity, Photonic applications and non-linear optics, optical information
Storage.

Module 3: Analysis and Testing of Polymers [8]

Chemical analysis of Polymers: Spectroscopic methods – IR spectroscopy, Raman spectroscopy, NMR spectroscopy, Mass spectroscopy – X-Ray Diffraction analysis. Thermal analysis: Differential Thermal Analysis (DTA), Differential Scanning Calorimetry (DSC), Thermo Gravemetric Analysis (TGA).

Module 4: Surfactants and Lubricants[10]

Methods of preparation, cleaning mechanism. Critical micelle concentration and its determination. Hydrophobic and hydrophilic interactions. Micelles and reverse micelles. Detergents. Fricohesity of surfactants. Lubricants-physical and chemical properties, types and mechanism of lubrication. Additives of lubricants and freezing points of lubricants.

Module 5: Metals and Alloys [9]

Phase rule and applications to one, two and multi-component systems. Iron-carbon phase diagram. Types of alloys, carbon steel, alloy steel, alloys of Cu, Al, Pb.

Text Books

1. A Textbook of Engineering Chemistry, by Shashi Chawla
2. Engineering Chemistry, by S. S. Dara

Reference Books

1. Engineering Chemistry, by P. C Jain and M. Jain
2. Advanced Polymer Chemistry, by M. Chanda

E-Resources

1. https://www.acs.org/content/acs/en/careers/college-to-career/chemistry-careers/nanochemistry.html
2. https://www.sciencedirect.com/book/9780444519566/nanochemistry
3. https://www.researchgate.net/publication/320068992_Introduction_to_Nano-chemistry_and_Nano-materials
4. https://www.kemi.dtu.dk/english/research/organic-inorganic-chemistry/nanochemistry
5. https://www.cambridge.org/core/books/engineering-chemistry/nanochemistry/D6DB35E32E530525DD927E68CED43197

Course Outcomes

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

1. Learn the different synthetic methods of the fibres and rubbers.
2. Know the electronic applications of polymers.
3. Acquire the knowledge on various instrumental methods of analysis.
4. Know the use of surfactants and lubricants.
5. Learn the use and applications of alloys.

AY 2022-23 onwards	J. B. INSTITUTE OF ENGINEERING AND TECHNOLOGY (UGC Autonomous)	B. Tech S&H III Year – II Sem			
Course Code: **L32O6**	**TECHNICAL COMMUNICATION SKILLS (COMMON TO ALL)**	**L**	**T**	**P**	**D**
Credits: 3		**3**	**0**	**0**	**0**

Pre-Requisites: Nil

Objectives:

1. Understand the role of language as a communication
2. Employ the role of presentation skills in public speaking
3. Know the importance of body language
4. Examine the role of group discussion for getting jobs
5. Understand the importance of interview skills for getting jobs

Module -I Language as a Communication

Introduction-definition-the process of communication-types of communication-barriers of communication; language and communication-properties of language.

Module -II Presentation Skills

Nature and importance of oral presentation-planning the presentation-preparing the presentation-organizing the presentation-rehearsing the presentation and checklist for making oral presentation

Module -III Body Language

Introduction-definition-eye contact- facial expressions-gesture and posture.

Module -IV Group Discussion

Nature of GD- Characteristics and Strategies of GD-Techniques for Individual Contribution-Group Interaction Strategies.

Module -V Interview Skills

The Interview Process-Characteristics of Interview-Pre-interview preparation Techniques-interview questions-FAQ- Projecting a Positive Image and Alternative Interview Format.

References:

1) Raman, Meenakshi and Sangeeta Sharma. Technical Communication-Principles and Practice. Third Edition, New Delhi: UP., 2015.
2) Rizvi, M Ashraf. Effective Technical-Communication. New Delhi: Tata McGraw-Hill., 2005.

Course outcomes:

1. Use the language skills in order to better communication
2. Learn the presentation skills and use them in conferences and seminars
3. Identify the role of presentation skills in expressing our feelings and emotions
4. Understand the role of group discussion for getting jobs
5. Know the importance of interview skills for getting jobs

CO-PO/PSO Mapping

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 ***	
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	..	..	..	..	..	..	..	..	2	3	..	3	..	..
CO2	..	..	..	..	..	..	..	..	2	3	..	3	..	..
CO3	..	..	..	..	..	..	..	..	2	3	..	3	..	..
CO4	..	..	..	..	..	..	..	..	2	3	..	3	..	..
CO5	..	..	..	..	..	..	..	..	2	3	..	3	..	..
Total	..	..	..	..	..	..	..	..	2	3	..	3	..	..

OPEN ELECTIVE-IV

AY: 2022-23 Onwards	**J. B. Institute of Engineering and Technology** (UGC Autonomous)	**B. Tech CE IV Year-I Sem**			
Course Code: **L41OA**	**ENVIRONMENTAL IMPACT ASSESSMENT (OE-IV)**	L	T	P	D
Credits: 3		**3**	**0**	**0**	**0**

Pre-Requisites: Environmental Science.

Module 1:

Unit-1: Initial Environmental examination –Factors affecting EIA – Need for Environmental Impact Assessment (EIA), Rapid and Comprehensive EIA, Environmental Impact statement (EIS)
– EIA capability and limitations – Legal provisions on EIA – stages of EIA.

Module 2:

Unit-1: Role of NEPA in EIA, CEQ, Environmental documents. EIA/ EIS& FONSI relationship, processing of EIA/EIS, Environmental attributes.

Methodologies: Criteria to be considered for the selection of EIA methodologies, Adhoc, overlays, Check lists – Matrices – Networks – Cost-benefit analysis with their advantages and limitations.

Module 3:

Unit-1: EIA guidelines for Development Projects, Prediction and Assessment – Assessment of Impact on land, water, air, and noise. Social and cultural activities and on flora and fauna – mathematical models – public participation, Forest act 1980, Wild life Protection Act-1972, The water (Prevention and control) Act-1974

Module 4:

Unit-1: Environment management plan:

Plan for mitigation of adverse impact on Environment – Options for mitigation of impact on water, air, land and on flora and fauna – Addressing the issues related to project affected people. Post project monitoring. ISO 9000, 14000 & 18000.

Module 5:

Unit-1:

EIA for Water resource developmental projects, Highway projects: Nuclear Power plant projects, Mining project (Coal, Iron ore), Thermal Power Plant, Infrastructure Construction Activities.

Text Books

1. "Environmental Impact Assessment" by S.R. Khandeshwar N.S. Raman, A.R. Gajbhiye, I k international house publishing, pvt ltd. 1st addition Sep 2019.
2. "Environmental Impact Assessment" by Barthwell, R. R. New Age International Publications. 3rd addition Oct 2017.

Reference Books

1. "Environmental Impact Analysis" by Jain R.K.-Van Nostrand Reinhold Co, H

K E S international publication, 3rd addition oct 2014.
2. "Environment Impact Assessment" by Anjaneyulu, B S Publication, 2nd addition Jan 2010

Web Resources

1. https://nptel.ac.in/courses/120/108/120108004/

Course Outcomes

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

1. **Explain** the stages and need for environmental impact assessment.
2. **Discuss** different methodologies for environmental impact prediction and assessment.
3. **Evaluate** the environmental management plans.
4. **Solve** the problems associated with adverse impact on environment.
5. **Apply** the knowledge of EIA on 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	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	2	-	-	-	1	2	3	-	-	-	-	2	1
CO2	-	-	-	-	-	2	3	1	-	-	-	-	1	1
CO3	-	-	-	-	-	2	2	3	-	-	-	-	2	1
CO4	-	2	-	-	-	1	2	3	-	-	-	-	1	3
CO5	-	-	-	-	-	1	3	2	-	-	-	-	2	2
Average	-	0.8	-	-	-	1.4	2.4	2.4	-	-	-	-	1.6	1.6

AY: 2022-23 Onwards	J. B. INSTITUTE OF ENGINEERING AND TECHNOLOGY (UGC Autonomous)	B. Tech-CSE IV Year- I Sem			
Course Code: **L41OB**	**INTRODUCTION TO PYTHON PROGRAMMING (Open Elective -IV)**	L	T	P	D
Credits: **3**		**3**	**0**	**0**	**0**

Pre-Requisites: NIL

Course Objectives:

The students should be able to

1. Acquire programming skills in core Python.
2. Apply the Python programming language operations, control structures
3. Develop the ability to use built-in data types
4. Develop the skill of creating functions, writing data to files
5. Acquire Object Oriented Skills in Python

Module 1: Introduction

Unit-I: History

Python Introduction, History of Python, Introduction to Python Interpreter and program execution, Python Installation Process in Windows and Linux, Introduction to anaconda.

Unit-II: Variables

Python IDE, python variable declaration, Keywords, Indents in Python, Python input/output operations.

Module 2: Operators, Conditional Statements, Loops

Unit-I: Operators

Arithmetic Operators, Comparison Operators, Assignment Operators, Logical Operators, Bitwise Operators, Membership Operators, Identity Operators, Ternary Operator, Operator precedence.

Unit-II: Conditional Statements, Loops

Conditional Statements (If, If-else, If-elif-else, Nested-if etc.) and loop control statements (for, while, Nested loops, Break, Continue, Pass statements)

Module 3: Built-in Data types

Unit-I: Strings, Lists

Strings Creating, initializing and accessing the elements; String operators, String functions and methods. Lists: Concept of mutable lists, creating, initializing and accessing the elements, traversing, appending, updating and deleting elements

Unit-II: Tuple, Set, Dictionary

Tuples creating, initializing and accessing the elements in a tuple. Concept of key-value pair, creating, initializing and accessing the elements in a dictionary, dictionary operations, Dictionary functions and methods.

Module 4: Functions and Files

Unit-I: Functions

Introduction to functions, Function definition and calling, Function parameters, Default argument function, Variable argument function, in built functions in python, Scope of variable in python.

Unit-II: Files

Concept of Files, File opening in various modes, closing of a file. Reading from a file, writing onto a file, some important File handling functions.

Module 5: Object oriented Programming

Unit-I: Programming types

Programming types, Procedure-oriented programming, Object Oriented Programming.

Unit-II:

Accessing Databases using Python.

Text Books

1. Python for Everybody: Exploring Data in Python 3 by Charles Severance

Reference Books

1. Programming in Python 3 - A complete Introduction to the Python Language Second Edition, Mark Summerfield, Addison-Wesley 2010
2. Object-Oriented Programming in Python, Michael H, Goldwasser, David Letscher, Pearson Prentice Hall, 2008.
3. Programming Python- 4 th Edition, Mark Lutz, O'Reilly, 2011.

E-Resources

1. https://www.youtube.com/watch?v=YYXdXT2l-Gg&list=PL-osiE80TeTskrapNbzXhwoFUiLCjGgY7
2. https://docs.python.org/3/tutorial/
3. https://www.programiz.com/python-programming
4. https://www.w3schools.com/python/

Course Outcomes

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

CO1. Choose the right data representation formats based on the requirements of the problem.
CO2. Identify tasks and write programs in python, to solve the task.
CO3. Use the comparisons and limitations of the various built-in data types and choose the right one.
CO4. Identify and write the functions, programs required for accessing files.
CO5. Demonstrates how to achieve reusability using inheritance, interfaces.

AY 2022-23 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech: AI&ML IV Year-I Sem			
Course Code: **L410C**	**INTRODUCTION TO DEEP LEARNING (Open Elective IV)**	**L**	**T**	**P**	**D**
Credits: 3		**3**	**0**	**0**	**0**

Pre-Requisites:

1. 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, RMSProp, Adam.

Module 3:

Neural Network

Introduction to Neural Network, Multilayer Perceptron, Back Propagation Learning, Unsupervised Learning with Deep Network, Autoencoders, Convolutional Neural Network, Building blocks of CNN, Transfer Learning, LSTM Networks.

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

Module 5:

Applications

Detection & Segmentation problem definition, challenges, Evaluation, Datasets and Localization by regression, Detection as classification

Region proposals, RCNN and YOLO architectures, fully convolutional segmentations, Mask-RCNNs.

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. Implement 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 2022-23 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech: AI&DS IV Year – I Sem			
Course Code: **L410D**	**OPEN ELECTIVE – IV FUNDAMENTALS OF BIG DATA**	**L**	**T**	**P**	**D**
Credits: 3		**3**	**0**	**0**	**0**

Course Objectives:

1. The purpose of this course is to provide the students with the knowledge of Big data Analytics principles and techniques.
2. This course is also designed to give an exposure of the frontiers of Big data Analytics

MODULE-I: Introduction to Big Data and Big Data Analytics

Unit 1:

Introduction to Big Data: Big Data and its Importance, Four V's of Big Data,Structring Big Data

Unit 2:

Drivers for Big Data, Introduction to Big Data Analytics, Classification of Analytics, Big Data Analytics applications

MODULE- II: Big Data Technologies Unit 1:

Big Data Technologies: Hadoop's Parallel World, Data discovery, Open source technology for Big Data Analytics, cloud and Big Data.

Unit 2:

Predictive Analytics, Mobile Business Intelligence and Big Data

MODULE- III: Introduction to Hadoop and Map Reduce

Unit 1:

Introduction Hadoop: Big Data, Apache Hadoop & Hadoop Eco System, Moving Data in and out of Hadoop.

Unit 2:

Map Reduce, understanding inputs and outputs of Map Reduce - Data Serialization.

MODULE- IV:Hadoop Architecture & HDFS Architecture

Unit 1:

Hadoop Architecture: Hadoop: RDBMS Vs Hadoop, Hadoop Overview, Hadoop distributors, HDFS,HDFS Daemons, Anatomy of File Write and Read., Name Node, Secondary Name Node, and DataNode.

Unit 2:

HDFS Architecture, Hadoop Configuration, Map Reduce Framework, Role of HBase in Big Data processing, HIVE, PIG.

MODULE- V: Data Analytics & Social Media Analytics

Unit 1:

Data Analytics with R Machine Learning: Introduction, Supervised Learning, Unsupervised Learning.

Unit 2:

Collaborative Filtering, Social Media Analytics, Mobile Analytics, Big Data Analytics with Big R

TEXT BOOKS:

1. Big Data Analytics, Seema Acharya, Subhasini Chellappan, Wiley 2015.
2. Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Business, Michael Minelli, Michehe Chambers, 1st Edition, Ambiga Dhiraj, Wiely 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, Arvind Sathi, 1st Edition, IBM Corporation, 2012.

REFERENCE BOOKS:

1. Big Data and Business Analytics, Jay Liebowitz, Auerbach Publications, CRC press (2013)
2. Using R to Unlock the Value of Big Data: Big Data Analytics with Oracle R Enterprise and Oracle R Connector for Hadoop, Tom Plunkett, Mark Hornick, McGraw-Hill/Osborne Media (2013), Oracle press.
3. Professional Hadoop Solutions, Boris lublinsky, Kevin t. Smith, Alexey Yakubovich, Wiley, ISBN: 9788126551071, 2015.
4. Understanding Big data, Chris Eaton, Dirk deroos et al. McGraw Hill, 2012.
5. Intelligent Data Analysis, Michael Berthold, David J. Hand, Springer, 2007.
6. Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics, Bill Franks, 1st Edition, Wiley and SAS Business Series, 2012.

Courses Outcomes:

1. Ability to explain the foundations, definitions, and challenges of Big Data and various Analytical tools.
2. Ability to program using HADOOP and Map reduce, NOSQL
3. Ability to understand the importance of Big Data in social media and Mining.

AY: 2022-23 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech ECE IV Year-I Sem			
Course Code: **L41OE**	**CONSUMER ELECTRONICS (OPEN ELECTIVE)**	L	T	P	D
Credits: **3**		**3**	**0**	**0**	**0**

Pre-Requisites: NIL

Module 1: [10L]

Unit-I: [6L]

Audio Fundamentals and Devices: Basic characteristics of sound signal: level and loudness, pitch, frequency response, fidelity and linearity, Reverberation. Audio level metering, decibel level in acoustic measurement. Microphone: working principle, sensitivity, nature of response, directional characteristics.

Unit-II: [4L]

Types: carbon, condenser, crystal, electrets, tie- clip, wireless. Loudspeaker: working principle, characteristic impedance, watt capacity. Types: electrostatic, dynamic, permanent magnet, woofers, and tweeters. Sound recording: Optical recording, stereophony and multichannel sound, MP3 standard.

Module 2: [8L]

Unit-I: [4L]Audio systems: CD player, home theatre sound system, surround sound. Digital console: block diagram, working principle, applications.

Unit-II: [4L]FM tuner: concepts of digital tuning, ICs used in FM tuner TDA 7021T. PA address system: planning, speaker impedance matching, Characteristics, power amplifier, Specification.

Module 3: [8L]

Unit-I: [4L]Television Systems: Monochrome TV standards, scanning process, aspect ratio, persistence of vision and flicker, interlace scanning, picture resolution. Composite video signal: horizontal and vertical sync details, scanning sequence.

Unit-II: [4L]Colour TV standards, colour theory, hue, brightness, saturation, luminance and chrominance. Different types of TV camera. Transmission standards: PAL system, channel bandwidth

Module 4: [10L]

Unit-I: [5L]Television Receivers and Video Systems: PAL-D colour TV receiver, block diagram, Precision IN Line colour picture tube. Digital TVs: - LCD, LED, PLASMA, HDTV, 3-D TV, projection TV, DTH receiver.

Unit-II: [5L]Video interface: Composite, Component, Separate Video, Digital Video, SDI, HDMI

Multimedia Interface), Digital Video Interface. CD and DVD player: working principles, Interfaces.

Module 5: [9L]

Unit-I: [5L]Home / Office Appliances: FAX and Photocopier. Microwave Oven: types, single chip controllers, wiring and safety instructions, technical

specifications. Washing Machine: wiring diagram, electronic controller for washing machine, technical specifications, types of washing machine, fuzzy logic.

Unit-II:[4L]Air conditioner and Refrigerators: Components features, applications, and technical specification. Digital camera and cam coder: - pick up devices - picture processing - picture storage.

Textbooks

4. Consumer Electronics, Bali S.P., Pearson Education India,2010.
5. Audio video systems: principle practices & troubleshooting, Bali R and Bali S.P., Khanna Book Publishing Co. (P) Ltd., 2010Delhi, India.

Reference Books

3. Intellectual Property in Consumer Electronics, Software and Technology Startups, Springer Nature; 2014th edition (24 September 2013),ISBN-10:9781461479116.
4. Consumer Electronics, B.R. Gupta , V. Singhal, S.K. Kataria & Sons; 2013th edition.

E-Resources

1. https://www.allaboutcircuits.com/videos/category/consumer-electronics/
2. https://www.youtube.com/watch?v=IttXKAGl6zE

Course Outcomes

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

CO1. Learn how a Consumer Product is developed.

CO2. **Analyze** how to simulate and test that designs.

CO3. **Apply** in-depth study of systems and the use of those.

CO4. **Understand** concept of Audio Systems.

CO5. **Develop**Television Receivers & Video Systems.

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	3	-	-	-	-	-	-	-	2	-
CO2	2	2	-	-	-	-	-	-	-	-	-	-	2	-
CO3	3	2	-	-	-	-	-	-	-	-	-	-	2	-
CO4	-	-	-	-	-	-	-	-	-	-	-	-	2	-
CO5	2	-	3	3	-	-	-	-	-	-	-	-	2	-
Average	2.3	2	2.5	2.5	3	-	-	-	-	-	-	-	2	**-**

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

AY: 2022-23 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech ECM IV Year-I Sem			
Course Code: **L41OF**	**INTRODUCTION TO EMBEDDED SYSTEMS (Open Elective-IV)**	L	T	P	D
Credits: **3**		**3**	**0**	**0**	**0**

Pre-Requisites: Nil

Course Objectives:

Students will learn to

1. Understand the basic concepts of embedded systems and 8051 microcontrollers.
2. Compare and contrast the basics of assembly programming language.
3. Identify the unique characteristics of real-time systems
4. Analyze the general structure of a real-time system and define the unique design problems and challenges of real-time systems.
5. Acquaint the embedded software development tools and various advanced architectures.

Module 1:

Unit-I: Embedded Computing

Introduction, complex systems and microprocessor, the embedded system design process, formalisms for system design, design examples

Unit-II: The 8051 Architecture

Introduction, 8051 micro controller hardware, input/output ports and circuits, external memory, counter and timers, serial data input/output, interrupts.

Module 2:

Unit-I: Basic Assembly Language Programming Concepts

The assembly language programming process, programming tools and techniques, programming the 8051.

Unit-II:

Data transfer and logical instructions, arithmetic operations, decimal arithmetic, jump and call instructions.

Module 3:

Unit-I: Introduction to Real-Time Operating Systems

Tasks and task states, tasks and data, semaphores, and shared data; message queues, mailboxes and pipes, timer functions, events, memory management, interrupt routines in an RTOS environment.

Unit-II: Basic Design Using a Real-Time Operating System

Principles, semaphores and queues, hard real-time scheduling considerations, saving memory and power, an example RTOS like uC-OS (open source).

Module 4:

Unit-I: Embedded Software Development Tools

Host and target machines, linker/locators for embedded software, getting embedded software into the target system

Unit-II: Debugging Techniques

Testing on host machine, using laboratory tools, an example system.

Module 5:

Unit-I: Introduction to advanced Architectures

ARM and SHARC, processor and memory organization and instruction level parallelism.

Unit-II: Networked embedded systems: bus protocols, I2C bus and CAN bus; internet-enabled systems, design example-elevator controller.

Text Books

1. Wayne Wolf (2008), Computers as Components-principles of embedded computer system design, Elseveir, New Delhi, India.
2. Kenneth J. Ayala (2008), The 8051 Microcontroller, 3rd edition, Cengage Learning, India.

Reference Books

1. David E. Simon (1999), An Embedded Software Primer, Pearson Education, India.
2. Jean J. Labrosse (2000), Embedding System Building Blocks, 2nd edition, CMP publishers, USA.
3. Raj Kamal (2004), Embedded Systems, Tata McGraw hill, India.

E-Resources

1. https://nptel.ac.in/courses/108/102/108102045/
2. https://www.edx.org/course/utaustinx/utaustinx-ut-6-02x-embedded-systems-4806

Course Outcomes

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

CO1. Program an embedded system.

CO2. Analyze Interfacing with keyboard, A/D & D/A conversions, serial data Communication, LCD and LED display.

CO3. Illustrate Tasks, Semaphores, Message queues, pipes, Timer functions.

CO4. Design embedded systems and real-time systems.

CO5. Compare and contrast ARM, SHARC, internet enabled systems.

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	1	2	-	-	-	-	-	1	-	2	2	2	-
CO2	2	2	2	-	-	-	-	-	2	-	2	2	3	1
CO3	2	2	-	-	-	-	-	-	2	-	-	2	3	1
CO4	1	3	-	-	-	-	-	-	2	-	-	2	3	1
CO5	2	1	-	-	-	-	-	-	2	-	2	2	2	1
Average	1.8	1.8	2	-	-	-	-	-	1.8	-	2	2	2.6	1

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

AY: 2022-23 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech EEE IV Year-I Sem			
Course Code: **L41OG**	**SPECIAL ELECTRICAL MACHINES (OPEN ELECTIVE-IV)**	L	T	P	D
Credits: **3**		**3**	**0**	**0**	**0**

Pre-Requisites: Basic Electrical and Electronics Engineering

Module 1: PERMANENT MAGNET BRUSHLESS DC MOTORS [8L]

Fundamentals of permanent magnets – types - principle of operation- magnetic circuit analysis - EMF and torque equations, Characteristics and control.

Module 2: PERMANENT MAGNET SYNCHRONOUS MOTORS [12L]

Principle of operation – EMF and torque equations - Phasor diagram - Power controllers – performance characteristics – Digital controllers – Constructional features, operating principle and characteristics of synchronous reluctance motor.

Module 3: SWITCHED RELUCTANCE MOTORS [10L]

Constructional features – Principle of operation - Torque prediction – performance Characteristics-Power controllers – Control of SRM drive - Sensor less operation of SRM – Applications.

Module 4: STEPPER MOTORS [10L]

Constructional features –Principle of operation –Types – Torque equation – Linear and Nonlinear analysis – Characteristics – Drive circuits – Closed loop control – Applications.

Module 5: OTHER SPECIAL ELECTRICAL MACHINES [8L]

Principle of operation and characteristics of Hysteresis motor – AC series motors – Linear inductionmotor – Applications.

Text Books

1. T.J.E. Miller, Brushless magnet and Reluctance motor drives, Claredon press, London, 1989.
2. R.Krishnan, Switched Reluctance motor drives, CRC press, 2001.
3. T.Kenjo, Stepping motors and their microprocessor controls, Oxford University press, New Delhi, 2000.
4. K. Venkataratnam, Special Electrical Machines, Universities Press, 2014.

Reference Books

1. T.Kenjo and S.Nagamori, Permanent magnet and Brushless DC motors, Clarendon press, London, 1988.
2. R.Krishnan, Electric motor drives, Prentice hall of India, 2002.
3. D.P.Kothari and I.J.Nagrath, Electric machines, Tata Mc Graw hill publishing company, New Delhi,Third Edition, 2004
4. Irving L.Kosow, Electric Machinery and Transformers, Pearson Education, Second Edition, 2007

E-Resources

1. https://nptel.ac.in/courses/108/102/108102156/
2. https://www.academia.edu/9885014/SPECIAL_ELECTRICAL_MACHINES_NPTEL_NOTES
3. https://easyengineering.net/ee6703-special-electrical-machines/

Course Outcomes

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

CO 1. Analyze given magnetic circuit and understand operation, characteristics and control of PMBLDC motor.
CO 2. Understand the construction, operation performance characteristics of PMSM and its power controllers.
CO 3. Understand the construction, operation and control of SRM drive and its power controllers.
CO 4. Understand the construction, operation, characteristics and control of stepper motor.
CO 5. Understand the operation & characteristics of other special electrical machines.

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	1	3	3	3	-	-	-	-	-	-	-	-	3	3
CO2	2	2	-	-	-	-	-	-	-	-	-	-	-	-
CO3	2	2	-	-	-	-	-	-	-	-	-	-	-	-
CO4	2	2	-	-	-	-	-	-	-	-	-	-	-	-
CO5	2	2	-	-	-	-	-	-	-	-	-	-	-	-
Average	1.8	2.2	3	3	-	-	-	-	-	-	-	-	3	3

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

AY: 2022-23 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech IT IV Year-I Sem			
Course Code: **L41OG**	**Object Oriented Analysis and Design (OPEN ELECTIVE-IV)**	L	T	P	D
Credits: **3**		**3**	**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 BOOK

1. Grady Booch, James Rumbaugh, Ivar Jacobson : The Unified Modeling Language User Guide, Pearson Education**.**

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.

CO 4. Analyze Dynamic Aspects of a Software System using Use Case, Interaction and Activity Diagrams.

CO 5. Apply techniques of State Chart Diagrams and Implementation Diagrams to model behavioral aspects and Runtime environment of Software Systems.

AY: 2022-23 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech IV Year-I Sem			
Course Code: **L41OI**	**BASICS OF MINE ENVIRONMENT (OPEN ELECTIVE – IV)**	L	T	P	D
Credits: **3**		**3**	**0**	**0**	**0**

Pre- Requisites: Nil

Course Objectives

This course will enable students to:

1. To introduce about atmospheric, mine air & their limitations
2. To acquaint with spontaneous heating and explosions in coal mines
3. To get idea about sources of dust, and its control in mines
4. To get idea about miners' diseases & lighting in mines
5. To know about reclamation of mines, impact of mining on environment & sustainable mining

Module 1

Atmosphere and mine air composition. Origin of gases, properties, limitations of gases in underground mines

Module 2

Spontaneous Combustion: Factors, control measures.

Explosions: Causes of firedamp explosion, preventive measures against firedamp explosion.

Module 3

Dust: Sources in underground and opencast mines, standards, and control measures.

Module 4

Miner's diseases, Lighting standards in underground and opencast mines**.**

Module 5

Reclamation, plantation of surface mines, Impact of mining on environment & sustainable mining.

Textbooks

1. Elements of Mining Technology (VOL-2) – by D.J. Deshmukh.
2. Surface Mining – by S.K. Das.

Reference Books

1. Mine Ventilation – by G.B. Mishra.

Course Outcomes

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

CO1 Learn about atmospheric and mine air
CO2 Learn about spontaneous combustion and explosion in coal mines
CO3 Understand about dust sources and its control in mines
CO4 Learn about miners' diseases, mine lighting, and its standards
CO5 Learn about reclamation of mines, impacts of mining on environment and sustainable mining

AY: 2022-23 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech MBA IV Year-I Sem			
Course Code: **L41OJ**	**RURAL MARKETING (OPEN ELECTIVE-IV)**	L	T	P	D
Credits: **3**		**3**	**0**	**0**	**0**

Course Objective: To understand the importance of Rural Marketing, Rural Environment, Problems in Rural Marketing in India and Strategies to be adopted by the corporate.

UNIT-I:

Introduction: Meaning - Evolution – Nature and Characteristics of Rural Market – Understanding the Indian Rural Economy –Rural Marketing Models – Rural Marketing Vs Urban Marketing – Parameters differentiating Urban & Rural Market - Differences in consumer behavior in Rural and Urban market.

UNIT-II:

Rural Market Research: Sources of Information- Factors influencing rural consumers during purchase of products – Rural consumer Life style – Approaches and Tools of Marketing Research - Rural Business Research- Evolution of Rural Marketing Research – Sources and methods of data collection , data collection approaches in rural areas, data collection tools for rural market. Limitation and challenges in rural marketing research, role of rural marketing consulting agencies

UNIT-III:

Rural Marketing Mix: Rural Marketing Mix – Additional Ps in Rural Marketing – 4As of Rural Marketing Mix – New Product Development for Rural Market – Rural Market Product Life Cycle – Objectives behind new product launch – New Product development process

UNIT-IV:

Rural Market Brand & Channel Management: Brand Loyalty in Rural Market – Regional Brands Vs National Brands – Channel Management – Indian Rural Retail Market – Rural Retail Channel Management – Strategies of Rural Retail Channel Management.

UNIT-V:

Applications and Innovations: Marketing of Consumer products, services, social marketing, agricultural marketing, rural industry products- Innovation for Rural Market – Marketing Strategies – e- Rural Marketing – Agricultural Co – operative Marketing – Rural Market Mapping – Corporate Social Responsibility – Organized Rural Marketing – IT for Rural Development – e-Governance for Rural India.

TEXT BOOKS:

1. C.S.G. Krishnamacharyulu, Lalitha Ramakrishnan, Rural Marketing: Text and Cases, Pearson Education, 2009.

2. Pradeep Kashyap, Rural Marketing, 3e Perason Education, 2016.
3. Balram Dogra & Karminder Ghuman, Rural Marketing, TMH, 2009.
4. Sanal Kumar Velayudhan, Rural Marketing, 2e Sage publications, 2012.
5. T P Gopalaswamy, Rural Marketing, Environment, problems, and strategies, 3e Vikas Publications, 2016.

OPEN ELECTIVE-V

AY: 2022-23 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech CE IV Year – II Sem			
Course Code: **L42OA**	**ENERGY AUDIT & GREEN BUILDINGS (Open Elective – V)**	L	T	P	D
Credits: **3**		**3**	**0**	**0**	**0**

Pre-requisite: Green buildings

Module 1:

Unit 1: Energy Scenarios:

Energy Conservation-Energy Audit-Energy Consumption-Energy Security-Energy Strategy-Clean Development Mechanism.

Unit 2: Types of Energy Audits and Energy-Audit Methodology:

Definition of Energy Audit-Place of Audit-Energy- Audit Methodology-Financial Analysis-Sensitivity Analysis-Project Financing Options-Energy Monitoring and Training

Module 2:

Unit 1: Environmental Audit:

Environmental Audit; Introduction-Necessity-Norms. Types: Objectives-Bases types; Liabilities Audit-Management Audit-Activities Audit-Client drive and types; regulatory external audits- independent external audit-internal environmental audit -third party audit.

Unit 2: Environmental Impact Assessment:

Introduction-EIA regulations-Steps in Environmental impact assessment process benefits of EIA- limitations of EIA-Environmental Clearance for Civil Engineering Projects.

Module 3:

Unit 1: Energy Sources:

Renewable and Non-renewable sources of energy - Coal, Petroleum, Nuclear, Wind, Solar, Hydro, Geothermal sources, potential of these sources, hazards

Unit 2: Energy Conservation:

Introduction-Specific objectives-need of energy conservation-LEED India rating system and Energy Efficiency.

Module 4:

Unit 1: Green Building:

Introduction-Definition-Benefits-Principles; Planning concept of Green Building-Salient features of Green Building-Environmental Design-Strategies for Building Construction- Process; Improvement in Environmental Quality in Civil Structure. Materials; Bamboo, Rice Husk Ash, Concrete, Plastic Bricks-Reuse of waste materials- Plastic, Rubber, News Paper, Wood, Non- Toxic paint, Green roofing.

Module 5:

Unit 1: Rating system for Green Building:

Leadership in Energy and Environmental Design (LEED) Criteria-Indian Green Building Council (IGBC) Green Rating-Green Rating for Integrated Habitat Assessment (GRIHA) criteria-HVAC unit in Green Building-Certification Programs (including GEM and ECBC Certifications).

TEXT BOOKS:

1. "Sustainable construction: Green Building design and delivery" by Kibert, C.J(John Wiley Hoboken, New Jersey).
2. "Non-Conventional Energy resources" by Chauhan, D S Sreevasthava, S K (New Age International Publishers, New Delhi).
3. "Alternative Building Materials and Technologies" by Jagadeesh, K S, Reddy Venkatta Rama, Nanjunda Rao K S (New Age International Publishers, New Delhi).
4. "Green Buildings" by Gevorkian (McGraw hill publication).

REFERENCES:

1. "Handbook of Green Building Design and Construction" by Sam Kubba (Butterworth-Heinemann).
2. Emerald Architecture: case studies in green buildings, The Magazine of Sustainable Design.
3. Energy Conservation Building Code 2017.

E-Resources:

1. https://nptel.ac.in/noc/courses/noc18/SEM1/noc18-ce06
2. https://nptel.ac.in/noc/courses/noc19/SEM2/noc19-ce40

Course outcomes:

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

1. Differentiate and select best of various energy scenarios and energy auditing methodology
2. Identify various Renewable and Non-renewable sources of energy.
3. Justify others to use the waste materials efficiently and effectively.
4. Explain the application of design guidelines of Green Building considering the Energy Conservation Measures.
5. Discuss the building codes, relevant legislation governing the consumption of resources

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	1	2	1	1	-	1	2	-	-	-	-	-	1	1
CO2	1	2	1	1	-	2	2	-	-	-	-	-	1	-
CO3	2	1	2	1	-	1	2	-	-	-	-	-	-	1
CO4	1	1	1	1	-	2	2	-	-	-	-	-	1	1
CO5	-	1	1	1	-	1	2	-	-	-	-	-	1	-
Average	1	1.4	1.2	1	-	1.4	2	-	-	-	-	-	0.8	0.6

AY: 2022-23 Onwards	J. B. INSTITUTE OF ENGINEERING AND TECHNOLOGY (UGC Autonomous)	B. Tech-CSE IV Year- II Sem			
Course Code: **L41OB**	**INTRODUCTION TO DESIGN THINKING (Open Elective -V)**	L	T	P	D
Credits: **3**		**3**	**0**	**0**	**0**

Pre-Requisites: NIL

Course Objectives:

The students should be able to

1. Understand design thinking skills and customer needs.
2. Use Applied creativity, design thinking approach for idea generation.
3. Understand Design Research strategies, teamwork, and Service design.
4. Understand the Economics of Innovation
5. Understand Design thinking and innovations in various companies.

Module 1:

Unit-I:

Understand the critical design thinking skills needed to either improve an existing product or design a new product.

Identifying & Understanding Customer Needs, Innovation and Business Success Learn to identify customer needs and draft customer needs statements as a first step towards user innovations.

Unit-II:

Design Thinking Approach for New Product Development, Product Specifications. Learn how to translate user needs into product specifications quantitatively, and how establishing product metrics can help to define those specifications. Learn the concepts that drive design thinking.

Module 2:

Unit-I:

Introduction to Synthesis, Applied Creativity, Design Thinking Approach for Idea Generation,

Learn to apply creativity, brainstorming, and concept generation process in designing needs solutions. Translate needs into product specifications, Choose the right development process. Present the final ideas, get real-time feedback.

Unit-II:

Introduction to Ideation and Prototyping Strategies, Prototyping Explore prototyping methods, strategies, and real-life examples where these have been applied to create a design that represents customer needs and product specifications. Submit the project ideas around user innovations.

Module 3:

Unit-I:

Design Thinking Approach for Deciphering Needs, Introduction to Design Research Strategies, Design for Services, Team Work and Service Design

Understand design of services, identify the potential for innovations within them, and learn how to apply product development frameworks to the service context.

Unit-II:

Design Thinking Approach for Concept Development, Product Architecture, Design Thinking Approach for Concept Evaluation, Analyse the economics of the innovation.

Learn to use the modular and integral product architectures in determining the building blocks of a product. Identify customer needs and user groups.

Module 4:

Unit-I:

Analyse the economics of the innovation Learn to perform financial analysis of your project idea and decide if it is backed by a strong business rationale (Worth-It). Design for Environment, User Testing.

Unit-II:

Learn how to apply design for environment principles to a product life cycle.

Product Development Processes, Design Thinking Approach for Obtaining User Feedback (What Works), Marketing of Innovation and Designing Business Models, learn to select and implement a product development process (staged, spiral, and agile) that's aligned to this project needs.

Module 5: Case Studies

Unit-I:

Design Thinking and Innovation at Apple, IDEO Human Centred Service Design,

Unit-II:

Asia Miles Road to Stakeholder Centric Insight Driven Innovation.

Present the final ideas, get real-time feedback.

Text Books

1. Design Thinking: A Guide to Creative Problem Solving for Everyone, Andrew Pressman, Routledge Taylor & Francis eBooks, 2018.

Reference Books

1. Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation, Tim Brown, HarperCollins Publishers, 2009.
2. The Design Thinking Playbook: Mindful Digital Transformation of Teams, Products, Services, Businesses and Ecosystems, Michael Lewrick, Wiley Publishers, 2017.

E-Resources

1. https://www.researchgate.net/publication/329310644_Handbook_of_Design_Thinking
2. https://www.rcsc.gov.bt/wp-content/uploads/2017/07/dt-guide-book-master-copy.pdf
3. http://www.designthinkingbook.co.uk/DT_MJV_book.pdf
4. https://www.tutorialspoint.com/hi/design_thinking/design_thinking_tutorial.pdf
5. https://www.uni-due.de/imperia/md/content/innovationhub/designthingkingforlibraries.pdf
6. https://www.ibm.com/cloud/architecture/files/design-thinking-field-guide.pdf
7. https://thisisdesignthinking.net/on-design-thinking/design-thinking-resources/

Course Outcomes

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

CO1: Identify the Design Thinking skills and customer needs.
CO2: Apply creativity, design thinking approach for idea generation.
CO3: Identify Design Research strategies, teamwork, and Service design.
CO4: Analyse the economics of innovation.
CO5: Identify the Design thinking and innovations in various companies.

AY 2022-23 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech: **AI&ML** IV Year – II Sem			
Course Code: **L420C**	**INTRODUCTION TO GENERATIVE ADVERSARIAL NETWORKS (Open Elective V)**	**L**	**T**	**P**	**D**
Credits: 3		**3**	**0**	**0**	**0**

Pre-Requisites:

1. Math: Linear Algebra, Calculus, Probability and Statistics
2. Data Structures
3. Machine Learning
4. Deep Learning

Course objectives:

The student will:

1. Understand the difference between generative and discriminative models.
2. Identify problems that GANs can solve.
3. Understand the roles of the generator and discriminator in a GAN system.
4. Understand the advantages and disadvantages of common GAN loss functions.
5. Identify possible solutions to common problems with GAN training.

Module 1:

Introduction to GANs:-

What are GANs?- How do GANs work?- GAN Training- Reaching Equilibrium- Applications of GANs

Generative Modelling with encoders:-

Introduction to Generative Modelling- Working of Auto Encoders at high level- Auto Encoders to GAN- Usage of Auto Encoders

Module 2:

Convolutional Neural Networks:

Introduction to CNN- Convolutional Filters- Parameter sharing- ConvNets Visualized.

Deep GAN:

Introduction to Deep GAN- Batch Normalization- Understanding Normalization- Computing Normalization.

Module 3:

Evaluation:

Evaluation Framework- Inception Score- Frechet Inception Distance

Challenges in Training:

Adding Network depth- Min-Max GAN- Non-Saturating GANs- When to Stop training?- Wasserstein GAN

Module 4:

Semi Supervised GAN:

What is Semi Supervised GAN?- Architecture- Training Process- Training Objectives- Implementation- Comparison to fully supervised Classifier

Conditional GAN:

Motivation- CGAN Generator- CGAN Discriminator- Architecture- Implementation

Module 5:

Cycle GAN:

Image to Image Translation- Cycle Consistency Loss- Adversarial Loss- Identity Loss- Architecture- Applications of Cycle GAN

Applications of GAN:

Image Generation- Training GANs for specific image generation tasks- Style Transfer- photo-to-painting and day-to-night style transfer- Data Augmentation- generating realistic synthetic data to enhance the performance and generalization of machine learning models.

Text Books:

1. GANs in Action, Deep learning with Generative Adversarial Networks, Jakub Langr, Vladimir Bok, Manning Publication
2. Generative Deep Learning by David Foster, O'Reilly Media, Inc.

Reference Book:

1. Learning Generative Adversarial Networks,Kuntal Ganguly, Packt Publishing
2. Generative Adversarial Networks Cookbook, Josh Kalin,Packt Publishing

Course outcomes:

The student will be able to:

1. Design generative and discriminative models.
2. Implement problems that GANs can solve.
3. Compare and contrast the roles of the generator and discriminator in a GAN system.
4. Inspect the challenges posed by common GAN loss functions.
5. Implement possible solutions to common problems with GAN training.

AY 2022-23 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech: AI&DS IV Year – II Sem			
Course Code: **L420D**	**CLOUD COMPUTING (Open Elective V)**	**L**	**T**	**P**	**D**
Credits: 3		**3**	**0**	**0**	**0**

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, andrzej Goscinski, 2013 Wiley.
2. Cloud computing: Dr Kumar Saurab Wiley India 2011 **Reference Books:**
3. Cloud Computing: Arshdeep Bahga, Vijay Madisetti, 2014, University Press.
4. Mastering Cloud Computing: Raj Kumar buyya, Christian Vecchiola,selvi-2013.

E - Resources:

1. https://nptel.ac.in/courses/106/105/106105167/1
2. https://sjceodisha.in/wp-content/uploads/2019/09/CLOUD-COMPUTING-Principles-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

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	2	-	-	-	-	-	-	-	-	-	-	2	2
CO2	2	2	-	2	2	-	-	-	-	-	-	-	2	2
CO3	2	2	2	-	2	-	-	-	-	-	-	-	-	2
CO4	2	2	2	-	1	-	-	-	-	-	-	-	-	-
CO5	2	-	-	-	-	-	-	-	-	-	-	-	2	2
Average	**2.0**	**2.0**	**2.0**	**2.0**	**1.7**	-	-	-	-	-	-	-	**2.0**	**2.0**

AY: 2022-23 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech ECE IV Year-II Sem			
Course Code: **L420E**	**Principles of Sensors and their Application (OE-05)**	L	T	P	D
Credits: **3**		**3**	**0**	**0**	**0**

Pre-Requisites:

Course Objectives:

1. Understand the fundamental principles of various sensors and their classifications.
2. Gain knowledge of signal conditioning and interfacing techniques for sensor integration.
3. Explore the applications of physical, chemical, and biological sensors in different domains.
4. Learn about smart sensors, IoT, and their integration in sensor networks.
5. Develop skills in sensor data processing, fusion, and application-specific algorithms.

Module 1: Introduction to Sensors [8L]

Unit-I: Overview of Sensors [4L]

Introduction to sensors: Definition, types, and classifications; Sensing principles: Mechanical, electrical, thermal, and optical; Sensor characteristics: Range, sensitivity, accuracy, resolution, and response time

Unit-II: [4L]

Sensor signal conditioning: Amplification, filtering, and linearization; Sensor interfacing: Analog and digital interfaces; Sensor calibration and compensation techniques

Module 2: Physical Sensors [9L]

Unit-I: [5L]

Temperature sensors: Thermocouples, RTDs, thermistors, and semiconductor temperature sensors; Pressure sensors: Piezoresistive, capacitive, and optical pressure sensors; Strain sensors: Resistive, capacitive, and piezoelectric strain gauges

Unit-II: [4L]

Accelerometers: Piezoresistive, piezoelectric, and capacitive accelerometers; Gyroscopes: Vibrating structure, fiber optic, and MEMS-based gyroscopes; Force and torque sensors: Load cells, strain gauge-based force sensors, and optical torque sensors.

Module 3: Chemical and Biological Sensors [8L]

Unit-I: [4L]

pH sensors: Glass electrode and ion-sensitive field-effect transistor (ISFET) sensors; Gas sensors: Electrochemical, semiconductor, and optical gas sensors; Biosensors: Enzyme-based, DNA-based, and immune sensors.

Unit-II: [4L]

Biosensors (continued): Lab-on-a-chip technology and bio-electrochemical sensors; Environmental sensors: CO2 sensors, humidity sensors, and particulate matter sensors; Biomedical sensors: ECG, EEG, and pulse oximetry sensors.

Module 4: Smart Sensors and Internet of Things (IoT)[10L]

Unit-I: [5L]

Introduction to smart sensors: Features, architecture, and applications; Sensor networks: Wireless sensor networks, ad-hoc networks, and protocols; IoT and sensor integration: Data acquisition, processing, and communication.

Unit-II: [5L]

Energy harvesting for sensors: Solar, thermal, and vibration energy harvesting; Wearable sensors: Applications in healthcare, sports, and activity monitoring; Industrial IoT: Sensor applications in manufacturing, automation, and predictive maintenance

Module 5: Name of the Module [9L]

Unit-I: [5L]

Signal processing techniques for sensor data: Filtering, noise reduction, and feature extraction; Data fusion: Sensor fusion techniques and algorithms Sensor arrays: Beamforming and spatial processing.

Unit-II: [4L]

Sensor-based localization and tracking: GPS, RFID, and computer vision-based methods; Sensor applications in robotics and automation Emerging trends in sensor technology and applications.

Text Books

1. Ernest O Doebelin, "Measurement Systems – Applications and Design", Tata McGraw-Hill,2009.
2. Sawney A K and PuneetSawney, "A Course in Mechanical Measurements and Instrumentation and Control", 12th edition, DhanpatRai & Co, New Delhi,2013.

Reference Books

1. Sensors and Signal Conditioning by Ramon Pallas-Areny and John G. Webster
2. Principles of Measurement Systems by John P. Bentley
3. Sensors and Sensing Technology by V. Venkatesh and R. Srinivasan
4. Biosensors: Essentials by Min Wang

E-Resources

1. NPTEL: Introduction to Sensors (https://nptel.ac.in/courses/117/101/117101073/)
2. Lecture Notes on Sensors and Transducers (http://people.scs.carleton.ca/~soma/tech-notes/Sensors.pdf)
3. Tutorialspoint: Sensors (https://www.tutorialspoint.com/sensors/index.htm)
4. NPTEL: Physical Sensors (https://nptel.ac.in/courses/117/105/117105057/)
5. Lecture Notes on Physical Sensors (http://www-personal.umich.edu/~johannb/Pubs/Sensors-Chapter-Outline.pdf)
6. Tutorialspoint: Physical Sensors (https://www.tutorialspoint.com/physical_sensors/index.htm)
7. NPTEL: Chemical Sensors (https://nptel.ac.in/courses/117/106/117106071/)
8. Lecture Notes on Chemical Sensors (http://www-personal.umich.edu/~johannb/Pubs/Sensors-Chapter-Outline.pdf)
9. Tutorialspoint: Chemical Sensors (https://www.tutorialspoint.com/chemical_sensors/index.htm)
10. NPTEL: Smart Sensors (https://nptel.ac.in/courses/117/107/117107044/)
11. Lecture Notes on IoT and Smart Sensors (https://www.iotforall.com/iot-resources/lecture-notes-internet-of-things/)
12. Tutorialspoint: IoT (https://www.tutorialspoint.com/internet_of_things/index.htm)
13. NPTEL: Sensor Data Processing (https://nptel.ac.in/courses/117/103/117103042/)
14. Lecture Notes on Sensor Data Processing (http://www.dca.fee.unicamp.br/~miyagi/lectures/dsp-lecture-notes.pdf)
15. Tutorialspoint: Signal Processing (https://www.tutorialspoint.com/digital_signal_processing/index.htm)

Course Outcomes

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

CO1. Identify and select appropriate sensors for specific applications based on their sensing principles and characteristics.
CO2. Design sensor interfaces and signal conditioning circuits to enhance the accuracy and reliability of sensor measurements.
CO3. Analyze and evaluate the performance of physical, chemical, and biological sensors in real-world scenarios.
CO4. Develop solutions using smart sensors, IoT, and sensor networks for monitoring and control applications.

CO5. Apply signal processing techniques to sensor data for feature extraction, localization, and tracking in diverse 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	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO4	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Average	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

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

AY: 2022-23 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech ECM IV Year-II Sem			
Course Code: **L42OF**	**INTRODUCTION TO ELECTRONICS INSTRUMENTATION (Open Elective-V)**	L	T	P	D
Credits: **3**		**3**	**0**	**0**	**0**

Pre-Requisites: Nil

Course Objectives:

Students will learn to

1. Get an understanding of various measurement systems functioning and metrices for performance analysis.
2. Understand the principle of operation, working of different electronic instruments viz. Signal generators, signal analyzers, recorders and measuring equipments.
3. Use various measurement techniques for measurement of different physical parameters using different classes of transducers.
4. Gain knowledge on parameters and functions of CRO.
5. Obtain knowledge on various transducers.

Module 1:

Unit-I:

Block Schematics of Measuring Systems, Performance characteristics, Static characteristics, Accuracy, Precision, Resolution, Types of Errors, Gaussian Error, Root Sum Squares formula, Dynamic Characteristics, Repeatability, Reproducibility, Fidelity, Lag; Measuring Instruments: DC Voltmeters, D' Arsonval Movement, DC Current Meters, AC Voltmeters and Current Meters, Ohmmeters.

Unit-II:

Multimeters, Meter Protection, Extension of Range, True RMS Responding Voltmeters, Specifications of Instruments. Electronic Voltmeters, Multimeters, AC,DC Meters, Digital Voltmeters: Ramp Type, Staircase Ramp, Dual Slope Integrating type, Successive Approximation Type,Autoranging,31/2,33/4 Digit Display, Pico ammeter, High Resistance Measurements, Low current Ammeter, Applications.

Module 2:

Unit-I:

Signal Generators: AF, RF Signal Generators, Sweep Frequency Generators, Pulse and Square wave Generators, Function Generators, Arbitrary waveform Generator, Video Signal Generators, and Specifications.

Unit-II:

Signal Analyzers, AF, HF Wave Analyzers, Harmonic Distortion, Heterodyne wave Analyzers, Spectrum Analyzers, Power Analyzers, Capacitance-Voltage Meters, Oscillaors.

Module 3:

Unit-I:

DC and AC Bridges: Wheat Stone Bridge, Kelvin Bridge, AC Bridges, Maxwell, Hay, Schering, Wien, Anderson Bridges.

Unit-II:

Resonance Bridge, Similar Angle Bridge ,Wagner's ground connection, Twin T, Bridged T Networks, Detectors.

Module 4:

Unit-I:

Oscilloscopes: CRT, Block Schematic of CRO, Time Base Circuits, Lissajous Figures, CRO Probes, High Frequency CRO Considerations, Delay lines, Applications, Specifications.

Unit-II:

Special Purpose Oscilloscopes: Dual Trace, Dual Beam CROs, Sampling Oscilloscopes, Storage Oscilloscopes, Digital Storage CROs, Frequency Measurement, Period Measurement, Errors in time/Frequency Measurements, universal counters, Extension of range; Recorders: Strip chart, X-Y, oscillographic recorders.

Module 5:

Unit-I:

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

Unit-II:

Measurement of Physical Parameters: Flow Measurement, Displacement Meters, Liquid level Measurement, Measurement of Humidity and Moisture, Velocity, Force, Pressure - High Pressure, Vacuum level, Temperature - Measurements, Data Acquisition Systems.

Text Books

1. Electronic Measurements and Instrumentations by K. Lal Kishore, Pearson Education - 2010.
2. Electronic instrumentation: H.S.Kalsi - TMH, 2nd Edition 2004.

Reference Books

1. Electronic Instrumentation and Measurements - David A. Bell, Oxford Uiv. Press, 1997.
2. Modern Electronic Instrumentation and Measurement Techniques: A.D. Helbincs, W.D. Cooper: PHI, 5th Edition, 2003.
3. Electronic Measurements and Instrumentation: B. M. Oliver, J. M. Cage TMH Reprint.
4. Industrial Instrumentation: T. R. Padmanabham Spiriger 2009.

Course Outcomes

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

CO1. List the various measurement techniques available and analyze the basic working of instruments used for measurement..

CO2. Compute the errors in measurements and their rectification

CO3. Analyse the working of AC and DC bridges.

CO4. Illustrate the basic principle and working of Oscilloscopes

CO5. Distinguish different types of transducers.

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	3	-	-	-	-	-	-	-	-	-	-	2	2	2
CO2	2	-	-	-	-	-	-	-	-	-	-	-	2	-
CO3	2	2	-	2	-	-	-	-	-	-	-	2	2	-
CO4	2	2	2	2	-	-	-	-	-	-	-	2	2	2
CO5	2	-	2	-	-	-	-	-	-	-	-	-	2	-
Average	2.2	2	2	2	-	-	-	-	-	-	-	2	2	2

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

AY: 2022-23 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech EEE IV Year-II Sem			
Course Code: **L42OG**	**Instrumentation (Open Elective-V)**	L	T	P	D
Credits: **3**		**3**	**0**	**0**	**0**

Pre-Requisites: Electrical Measurements

Module 1: Characteristics of Measuring Instruments and Signal Representations

Unit 1 [6L]

Measuring Systems, Performance Characteristics, – Static characteristics, Dynamic Characteristics; Errors in Measurement – Gross Errors, Systematic Errors, Statistical Analysis of Random Errors.

Unit 2 [6L]

Signal and their representation: Standard Test, periodic, aperiodic, modulated signal, sampled data, pulse modulation and pulse code modulation.

Module 2: Oscilloscope and Digital Voltmeters

Unit 1 [6L]

Cathode ray oscilloscope-Cathode ray tube-time base generator-horizantal and vertical amplifiers-CRO probes-applications of CRO-Measurement of phase and frequency-lissajous patterns-Sampling oscilloscope-analog and digital type.

Unit 2 [6L]

Digital voltmeters- Successive approximation, ramp, dual-Slope integration continuos balance type-Microprocessor based ramp type DVM digital frequency meter-digital phase angle meter.

Module 3: Wave Analyzers and Spectrum Analyzers

Unit 1 [5L]

Wave Analyses - Frequency selective analyzers, Heterodyne, Application of Wave analyzers- Harmonic Analyzers, Total Harmonic distortion.

Unit 2 [5L]

Spectrum analyzers, Basic spectrum analyzers, spectral displays, vector impedance meter, Q meter. Peak reading and RMS voltmeters.

Module 4: Transducers

Unit 1 [6L]

Definition of transducers, Classification of transducers, Advantages of Electrical transducers, Characteristics and choice of transducers; Principle operation of resistor, inductor, LVDT and capacitor transducers; LVDT Applications.

Unit 2 [6L]

Strain gauge and its principle of operation, gauge factor, Thermostats, Thermocouples, Synchros, Piezo electric transducers, photovoltaic, photo conductive cells, photo diodes.

Module 5: Measurement of Non-Electrical Quantities

Unit 1 [5L]

Measurement of strain, Gauge Sensitivity, Displacement, Velocity, Angular Velocity, Acceleration, Force, Torque.

Unit 2 [5L]

Measurement of Temperature, Pressure, Vacuum, Flow, Liquid level.

Text Books

1. A. K. Sawhney, "A course in Electrical and Electronics Measurements and Instrumentation", Dhanapath Rai and Sons., 10th Edition, 2007.
2. Transducers and Instrumentation by D.V.S Murthy, Prentice Hall of India.

Reference Books

1. J.B. Gupta," A course in Electronics and Electrical Measurements and Instrumentation", S. K. Kataria & Sons, 2009.
2. H.S. Kalsi," Electronic Instrumentation", Tata McGraw Hill, 2004.
3. U. A. Bakshi, A. V. Bakshi "Electrical Measurements and Instrumentation", Technical Publications, 2009

E-Resources

1. https://nptel.ac.in/courses/108/105/108105153/
2. https://nptel.ac.in/courses/112/106/112106138/
3. https://nptel.ac.in/courses/112/107/112107242/

Course Outcomes

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

CO1. Compare the performance characteristics of Measuring Instruments.

CO2. Understand operating principles of CRO and Digital Voltmeters.

C03. Understand operating principles of Wave Anlayzer and Spectrum Analyzer.

C04. Summarize the operation of various Transducers.

C05. Measure Non-Electrical Quantities using Transducers.

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**	**PS O1**	**PS O2**
CO1	2	-	2	2	-	-	3	-	-	-	-	-	2	-
CO2	3	-	1	3	-	-	2	-	-	-	-	-	3	-
CO3	3	-	3	2	-	-	2	-	-	-	-	-	3	-
CO4	2	-	3	2	-	-	1	-	-	-	-	-	3	-
CO5	1	-	2	3	-	-	2	-	-	-	-	-	2	-
Average	2.2	-	2.2	2.4	-	-	2	-	-	-	-	-	2.6	-

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

AY: 2022-23 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech IT IV Year-II Sem			
Course Code: **L42OH**	**Cyber Laws and Ethics (Open Elective-V)**	L	T	P	D
Credits: **3**		**3**	**0**	**0**	**0**

Unit I: Information Technology & Cyber Crimes:

Introduction, Glimpses, Definition and Scope, Nature and Extent, Know no Boundaries, Rapid Transmission and Accuracy, Diversity and Span of Victimization, Cyber World, Inadequacy of Law, Influence of Teenagers

Unit II: Technology & Forms of Cyber Crimes:

Influence of Technology on Criminality, Forms of Cyber Crimes.

Unit III: Cyber Crimes 'and Global Response:

Global Perspective, Country wise Legal Response, Country wise Analysis.

Unit IV: Investigation in Cyber Crimes: Implications and Challenges:

Introduction, Procedural Aspects, Issues, Complications and Challenges Concerning Cyber Crimes, Problems and Precautionary measures for Investigation.

Unit V: Cyber Crimes: Discovery and Appreciation of Evidences:

Introduction, Law of Evidence, Evidences in Cyber Crimes: Challenges and Implications, Computer Generated Evidence and their Admissibility, Judicial Interpretation of Computer related Evidence.

Text Book:

1. Dr Pramod Kr.Singh, "Laws on Cyber Crimes [Along with IT Act and Relevant Rules]" Book Enclave Jaipur India..

Course Outcomes: on completion of this course, the students should be able to:

CO 1. Understand Cyber Space, Cyber Crime, Information Technology, Internet & Services.

CO 2. List and discuss various forms of Cyber Crimes

CO 3. Explain Computer and Cyber Crimes

CO 4. Understand Cyber Crime at Global and Indian Perspective.

CO 5. Describe the ways of precaution and prevention of Cyber Crime as well as Human Rights.

AY: 2022-23 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech IV Year-II Sem			
Course Code: **L42OI**	**FUNDAMENTALS TO ROCK MECHANICS (OPEN ELECTIVE – V)**	L	T	P	D
Credits: **3**		**3**	**0**	**0**	**0**

Pre Requisites: Nil

Course Objectives

This course will enable students to:

1. To introduce about concepts of stress and strain and failure criteria for rock and rock mass.
2. To acquaint with pre-mining stresses in rock and various methods of rock stress determination, its importance in mining applications.
3. To get idea about various engineering properties of rocks and soil; rock mass classification and soil classification methods
4. To get idea about instrumentation and monitoring systems used in surface and underground mine excavation stability.
5. To know about various ground improvement techniques and methods for safe mining operations

Module 1

Basic concept of stress, strain and failure of rock, Analysis of stress, Analysis of strain, Constitutive relations, Parameters influencing strength/stress-strain behavior, Failure Criteria for Rock and Rock Mass Classical theories of rock failure: Coulomb's criterion, Mohr's criterion, Pre-mining state of Stress Stresses in rock mass, Factors influencing the in-situ state of stress, Estimating in situ stresses

Module 2

Rock mass Classification and soil characterization, Overview of shear strength and compressibility of soil, Physico-mechanical properties of intact rock, Rock mass classification methods and their applications, Soil classification methods and their applications

Module 3

Response of rock mass and soil to excavation, Response of rock mass to Excavations Underground, Induced stresses and displacements around single opening in rock mass, Ground support interaction analysis and reinforcement

of ground (rock mass and soil), selection and design of support systems.

Module 4

Slope Engineering: Slope failure and causes; Basic approaches to slope stability analysis and stabilisation, Monitoring of Excavation Stability: Purpose and nature of monitoring, Instrumentation and monitoring systems - Load; Stress and Deformation measuring, devices; Interpretation of monitoring data; Practical aspects of monitoring

Module 5

Ground improvement; grouting, fore polling, pre-reinforcement, shotcreteing and other methods

Textbooks

1. Introduction to Rock Mechanics, Goodman, RE.
2. Fundamental of Rock Mechanics by Jaeger, J.C. and Cook, NGW

Reference Books

1. Underground Excavation in Rock, Hoek, E and Brown, ET
2. Rock Mechanics for Underground Mining, Brady, BHG and Brown, ET

Course Outcomes

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

1. Learn about concepts of stress and strain and failure criteria for rock and rock mass.
2. Learn about pre-mining stresses in rock and various methods of rock stress determination, its importance in mining applications.
3. Understand various engineering properties of rocks and soil; rock mass classification and soil classification methods.
4. Learn about instrumentation and monitoring systems used in surface and underground mine excavation stability.
5. Learn about various ground improvement techniques and methods for safe mining operations

AY: 2022-23 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech MBA IV Year-II Sem			
Course Code: **L42OK**	**CUSTOMER RELATIONSHIP MANAGEMENT (Open Elective-V)**	L	T	P	D
Credits: **3**		**3**	**0**	**0**	**0**

Course Objective: To understand the importance of Customer Relationship Management in Business.

UNIT-I:

Introduction to CRM: Concepts, Evolution, Need, understanding goals and objectives of CRM, Components of CRM, Benefits, CRM as a strategic marketing tool, CRM significance to the stakeholders, CRM Applications in Consumer and Business Markets, CRM Issues & Problems.

UNIT-II:

Building Customer Relations: Customer information Database – Customer Profile Analysis - Customer perception, Expectations analysis – Customer behaviour in relationship perspectives; individual and group customer's - Customer life time value – Selection of Profitable customer segments - Customer Life Cycle, Business Networks and CRM.

UNIT-III:

CRM Process: Introduction and Objectives of a CRM Process; an Insight into CRM and e- CRTA/online CRM, The CRM cycle i.e. Assessment Phase; Planning Phase; The Executive Phase; Modules in CRM, 4C's (Elements) of CRM Process, CRM Process for Marketing Organization, CRM Value Chain, CRM Affiliation in Retailing Sector.

UNIT-IV:

CRM Structures: Elements of CRM – CRM Process – Strategies for Customer acquisition – Customer Retention and Development – Strategies for Customer Retention, Models of CRM – G- SPOT Model, KOEL's Model, WebQual Audit Model, ONYX Model - CRM road map for business applications.

UNIT-V:

CRM Planning and Implementation: Strategic CRM planning process – Implementation issues – CRM Tools- Analytical CRM –Operational CRM – Call centre management – Role of CRM Managers, Trends in CRM- e-CRM Solutions –Features and advantages of e CRM, Functional Components of e CRM- Data Warehousing – Data mining for CRM – an introduction to CRM software packages.

Course Outcome: Students will be able to understand

1. need of CRM
2. building customer relations
3. CRM process
4. CRM structures
5. Planning and Implementation of CRM.

Suggested Readings:

1. G. Shainesh, Jagdish, N.Sheth, Atul Parvatiyar, Customer Relationship Management: Emerging Concepts, Tools and Applications, Macmillan 2005.
2. Francis Buttle, Customer Relation Management: Concepts and Technologies, 2e, Routledge, 2013.
3. Ekta Rastogi, Customer Relation Management: Text and Cases, Excel Books, 2011.
4. Zikmund, Customer Relationship Management, Wiley 2012.
5. Paul Greenberg, CRM at the speed of light, 4e, TMH, 2009.
6. Lakshman Jha, Customer Relationship Management: A Strategic Approach, Global India Pvt Ltd, 2008.