ACADEMIC REGULATIONS
COURSE STRUCTURE AND
AND
DETAILED SYLLABUS

ELECTRICAL AND ELECTRONICS ENGINEERING

B.TECH FOUR YEAR UG COURSE

(Applicable for the batches admitted from 2020-2021)

REGULATION: R20

(I, II, III & IV Year Syllabus)

J.B. INSTITUTE OF ENGINEERING & TECHNOLOGY

UGC AUTONOMOUS

Bhaskar Nagar, Moinabad Mandal, R.R. District,
Hyderabad – 500 075, Telegana State, India
Email: principal@jbiet.edu.in, Website: www.jbiet.edu.in

Vision And Mission of the Institution

VISION

To be a centre of excellence in engineering and management education, research and application of knowledge to benefit society with blend of ethical values and global perception.

MISSION

- To provide world class engineering education, encourage research and development.
- To evolve innovative applications of technology and develop entrepreneurship.
- To mould the students into socially responsible and capable leaders.

Vision And Mission of The Department

VISION

- To be a Centre 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

- 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.
- To ENGINEER the student to engage in research activities leading to innovative applications of technology for the benefit of society.
- To ENABLE the student with the qualities of leadership and social responsibility.

Program Educational Objectives (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. Also 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.

Program Outcomes of EEE Department (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 specified needs with appropriate consideration for public health and safety, cultural, societal and environmental considerations.

PO4
Conduct investigations of complex problems: using research-based knowledge and research methods including design of experiments, analysis and interpretation of data and synthesis of 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 contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice.

PO7
Environment and Sustainability: Understand the impact of professional engineering solutions in societal and environmental contexts and demonstrate knowledge of and need for sustainable development.

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

PO9
Individual and Team Work: Function effectively as an individual, and as a member or leader in diverse teams and in multi-disciplinary settings.

PO10
Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations and give and receive clear instructions.

PO11
Project Management and Finance: Demonstrate knowledge and understanding of 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. Any signatory needs to provide an overview of its learning outcomes and confirm that compliance of programs.

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.

J.B. INSTITUTE OF ENGINEERING AND TECHNOLOGY

(UGC AUTONOMOUS)

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

Academic Regulations– JBIET - R20

Applicable to

B.Tech Regular Four Year Degree Programme

(For the Batches admitted from the Academic Year 2020- 2021)

&

B.Tech (Lateral Entry Scheme)

(For the Batches admitted from the Academic Year 2021- 2022)

J.B. INSTITUTE OF ENGINEERING AND TECHNOLOGY

UGC AUTONOMOUS

ACADEMIC REGULATIONS R-20 FOR B.Tech (REGULAR)

(CHOICE BASED CREDIT SYSTEM)

Applicable for the Students of B.Tech (Regular) admitted from the Academic Year 2020-21

1.0 UNDER-GRADUATE DEGREE PROGRAMME IN ENGINEERING & TECHNOLOGY (UGP IN E&T)

J. B. Institute of Engineering and Technology (JBIET) offers a **4-Year (8 Semesters)** Bachelor of Technology (B.Tech.) Degree Programme, under Choice Based Credit System (CBCS) in the following branches of Engineering with effect from the academic year 2020-21.

S.No.	Branch
1	Civil Engineering (CE)
2	Electrical and Electronics Engineering (EEE)
3	Mechanical Engineering (ME)
4	Electronics and Communication Engineering (ECE)
5	Computer Science and Engineering (CSE)
6	Information Technology (IT)
7	Electronics and Computer Engineering (ECM)
8	Mining Engineering (MIE)

2.0 ELIGIBILITY FOR ADMISSION

2.1 Admission to the under graduate (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 Coollege, subject to reservations as prescribed by the government from time to time.

2.2 The medium of instructions for the entire Under Graduate Programme in Engineering &Technology is English only.

3.0 B.TECH. PROGRAMME STRUCTURE

3.1 Duration of The UG Program

3.1.1 *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.

3.1.2 *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.

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

3.2.1 *Semester scheme***:** Each Under Graduate 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 and AICTE are followed while designing curriculum/course structure.

3.2.2 *Credit courses***:**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:

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

Mandatory Courses and Audit Courses will not carry any credits.

3.2.3 *Subject Course Classification:* All subjects/ courses offered for the Under Graduate Programme in E&T (B.Tech. degree programme) are broadly classified as follows.

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		Project	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		PE – Professional Electives	Includes elective subjects related to the parent discipline/ department/ branch of Engineering.

8	Elective Courses (EℓC)	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/ 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)

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.	60
5	Professional Electives (PE)-Courses relevant to the chosen specialization / branch.	18
6	Open Elective (OE) - Courses from other technical and / or emerging subject areas.	12
7	Mini-project / Project Work / Internship / Industrial training / Seminar	15
8	Mandatory Courses / Audit Courses.	Non-Credit
TOTAL		160

4.0 COURSE REGISTRATION

4.1 A ‘Faculty Advisor is assigned to I, II, III and IV years in every branch of engineering, who will advise the students about the Under Graduate Programme, it’s course structure and curriculum, choice/option for subjects/ courses, based on their competence, progress, pre-requisites and interest.

4.2 The Academic Section of the college invites Registration forms from all Eligible students through their concerned departments before beginning of the Semester through a well defined registration process. Registrations for coming semesters shall be completed before the commencement of SEE of the preceding semester. It is mandatory for the student to register for courses as per his course structure in time. Students shall be allowed to register, only if he/she has cleared all the pending fee dues for all the previous semesters including the current semester

4.3 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.

4.4 *Registration for Additional Online SWAYAM/ MOOCs :* A student may be permitted to register for all the subjects/ courses in a semester as specified in the course structure with maximum additional subject(s)/course(s) limited to 4 credits, based on progress and SGPA/ CGPA, and completion of the 'pre-requisites' as indicated for various subjects/ courses, in the department course structure and syllabus contents.

4.4.1 However, the additional credits scored shall not be considered for award of division and also not considered for calculation of Semester Grade Point Average (SGPA) and Cumulative Grade Point Average (CGPA). For such extra course(s) registered, a certificate will be issued with a letter grade indicated as a performance measure.

4.4.2 Choice for 'additional subjects/ courses' must be clearly indicated, which needs the specific approval and signature of the faculty advisor/ counselor.

4.4 A student is allowed to register for 160 credits in completion of B.Tech programme. However, they can register for additional credits (above 160 credits). The additional credits scored shall not be considered for award of division and also not considered for calculation of Semester Grade Point Average (SGPA) and Cumulative Grade Point Average (CGPA). For such extra course(s) registered, a certificate will be issued with a letter grade indicated as a performance measure.

4.5 If the 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, only the first mentioned subject/ course in that category will be taken into consideration.

4.5 Subject/ course options exercised while registration are final and cannot be changed or inter- changed; further, alternate choices also will not be considered. However, if the subject/ course that has already been listed for registration by the Head of the Department in a semester could not be offered due to any 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.

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

4.7 *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.

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

5.0 ELECTIVESUBJECTS/ COURSES TO BE OFFERED

5.1 A typical section (or class) strength for each semester is 60.

5.2 A subject / course may be offered to the students, only if a minimum of 20 students (1/3 of the section strength) opt for it. The maximum strength of a section is limited to 80 (60 + 1/3 of the section strength).

5.3 More than one faculty member may offer the same subject (lab / practical may be included along with the corresponding theory subject in the same semester) in any semester. However, the selection of choice for students will be based on - 'first come, first serve basis and CGPA criterion'.

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

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

6.0 ATTENDANCE REQUIREMENTS

6.1 A student is 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.

6.2 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.

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

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

6.4.1 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.

6.4.2 They 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.

6.4.3 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 fulfillment of academic requirements. **The academic regulations under which a student has been readmitted shall be applicable.**

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

7.0 ACADEMIC REQUIREMENTS: The following academic requirements have to be satisfied, in addition to the attendance requirements mentioned in item no.6.

7.1 A student shall be deemed to have satisfied the minimum academic requirements and earned the credits allotted to each subject/ course/ Laboratories/ Project Stage-II etc. having both SEE and CIE, if he/she secures not less than 35% of marks (24 out of 70 marks) in the semester end examination and a minimum of 40% of marks in the sum total of the continuous internal evaluation (CIE) and semester end examination (SEE) taken together.

7.2 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 reappear before the Departmental Committee as and when it is arranged.

7.2.1 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.

7.2.2 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.

7.3 *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.

7.3.1 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.

7.4 A student (i) shall register for all courses/subjects covering 160 credits as specified and listed in the course structure, (ii) fulfills all the attendance and academic requirements for 160 credits, (iii) earn all 160 credits by securing SGPA ≥ 5.0 (in each semester), and CGPA (at the end of each successive semester) ≥ 5.0, (iv) passes all the mandatory courses, to successfully complete the under graduate programme. The performance of the student in these 160 credits shall be taken into account for the calculation of 'the final CGPA (at the end of under graduate programme).

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

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

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

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

7.9 A student who fails to earn all the 160 credits as indicated in the Program structure within **Eight Academic Years** of course of study from the year of admission plus Two More Academic years given for appearing in supplementary examinations(i.e. total 10 years), shall forfeit his seat in B.Tech Program.

8.0 EVALUATION - DISTRIBUTION AND WEIGHTAGE OF MARKS

8.1 The performance of a student in all theory and Laboratory courses shall be evaluated for 100 marks each, with 30 marks allotted for Continuous Internal Evaluation (CIE) and 70 marks for Semester End-Examination (SEE).The details of course-wise allotment of marks are given below(Table- 1).

Table 1. Distribution of Marks

S. No.	Course	Marks	
		CIE	SEE
1	Theory courses	30	70
2	Laboratory courses	30	70
3	Mandatory courses	Satisfactory/ Not Satisfactory	
4	Audit Courses	--	--
5	Internship- I	50	
6	Internship- II	50	
7	Mini Project	50	
8	Project Stage - I	50	
9	Seminar	50	
10	Project Stage - II	30	70

8.2 Continuous Internal Evaluation (CIE)

8.2.1 Theory Courses: Continuous Internal Evaluation (CIE) for theory courses has the following components.

S.No	Component	Frequency of Evaluation	Marks for Each test	Final Marks (Average)
1	Mid-Term Examinations	2	20	20
2	Quiz Examinations	2	5	5
3	Assignments	5	5	5
Total				30

(a) *Mid-term Examinations (20 marks):* There shall be two Mid-Term Examinations of 60 minutes each. The First Mid-Term Examinations shall be conducted with syllabi from Units I & II and the Second Mid-Term Examinations shall be conducted with syllabi from Units III, IV & V. In each theory course, the question paper for the Mid-Term Examinations consists of four questions each for 5 marks with "either" / "or" option. There shall be a minimum of one question from each unit. A student is required to answer all four questions for maximum 20 marks. In final assessment, the average performance in the two Mid-Term Examinations shall be considered for awarding marks.

If a student is absent for any Mid-Term Examinationson medical grounds, he/she 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.

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

(b) Quiz Examinations (5 marks): Two Quiz Examinations of 20 minutes each shall be conducted with syllabi from Units I & II for the first and Units III, IV & V for the second. The Quiz Examination shall have 20 objective questions. In final assessment, the average performance of the student in two Quizzes shall be considered for awarding marks.

(c) Assignments (5 marks): There shall be one assignment from each unit. The average of better four assignments marks shall be considered for awarding marks. The assignments are used to test the student in Bloom's higher order thinking skills.

(d) For the courses like **Engineering Drawing**, the CIE shall be 30 marks out which 15 marks for day-to-day work, 10 marks for each mid-term examination and 5 marks for Assignment. The question paper for the mid-term examination consists of 2 questions with "either" / "or" option. The student is required to answer 2 questions for maximum 10 marks in each mid-term examination with minimum of one questions from each unit .

8.2.2 Laboratory Courses

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

S.No	Component	Marks
1	Day-to-Day Evaluation	20
2	Internal Examination	10
	Total	30

8.3 Semester End Examinations (SEE)

8.3.1 Theory Courses

The semester end examinations for theory courses (including **Engineering Drawing**) will be conducted for duration of 3 hours. In each course, the question paper shall consist of 5 questions, one from each Unit with either / or option, carrying 14 marks each. A student is required to answer all 5 questions for maximum 70 marks.

8.3.2 Laboratory Courses

The performance of the student in laboratory courses shall be evaluated for 70 marks jointly by Internal and External Examiners for 3 hours duration.

8.4 Internship

The students should undergo two Internships, viz, i) Internship-I on areas of Science/ Basic engineering with some social relevance. ii) Internship- II in an Industry of their branch of Engineering. The Internship must involve practical work related to Science/ Basic Engineering, systems engineering, Industry practices etc. The duration of Internship shall be for a period of minimum 4 weeks continuously.

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 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, along with a certificate from the organization. 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.

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

8.4 INDUSTRY ORIENTED MINI PROJECT

A student is required to undergo a Mini Project of his/her choice during the vacation after III

Year II Semester Examination by applying theoretical concepts to develop a practical component /element/system that includes design/ testing/ analysis. The performance of a student in the Mini Project shall be evaluated in IV Year I Semester by a three-member committee constituted by the HoD as per the following parameters:

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

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

8.5 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.

8.6 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 fails in such 'one reappearance' evaluation also, he has to reappear for the same in the next subsequent semester, as and when it is scheduled.

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 30 marks as continuous evaluation. The External Examiner shall evaluate the

Project work for 70 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, or (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 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.

8.7 Mandatory Courses (MC)

Mandatory courses are assessed for PASS or FAIL only. No credits will be assigned to these courses. If a student secures more than 40 out of 100 marks, he / she will be declared PASS, else FAIL. Only Pass/Fail is indicated in Grade Card. PASS grade is necessary to be eligible to get the degree.

8.8 Audit Courses (AC)

The audit courses offered provide ample scope for the students as well as faculty to keep pace with the latest technologies pertaining to their chosen fields of study. 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.

8.9 Massive Open Online Courses (MOOCs)

A student without backlog courses up to fifth semester 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.

One faculty member for each course shall be nominated as coordinator by the Department to monitor the progress made by the student. The coordinator need to carry out the conversion of grades awarded to the student in internal and external examinations by the Host institution into corresponding grades of Parent institution. If any student fails in successfully completing the MOOC course in the first attempt he/she must take the same subject/Substitute subject offered by the college and successfully complete it in the 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 in the Institute.

9.0 GRADING PROCEDURE

9.1 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.

9.2 As a measure of the performance of a student, a **10-pointAbsolute 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).

9.3 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:

$$SGPA = \left(\sum_{i=1}^{N} C_i G_i\right) \Big/ \left(\sum_{i=1}^{N} C_i\right) \quad \text{For each Semester}$$

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

9.4 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.

$$CGPA = \left(\sum_{j=1}^{M} C_j G_j\right) \Big/ \left(\sum_{j=1}^{M} C_j\right) \text{ for all S number of semesters registered}$$

(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 1^{st} semester onwards up to and inclusive of the 8^{th} semester, 'j' is the subject indicator index (takes into account all subjects from 1 to 8 semesters), C_j is the no. of credits allotted to the j^{th} subject, and G_j represents the grade points (GP) corresponding to the letter grade awarded for that j^{th} subject. After registration and completion of I Year I Semester, the SGPA of that semester itself may be taken as the CGPA, as there are no cumulative effects.

Illustration of calculation of SGPA:

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

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

9.6 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.

10. PASSING STANDARDS

10.1 A student is declared successful or '**PASSED**' in a semester, if he secures a GP ≥ 5 ('C' grade or above) in every subject/course in that semester (i.e. when the student gets an SGPA ≥5.00 at the end of that particular semester); and he is declared successful or **'PASSED'** in the entire Under Graduate Programme, only when gets a CGPA ≥ 5.00 for the award of the degree as required.

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

11. DECLARATION OF RESULTS

11.1 Computation of SGPA and CGPA are done using the procedure listed in 10.3 to 10.6.

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

$$\% \text{ of Marks} = (\text{final CGPA} - 0.5) \times 10$$

12.0 Eligibility for award of B. Tech. Degree For Regular Students:

i. A student who registers for all the specified subjects/ courses as listed in the course structure and secures the required number of 160 credits (with CGPA ≥ 5.0), within **8Academic Years and Two more Academic Years for writing supplementary examinations** from the date of commencement of the First Academic Year, is declared to have 'qualified' for the award of B.Tech. degree in the chosen branch of Engineering selected at the time of admission.

ii. A student who qualifies for the award of the degree as listed in item 12.3 (i) is awarded with one of the classes mentioned in 12.5.

12.1 Eligibility for award of B. Tech. Degree (LES)

i. The LES students after securing admission shall pursue a course of study for not less than **Three Academic Years** and not more than **Six Academic Years**.

ii. The student shall register for 122 credits and secure 122 credits with CGPA ≥ 5 from II Year to IV Year B.Tech. Programme (LES) for the award of B.Tech. degree.

iii. The students, who fail to fulfill the requirement for the award of the degree in Six Academic Years from the year of admission. However, he/she is permitted to write the examinations for two more Academic Years after Six Academic Years of course work, failing which he/she shall forfeit his/her seat in B.Tech course.

iv. The attendance requirement of B. Tech. (Regular) is also applicable to B.Tech. (LES).

12.2 A student with final CGPA (at the end of the Under Graduate Programme) ≥ 8.00, and fulfilling the following conditions - is placed in 'First Class with Distinction'.
However, he / she:

(i) Should have passed all the subjects/courses in 'first appearance' within the First 4 Academic Years (or 8 sequential Semesters) from the date of commencement of First Year First Semester.

(ii) Should have secured a CGPA ≥ 8.00, at the end of each of the 8 sequential semesters, starting from I Year I Semester onwards.

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

A student not fulfilling any of the above conditions with final CGPA > 8 is placed in First Class.

Students with final CGPA (at the end of the Under Graduate Programme) ≥ 6.50 but <8.00 are placed in ‘First Class’. Students with final CGPA (at the end of the Under Graduate Programme) ≥ 5.50 but < 6.50, are placed in ‘Second Class’. All other students who qualify for the award of the degree (as per item 12.3.1), with final CGPA (at the end of the Under Graduate Programme) ≥ 5.00 but < 5.50, are placed in ‘Pass Class’. A student with final CGPA (at the end of the Under Graduate Programme)< 5.00 will not be eligible for the award of the degree. Students fulfilling the conditions listed under item 12.5 alone will be eligible for award of ‘Gold Medal’.

However any amendments related to 12.5 by JNTUH for award of class will be applicable accordingly.

13.0 WITHHOLDING OFRESULTS

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

14. 0 STUDENTTRANSFERS

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

15.0 SCOPE

15.1 The academic regulations should be read as a whole, for the purpose of any interpretation.

15.2 In case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Academic Council is final.

15.3 The College may change or amend the academic regulations, course structure or syllabi at any time, and the changes or amendments made is applicable to all students with effect from the dates notified by the College authorities.

15.4 Where the words “he”, “him”, “his”, occur in the regulations, they include “she”, “her”, “hers”.

16. 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.
4.	Smuggles in the answer book or additional sheet or takes out or arranges to send out the question paper during the examination or answer book or additional sheet, during or after the examination.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the 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.

5.	Uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks.	Cancellation of the performance in that subject.
6.	Refuses to obey the orders of the chief superintendent/assistant superintendent / any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out, or threatens the officer-in charge or any person on duty in or outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the officer-in-charge, or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction of property in the examination hall or any part of the college campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination.	In case of students of the college, they is expelled from examination halls and cancellation of their performance in that subject and all other subjects the student(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the subjects of that Semester/year. The students also are debarred and forfeit their seats. In case of outsiders, they will be handed over to the police and a Police case is registered against them.

7.	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.
8.	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.
9.	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.
10.	Comes in a drunken condition to the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the 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/yea

11.	Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny.	Cancellation of the performance in that subject and all other subjects the student has appeared including practical examinations and project work of that semester/year examinations.
12.	If any malpractice is detected which is not covered in the above clauses 1 to 11 shall be referred to the Malpractice Committee for further action and to award suitable punishment.	

J.B. INSTITUTE OF ENGINEERING AND TECHNOLOGY

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING
B. Tech - ELECTRICAL AND ELECTRONICS ENGINEERING: R-20
COURSE STRUCTURE – B. Tech (2020-2021)

I YEAR- I SEMESTER						
Sl. No.	**Code**	**Course Title**	**L**	**T**	**P/D**	**C**
1.	J110A	Differential Equations and Calculus	3	1	0	4
2.	J110B	English	3	0	0	3
3.	J110D	Semiconductor Physics	3	0	0	3
4.	J115A	Programming for Problem Solving	3	0	0	3
5.	J1101	English Language and Communication skills Lab	0	0	2	1
6.	J1102	Physics Lab	0	0	2	1
7.	J1151	Programming for Problem Solving Lab	0	0	4	2
8.		Induction Program				
TOTAL CREDITS			**12**	**1**	**8**	**17**

I YEAR- II SEMESTER						
Sl. No.	**Code**	**Course Title**	**L**	**T**	**P/D**	**C**
1.	J120A	Linear Algebra and Advanced Calculus	3	1	0	4
2.	J1231	Engineering Drawing	0	0	6	3
3.	J120D	Engineering Chemistry	3	0	0	3
4.	J122A	Basic Electrical Engineering	3	0	0	3
5.	J124A	Basic Electronics Engineering	3	0	0	3
6.	J1201	Chemistry Lab	0	0	2	1
7.	J1221	Basic Electrical Engineering Lab	0	0	2	1
8.	J1241	Basic Electronics Engineering Lab	0	0	2	1
9.	J1292	Engineering and IT Workshop Lab	0	0	4	2
10.	J12M1	Environmental Science	2	0	0	0
TOTAL CREDITS			**14**	**1**	**16**	**21**

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COURSE STRUCTURE – B. Tech (2020-2021)

II YEAR- I SEMESTER						
Sl. No.	**Code**	**Course Title**	**L**	**T**	**P/D**	**C**
1.	J210A	Complex Variables and Special Functions	3	1	0	4
2.	J212A	Electrical Circuit Analysis	3	1	0	4
3.	J212B	Electrical Machines – I	3	0	0	3
4.	J212D	Power Systems-I	3	0	0	3
5.	J212C	Electromagnetic Fields	3	0	0	3
6.	J2121	Electrical Circuits Lab	0	0	3	1.5
7.	J2122	Electrical Machines Lab – I	0	0	3	1.5
8.	J21M1	Gender Sensitization	2	0	0	0
9.	J2123	Internship-I	0	0	2	1
TOTAL CREDITS			**17**	**2**	**8**	**21**
II YEAR- II SEMESTER						
Sl. No.	**Code**	**Course Title**	**L**	**T**	**P/D**	**C**
1.	J220A	Integral Transforms	3	0	0	3
2.	J222A	Electrical Machines – II	3	1	0	4
3.	J224G	Digital Electronics	3	0	0	3
4.	J222B	Control Systems	3	1	0	4
5.	J22EA	Managerial Economics and Management Science	3	1	0	4
6.	J2221	Electrical Simulation Lab	0	0	2	1
7.	J2243	Digital Electronics Lab	0	0	2	1
8.	J2222	Control Systems Lab	0	0	2	1
9.	J22M1	Professional Ethics	2	0	0	0
10.	J2201	Soft Skills	2	0	0	0
TOTAL CREDITS			**19**	**3**	**6**	**21**

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COURSE STRUCTURE – B. Tech (2020-2021)

III YEAR- I SEMESTER						
Sl. No.	**Code**	**Course Title**	**L**	**T**	**P/D**	**C**
1.	J312A	Power Systems – II	3	1	0	4
2.	J312B	Electrical Machines – III	3	1	0	4
3.	J312C	Power Electronics	3	1	0	4
4.	BTEEEO1	**OPEN ELECTIVE – I**	3	0	0	3
	J31OC	Energy Engineering				
	J31OD	Sensors and Transducers				
5.	J3121	Power Systems Lab	0	0	3	1.5
6.	J3122	Electrical Machines Lab – II	0	0	2	1
7.	J3123	Power Electronics Lab	0	0	3	1.5
8.	J31M2	Cyber Security	2	0	0	0
9.	J3101	Employability Skills	2	0	0	0
10.	J3124	Internship -II	0	0	2	1
TOTAL CREDITS			**16**	**3**	**10**	**20**

III YEAR- II SEMESTER						
Sl. No.	**Code**	**Course Title**	**L**	**T**	**P/D**	**C**
1.	J322A	Electrical Measurements	3	1	0	4
2.	J322B	Computer Aided Power System Analysis	3	1	0	4
3.	BTEEEE1	**PROFESSIONAL ELECTIVE - I**				
	J322D	Power Quality Studies	3	0	0	3
	J322E	Modern Control Theory				
	J322F	Switch Gear and Protection				
4.	BTEEEE2	**PROFESSIONAL ELECTIVE - II**				
	J322G	Analysis of Power Converters	3	0	0	3
	J322H	Power Semiconductor Drives				
	J322I	Digital Control Systems				
5.	BTEEEO2	**OPEN ELECTIVE – II**	3	0	0	3
	J32OC	Hybrid Electric Vehicles				
	J32OD	Energy Auditing Conservation and Managements				
6.	J3221	Electrical Measurements Lab	0	0	3	1.5
7.	J3222	Computer Aided Power System and Simulation Lab	0	0	3	1.5
8.	J32M1	Artificial Intelligence	2	0	0	0
9.	J3201	Life Skills & Professional Skills Lab	0	0	4	2
TOTAL CREDITS			**17**	**2**	**10**	**22**

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COURSE STRUCTURE – B. Tech (2020-2021)

IV YEAR- I SEMESTER

Sl. No.	Code	Course Title	L	T	P/D	C
1.	J414L	Microprocessors and Applications	3	1	0	4
2.	BTEEEE3	**PROFESSIONAL ELECTIVE -III**				
	J412B	Electrical Machine Design	3	0	0	3
	J412C	High Voltage Engineering				
	J412D	Advanced Control Systems				
3.	BTEEEE4	**PROFESSIONAL ELECTIVE -IV**				
	J412E	EHV AC Transmission	3	0	0	3
	J412F	Power System Operation and Control				
	J412G	Industrial Control and Automation				
4.	BTEEEE5	**PROFESSIONAL ELECTIVE -V**				
	J412H	Power Electronics for Renewable Energy Systems	3	0	0	3
	J412I	HVDC Transmission				
	J412J	Restructured Power Systems				
5.	BTEEEO3	**OPEN ELECTIVE – III**				
	J41OC	Electrical Engineering Materials	3	0	0	3
	J41OD	Non-Conventional Energy Sources				
6.	J4144	Microprocessors and Applications Lab	0	0	4	2
7.	J4121	Power System Protection Lab	0	0	2	1
8.	J4122	Industry Oriented Mini Project	0	0	4	2
9.	J4123	Project Stage-I	0	0	6	3
		TOTAL CREDITS	**15**	**1**	**16**	**24**

IV YEAR- II SEMESTER

Sl. No.	Code	Course Title	L	T	P/D	C
1.	BTEEEE6	**PROFESSIONAL ELECTIVE -VI**				
	J422A	Utilization of Electrical Energy	3	0	0	3
	J422B	Reliability Engineering				
	J422C	Advanced Power System Protection				
2.	BTEEEO4	**OPEN ELECTIVE – IV**				
	J42OC	Special Electrical Machines	3	0	0	3
	J42OD	Electrical Safety Engineering				
3.	J4221	Seminar	0	0	2	1
4.	J4222	Project Stage-II	0	0	14	7
		TOTAL CREDITS	**6**	**0**	**16**	**14**

Total Credits: 160

Note: *All end Examinations (Theory and Practical) are of three hours duration.*

T-Tutorial L—Theory P—Practical D-Drawing C–Credit

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R20 - PROFESSIONAL ELECTIVES
List of Subjects offered by various Board of Studies

Professional Elective – I

S.No	Code	Course Title
1	J322D	Power Quality Studies
2	J322E	Modern Control Theory
3	J322F	Switch Gear and Protection

Professional Elective – II

S.No	Code	Course Title
1	J322G	Analysis of Power Converters
2	J322H	Power Semiconductor Drives
3	J322I	Digital Control Systems

Professional Elective – III

S.No	Code	Course Title
1	J412B	Electrical Machine Design
2	J412C	High Voltage Engineering
3	J412D	Advanced Control Systems

Professional Elective – IV

S.No	Code	Course Title
1	J412E	EHV AC Transmission
2	J412F	Power System Operation and Control
3	J412G	Industrial Control and Automation

Professional Elective – V

S.No	Code	Course Title
1	J412H	Power Electronics for Renewable Energy Systems
2	J412I	HVDC Transmission
3	J412J	Restructured Power Systems

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R20 - OPEN ELECTIVES
List of Subjects offered by various Board of Studies

Open Elective – I

S.No.	Code	Name of the Subject	Name of the BOS offering the Subject
1.	J31OA	Elements of CIVIL Engineering	CIVIL
2.	J31OB	Environmental Impact Assessment	CIVIL
3.	J31OC	Energy Engineering	EEE
4.	J31OD	Sensors and Transducers	EEE
5.	J31OE	Automotive Technology	MECH
6.	J31OG	Principles of Sensors and their Application	ECE
7.	J31OH	Principles of Communications	ECE
8.	J31OI	Fundamentals of Database Management System	CSE
9.	J31OJ	Principles of Operating Systems	CSE
10.	J31OK	Introduction to Data Structures through Python	IT
11.	J31OL	Introduction to Web Design	IT
12.	J31OM	Basics of Object Oriented Programming	ECM
13.	J31ON	Fundamentals of Digital Logic Design	ECM
14.	J31OP	Introduction to Mining Technology	MIE
15.	J31OR	Numerical solution of Ordinary differential equations (Common to EEE,ECE,CSE,IT & ECM) OR Number Theory & Cryptography (Common to CE,EEE,ME,ECE,CSE,IT,ECM & MIE)	Mathematics
16.	J31OS	Nano Materials	Physics
17.	J31OT	Chemistry of Engineering Materials	Chemistry
18.	J31OU	Technical Communication Skills	English
19.	J31OV	Entrepreneurship	MBA

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R20 - OPEN ELECTIVES
List of Subjects offered by various Board of Studies

Open Elective – II

S.No.	Code	Name of the Subject	Name of the BOS offering the Subject
1.	J32OA	Construction Management, Contracts and valuation	CIVIL
2.	J32OB	Energy Audit & Green buildings	CIVIL
3.	J32OC	Hybrid Electric Vehicles	EEE
4.	J32OD	Energy Auditing Conservation and Managements	EEE
5.	J32OE	Fundamentals of Operations Research	MECH
6.	J32OG	Software Defined Radio	ECE
7.	J32OH	Basics of IC Technology	ECE
8.	J32OI	Fundamentals of Computer Networks	CSE
9.	J32OJ	Introduction to Java Programming	CSE
10.	J32OK	Computer Organization	IT
11.	J32OL	Fundamentals of Human Computer Interaction	IT
12.	J32OM	Introduction to Microprocessors and Microcontrollers	ECM
13.	J32ON	Internet of Things	ECM
14.	J32OP	Introduction to Surface Mining	MIE
15.	J32OR	rical Solution of Partial Differential Equations	Mathematics
16.	J32OS	Advanced Physics for Engineers	Physics
17.	J32OT	Green Chemistry	Chemistry
18.	J32OU	Technical Writing Skills	English
19.	J32OV	Research Methodology	MBA

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R20 - OPEN ELECTIVES
List of Subjects offered by various Board of Studies

Open Elective – III

S.No.	Code	Name of the Subject	Name of the BOS offering the Subject
1.	J41OA	Waste Management	CIVIL
2.	J41OB	Road Safety Engineering	CIVIL
3.	J41OC	Electrical Engineering Materials	EEE
4.	J41OD	Non-Conventional Energy Sources	EEE
5.	J41OE	Basics of Robotics	MECH
6.	J41OG	Digital Systems Using VHDL	ECE
7.	J41OH	MATLAB Programming Language	ECE
8.	J41OI	Introduction to Python Programming	CSE
9.	J41OJ	Introduction to Mobile Application Development	CSE
10.	J41OK	Fundamentals of Object Oriented Programming Through C++	IT
11.	J41OL	Fundamentals of Data Science	IT
12.	J41OM	Introduction to Neural networks	ECM
13.	J41ON	IC Applications	ECM
14.	J41OP	Introduction to Geology	MIE
15.	J41OR	Integral Transforms And Integral Equations	Mathematics
16.	J41OS	NDT And Vacuum Technology	Physics
17.	J41OT	Nano Chemistry	Chemistry
18.	J41OU	Teamwork and Team Building	English
19.	J41OV	Intellectual Property Rights	MBA

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R20 - OPEN ELECTIVES
List of Subjects offered by various Board of Studies

Open Elective – IV

S.No.	Code	Name of the Subject	Name of the BOS offering the Subject
1.	J42OA	Air Pollution & Control	CIVIL
2.	J42OB	Disaster Management	CIVIL
3.	J42OC	Special Electrical Machines	EEE
4.	J42OD	Electrical Safety Engineering	EEE
5.	J42OE	Digital Manufacturing	MECH
6.	J42OG	Consumer Electronics	ECE
7.	J42OH	Nano Electronics	ECE
8.	J42OI	Fundamentals of Cloud Computing	CSE
9.	J42OJ	Introduction to Big Data Analytics	CSE
10.	J42OK	Fundamentals of E-Commerce	IT
11.	J42OL	E-Waste Management	IT
12.	J42OM	Introduction to Embedded Systems	ECM
13.	J42ON	Introduction to Network Security	ECM
14.	J42OP	Introduction to Mine Environment	MIE

<table>
<tr><td>AY 2020-21 onwards</td><td>J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B.Tech
I Year – I Sem</td></tr>
<tr><td>Course Code: J110A</td><td rowspan="2">Differential Equations and Calculus
(COMMON TO CE, EEE,ME,ECE,CSE,IT, ECM& MIE)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 4</td><td>3</td><td>1</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Nil

Course Objectives:
This course will enable students to:

1. methods of solving first order differential equations and learn about its applications to basic engineering problems
2. methods of solving higher order differential equations and learn about its applications to basic engineering problems
3. the Fourier series of a periodic function
4. improper integrals using Beta and Gamma functions
5. maximum and minimum value of a given function

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)
Unit 1: Definition of a Sequence, limit; Convergent, Divergent and Oscillatory sequences.
Series: Convergent, Divergent and Oscillatory Series; Series of positive terms; Comparison test, P-test, Alternating series: Leibnitz test, Absolute and Conditionally Convergence.
Unit 2 : Determination of Fourier coefficients – Fourier series – 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)
Unit 1: 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
Unit 2: Definition of Improper Integrals, Beta functions: Properties and other forms of beta functions (statements only) and problems, Gamma functions: Properties of Gamma functions (statements only), Relation between the Beta and Gamma functions (without proofs) and Evaluation of improper integrals using Beta and Gamma functions

Module 5: Functions of Multi Variables (10L)
Limits, Continuity, Partial differentiation, partial derivatives of first and second order, Jacobian, Taylor's theorem of two variables(without proof). Maxima and Minima of two variables, Lagrange's method of undetermined Multipliers.

Text Books:

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

Reference Books:

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

E - Resources:

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

Course Outcomes:

The students will be able to:

1. Formulate and solve the First order linear differential equations
2. Apply the concepts of higher order linear differential equations with constant coefficients solving physical problems arising in engineering.
3. Determine Fourier series expansion of a given function
4. Analyse the improper integrals
5. Find the maxima and minima of multivariable functions.

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	3	..	..	..	..	..	..	..	3	..	..
CO2	3	3	2	3	..	..	..	..	..	..	..	3	..	..
CO3	2	2	1	1	..	..	..	..	..	..	..	2	..	..
CO4	3	3	2	1	..	..	..	..	..	..	..	2	..	..
CO5	3	3	2	2	..	..	..	..	..	..	..	2	..	..
Average	3	3	1.9	1.6	-	-	-	-	-	-	-	2.4	..	..

<table>
<tr><td>AY 2020-21 onwards</td><td colspan="4">J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B.Tech
I Year – I Sem</td></tr>
<tr><td>Course Code: J110B</td><td rowspan="2" colspan="4">ENGLISH
(COMMON TO CE,EEE, ME & MIE)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Nil

Course Objectives:

This course will enable students:

1. To improve the language proficiency of students in English with an emphasis on LSRW skills
2. To enrich Vocabulary and Grammar.
3. To equip students to study academic subjects more effectively and critically using the theoretical and practical components of English syllabus.
4. To develop study skills
5. To enhance the communication skills in formal and informal situations.

Module 1:

'The Raman Effect' from the prescribed textbook 'English for Engineers' published by Cambridge University Press.

Vocabulary Building: The Concept of Word Formation --The Use of Prefixes and Suffixes.

Grammar: Identifying Common Errors in Writing with Reference to Articles and Prepositions. **Reading:** Reading and Its Importance- Techniques for Effective Reading.

Basic Writing Skills: Sentence Structures -Use of Phrases and Clauses in Sentences- Importance of Proper Punctuation- Techniques for writing precisely – **Paragraph writing** – Types, Structures and Features of a Paragraph - Creating Coherence-Organizing Principles of Paragraphs in Documents.

Module 2:

'Ancient Architecture in India' from the prescribed textbook 'English for Engineers' published by Cambridge University Press.

Vocabulary: Synonyms and Antonyms, Homophones, Homonyms, and Homographs.

Grammar: Identifying Common Errors in Writing with Reference to Noun-pronoun Agreement and Subject-verb Agreement.

Reading: Improving Comprehension Skills – Techniques for Good Comprehension

Writing: Format of a Formal Letter-**Writing Formal Letters** E.g.., Letter of Complaint, Letter of Requisition, and Job Application with Resume.

Module 3:

'Blue Jeans' from the prescribed textbook 'English for Engineers' published by Cambridge University Press.

Vocabulary: Acquaintance with Prefixes and Suffixes from Foreign Languages in English to form Derivatives-Words from Foreign Languages and their Use in English.

Grammar: Identifying Common Errors in Writing with Reference to Misplaced Modifiers and Tenses.

Reading: Sub-skills of Reading- Skimming and Scanning

Writing: Nature and Style of Sensible Writing- **Defining- Describing** Objects, Places and Events – **Classifying**-Providing Examples or Evidence and Essay Writing

Module 4:

'What Should You Be Eating' from the prescribed textbook 'English for Engineers' published by Cambridge University Press.

Vocabulary: Standard Abbreviations in English

Grammar: Redundancies and Clichés in Oral and Written Communication.
Reading: Comprehension- Intensive Reading and Extensive Reading
Writing: Writing Practices--Writing Introduction and Conclusion -Précis Writing.

Module 5:

'How a Chinese Billionaire Built Her Fortune' from the prescribed textbook 'English for Engineers' published by Cambridge University Press.
Vocabulary: Technical Vocabulary and their usage
Grammar: Common Errors in English
Reading: Reading Comprehension-Exercises for Practice
Writing: Technical Reports- Introduction – Characteristics of a Report – Categories of Reports

Text Books:

1. "English for Engineers", Sudarshana, N.P. and Savitha, C, Cambridge University Press, (2018).

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://www.youtube.com/channel/UCS5ME54d_iJ0cOOZun4ikKQ
2. https://nptel.ac.in/courses/109/106/109106094/

Course Outcomes:
The students will be able to:

1. Use English Language effectively in spoken and written forms.
2. Comprehend the given texts and respond appropriately.
3. Use the proper vocabulary and grammatically correct sentences.
4. Communicate confidently in various contexts and different cultures.
5. Acquire basic proficiency in English including reading and listening comprehension, writing and speaking skills.

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	..	..
CO2	..	..	..	..	..	..	..	..	2	2	..	3	..	..
CO3	..	..	..	..	..	..	..	..	2	2	..	3	..	..
CO4	..	..	..	..	..	..	..	..	2	2	..	3	..	..
CO5	..	..	..	..	..	..	..	..	2	2	..	3	..	..
Average	..	..	..	..	..	..	..	..	2	2		3	..	..

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech I Year – I Sem			
Course Code: J110D	Semiconductor Physics (COMMON TO EEE, ECE,CSE,IT & ECM)	L	T	P	D
Credits: 3		3	0	0	0

Pre-requisite: Nil

Course Objectives:
This course will enable students to:

1. To illustrate the phenomena of old quantum theory and derive Heisenberg Uncertainty principle and Schrödinger's equations.
2. Learns the fundamental concepts of solids and semiconductors.
3. Develop strong fundamentals of electronic and optoelectronic materials.
4. To understand basic lasing action, study various types of lasers and to have basic idea of fiber optics.
5. To construct Maxwell's equations from basic principles and use it to solve electromagnetic plane wave equations.

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: Electronic Materials & Semiconductors (9L)
UNIT-I: Electronic Materials: Free electron theory, Fermi Energy level, Fermi distribution function, Density of states, 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.
UNIT-II: Semiconductors: Intrinsic and extrinsic semiconductors, Carrier concentration, Dependence of Fermi level on carrier concentration and temperature, Hall effect.

Module 3: Semiconductor Devices (9L)
UNIT-I: Carrier generation and recombination, Carrier transport: diffusion and drift, 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 & Fibre Optics (9L)
Unit-I: **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.
Unit-II: **Fibre Optics:** Introduction, Construction and working principle of Optical fibres, Acceptance angle, Acceptance cone and Numerical aperture, Types of optical fibres, Applications of optical fibres

Module 5: Electromagnetism & Dielectric Properties (9L)
Unit-I: **Electromagnetism**: Laws of electrostatics, Electric current and the continuity equation, Ampere's and Faraday's laws, Maxwell's equations.
Unit-II: **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, Applications – Piezo electricity and Ferro-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.TVSArunMurthy , Dr. M.N. Avadhanulu, Dr. P.G. Kshirsagar – Chand.

Reference Books:

1. “Quantum Mechanics “, Richard Robinett.
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. “Engineering Physics”, P.K.Palanisamy, 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:
The students will be 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 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	1	-	-	-	-	-	-	-	-	-	1	-
CO2	3	1	2	-	-	-	-	-	-	-	-	-	1	-
CO3	2	2	2	-	-	-	-	-	-	-	-	-	1	-
CO4	2	2	1	-	-	-	-	-	-	-	-	-	1	-
CO5	3	2	2	-	-	-	-	-	-	-	-	-	2	-
Average	2.4	1.8	1.6	-	-	-	-	-	-	-	-	-	1.2	-

<table>
<tr><td>AY 2020-21
onwards</td><td>J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B.Tech
I Year – I Sem</td></tr>
<tr><td>Course Code:
J115A</td><td rowspan="2">PROGRAMMING FOR PROBLEM SOLVING
(COMMON TO EEE, ECE,CSE,IT & ECM)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-Requisites:

1. Mathematical Knowledge.
2. Analytical Skills.

Course objectives:

This course will enable students to:

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– I: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.

In 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 – II: 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 – III: 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 – IV : 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 – V : 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)

REFERENCES:

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's Outline 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. Make Use of 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	-	-	-	-	-	-	-	-	-	1	2	2
CO2	2	2	3	2	2	-	-	-	-	-	-	-	2	-
CO3	3	2	2	-	-	-	-	-	-	-	-	1	-	3
CO4	3	2	2	2	-	-	-	-	-	-	-	1	-	3
CO5	3	2	2	-	-	-	-	-	-	-	-	1	2	3
Average	**2.8**	**2.0**	**2.3**	**2.0**	**2.0**	**-**	**-**	**-**	**-**	**-**	**-**	**1.0**	**2.0**	**2.8**

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech I Year – I Sem			
Course Code: J1101	**ENGLISH LANGUAGE AND COMMUNICATION SKILLS LAB (COMMON TO CE,EEE ME & MIE)**	**L**	**T**	**P**	**D**
Credits: 1		**0**	**0**	**2**	**0**

Pre-requisite: Nil

Course Objectives:
This course will enable:

1. To sensitize students to the nuances of English speech sounds, word accent, intonation and rhythm
2. To bring about a consistent accent and intelligibility in students' pronunciation of English by providing an opportunity for practice in speaking
3. To improve the fluency of students in spoken English and neutralize their mother tongue influence
4. To train students to use language appropriately for public speaking.
5. To train students to face the interviews

The following course content is prescribed for the English for the English Language and Communication Skills Lab based on Unit -6 of AICTE Model Curriculum 2018 for B.Tech First English. As the syllabus is very limited, it is required to prepare teaching/learning materials by the teachers collectively in the form of handouts based on the needs of the students in their respective colleges for effective teaching/learning and timesaving in the lab.

SYLABUS:

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:

CALL Lab:

Understand: Listening Skill- Its importance – Purpose- Process- Types- Barriers of Listening. ***Practice*:** Introduction to Phonetics – Speech Sounds – Vowels and Consonants.

ICS Lab:

Understand: Communication at Work Place- Spoken vs. Written language.

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

Module 2:

CALL Lab:

Understand: Structure of Syllables – Word Stress and Rhythm– Weak Forms and Strong Forms in Context.

Practice: Basic Rules of Word Accent - Stress Shift - Weak Forms and Strong Forms in Context.

ICS Lab:

Understand: Features of Good Conversation – Non-verbal Communication.

Practice: Situational Dialogues – Role-Play- Expressions in Various Situations –Making Requests and Seeking Permissions - Telephone Etiquette.

Module 3:

CALL Lab:

Understand: Intonation-Errors in Pronunciation-the Influence of Mother Tongue (MTI).

Practice: Common Indian Variants in Pronunciation – Differences in British and American Pronunciation.

ICS Lab:

Understand: How to make Formal Presentations.

Practice: Formal Presentations.

Module 4:
CALL Lab:
Understand: Listening for General Details.
Practice: Listening Comprehension Tests.
ICS Lab:
Understand: Public Speaking – Exposure to Structured Talks.
Practice: Making a Short Speech – Extempore.

Module 5:
CALL Lab:
Understand :Listening for Specific Details.
Practice: Listening Comprehension Tests.
ICS Lab:
Understand: Interview Skills.
Practice: Mock Interviews.

Facilities:
Computer Assisted Language Learning (CALL) Lab:

The Computer Assisted Language Learning Lab has to accommodate 30 students with 30 systems, with one Master Console, LAN facility and English language learning software for self- study by students. **System Requirement (Hardware component):** *Computer network with LAN facility (minimum 40 systems with multimedia) with the following specifications:*
i) Computers with Suitable Configuration
ii) High Fidelity Headphones

Interactive Communication Skills (ICS) Lab:
1. **The Interactive Communication Skills Lab:** A Spacious room with movable chairs and audio-visual aids with a Public-Address System, a LCD and a projector etc.

Course Outcomes:
The students will be able to:
1. Better understanding of nuances of English language through audio- visual experience and group activities
2. Neutralization of accent for intelligibility
3. Speaking skills with clarity and confidence which in turn enhances their employability skills
4. The public speaking skills and facing the interviews
5. Good communication skills and use them at workplace.

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	..	..	..	..	..	..	..	..	..
CO2	..	..	..	..	..	..	..	..	..	1	..	..	..	..
CO3	..	..	..	..	..	..	..	..	..	1	..	..	..	..
CO4	..	..	..	..	..	..	..	..	1	2	..	..	..	..
CO5	..	..	..	..	..	..	..	..	..	2	..	..	..	..
Average	..	..	..	..	**2**	..	..	..	**1**	**1.49**	..	..	..	..

<table>
<tr><td>AY 2020-21 onwards</td><td colspan="4" align="center">J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4" align="center">B.Tech
I Year – I Sem</td></tr>
<tr><td>Course Code: J1102</td><td rowspan="2" align="center">PHYSICS LAB
(COMMON TOEEE, ECE, CSE, IT & ECM)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 1</td><td>0</td><td>0</td><td>2</td><td>0</td></tr>
</table>

Pre-requisite: Nil

Course Objectives:
This course will enable students to:

1. Demonstrate skills in scientific inquiry, problem solving and laboratory techniques.
2. Demonstrate competency and understanding of the concepts found in LED, Electric and Electronic materials a broad base of knowledge in physics.
3. Solve Experimental problems that potentially draw an experimental knowledge in multiple Areas of physics.
4. Study applications in engineering like Hall effect, and magnetic properties.
5. Study applications in engineering like Optical fiber, Lasers, Photodiode and Solar cell.

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:**
   Plot V-I characteristics of light emitting diode.
4. **Optical fiber:**
   Determination of Numerical Aperture and Bending losses 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).

Note: Any 8 experiments are to be performed.

Course Outcomes:
The 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. Be exposed to the phenomena of electromagnetism and also to have exposure on magnetic materials and dielectric materials.

5. Lasers and fibre optics enable the students to apply to various systems like communications, solar cell, photo cells and so on.

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	1	..	-	-	-	-	-	-	-	-	-	1	-
CO2	3	1	..	-	-	-	-	-	-	-	-	-	1	-
CO3	3	2	1	-	-	-	-	-	-	-	-	-	1	-
CO4	3	1	1	-	-	-	-	-	-	-	-	-	1	-
CO5	3	2	2	-	-	-	-	-	-	-	-	-	1	-
Average	3	1.4	1.33	-	-	-	-	-	-	-	-	-	1	-

<table>
<tr><td>AY 2020-21 onwards</td><td colspan="4">J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B.Tech
I Year – I Sem</td></tr>
<tr><td>Course Code: J1151</td><td rowspan="2" colspan="4">PROGRAMMING FOR PROBLEM SOLVING LAB
(Common to all branches)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 2</td><td>0</td><td>0</td><td>4</td><td>0</td></tr>
</table>

Course objectives:

This course will enable students to:

1. Work with an IDE to create, edit, compile, run and debug programs
2. Analyze 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

1. SIMPLE NUMERIC PROBLEMS:

a) Write a program for find the max and min from the three numbers.
b) Write the program for the simple, compound interest.
c) Write program that declares Class awarded for a given percentage of marks, where mark<40%= Failed, 40% to <60% = Second class, 60% to <70%=First class, >=70% = Distinction. Read percentage from standardinput.

2. EXPRESSION EVALUATION:

a) 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)
b) Write a program that finds if a given number is a prime number

A Fibonacci sequence is defined as follows: the first and second terms in the sequence are 0 and 1. Subsequent terms are found by adding the preceding two terms in the sequence. Write a C program to generate the first n terms of the sequence.

3. ARRAYS AND POINTERS AND FUNCTIONS:

a) Write a C program to find the minimum, maximum and average in an array of integers.
b) Write a C program to find Addition of Two Matrices
c) Write a C program to find Multiplication of Two Matrices.
d) Write C programs that use both recursive and non-recursive functions
e) Write a program for reading elements using pointer into array and display the values using array.

4.Files:

a) Write a C program to display the contents of a file to standard output device.
b) Write a C program which copies one file to another, replacing all lowercase characters with their uppercase equivalents
c) Write a C program to count the number of times a character occurs in a text file. Thefilename and the character are supplied as command line arguments.

5. Strings:

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

b) Write a C program to count the lines, words and characters in a giventext.

6. Sorting and Searching:

a) Write a C program for using binary searchmethod.
b) Write a C program for linear search.
c) Write a C program that implements the Bubble sort method.
d) Write a C program that implements the Insertion sort method.
e) Write a C program that implements the Quick sort method.
f) Write a C program that implements the Merge sort method.

ADDITIONAL PROGRAMS (Given to Student as Assignment):

1) Write a program that prints a multiplication table for a given number and the number of rows in the table. For example, for a number 5 and rows = 3, the output should be:
   a. 5 x 1 = 5
   b. 5 x 2 =10
   c. 5 x 3 =15
2) Write a program that shows the binary equivalent of a given positive number between 0 to255.
3) Write a C program to find the sum of individual digits of a positive integer and test given numberispalindrome.
4) Write a C program to generate all the prime numbers between 1 and n, where n is a value supplied by the user.
5) Write a C program to calculate the following, where x is a fractional value.
   1-x/2+x^2/4-x^3/6.
6) Write a C program to read in two numbers, x and n, and then compute the sum of this Geometricprogression:1+x+x^2+x^3+.......................... +x^n. For example: if n is3 and xis5, then the program computes 1+5+25+125.
7) Write a C program to find the minimum, maximum and average in an array of integers.
8) Write a functions to compute mean, variance, Standard Deviation, sorting of n elements in single dimensionarray.

9) Write a C program that uses functions to perform the following:
   (a) Transpose of a matrix with memory dynamically allocated for the new matrix as row and column counts may not be same.
   (b) To find the factorial of a given integer.
   (c) To find the GCD (greatest common divisor) of two given integers.

10) Write a C program that does the following:
   (a) It should first create a binary file and store 10 integers, where the file name and 10 values are given in the command line. (hint: convert the strings using atoi function) Now the program asks for an index and a value from the user and the value at that index should be changed to the new value in the file. (hint: use fseek function). The program should then read all 10 values and print them back.
   (b) Write a C program to merge two files into a third file (i.e., the contents of the first file followed by those of the second are put in the third file).
11) Write a C program to convert a Roman numeral ranging from I to L to its decimal

equivalent.

12) Write a C program that converts a number ranging from 1 to 50 to Roman equivalent

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

(a)To insert a sub-string in to a given main string from a given position.

(b) To delete n Characters from a given position in a given string.

14) Write a C program to construct a pyramid of numbers as follows:

1	*	1	1	*
1 2	* *	2 3	2 2	* *
1 2 3	* * *	4 5 6	3 3 3	* * *
			4 4 4 4	* *
				*

15) Write a C program that sorts a given array ofnames.

Reference Books:

1. B.A. Forouzan and R.F. Gilberg C Programming and Data Structures, Cengage Learning, (3rdEdition)
2. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language,Prentice Hall of India
3. R.G. Dromey, How to solve it by Computer, Pearson (16thImpression)
4. Stephen G. Kochan,Programming in C, Fourth Edition, PearsonEducation.
5. Herbert Schildt, C: The Complete Reference, McGrawHill, 4thEdition

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 of different functions 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	-	-	-	-	-	-	2	-	-	-	-	2
CO2	3	2	-	-	-	-	-	-	2	-	-	-	-	2
CO3	3	2	-	-	-	-	-	-	2	-	-	-	-	2
CO4	3	2	-	-	-	-	-	-	2	-	-	-	-	2
CO5	3	2	-	-	-	-	-	-	2	-	-	-	-	2
Average	**3.0**	**2.0**	**-**	**-**	**-**	**-**	**-**	**-**	**2.0**	**-**	**-**	**-**	**-**	**2.0**

<table>
<tr><td>AY 2020-21 onwards</td><td>J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B.Tech
I Year – II Sem</td></tr>
<tr><td>Course Code: J120A</td><td rowspan="2">LINEAR ALGEBRA AND ADVANCED CALCULUS (COMMON TO CE, EEE,ME,ECE,CSE,IT, ECM & MIE)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 4</td><td>3</td><td>1</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Nil

Course Objectives:
This course will enable students to:

1. methods of solving first order differential equations and learn about its applications to basic engineering problems
2. methods of solving higher order differential equations and learn about its applications to basic engineering problems
3. the Fourier series of a periodic function
4. improper integrals using Beta and Gamma functions
5. maximum and minimum value of a given function

Module 1: Matrices and System of Equations (10L)

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

Module 2 : Eigen values, Eigen vectors and Matrix of Transforms (12L)

Linear Transformation and Orthogonal Transformation: Eigen values and Eigenvectors and their properties: Diagonalization of a matrix; Cayley-Hamilton Theorem (without proof); finding inverse and power of a matrix by Cayley-Hamilton Theorem; Quadratic forms and Nature of the Quadratic Forms; Reduction of Quadratic form to canonical forms using Linear Transformation and Orthogonal Transformations.

Module 3: Multiple Integrals: (10L)

Evaluation of double integrals, change of order of integration, Change of variables (Cartesian & Polar coordinates),evaluation of triple integrals, change of variables (Cartesian to Spherical and Cylindrical polar coordinates) Applications: computation of Areas and volumes. Definition of a Sequence, limit; Convergent, Divergent and Oscillatory sequences.

Module 4: Vector Differential Calculus: (8L)

Scalar and vector fields, vector differentiation, level surfaces, directional derivative, gradient of a scalar field, divergence and curl of a vector field, Laplacian, Scalar potential functions, 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. "Higher Engineering Mathematics", B.S. Grewal, Khanna Publishers, 2015
2. "Advanced Engineering Mathematics", Erwin kreyszig, 9th Edition, John Wiley & Sons,2006.

3. "Advanced Engineering Mathematics", R.K.Jain& S.R.K. Iyengar, Narosa Publications, 5th Edition, 2015.

Reference Books:

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

E - Resources:

1. https://nptel.ac.in/courses/122/104/122104018/
2. https://en.wikipedia.org/wiki/Eigenvalues_and_eigenvectors
3. https://nptel.ac.in/courses/111/107/111107108/
4. https://www.cheric.org/files/education/cyberlecture/e200303/e200303-301.pdf
5. https://www.whitman.edu/mathematics/calculus_online/chapter16.html

Course Outcomes:

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

1. solve the consistent system of linear equations
2. apply orthogonal congruent Transformations to a quadratic form
3. evaluate multiple integrals in various coordinate system
4. apply the concept of gradient, divergence and curl to formulate engineering problems
5. convert line integrals to surface integrals and surface integrals to volume integrals

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	1	3	-	-	-	-	-	-	-	2	..	..
CO2	3	3	2	3	-	-	-	-	-	-	-	3	..	..
CO3	3	3	2	3	-	-	-	-	-	-	-	3	..	..
CO4	3	3	1	3	-	-	-	-	-	-	-	2	..	..
CO5	3	3	2	3	-	-	-	-	-	-	-	3	..	..
Average	3	3	1.6	3	-	-	-	-	-	-	-	2	..	..

<table>
<tr><td>AY 2020-21
onwards</td><td>J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B. Tech:
I Year – II Sem</td></tr>
<tr><td>Course Code:
J1231</td><td rowspan="2">ENGINEERING DRAWING
(Common to CE, MIE, EEE, ME)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>0</td><td>0</td><td>0</td><td>6</td></tr>
</table>

Pre-requisite: Engineering Mathematics.

Course Objectives:
This course will enable students to:
1. Learn how to prepare Engineering Drawings by Manual Drafting and Computer-Aided Drawings and Practice various methods of drawing Conic Sections & Curves.
2. Learn the principles of Orthographic Projections to show the projections of points, lines and planes effectively.
3. Learn to use the various methods for drawing the projections of solids.
4. Learn to use various methods for drawing the projections of sections of solids and surface developments of solids.
5. Learn to convert orthographic views into isometric views and vice versa.

Module 1
Unit 1: Principles of Engineering Drawing: Introduction to Engineering Drawings, Significance, Introduction to AutoCAD.
Unit 2: Conic Sections: Ellipse – Eccentric Method, Arcs Method, Concentric, Circle Method, Rectangular Method; Parabola – Eccentric Method, Rectangular Method, Tangent Method; Hyperbola – Eccentric Method, Rectangular Hyperbola.
Unit 3: Curves: Cycloid – Epicycloid, Hypocycloid, Involute of Circles.
Unit 4: Scales: Construction of Plain, Diagonal Scales.

Module 2
Unit 1: Principles of Orthographic Projections: Introduction to Orthographic Projections, Conventions.
Unit 2: Projections of Points and Lines: Projections of Points in four Quadrants, Projection of Lines in first quadrant, Inclined to both Principle Planes.
Unit 3: Projections of Planes: Projections of Planes in first quadrant and inclined to both Principle Planes for Regular Geometrical Figures – Circle, Square, Rectangle, Triangle, Pentagon, Hexagon.

Module 3
Unit 1: Projections of Solids: Projections of Right Regular Solids – Prisms and Pyramids of Square, Rectangle, Pentagon, Hexagon; Projections of Generated Solids – Cone, Cylinder.

Module 4
Unit 1: Sections of Solids: Sectional and Auxiliary Views of Right Regular Solids – Prisms and Pyramids of Pentagon, Hexagon; Generated solids – Cylinder and Cone.
Unit 2: Development of Surfaces of Solids: Surfaces of Right Regular solids – Prism, cylinder pyramid and cone

Module 5
Unit 1: Isometric Projections and Views: Principles of Isometric Projections, Isometric Scale, Isometric Views of Simple and Compound Solids; Conversion of Orthographic Views of simple objects to Isometric Views.
Unit 2: Orthographic Views: Conversion of Isometric Views to Orthographic Views.

(First Angle Projection Convention to be followed)

Note: *Practice of few exercises from Unit I to Unit V using open source AutoCAD software to be considered for Internal Evaluation only.*

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.
3. AutoCAD Software Theory and User Manuals

Reference Books:

1. Narayana, K.L. & P Kannaiah, “Text book on Engineering Drawing”, Scitech Publishers, 2008
2. Agrawal B. & Agrawal C. M., “Engineering Graphics”, TMH Publication, 2012.

E - Resources:

1. https://nptel.ac.in/courses/112/103/112103019/
2. http://www.autocadtutorials.net/
3. https://urlzs.com/fLJ3T
4. https://urlzs.com/zky46

Course Outcomes:
The students will be able to:

1. **Equipped** with the basic knowledge of using the drawing instruments and dimensioning practice.
2. **Represent** any three-dimensional object with two-dimensional drawings and exposed to the visual aspects of lines and planes.
3. **Visualize** of solids inclined to both the planes.
4. **Visualization** of sections of solids and their developments.
5. **Representation** of 3D objects through isometric and orthographic views

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	-	-	-	-
CO2	3	-	3	-	2	-	2	-	-	-	-	-	-	-
CO3	2	-	2	-	3	-	2	-	-	-	-	-	-	-
CO4	2	3	-	3	2	-	3	-	-	2	-	-	-	-
CO5	2	3	-	3	2	-	-	-	-	3	-	-	-	-
Average	2.4	3	2.5	3	2.3	-	2.3	-	-	2.3	-	-	-	-

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech I Year – II Sem			
Course Code: J120D	**ENGINEERING CHEMISTRY (COMMON TO EEE, ECE,CSE,IT & ECM)**	**L**	**T**	**P**	**D**
Credits: 3		**3**	**0**	**0**	**0**

Pre-requisite: Nil

Course Objectives:
This course will enable students to:

1. To understand the microscopic chemistry in terms of atomic and molecular orbitals and intermolecular forces.
2. To know the suitability of water for domestic and industrial purposes.
3. To acquire Knowledge about different types of batteries and to understand the concepts of corrosion.
4. To impart the basic knowledge of spectroscopic techniques and molecular energy levels
5. Gain the knowledge of chemical reactions those are used in the synthesis of molecules

Module 1: Atomic Structure And Theories Of Bonding: (9L)
Atomic and Molecular orbitals. Linear Combination of Atomic Orbitals (LCAO), molecular orbitals of diatomic molecules, molecular orbital energy level diagrams of N2, O2, F2, CO and NO.Crystal Field Theory (CFT), Salient Features of CFT – Crystal Field Splitting of transition metal ion d- orbitals in Tetrahedral, Octahedral and square planar geometries. Band structure of solids and effect of doping on conductance.

Module 2: Water And Its Treatment: (8L)
Introduction – hardness of water – Causes of hardness - Types of hardness- temporary and permanent – expression and units of hardness – Estimation of hardness of water by complexometric method. Potable water and its specifications. Steps involved in treatment of water – Disinfection of water by chlorination and ozonization. Boiler troubles-scale&sludge formation, foaming&priming Boiler feed water and its treatment – Calgon conditioning, Phosphate conditioning and Colloidal conditioning. External treatment of water – Ion exchange process. Desalination of water – Reverse osmosis. Numerical problems.

Module 3: (11L)
Unit-1: Electro Chemistry
Electrochemical cells – electrode potential, standard electrode potential, Nernst equation,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 (Lithium cell) and secondary batteries (Lead – acid storage battery and Lithium ion battery).
Unit-2:**Corrosion**
Causes and effects of corrosion – theories of chemical and electrochemical corrosion – mechanism of electrochemical corrosion, Corrosion control methods- Cathodic protection – Sacrificial anode and impressed current cathodic methods. techniques of coating(applications)-hot dipping, cementation and electroless plating of Nickel.

Module 4: Spectroscopic applications and techniques (9L)
Principles of spectroscopy, molar-extinction co-efficient, types of transitions in UV,selection rules, important terms in UV spectra and applications of electronic spectroscopy. Vibrational spectroscopy-principle, stretching and bending vibrations in IR,selection rule and applications. Basic concepts of Nuclear magnetic resonance Spectroscopy, chemical shift-factors effecting chemical shift (Electronegativity, Anisotropic effect, Hydrogen Bonding) and spin-spin splitting, coupling constant. Introduction to Magnetic resonance imaging.

Module 5: (7L)

Unit-1:Reaction Mechanism And Synthesis Of Drug Molecules:

Substitution reactions: Nucleophilic substitution reactions: Mechanism of SN1, SN2 reactions. Electrophilic and nucleophilic addition reactions: Addition of HBr to propene. Markownikoff and anti Markownikoff's additions. Grignard additions on carbonyl compounds. Elimination reactions: Dehydro halogenation of alkylhalides. Saytzeff rule. Oxidation reactions: Oxidation of alcohols using $KMnO_4$ and chromic acid. Reduction reactions: reduction of carbonyl compounds using $LiAlH_4$& $NaBH_4$.

Unit-2: Structure, synthesis and pharmaceutical applications of Paracetamol and Aspirin.

Text Books:

1. "Engineering Chemistry", P. C. Jain & M. Jain, Dhanpat Rai Publishing Company (P) Ltd., New Delhi.
2. "Fundamentals of Molecular Spectroscopy", C.N. Banwell.
3. "Organic Chemistry: Structure and Function", K.P.C. Volhardt and N. E. Schore, 5th Edition.
4. "University Chemistry", B.M. Mahan, Pearson, Narosa Publishing house,New Delhi,IV Edition.
5. "Physical Chemistry", P.W. Atkins,J.D.Paula, Oxford 8th edition.

Reference Books:

1. "Engineering Chemistry", M.Thirumalachary and Laxminarayan, Scitech Publications.
2. "Engineering Chemistry", B. L. Tembe, Kamaluddin and M.S.Krishnan ,NPTEL web book).
3. "Stereochemistry of organic compounds" , D.Narsipuri published by New age international publishers.

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.scribd.com/document/6668739/Chemical-Energy-Source
5. https://sengerandu.wordpress.com/tutorials/physical-metallurgy/engineering- materials

Course Outcomes:

The students will be able to:

1. Acquire the knowledge of atomic, molecular and electronic changes.
2. Apply the various methods used in treatment of water for domestic and industrial purposes.
3. Understand the concepts of electrochemistry and corrosion.
4. Understand the basic concepts of spectroscopy.
5. Learn the major chemical reactions and implement the synthesis of drug molecules

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	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	3	-	-	-	-	1	-	-	-	-	-	2	-	-
CO3	3	-	-	-	-	1	-	-	-	-	-	2	-	-
CO4	2	-	-	-	-	-	-	-	-	-	-	-	-	-
CO5	2	-	-	-	2	-	-	-	-	-	-	-	-	-
Average	2.2	-	-	-	2	1	-	-	-	-	-	2s	-	-

<table>
<tr><td>AY 2020-21 onwards</td><td>J. B. Institute of Engineering and Technology (UGC Autonomous)</td><td colspan="4">B.Tech
I Year – II Sem</td></tr>
<tr><td>Course Code:J122A</td><td rowspan="2">BASIC ELECTRICAL ENGINEERING (Common to EEE, ECE, CSE, IT & ECM)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Physics

Course Objectives:

1. To introduce the concept of electrical circuits using network laws and theorems.
2. To outline and analyse single phase A.C and three phase A.C circuits.
3. To study and understand magnetic circuits and transformers.
4. To understand the different types of D.C and A.C rotating electrical machine.
5. To import the knowledge of protection of electrical components and Measuring Instruments.

MODULE -I: DC Circuits: Electrical circuit elements (R, L and C), voltage and current sources, Analysis of simple circuits with DC excitation. Kirchhoff's Laws, Network reduction techniques – series, parallel, series-parallel combinations.
Star to Delta and Delta to Star Transformations, Source transformations, Superposition, Thevenin and Norton Theorems.

6.
MODULE –II: AC Circuits: Representation of sinusoidal waveforms, peak and RMS values, phasor representation, real power, reactive power, apparent power, power factor.
Analysis of single-phase AC circuits consisting of R, L, C, RL, RC and RLCseriescombinations, resonance in series RLC circuit. Three phase balanced circuits, voltage and current relations in star and delta connections.

7.
MODULE -III: Transformers: Magnetic materials, BH characteristics,ideal and practical transformer, equivalentcircuit, EMF equation of Transformer.
Losses in transformers, regulation and efficiency. Auto-transformer and three- phase transformer connections.

MODULE -IV: Rotating Electrical Machines: D.C Motors - principle of operation, characteristics, speed control and application of series and shunt motor.
Three-phase induction motor - construction, generation of rotating magnetic fields, principle of operation, torque-slip characteristics.

MODULE –V: Electrical Installations: Components of LT switchgear: Switch fuse unit (SFU), MCB, MCCB, Earthing, Types of batteries.
Measurement Instruments: Types of instruments: construction and working principle of PMMC and MI type voltmeter and ammeters.

Text Books:

1. S.Salivahan, R. Rengaraj"Basic Electrical Engineering",Tata McGrawHill,2018.
2. V.K. Mehta and Rohith Mehta, "Basic Electrical Engineering", S. Chand Publications,2012.
3. D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill,2009.
4. L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford UniversityPress,2011.
5. K. Sawhney, "A course in Electrical and Electronics Measurements and Instrumentation", Dhanapath Rai and Sons., 10thEdition, 2007.

Reference Books:

1. Dr. Ramana Pilla, Dr. M. Suryakalavathi, “Basic Electrical Engineering”,S. Chand,2018.
2. V. D. Toro, “Electrical Engineering Fundamentals”, Prentice Hall India,1989.

E - Resources:

1. https://nptel.ac.in/courses/108/108/108108076/
2. https://nptel.ac.in/courses/108/105/108105112/
3. https://www.electrical4u.com/

Course Outcomes:

The students will be able to:

1. Illustrate and solve electrical circuits using network laws and theorems.
2. Acquire knowledge about the single phase and three phase electrical circuits.
3. Get exposure of magnetic circuits and transformers.
4. Demonstrate the working principle of electrical machines.
5. Introduce components of low voltage electrical installation and applications of Measuring Instruments.

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	2	1	2	1	-	-	-	-	-	1	1	-
CO2	3	2	2	-	1		-	-	-	-	-	1	1	-
CO3	3	1	1	-	1	1	-	-	-	-	-	1	1	-
CO4	3	1	1	-	2		-	-	-	-	-	1	1	-
CO5	3	-	-	1	3	2	-	-	-	-	-	1	1	-
Average	3	1.5	1.5	1	1.8	1.3	-	-	-	-	-	1	1	-

<table>
<tr><td>AY 2020-21 onwards</td><td colspan="4">J. B. Institute of Engineering and Technology (UGC Autonomous)</td><td colspan="4">B.Tech I Year – II Sem</td></tr>
<tr><td>Course Code: J124A</td><td rowspan="2">BASIC ELECTRONICS ENGINEERING (COMMON TO EEE, ECE,CSE,IT & ECM)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Course Objectives:

This course will enable students to:

1. Understand PN junction diode operation, characteristics and applications.
2. Learn Transistor characteristics in various configurations.
3. Gain knowledge on FET & MOSFET operations & Characteristics.
4. Understand the biasing of BJT & FET in various models.
5. Understand fabrication of integrated circuits.

MODULE – I: P-N Junction diode

Construction and working of a P-N junction diode , V-I relationship of a P-N junction diode.(Qualitative analysis only, No Derivation) V-I characteristics of a P-N Junction diode, static and dynamic resistance of a diode , ideal diode, Zener Diode, Avalanche and Zener Breakdowns , V-I characteristics of Zener Diode

The PN- Junction 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 –II Special Diodes:

Tunnel diode construction and working (using Energy Band diagram) , V-I Characteristics of tunnel diode .Photo diode construction, working and V-I Characteristics, UJT construction, working and V-I Characteristics, SCR construction,working and V-I Characteristics.

Transistor (BJT) Characteristics

Construction and operation of Bi-Polar Junction Transistor (BJT), Different configurations, current components in a junction Transistor ,V-I characteristics in CB and CE configurations, determination of " α"

and " β " of a transistor from the V-I characteristics , relation between " α" and " β " of a transistor

MODULE -III: 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. derivation for pinchoff voltage.

MOSFET Construction & Operation in Enhancement and Depletion modes, V-I Characteristics of MOSFET

MODULE –IV:Biasing and Analysis of Transistor amplifiers

Need for Biasing of transistors, Determination of Quiescent point from the CE characteristics, stability factors S, fixed bias, Self bias, and collector to base bias, quiescent point **Q(V_{ce}, I_c)** and stability factor **S** calculations.

H -Parameter equivalent circuit for BJT , Definition & Determination of h-Parameters from CE V-I Characteristics, Analysis of single stage transistor amplifiers (Ai,Ri , Av , Ro Calculations) for CE,CB,CC Amplifiers Small Signal model for JFET, Self-Bias circuit for FET.

MODULE –V: Integrated circuit fabrication process

Basic Monolithic Integrated Circuits, Integrated Resistors, Capacitors & inductors Epitaxial growth Masking and Etching oxidation, diffusion, ion implantation, photolithography.

Monolithic circuit layout, chemical vapour deposition, sputtering, twin-tub CMOS process.

TEXT BOOKS:

1. Electronc Devices And Circuits, Millman & Halkias, Mcgraw Hill.(Mandatory).
2. Integrated Electronics,Millman& Halkias, Mcgraw Hill.

REFERENCE BOOKS:

1. G. Streetman, and S. K. Banerjee, “Solid State Electronic Devices,” 7th edition, Pearson, 2014.
2. D. Neamen, D. Biswas "Semiconductor Physics and Devices," McGraw-Hill Education
3. S. M. Sze and K. N. Kwok, “Physics of Semiconductor Devices,” 3rd edition, John Wiley &Sons, 2006.
4. C.T. Sah, “Fundamentals of solid state electronics,” World Scientific Publishing Co. Inc,1991.
5. Y. Tsividis and M. Colin, “Operation and Modeling of the MOS Transistor,” Oxford Univ.Press, 2011.
6 Electronc Devices and Circuits, BOYLESTAD.

E-Resources:

1. **https://nptel.ac.in/courses/117/103/117103063/**
2. **https://nptel.ac.in/courses/108/101/108101091/**
3. **https://nptel.ac.in/courses/108/102/108102097/**
4. **https://nptel.ac.in/courses/108/105/108105112/**

Course Outcomes:
The student will be able to:

1. Construct different circuits using PN-Junction diode.
2. Analyze working of transistor in different configurations.
3. Operate and study the characteristics of JFET, MOSFET in Enhancement and Depletion Modes.
4. Apply BJT & MOSFET for biasing and analysis using small signal models.
5. Analyze the fabrication process of Integrated circuits.

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	-	-	-	-	-	-	-	-
CO2	1	-	-	-	-	-	-	-	-	-	-	2	-	-
CO3	1	-	-	-	-	-	-	-	-	-	-	-	-	-
CO4	1	-	-	-	-	-	-	-	-	-	-	-	-	-
CO5	1	-	-	-	-	-	-	-	-	-	-	-	-	-
Average	1.5	-	-	-	-	2	-	-	-	-	-	2	-	-

<table>
<tr><td>AY 2020-21
onwards</td><td>J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B.Tech
I Year – II Sem</td></tr>
<tr><td>Course Code:
J1201</td><td rowspan="2">CHEMISTRY LAB
(COMMON TO EEE, ECE,CSE,IT & ECM)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 1</td><td>0</td><td>0</td><td>2</td><td>0</td></tr>
</table>

Pre-requisite: Nil

Course Objectives:
This course will enable students to:

1. Estimation of hardness and chloride content in water to check its suitability for drinking purpose.
2. To determine the rate constant of reactions from concentrations as a function of time.
3. The measurement of physical properties like adsorption and viscosity.
4. To synthesize the drug molecules and check the purity of organic molecules by thin layer chromatographic (TLC) technique.
5. To measure the conductance and EMF values of different solutions.

List of Experiments:

1. Determination of total hardness of water by complexometric method using EDTA
2. Determination of chloride content of water by Argentometry
3. Estimation of an HCl by Conductometric titrations
4. Estimation of Acetic acid by Conductometric titrations
5. Estimation of HCl by Potentiometric titrations.
6. Estimation of Fe^{2+} by Potentiometry using KMnO4
7. Estimation of amount of $Cu^{+2}$by Colorimetry.
8. Estimation of amount of $KMnO_4$ by Colorimetry.
9. Synthesis of Aspirin and Paracetamol.
10. Determination of acid value of coconut oil .
11. Thin layer chromatography calculation of R_f values. Eg.ortho and para nitro phenols
12. Determination of viscosity of castor oil and ground nut oil by using Ostwald's viscometer.
13. Determination of partition coefficient of acetic acid between n-butanol and water.
14. Determination of surface tension of a give liquid using stalagmometer.

Note: Any 8 experiments are to be performed.

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 and 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:
The 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. Be exposed to the phenomena of electromagnetism and also to have exposure on magnetic materials and dielectric materials.
5. Lasers and fibre optics enable the students to apply to various systems like communications, solar cell, photo cells and so on.

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	-	-	-	-	-	-	-	-
CO2	1	-	-	-	-	-	-	-	-	-	-	2	-	-
CO3	1	-	-	-	-	-	-	-	-	-	-	-	-	-
CO4	1	-	-	-	-	-	-	-	-	-	-	-	-	-
CO5	1	-	-	-	-	-	-	-	-	-	-	-	-	-
Average	1.5	-	-	-	-	2	-	-	-	-	-	2	-	-

<table>
<tr><td>AY 2020-21 onwards</td><td colspan="4">J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B.Tech: EEE
I Year – II Sem</td></tr>
<tr><td>Course Code: J1221</td><td colspan="4" rowspan="2">BASIC ELECTRICAL ENGINEERING LAB
(Common to EEE, ECE, CSE, IT & ECM)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 1</td><td>0</td><td>0</td><td>2</td><td>0</td></tr>
</table>

Course Objectives:
This course will enable students to:

1. analyse a given network by applying various electrical laws and network theorems.
2. know the response of electrical circuits for different excitations.
3. calculate, measure and know the relation between basic electrical parameters.
4. analyse the performance characteristics of DC and AC electrical machines
5. know 3 phase balanced and unbalanced, star and delta connected supply and load and to measure power in 3 phase circuits

Choice of 10-12 experiments from the following

List of Experiments

1. Verification of Ohms Law.
2. Determination of unknown resistance.
3. Verification of KVL and KCL.
4. Transient response of series RL and RC circuits using DC excitation.
5. Transient response of RLC series circuit using DC excitation.
6. Resonance in series RLC circuit.
7. Calculations and verification of impedance and current of RL, RC and RLC series circuits.
8. Measurement of voltage, current and real power in primary and secondary circuits of a single-phase transformer.
9. Load test on single phase transformer (Calculate Efficiency and Regulation).
10. Three phase transformers: Verification of relationship between voltages and currents (Star-Delta, Delta-Delta, Delta-star, Star-Star).
11. Measurement of active and reactive power in a balanced three-phase circuit.
12. Performance Characteristics of a DC Shunt Motor.
13. Torque-Speed Characteristics of a DC Shunt Motor.
14. Performance Characteristics of a Three-phase Induction Motor.
15. Torque-speed Characteristics of a Three-phase Induction Motor.

Course Outcomes:
The students will be able to:

1. Get an exposure to basic electrical laws.
2. Relate the response of different types of electrical circuits to different excitations.
3. Understand the measurement, calculation and relation between the basic electrical parameters.
4. Inspect the basic characteristics of transformers and electrical machines.
5. Understand 3 phase balanced and unbalanced, star and delta connected supply and load and to measure power in 3 phase circuits.

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	1	1	1	1	-	-	-	2	2	-	-	1	-
CO2	3	1	1	1	1	-	-	-	2	2	-	-	1	-
CO3	3	1	-	1	1	-	-	-	2	2	-	-	-	-
CO4	3	1	-	1	1	-	-	-	2	2	-	-	-	-
Average	3	1	1	1	1	-	-	-	2	2	-	-	1	-

<table>
<tr><td>AY 2020-21
onwards</td><td>J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B. Tech:
I Year – II Sem</td></tr>
<tr><td>Course Code:
J1241</td><td rowspan="2">BASIC ELECTRONICS ENGINEERING LAB
(COMMON FOR ECE, EEE, ECM,IT)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 1</td><td>0</td><td>0</td><td>2</td><td>0</td></tr>
</table>

COURSE OBJECTIVES
This course will enable students to:
1. Learn Colour coding of different components like Resistor, capacitor and Inductor.
2. Study basic electronic equipment like CRO, RPS, Function generator etc
3. Observe characteristics of electronic devices
4. Calculate various parameter of rectifier circuits
5. Get the Knowledge Frequency Response of various Amplifier circuits

PART A: (Only for Viva-voce Examination)
ELECTRONIC WORKSHOP PRACTICE (in 3 lab sessions) :
1. Identification, Specifications, Testing of R, L, C Components (Color Codes), Potentiometers,Switches (SPDT, DPDT, and DIP), Coils, Gang Condensers, Relays, Bread Boards, PCB‘s
2. Identification, Specifications and Testing of Active Devices, Diodes, BJT‘s, Low power, JFET‘s, MOSFET‘s, Power Transistors, LED‘s, LCD‘s, SCR, UJT.
3. Study and operation of Multimeters (Analog and Digital),Function Generator, Regulated Power Supplies .CRO.

PART B: (For Laboratory Examination – Minimum of 10 experiments)
1. Forward & Reverse Bias Characteristics of PN Junction Diode.
2. Zener diode characteristics and Zener as voltage Regulator.
3. Input & Output Characteristics of Transistor in CB Configuration.
4. Input & Output Characteristics of Transistor in CE Configuration.
5. Half Wave Rectifier with & without filters
6. Full Wave Rectifier with & without filters
7. FET characteristics
8. Measurement of h parameters of transistor in CB, CE, CC configurations
9. Frequency Response of CC Amplifier.
10. Frequency Response of CE Amplifier.
11. Frequency Response of Common Source FET amplifier
12. SCR characteristics.
13. UJT Characteristics

Equipment required for Laboratories:
1. Regulated Power supplies (RPS) - 0-30 V
2. CRO‘s - 0-20 MHz.
3. Function Generators - 0-1 MHz.
4. Multimeters
5. Decade Resistance Boxes.
6. Decade Capacitance Boxes
7. Ammeters (Analog or Digital) - 0-20 μA, 0-50μA, 0-100μA, 0-200μA, 0-10 mA.
8. Voltmeters (Analog or Digital) -0-50V, 0-100V, 0-250V
9. Electronic Components - Resistors, Capacitors, BJTs, LCDs, SCRs,UJTs,FETs, LEDs, MOSFETs,diodes Ge& Sitype,Transistors – npn,pnp type)

COURSE OUTCOMES

The students will be able to:

1. Calculate value of Resistor, capacitor and Inductor using colour coding
2. Measure voltage, frequency and phase of any waveform using CRO.
3. Generate sine, square and triangular waveforms with required frequency and amplitude using function generator
4. Analyze the characteristics of different electronic devices such as diodes, transistors etc., and simple circuits like rectifiers, amplifiers , etc
5. Analyze Frequency Response of various Amplifier circuits

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	-	-	-	-	-	-	-	-
CO2	1	-	-	-	-	-	-	-	-	-	-	2	-	-
CO3	1	-	-	-	-	-	-	-	-	-	-	-	-	-
CO4	1	-	-	-	-	-	-	-	-	-	-	-	-	-
CO5	1	-	-	-	-	-	-	-	-	-	-	-	-	-
Average	1.5	-	-	-	-	2	-	-	-	-	-	2	-	-

<table>
<tr><td>AY 2020-21
onwards</td><td>J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B. Tech:
I Year – II Sem</td></tr>
<tr><td>Course Code:
J1292</td><td rowspan="2">ENGINEERING AND IT WORKSHOP LAB
(Common CE, MIE, EEE, ME)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 2</td><td>0</td><td>0</td><td>4</td><td>0</td></tr>
</table>

Pre-requisite: Basic knowledge about tools and different trades

Course Objectives:
This course will enable students to:

1. Develop understanding of various Engineering materials and Manufacturing processes
2. Know different tools used in Carpentry, fitting, tin smithy, house wiring, welding, foundry, machine shop and black smithy.
3. Develop Engineering Skill in making components, system integration and assembly to form a useful product.
4. Study/demonstrate the concepts of computer w.r.t. its hardware.
5. Install the operating system and perform various tasks

(A) ENGINEERING WORKSHOP

Trades for Practice(Minimum 1 Exercise from each category)

1. Carpentry
2. Fitting shop
3. Tin Smithy
4. Electrical house wiring
5. Foundry practices – mould preparation
6. Welding (Arc Welding)

Trades for Demonstration

1. Black Smithy
2. Machine shop

(B) IT WORKSHOP

1. a. Computer Hardware: Identification of Peripherals
b. Study of UPS and SMPS
2. a. Assembling and disassembling of a PC
b. Simple diagnostic exercises – Related to hardware
3. a. Installation of Windows Operating System
b. Installation of Linux Operating System
4. a. Basic Windows and Linux Commands
b. Simple diagnostic exercises –Related to Operating System

Course Outcomes:
The students will be able to:

1. Understand trades and techniques used in Workshop, chooses the best material/ manufacturing process
2. Use Apt tools for different engineering applications following precautionary measures.
3. Gain different skills of manufacturing and importance of dimensional accuracies and dimensional tolerances in assembling of various components.

4. Identify, assemble and dissemble the given configuration of a computer.
5. Install the operating system in the given configuration of a computer and execute commands for LINUX Operating System

Note: *The work load for this to be distributed in 75:25 for Engineering workshop and IT workshop*

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	2	-	-	-	2	-	-	-	-	-	-	-
CO2	3	3	2	-	-	-	2	-	-	-	-	-	-	-
CO3	3	3	3	-	-	-	3	-	-	-	-	-	-	-
CO4	2	2	2	-	-	-	2	-	-	-	-	-	-	-
CO5	2	2	2	-	-	-	2	-	-	-	-	-	-	-
Average	2.6	2.4	2.2	-	-	-	2.2	-	-	-	-	-	-	-

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech: EEE I Year – II Sem			
Course Code: J12M1	ENVIRONMENTAL SCIENCE (Common to CE,EEE, ME and MIE)	L	T	P	D
Credits: 0		2	0	0	0

Pre-requisite: Nil

Course Objectives:

This course will enable students to:

1. Study about the different natural resources available and how to use them.
2. Explain about biodiversity.
3. Discuss about Global Environmental Problems and Global Efforts.
4. Identify the global environmental problems.
5. Explain about sustainable development.

Module 1:

Unit-1: Ecosystems & Natural Resources, **Biodiversity**

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-1: 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)
3. "Environmental Studies (A Text Book for Undergraduates)" by Dr. K Mukkanti, S. Chand, 2010
4. "Environmental Studies" by Kaushik Anubha, C P Kaushik, New Age International Private Limited 1st August 2018

Reference Books

1. "Environmental Studies" by Benny Joseph, McGraw Hill Education 2008.
2. "Textbook of Environmental Studies for Undergraduate Courses" by ErachBharucha 2005, University Grants Commission, University Press.

E- Resources:

1. https://nptel.ac.in/courses/120/108/120108004/#

Course Outcomes

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.

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 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech II Year – I Sem			
Course Code:J210A	Complex Variables and Special Functions (COMMON TO EEE, ECE& ECM)	L	T	P	D
Credits: 4		3	1	0	0

Pre-requisite: Nil

Course Objectives:
This course will enable students to:

1. The ways of finding the solutions of Bessel and Legendre equations.
2. Analytic function and their properties.
3. Concept of complex integration.
4. Classifications of Singular points and residues.
5. The notion of Conformal mapping

Module 1: Special functions- Bessel function-Legendre function: (9L)
Bessel functions, Recurrence relations, properties. Generating function and Orthogonal properties, Legendre polynomials, Properties, Rodrigue’s formula, Recurrence relations Generating function, and Orthogonal properties.

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

Module 4 : Contour Integration: (10L)
Singular point, Isolated singular point, pole of order m – essential singularity. (Distinction between the real analyticity and complex analyticity).
Residue – Evaluation of residue by formula and by Laurent series - Residue theorem, Evaluation of integrals of the type

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. “Advanced Engineering Mathematics”,Erwin Kreyszig ,John Wiley and Sons, 8^{th} Edition, 2008. 4
2. “Higher Engineering Mathematics”,B.S. Grewal ,Khanna Publications, 2017
3. “Advanced Engineering Mathematics”, R.K.. Jain& S.R.K. Iyengar, Narosa Publications, 5^{th} Edition, 2015

Reference Books:

1. "Complex variables and its applications", R.V. Churchill, McGraw Hill, 2009.
2. "Special Functions for Scientists and Engineers ",W.W. Bell, Dover Publications, 2004

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:
The students will be able to:

1. Learn and use properties of Bessel's and Legendre functions.
2. Understand the concept of analytic functions
3. Use power series and solve the ordinary differential equations
4. Understand the use of complex variables and evaluation of real integrals.
5. Convert complicated regions to simpler regions using the conformal 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	-	-
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	-	-

<table>
<tr><td>AY 2020-21 onwards</td><td colspan="4">J. B. Institute of Engineering and Technology (UGC Autonomous)</td><td colspan="4">B.Tech
II Year – I Sem</td></tr>
<tr><td>Course Code:J212A</td><td colspan="4" rowspan="2">ELECTRICAL CIRCUIT ANALYSIS
(EEE)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 4</td><td>3</td><td>1</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Basic Electrical Engineering

Course Objectives:

1. To impart knowledge on solving circuit equations using network theorems.
2. To find solution of first and second order networks.
3. To introduce Phasor diagrams and analysis of three phase circuits.
4. To analyse electric circuits using Laplace Transform.
5. To educate on Two Port Network and Network Functions.

MODULE 1: A.C. NETWORK THEOREMS

UNIT-I: 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.

MODULE2: TRANSIENT RESPONSE ANALYSIS

UNIT-II: 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.

MODULE 3: INTRODUCTION OF A.C. CIRCUITS

UNIT-III: 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. Three-phase circuits, Mutual coupled circuits, Dot Convention in coupled circuits, Ideal Transformer.

MODULE 4: LAPLACE TRANSFORM FOR ELECTRICAL CIRCUITS

UNIT-IV: 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

Module5: TWO PORT NETWORK PARAMETERS

UNIT -V: 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. M. E. Van Valkenburg, “Network Analysis”, Prentice Hall, 2006.
2. D. Roy Choudhury, “Networks and Systems”, New Age International Publications, 1998.
3. W. H. Hayt and J. E. Kemmerly, “Engineering Circuit Analysis”, McGraw Hill Education, **2013.**

Reference Books:

1. C. K. Alexander and M. N. O. Sadiku, “Electric Circuits”, McGraw Hill Education, 2004.
2. K. V. V. Murthy and M. S. Kamath, “Basic Circuit Analysis”, Jaico Publishers, 1999.

E - Resources:

https://www.khanacademy.org/science/electrical-engineering/ee-circuit-analysis-topic
https://www.allaboutcircuits.com
https://sites.google.com/site/eeenotes2u/courses/network-analysis
https://www.sciencedirect.com/topics/engineering/circuit-theory
https://www.electronics-tutorials.ws/
http://dl.booktolearn.com/ebooks2/engineering/electrical/9781119284932_Introduction_to_Electrical_Circuit_Analysis_71f7.pdf
https://www.electrical4u.com/electrical-engineering-articles/circuit-theory/

Course Outcomes:

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

- Apply network theorems for solving DC electric circuit equations.
- Solve first and second order networks.
- Analyse AC circuits using phasor diagrams.
- Analyse electric circuits using Laplace Transform.
- Understand Two Port Network and Network Functions.

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	3	-	-	-	-	-	-	-	2	3	3
CO2	3	3	2	3	-	-	-	-	-	-	-	2	3	3
CO3	3	2	-	-	-	-	-	-	-	-	-	-	3	3
CO4	3	2	3	-	3	-	-	-	-	-	-	3	3	3
CO5	3	2	-	3	-	-	-	-	-	-	-	-	-	-
Average	3	2.4	2.3	3	3	-	-	-	-	-	-	2.3	3	3

<table>
<tr><td>AY 2020-21 onwards</td><td colspan="4">J. B. Institute of Engineering and Technology (UGC Autonomous)</td><td colspan="4">B.Tech II Year – I Sem</td></tr>
<tr><td>Course Code: J212B</td><td rowspan="2">ELECTRICAL MACHINES – I</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Basic Electrical Engineering

Course Objectives:

This course will enable students to:

1. To impart knowledge on magnetic circuit analysis.
2. To study the construction and operation of DC Machine.
3. To be familiar with the EMF equation, Torque equation, Armature circuit equation for motoring and generation.
4. To study the various characteristics of DC Motor
5. To impart knowledge on speed control methods Of DC Motor.

MODULE – I: ELECTROMECHANICAL ENERGY CONVERSION

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 – II: D.C. GENERATORS

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 – III: ARMATURE REACTION IN D.C. GENERATOR

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 – IV: D.C. MOTORS

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 – V: SPEED CONTROL OF D.C. MOTORS

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 of stray losses in a d.c. motor test.

Textbooks:

1. E. Fitzgerald and C. Kingsley, "Electric Machinery", New York, McGraw Hill Education, 2013.
2. E. Clayton and N. N. Hancock, "Performance and design of DC machines", CBS Publishers, 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.

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:

The students will be able to:

1. Recollect magnetic field and magnetic circuit.
2. Explain the construction and operation of DC Machine.
3. Derive the EMF equation, Torque equation, Armature circuit equation for motoring and generation.
4. Demonstrate the various characteristics of DC Machines speed control methods.
5. Summarize the speed control methods OF DC MOTOR

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**	**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**

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech II Year –I Sem			
Course Code: J212D	**POWER SYSTEMS – I**	**L**	**T**	**P**	**D**
Credits: 3		**3**	**0**	**0**	**0**

Course Objectives:
This course will enable students to:

1. understand the working of power generating stations and sub systems
2. examine A.C. and D.C. distribution systems.
3. understand classification of substations and examine Air insulated substations and Gas insulated substations.
4. understand different types of tariffs and economical aspects of power generation.
5. understand concepts of Power factor correction and voltage control.

MODULE-I: Power Stations
UNIT-1:-Thermal 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.
UNIT-2:-Hydel Power Stations- Schematic Arrangement, Brief description of Hydraulic Structures, Water turbines.
UNIT-3:-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.
UNIT-4:-Gas Power Stations- Principle of Operation and Components (Block Diagram Approach Only).

MODULE-II: D.C & A.C Distribution Systems
UNIT-1:- 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-2:-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-III: Air Insulated & Gas Insulated (GIS) Substations
UNIT-1:-Classification of Substations: - Indoor & Outdoor substations: Substations layout showing the location of all the substation equipment.
UNIT-2:-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-3:-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, Installation and maintenance of GIS, Comparison of Air insulated substations and Gas insulated substations.
MODULE-IV: Power Factor
UNIT-1:-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

MODULE-V: Economic Aspects of Power Generation & Tariff
UNIT-1:-Load curve, load duration and integrated load duration curves-load, demand, diversity, capacity, utilization and plant use factors- Numerical Problems.
UNIT-2:-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"

References:
1. R.K. Rajput, "A Text book of Power system Engineering," Laxmi Publications (P) Limited.
2. S.N.Singh', "Electrical 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:
The students will be able to:
1. Understand the concepts of generating stations, substations, tariff systems.
2. Apply concepts in distribution systems to solve problems.
3. Analyze economics of power generation and Power factor correction
4. Evaluate the power tariff methods.
5. Know the importance of Power factor improvement and voltage control.

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	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

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech EEE II Year – I Sem			
Course Code: J212C	ELECTROMAGNETIC FIELDS	L	T	P	D
Credits: 3		3	0	0	0

Prerequisite: Basic Electrical Engineering, Physics, Mathematics

Course Objectives:
This course will enable students to:

1. To introduce the basic mathematical concepts related to electromagnetic vector fields.
2. To impart knowledge on the concepts of electrostatic fields, electrical potential, energy density and their applications.
3. To impart knowledge on the concepts of Magneto static fields, magnetic flux density, vector potential and its applications.
4. To impart knowledge on the concepts of different methods of E.M.F generation and Maxwell's equations.
5. To impart knowledge on the concepts of Electromagnetic waves and characterizing parameters.

MODULE I: ELECTROSTATIC FIELD
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 – potential gradient – Divergence and divergence theorem – Poisson's and Laplace equations.

MODULE II: ELECTROSTATIC APPLICATIONS
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 III: STEADY ELECTRO-MAGENTIC FIELDS
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 IV: MAGNETO STATICS AND APPLICATIONS
Introduction to magnetic materials – Magnetization and Permeability – Magnetic boundary conditions – 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 V: ELECTROMAGNETIC FIELDS AND WAVE PROPAGATION
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:

The students will be able to:

1. Understand the basic mathematical concepts related to electromagnetic vector fields.
2. Summarize the concepts of electrostatic fields, electrical potential, energy density and their applications
3. Explain the concepts of Magneto static fields, magnetic flux density, vector potential and its applications.
4. Explain the concepts of different methods of E.M.F generation and Maxwell’s equations.
5. Understand the concepts of Electromagnetic waves and characterizing parameters

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	-	-	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

<table>
<tr><td>AY 2020-21 onwards</td><td colspan="4">J. B. Institute of Engineering and Technology (UGC Autonomous)</td><td colspan="4">B.Tech: EEE
II Year – I Sem</td></tr>
<tr><td>Course Code:J2121</td><td rowspan="2">ELECTRICAL CIRCUITS LAB</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 1.5</td><td>0</td><td>0</td><td>3</td><td>0</td></tr>
</table>

Pre-requisite: Basic Electrical Engineering Lab

Course Objectives:
This course will enable students to:
1. Develop the basic concepts of network analysis, which is the pre-requisite for all the electrical engineering subjects.
2. Solve different complex circuits using various network reduction techniques such as Source transformation, Network theorems etc.
3. Synthesize the transmission line parameters using two-port networks
4. Impart hands on experience in measurement of circuit parameters, study of circuit characteristics and simulation of time response.
5. Expose on the usage of CRO, power sources, function generator etc.

List of 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.
13. Locus diagrams of RL & RC series circuit.

Course Outcomes:
The Student will be able to:
1. Become familiar with the basic circuit components and know how to connect them to make a real electrical circuit.
2. Verify the laws and principles of electrical circuits; understand the relationships and differences between theory and practice.
3. Gain the knowledge to solve transmission line networks and apply in designing the transmission lines
4. Carefully and thoroughly document and analyze experimental work.
5. Gain practical experience related to electrical circuits, stimulate more interest and motivation for further studies of electrical circuits.

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

<table>
<tr><td>AY 2020-21 onwards</td><td>J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B.Tech: EEE
II Year – I Sem</td></tr>
<tr><td>Course Code: J2122</td><td rowspan="2">ELECTRICAL MACHINES LAB – I</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 1.5</td><td>0</td><td>0</td><td>3</td><td>0</td></tr>
</table>

Pre-requisite: Basic Electrical Engineering

Course Objectives:
The Student will:

1. Conduct testing and experimental procedures on dc machine
2. Get a chance to practice different types of wiring and devices connections.
3. Have the capability to analyse the operation of electric machines under different loading conditions.
4. To impart knowledge on speed control methods of dc motor
5. To study the various characteristics of DC machine

Any Ten of the experiments are required to be conducted as compulsory experiments :

1. Magnetization characteristics of DC shunt generator. Determination of critical field resistance 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. 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 various characteristics and parameters of electrical machines.
4. Understand the operation of DC machines in load sharing.
5. Demonstrate the ability to work effectively in groups to troubleshoot and analyze electrical machines

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 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech: EEE II Year – I Sem			
Course Code: J21M1	GENDER SENSITIZATION	L	T	P	D
Credits: 0		2	0	0	0

Course objectives:
The Student will :

1. Develop sensibility with regard to issues of gender in contemporary India.
2. Understand the critical perspective on the socialization of men and women.
3. Know the information about some key biological aspects of genders.
4. Explore the debates on the politics and economics of work.
5. Understand how to reflect critically on gender violence.

MODULE -I – Gender: Why should we study it?, Socialization: Making women, Making Men, Introduction, Preparing For Womanhood, Growing up male, First lessons in caste, Different masculinities.

MODULE -II- Women's Work: Its Politics and Economics,
Fact and fiction, Unrecognized and unaccounted work, Further reading: Wages and conditions of work, Domestic Violence: Speaking Out, Is home a safe place?, When women unite [Film], Rebuilding lives, Further reading: New forums for justice.

MODULE -III–Just Relationships: Being Together as Equals,
Mary kom and Onler, Love and acid just do not mix, Love letters, Mothers and fathers, Further Reading: Rosa Parks – The brave heart.

Text Books:
1. Towards a world of equals by A.Suneetha Susic Tharu publication Telugu academy Hyderabad

Course outcomes:
The student will be able to:

1. Develop sensibility with regard to issues of gender in contemporary India
2. Identify egalitarian interactions between men and women
3. Justify politics and economics of work.
4. Describe on the history of women
5. Create awareness about socialization of men and women

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

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech: EEE II Year – I Sem			
Course Code: J220A	**INTEGRAL TRANSFORMS (Common to CE, EEE, ME, ECE, CSE, IT, ECM & MIE**	**L**	**T**	**P**	**D**
Credits: 3		3	0	0	0

Prerequisite : Differential Equations
Course Objectives:
This course will enable students to:

1. Approximation of real-valued periodic functions to suitably restricted non-periodic functions f(x) defined for all real numbers
2. How to use laplace transform methods to solve ordinary and partial differential equations
3. Make them familiar with the methods of solving differential equations, partial differential equations.
4. The properties of z-transform and associating the knowledge of properties of roc in response to different operations on discrete signals.
5. Discretization techniques to find approximate solutions of differential equations different types of errors involved in such solutions, their measures and practical applications.

MODULE-I: Introduction **(8L)**
Basic introduction of the course using precise examples like periodic functions, signal propagation, solving mathematical models corresponding to Electrical Circuits

MODULE-II: Laplace Transforms **(12L)**
UNIT-I: 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.
UNIT-II: 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. Heaviside expansion theorem. Inverse Laplace Transform of integrals – definition of convolution – Convolution theorem.

MODULE–III : 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–IV : 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-V: 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 PrakashamMandirurray
2. R.Spiegel, Theory and problems of Laplace transforms - Shamus Outline Series Tata Mac Grawhill

References:

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:

The students will be able to:

1. Understand the concepts of integral transforms
2. Determine laplace transform of a function and understand the fundamental properties and apply laplace transform in solving odes.
3. Determine fourier and inverse fourier transform of a function and understand the fundamental properties and apply fourier transform in solving odes.
4. *Apply the z transform techniques to solve second-order ordinary difference equations*.
5. Apply the hankel transform in the infinite 2-dimensional plane

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	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	-	-

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech: EEE II Year – II Sem			
Course Code:J222A	ELECTRICAL MACHINES-II	L	T	P	D
Credits: 4		3	1	0	0

Pre-requisite: ELECTRICAL MACHINES - I

Course objectives:
This course will enable students to:

1. To acquire the basic knowledge of construction, working and operation of transformer and induction motor.
2. To know about the insulation of the machines and to choose good insulator for better performance and efficiency.
3. To design the speed controlling techniques for the induction motor
4. To select a particular transformer/induction motor depending on the application
5. To design a particular transformer for the application.

MODULE – I: Transformers (Part-I)
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 – II: **Transformers** (Part-II)
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 – III: **Parallel Operation And Three Phase Transformers**
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 – IV: **Poly Phase Induction Motors** (Part-I)
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 – V: **Poly Phase Induction Motors** (Part-II)
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. **Electrical machines** by PS Bhimbra, Khanna Publishers.
2. **Electric machinery** by A.E. Fritzgerald, C.Kingsley and S.Umans, Mc Graw Hill Companies, 5th edition

References Books:

1. **Performance and Design** of AC Machines by MG.Say, BPB Publishers
2. **Theory of Alternating Current Machinery** by Langsdorf, Tata McGraw-Hill Companies, 2nd edition.
3. **Electric Machines** by I.J.Nagrath and D.P.Kothari,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:

1. Analyze the performance of a transformer under different operating conditions and recognize the various losses & drops inside a transformer and discuss about transformer.
2. Evaluate the performance of single-phase transformer by estimating its efficiency, regulation.
3. Apply parallel operation of single-phase and three-phase transformers to meet the maximum demand.
4. Describe the working principle of induction motors based on basic theories of electromagnetic induction and analyze the motor from its speed-time characteristics.
5. Analyze the performance by Constructing circle diagram of an induction motor.

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

<table>
<tr><td>AY 2020-21
onwards</td><td colspan="1">J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B. Tech: EEE
II Year – II Sem</td></tr>
<tr><td>Course
Code:J224G</td><td rowspan="2">DIGITAL ELECTRONICS</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Course objectives:
This course will enable students to:

1. Introduce concepts of digital and binary number systems
2. Understand Boolean Algebra and simplify Boolean functions using K-Maps
3. Emphasize on the concepts of designing combinational circuits
4. Emphasize on the concepts of designing sequential circuits
5. To study some of the programmable logic devices and their use in realization of switching functions.

Module 1: Digital Fundamentals
Unit 1: Number Systems
Decimal, Binary, Octal, Hexadecimal and their conversions. Signed Binary Numbers- Sign Magnitude, 1‘s and 2‘s complement representations.
Unit 2: Codes
Binary, BCD, Excess 3, Gray, Alphanumeric codes, Error Detecting & Error Correcting Codes-Parity bit, Hamming codes.

Module 2: Boolean Algebra and Switching Functions
Unit 1: Basic Digital Circuits
Logic gates, Universal gates, Properties of XOR 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 2: Minimization of Switching Functions
Karnaugh Map Method- Two, Three, Four and Five variable, Prime Implicants, Don’t care combinations, Tabular Method, Prime –Implicant chart, Simplification rules.

Module 3: Combinational Logic Design using MSI circuits
Design of Half and Full Adders, Half and Full Subtractors, Binary Parallel Adder – Carry look ahead Adder, BCD Adder.
Multiplexer, Demultiplexer /Decoders, Encoder, Priority Encoder, Magnitude Comparator

Module 4: Sequential Circuits
Unit I: Synchronous Sequential Circuits
Flip-Flops- SR, JK, D, T, Master-Slave JK FF operation and excitation tables. Triggering of FF. Design of Counters- Ripple Counters, Ring Counters
Unit II: Analysis and design of clocked sequential circuits
Design – Moore/Mealy models, Minimization of Completely Specified and Incompletely Specified Sequential Machines.

Module 5: Memories and Programmable Logic
Unit I: Memory organization
Memory Decoding, Internal Structure and operation of RAM- Static and Dynamic, ROM, PROM, EPROM, EEPROM.
Unit II: Programmable Logic Devices
Programmable Logic Array, Programmable Array Logic, Field Programmable Gate Array.

Realization of Switching functions using PLD's.

TEXTBOOKS :

1. Switching & Finite Automata theory – Zvi Kohavi, 2 ed., TMH.
2. Digital Design – Morris Mano, 3 ed., 2006, PHI.
3. R.P. Jain, "Modern digital Electronics", Tata McGraw Hill, 4th edition, 2009.

REFERENCES BOOKS:

1. Switching Theory and Logic Design – A. Anand Kumar, 2008, PHI.
2. An Engineering Approach to Digital Design – Fletcher, PHI.
3. Fundamentals of Logic Design – Charles H. Roth, 5 ed., 2004, Thomson Publications.
4. W.H. Gothmann, "Digital Electronics- An introduction to theory and practice", PHI, 2nd edition ,2006

E Resources:

1. **http://www.inf.fu-berlin.de/lehre/WS00/19504-V/Chapter1.pdf**
2. **https://nptel.ac.in/courses/108/105/108105113/**
3. **https://nptel.ac.in/courses/108/105/108105132/**
4. **https://www.youtube.com/watch?v=CeD2L6KbtVM**

Course Outcomes:
The student will be able to:

1. **Develop** different type of codes and number systems which are used in digital communication and computer systems.
2. **Apply** Boolean Algebra and K-Maps to minimize Boolean functions
3. **Analyse** & **design** of various combinational logic circuits using the concepts of Boolean algebra.
4. **Analyse** & **design** of various sequential logic circuits using the concepts of Boolean algebra.
5. **Analyse** & **design** various logic gates starting from simple ordinary gates to complex programmable logic devices & arrays.

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

<table>
<tr><td>AY 2020-21 onwards</td><td colspan="1">J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B. Tech: EEE
II Year – II Sem</td></tr>
<tr><td>Course Code:J222B</td><td rowspan="2">CONTROL SYSTEMS</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 4</td><td>3</td><td>1</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Network Theory and Mathematics
Course Objectives:
This course will enable students to:

1. To classify control systems and determine mathematical representation of various systems.
2. To understand the various steps in analysis of control systems.
3. To understand the various frequency response plots in analysing control systems.
4. To determine the system stability with various techniques.
5. To Apply state space analysis for linear time invariant control systems.

MODULE 1: INTRODUCTION

Introduction to control systems – Control theory concepts - Open loop and feedback control systems – Mathematics modeling of control systems – Analysis of control systems using Laplace transforms – Block diagram reduction techniques – Signal flow graphs. Controller components – types.

MODULE 2: TIME RESPONSE ANALYSIS

Time Response Analysis - Analysis of transient and steady state behavior of control systems – Standard test signals – Time response of first order and higher order systems – Steady state errors – Error criterion.

MODULE 3: ROOT – LOCUS AND FREQUENCY RESPONSE ANALYSIS

Root locus concepts - Construction of root loci – Root contours Time and frequency response correlation – Polar plot – Bode plot – All pass minimum phase and non-minimum phase systems.

MODULE 4: SYSTEM STABILITY

Stability concepts – Conditions for stability – Routh, Hurwitz stability criteria – Relative stability analysis - Stability in frequency domain – Nyquist stability criterion – Relative stability analysis – Gain margin – Phase margin – Frequency response specification –Constant M circles – Constant N circles – Nichol’s chart.

MODULE 5: STATE SPACE ANALYSIS OF LINEAR CONTINUOUS SYSTEMS

Introduction - State space representation using physical variables – Phase variables and canonical variables – Derivation of transfer function from state model – Solving the time invariant state equation – State transition Matrix – Its properties and computation. Introduction to 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. K. Ogata, "Modern control engineering", pearson Education, 4th edition,2004.
3. A. NagoorKani, “Control Systems”, RBA Publications, 2006

Reference Books:

1. Norman S. Nise, “Control System Engineering”, 4th edition, Wiley Student Edition, 2008.
2. B.C.Kuo "Automatic control systems", 8th edition, Wiley Student Edition, 2008.
3. D.K.Cheng, Analysis of linear systems" Narosa Publishing House, New Delhi,2002.

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:

The students will be able to:

1. **Apply** transfer function method for physical control systems.
2. **Evaluate** the time response of control systems.
3. **Develop** frequency response plots to analyse control systems
4. **Make Use of** time and frequency response plots to analyse stability of control systems.
5. **Apply** State Space Analysis for linear time invariant control systems to test the control systems.

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	-
CO2	3	3		3	-	-	-	-	-	-	-	2	3	-
CO3	3	3	3	2	-	-	-	-	-	-	-	2	3	-
CO4	3	3	2	2	-	-	-	-	-	-	-	2	3	-
CO5	3	2		3	-	2	-	-	-	-	-	-	2	-
Average	3	2.6	2.5	2.6	-	2	-	-	-	-	-	2	2.8	-

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech: EEE II Year – II Sem			
Course Code:J22EA	Managerial Economics and Management Science (CE, ME, MIE & EEE)	L	T	P	D
Credits: 4		3	1	0	0

Pre-Requisites: Nil
Course objectives:
The Student will:

1. Learn principles and practices of the organization.
2. Learn preparation of balance sheet and accounting standards.
3. Understand the principles of management.
4. Gain knowledge on graphical presentation of improving the quality.
5. Understand the importance of inventory control in the organization.

Module 1:
Unit – 1: Introduction to managerial economics, concepts of Managerial Economics: Demand Analysis: Law of Demand, Elasticity of demand & Demand forecasting.
Unit – 2: Production & cost Analysis: Production functions, Law of returns, Economies of scale.
Cost concepts: Variable cost, fixed cost, Marginal cost, Semi-variable cost. Break – even analysis.

Module 2:
Unit – 1: Market Structures: Different types of Markets.
Pricing: Methods of pricing and Strategies, Skimming and Penetration pricing.
Unit – 2: Capital Budgeting: Estimation of fixed and working capital, methods & sources of raising capital. Methods of capital budgeting, Traditional & Discounted Techniques.
Financial Accounting & Financial Analysis: Overview of financial Accounts, Journal, Subsidiary books, Ledger, Trial Balance and preparation of Trading Account, Profit& Loss Account and Balance Sheet. Financial Analysis with the help of Ratios.

Module 3:
Unit – 1: Management: Functions of Management, Taylor's scientific management, Fayol's principles of management.
Designing of organization structures: Different methods with merits and demerits and their suitability.
Unit – 2: Human Recourse Management: Recruitment, Selection, Training and Development and Performance.

Module 4:
Unit – 1: Operation Management: Types of plant layout, Methods of production, Work study – procedure involved in Methods study and work Measurement. Statistical quality control. X, R, C & P charts.
Unit – 2 : Project Management: Program Evaluation & Review Technique (PERT), Critical Path Method (CPM), Identification of critical path.

Module 5:
Unit – 1: Material Management: objectives, need for inventory control, EQC, ABC Analysis,

VED Analysis, Purchase procedure, Store Management.

Unit – 2: Marketing: Functions, Marketing Mix, Marketing strategies based on product life cycle, channels of distribution.

Text books:

1. Managerial Economics & Financial Accounting – Prentice Hall of Inadia: Dr. M. Kasi Reddy, Dr. S. Saraswathi
2. Varshney&Maheswari: Managerial Economics, Sulthan Chand, 2009.
3. P. Subba Rao: Human Recourse Management.

Reference book:

1. AmbrishGuptha, Financial Accounting for Management, Pearson Education, New Delhi, 2009.
2. Naraanaswamy: Financial Accounting – A Managerial Perspective, PHI, 2008.
3. S. N. Maheswari& S. K. Maheswari, Financial Accounting, Vikas, 2008.

E-resources:

1. https://nptel.ac.in/courses/110/101/110101005/
2. https://sites.google.com/site/economicsbasics/
3. http://www.whatishumanresource.com/system/app/pages/search?scope=search-site&q=Compensation+and+Reward+Management

Course outcomes:

The Student will be able to:

1. Develop analytical skills for investigating and analyzing quality management issues in the industry and suggest implement able solutions to those.
2. Develop in-depth understanding on continuous process improvement & benchmarking process
3. Learn the applications of quality tools and techniques in both manufacturing and service Industry.
4. Develop in-depth knowledge on various tools and techniques of quality management.
5. Develop analytical skills for investigating and analyzing quality management issues in the industry and suggest implement able solutions to those.

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	-	-	-	-	-	-	-	-	-	-	-
CO2	2	2	-	2	-	-	-	-	-	-	-	-	-	-
CO3	3	2	-	3	-	-	-	-	-	-	-	-	-	-
CO4	3	1	-	-	-	-	-	-	-	-	-	-	-	-
CO5	2	2	3	3	-	-	-	-	-	-	-	-	-	-
Average	**2.4**	**2.0**	**2.5**	**2.67**	-	-	-	-	-	-	-	-	-	-

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech: EEE II Year – II Sem			
Course Code:J2221	ELECTRICAL SIMULATION LAB	L	T	P	D
Credits: 1		0	0	2	0

Prerequisite: Basic Electrical Engineering, Electrical Circuit Analysis

Course Objectives:

The Student will:

1. understand the objective of Electrical Simulation laboratory is to impart hands on experience in verification of circuit laws and theorems, measurement of circuit parameters, study of circuit characteristics and simulation of time response. It also gives practical exposure to the usage of CRO, power sources, function generator etc.
2. learn analysis of electrical system through computer simulation, using software packages.
3. analyze the series and parallel resonance circuits.
4. synthesize the two-port network parameters.
5. learn background/hands-on experience on PSPICE.

Any Ten of the experiments are required to be conducted as compulsory experiments.

List of Experiments:

1. Simulation of Mesh Analysis & Nodal Analysis
2. Simulation of Thevenin's, Theorem.
3. Simulation of Norton's Theorem.
4. Simulation of Maximum Power Transfer Theorem.
5. Simulation of Superposition Theorem.
6. Simulation of Reciprocity Theorem.
7. Simulation of Compensation Theorem.
8. Simulation of Milkman's Theorem.
9. Simulation of Locus Diagrams of RL and RC Series Circuits.
10. Simulation of Frequency response of Series and Parallel resonance circuits.
11. Simulation of Z and Y Parameters.
12. Simulation of Transmission and hybrid parameters.

Course Outcomes

The Student will be able to:

1. Become familiar with the basic circuit components and know how to connect them to make a real electrical circuit.
2. Verify the laws and principles of electrical circuits; understand the relationships and differences between theory and practice.
3. Gain practical experience related to electrical circuits, stimulate more interest and motivation for further studies of electrical circuits
4. Carefully and thoroughly document and analyze experimental work.
5. Evaluate the parameters of two port networks and can apply in future concepts

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**	**-**

<table>
<tr><td>AY 2020-21 onwards</td><td colspan="4">J. B. Institute of Engineering and Technology (UGC Autonomous)</td><td colspan="4">B.Tech: EEE II Year – II Sem</td></tr>
<tr><td>Course Code:J2243</td><td rowspan="2">DIGITAL ELECTRONICS LAB</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 1</td><td>0</td><td>0</td><td>2</td><td>0</td></tr>
</table>

Course objectives:
The student will:

1. Learn and understand the basics of digital electronics
2. Able to design basic logic gates , combinational and sequential circuits
3. Analyze the RAM operations
4. Know the concepts of Combinational circuits.
5. Understand the concepts of flipflops, registers and counters.

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 IC7445 and IC 74147
8. To design and verify truth table of 4 to 1 multiplexer and 1 to 4 demultiplexer and study of IC74150 and IC 74154
9. Realize 2 bit comparator using gates and 4 bit Comparator using 74X85 Verify the truth tables.
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) - 74189 Perform read and write operations.

Course outcomes:
The students will be able to:

1. Learn the basics of gates and design simple logic circuits
2. Understand the conversions of binary to gray and gray to binary using gates
3. Design different combinational circuits and verify their functionalities.
4. design and implement encoder and decoder
5. Design sequential circuits.

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	1	-	-	-	-	-	-	-	-	-	2	2
CO2	2	2	2	-	-	-	-	-	-	-	-	-	2	2
CO3	2	2	2	-	-	-	-	-	-	-	-	-	2	2
CO4	3	2	2	-	-	-	-	-	-	-	-	-	2	2
CO5	3	2	2	-	-	-	-	-	-	-	-	-	2	2
Average	3	2	2	-	-	-	-	-	-	-	-	-	2	2

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech: EEE II Year – II Sem			
Course Code:J2222	CONTROL SYSTEMS LAB	L	T	P	D
Credits: 1		0	0	2	0

Pre-requisite: Control Systems

Course Objectives:
This course will enable students to:

1. To Understand and practice the modelling, simulation, and implementation of a physical dynamical system by a linear time invariant ordinary differential equation, to highlight the electrical modelling of a second order system and analyse the different damped cases.
2. To Familiarize with Servo-Motor. To implement the basic principles of Servo-Motor calibration.
3. To Study the effects of Lead, Lag and Lag-Lead series compensator on a second order system transient and steady state system response.
4. To Investigate the characteristics of Servo-Motor speed, position control and Temperature control systems by designing and selecting specific P, I and PI for specific responses.
5. To analyse stability of various linear systems using Simulation software.

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. **Demonstrate** theoretical concepts in the field of control engineering and **Develop**models for physical systems.
2. **Apply** knowledge of control engineering and gains the ability to interact and communicate effectively with peers in the group.
3. **Identify, formulate, and solve** engineering problems using various control techniques.
4. **Demonstrate** an ability to use the techniques, skills, and modern engineering tools such as MATLAB for engineering practice.
5. **Design** Lag and Lead Compensators.

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	-

<table>
<tr><td>AY 2020-21 onwards</td><td>J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B.Tech: EEE
II Year – II Sem</td></tr>
<tr><td>Course Code: J22M1</td><td rowspan="2">PROFESSIONAL ETHICS
(Mandatory course)
(Common For All Branches)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 0</td><td>2</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Course objectives:

The Student will:

1. To know the importance of corporate social responsibility and values.
2. To understand ethics as a professional responsibility.
3. Corporate ethical course and ethical audit.
4. To understand importance of values and ethical living.
5. To ensure safety at work place.

MODULE - I: Introduction to Ethics

Corporate Governance – importance of Corporate Governance, Ethics &CSR(Corporate Social Responsibility) Indian and western thoughts on ethics.

Value education, dimensions of ethics, goal setting importance of morality and ethics, basic ethical principles, moral developments theories, classification of ethical theories.

MODULE - II: Professional and professionalism

Introduction to profession, professional associations, professional's roles and professional risks. Professional accountability, successful professional, ethics and profession.

Engineering as social experimentation, engineering ethics, roles of engineers, professional responsibilities, and professional rights. Professional etiquettes- Dress code, Telephone call, Email writing.

MODULE - III: Ethical codes and audits

Introduction, need for ethical codes, sample codes, corporate codes, limitations of the codes.

Need for Ethical Audit, Sustainability, Ethical standards, Ethical audit.

MODULE -IV : Human values and ethical living

Introduction, terminology, domains of learning, human values, attitudes, behavior values, attitudes and professionals.

Needs of life, harmony in life, what is ethical living, case studies.

MODULE -V: Global issues and safety

Introduction, current scenario, business ethics, environmental ethics, computer ethics, media ethics, war ethics, bio-ethics, research ethics, intellectual property right.

Safety and risk, assessment of risk, risk and cost, engineer's responsibility for safety, risk benefit, analysis, risk cause and management, case studies, providing for safe exit, ethical issues of safety.

TEXT BOOKS:

1. Professional ethics by R. Subramanian, Oxford press.
2. Text book on Professional ethics and human values by R.S.Nagarajan, New age international.

REFERENCES:

1. Professional ethics and human value by D.R.Kiran, Tata McGraw Hills education.
2. Ethics in engineering by Mike W. Martin and Roland Schinzinger, Tata McGraw Hills education.
3. Fundamental of Ethics by Edmund G Seebauer and Robert L.Barry, Oxford university press.

E-resources:

1. http://jits.ac.in/humanvalues_professional-ethics/
2. https://www.tutorialspoint.com/engineering_ethics/engineering_ethics_introduction.htm
3. https://www.onlineethics.org/
4. https://onlinecourses.nptel.ac.in/noc19_hs35/preview

Course outcomes:
The student will be able to:

1. Use of ethical values and attitudes in their life.
2. Implement once he/she becomes a professional.
3. Solve the issues related with environment and technology
4. Apply the different types of professional ethical codes in their organization.
5. Use of the rules framed by the auditors.

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	-	-	-	-	-	-	3	2	1	-	3	-	-
CO2	1	-	-	-	-	-	-	3	2	-	-	3	-	-
CO3	-	1	-	-	-	-	-	3	2	-	-	3	-	-
CO4	1	-	-	-	-	-	-	3	2	1	-	3	-	-
CO5	1	-	-	-	-	-	-	3	2	1	-	3	-	-
Average	**1.0**	**1.0**	-	-	-	-	-	**3.0**	**2.0**	**1.0**	-	**3.0**	-	-

<table>
<tr><td>AY 2020-21
onwards</td><td colspan="1">J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B.Tech: EEE
II Year – II Sem</td></tr>
<tr><td>Course
Code:J2201</td><td rowspan="2">SOFT SKILLS
(Common to all)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 0</td><td>2</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Course Objectives:
Students will learn to:

1. Understand the importance of advanced communication skills.
2. Obtain knowledge on intra personal skills andinter personal skills.
3. Gain knowledge on design thinking.
4. Know about the neuro linguistic programming.
5. Know about self- concept and self- reliance.

Module 1: Advanced Communication:
Barriers of Communication Skills – Real-life case studies, Intra personal skills & Inter personal skills- Practical sessions, Adjustability, Adaptability, Change Planning & Management- For Self, Communication skills-debates, practical sessions & public speaking skills, Body language through NLP (neuro linguistic programming) communication.

Module 2: Design Thinking:
Introduction of Design Thinking, Digitization & Data – Latest Trends in Human Resource,
Thinking Out-of-the Box – Case-study & Activity Based, Dealing with Criticism & Conflict Resolution & Management, Diversity, Social Responsibility, Positive Attitude & Power of Positive Energy.

Module 3: Self-concept & Self-reliance:
Wheel of Life – Self-assessment & Activities, SWOT Analysis, Johari Window tool, developing a Vision & Action-plan, Emotional Intelligence, Stress & Anger Management, Empathy- Practice Sessions & Role-plays, Time management & Prioritization, Problem solving & Decision-making skills.

REFERENCES:

1. Dr Alex. K, Soft Skills, New Delhi: S.Chand, 2009.
2. Dr Ravikanth Rao. K, Dr P. Dinakar. Life Skills Education Paperback, 2016.

E-Resources:

1. https://www.youtube.com/watch?v=Bhf35YngKl4&ab_channel=DanielAlly
2. https://www.youtube.com/watch?v=gHGN6hs2gZY&ab_channel=AJ%26Smart
3. https://www.youtube.com/watch?v=_r0VX-aU_T8&ab_channel=Sprouts.
4. https://www.youtube.com/watch?v=aKGm3nprVA0&t=465s&ab_channel=DreamsAroundTheWorld
5. https://www.youtube.com/watch?v=JXXHqM6RzZQ&ab_channel=SmartDraw
6. https://www.youtube.com/watch?v=Zi4SvpAFRmY&t=309s&ab_channel=CommunicationCoachAlexLyon
7. https://www.youtube.com/watch?v=LgUCyWhJf6s&ab_channel=TheSchoolofLife
8. https://www.youtube.com/watch?v=BsVq5R_F6RA&ab_channel=watchwellcast
9. https://www.youtube.com/watch?v=czh4rmk75jc&ab_channel=WaysToGrow

Course outcomes:

At the end of this course students will be able to

1. Use the advance communication skills in daily life.
2. Utilize the importance of positive energy and positive attitude.
3. Handle criticism in a positive way.
4. Use knowledge to take proper decision in life
5. Acquire knowledge on Self-awareness and time management.

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**	**PO1 0**	**PO1 1**	**PO1 2**	**PSO 1**	**PS O2**
CO1	-	-	3	-	-	-	-	3	3	-	3	3	-	-
CO2	-	-	2	-	-	-	-	3	3	-	3	3	-	-
CO3	-	-	2	-	-	-	-	3	2	-	3	2	-	-
CO4	-	-	2	-	-	-	-	2	2	-	3	2	-	-
CO5	-	-	2	-	-	-	-	2	2	-	2	1	-	-
Average	-	-	2.2	-	-	-	-	2.2	2.2	-	-	2.2	-	-

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech: EEE III Year – I Sem			
Course Code: J312A	**POWER SYSTEMS – II**	**L**	**T**	**P**	**D**
Credits: 4		**3**	**1**	**0**	**0**

Pre- requisites: Power Systems-I

Course Objectives
This course will enable students to:

1. To study the line parameters and interference with neighbouring circuits.
2. Able to analyze the performance of transmission lines.
3. To learn different insulators and underground cables.
4. To compute sag and conductor length for different weather conditions.
5. To impart knowledge about recent trends in transmission.

Module-I: TRANSMISSION LINE PARAMETERS
Unit: - 1 Types of conductors
Unit-2:- calculation of resistance for solid conductors
Unit-3:-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-4:-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 II: PERFORMANCE OF TRANSMISSION LINES
Unit:-1 Development of equivalent circuits for short, medium and long lines - efficiency and regulation. **Unit:-2 A**ttenuation constant and phase constant - surge impedance loading - power circle diagrams for sending and receiving ends - Surge Impedance and SIL, Wave Length and Velocity of Propagation of Waves (numerical problems).

Module III: CORONA, TRANSMISSION LINE INSULATORS, SAG AND TENSION CALCULATIONS
Unit-1:-Corona - Description of the phenomenon, factors affecting corona, critical voltages and power-loss, Radio Interference - Numerical Problems.
Unit-2:-Types of Insulators, String efficiency and Methods of improvement- Capacitance grading andStatic Shielding - Numerical Problems.
Unit-3:-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 IV: UNDERGROUND CABLES
Unit-1:-Types of Cables, Construction, Types of Insulating materials, Calculations of Insulation resistance and stress in insulation, Numerical Problems.
Unit-2:-Capacitance of Single and 3-Core belted cables, Numerical Problems. Grading of Cables - Capacitance grading, Numerical Problems, Description of Inter-sheath grading.

Module V: RECENT TRENDS IN TRANSMISSION
Unit-1:-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.

References:

1. D.P.Kothari, I.J.Nagarath, ‘Power System Engineering’ Tata Mc Graw -Hill PublishingCompany limited, New Delhi, 2007.
2. C.L.Wadhwa, ‘Electrical Power Systems’, New Academic Science Ltd, 2009.
3. LucesM.Fualkenberry ,Walter Coffer, ‘Electrical Power Distribution and Transmission’Pearson Education, 2007.
4. HadiSaadat, ‘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:

The students will be able to:

1. Ability to compute line parameters for different configurations.
2. Ability to model transmission line and to determine the performance of line.
3. Ability to do mechanical design of transmission line.
4. Ability to choose various insulators and cables for transmission line.
5. Ability to understand structure of recent trends in transmission.

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	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

AY 2020-21 onwards	**J. B. Institute of Engineering and Technology (UGC Autonomous)**	**B.Tech: EEE III Year – I Sem**			
Course Code: J312B	**Electrical Machines – III**	**L**	**T**	**P**	**D**
Credits: 4		**3**	**1**	**0**	**0**

Course Objectives:
The Student will:

1. Understand the performance of single phase transformer, parallel operation of transformer, performance of induction motor, regulation of alternator and equivalent circuit of single phase induction motor.
2. Understand Parallel operation of Single phase transformer and measurement of Sequence impedance of 3-phase alternator.
3. Study the performance Alternators with infinite bus
4. Know the performance Synchronous induction Motor
5. Study the performance of A.C. Series motor- Universal motor

MODULE - I: Fundamentals of Synchronous Generators
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 –phas or diagram – load characteristics.

MODULE - II: Regulation of Synchronous Generators
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 - III: Parallel Operation of Synchronous Generators
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 - IV: Synchronous Motors
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 - V: Single Phase Motors-Constructional features.
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. **Electric Machines** by I.J.Nagrath and D.P.Kothari, Tata McGraw Hill Publishers, 7thEdition2005.
2. **Electrical Machines** by P.S. Bimbra, KhannaPublishers.

Reference Books:

1. **The Performance and Design of A.C.Machines** by M.G.Say, ELBS and Ptiman andSons.
2. **Electric Machinery** by A.E. Fitzgerald, C.Kingsley and S.Umans, McGraw-Hill Companies, 5thedition, 1990.
3. **Theory of Alternating Current Machinery** by Langsdorf, Tata McGraw-Hill, 2ndedition.

Course Outcomes:

The Student will be able to:

1. Calculate the efficiency of the single phase transformer, three phase induction motor, and alternator.
2. Know the parallel operation of single phase transformer. Efficiency of three phase alternator.
3. Evaluate the performance Alternators with infinite bus
4. Analyze the performance Synchronous induction Motor
5. Analyze the performance of A.C. Series motor- Universal motor

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 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech III Year – I Sem			
Course Code:J312C	POWER ELECTRONICS	L	T	P	D
Credits: 4		3	1	0	0

Course Objectives:
This course will enable students to:

1. Different types of power semiconductor devices and their switching.
2. Operation, characteristics and performance parameters of Thyristor rectifiers.
3. Operation, switching techniques and basics topologies of DC-DC buck converters.
4. Operation of Single phase voltage source converter.
5. Operation of Three Phase voltage source converters.

MODULE I: Power switching devices :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 II: Thyristor rectifiers: 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 III: DC-DC buck converter: 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 IV: Single-phase voltage source inverter: 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 V:AC-AC Converters (AC Voltage Controllers): 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.

References 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:
The students will be able to:

1. Understand the differences between signal level and power level devices
2. Analyse controlled rectifier circuits.
3. Understand the operation of DC-DC choppers.
4. Analyse the operation of DC-DC choppers.
5. Analyse the operation of voltage source inverters.

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	-

<table>
<tr><td>AY 2020-21 onwards</td><td colspan="1">J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B.Tech: EEE
III Year – I Sem</td></tr>
<tr><td>Course Code: J3121</td><td rowspan="2">POWER SYSTEMS LAB</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 1.5</td><td>0</td><td>0</td><td>3</td><td>0</td></tr>
</table>

Prerequisites: Power System

Course Objectives:
This course will enable students to:

1. To have knowledge on line – line and line to ground faults (L-G, L-L, L-L-G,L-L-L-G) and its analysis on synchronous machine.
2. To evaluate the behaviour of generator protection system.
3. To Analyse the various faults in the electrical machines
4. To analyse power angle characteristics of salient pole alternator
5. To perform short circuit analysis on synchronous machine

List of Experiments:

1. Determination of sequence impedance of cylindrical rotor synchronous machine.
2. Single line to ground fault (L-G) analysis of cylindrical rotor synchronous machine.
3. Line to line fault (L-L) analysis of cylindrical rotor synchronous machine.
4. Double line to ground fault (L-L-G) analysis of cylindrical rotor synchronous machine.
5. Triple line to ground fault (L-L-L-G) analysis of cylindrical rotor synchronous machine.
6. Determination of sub-transient reactance of a salient pole synchronous machine.
7. Power angle characteristics of salient pole alternator.
8. Determine ABCD parameters of transmission lines.
9. Determine sequence impedance of three phase transformer.
10. Determine the equivalent winding of three phase transformer
11. Simulation of Two Port network parameters – ABCD and Hybrid parameters
12. Simulation of Two Port network parameters – Z,Y parameters
13. Determination of Line and Load currents in three phase star/delta circuit.

Course Outcomes:
The student will be able to:

1. Analyse short circuit analysis.
2. Evaluate the characteristics of synchronous machine.
3. Determine the ABCD parameters of transmission line.
4. Identify faults in the electrical machines
5. Determine sequence impedance of three phase transformer.

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	-
CO2	3	3	-	3	-	-	-	-	-	-	-	2	3	2
CO3	2	3	2	2	-	-	-	-	-	-	-	3	3	3
CO4	2	3	2	2	-	-	-	-	-	-	-	2	3	3
CO5	2	2	2	3	-	-	-	-	-	-	-	2	3	
Average	2.4	2.8	2	2.6	-	-	-	-	-	-	-	2.2	3	2.66

<table>
<tr><td>AY 2020-21 onwards</td><td>J. B. Institute of Engineering and Technology (UGC Autonomous)</td><td colspan="4">B.Tech: EEE
III Year – I Sem</td></tr>
<tr><td>Course Code:J3122</td><td rowspan="2">ELECTRICAL MACHINES LAB – II</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 1</td><td>0</td><td>0</td><td>2</td><td>0</td></tr>
</table>

Course Objective:
This course will enable students to:

1. understand the performance of single phase transformer
2. understand the parallel operation of transformer
3. understand various tests on alternators and obtaining their performance indices using standard analytical as well as graphical methods.
4. know the regulation of alternator and equivalent circuit of single phase induction motor.
5. understand various tests on induction machines and obtaining their performance indices using standard analytical as well as graphical methods

Any Ten of the experiments are required to be conducted as compulsory experiments :

Experiment 1. O.C. & S.C. Tests on Single phase Transformer.

Experiment 2.Sumpner's test on a pair of single phase transformers.

Experiment 3. Brake test on three phase Induction Motor.

Experiment 4. No-load & Blocked rotor tests on three phase Induction motor.

Experiment 5. Regulation of a three –phase alternator by synchronous impedance & m.m.f. methods.

Experiment 6.V and Inverted V curves of a three—phase synchronous motor.

Experiment 7. Equivalent Circuit of a single phase induction motor.

Experiment 8. Determination of Xd and Xq of a salient pole synchronous machine.

Experiment 9. Separation of core losses of a single phase transformer.

Experiment 10. Regulation of three-phase alternator by Z.P.F. and A.S.A methods.

Experiment 11. Parallel operation of Single phase Transformer.

Experiment 12. Scott connection of transformer.

Experiment 13. Efficiency of a three-phase alternator.

Experiment 14. Measurement of sequence impedance of a three-phase alternator.

Course Outcomes:
The students will be able to:

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

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	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	-

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech: EEE III Year – IISem			
Course Code:J3123	POWER ELECTRONICS LAB	L	T	P	D
Credits: 1.5		0	0	3	0

Pre-requisite: Nil

Course Objectives:
This course will enable students to:

1. To simulate and design various gate firing circuits.
2. To familiarize the students by introducing Pspice and MULTISIM and help them to simulate and analyze different Converters
3. To enable the student to study and simulate various Chopper Circuits using MATLAB
4. Simulate Rectifier, Chopper, Inverter and AC Voltage Controller
5. Simulate Cyclo-Converter and calculate harmonics.

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:
The students will be able to:

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

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	3.0						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

<table>
<tr><td rowspan="1">AY 2020-21
onwards</td><td>J. B. INSTITUTE OF ENGINEERING AND TECHNOLOGY
(UGC Autonomous)</td><td colspan="4">B.Tech
III Year – I Sem</td></tr>
<tr><td>Course Code:
J31M2</td><td rowspan="2">CYBER SECURITY
(Common to CE, EEE, ME, and MIE)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 0</td><td>2</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Nil

Course Objectives:

This course will enable students to:

1. To familiarize various types of cyber-attacks and cyber-crimes
2. To give an overview of the cyber laws
3. To study the defensive techniques against these attacks.
4. To understand security issues in organizations.
5. To know data privacy.

Module I: Introduction to Cyber Security:

Unit-1:

Basic Cyber Security Concepts, layers of security, Vulnerability,threat, Harmful acts, Internet Governance – Challenges and Constraints, Computer Criminals, CIATriad, Assets and Threat, motive of attackers, active attacks, passive attacks, Software attacks,hardware attacks, Spectrum of attacks, Taxonomy of various attacks, IP spoofing,

Unit-2

Methods of defense,Security Models, risk management, Cyber Threats-Cyber Warfare, Cyber Crime, Cyber terrorism,Cyber Espionage, etc., Comprehensive Cyber Security Policy.

Module II:Cyberspace and the Law & Cyber Forensics

Unit-1: Introduction, Cyber Security Regulations, Roles ofInternational Law. The INDIAN Cyberspace, National Cyber Security Policy.

Unit-2: Introduction, Historical background of Cyber forensics, Digital Forensics Science, The Need forComputer Forensics, Cyber Forensics and Digital evidence, Forensics Analysis of Email, DigitalForensics Lifecycle, Forensics Investigation, Challenges in Computer Forensics, Special Techniquesfor Forensics Auditing.

Module III:Cybercrime: Mobile and Wireless Devices

Unit-1: Introduction, Proliferation of Mobile and WirelessDevices, Trends in Mobility, Credit card Frauds in Mobile and Wireless Computing Era, SecurityChallenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication serviceSecurity, Attacks on Mobile/Cell Phones, Mobile Devices:

Unit-2: Security Implications for Organizations,Organizational Measures for Handling Mobile, Organizational Security Policies and Measures in MobileComputing Era, Laptops.

Module IV: Cyber Security: Organizational Implications

Unit-1: Introduction, cost of cybercrimes and IPR issues, webthreats for organizations, security and privacy implications, social media marketing: security risks andperils for organizations, social computing and the associated challenges for organizations

Unit-2: Introduction, intellectual property in the cyberspace, the ethicaldimension of cybercrimes the psychology, mindset and skills of hackers and other cyber criminals.

Module V: Privacy Issues, Cybercrime: Examples and Mini-Cases

Unit-1: Basic Data Privacy Concepts: Fundamental Concepts, Data Privacy Attacks, Datalinking and profiling, privacy policies and their specifications, privacy policy languages, privacy indifferent domains- medical, financial, etc.

Unit-2: Official Website of Maharashtra Government Hacked, Indian Banks Lose Millions of

Rupees, Parliament Attack, Pune City Police Bust Nigerian Racket, e-mail spoofing instances.The Indian Case of online Gambling, An Indian Case of Intellectual Property Crime,Financial Frauds in Cyber Domain.

Text Books

1. Nina Godbole and SunitBelpure, Cyber Security Understanding Cyber Crimes, ComputerForensics and Legal Perspectives, Wiley.
2. B. B. Gupta, D. P. Agrawal, Haoxiang Wang, Computer and Cyber Security: Principles,Algorithm, Applications, and Perspectives, CRC Press, ISBN 9780815371335, 2018.

Reference Books

1. Cyber Security Essentials, James Graham, Richard Howard and Ryan Otson, CRC Press.
2. Introduction to Cyber Security, Chwan-Hwa(john) Wu,J. David Irwin, CRC Press T&F

E-Resources

1. http://uou.ac.in/foundation-course
2. http://uou.ac.in/progdetail?pid=CEGCS-17

Course Outcomes

The students will be able to:

1. Understand cyber-attacks and types of cybercrimes.
2. Summarize Cyber Laws and Cyber Forensics.
3. Understand frauds in Wireless era.
4. Analyze and evaluate the cyber security needs of an organization.
5. Outline Data Privacy and privacy policies.

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	2	1	-	-	-	-	1	-	-
CO2	-	-	2	-	1	2	-	-	-	-	-	1	-	-
CO3	2	3	1	-	2	1	1	-	-	-	-	-	-	-
CO4	2	2	2	-	-	-	1	-	-	-	-	1	-	-
CO5	-	-	-	-	-	1	2	-	-	-	-	2	-	-
Average	1.2	1.4	1.4	-	1	1.2	1	-	-	-	-	1	-	-

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech: EEE III Year – I Sem			
Course Code:J3101	**EMPLOYABILITY SKILLS** (COMMON TO ALL)	**L**	**T**	**P**	**D**
Credits: 0		2	0	0	0

Course Objectives:
This course will enable students to:

1. Understand the importance of Listening skills.
2. Learn how reading skills help an individual.
3. Obtain knowledge and practice session on speaking effectively.
4. Understand why proper writing skills are important.
5. Implement business Etiquette in day to day life.

Module 1: Listening Skills:
The Listening Process, Hearing and Listening, Types of Listening-Superficial Listening-Appreciative Listening-Focused Listening-Evaluative Listening- Attentive Listening-Empathetic Listening, Listening with a purpose, Barriers to Listening-Physical Barriers-Psychological Barriers-Linguistic Barriers-Cultural Barriers.
Improving Listening Comprehension
Listening comprehension-Effective Listening Strategies- Listening in Conversational Interaction-Listening to structured talks, Team Listening.

Module 2: Speaking Skills:
The Speech process-The Message-The Audience- The Speech Style-Encoding- Feedback Conversations and Oral Skills-Body Language-Types of Conversations: Formal and Informal-Strategies for Good Conversation, Improving Fluency and Self-expression- Articulation, good pronunciation-Voice quality-Accent and Intonation Speaking Techniques- Body Language-Eye Contact-Facial Expression-Gesture-Posture and Body Movements.
Speaking Techniques
Techniques to Develop Effective Word Accent- Word Stress, Using Correct Stress -Patterns – Developing Voice Quality-Rhythm in Corrected speech and developing correct tone

Module 3: Writing Skills and Business Etiquettes:
Effective Resume writing, Letter writing skills.
Business Etiquettes: Personal Grooming & Behavioural Etiquettes – Event Based Learning Activity, -Facial -Introduction & Role-plays. Personal Values, Developing Values, Cultivating Habits – Real-life cases, Activities

REFERENCES:

2. Rizvi, Ashraf M. Effective Technical communication, New Delhi: Tata McGraw-Hill, 2005.
3. Influencer: The new science of leading change by Joseph Grenny, Kerry Patterson, David Maxfield, Ron McMillan and Al Switzler.
4. Skill with people by Les Gibli

E-Resources:

1. **https://www.youtube.com/watch?v=JIdPnUFr36g&ab_channel=LearnEnglishLab**
2. **https://www.youtube.com/watch?v=xrEq1UujOo&ab_channel=LearnEnglishLab**
3. **https://www.youtube.com/watch?v=srn5jgr9TZo&ab_channel=SimerjeetSingh**
4. **https://www.youtube.com/watch?v=O0qT4cKwtk&ab_channel=LearnEnglishLab.**
5. **https://www.youtube.com/watch?v=p6qVJ1KhHek&ab_channel=LearnEnglishwith**

Let%27sTalk-FreeEnglishLessons.

6. **https://www.youtube.com/watch?v=I4uL5mkcAJc&ab_channel=LearnEnglishwithLet%27sTalk-FreeEnglishLessonsLearnEnglishwithLet%27sTalk-FreeEnglishLessonsVerified**

Course outcomes:
The students will be able to

1. Practice listening and probing any problem.
2. Understand the importance of reading skills.
3. Understand how to speak effectively.
4. Write essays and letter using proper vocabulary.
5. Practice creativity in day to day life

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

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech: EEE III Year – II Sem			
Course Code:J322A	ELECTRICAL MEASUREMENTS	L	T	P	D
Credits: 4		3	1	0	0

Pre-requisite: Electric Circuits, Machines.

Course Objectives:

1. To impart them the knowledge required for them, in understanding the working of various instruments and equipment's used for the measurement of various electrical engineering parameters like voltage, current, power, phase etc.
2. To select suitable instrument for measuring Power, Power factor and Frequency.
3. To identify various errors in Energy meter and compensation techniques for minimizing them.
4. To understand the concepts of measuring electrical circuit parameters.
5. To Identify instruments for typical magnetic measurements.

MODULE – I: Analog Ammeters, Voltmeters And Instrument Transformers

Classification of analog instruments–PMMC and MI Instruments: Principle, construction, Torque equation, Range Extension, Effect of temperature, Errors, advantages and disadvantages.

Current Transformer and Potential Transformer: Construction, theory, Phasor diagram, Errors, testing and applications.

MODULE – II: Wattmeter, Power Factor Meter And Frequency Meters

Electro dynamo meter type Wattmeter: Construction, Theory, Shape of scale, errors–Low power factor wattmeter– Three phase wattmeter – Measurement of active and reactive power in single phase and three phases.

Single phase and three phase electro dynamometer type and MI type power factor meters – Electrical resonance and Weston type frequency meters.

MODULE – III: Energy Meter And Potentiometers

Single phase induction type energy meter: Construction, theory, operation, errors, compensations, Maximum demand indicators–Measurement of VAH,VARh.

Basic Potentiometer–Standardization–Crompton's Potentiometer–Polar type and coordinate type AC potentiometers–Applications of DC& AC potentiometer.

MODULE – IV: DC & AC Bridges

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–measurement of earth resistances.

Measurement of Inductance and capacitances: Maxwel's Bridge–Anderson 's Bridge–Hays Bridge–Owen 's Bridge–Desauty's Bridge–Schering bridge.

Measurement of Mutual inductance: Campbell 's Heaviside bridge–Carey foster bridge– Campbell 's bridge–Measurement of frequency: Wien 's Bridge.

MODULE – V: Magnetic Measurements

D'Arsonval galvanometer, Ballistic and flux meters: Construction, Theory, Operation. Ballistic Tests–Measurement of flux density, magnetizing force–Determination of B-H Curve– Hysteresis loop.

Text Books:

1. Sawhney, "A course in Electrical and Electronics Measurements and Instrumentation",DhanapathRai and Sons., 10thEdition, 2007.
2. W.Golding&F.C.Widdis,"ElectricalMeasurements&MeasuringInstruments",A.H. Wheeler&Co, Fifth Edition, 2001.

Reference Books:

1. J.B. Gupta," A course in Electronics and Electrical Measurements andInstrumentation", 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:

The student will be able to:

1. Compare performance of MC & MI Instruments and Compute the errors in CTs and PTs.
2. Understand operating principles of Electro dynamo type instruments and frequency meters.
3. Understand operating principles of Induction type instruments and comparison instruments.
4. Determine the circuit parameters using AC and DC bridges.
5. Identify instruments for typical magnetic measurements.

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	-	-	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	-

<table>
<tr><td>AY 2020-21
onwards</td><td colspan="1">J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B.Tech EEE
III Year – II Sem</td></tr>
<tr><td>Course
Code:J322B</td><td rowspan="2">COMPUTER AIDED POWER SYSTEM ANALYSIS</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 4</td><td>3</td><td>1</td><td>0</td><td>0</td></tr>
</table>

Pre Requisite: Power Systems

Course Objectives

This course will enable students to:

1. To provide the students in getting basic idea of different computer methods in power systems
2. To Format the Z bus of a transmission line, power flow studies by various methods.
3. To Deal the short circuit analysis and analysis of power system for steady state and transient stability.
4. To analyse the Load flows using different methods.
5. To train the students to have a solid foundation in mathematical and engineering fundamentals required to solve engineering problems.

MODULE – I: POWER SYSTEM NETWORK MATRICES-1:

Graph Theory: Definitions, Bus Incidence Matrix, Y_{bus} formation by Direct and Singular Transformation Methods, Numerical Problems. Power System Network Matrices-2

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-1:

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.

POWER FLOW STUDIES-2

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-1:

Per-UNIT - System of Representation. Per-UNIT - equivalent reactance network of a three phase Power System, Numerical Problems.
Symmetrical faultAnalysis: Short Circuit Current and MVA Calculations, Fault levels, Application of Series Reactors, NumericalProblems.

SHORT CIRCUIT ANALYSIS-2: 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:

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:

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. AbhijitChakrabarthi,SunitaHaldar “Power system Analysis Operation and control,”, 3rd edition, PHI,2010.
2. I.J.Nagrath&D.P.Kothari“Modern Power system Analysis”TataMcGraw-Hill Publishing company, 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:

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

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	-

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech EEE III Year – II Sem			
Course Code:J322D	POWER QUALITY STUDIES (PROFESSIONAL ELECTIVE - I)	L	T	P	D
Credits: 3		3	0	0	0

Prerequisite: Power Systems and Power Electronics

Course Objectives:

This course will enable students to:

1. To know different terms of power quality.
2. To Illustrate of voltage power quality issue - short and long interruption.
3. To construct study of characterization of voltage sag magnitude and three phase unbalanced voltage sag.
4. To know the behaviour of power electronics loads; induction motors, synchronous motor etc by the power quality issues.
5. To prepare mitigation of power quality issues by the VSI converters.

MODULE -I: INTRODUCTION:

Introduction of the Power Quality (PQ) problem, Terms used in PQ: Voltage, Sag, Swell, Surges,Harmonics, over voltages, spikes, Voltage fluctuations, Transients, Interruption, overview ofpower quality phenomenon, Remedies to improve power quality, power quality monitoring.

MODULE -II: LONG & SHORT INTERRUPTIONS:

Long interruptions – Definition – Difference between failures, outage, Interruptions – causes of Longinterruptions – Origin of interruptions – Limits for the Interruption frequency – Limits for theinterruption duration – Costs of Interruption – Overview of reliability evaluation to power quality, Comparison of observations and reliability evaluation.

Short interruptions: Definition, Origin of short interruptions, Basic principle, Fuse saving, Voltagemagnitude events due to re-closing, Voltage during the interruption, Monitoring of shortinterruptions, Difference between medium and low voltage systems. Multiple events, Single phasetripping – Voltage and current during fault period, Voltage and current at post fault period,Stochastic prediction of short interruptions.

MODULE III: 1 & 3-PHASE VOLTAGE SAG CHARACTERIZATION:

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.Three phase faults, Phase angle jumps, Magnitude and phase angle jumps for three phaseunbalanced sags, Load influence on voltage sags.

MODULE -IV: POWER QUALITY CONSIDERATIONS IN INDUSTRIAL POWER SYSTEMS:

Voltage sag – Equipment behaviour of power electronic loads, Induction motors, Synchronousmotors, computers, Consumer electronics, Adjustable speed AC drives and its operation.Mitigation of AC Drives, Adjustable speed DC drives and its operation, Mitigation methods of DCdrives.

MODULE -V: MITIGATION OF INTERRUPTIONS & VOLTAGE SAGS:

Overview of mitigation methods from fault to trip, reducing the number of faults, reducing thefault clearing time changing the power system, installing mitigation equipment, Improvingequipment immunity, Different events and mitigation methods. System equipment interface –Voltage source converter, Series voltage controller, Shunt controller, combined shunt and seriescontroller.

PQ and EMC standards:Introduction to standardization, IEC electromagnetic compatibility standards, European voltagecharacteristics 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. SurajitChattopadhyay, MadhuchhandaMitra, SamarjitSengupta, “Electric Power Quality”, Springer, First Edition, 2007.

Reference Books:

1. R. SastryVedamMulukutlaS.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:

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

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 2020-21 onwards	**J. B. Institute of Engineering and Technology (UGC Autonomous)**	**B. Tech: EEE III Year – II Sem**			
Course Code:J322E	**MODERN CONTROL THEORY (PROFESSIONAL ELECTIVE - I)**	**L**	**T**	**P**	**D**
Credits: 3		3	0	0	0

Pre-requisite: Control Systems

Course Objectives:
This course will enable students to:

1. To explain the concepts of basic and modern control system for the real time analysis and design of control systems.
2. To apply concepts of state variables analysis.
3. To study and analyse non-linear systems.
4. To gain the knowledge of phase plane methods.
5. To analyse the concept of stability of nonlinear systems and categorization.

MODULE –I: State variable analysis: 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 -II: State variable analysis &design: 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 -III: Non - linear systems: 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 -IV: Phase plane methods:Introduction to phase-plane analysis, Method of isoclines for constructing trajectories, Singular points, Phase-plane analysis of non-linear control systems.

MODULE -V:Stability analysis: 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:
The students will be able to:

1. Apply the knowledge of basic and modern control system for the real time analysis.
2. Design the real time control systems.
3. Understand the concepts of state variables analysis.
4. Analyse the concept of stability of nonlinear systems.
5. Get the knowledge on phase plane methods.

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	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

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech EEE III Year – II Sem			
Course Code:J322F	SWITCH GEAR AND PROTECTION (PROFESSIONAL ELECTIVE - I)	L	T	P	D
Credits: 3		3	0	0	0

Pre-requisite: Power Systems
Course Objectives:
This course will enable students to:

1. Teach the principles and need for protection schemes by different fault current calculations.
2. Learn the principles, construction and problems associated with different types of circuit Breaker.
3. Teach the basic principles, construction and characteristics of different types of relays.
4. Learn to protect different power equipment's like transformer, generator etc.,
5. Teach different aspects of feeder protection and protection against over voltages.

MODULE 1: CIRCUIT BREAKERS
UNIT 1: CIRCUIT BREAKER - 1: Elementary principles of arc interruption, Restricking 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 following types of circuit breakers: Minimum Oil Circuit breakers, Air Blast Circuit Breakers, Vacuum and SF6 circuit breakers.

MODULE 2: ELECTROMAGNETIC AND STATIC RELAYS
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
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 CT s Ratio, Buchholz relay Protection.

MODULE 4: FEEDER, BUS-BAR PROTECTION AND NEUTRAL GROUNDING
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.

MODUE 5: PROTECTION AGAINST OVER VOLTAGES: 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. ttps://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:

1. Analyse different types of faults and their effects on the power system and understand the practical significance of protection zones.
2. Understand the principles, construction, selection and problems associated with different types of circuit breaker.
3. Understand the basic principles, construction and characteristics of different types of relays.
4. Analyse and protect different power equipment’s like transformer, generator etc., against various electrical faults.
5. Understand different aspects of feeder protection and protection against over voltages.

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	-

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech III Year – II Sem			
Course Code:J322G	ANALYSIS OF POWER CONVERTERS (PROFESSIONAL ELECTIVE - II)	L	T	P	D
Credits: 3		3	0	0	0

Prerequisite: Power Electronics
Course Objectives:
This course will enable students to:
1. comprehend the concepts of converters
2. relate to the applications of phase controlled rectifiers
3. describe the importance of AC voltage controllers and cyclo converters for various industrial applications
4. analyze and design switch mode power electronic converters for various applications including microprocessor power supplies, renewable energy systems, and motor drives.
5. analyze pulse width modulated inverters which are used in variable speed drives

MODULE I: SINGLE PHASE AC VOLTAGE CONTROLLERS:
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 II: THREE PHASE AC VOLTAGE CONTROLLERS
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 III: SINGLE PHASE CONVERTERS
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 IV: D.C. TO D.C. CONVERTERS
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 V: PULSE WIDTH MODULATED INVERTERS (SINGLE PHASE)
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. Pulse Width Modulated Inverters(three phase): Three phase inverters - analysis of 180 degree condition for output voltage And current with resistive, inductive loads - analysis of 120 degree Conduction - voltage control of three phase inverters - sinusoidal PWM - Third Harmonic PWM – 60 degree PWM - space vector modulation - Comparison of PWM techniques - harmonic reductions - Current Source Inverter - variable d.c. link inverter - boost inverter - buck and boost inverter - inverter circuit design - advantages -applications

- 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 Electronis”, 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

The students will be able to:

1. understand the basic principles of switch mode power conversion
2. understand the operating principles and models of different types of power electronic converters including dc-dc converters, PWM rectifiers and inverters
3. choose appropriate power converter topologies and design the power stage and feedback controllers for various applications
4. use power electronic simulation packages for analyzing and designing power converters
5. analyze various single phase and three phase power converter circuits and understand their applications.

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	-

<table>
<tr><td>AY 2020-21 onwards</td><td colspan="4">J. B. Institute of Engineering and Technology (UGC Autonomous)</td><td colspan="4">B.Tech: EEE
III Year – IISem</td></tr>
<tr><td>Course Code:J322H</td><td rowspan="2">POWER SEMICONDUCTOR DRIVES
(PROFESSIONAL ELECTIVE - II)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Nil

Course Objectives:
This course will enable students to:

1. Get ability to use the (1phase & 3phase) Controlled Converters for Speed Control operation of DC Drives.
2. Understand Multi Quadrant operation of DC Drives by Dual converter, Different Braking Methods& Improvement of Speed response by Closed loop control.
3. Use the Choppers for Speed Control operation of DC Drives & An understanding of Four Quadrant operation of Dc drive by chopper.
4. Use the AC voltage controllers to control the speed of an Induction motor.
5. Understand Variable frequency control of Induction Motor by VSI, CSI, Cyclo converters & PWM Control.

MODULE I: Control of DC Motors by Single Phase Converters:
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 II: Control of DC Motors by Three Phase Converters
Three phase semi and fully controlled converters connected to DCseparately excited and DC series motors – output voltage and current waveforms – Speed and Torque expressions – Speed – Torque characteristics – Problems.

MODULE III: Four Quadrant Operation of DC Drives
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 quadrant 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 IV: Control of Induction Motor through Stator Voltage and Stator Frequency:
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 V: Control of Synchronous Motors
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:

The students will be able to:

1. Able to design controlled converter for speed control operation of DC drives.
2. Develop the circuits for chopper control drive for speed control of DC Motor.
3. Analyze the multi quadrant operation of dual converter with breaking plugging operation
4. Design the AC voltage controllers to control the speed of an Induction motor
5. Develop the Variable frequency controllers of Induction Motor by VSI, CSI, Cyclo converters & PWM Control

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**	**-**	**-**	**-**	**2.0**	**3.0**	**-**	**2**	**2**	**-**	**3**	**3**	**2.0**
CO2	**3**	**3**	**2**	**-**	**-**	**3.0**	**3.0**	**-**	**1**	**2**	**-**	**2**	**3**	**1.0**
CO3	**3**	**3**	**-**	**-**	**2**	**-**		**2**	**-**	**-**	**-**	**3**	**3**	**2.0**
CO4	**3**	**2**	**3**	**-**	**-**	**-**	**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**

<table>
<tr><td>AY 2020-21 onwards</td><td>J. B. Institute of Engineering and Technology (UGC Autonomous)</td><td colspan="4">B. Tech: EEE
III Year – II Sem</td></tr>
<tr><td>Course Code: J322I</td><td rowspan="2">DIGITAL CONTROL SYSTEMS
(PROFESSIONAL ELECTIVE - II)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Control Systems

Course Objectives:
This course will enable students to:

1. Equip the basic knowledge of discretization.
2. Study the stability analysis of digital control system.
3. Determine steady state performance of digital control systems.
4. Design the controller and observer for digital control systems.
5. Know the discrete PID controllers

MODULE –I:UNIT – I: Sampling and Reconstruction
Introduction, Examples of Data control systems – Digital to Analog conversion and Analog to Digitalconversion, 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 – II: State Space Analysis
State Space Representation of discrete time systems, Pulse Transfer Function Matrix solving discrete timestate space equations, State transition matrix and it's Properties, Methods for Computation of StateTransition Matrix, Discretization of continuous time state – space equations.
Controllability and Observability
Concepts of Controllability and Observability, Tests for controllability and Observability. Duality betweenControllability and Observability, Controllability and Observability conditions for Pulse Transfer Function.

MODULE – III: Stability Analysis
Mapping between the S-Plane and the Z-Plane – Primary strips and Complementary Strips – Constantfrequency 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 – IV:Design of Discrete Time Control System by Conventional Methods
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 compensatorsand digital PID controllers.

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

Text 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:
The students will be able to:
1. To understand mathematical models of linear discrete-time control systems using transfer functions and state-space models.
2. To analyse transient and steady state behaviours of linear discrete time control systems.
3. To determine whether performance of linear discrete time control systems meet specified design criteria.
4. To design controllers and observers for linear discrete-time control systems so that their performance meets specified design criteria.
5. To design the PID controllers in discrete time intervals.

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	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

<table>
<tr><td>AY 2020-21 onwards</td><td colspan="4">J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B.Tech: EEE
III Year – II Sem</td></tr>
<tr><td>Course Code:J3221</td><td rowspan="2" colspan="4">ELECTRICAL MEASUREMENTS LAB</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 1.5</td><td>0</td><td>0</td><td>3</td><td>0</td></tr>
</table>

Pre-requisite: Basic Electrical, Machines.

Course Objectives:
This course will enable students to:

1. Acquire hand on experience about different measurement devices and its working principles.
2. Acquire knowledge of dealing with magnetic circuit and measurement of its parameters like determination of B-H curve μr - H curve and μr - B curve using standard solenoid, search coil and Lloyd, Fisher magnetic method
3. Acquire hand on experience and knowledge on working of ammeter, voltmeter, wattmeter, Kelvin's double bridge and wheat stone's bridge, AC bridges, slide wire potentiometer. CT/PT, single – phase energy meter, concept of direct loading and phantom loading
4. Acquire hand-on experience on measurement of parameters and calibration of LVDT
5. Acquire hand-on experience on measurement of dielectric strength of OIL using dielectric oil test method.

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:
The student will be able to

1. Measure various electrical parameters with accuracy, precision, resolution.
2. Make use of AC and DC bridges for relevant parameter measurement.
3. Test current transformers and dielectric strength of oil.
4. Ability to balance Bridges to find unknown values.
5. Demonstrate & Calibrate LVDT and resistance strain gauge.

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	-

<table>
<tr><td>AY 2020-21 onwards</td><td colspan="4">J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td>B.Tech EEE
III Year – II Sem</td></tr>
<tr><td>Course Code:J3222</td><td rowspan="2">COMPUTER AIDED POWER SYSTEM AND SIMULATION LAB</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 1.5</td><td>0</td><td>0</td><td>3</td><td>0</td></tr>
</table>

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 transmission system
3. Deals with computer algorithms for contingence analysis,state estimation and phase domain fault 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 :

1. Develop his own program for such pourposes and feel more confident while using commercial software in the field.
2. Understand the computer algorithms for contingence analysis,state estimation and phase domain fault analysis method
3. Understand the solution methods and techniques used in power system studies
4. Models of power systems and power electronics.
5. Analyze computer algorithms for analysis of any general power transmission system

<table>
<tr><td colspan="15">CO-PO/PSO Mapping Chart
(3/2/1 indicates strength of correlation)
3 – Strong; 2 – Medium; 1 - Weak</td></tr>
<tr><td rowspan="2">Course Outcomes (COs)</td><td colspan="12">Program Outcomes (POs)</td><td colspan="2">Program Specific Outcomes</td></tr>
<tr><td>PO 1</td><td>PO 2</td><td>PO 3</td><td>PO 4</td><td>PO 5</td><td>PO 6</td><td>PO 7</td><td>PO 8</td><td>PO 9</td><td>PO 10</td><td>PO 11</td><td>PO 12</td><td>PSO 1</td><td>PSO 2</td></tr>
<tr><td>CO1</td><td>3</td><td>3</td><td>2</td><td>2</td><td>2</td><td>-</td><td>-</td><td>-</td><td>-</td><td>2</td><td>-</td><td>-</td><td>2</td><td></td></tr>
<tr><td>CO2</td><td>3</td><td>2</td><td>2</td><td>2</td><td>2</td><td>-</td><td>-</td><td>-</td><td>-</td><td>2</td><td>-</td><td>-</td><td>2</td><td></td></tr>
<tr><td>Average</td><td>3</td><td>3</td><td>2</td><td>2</td><td>2</td><td>-</td><td>-</td><td>-</td><td>-</td><td>2</td><td>-</td><td>-</td><td>2</td><td></td></tr>
</table>

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech EEE III Year – I Sem			
Course Code:J32M1	**ARTIFICIAL INTELLIGENCE** (Common to CSE, IT, EEE& ECM in III-I) and (Common to ECE, CIVIL, ME & MIE in III-II)	L	T	P	D
Credits: 2		2	0	0	0

Pre-Requisites:

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

Course objectives:

The Student will:

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 -I:

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-II

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 -III:

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

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

MODULE -IV:

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

MODULE -V:

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

REFERENCES:

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:
The Student will be able to:

1. Identify the AI based problems.
2. Apply AI techniques for representing the basic problem.
3. Apply Advanced AI techniques to solve the problem.
4. Analyze Learning and explain various learning techniques.
5. Illustrate the use of expert system.

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	-
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**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3.0**	**3.0**

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech EEE III Year – II Sem			
Course Code:J3201	LIFE SKILLS & PROFESSIONAL SKILLS LAB	L	T	P	D
Credits: 2		0	0	4	0

Course objectives:

This course will enable students to:

1. Understand the importance of Communication and effective communication skills.
2. Obtain ample knowledge in understanding self-awareness and self-assessment.
3. Learn about empathy and emotional intelligence.
4. Understand the need of Leadership skills.
5. Be familiar with Interview skills and corporate etiquettes.

List of Experiments:

1. Understand the importance of Self introduction and practice session on "Tell me about yourself".
2. Importance of Communication skills.
3. Advance communication skills needed for effective communication.
4. Understand the concepts of Self-assessment and self-awareness with required tools.
5. Understanding Empathy, Assertive behavior.
6. Importance of Social skills and how to handle criticism
7. Understanding Emotional Intelligence, Conflict resolution and anger management.
8. Understand the concepts of Innovation and creativity.
9. Understand importance of Leadership skills.
10. Case studies of famous leaders who inspired many.
11. A hands-on how to write proper curriculum vitae.
12. Role plays.
13. Group discussion and JAM session.
14. Mock interview sessions.
15. Corporate etiquettes.

Course Outcomes

Students will be able to:

1. Know the importance of proper and effective communication.
2. Understand more about how to handle one's own self.
3. Handle pressure in today's world.
4. Know how industry operates in real time.
5. Equip with interview skills.

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

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech IV Year – I Sem		
Course Code:J414L	MICROPROCESSORS AND APPLICATIONS EEE	L	T	P/D
Credits: 4		3	1	0

Pre-requisite: DE

Course Objectives:
This course will enable students to:
1. To introduce the architecture and programming of 8085 microprocessor.
2. Understand the basic 16-bit microprocessor architecture and its functionalities.
3. Develop the microprocessor-based programs for various applications.
4. Make the interfacing in between microprocessor and various peripherals.
5. Understand basic feature of 8051 controller.

Module 1: 8085 Architecture
8085 Architecture – Instruction set, Addressing modes, Timing diagrams, Interrupts – Memory interfacing

Module 2: 8086 Architecture
Unit-1:
8086 Architecture-Functional diagram, register organization, memory segmentation, programming model, memory addresses.
Unit-2:
Physical memory organization, architecture of 8086, signal descriptions of 8086-common function signals, timing diagrams, interrupts of 8086.

Module 3: Instruction set and assembly language programming of 8086:
Instruction formats, addressing modes, instruction set, assembler directives, macros, simple programs involving logical, Branch and call instructions, sorting, evaluating arithmetic expressions, string manipulations.

Module 4: I/O Interface
Unit-1::
8255 PPI, Various modes of operation and interfacing to 8086, interfacing keyboard, Display, D/A and A/D converter.
Unit-2:
Interfacing with advanced devices: Memory interfacing to 8086 interrupt structure of 8086, vector interrupt table, interrupt service routine. Communication interface: serial communication standards, serial data transfer schemes, 8251 USART architecture and interfacing.

Module 5: Introduction to Microcontrollers:
Overview of 8051 microcontroller, architecture, I/O ports. Memory organization, addressing modes and instruction set of 8051, simple programs, interfacing memory.

TEXTBOOKS
1. Ramesh S Gaonkar, Microprocessor Architecture, Programming and application with 8085, 4th Edition, Penram International Publishing, New Delhi, 2000.
2. John Uffenbeck, The 80x86 Family, Design, Programming and Interfacing, Third Edition. Pearson Education, 2002.

3. Mohammed Ali Mazidi and Janice Gillespie Mazidi, The 8051 Microcontroller and Embedded Systems, Pearson Education Asia, New Delhi, 2003. (Unit IV, V)

REFERENCES

1. A.K. Ray and K.M.Burchandi, Intel Microprocessors Architecture Programming and Interfacing, McGraw Hill International Edition, 2000
2. Kenneth J Ayala, The 8051 Microcontroller Architecture Programming and Application, 2nd Edition, Penram International Publishers (India), New Delhi, 1996.
3. M. Rafi Quazzaman, Microprocessors Theory and Applications: Intel and Motorola prentice Hall of India, Pvt. Ltd., New Delhi, 2003.

Web Resources:

1. https://nptel.ac.in/courses/108/105/108105102
2. https://www.geeksforgeeks.org/microprocessor-tutorials/
3. http://techpreparation.com/microprocessor-interview-questions1.htm#.X1pMDWgzZPY

Course outcomes:
The Student will be able to:

1. Analyse 8085 microprocessors architectures and its functionalities.
2. Analyse 8086 microprocessors architectures and its functionalities.
3. Design 8086 Microprocessor based systems for real time applications using programming languages like Assembly Language and MASM.
4. Interface and program external peripherals and I/O devices to 8086 microprocessors.
5. Explain the basics of 8051 microcontroller's architecture and its functionalities.

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

<table>
<tr><td>AY 2020-21 onwards</td><td colspan="4">J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B.Tech EEE
IV Year – I Sem</td></tr>
<tr><td>Course Code:J412B</td><td rowspan="2" colspan="4">ELECTRICAL MACHINE DESIGN
(PROFESSIONAL ELECTIVE-III)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Electrical Machines –I, Electrical Machines -II

Course Objectives:

This course will enable students to:

1. Provide sound knowledge about basics of design considerations for rotating and static electrical machines.
2. Learn about the importance of magnetic and electric loadings of various electrical machines.
3. Design armature and field systems for D.C. machines.
4. Design core, yoke, windings and cooling systems of transformers.
5. Design stator and rotor of induction machines and alternators.

MODULE 1: INTRODUCTION

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

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

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

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

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.
4. Rai, H.M., Principles of Electrical Machine Design, Sathya Prakashan, 2010.
5. Mittle, V.N. and Mittal, A., Design of Electrical Machines, Standard Publishers, 5th edition, 2012.

E-RESOURCES:

1. http://nptel.vtu.ac.in/econtent/courses/EEE/06EE63/index.php
2. https://nptel.ac.in/courses/108/106/108106023/

Course Outcomes:
The students will be able to:

1. Understand the basics of design considerations for rotating and static electrical machines.
2. Understand the importance of magnetic and electric loadings of various electrical machines.
3. Design armature and field of DC machines.
4. Design core, yoke, windings and cooling systems of transformers.
5. Analyze the performance of electrical machines with changing parameters and constraints.

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	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

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech EEE IV Year – I Sem			
Course Code:J412C	HIGH VOLTAGE ENGINEERING (PROFESSIONAL ELECTIVE-III)	L	T	P	D
Credits: 3		3	0	0	0

Prerequisite: Power Systems, EMF

Course Objectives:

This course will enable students to:

1. Understand the basics of high voltage engineering
2. Deal with the detailed analysis of Breakdown occurring in gaseous, liquids and solid dielectrics
3. Understand the generation methods of high A.C, DC & impulse voltages required for various application.
4. Apply the measuring techniques of high A.C., D.C & impulse voltages and currents.
5. Identify the testing techniques for high voltage equipment.
6. Understand the phenomenon of over-voltages, concept of insulation co-ordination.

MODULE - I: Introduction To High Voltage Technology And Applications

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 - II: Break Down In Gaseous And Liquid Dielectrics

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 - III: Generation Of High Voltages And Currents

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 - IV: Over Voltage Phenomenon And Insulation Co-Ordination

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 - V: Non-Destructive Testing Of Material And Electrical Apparatus

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. **High Voltage Engineering** by M.S.Naidu and V. Kamaraju – TMH Publications, 3rd Edition.

2. **High Voltage Engineering: Fundamentals** by E.Kuffel, W.S.Zaengl, J.Kuffel by Elsevier, 2nd Edition.

ence Books:

1. **High Voltage Engineering** by C.L.Wadhwa, New Age Internationals (P) Limited, 1997.
2. **High Voltage Insulation Engineering** by Ravindra Arora, Wolfgang Mosch, New Age International (P) Limited, 1995.
3. **High Voltage Engineering, Theory and Practice** by 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:

The student will be able to:

1. Know conduction and breakdown will occur in gases, liquids and solids dielectrics, and different applications of the insulating materials in electrical power apparatus.
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.
3. Knowledge of generation and measurement of DC, AC and impulse voltages.
4. Interpret the necessity to measure the voltages and currents accurately, ensuring perfect safety to the personnel and equipment.
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 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**	**-**	**-**	**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**

<table>
<tr><td>AY 2020-21 onwards</td><td>J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B.Tech EEE
IV Year – I Sem</td></tr>
<tr><td>Course Code:J412D</td><td rowspan="2">ADVANCED CONTROL SYSTEMS
(PROFESSIONAL ELECTIVE-III)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Course Objectives:

This course will enable students to:

1. Learn the methods for analyzing the behaviour of nonlinear control systems and the designing of control systems.
2. Study the stability of Non Linear and Linear systems.
3. Study the Method of Isoclines for Constructing Trajectories
4. Know the Stability in the sense of Lyapunov
5. Design of State Feedback Control through Pole placement

MODULE - I: State Space Analysis

State Space Representation, Solution of State Equation, State Transition Matrix, Canonical Forms – Controllable Canonical Form, Observable Canonical Form, Jordan Canonical Form.

MODULE - II: Controllability and Observability

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 - III: Describing Function Analysis

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 - IV: Stability Analysis

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 - V: Modal Control

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.

3ooks:

1. **Modern Control System Theory** – by M. Gopal, New Age International Publishers, 2nd edition, 1996.
2. **Modern Control Engineering** – by K. Ogata, Prentice Hall of India, 3rd edition, 1998.

ence 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:
The students will be able to:

1. demonstrate non-linear system behaviour by phase plane and describing function methods
2. perform the stability analysis nonlinear systems by Lyapunov method develop design skills in optimal control problems
3. derive discrete-time mathematical models in both time domain (difference equations, state equations) and z domain (transfer function using z-transform).
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.
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 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	-	-	-	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	-

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech EEE IV Year – I Sem			
Course Code:J412E	EHVAC TRANSMISSION (PROFESSIONAL ELECTIVE –VI)	L	T	P	D
Credits: 3		3	0	0	0

Course Objectives:
This course will enable students to:

1. Provide In-depth understanding of different aspects of Extra High Voltage AC transmission system design and Analysis and to Calculate the Value of Line Inductance and Capacitance of EHV transmission Line.
2. Understand the concept of Voltage gradients of conductors and to calculate the Electrostatic field and to understand its effects over humans, animal and plants
3. Develop Power circle diagram and understand various Line Compensating systems.
4. Develop the empirical formula to determine the Corona loss occurring in EHV AC transmission Line and to determine the interference caused by Corona and to measure its magnitude
5. Design EHV cables and understand their characteristics

MODULE - I:

E.H.V.A.C. Transmission line trends and preliminary aspect standard transmission voltages – Estimation at line and ground parameters-Bundle conductor systems-Inductance and Capacitance of E.H.V. lines – positive, negative and zero sequence impedance – Line Parameters for Modes of Propagation.

MODULE - II:

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 - III:

Electrostatic induction in un energized 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 - IV:

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 - V:

Design of EHV lines based on steady state and transient limits - EHV cables and their characteristics

Text Books:

1. R. D. Begamudre ,―EHVAC Transmission Engineering‖, New Age International (p) Ltd. 3rd Edition.
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:

The Student will be able to

1. Learn about the trends in EHV AC Transmission and can calculate Line inductance and capacitances of bundled conductors.
2. Calculate voltage gradient of bundled conductors and calculate electrostatic field of EHV AC lines.
3. Analyze compensated devices for voltage control.
4. Understand the effects of corona like Audible noise and Radio Interference.
5. Design EHV cables and understands their characteristics

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**	**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	**3.0**	**2.8**	**3.0**	**2.4**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3.0**	**3.0**	**3.0**

<table>
<tr><td>AY 2020-21 onwards</td><td colspan="1">J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B.Tech: EEE
IV Year – I Sem</td></tr>
<tr><td>Course Code:J412F</td><td rowspan="2">POWER SYSTEM OPERATION AND CONTROL
(PROFESSIONAL ELECTIVE-IV)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Prerequisite: Power Systems - I & Power Systems - II

Course Objectives:
This course will enable students to:
1. To understand the Load-Frequency control
2. To Analyze different methods to control reactive power and voltage
3. To solve economic dispatch problem
4. To solve unit commitment problem
5. To understand the need of real time control of power systems

MODULE - I: LOAD –FREQUENCY CONTROL
UNIT-1:-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-2:-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 II : REACTIVE POWER – VOLTAGE CONTROL
Unit-1:-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-2:-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 III: ECONOMIC LOAD DISPATCH
Unit-1:-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 IV: UNIT COMMITMENT
Unit-1:- Statement of Unit Commitment problem – constraints; spinning reserve, thermal unit constraints, hydro constraints, fuel constraints and other constraints.
Unit-2:-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 V: COMPUTER CONTROL OF POWER SYSTEMS:
Unit-1:-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-2:-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:

1. Analyze Load Frequency Control of single-area and two-area systems
2. Analyze different methods to control reactive power and voltage
3. Solve economic dispatch problem by direct method and λ-iteration method
4. Solve Unit Commitment by Priority-list methods - forward dynamic programming approach
5. Summary the need and operation of real time control of power systems

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	-	-	-	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	-

<table>
<tr><td>AY 2020-21
onwards</td><td>J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B.Tech: EEE
IV Year – I Sem</td></tr>
<tr><td>Course
Code:J412G</td><td rowspan="2">INDUSTRIAL CONTROL AND AUTOMATION
(PROFESSIONAL ELECTIVE –IV)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Prerequisite: Control System

Course Objectives:
This course will enable students to:

1. familiarize the students about the industrial control and automation.
2. provide basic knowledge about PLC and its applications.
3. provide the significance of control concepts.
4. study about Programming the PLC
5. understand the Factors to be considered in selecting a Distributed Control Systems

MODULE –I: PROCESS MODELLING
Mathematical modelling of a process - Process Identification - Open loop identification - First order and second order model - without and with pure delay - Closed loop identification method - Identification of unstable systems - Self regulation characteristics - Inverse response - Tuning theory – Anti-reset windup technique.

MODULE –II: CONTROLLERS
Transfer function of control equipments - ON OFF control - Time proportional control - Proportional plus integral control - Derivative control - PID controller - Electronic controller - Ratio control systems - Split range control - Cascade control – Selective control - Inverse derivative control - Feedback control - feed forward control - bumpless automatic control - Typical process - PID algorithms - design for load changes.

MODULE –III: DIGITAL CONTROL STRATEGIES
Introduction – Basics of a digital control system -Sampling - Sample and hold circuits - Discrete time signal - Linear discrete time systems - Pulse transfer functions - Analysis of digital control system using Z transform - Stability analysis - Jury's stability criterion.

MODULE –IV: PROGRAMMABLE LOGIC CONTROLLERS
Evolution of modern day PLC - relay based PLC - microprocessor based PLC -input and output units - other functional elements - personal computer as PLC - Programming the PLC - ladder logic diagram - Boolean language - on line and off line programming aids - communication in PLC - typical applications of PLC - PID control capability in programmable controllers.

MODULE –V: DISTRIBUTED CONTROL SYSTEMS
Evolution of DCS - Factors to be considered in selecting a DCS – Typical architecture - local control unit (LCU) and architecture - LCU languages - LCU - process interfacing issues - communication system requirements - architectural issues - protocol issues - communication media - message security - communication system standards - field bus, HART. Operation interface - requirements - display - alarms and alarm management - engineering interface – requirements - Comparison of DCS with direct digital control and supervisory control.

TEXT BOOKS:

1. George Stephanopoulos, “Chemical Process Control, An Introduction to the theory and Practice”, Prentice Hall International Inc., 2001.
2. Gopal.M, "Digital control and state variable methods” TMH, Second Edition,2002
3. Michal P Lucas., "Distributed Control Systems" Van Noster and Reinhold Co., 1986.

REFERENCE BOOKS:

1. Donald R Coughanowr," Process System and Control, Second Edition", McGraw Hill 2006.
2. F.D Petruzella., "Programmable Logic Controllers" McGraw Hill 2006.
3. Thomas Hughes, "Programmable Controller" Instrument Society of America, 1992.

E-Resources:

1. https://nptel.ac.in/courses/108/105/108105088/
2. https://nptel.ac.in/courses/108/105/108105063/

Course Outcomes:

The student will be able to:

1. Understand the practical significance of Industrial control systems.
2. Understand the various industrial control configurations.
3. Analysis of digital control system using Z transform
4. Familiarize PLC and its programming.
5. Understand the local control unit (LCU) and architecture

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

<table>
<tr><td>AY 2020-21 onwards</td><td colspan="4">J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B.Tech: EEE
IV Year – ISem</td></tr>
<tr><td>Course Code:J412H</td><td rowspan="2">POWER ELECTRONICS FOR RENEWABLE ENERGY SYSTEMS
(PROFESSIONAL ELECTIVE –V)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Power electronics, Machines.

Course Objectives:
This course will enable students to:

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. Gin the knowledge of WIND turbines and PV system.
5. Learn the Hybrid Renewable System.

MODULE -I: INTRODUCTION
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 -II: ELECTRICAL MACHINES FOR RENEWABLE ENERGY CONVERSION
Reference theory fundamentals-principle of operation and analysis: IG, PMSG, SCIG and DFIG.

MODULE -III: POWER CONVERTERS
Solar: Principle of operation: line commutated converters (inversion-mode) - Boost and buck-boostConverters- 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 -IV: ANALYSIS OF WIND AND PV SYSTEMS
Standalone operation of fixed and variable speed wind energy conversion systems - Grid integratedPMSG, SCIG Based WECS, Standalone and grid Integrated solar system- Grid connection Issues.

MODULE -V: HYBRID RENEWABLE ENERGY SYSTEMS
Need for Hybrid Systems- Rangeand type of Hybrid systems- Case studies of Wind-PV MaximumPower Point Tracking (MPPT).

Text Books:

1. S. N. Bhadra, D.Kastha, S.Banerjee, “Wind Electrical Systems”, Oxford University Press 2005.

Reference Books:

1. Rashid .M. H “power electronics Hand book”, Academic press, 2001.
2. Ion Boldea, “Variable speed generators”, Taylor & Francis group, 2006.
3. Rai. G.D, “Non-conventional energy sources”, Khanna publishes, 1993.
4. Gray, L. Johnson, “Wind energy system”, prentice hall linc, 1995.

5. Non-conventional Energy sources B.H.Khan Tata McGraw-hill Publishing Company, New Delhi,2011.

E - Resources:

1. **https://nptel.ac.in/courses/108/108/108108078/**
2. **https://nptel.ac.in/noc/courses/noc19/SEM2/noc19-ee69/**

Course Outcomes:
The students will be able to:

1. Understand the use of power converters in PV applications.
2. Develop analytical techniques for IG, PMSG, SCIG and DFIG.
3. Design important elements of a power converter system.
4. Understand the use of power converters in wind turbines
5. Understand the concept of maximum power point tracking

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	-	-	3
CO4	2	-	3	-	1	-	-	-	-	-	2	-	-	3
CO5	1	-	2	-	2	-	-	-	-	-	3	-	-	2
Average	2.2	-	2.2	-	2	-	-	-	-	-	2.3	-	-	2.4

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech: EEE IV Year – I Sem			
Course Code: J412I	HVDC TRANMISSION (PROFESSIONAL ELECTIVE –V)	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 -I: Introduction: General consideration, Power handling capabilities of HVDC Lines, Basic Conversion principles, Static converter configuration.

MODULE -II: 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 -III: 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 andDC systems – Voltage interaction, Harmonic instability problems and DC power modulation.

MODULE -IV: 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 -V: 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:

1. Compare the differences between HVDC and HVAC transmission.
2. Analyze the rectifier and inverter commutating circuits.
3. Identification of valve firing control schemes.
4. Estimate the requirement of HVDC filters.
5. Address the role of AC system faults on HVDC system and know about VSC transmission advantages.

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	-

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onwards</td><td colspan="4">J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B.Tech: EEE
IV Year – I Sem</td></tr>
<tr><td>Course Code:
J412J</td><td rowspan="2" colspan="4">RESTRUCTURED POWER SYSTEMS
(PROFESSIONAL ELECTIVE –V)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Prerequisite: Power System

Course Objectives:

This course will enable students to:

1. To understand the fundamentals of restructured power systems.
2. To learn the significance of Independent System Operator.
3. To know about transmission pricing and ancillary services.
4. To study about the power system analysis under market environment.
5. Analysis of Performance Evaluation of Price Forecasting

MODUE–I : INTRODUCTION TO RESTRUCTURING

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–II : POWER SYSTEM OPERATION IN COMPETITIVE ENVIRONMENT

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- The Genco in Pool Markets- The Genco in Bilateral Markets- Market Participation Issues- Competitive Bidding.

MODULE–III : TRANSMISSION OPEN ACCESS AND PRICING

Power Wheeling- Transmission Open Access- Types of Transmission Services in Open Access- Cost Components in Transmission- Pricing of Power Transactions- Embedded Cost Based Transmission Pricing- Incremental Cost Based Transmission Pricing.

MODULE–IV : ANCILLARY SERVICES MANAGEMENT

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–V : POWER SYSTEM ANALYSIS IN MARKET ENVIRONMENT

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:

1. Understand the difference between traditional and restructured power systems.
2. Acquire knowledge about various entities involved in power markets.
3. Familiarize with electricity pricing and ancillary services.
4. Learn about the new dimensions associated with the power system analysis
5. Learn Analysis using AC Optimal Power Flow and Economic Load Dispatch.

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	-

<table>
<tr><td>AY 2020-21
onwards</td><td colspan="3">J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="3">B.Tech
IV Year – I Sem</td></tr>
<tr><td>Course Code:
J4144</td><td colspan="3" rowspan="2">MICROPROCESSORS AND APPLICATIONS LAB</td><td>L</td><td>T</td><td>P/D</td></tr>
<tr><td>Credits: 2</td><td>0</td><td>0</td><td>4</td></tr>
</table>

Course Objectives:

This course will enable students to:

1. Learn assembly language programming and embedded C.
2. Familiarize with programming and interfacing microcontrollers to various devices.
3. Design various applications using microcontrollers.
4. Learn programming using arithmetic, logical and bit manipulation instructions of 8051.
5. Gain knowledge on parallel and serial communication.

List of Experiments:

1. Programs for 16 bit arithmetic operations 8086(using various addressing modes)
2. Programs for sorting an array for 8086.
3. Programs for searching for a number of characters in a string for 8086.
4. Programs for string manipulation for 8086.
5. Programs for digital clock design using 8086.
6. Interfacing ADC and DAC to 8086.
7. Parallel communication between two microprocessor using 8255.
8. Serial communication between two microprocessor using 8251.
9. Interfacing to 8086 and programming to control stepper motor.
10. Programming using arithmetic, logical and bit manipulation instructions of 8051.
11. Program and verify Timer/Counter in 8051.
12. Program and verify interrupt handling in 8051.
13. Communication between 8051 microcontroller & PC.
14. Interfacing LCD to 8051.
15. Interfacing Matrix/Keyboard to 8051.

Note: - Minimum of 12 experiments to be conducted.

Course Outcomes:

The student will be able to:

1. Write assembly language programming and embedded C.
2. Interface microcontrollers to various devices.
3. Analyse and develop various applications using microcontrollers.
4. Program and verify interrupt handling in 8051.
5. Demonstrate parallel and serial communication.

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	-	3	-	-	3	1	-	2	2	1
CO2	2	2	-	-	1	3	-	-	-	1	-	2	-	1
CO3	2	1	-	-	-	3	-	-	-	1	-	2	-	1
CO4	2	1	-	-	1		-	-	-	-	-	2	-	1
CO5	2	2	2	2	1	3	-	-	3	1	-	1	2	1
Average	2	1.6	2	2	1	3	-	-	3	1	-	1.8	2	1

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech IV Year – I Sem		
Course Code: J4121	**POWER SYSTEM PROTECTION LAB**	**L**	**T**	**P/D**
Credits: 1		0	0	2

Prerequisites: Power System Analysis, Power System Protection

Course Objectives:
This course will enable students to:
1. Understand the Performance of Transformers and Synchronous Machines.
2. Select the Transmission Lines, UG Cables, String Insulators, CTs and PTs.
3. Analyze the characteristics of OC, UV/OV, negative sequence relays.
4. Realize the Performance and Testing of Transformer Protection System
5. Study about Differential protection on Single Phase Transformer

List of Experiments:

1. Determination of Equivalent circuit of a 3-Winding Transformer.
2. Determination of Sequence Impedances of Three Phase Transformer.
3. Characteristics of Over Current Relays i. IDMT Electromagnetic Relay (7051 A). ii. Microprocessor based Relay (7051 B).
4. Characteristics of Percentage biased Differential Relay. i. Electromagnetic Relay (7054 A). ii. Static Relay (7054 B).
5. Characteristics of Over Voltage Relay. I. Electromagnetic Relay (7053 A). II. Microprocessor based Relay (7053 B).
6. Characteristics of Under Voltage (UV) and Negative sequence Relays i. UV Electromagnetic Relay (7052 A). ii. UV Microprocessor Based Relay (7052 B). iii. Static Negative Sequence Relay (7055 B).
7. Performance and Testing of Transformer Protection System.
8. Performance and Testing of Feeder Protection System.
9. Performance and Testing of Transmission Line Model.
10. Differential protection on Single Phase Transformer.

Course Outcomes:
The student will be able to:
1. Test and evaluate the performance of Power Transformers and Synchronous Machines.
2. Test and evaluate the performance of Transmission lines, UG Cables, Insulators and other Auxiliary Power Systems Equipment Test.
3. Evaluate/Choose the various types of Relays (Electromagnetic, Static and Microprocessor based relays).
4. Understand the Performance and Testing of Transmission Line Model.
5. Test the Performance of Feeder Protection System

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	-
CO2	3	3	-	3	-	-	-	-	-	-	-	2	3	2
CO3	2	3	2	2	-	-	-	-	-	-	-	3	3	3
CO4	2	3	2	2	-	-	-	-	-	-	-	2	3	3
CO5	2	2	2	3	-	-	-	-	-	-	-	2	3	
Average	2.4	2.8	2	2.6	-	-	-	-	-	-	-	2.2	3	2.66

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<tr><td>AY 2020-21
onwards</td><td>J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B.Tech: EEE
IV Year – II Sem</td></tr>
<tr><td>Course
Code:J422A</td><td rowspan="2">UTILIZATION OF ELECTRICAL ENERGY
(PROFESSIONAL ELECTIVE –VI)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Prerequisite: Electrical Machines

Course Objectives

This course will enable students to:

1. To introduce the energy saving concept by different ways of illumination.
2. To understand the different methods of electric heating and electric welding.
3. To know various electric drives and traction motors with applications
4. To provide the students the fundamental concepts of drives and types of drives used in traction.
5. To study basic principles of batteries.

MODULE I: ILLUMINATION

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 II: ELECTRIC HEATING AND WELDING

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 III: ELECTRIC DRIVES AND CONTROL

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 IV: ELECTRIC TRACTION

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 V: ELECTROLYTIC PROCESSES

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

1. Ability to choose suitable electric drives for different applications.
2. Ability to design the illumination systems for energy saving.
3. Ability to understand the utilization of electrical energy for heating and welding purposes.
4. Ability to choose suitable electric drives for different applications.
5. Ability to know the effective usage of batteries.

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

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onwards</td><td>J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B.Tech: EEE
IV Year – II Sem</td></tr>
<tr><td>Course Code: J422B</td><td rowspan="2">RELIABILITY ENGINEERING
(PROFESSIONAL ELECTIVE –VI)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Prerequisite: Mathematics

Course Objectives:

This course will enable students to:

1. Introduce the basic concepts of reliability, various models of reliability
2. Analyze reliability of various systems
3. Introduce techniques of frequency and duration for reliability evaluation of repairable systems.
4. Study about Unreliability evaluation of single and two component repairable systems
5. Learn about application to multi state problems

MODULE – I

Basic Probability Theory: Elements of probability, probability distributions, Random variables, Density and Distribution functions- Binomial distribution- Expected value and standard deviation - Binomial distribution, Poisson distribution, normal distribution, exponential distribution, Weibull distribution. Definition of Reliability: Definition of terms used in reliability, Component reliability, Hazard rate, derivation of the reliability function in terms of the hazard rate. Hazard models - Bath tub curve, Effect of preventive maintenance. Measures of reliability: Mean Time to Failure and Mean Time between Failures.

MODULE – II

Network Modeling and Evaluation of Simple Systems: Basic concepts- Evaluation of network Reliability / Unreliability - Series systems, Parallel systems- Series-Parallel systems Partially redundant systems- Examples. Network Modeling and Evaluation of Complex systems: Conditional probability method tie set, Cutset approach- Event tree and reduced event tree methods- Relationships between tie and cut sets- Examples.

MODULE – III

Time Dependent Probability: Basic concepts- Reliability function f(t). F(t), R(t) and h(t) - Relationship between these functions. Network Reliability Evaluation Using Probability Distributions: Reliability Evaluation of Series systems, Parallel systems – Partially redundant systems- determination of reliability measure- MTTF for series and parallel systems – Examples.

MODULE – IV

Discrete Markov Chains: Basic concepts- Stochastic transitional probability matrix- time dependent probability evaluation- Limiting State Probability evaluation- Absorbing states – Examples Continuous Markov Processes: Modeling concepts- State space diagrams- Unreliability evaluation of single and two component repairable systems

MODULE – V

Frequency and Duration Techniques: Frequency and duration concepts, application to multi state problems, Frequency balance approach. Approximate System Reliability Evaluation: Series systems – Parallel systems- Network reduction techniques- Cut set approach- Common mode failures modeling and evaluation techniques- Examples.

TEXT BOOKS:

1. Roy Billinton and Ronald N Allan, Reliability Evaluation of Engineering Systems, Plenum Press, 1983.
2. E. Balagurusamy, Reliability Engineering by Tata McGraw-Hill Publishing Company Limited, 2002.

REFERENCE BOOK:

1. K. K. Agarwal, Reliability Engineering-Kluwer Academic Publishers, 1993.

E - Resources:

1. **https://www.scribd.com/doc/31393143/MCQ-Question-Bank**
2. **https://lecturenotes.in/subject/1476/reliability-engineering-re**

Course Outcomes:

1. model various systems applying reliability networks
2. evaluate the reliability of simple and complex systems
3. estimate the limiting state probabilities of repairable systems
4. apply various mathematical models for evaluating reliability of irreparable systems
5. Understand the Network reduction techniques

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

<table>
<tr><td>AY 2020-21
onwards</td><td colspan="4">J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B.Tech EEE
IV Year – II Sem</td></tr>
<tr><td>Course Code:
J422C</td><td colspan="4" rowspan="2">ADVANCED POWER SYSTEM PROTECTION
(PROFESSIONAL ELECTIVE-VI)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Prerequisite: Switch Gear and Protection

Course Objectives:

This course will enable students to:

1. Understand about types of relays and its applications.
2. Distinguish all kinds of circuit breakers and relays for protection of generators.
3. Transformers and feeder bus bars from over voltages and other hazards.
4. Generalize neutral grounding for overall protection.
5. Illustrate the phenomenon of over voltages and its classification.

MODULE -I: Static relays: Advantages of static relays, Basic construction of static relays, Level detectors, Replica impedance, Mixing circuits, General equation for two input phase and amplitude comparators, Duality between amplitude and phase comparators. Amplitude comparators: Circulating current type and opposed voltage type, Rectifier bridge comparators, Direct and instantaneous comparators.

MODULE -II: Phase comparators: Coincidence circuit type- block spike phase comparator, techniques to measure the period of coincidence, Integrating type, Rectifier and Vector product type, Phase comparators. Static over current relays: Instantaneous over current relay, Time over current relays, Basic principles, Definite time and inverse definite time over-current relays.

MODULE -III: Static differential relays: Analysis of static differential relays, Static relay schemes, Duo bias transformer differential protection, Harmonic restraint relay. Static distance relays: Static impedance-reactance, MHO and angle impedance relay, Sampling comparator, Realization of reactance and MHO relay using sampling comparator.

MODULE -IV: Multi-input comparators: Conic section characteristics, Three input amplitude comparator, Hybrid comparator, switched distance schemes, Poly phase distance schemes, phase fault scheme, three phase scheme, combined and ground fault scheme. Power swings: Effect of power swings on the performance of distance relays, Power swing analysis, Principle of out of step tripping and blocking relays, Effect of line length and source impedance on distance relays.

MODULE -V: Microprocessor based protective relays:(Block diagram and flowchart approach only), Over current relays– Impedance relays – Directional relay-reactance relay. Generalized mathematical expressions for distance relays-measurement of resistance and reactance, MHO and offset MHO relays, Realization of MHO characteristics, Realization of offset MHO characteristics, Basic principle of Digital computer relaying.

TEXT BOOKS:

1. Badri Ram and D.N.Vishwakarma, “Power system protection and Switch gear”, Tata McGraw Hill Publication, New Delhi, 1995.
2. T.S.Madhava Rao, “Power system protection: Static relays”, Tata McGraw Hill Publication, New Delhi, Second edition, 1989.

REFERENCE BOOKS:

1. BhaveshBhalja, R. P. Mahesheari, Nilesh G. Chothani, “Protection and Switchgear”, OxfordUniversity Press, First Edition, 2011.
2. C. Christopoulos and A. Wright, “Electrical Power System Protection”, Springer International, Second Edition, 1999.
3. Russel Mason, “Art and Science of protective relays”, Wiley – Blackwell Publications, First Edition, 1966.

E-Resources:

1. **https://nptel.ac.in/courses/108/101/108101039/**
2. **https://nptel.ac.in/courses/108/105/108105167/**

Course Outcomes:

Upon the completion of the subject, the student will be able to

1. Understand the basic function of a circuit breaker, all kinds of circuit breakers and differentiate fuse and circuit breakers under fault condition.
2. Describe the necessity for the protection of alternators, transformers and feeder bus bars from over voltages and other hazards.
3. Understand the Realization of reactance and MHO relay using sampling comparator.
4. Illustrate neutral grounding, and how over voltages can be generated and how system can be protected against lightning and switching transient over voltages with various protective schemes.
5. Identify operation and control of microprocessor based relays.

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	-	-	-	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	-

AY 2020-21 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech III Year – I Sem			
Course Code: J31OA	**ELEMENTS OF CIVIL ENGINEERING** (Open Elective-I)	**L**	**T**	**P**	**D**
Credits:3		**3**	**0**	**0**	**0**

Pre-requisite: Nil

Course Objectives:

This course will enable students to:

1. Study the basic requirements of civil engineering components.
2. Study the basic concepts of surveying.
3. Study the different types of building materials and components.
4. Study to deal with fire risk prevention and control.
5. Study about Highway development in India, Necessity for Highway planning, different road development plans

Module-1:

Unit-1: Introduction:

History of the civil engineering, sub – disciplines of civil engineering.

Module-2:

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.

TEXTBOOKS:

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.
4. "Building drawing"byM.G.Shah, C.M.Kale and S.Y.Patki,Tata McGraw Hill.

REFERENCES:

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, students will be able to:

1. **Explain** the basic requirements of civil engineering components.
2. **Evaluate** area for irregular shaped bodies.
3. **Explain** the various building materials.
4. **Plan** the building against the fire.
5. **Discuss** the highway development in India.

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	-	-	-	-	-	-	-	-

<table>
<tr><td rowspan="1">AY 2020-21
Onwards</td><td>J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B.Tech
III Year – I Sem</td></tr>
<tr><td>Course Code:
J31OB</td><td rowspan="2">ENVIRONMENTAL IMPACT ASSESSMENT
(Open Elective-I)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits:3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Environmental Science.

Course Objectives:

This course will enable students to:

1. Study the need of environmental impact assessment.
2. Study the role of EIA and different methodologies of EIA.
3. Discuss the guidelines of EIA for the project.
4. Study the different approaches to mitigate the adverse impact on environment.
5. Identify the EIA for specific case studies.

Module 1:

Unit-1: Impact of developmental projects – sustainable development – 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, Rapid and Comprehensive EIA.

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.

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	
	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	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

<table>
<tr><td>AY 2020-21 onwards</td><td colspan="4">J. B. Institute of Engineering and Technology (UGC Autonomous)</td><td colspan="4">B.Tech III Year – I Sem</td></tr>
<tr><td>Course Code: J31OC</td><td rowspan="2">Energy Engineering
(Open Elective-I)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisites: Nil

Course Objectives:

This course will enable students to:

1. To provide basic knowledge about various types of energy resources.
2. To familiarize the students about conventional energy systems.
3. To understand the practical significance of hydro-electric technology, wind, solar and biomass energy technologies.
4. Illustrate how biomass is currently used as a source of energy, its Future potential both in providing energy and in producing alternative fuels.
5. To familiarize energy conservation and management.

MODULE-I: INTRODUCTION TO ENERGY RESOURCES

World Energy status – Indian scenario, Energy resources – conventional and renewable, fuel cells, hydrogen energy, small hydro resources; Need for energy storage, energy storage methods; Environmental aspects of energy – Economics.

MODULE-II: CONVENTIONAL ENERGY SYSTEMS

Unit-I: Coal fired steam thermal power plant – layout, working, T-S diagram of water and steam, rankine cycle for steam turbine, efficiency.

Unit-II: Gas turbine power plant – various options, layout, working and T-S diagram for simple and combined cycle power plant, comparison, efficiency.

Nuclear power plants: fuels, nuclear fuel cycle, reactors, nuclear power plant, nuclear waste management.

MODULE-III: HYDRO ELECTRIC TECHNOLOGY

Hydro Electric plants – Types, energy conversion schemes, power equation, environmental aspects – Hydro-Thermal coordination. Ocean Energy Technology, Wave and tidal energy - fundamentals - energy converters - power plant - limitations.

MODULE-IV: WIND, SOLAR AND BIOMASS ENERGY TECHNOLOGIES

Unit-I: Wind turbine types and construction – power equation – wind energy conversion systems grid connection - environmental aspects.

Unit-II: Solar energy basics – energy from the sun, solar constant, solar spectrum, clarity index, V-I characteristics of a solar cell – solar module –Solar PV plant – hybrid systems.

Biomass energy resources – conversion technologies – urban waste to energy conversion –Biogas plant.

MODULE-V: ENERGY CONSERVATION AND MANAGEMENT

Unit-I: Principle of energy conservation - waste heat recovery - Heat pump – Economics of energy conservation, cogeneration, combined cycle plants, electrical energy conservation opportunities.

Unit-I: Definition and Objectives of Energy Management, Energy Management System, Top management support, Energy policy purpose, Roles and responsibilities of energy manager.

Energy Audit: Type and Methodology, Energy audit reporting format, Understanding Energy Costs, Fuel and Energy Substitution, Energy Audit Instruments.

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", WileyEastern Limited, 1990.

REFERENCE BOOKS

1. G.D.Rai, "Non-conventional energy sources", Khanna pub. Fourth Edition, 2002.
2. Pulfrey, D.L., Photovoltaic Power Generation, Van Nostrand Co., 1983.
3. Abbasik "Renewable Energy Sources and their Environment", PHI, 2008.
4. B.Mohanty, R.S.Liu, U.V Krishna Mohan Rao, "Energy Audit Management for theIndian Industry", Directorate the Institute of Charted Accountants of India, New Delhi,2001.
5. Encyclopedia of Energy – McGraw Hill Publication.
6. Energy Management Handbook, John Wiley & Sons, Wayne C.Turner.
7. Kothari et al. "Renewable Energy Sources and Emerging Technologies", PHI, 2008.

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=Ota2_LUuar0
4. https://www.youtube.com/watch?v=3dJAtHaSQ98
5. https://www.youtube.com/watch?v=xokHLFE96h8
6. http://www.tatapower.com/businesses/renewable-energy.aspx
7. http://www.cleanlineenergy.com/technology/wind-and-solar

Course Outcomes:

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

1. **Provide** basic knowledge about various types of energy resources.
2. **Familiarize** the students about conventional energy systems.
3. **Understand** the practical significance of hydro-electric technology, wind, solar and biomass energy technologies.
4. **Know** how biomass is currently used as a source of energy, its Future potential both in providing energy and in producing alternative fuels.
5. **Familiarize** energy conservation and management.

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	-	-	-	-	-	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

<table>
<tr><td>AY 2020-21 onwards</td><td>J. B. Institute of Engineering and Technology (UGC Autonomous)</td><td colspan="4">B.Tech III Year – I Sem</td></tr>
<tr><td>Course Code: J31OD</td><td rowspan="2">SENSORS AND TRANSDUCERS
(Open Elective-I)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisites: Nil

Course Objectives:

1. To make students familiar with the constructions and working principle of different types of sensors and transducers
2. To make students aware about the measuring instruments and the methods of measurement and the use of different transducers.
3. To make students familiar with the Potentiometer, Loading effect, Strain gauge
4. To make students aware about Linear Variable Differential Transformer, LVDT Accelerometer
5. To make students aware piezoelectric and pyro-electric transducers

MODULE – I

Measurements and Instrumentation of Transducers: Measurements – Basic method of measurement – Generalized scheme for measurement systems – Units and standards – Errors – Classification of errors, error analysis – Statistical methods – Sensor – Transducer – Classification of transducers – Basic requirement of transducers.

MODULE – II

Characteristics of Transducers: Static characteristics – Dynamic characteristics – Mathematical model of transducer – Zero, first order and second order transducers – Response to impulse, step, ramp and sinusoidal inputs.

MODULE– III

Resistive Transducers: Potentiometer –Loading effect – Strain gauge – Theory, types, temperature compensation – Applications – Torque measurement – Proving Ring – Load Cell – Resistance thermometer – Thermistors materials – Constructions, Characteristics – Hot wire anemometer.

MODULE – IV

Inductive and Capacitive Transducer: Self inductive transducer – Mutual inductive transducers – Linear Variable Differential Transformer – LVDT Accelerometer – RVDT – Synchros – Microsyn – Capacitive transducer – Variable Area Type – Variable Air Gap type – Variable Permittivity type – Capacitor microphone.

MODULE – V

Miscellaneous Transducers: Piezoelectric transducer – Hall Effect transducers – Smart sensors – Fiber optic sensors – Film sensors – MEMS – Nano sensors, Digital transducers.

TEXT BOOKS:

1. Sawhney. A.K, “A Course in Electrical and Electronics Measurements and Instrumentation”, 18th Edition, Dhanpat Rai & Company Private Limited, 2007.

2. Patranabis. D, “Sensors and Transducers”, Prentice Hall of India, 2003.

REFERENCE BOOKS:

1. Renganathan. S, “Transducer Engineering”, Allied Publishers, Chennai, 2003.
2. Doebelin. E.A, “Measurement Systems – Applications and Design”, Tata McGrawHill, New York, 2000.
3. John. P, Bentley, “Principles of Measurement Systems”, IIIEdition, PearsonEducation, 2000.
4. Murthy. D. V. S, “Transducers and Instrumentation”, Prentice Hall of India, 2001.
5. Sensor Technology Hand Book – Jon Wilson, Newne 2004.
6. Instrument Transducers – An Introduction to their Performance and design – byHerman K. P. Neubrat, Oxford University Press.

E-Resources:

1. http://cas.ee.ic.ac.uk/people/dario/files/E302/1-Sensors.pdf

Course Outcomes:

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

1. **Concept** behind working of measurement systems and different types of sensors and transducers.
2. **Sensor** to measure various physical parameters used in Industry and normal measurement applications
3. **Working** principle of resistive, inductive and capacitive transducers and their applications.
4. **Understanding** of digital and proximity sensors and their applications.
5. **Understanding** of thermocouples, piezoelectric and pyro-electric transducers and their applications.

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	-
CO2	2	1	-	-	-	-	-	-	-	-	-	-	2	-
CO3	2	2	1	1	1	-	-	-	1	-	-	-	2	1
CO4	2	-	-	-	1	-	2	-	-	-	-	-	2	-
CO5	1	-	-	-	1	-	-	-	-	-	-	-	1	-
Average	1.6	1.5	1	1	1	1	2		1	-	-	-	1.6	1

<table>
<tr><td>AY 2020-21 onwards</td><td>J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B.Tech
III Year – I Sem</td></tr>
<tr><td>Course Code: J31OE</td><td rowspan="2">AUTOMOTIVE TECHNOLOGY
(Open Elective-I)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Engineering Chemistry, Engineering Physics.

Course Objectives:
This course will enable students to:

1. Provide an overview on automobile engineering
2. Learn different fuels and advanced control systems
3. Study the concepts and drive train configurations of electric and hybrid electric vehicles
4. Understand use of intelligent vehicle technologies like navigation in automobiles
5. Provide awareness of safety security and regulations

Module 1
Unit-1: Structural systems of automobile– chassis and body, power unit, transmission system, Steering System, Suspension System, Braking System.
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, advantages and limitations.
Unit-2: Advanced Engine Controls: Concept of an electronic engine control system, electronic fuel injection - throttle body fuel injection, multi-point fuel injection, gasoline direct injection, common rail direct injection, electronic ignition control.

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, adaptive cruise control system, active suspension system, power steering and power windows.

Module 5
Unit-1: Safety and Security Systems: Active and passive safety, airbags, seat belt tightening system, collision warning systems, anti-lock braking systems, traction control system, electronic immobilizers, remote keyless entry, smart card system, number plate coding.
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. LjuboVlacic, 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:

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

1. **Outline** the overview of automobile engineering
2. **Identify** the different fuels and advanced control systems
3. **Develop** the concepts and drive train configurations of electric and hybrid electric vehicles
4. **Apply** the use of intelligent vehicle technologies like navigation in automobiles
5. **Aware** of safety security and regulations

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

<table>
<tr><td>AY 2020-21 onwards</td><td colspan="4">J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B.Tech
III Year – I Sem</td></tr>
<tr><td>Course Code: J31OG</td><td colspan="4" rowspan="2">PRINCIPLES OF SENSORS AND THEIR APPLICATIONS
(Open Elective-I)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Nil

Course Objectives:
This course will enable students 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 1: INTRODUCTION
Basics of Measurement – Classification of errors – Error analysis – Static and dynamic characteristics of transducers .

Unit 2: Performance measures of sensors – Classification of sensors – Sensor calibration techniques – Sensor Output Signal Types.

Module 2:
Unit 1: MOTION, PROXIMITY ANDRANGINGSENSORS
Motion Sensors – Potentiometers, Resolver, Encoders – Optical, Magnetic, Inductive, Capacitive.

Unit 2: LVDT – RVDT – Synchro – Microsyn, Accelerometer.,– GPS, Bluetooth, Range Sensors – RF beacons, Ultrasonic Ranging, Reflective beacons, Laser Range Sensor (LIDAR).

Module 3:
Unit 1: FORCE, MAGNETIC AND HEADINGSENSORS
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 1: OPTICAL, PRESSURE ANDTEMPERATURE SENSORS9
Photo conductive cell, photo voltaic, Photo resistive, LDR – Fiber optic sensors – Pressure – Diaphragm, Bellows, Piezoelectric – Tactile sensors, Temperature – IC, Thermistor, RTD.

Unit 2: Thermocouple. Acoustic Sensors – flow and level measurement, Radiation Sensors - Smart Sensors

Film sensor, MEMS & Nano Sensors, LASER sensors.

Module 5 :

Unit 1: SIGNAL CONDITIONING andDAQSYSTEMS9

Amplification – Filtering – Sample and Hold circuits – Data Acquisition: Single channel and multi-channel data acquisition .

Unit 2: Data logging - applications - Automobile, Aerospace, Home appliances, Manufacturing, Environmental monitoring.

TEXT BOOKS:

1. 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.

REFERENCES

1. Patranabis D, "Sensors and Transducers", 2nd Edition, PHI, New Delhi,2010.
2. John Turner and Martyn Hill, "Instrumentation for Engineers and Scientists", Oxford Science Publications,1999.
3. 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/

OUTCOMES:

The students will be able to

1. **Expertise** in various calibration techniques and signal types for sensors.
2. **Apply** the various sensors in the Automotive and Mechatronics applications
3. **Study** the basic principles of various smart sensors.
4. **Apply** Optical and Acoustic sensors in Home Appliances.
5. **Implement** the DAQ systems with different sensors for real time applications

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											
CO2	2	2		2										
CO3	3	2		3										
CO4	3	1												
CO5	2	2	3	3										
Average	**2.4**	**2.0**	**2.5**	**2.67**										

<table>
<tr><td>2020-21</td><td>J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B.Tech
III Year – I Sem</td></tr>
<tr><td>Course Code:
J31OH</td><td rowspan="2">PRINCIPLES OF COMMUNICATIONS
(Open Elective-I)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Communication systems

Course Objectives:

The Student will

1. provide the basic concepts of communication systems.
2. gain knowledge about Amplitude modulation and Angle Modulation.
3. study sampling and pulse modulation methods.
4. study and compare different binary digital modulation techniques.
5. understand the basic concepts of information theory.

Module 1: Introduction

Unit 1: Block diagram of Electrical communication system, Radio communication: Types of communications, Analog, pulse and digital types of signals,

Unit 2: Noise – Types of noise, sources of noise, calculation of noise in Linear systems and noise figure.

Module 2: Amplitude Modulation

Unit 1: Need for modulation, Types of Amplitude modulation, AM, DSB SC, SSB SC, Power and BW requirements, generation of AM, DSB SC, SSB SC, Demodulation of AM: Diode detector, Product demodulation for DSB SC & SSB SC.

Unit 2: Angle Modulation: Frequency & Phase modulations, advantages of FM over AM, Bandwidth consideration, Narrow band and Wide band FM, Comparison of FM & PM.

Module 3: Pulse Modulations

Unit 1: Sampling, Nyquist rate of sampling, Sampling theorem for Band limited signals, PAM, regeneration of base band signal, PWM and PPM.

Unit 2: Time Division Multiplexing, Frequency Division Multiplexing, Asynchronous Multiplexing.

Module 4: Digital Communication

Unit 1: Advantages, Block diagram of PCM, Quantization, effect of quantization, quantization error, Base band digital signal, DM, ADM, ADPCM and comparison.

Unit 2: Digital Modulation: ASK, FSK, PSK, DPSK, QPSK demodulation, coherent and incoherent reception, Modems.

Module 5: Information Theory

Unit 1: Concept of information, rate of information and entropy, Source coding for optimum rate of information, Coding efficiency, Shanon-Fano and Huffman coding

Unit 2: Error control coding: Introduction, Error detection and correction codes, block codes, convolution codes

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.

REFERENCES:

1. Electronic Communication Systems – Kennedy and Davis, TMH , 4th edition, 2004.
2. Communication Systems Engineering -John. G. Proakis and Masoud Salehi, PHS, 2nd ed.2004.

E - Resources:

1. https://nptel.ac.in/courses/Nanoelectronics/ IIT Madras/ab1011/102/111102111/

Course Outcomes:

The student will be able to:

1. **illustrate** the main concepts of analoge and digital communication systems.
2. **analyze** and design an AM and FM modulator/demodulator.
3. **explain**, discuss, and compare different binary digital modulation techniques.
4. **distinguish** different types of noise and explain the effects of noise on communication system.
5. **use** the basic concepts of information theory.

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	1	-	-	-	-	-	-	-	-	-	1	1	-
CO2	2	2	1	-	-	-	-	-	-	-	-	-	2	-
CO3	1	1	-	-	-	-	-	-	-	-	-	-	1	-
CO4	1	1	-	-	-	-	-	-	-	-	-	-	2	-
CO5	2	2	-	-	-	-	-	-	-	-	-	-	1	-
Average	2	2	1	-	-	-	-	-	-	-	-	1	1.2	-

<table>
<tr><td>AY 2020-21 onwards</td><td>J. B. Institute of Engineering and Technology (UGC Autonomous)</td><td colspan="4">B.Tech
III Year – I Sem</td></tr>
<tr><td>Course Code: J31OI</td><td rowspan="2">FUNDAMENTALS OF DATA BASE MANAGEMENT SYSTEM
(Open Elective-I)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-Requisites: A course on "Data Structures"

Course objectives:

The Student will

1. Understanding of the architecture and functioning of database management systems.
2. Understand and apply the principles of data modeling using relational model and
3. develop a good database design.
4. Understand the use of structured query language (SQL) and its syntax.
5. Apply normalization techniques to normalize a database.
6. Understand the need of database processing and learn techniques for controlling the Consequences of concurrent data access.

Module 1:

Introduction to Data Base Systems

Data base System Applications, data base System VS file System – View of Data – Data Abstraction – Instances and Schemas – data Models – the ER Model – Relational Model – Other Models – Database Languages – DDL – DML.

Database Access for applications Programs

data base Users and Administrator – Transaction Management – data base System Structure – Storage Manager – the Query Processor.

Module 2:

Introduction to the Relational Model

Integrity Constraint Over relations – Enforcing Integrity constraints – Querying relational data – Logical data base Design – Introduction to Views – Destroying /altering Tables and Views.

Relational Algebra

Selection and projection set operations – renaming – Joins – Division – Examples of Algebra overviews – Relational calculus – Tuple relational Calculus – Domain relational calculus.

Module 3:

Form of Basic SQL Query

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

Schema refinement

Problems Caused by redundancy – Decompositions – Problem related to decomposition – reasoning about FDS – FIRST, SECOND, THIRD Normal forms – BCNF – Lossless join Decomposition – Dependency preserving Decomposition – Schema refinement in Data base Design – Multi valued Dependencies – FORTH Normal Form.

Module 4:

Transaction Concept

Transaction State- Implementation of Atomicity and Durability – Concurrent Executions – Serializability-Recoverability– Implementation of Isolation – Lock –Based Protocols – Timestamp Based Protocols-Validation- Based Protocols.

Recovery and Atomicity

Log – Based Recovery – Recovery with Concurrent Transactions – Buffer Management – Failure with loss of nonvolatile storage-Advance Recovery systems- Remote Backup systems.

Module 5:

Data on External Storage

-File Organization and Indexing – Cluster Indexes, Primary and Secondary Indexes – Index data Structures – Hash Based Indexing – Tree base Indexing – Comparison of File Organizations – Indexes and Performance Tuning- Intuitions for tree Indexes – Indexed Sequential Access Methods (ISAM).

Advanced Database Management System

Introduction to Distributed Database-Reference Architecture, fragmentation, Allocation, Joins.

Text Books:

1. Data Base Management Systems, Raghurama Krishnan, Johannes Gehrke, TATA McGrawHill 3rd Edition
2. Data base System Concepts, Silberschatz, Korth, McGraw hill, V edition.

Reference Books:

1. Data base Systems design, Implementation, and Management, Peter Rob & Carlos Coronel 7th Edition.
2. Fundamentals of Database Systems, Elmasri Navrate Pearson Education
3. Introduction to Database Systems, C.J.Date Pearson Education.

E - Resources:

1. http://www.iran-lms.com/images/images/Books/PDF/Fundamentals-of-Database-Systems-Pearson-2015-Ramez-Elmasri-Shamkant-B.-Navathe.pdf
2. https://view.officeapps.live.com/op/view.aspx?src=https%3A%2F%2Fcs.gmu.edu%2F~aobaidi%2Ffall_05%2Findex_files%2FLectures%2FENCh10.ppt
3. https://www.youtube.com/watch?v=T7AxM7Vqvaw
4. https://cs.ulb.ac.be/public/_media/teaching/infoh303/dbmsnotes.pdf
5. https://www.w3schools.in/dbms/intro/

Course outcomes:

The Student will be able to

1. **Identify** the underlying concepts of database technologies.
2. **Design** a database schema for a given problem domain.
3. **Formulate** SQL queries and integrity constraints over relations.
4. **Apply** normalization on database for eliminating redundancy.
5. **Summarize** transaction properties, concurrency control and recovery techniques and learn various data storage and security mechanisms.

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	-	1	-	-	-	-	-	-	-	-	2
CO2	3	3	3	2	2	-	-	-	-	-	-	-	-	2
CO3	3	3	2	2	2	-	-	-	-	-	-	-	-	2
CO4	3	2	3	3	2	-	-	-	-	-	-	-	-	3
CO5	2	2	3	1	3	-	-	-	-	-	-	-	-	1
Average	**2.8**	**2.6**	**2.6**	**2.0**	**2.0**	-	-	-	-	-	-	-	-	**2.0**

<table>
<tr><td>AY 2020-21
onwards</td><td colspan="4">J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B.Tech
III Year – I Sem</td></tr>
<tr><td>Course Code:
J31OJ</td><td rowspan="2" colspan="4">PRINCIPLES OF OPERATING SYSTEMS
(Open Elective-I)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

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

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

Module 1:
Background
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 Management
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:

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.

Text Books:
1. Operating System Concepts-A. Silberschatz, Peter B. Galvin, Greg Gagne, 10th Edition, John Wiley& Sons inc.
2. Operating Systems Internals and Design Principles – William Stallings, 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: // www.tutorialspoint .com/operating_system/
2. https: // www.studytonight.com/operating-system/
3. https: // learn.saylor.com/course/view.php?id=948&sectioned=967
4. https: //nptel.ac.in/courses/106/105/106105214/
5. https://www.edx.org/course/computer-hardware-and-operating-systems
6. **Course outcomes:**

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

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

<table>
<tr><td>AY 2020-21 onwards</td><td>J. B. Institute of Engineering and Technology (UGC Autonomous)</td><td colspan="4">B. Tech III Year – I Sem.</td></tr>
<tr><td>Course Code: J31OK</td><td rowspan="2">INTRODUCTION TO DATA STRUCTURES through PYTHON
(Open Elective-I)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Programming in C

Course Objectives:

This course will enable students to:

1. Understand fundamentals of programming.
2. Adapt Basic taxonomy of python.
3. Familiarize with OOP.
4. Understand Data Structure in Python.
5. Design Solutions with OOP Paradigm.

Module I: Introduction

Unit 1:

Relationship between computers and programs, Basic principles of computers, Fundamentals of Programming and File systems,

Unit 2:

Using the Python interpreter, Introduction to binary computation, Input / Output.

Module II: Data types and control structures

Unit 1:

Keywords, Operators (unary, arithmetic, etc.), Data types, variables, expressions, and statements, Assignment statements, Strings and string operations.

Unit 2:

Control Structures: loops and decision

Module III: Modularization and Classes

Unit 1:

Standard modules, Packages and using of Packages.

Unit 2:

Defining Classes, Defining functions, Functions and arguments.

Module IV: Data Structures and Exceptions

Unit 1:

Data Structures (array, List, Tuples and Dictionary).

Unit 2:

Error processing, Exception Raising and Handling.

Module V: Object oriented design

Unit 1:

Programming types, Object Oriented Programming, Object Oriented Design.

Unit 2:

Inheritance and Polymorphism.

Text Books:

1. Data Structures and Algorithms in Python. Michael T. Goodrich , Roberto Tamassia , Michael H. Goldwasser, Wiley, 2013.Reference Books:

Reference Books:

1. Data Structures and Algorithms Using Python Rance D. Necaise, JOHN WILEY & SONs.

E - Resources:

1. https://www.my-mooc.com/en/mooc/introduction-to-python-programming/

Course Outcomes:

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

1. **Recall** fundamentals of programming.
2. **summarize** Basic taxonomy of python.
3. **Get** Familiarity with OOP.
4. **Apply** Data Structure in Python.
5. **Solve** Problems with OOP Paradigm.

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	1	1	-	-	-	-	-	-	-	-	2	1
CO2	1	2	2	1	-	-	-	-	-	-	-	-	1	2
CO3	2	2	2	2	-	-	-	-	-	-	-	-	1	1
CO4	2	2	2	2	-	-	-	-	-	-	-	-	2	2
CO5	1	2	2	2	-	-	-	-	-	-	-	-	2	1
Average	1.6	2	1.8	1.6	-	-	-	-	-	-	-	-	1.6	1.4

onwards	(UGC Autonomous)	III Year – I Sem.			
Course Code: J31OL	**INTRODUCTION TO WEB DESIGN** (Open Elective-I)	**L**	**T**	**P**	**D**
Credits: 3		**3**	**0**	**0**	**0**

Pre-requisite: Nil

Course Objectives:

This course will enable students to:

1. Know regarding internet related technologies.
2. Understanding of the current industry support for web technologies.
3. Explain the basic concepts of CSS.
4. Visualize the basic concepts of PHP.
5. Understanding PHP functions and Methods

Module I:

UNIT-I: Basics in Web Design: Brief History of Internet, what is World Wide Web, why create a web site, Web Standards, Audience requirement.

UNIT -II: Web Design Principles: Basic principles involved in developing a web site, Planning process, Five Golden rules of web designing, Designing navigation bar page design, Home Page Layout, Design Concept.

Module II:

UNIT-I: What is HTML, HTML Documents, Basic structure of an HTML document, creating an HTML document, Mark up Tags, Heading-Paragraphs, Line Breaks, HTML Tags, HTML Tables, HTML Forms.

UNIT II: Introduction to elements of HTML, working with Text Working with Lists, Tables and Frames, working with Hyperlinks, Images and Multimedia, Working with Forms and controls.

Module III:

UNIT-I: Concept of CSS, Creating Style Sheet and types of CSS, CSS Properties, CSS Styling(Background, Text Format, Controlling Fonts), Working with block elements and objects, Working with Lists and Tables, CSS Id and Class, Box Model(Introduction, Border properties, Padding Properties, Margin properties).

UNIT-II: Grouping, Dimension, Display, Positioning, Floating, Align, Pseudo class, Navigation Bar, Image Sprites, Attribute sector), CSS Colors, Creating page Layout and Site Designs.

Module IV:

UNIT-I: Downloading, installing, configuring PHP, The anatomy of a PHP Page. Basic Security Guidelines, Variables, Data Types, Operators and Expressions, Constants, Flow Control Functions; Switching Flow, Loops.

UNIT II: Code Blocks and Browser Output, Objects, Strings Processing, Form processing, connecting to database, using cookies, dynamic contents.

Module V:

UNIT I: Creating the Web Site, Saving the site, working on the web site, Creating web site structure, Creating Titles for web pages, Themes-Publishing web sites.

Text Books:

1. Dietel and Dietel : ―Internet and World Wide Web - How to Program‖, 5th Edition, PHI/Pearson

Education,2011

2. Web Technologies: HTML,CSS, XML,Php BlackBook.

Reference Books:

1. Chris Bates, ―Web Programming, building internet applications‖, 2ndEdition, WILEY, Dreamtech,2008.
2. HTML 5 in simple steps Kogent Learning Solutions Inc, DreamtechPress.
3. Beginning CSS: Cascading Style Sheets for Web Design Ian Pouncey, ichard York Wiley India

E - Resources:

1. https://nptel.ac.in/courses/106/105/106105084/
2. http://www.nptelvideos.in/2012/11/internet-technologies.html
3. http://www.nptelvideos.com/php/php_video_tutorials.php

Course Outcomes:

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

1. **Develop** the application of the HTML for document structure.
2. **Develop** the skills in analyzing the usable of a website.
3. **Create** dynamic webpage, using PHP.
4. **Using** PHP to manipulate Files.
5. **Develop** the concept of web publishing.

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

<table>
<tr><td>AY 2020-21 onwards</td><td colspan="1">J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="3">B.Tech
III Year – I Sem</td></tr>
<tr><td>Course Code: J31OM</td><td rowspan="2">BASICS OF OBJECT ORIENTED PROGRAMMING
(Open Elective-I)</td><td>L</td><td>T</td><td>P/D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Basic Knowledge of C and C++

Course Objectives:
The Students will
1. Familiar with concepts of OOP
2. Explain inheritance and polymorphism
3. Familiar with packages and interfaces
4. Familiar with exception handling and multithreading
5. Familiar with applet programming and event handling.

Module I:
Unit 1: Introduction: Concepts of Object Oriented Programming, Encapsulation and Polymorphism, history of Java.
Unit 2 : Java buzzwords, data types, variables, scope and life time of variables, arrays, operators, expressions, control statements, type conversion and casting, simple java program.

Module II:
Unit 1: Classes and Objects: Concepts of classes, objects, constructors, methods, this keyword, garbage collection, overloading methods and constructors, parameter passing, recursion. String handling.
Unit 2 : Inheritance 1: Base class object, subclass, member access rules, super uses, using final with inheritance, method overriding, abstract classes

Module III:
Unit 1: Interfaces 2: Defining an interface, implementing interface, differences between classes and interfaces and extending interfaces.
Unit 2 : Packages: Defining, creating and accessing a package, importing packages, access control, exploring package - java.io.

Module IV:
Unit 1 : 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.
Unit 2 : Multithreading: Differences between multi-threading and multitasking, thread life cycle, creating threads, synchronizing threads, daemon threads, thread groups.
Module V:
Unit 1: Applets: Concepts of applets, differences between applets and applications, life cycle of applet, types of applets, creating applets, passing parameters to applets.
Unit 2: 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

Text Books:

1. Java The complete reference, 8th editon, Herbert Schildt, TMH.
2. Understanding OOP with Java, up dated 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. www.javasoft.com
2. www.w3schools.com
3. www.tutorialpoint.com
4. www.oracle.com
5. https://www.youtube.com/watch?v=-HafzawNlUo&ab_channel=SundeepSaradhiKanthety.
6. https://www.youtube.com/watch?v=7WhnYwoBY24&list=PLlhM4lkb2sEhf5NlWeYh_gdcN49pHjVP0&ab_channel=SmartProgramming.
7. https://www.youtube.com/watch?v=G_t6BbZeyUU&ab_channel=VoidRealms

Course Outcomes:

Students will be able to

1. **Familiar** with constructors and string handling
2. **Understand** inheritance and polymorphism
3. **Understand** packages and interfaces
4. **Understand** exception handling and multithreading
5. **Understand** applet programming

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	-	3	-	-	2	-	-	3	-
CO2	-	-	2	-	-	3	-	3	-	-	3	-	-	3
CO3	3	-	-	3	-	2	-	-	3	-	-	3	-	-
CO4	3	-	-	-	3	-	-	3	3	3	-	-	3	-
CO5	-	3	-	-	-	-	2	-	-	-	3	-	-	3
Average	**3.0**	**3.0**	**2.0**	**3.0**	**3.0**	**2.5**	**2.5**	**3.0**	**3.0**	**2.5**	**3.0**	**3.0**	**3.0**	**3.0**

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech III Year – I Sem		
Course Code: J31ON	**FUNDAMENTALS OF DIGITAL LOGIC DESIGN** (Open Elective-I)	**L**	**T**	**P/D**
Credits: 3		3	0	0

Pre-requisite: 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 I:
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 II:
Unit 1: 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 III:
Unit 1: 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 IV:
Unit 1 : 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 V:
Unit 1: Registers, shift registers, ripple counters synchronous counters, other counters, hdl for registers and counters.

Text Books:
1. Digital design – third edition , m.morris mano, pearson education/phi.
2. Fundamentals of logic design, roth, 5th edition,thomson.

Reference Books:

1. Switching and finite automata theory by zvi. Kohavi, tata mcgraw hill.
2. Switching and logic design, c.v.s. rao, pearson education
3. Digital principles and design – donald d.givone, tata mcgraw 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:

Students will be able to

1. **Manipulate** numeric information in different forms, e.g. different bases, signed integers, various codes such as ASCII, gray, and BCD.
2. **Build** Boolean expressions using the theorems and postulates of Boolean algebra and to minimize combinational functions.
3. **Design** and analyze small combinational circuits and to use standard combinational functions/building blocks to build larger more complex circuits.
4. **Analyze** small sequential circuits and devices and to use standard sequential functions/building blocks to build larger more complex circuits.
5. **Construct** digital systems by Algorithmic State Machine Charts

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**	**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**

<table>
<tr><td>AY 2020-21 onwards</td><td>J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B.Tech
III Year – I Sem</td></tr>
<tr><td>Course Code: J31OP</td><td rowspan="2">INTRODUCTION TO MINING TECHNOLOGY
(Open Elective-I)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Nil

Course objectives:

1. To introduce the 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

Unit - I: Introduction: Distribution of mineral deposits in India and other countries, mining contributions to civilization, mining terminology

Module 2

Unit - I: Stages in the life of the mine - prospecting, exploration, development, exploitation, and reclamation.

Unit - II: Access to mineral deposit- selection, location, size, and shape (incline, shaft and Adit), brief overview of underground and surface mining methods.

Module 3

Unit - I: Drilling: Types of drills, drilling methods, electric, pneumatic, and hydraulic drills, drill steels and bits, drilling rigs, and jumbos.

Module 4

Unit - I: Explosives: Classification, composition, properties and tests, fuses, detonators, blasting devices and accessories, substitutes for explosives, handling and storage, transportation of explosives.

Unit - II: Rock blasting: Mechanism of rock blasting, blasting procedure, and pattern of shot holes.

Module 5

Unit - I: 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.

E-resources:

1. https://www.cienciaviva.pt/img/upload/Introduction%20to%20mining.pdf
2. https://www.researchgate.net/publication/282572490_Basic_concept_of_mining_technology

Course outcomes:

The student will be able to:

1. **Learn** about distribution of mineral deposits in India
2. **Learn** about stages on mining process
3. **Learn** about drilling and its machinery
4. **Understand** about explosives, blasting and blasting mechanism
5. **Understand** about shaft sinking methods, precautions, and lining of shafts

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	2	-	-	-	-	-	-	-	-	-	-	-
CO2	3	2	2	-	-	-	-	-	-	-	-	-	-	-
CO3	3	2	1	-	-	-	-	-	-	-	-	-	-	-
CO4	2	2	1	-	-	-	-	-	-	-	-	-	-	-
CO5	3	1	2	-	-	-	-	-	-	-	-	-	-	-
Average	3	2	1.6	-	-	-	-	-	-	-	-	-	-	-

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech III Year – I Sem			
Credits: 3	Numerical Solution of Ordinary Differential Equations (Common to EEE, ECE, CSE, IT&ECM) (Open Elective-I)	L	T	P	D
Course Code:		3	0	0	0

Pre-requisite: Nil

Pre-requisite: Nil

Course Objectives:
This course will enable students to:

1. To solve algebraic, transcendental equations and system of linear equation by various methods and find Eigen value by iteration method.
2. To Interpolate and approximate equal and unequal intervals by various formulae.
3. To discuss approximation of numerical differentiation and integration(single &double).
4. To solve Ordinary Differential Equations (ODEs) in Initial value Problems (IVPs) by various methods.
5. To solving ODEs & Partial Differential Equations (PDEs) in boundary value Problems(IVPs) by various methods

Module 1: Solution of Equations and Eigen value Problems
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
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
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 1/3rules.

Module 4 : Initial Value Problems for Ordinary Differential Equations
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**.**

Module 5 : Boundary Value Problems in Ordinary Differential Equations
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. "Higher Engineering Mathematics", B.S. Grewal ,Khanna Publications, 2017
2. "Numerical Methods for Engineers", Chapra. S.C., and Canale.R.P., Tata McGraw Hill, 5 th Edition, New Delhi,2007.

Reference Books:

1. "Advanced Engineering Mathematics", R.K.Jain& S.R.K. Iyengar, Narosa Publications, 5th Edition, 2015.
2. "Higher Engineering Mathematics", Ramana B.V., 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. http://ramanujan.math.trinity.edu/wtrench/texts/TRENCH_FREE_DIFFEQ_II.PDF

Course Outcomes:

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

1. **understand** the basic knowledge on solution of Eigenvalues
2. **use** interpolation and approximation to solve engineering problems.
3. **discuss** the numerical differentiation and integration.
4. **apply** initial value problems for solving first order differential equation.
5. **apply** the boundary value problems in ordinary and partial differential equations.

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	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	-	-

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech III Year – I Sem			
Course Code:	**Number Theory & Cryptography** (Common to CE, EEE, ME, ECE, CSE, IT, ECM& MIE) (Open Elective-I)	**L**	**T**	**P**	**D**
Credits: 3		**3**	**0**	**0**	**0**

Pre-requisite: Nil

Course Objectives:

This course will enable students to:

1. The basic definitions and theorems in number theory
2. The concept of a congruence and use various results related to congruence's including the Chinese Remainder Theorem
3. Number theory algorithms and procedures to basic problems.
4. The fundamentals of Cryptography how number theory is related to and used in cryptograph

Module 1 : Divisibility Theory And Canonical Decompositions

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

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 :

Wilson‘s theorem – Fermat‘s little theorem – Euler‘s theorem – Euler‘s Phifunctions**.**

Module 4: Classical Encryption Techniques

Classical encryption techniques: Symmetric chipper model – Substitution techniques – Transposition techniques – Steganography.

Module 5: Block Chippers and Public Key Encryption

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. "Course on Number Theory and Cryptography", Koblitz, N. Springer Verlag, 1986
2. "Handbook of Applied Cryptography", Menezes, A, et.al. CRC Press,1996

Reference Books:

1. "An Introduction to the Theoryof Numbers", Ivan Niven, Herbert S. Zukerman, Hugh L. Montgomery.

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:

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

1. **Ability** to think and reason about abstract mathematics
2. **Analyze** the vulnerabilities in any computing system and hence be able to design a security solution
3. **Evaluate** security mechanisms using rigorous approaches, including theoretical
4. **Solve** problems in elementary number theory
5. **Apply** elementary number theory to cryptograpy

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	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	-	-

<table>
<tr><td>AY 2020-21 onwards</td><td>J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B.Tech
III Year – I Sem</td></tr>
<tr><td>Course Code:</td><td rowspan="2">NANOMATERIALS
(Common to CE, EEE, ME, ECE, CSE, IT& MIE)
(Open Elective-I)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Nil

Course Objectives:
This course will enable students to:

1. To familiarize about the various properties of nanostructures.
2. Utilizing the different physical and chemical methods in preparing nanomaterials.
3. Provide different methods of synthesis of Nano materials.
4. Bring out the distinct Quantum Structure properties of nanostructures.
5. Find out the particle size of a crystal by XRD technique.

Module 1: Introduction to Nanomaterials
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:
Unit-1: Physical Methods: Bottom-up approach and Top-down approach, Inert gas condensation, Arc Discharge, lasers ablation, laser pyrolysis, ball milling, and electro deposition.
Unit - 2: Chemical Methods: Nanocrystals by chemical reduction, photochemical synthesis, electrochemical synthesis, Nano crystals of semiconductors.

Module 3: Synthesis of Nanomaterials
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
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
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. "The chemistry of Nano materials: Synthesis, Properties and Applications", C N R Rao, A Muller and A K Cheetham , John Wiley, First Edition, 2004
2. "Nano structured Materials and Nanotechnology", Hari Singh Nalwa, Academic Press, First Edition, 2002.

Reference Books:

1. "Introduction to Nanotechnology", Charles P Poole Jr, John Willey & Sons, 1st Edition, 2003
2. Nanoscience: "Nanotechnologies and Nano physics", C Dupas, P Houdy, M Lahmani, Springer-Verlag Berlin Heidelberg, 1st Edition, 2007.

E - Resources:

1. http://nptel.ac.in/courses/103103033/module9/lecture1.pdf

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
6. http://nptel.ac.in/courses/118104008/
7. http://nptel.ac.in/courses/118102003/

Course Outcomes:

On completion of the course, the students will be 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. **Develop** 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.

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	1	-	-	-	-	-	-	-	-	-	-	1	-
CO2	2	1	-	-	-	-	-	-	-	-	-	-	1	-
CO3	2	1	-	-	-	-	-	-	-	-	-	-	1	-
CO4	3	2	2	-	2	-	-	-	-	-	-	-	1	-
CO5	3	2	2	-	2	-	-	-	-	-	-	-	1	-
Average	2.6	1.4	2	-	2	-	-	-	-	-	-	--	1	-

<table>
<tr><td>AY 2020-21 onwards</td><td colspan="4">J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B.Tech
III Year – I Sem</td></tr>
<tr><td>Course Code:</td><td rowspan="2" colspan="4">Chemistry of Engineering Materials
(Common to CE, EEE, ME, ECE, CSE, IT& MIE)
(Open Elective-I)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Nil

Course Objectives:

This course will enable students to

1. Learn the concept of phase rule and alloys, phase diagrams of different systems.
2. Gain the knowledge on abrasives, glass, ceramics, and adhesives.
3. Understand the basic concepts of chemistry to develop futuristic materials for high-tech. applications in the area of engineering.
4. Know the concepts of glass, ceramics and Refractories.
5. Analyze the different types of solutions.

Module 1: Phase Rule and alloys:

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:

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:

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:

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:

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:

On completion 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.

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	1	-	-	-	-	-	-	-	2	-	-
CO2	3	2	1	-	-	-	-	-	-	-	-	2	-	-
CO3	2	-	-	-	2	-	-	-	-	-	-	2	-	-
CO4	3	1	1	-	-	-	-	-	-	-	-	1	-	-
CO5	2	2	-	-	1	-	-	-	-	-	-	2	-	-
Average	2.4	1.4	1	1	-	-	-	-	-	-	-	1.8	-	-

<table>
<tr><td>AY 2020-21 onwards</td><td>J. B. INSTITUTE OF ENGINEERING AND TECHNOLOGY
(UGC Autonomous)</td><td colspan="4">B.Tech
III Year – I Sem</td></tr>
<tr><td>Course Code:</td><td rowspan="2">TECHNICAL COMMUNICATION SKILLS
(COMMON TO ALL)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-Requisites: Nil
Course Objectives:
The students will
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.

E-Resources:
1. https://www.ilstranslations.com/blog/language-vs-communication-theyre-not-the-same-thing/#:~:text=Language%20is%20a%20system%20of,is%20a%20tool%20of%20communication.

Course outcomes:
The students will be able to
2. Use the language skills in order to better communication
3. Learn the presentation skills and use them in conferences and seminars
4. Identify the role of presentation skills in expressing our feelings and emotions
5. Understand the role of group discussion for getting jobs
6. Know the importance of interview skills for getting jobs

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	-	-
CO2	-	-	-	-	-	-	-	-	2	3	-	3	-	-
CO3	-	-	-	-	-	-	-	-	2	3	-	3	-	-
CO4	-	-	-	-	-	-	-	-	2	3	-	3	-	-
CO5	-	-	-	-	-	-	-	-	2	3	-	3	-	-
Total	-	-	-	-	-	-	-	-	2	3	-	3	-	-

AY 2020-21 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech III Year – I Sem			
Course Code:	**ENTREPRENEURSHIP** (Open Elective - I)	**L**	**T**	**P**	**D**
Credits: 3		**3**	**0**	**0**	**0**

Pre-Requisites: Nil
Course Objective:
The students will

1. To implore an understanding of the dimensions and traits required to become an entrepreneur.
2. To understand the Entrepreneurial process and also inspire them to be Entrepreneurs
3. To understand the Entrepreneurship and its role in the society
4. To understand the process of Entrepreneurship & preparing business plans
5. To gain knowledge about the Entrepreneurship Development Institutions of Government
6. **Module 1:**

UNIT - I:
Understanding Entrepreneurial Mindset- The revolution impact of entrepreneurship- The evolution of entrepreneurship - Functions of Entrepreneurs – types of entrepreneurs.
UNIT - II:
Approaches to entrepreneurship- Process approach- Role of entrepreneurship in economic development- Twenty first century trends in entrepreneurship.

Module 2:
UNIT - I:
The individual entrepreneurial mind-set and Personality- The entrepreneurial journey-Stress and the entrepreneur - the entrepreneurial ego - Entrepreneurial motivations- Motivational cycle – Entrepreneurial motivational behavior – Entrepreneurial competencies.
UNIT - II:
Corporate Entrepreneurial Mindset, the nature of corporate entrepreneur- conceptualization of corporate entrepreneurship Strategy-sustaining corporate entrepreneurship.

Module 3:
UNIT - I:
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 - II:
Methods to initiate Ventures- Creating new ventures-Acquiring an Established entrepreneurial venture- Franchising- advantage and disadvantages of Franchising.
Module 4:
UNIT - I:
Legal challenges of Entrepreneurship - Intellectual property protection - Patents, Copyrights - Trademarks and Trade secrets - Avoiding trademark pitfalls
Feasibility Analysis - Industry and competitor analysis –
UNIT - II:
Formulation of the entrepreneurial Plan- The challenges of new venture start-ups, developing an effective business model – Sources of finance - Critical factors for new venture development - The Evaluation process.

Module 5:

UNIT - I:

Strategic perspectives in entrepreneurship - Strategic planning - Strategic actions-strategic positioning-Business stabilization - Building the adaptive firms - Understanding the growth stage – Internal growth strategies and external growth strategies, Unique managerial concern of growing ventures.

UNIT - II:

Initiatives by the Government of India to promote entrepreneurship, Social and women entrepreneurship - T-hub, J-hub

Text 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. S. S.Khanka, Entrepreneurship Development, S. Chand Publications, 2015. Stuart Read, Effectual Entrepreneurship, Routledge, 2013.

Reference Books:

1. Rajeev Roy, Entrepreneurship, 2e, Oxford publications, 2012
2. Nandan .H, Fundamentals of Entrepreneurship, PHI, 2013
3. Madhurima Lal Shikha Sahai – Entrepreneurship, Excel Books.
4. S.K Mohanthy, Fundamentals of Entrepreneurship, Prentice Hall of India, New Delhi.

E-Resources:

1. Entrepreneur.com
2. BusinessOwnersToolKit.com
3. YourStory.com
4. ASmartBear.com

Course outcomes:

Upon successful completion of the course, the students should be able to

1. Understand the need and significance of Entrepreneurship in the Economy
2. Develop Entrepreneurial Competencies
3. Develop Business Plan with the required contents.
4. Understand contribution of family business and Social Entrepreneurship in the Economy.
5. Plan Strategic perspectives in entrepreneurship

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	-	-
CO2	-	-	-	-	-	-	-	-	2	3	-	3	-	-
CO3	-	-	-	-	-	-	-	-	2	3	-	3	-	-
CO4	-	-	-	-	-	-	-	-	2	3	-	3	-	-
CO5	-	-	-	-	-	-	-	-	2	3	-	3	-	-
Total	-	-	-	-	-	-	-	-	2	3	-	3	-	-

<table>
<tr><td>AY 2020-21 onwards</td><td colspan="1">J. B. Institute of Engineering and Technology (UGC Autonomous)</td><td colspan="4">B.Tech
III Year – II Sem</td></tr>
<tr><td>Course Code: J32OA</td><td rowspan="2">CONSTRUCTION MANAGEMENT, CONTRACTS AND VALUATION
(Open Elective-II)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits:3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Construction Technology and Project Management, Estimation and Costing.

Course Objectives:

This course will enable students to:

1. Study the different tools and techniques for project management.
2. Explain the various types of organization and their impact on and suitability to construction projects.
3. Study the various safety concepts and requirements applied to construction industry.
4. Differentiate the different types of contracts.
5. Study purpose of valuation and types of valuation.

Module 1:

Unit 1: 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 1: Project Management Plan and Objectives

Programming – scheduling – project organization – organization and project team – role of communication in project management – controlling systems.

Module 3:

Unit 1: 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 1: 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 1: 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:

On completion of the course, the students 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	-

<table>
<tr><td rowspan="1">AY 2020-21 onwards</td><td>J. B. Institute of Engineering and Technology (UGC Autonomous)</td><td colspan="4">B.Tech
III Year – II Sem</td></tr>
<tr><td>Course Code: J32OB</td><td rowspan="2">ENERGY AUDIT & GREEN BUILDINGS
(Open Elective-II)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits:3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Nil

Course Objectives:
This course will enable students to:
1. Study the various energy scenarios and energy auditing methodology.
2. Explain various renewable and non-renewable sources of energy.
3. Describe the best green building practices adopted along with cost/benefit and life-cycle analysis of green buildings.
4. Explain the efficient use of waste materials in construction industry
5. Create awareness about the principles of green building technology and to have insight about the criteria for rating systems.

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).

Reference Books:

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:

On completion of the course, the students 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 (Draft) (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

<table>
<tr><td>AY 2020-21 onwards</td><td>J. B. Institute of Engineering and Technology (UGC Autonomous)</td><td colspan="4">B.Tech III Year – II Sem</td></tr>
<tr><td>Course Code: J32OC</td><td rowspan="2">HYBRID ELECTRIC VEHICLES
(Open Elective-II)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Nil

Course Objectives:

This course will enable students to:

1. Understand working of different configurations of electric vehicles, and its components
2. Understand hybrid vehicle configuration and performance analysis.
3. Introduce the transmission configuration and its analyze the characteristics
4. Analyze the different speed control techniques
5. Design and evaluate the sizing of components in hybrid vehicles.

MODULE -I: 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 -II: Basic concept of hybrid traction – Introduction to various hybrid drive train topologies – power flow control in hybrid drive – train topologies-Fuel efficiency analysis.

MODULE -III: 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 -IV: 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 -V: 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, 2017.
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/

Course Outcomes:

The students will be able to

1. **Understand** the working of different configurations of electric vehicles, hybrid vehicles and its components.
2. **Apply** the basic concepts of batteries and Motors in the design of Electric and Hybrid Vehicles.
3. **Differentiate** the modes of operation of Hybrid Vehicles.
4. **Analyze** the performance of hybrid vehicles.
5. **Design** the basic parameters of Electric and Hybrid Electric Vehicles.

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	-	-	-	2	-	-	-	-	-	3	2
CO2	3	2	3	2	-	-	2	-	-	-	-	-	2	2
CO3	3	2	3	-	-	-	-	-	-	-	-	2	2	2
CO4	2	3	2	-	-	-	-	-	-	-	-	2	3	3
CO5	2	3	3	-	-	-		2	-	-	-		2	2
Average	2.6	2.5	2.6	-	-	-	2	2	-	-	-	2	2.4	2..2

<table>
<tr><td>AY 2020-21 onwards</td><td colspan="4">J. B. Institute of Engineering and Technology (UGC Autonomous)</td><td colspan="4">B.Tech III Year – II Sem</td></tr>
<tr><td>Course Code: J32OD</td><td rowspan="2">ENERGY AUDITING CONSERVATION AND MANAGEMENTS
(Open Elective-II)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Nil

Course Objectives:

The students will

1. To understand the need of Energy Audit and Energy Conservation Schemes.
2. To know the necessity of conservation of energy.
3. To generalize the methods of energy management.
4. To illustrate the factors to increase the efficiency of electrical equipment.
5. To detect the benefits of carrying out energy audits.

MODULE -I: Basic Principles of Energy Audit: Energy Audit-

Unit-I: Definitions, Concept, Types of audit, Energy index, Cost index, Pie charts, Sankey diagrams.

Unit-II: Load profiles, Energy conservation schemes- Energy audit of industries- Energy saving potential, Building energy audit.

MODULE -II: Energy Management

Principles of energy management, organizing energy management program, Initiating, Planning, Controlling, Promoting, Monitoring, Reporting, Energy manger, Qualities and functions, Language, Questionnaire – Check list for top management.

MODULE -III: Energy Efficient Motors

Energy efficient motors, Factors affecting efficiency, Loss distribution, Constructional details, Characteristics - Variable speed, Variable duty cycle systems, RMS HP- Voltage variation-Voltage unbalance- Over motoring- Motor energy audit.

MODULE -IV: Power Factor Improvement, Lighting and Energy Instruments

Unit-I: Power factor – Methods of improvement, Location of capacitors, Pf with non-linear loads, Effect of harmonics on power factor.

Unit-II: Power factor motor controllers - Good lighting system design and practice, Lighting control , Lighting energy audit - Energy instruments- Wattmeter, Data loggers, Thermocouples, Pyrometers, Lux meters, Tongue testers ,Application of PLC's.

MODULE -V: Economic Aspects and Analysis

Economics analysis-Depreciation methods, Time value of money, Rate of return, Present worth method, Replacement analysis, Life cycle costing analysis- Energy efficient motors- Calculation of simple payback method, Net present worth method- Power factor correction, Lighting -Applications of life cycle costing analysis, Return on investment.

TEXT BOOKS

1. W.R. Murphy & G. Mckay, “Energy Management”, Butter worth, Heinemann Publications, Second Edition, 2009.
2. Paul o’ Callaghan, “Energy Management”, Tata Mc-Graw Hill Book Company- First Edition, 1998.
3. W.C.Turner, “Energy Management Hand Book”, CRC Press, First Edition, 2004.

REFERENCE BOOKS

1. John .C. Andreas, “Energy Efficient Electric Motors”, CRC Press, Third Edition, 1992.
2. Great Britain, “Energy Management and Good Lighting Practice: Fuel Efficiency- Booklet Volume 12-EEO, 1989.

E-Resources:

1. www.beeindia.gov.in

Course Outcomes:

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

1. **Tell** energy audit of industries.
2. **Predict** management of energy systems.
3. **Sequence** the methods of improving efficiency of electric motor.
4. **Analyze** the power factor and to design a good illumination system.
5. **Determine** pay back periods for energy saving equipment.

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	-	3	-	-	2	-	-
CO2		-	-	-	-	2	2	-	3	-	3	3	3	-
CO3	2	-	-	-	-	-	2	-	2	-	3		2	-
CO4	3	-	-	-	-	-	3	-		-	2	2	2	-
CO5	3	-	-	-	-	-	-	-	2	-	2	3	3	-
Average	2.2	-	-	-	-	1.2	2	-	2	-	2	2	2	-

<table>
<tr><td>AY 2020-21 onwards</td><td colspan="4">J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B.Tech
III Year – II Sem</td></tr>
<tr><td>Course Code: J32OE</td><td colspan="4" rowspan="2">FUNDAMENTALS OF OPERATIONS RESEARCH
(Open Elective-II)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Engineering Mathematics

Course Objectives:
This course will enable students to

1. Get the basic knowledge of Linear Programming and its applications to engineering problems and able to formulate a problem in LP model, and solve it using graphical method and Simplex method.
2. Be taught about the variants of the LP problem such as Transportation, Assignment, and Sequencing problems
3. Learn to find the optimal replacement time of capital cost equipment, and application of Group Replacement strategy
4. Learn the importance of maintaining optimal inventory in any industry, and be familiarized with the intricacies of waiting line models faced in real world situations
5. Understand the basics of Network analysis (CPM and PERT) and Project Cost Analysis; Learn Simulation and its applications.

Module 1
Unit 1: Introduction: Development – Definition – Scope, Characteristics and Phases – Types of 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 Models: 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 capital cost items that deteriorate with time – when money value is not counted and counted – Replacement of items that fail suddenly and 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.

Module 5

Unit 1: Network analysis (CPM and PERT): Basic Concepts of Network Analysis - Network diagram - Critical Path Method - Terminology in CPM 804 – Float – Limitations of CPM - PERT - Project Cost Analysis - Comparison between CPM and PERT.

Unit 2: Simulation: Definition – types of simulation models- applications, advantages and disadvantages - Brief introduction of simulation languages – simple problems on inventory and queuing using random numbers.

Text Books:

1. J. K. Sharma, "Operations Research", MacMillan Publishers India Ltd, 4th Edition 2009.
2. A.C.S. Kumar, "Operations Research (Quantitative Analysis for Business Decisions)", Yes Dee Publishers, 1st Edition, 2015.

Reference Books:

1. Maurice Saseini, ArhurYaspan, and Lawrence Friedman, "Operations Research: Methods and Problems", Literary Licensing Publisher, 2013
2. A. M. Natarajan, P. BalaSubramani and A. Tamilarasi "Operations Research" Pearson Education, 4th Edition, 2009.
3. Wagner H. M, "Principles of Operations Research", PHI Publications, 2nd Edition, 2006.
4. Hillier / Libermann "Introduction to Operations Research", MacMillan Publishers, 10th Edition, 2017.

E - Resources:

1. https://rb.gy/1ckbxh
2. https://rb.gy/gev0g5
3. https://nptel.ac.in/courses/112/106/112106134/
4. https://nptel.ac.in/courses/111/107/111107128/

Course Outcomes:

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

1. **Allocate** optimally the resources in any industry to maximize the overall effectiveness parameter, determine the number of each item to be produced
2. **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

3. **Schedule** and sequence production runs by proper allocation of machines and men to get maximum gain and Compute the economic order quantity. Find the optimal replacement period for capital cost items
4. **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
5. **Apply** the techniques of Network Analysis like CPM and Pert for Project Cost Analysis. Apply Simulation methods to inventory and queuing 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**	
	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	-	-	2	-	-	-	-	-	2		
CO2	3	3	3	-	-	2	-	-	-	-	-	2		
CO3	2	3	2	-	-	1	-	-	-	-	-	2		
CO4	3	3	2	-	-	2	-	-	-	-	-	2		
CO5	2	3	1	-	-	1	-	-	-	-	-	2		
Average	2.4	3	2	-	-	1.6	-	-	-	-	-	2		

<table>
<tr><td>AY 2020-21 onwards</td><td>J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B. Tech:
III Year – II Sem</td></tr>
<tr><td>Course Code: J32OG</td><td rowspan="2">SOFTWARE DEFINED RADIO
(Open Elective-II)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Prerequisite: Digital Signal Processing, TCP / IP

Course Objectives:

The objectives of this
Software course is

1. To provide fundamentals and state of the art concepts in software defined radio.
2. To Analyze the analog RF components as front end block in implementation of SDR.
3. To Visualize digital hardware architectures and development methods.
4. To Understand the radio recourse management in heterogeneous networks.
5. To Remember the object oriented representation of radio and network resources.

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Module -I:

Unit-1

Introduction: The Need for Radios, what is Software Radio, Characteristics and benefits of software radio-Design Principles of Software Radio, RF Implementation issues the Purpose of RF Front – End, Dynamic Range- The Principal Challenge of Receiver Design

Unit-2

RF Receiver Front- End Topologies- Enhanced Flexibility of the RF Chain with Software Radios-Importance of the Components to Overall Performance- Transmitter Architectures and Their Issues- Noise and Distortion in the RF Chain, ADC and DAC Distortion.

Module -II:

Unit-1

Profile and Radio Resource Management: Communication Profiles- Introduction, Communication Profiles, Terminal Profile, Service Profile, Network Profile, User Profile, Communication Profile Architecture, Profile Data Structure

Unit-2

XML Structure, Distribution of Profile Data, Access to Profile Data, Management of Communication Profiles, Communication Class marks, Dynamic Class marks for Reconfigurable Terminals, Compression and Coding, Meta Profile Data

Module -III:

Unit-1

Radio Resource Management in Heterogeneous Networks: Introduction, Definition of Radio Resource Management, Radio Resource Units over RRM Phases, RRM Challenges and Approaches, RRM Modelling and Investigation Approaches, Investigations of JRRM in Heterogeneous Networks

Unit-2

Measuring Gain in the Upper Bound Due to JRRM, Circuit Switched System, Packet-Switched System, Functions and Principles of JRRM, General Architecture of JRRM, Detailed RRM Functions in Sub-Networks and Overall Systems

Module -IV:

Unit-1

Reconfiguration of the Network Elements: Introduction, Reconfiguration of Base Stations and Mobile Terminals, Abstract Modelling of Reconfigurable Devices, the Role of Local Intelligence in Reconfiguration, Performance Issues, Classification and Rating of Reconfigurable Hardware, Processing Elements, Connection Elements, Global Interconnect Networks, Hierarchical Interconnect Networks

Unit-2

Installing a New Configuration, Applying Reconfiguration Strategies, Reconfiguration Based on Comparison, Resource Recycling, Flexible Workload Management at the Physical Layer, Optimized Reconfiguration, Optimization Parameters and Algorithms, Optimization Algorithms, Specific Reconfiguration Requirements, Reconfiguring Base Stations, Reconfiguring Mobile Terminals

Module -V:

Unit-1

Object – Oriented Representation of Radios and Network Resources: Networks- Object-oriented Programming- Object Brokers- Mobile Application Environments- Joint Tactical Radio System.

Unit-2

Case Studies in Software Radio Design: Introduction and Historical Perspective, SPEAKeasy- JTRS, Wireless Information Transfer System, SDR-3000 Digital Transceiver Subsystem, Spectrum Ware, CHARIOT.

TEXT BOOKS:

1. Software Defined Radio Architecture System and Functions- Markus Dillinger, Kambiz Madani, WILEY 2003
2. Software Defined Radio: Enabling Technologies- Walter Tuttle Bee, 2002, Wiley Publications.

REFERENCE BOOKS:

1. Software Radio: A Modern Approach to Radio Engineering - Jeffrey H. Reed, 2002, PEA Publication.
2. Software Defined Radio for 3G - Paul Burns, 2002, Artech House.
3. Software Defined Radio: Architectures, Systems and Functions - Markus Dillinger,Kambiz Madani, Nancy Alonistioti, 2003, Wiley.
4. Software Radio Architecture: Object Oriented Approaches to wireless System Engineering– Joseph Mitola, III, 2000, John Wiley & Sons.

Course Outcomes:

On completion of this course, the students:

1. **Understand** the design principles of software defined radio.
2. **Analyze** the analog RF components as front end block in implementation of SDR.

3. **Visualize** digital hardware architectures and development methods.
4. **Understand** the radio recourse management in heterogeneous networks.
5. **Remember** the object oriented representation of radio and network 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	1	-	-	-	-	-	-	-	-	-	2	-	1
CO2	3	2	1	1	-	-	-	-	-	2	2	2	-	2
CO3	2	1	-	-	-	-	-	-	-	-	-	2	-	1
CO4	2	2	2	-	-	2	-	-	-	-	2	3	-	2
CO5	2	1	-	-	-	-	-	-	-	-	-	2	-	1
Average	2	1.4	0.6	0.2	-	0.4	-	-	-	0.4	0.8	2.2	-	1.4

<table>
<tr><td>AY 2020-21 onwards</td><td>J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B.Tech:
III Year – II Sem</td></tr>
<tr><td>Course Code:
J32OH</td><td rowspan="2">BASICS OF IC TECHNOLOGY
(Open Elective-II)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Electronic devices and circuits Switching Theory & Logic Design, Pulse & Digital Circuits

Course Objectives:

The students will

1. To introduce the basic building blocks of linear integrated circuits.
2. To teach the linear and non – linear applications of operational amplifiers.
3. To introduce the theory and applications of analog multipliers and PLL.
4. To introduce the concepts of waveform generation and introduce some special function ICs.
5. To understand and implement the working of basic digital circuits

MODULE 1:

Unit 1: Introduction to Linear Integrated Circuits

Ideal and Practical Op-Amp, Op-Amp Characteristics, DC and AC Characteristics, Features of 741 Op-Amp, Modes of Operation - Inverting, Non-Inverting.

Unit 2: Non-Linear Applications of OP-AMP

Instrumentation Amplifier, AC Amplifier, Differentiators and Integrators, Comparators, Schmitt Trigger, Introduction to Voltage Regulators, Features of 723 Regulator.

MODULE 2:

Unit 1: Introduction to Filters

Introduction to Active Filters, Characteristics of Band pass, Band reject and All Pass Filters

Unit 2: wave form generators

Waveform Generators – Triangular, Saw tooth, Square Wave, IC555 Timer -Functional Diagram, Monostable, and Astable Operations.

MODULE 3:

Unit 1: Converters of DAC

Introduction, Basic DAC techniques, Different types of DACs-Weighted resistor DAC, R-2R ladder DAC, Inverted R-2R DAC

Unit 2: Converters of ADC

Different Types of ADCs – Parallel Comparator Type ADC, Counter Type ADC, Successive Approximation ADC and Dual Slope ADC, DAC and ADC Specifications.

MODULE 4:

Unit 1: Digital Integrated Circuits

Classification of Integrated Circuits, Comparison of Various Logic Families Combinational Logic ICs – Specifications.

Unit 2: Applications of Digital ICs

Code Converters, Decoders, Demultiplexers, LED & LCD Decoders with Drivers, Encoders, Priority Encoders, Multiplexers, Demultiplexers, Priority Generators/Checkers.

MODULE 5:

Unit 1: Combinational Circuits Using TTL 74XX ICS

Familiarity with commonly available 74XX &CMOS 40XX Series ICs – All Types of Flip-flops, Synchronous Counters, Decade Counters.

Unit 2: Memories

Memories - ROM Architecture, Types of ROMS & Applications, RAM Architecture, Static & Dynamic RAMs.

Textbooks:

1. Op-Amps & Linear ICs – Ramakanth A. Gayakwad, PHI, 2003.
2. Digital Fundamentals – Floyd and Jain, Pearson Education, 8th Edition, 2005

Reference Books:

1. Linear Integrated Circuits –D. Roy Chowdhury, New Age International (p) Ltd, 2ndEd., 2003.
2. Op Amps and Linear Integrated Circuits-Concepts and Applications James M. Fiore,Cengage Learning/ Jaico, 2009.
3. Operational Amplifiers with Linear Integrated Circuits by K. Lal Kishore – Pearson,2009.
4. Linear Integrated Circuits and Applications – Salivahanan, MC GRAW HILL EDUCATION.
5. Modern Digital Electronics – RP Jain – 4/e – MC GRAW HILL EDUCATION, 2010.

E - Resources:

1. http://fmcet.in/ECE/EC6404_uw.pdf
2. https://www.iare.ac.in/sites/default/files/lecture_notes/LDIC%20Lecture%20Notes.pdf.
3. http://smec.ac.in/sites/default/files/lecture_notes/Course%20File%20of%20LDIC(Linear%20 and%20Digital%20IC%20Applications).pdf
4. http://crectirupati.com/sites/default/files/lecture_notes/LDICA%20Lecture%20notes%20y% 20A.Mounika.pdf
5. http://www.springer.com/engineering/electronics/journal/10470.
6. https://www.journals.elsevier.com/microelectronics-journal
7. http://nptel.ac.in/courses/117107094/
8. https://www.youtube.com/watch?v=NVj_Eu3sJL4
9. http://freevideolectures.com/Course/2915/Linear-Integrated-Circuits
10. Analog Electronic Circuits: https://swayam.gov.in/nd1_noc19_ee38/preview
11. Op-amp practical Applications: Design, Simulation and Implementation: https://onlinecourses.nptel.ac.in/noc18_ee10/preview
12. Integrated Circuits, MOSFETS, Op-Amps and their Applications: https://archive.swayam.gov.in/courses/4441-integrated-circuits-mosfets-op-amps-andtheir-applications

Course Outcomes:

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

1. **understanding** of operational amplifiers with linear integrated circuits.
2. **Apply** the knowledge of the different families of digital integrated circuits and their characteristics.
3. **Analyse** the functioning of various design circuits using operational amplifiers for various applications.
4. **Design** various techniques to develop A/D and D/A convertors.
5. **Acquire** hands-on laboratory experience on IC based project kits in above areas according to specifications.

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	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

<table>
<tr><td>AY 2020-21 onwards</td><td>J. B. Institute of Engineering and Technology (UGC Autonomous)</td><td colspan="4">B.Tech
III Year – II Sem</td></tr>
<tr><td>Course Code: J32OI</td><td rowspan="2">FUNDAMENTALS OF COMPUTER NETWORKS
(Open Elective-II)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-Requisites:

1. Knowledge on “Digital Logic Design”.
2. Knowledge on “Computer Organization”.

Course objectives:

The Student will:

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

Module 1:

Overview of the Internet: Protocol, Layering Scenario, TCP/IP Protocol Suite: The 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, 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, Tunneling 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.

Text Books:

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

Reference Books:

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

E - Resources:

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

Course outcomes:

The Student will be able to

1. **Demonstrate** the networking concepts, various Layering approaches and their functionalities.
2. **Understand** the protocols of Data Link layer, how a medium can be shared among multiple devices and internetworking devices used.
3. **Work** on fragmentation, assigning of logical address and judge on routing, congestion.
4. **Demonstrate** the working of IP Protocol, other protocols of internet layer and services of transport layer.
5. **Explain** the transport layer and application layer protocols, their working

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	3	2	2	-	-	-	-	-	-	-	-	-	2	2
CO3	3	2	2	-	-	-	-	-	-	-	-	-	2	2
CO4	2	2	2	-	-	-	-	-	-	-	-	-	2	2
CO5	2	2	2	-	-	-	-	-	-	-	-	-	2	2
Average	**2.4**	**2.0**	**2.0**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2.0**	**2.0**

<table>
<tr><td>AY 2020-21 onwards</td><td>J. B. Institute of Engineering and Technology (UGC Autonomous)</td><td colspan="4">B.Tech
III Year – II Sem</td></tr>
<tr><td>Course Code: J32OJ</td><td rowspan="2">INTRODUCTION TO JAVA PROGRAMMING
(Open Elective-II)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-Requisites: Knowledge on Programming Language.

Course objectives:

The Student will:

1. Familiar with constructors and string handling functions
2. Explain inheritance and polymorphism
3. Familiar with packages and interfaces
4. Familiar with exception handling and multithreading
5. Familiar with applet programming and event handling.

Module 1:

Introduction: OOP concepts, history of Java, Java buzzwords, data types, variables, scope and life time 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

Text Books:

1. Java The complete reference, 8th editon, Herbert Schildt, TMH.
2. Under tanding OOP with Java, up dated 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. www.javasoft.com
2. www.w3schools.com
3. www.tutorialpoint.com
4. www.oracle.com

Course outcomes:

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

1. **Familiar** with constructors and string handling
2. **Understand** inheritance and polymorphism
3. **Understand** packages and interfaces
4. **Understand** exception handling and multithreading
5. **Understand** applet programming

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	-	3	-	-	2	-	-	3	-
CO2	-	-	2	-	-	3	-	3	-	-	3	-	-	3
CO3	3	-	-	3	-	2	-	-	3	-	-	3	-	-
CO4	3	-	-	-	3	-	-	3	3	3	-	-	3	-
CO5	-	3	-	-	-	-	2	-	-	-	3	-	-	3
Average	**3.0**	**3.0**	**2.0**	**3.0**	**3.0**	**2.5**	**2.5**	**3.0**	**3.0**	**2.5**	**3.0**	**3.0**	**3.0**	**3.0**

<table>
<tr><td>onwards</td><td>(UGC Autonomous)</td><td colspan="4">III Year – II Sem</td></tr>
<tr><td rowspan="2">Course Code: J32OK</td><td rowspan="3">COMPUTER ORGANIZATION
(Open Elective-II)</td><td rowspan="2">L</td><td rowspan="2">T</td><td rowspan="2">P</td><td rowspan="2">D</td></tr>
<tr></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: NIL

Course Objectives:
This course will enable students to:
1. To understand the basic operations of the computer system.
2. To know the functioning of CPU and the control unit.
3. To Analyse various algorithms for arithmetic operations in the computer.
4. To understand different hierarchical memory systems including cache memory and virtual memory.
5. Recognize different ways of communicating with input/output devices and standard I/O interfaces.

Module I
Unit 1 Basic structures of Computers
Computer Types, Functional unit, Basic operational concepts, Bus structures, software, Performance, multiprocessors and multi computers.
Unit 2 Data Representation
Fixed point representation, Floating point representation, Error detection codes.

Module II:
Unit 1 Register Transfer and Micro operations
Register transfer language, Register transfer, Bus and memory transfers, Arithmetic micro operations, logic micro operations, shift micro operations, Arithmetic logic shift unit.
Unit 2 Basic computer organization and Design
Instruction codes, computer registers, computer instructions, Timing and control, instruction cycle

Module III:
Unit 1 Computer Arithmetic
Introduction, Addition and Subtraction, Multiplication Algorithms, Division Algorithms, Floating-point arithmetic operations, Decimal arithmetic unit, Decimal arithmetic operations.

Module IV:
Unit 1 The Memory System
Basic concepts, Semiconductor RAM memories, Read-Only memories, speed, Size and Cost, Cache memories, performance considerations, Virtual memories, Secondary storage.
Module V:
Unit 1 Input/output Organization
Accessing I/O Devices Interrupts, Interrupt hardware, Enabling and disabling interrupts, Direct memory access, Buses, interface circuits, Standard I/O interfaces.

Text Books:

1. Computer Organization-Carl Hamacher, ZvonkoVranesic, SafwatZaky, Vth Edition, McGraw Hill.
2. Computer System Architecture-M.MorisMano,IIIrdEdition,Pearson/PHI

Reference Books:

1. Computer Organization and Architecture-William Stallings, SixthEdition, Pearson/PHI
2. Structures Computer Organization-Andrew S.Tanebaum,4th Edition PHI/Pearson.

E - Resources:

1. https://nptel.ac.in/courses/106/103/106103180/
2. https://nptel.ac.in/courses/117/105/117105078/
3. https://nptel.ac.in/courses/106/105/106105163/

Course Outcomes:

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

1. **Illustrate** basic operations of the computer system.
2. **Apply** knowledge of CPU and the control unit.
3. **Apply** various algorithms for arithmetic operations in the computer.
4. **classify** different memory systems.
5. **Produce** knowledge on input/output organization.

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	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	2	-	-	-	-	-	-	-	-	-	-	-	-
CO3	3	-	2	-	-	-	-	-	-	-	-	-	2	-
CO4	-	2	3	-	-	-	-	-	-	-	-	-	3	-
CO5	3	-	-	2	-	-	-	-	-	-	-	-	-	-
Average	3.0	2.0	2.5	2.0	-	-	-	-	-	-	-	-	2.5	-

<table>
<tr><td>Course Code: J32OL</td><td rowspan="2">FUNDAMENTALS OF
HUMAN COMPUTER INTERACTION
(Open Elective-II))</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: GUI(Windows) Working Knowledge

Course Objectives:
This course will enable students to:

1. Demonstrate an understanding of guidelines, principles, and theories influencing human computer interaction.
2. Design, implement and evaluate effective and usable graphical computer interfaces.
3. Describe and apply core theories, models and methodologies from the field of HCI.
4. Able to apply HCI principles, guidelines, methods, and techniques for human-centred information systems development.
5. Use the information sources available and be aware of the methodologies and technologies supporting advances in HCI.

Module I:
Unit 1:
Introduction: Importance of user Interface – definition, importance of good design. Benefits of good design. A brief history of Screen design.
Unit 2:
The graphical user interface – popularity of graphics, the concept of direct manipulation, graphical system, Characteristics, Web user – Interface popularity, characteristics- Principles of user interface.

Module II:
Unit 1:
Design process – Human interaction with computers, importance of human characteristics human consideration.
Unit 2:
Human interaction speeds, understanding business junctions

Module III:
Unit 1:
Screen Designing: Design goals – Screen planning and purpose, organizing screen elements, ordering of screen data and content – screen navigation and flow – Visually pleasing composition.

Unit 2:
amount of information – focus and emphasis, presentation of information simply and meaningfully – information retrieval on web – statistical graphics – Technological consideration in interface design.

Module IV:
Unit 1:

Windows – New and Navigation schemes selection of window, selection of devices based and screen based controls Components – text and messages, Icons and increases.

Unit 2:

Multimedia, colors, uses problems, choosing colors.

Module V:

Unit 1:

Software tools – Specification methods, interface – Building Tools. Interaction Devices – Keyboard and function keys – pointing devices.

Unit 2:

speech recognition digitization and generation – image and video displays – drivers.

Text Books:

1. The essential guide to user interface design, Wilbert O Galitz, Wiley DreamTech.
2. Designing the user interface. 3rd Edition Ben Shneidermann, Pearson Education Asia.

Reference Books:

1. Human – Computer Interaction. Alan Dix, Janet Fincay, Gre Goryd, Abowd, Russell Bealg, Pearson Education
2. Interaction Design Prece, Rogers, Sharps. Wiley Dreamtech.

E - Resources:

1. https://www.interaction-design.org/literature/book/the-encyclopedia-of-human-computer-interaction-2nd-ed/human-computer-interaction-brief-intro
2. https://www.interaction-design.org/literature/topics/human-computer-interaction
3. https://www.udacity.com/course/human-computer-interaction--ud400

Course Outcomes:

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

1. **Explain** the human computer components functions regarding interaction with computer.
2. **Describe** the key design principles for user interfaces.
3. **Apply** an interactive design process and universal design principles to designing HCI systems.
4. **Use** Paradigms, HCI in the software process.
5. **Implement** Interaction design basics.

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	1	2	2	-	1	-	-	-	-	-	1	-
CO2	1	1	2	2	2	-	1	-	-	-	-	-	2	-
CO3	1	3	3	3	3	-	2	-	-	-	-	-	2	-
CO4	-	2	2	2	1	-	1	-	-	-	-	-	-	-
CO5	1	2	1	1	1	-	1	-	-	-	-	-	2	-
Average	1	2	1.8	2	1.8	-	1.2	-	-	-	-	-	1.4	-

Course Code: J32OM	INTRODUCTION TO MICROPROCESSORS AND MICRO CONTROLLERS (Open Elective-II)	L	T	P/D
Credits: 3		3	0	0

Pre-requisite: Basic Knowledge in IC **'s**

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 1: 8086 Introduction: 8086 Architecture Functional diagrams, Register organization, memory segmentation, programming model, memory addresses, physical memory organization

Unit 2: 8086 Architecture: Architecture of 8086,signal descriptions of 8086-common function signals, Timing diagrams, interrupts of 8086.

Module 2:

Unit 1: Instruction set of 8086: Instruction formats, addressing modes, instruction set, assembler directives, macros.

Unit 2: Assembly language programming of 8086: Simple programs involving logical, branch and call instructions, sorting, evaluating arithmetic expressions, string manipulations.

Module 3:

Unit 1: I/O Interface: 8255 PPI, Various modes of operation and interfacing to 8086, interfacing keyboard, Display, D/A and A/D converter.

Unit 2: Interfacing with advanced devices: Memory Interfacing to 8086, Interrupt Structure of 8086, Vector Interrupt Table, Interrupt Service Routine.

Module 4:

Unit 1: Introduction to Microcontrollers: Overview of 8051 microcontrollers, architecture, I/O ports, memory organization.

Unit 2: Addressing Modes: Addressing modes and instruction set of 8051, simple programs.

Module 5:

Unit 1: 8051 Real Time control 1: Programming Time Interrupts, Programming External Hardware Interrupts.

Unit 2: 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,2 Edition 2006.
2. Kenneth.J.Ayala, The8051Microcontroler,3rdEd., C engage Learning.

Reference Books:

1. Advanced Microprocessors and Peripherals-A. K. Rayand K.M Bhurchandi, TMH, 2nd Edition 2006.
2. The 8051Microcontrollers.Architecture and programming and applications-K.Uma Rao, Andhe Pallavi,Pearson, 2009.
3. Microcomputer 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

Course Outcomes:

Students will be able to:

1. **Design** programs on 8085 microprocessors.
2. **Implement** programs on 8086 microprocessors.
3. **Design** interfacing circuits with 8086.
4. **Design** and implement 8051 microcontroller based systems
5. **Understand** the concepts related to I/O and memory interfacing

CO-PO/PSO Mapping Chart
(3/2/1 indicates strength of correlation)
3 – Strong; 2 – Medium; 1 - Weak

Course Outcomes (COs)	Program Outcomes (POs) PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	Program Specific Outcomes* PSO 1	PSO 2
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**

<table>
<tr><td>Course Code: J32ON</td><td rowspan="2">INTERNET OF THINGS
(Open Elective – II)</td><td>L</td><td>T</td><td>P/D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td></tr>
</table>

Pre-Requisites: Nill

Course Objectives:
Students will learn to

1. Understand the basic building blocks of IoT.
2. Analyze the difference between M2M and IoT along with IoT system Management
3. Extend the knowledge in Logical Design of IoT System using Python.
4. Acquire knowledge about IoT Physical Devices and End points.
5. Identify the IoT Physical Servers and cloud offerings.

Module 1:
Unit 1 Introduction to Internet of Things:
Definition and Characteristics of IoT, Physical Design of IoT –IoT Protocols, IoT communication models, IoT Communication APIs
Unit 2 IoT enabled Technologies:
Wireless Sensor Networks, Cloud Computing, Big data analytics, Communication protocols, Embedded Systems, IoT Levels and Templates, Domain Specific IoTs – Home, City, Environment, Energy, Retail, Logistics, Agriculture, Industry, health and Lifestyle.

Module 2:
Unit 1 IoT and M2M:
Software defined networks, network function virtualization, difference between SDN and NFV for IoT
Unit 2 Basics of IoT System:
Basics of IoT System Management with NETCOZF, YANG- NETCONF, YANG, SNMP NETOPEER.

Module 3:
Unit 1 Introduction to Python:
Language features of Python, Data types, data structures, Control of flow, functions, modules, packaging, file handling, data/time operations, classes, Exception handling.
Unit 2 Python packages:
JSON, XML, HTTPLib, URLLib, SMTPLib.

Module 4:
Unit 1 IoT Physical Devices and Endpoints:
Introduction to Raspberry PI-Interfaces (serial, SPI, I2C) Programming.
Unit 2 Python program with Raspberry PI-1:
Python program with Raspberry PI with focus of interfacing external gadgets, controlling output, reading input from pins.

Module 5:
Unit 1 Python program with Raspberry PI-2:

Python program with Raspberry PI with focus of interfacing external gadgets.
Unit 2: Controllingoutput, reading input from pins.

Text Books:

1. Internet of Things - A Hands-on Approach, ArshdeepBahga and Vijay Madisetti, Universities Press, 2015, ISBN: 9788173719547
2. Getting Started with Raspberry Pi, Matt Richardson & Shawn Wallace, O'Reilly (SPD), 2014, ISBN: 9789350239759

References:

1. Internet of Things by Jeeva Bose 1st edition, Khanna publishing.

Course Outcomes:

Students will be able to

1. **Understand** the basic building blocks of IoT.
2. **Analyze** the difference between M2M and IoT along with IoT system Management
3. **Extend** the knowledge in Logical Design of IoT System using Python.
4. **Acquire** knowledge about IoT Physical Devices and End points.
5. **Identify** the IoT Physical Servers and cloud offerings

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	-	-	-	-	-	-	-	-	-	-	1	2
CO2	3	3	2	-	-	-	-	-	-	-	-	-	1	2
CO3	3	3	3	-	-	-	-	-	-	-	-	-	2	2
CO4	3	3	3	-	-	-	-	-	-	-	-	-	2	2
CO5	3	3	3	-	-	-	-	-	-	-	-	-	2	2
Average	**3.0**	**3.0**	**2.8**	-	-	-	-	-	-	-	-	-	**1.6**	**2.0**

onwards	(UGC Autonomous)	III Year – II Sem			
Course Code: J32OP	**INTRODUCTION TO SURFACE MINING** (Open Elective-II)	**L**	**T**	**P**	**D**
Credits: 3		**3**	**0**	**0**	**0**

Pre-requisite: Nil

Course Objectives:
The students will

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
Unit - 1: Definition, Terminology, Applicability and limitations of surface mining, Classification, Advantages, and dis-advantages of surface mining.

Module 2
Unit - 1: 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
Unit - 1: Drilling & blasting**:** Drilling mechanism, drilling patters, Drill bits Explosives, Blasting accessories, Bulk explosives, problems in blasting.

Module 4
Unit -1: Basics of Mine lighting, Sources of dust in surface mining, dust control, and slope stabilization

Module 5
Unit - 1: Methods of excavation & transportation – shovel-dumper combination, draglines, surface miner, bucket wheel excavator. Impacts on environment due to surface mining

Textbooks:

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

E-Resources:

1. https://www.researchgate.net/publication/282572490_Basic_concept_of_mining_technology
2. http://www.eolss.net/sample-chapters/c05/e6-37-06-01.pdf

Course Outcomes:

The student will be able to:

1. **Understand** about surface mining terms and conditions of applicability
2. **Learn** about different machinery used in surface mining
3. **Learn** drilling and blasting in surface mining
4. **Understand** mine lighting, dust, and slopes in surface mining
5. **Understand** the transportation of ore and waste in surface mining.

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	2	-	-	-	-	-	-	-	-	-	-	-
CO2	3	2	2	-	-	-	-	-	-	-	-	-	-	-
CO3	3	2	1	-	-	-	-	-	-	-	-	-	-	-
CO4	2	2	1	-	-	-	-	-	-	-	-	-	-	-
CO5	3	1	2	-	-	-	-	-	-	-	-	-	-	-
Average	3	2	1.6	-	-	-	-	-	-	-	-	-	-	-

<table>
<tr><td>AY 2020-21 onwards</td><td>J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B.Tech
III Year – II Sem</td></tr>
<tr><td>Course Code:</td><td rowspan="2">Numerical Solution of Partial Differential Equations
(Common to CE, EEE,ME,ECE,CSE,IT, ECM& MIE)
(Open Elective-II)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Nil

Course Objectives:

This course will enable students to:

1. solve large number of algebraic linear equation by various methods
2. solve one Dimensional Parabolic Equations by numerical methods.
3. solve two Dimensional Parabolic Equations by numerical methods.
4. solve hyperbolic equations by numerical methods by using various methods.
5. solve elliptic equations by numerical methods by various methods

Module 1 : Linear Systems of Equations

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

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

Vector and matrix norms - Eigenvalues of a common tridiagonal matrix - Gerischgorin's theorems- Stability by matrix and Fourier-series methods - A.D.I. methods.

Module 4: Hyperbolic Equations

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

Solution of Laplace and Poisson equations in a rectangular region - Finite difference in Polar coordinate Formulas for derivatives near a curved boundary when using a square mesh - Discretisation error - Mixed Boundary value problems.

Text Books:

1. "Numerical Methods for Engineers", Chapra. S.C., and Canale.R.P., Tata McGraw Hill, 5 th Edition, New Delhi,2007.
2. "The Finite Difference Methods in Partial Differential Equations", Mitchel A.R. and Griffiths S.D.F., John Wiley and sons, New York,1980.

Reference Books:

1. "Numerical Solutions of Partial Differential Equations", Morton K.W., Mayers, D.F., Cambridge University Press, Cambridge,2002.
2. "Numerical Solution of P.D.E.",SmithG.D., Oxford University Press, New 2. York,1995.
3. "A first course in the Numerical Analysis of Differential Equations", Iserles A., Cambridge University press, New Delhi, 2010. xx t u u□

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_two-dimensional_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:

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

1. Know the knowledge of solving large number of algebraic linear equation.
2. Understand the knowledge of solving one dimensional parabolic equations by numerical methods
3. Recognize the knowledge of solving two dimensional parabolic equations by numerical methods.
4. Apply and understand the knowledge of solving hyperbolic equation by numerical methods.
5. Know the knowledge of solving elliptic equations by numerical methods.

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	1	3	-	-	-	-	-	-	-	2	-	-
CO2	3	3	2	3	-	-	-	-	-	-	-	3	-	-
CO3	3	3	2	3	-	-	-	-	-	-	-	3	-	-
CO4	3	3	1	3	-	-	-	-	-	-	-	2	-	-
CO5	3	3	2	3	-	-	-	-	-	-	-	3	-	-
Average	3	3	2	3	-	-	-	-	-	-	-	2	-	-

<table>
<tr><td>AY 2020-21 onwards</td><td colspan="4">J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B.Tech
III Year – II Sem</td></tr>
<tr><td>Course Code:</td><td rowspan="2" colspan="4">ADVANCED PHYSICS FOR ENGINEERS
(Common to CE, EEE, ME, ECE, CSE, IT, ECM& MIE)
(Open Elective-II)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Nil

Course Objectives:

This course will enable students to:

1. To distinguish between Newtonian Mechanics and special theory of relativity and develop the relationship of length contraction, time dilation and Einstein energy mass relation and to apply the concepts of special theory of relativity in various field of physics and engineering.
2. To understand the importance of hologram.
3. To introduce the fundamental concepts of film deposition.
4. To make the students acquainted with the concepts of photonic crystals.
5. To understand the fundamental concepts of Solar cell Physics.

Module 1: Special Theory of Relativity

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

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

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

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

Single, poly and amorphous silicon, GaAs, CdS, Cu_2S, 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. “Engineering Physics” ,R K Gaur and SL Gupta, Dhanpat Rai Publications, 8th revised Edition, 2006.
2. “Engineering Physics”,B K Pandey and S Chaturvedi, Cengage Learning India, Revised Edition, 2014.

Reference Books:

1. “Hand Book of Technologies for Films and coating”,R F Bun shah, Noyes publishers,1st Edition, 1996.
2. “Fundamentals of Photonics”,B E A Saleh and A C Tech, John Wiley and Sons, New York, 1st Edition, 1993.

E - Resources:

1. http://physics.mq.edu.au/~jcresser/Phys378/LectureNotes/SpecialRelativityNotes. 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/
7. http://nptel.ac.in/courses/117103066/11.

Course Outcomes:

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

1. **Explain** special theory of relativity and apply its concepts in various fields of physics and engineering.
2. **Analyze** the basic concepts of Holography and applications.
3. **Identify** different concepts of film deposition.
4. **Develop** basic knowledge on the photonic crystals.
5. **Apply** the basic concepts of solar cell physics.

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	1	-	-	-	-	-	-	-	-	-	-	-
CO2	3	2	1	-	-	-	-	-	-	-	-	-	1	-
CO3	3	1	1	-	1	1	-	-	-	-	-	-	1	-
CO4	2	1	1	-	-	-	-	-	-	-	-	-	1	-
CO5	3	2	1	-	3	2	2	-	-	-	-	-	2	-
Average	2.6	1.6	1	-	2	1.5	2	-	-	-	-	--	1.25	-

<table>
<tr><td>AY 2020-21 onwards</td><td>J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B.Tech
III Year – II Sem</td></tr>
<tr><td>Course Code:</td><td rowspan="2">Green Chemistry
(Common to CE, EEE, ME, ECE, CSE, IT, ECM& MIE)
(Open Elective-II)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Nil

Course Objectives:
This course will enable students to:
1. Acquire knowledge of issues in sustainability as they relate to business and industry internationally and nationally.
2. Examine and evaluate case studies of sustainable practices in business and industry.
3. Knowledge on Non-conventional energy sources.
4. Study the Green synthetic method.
5. Understand and analyse the interconnectivity of global concerns.

Module 1: Green Chemistry - An Overview:
Introduction: Definition, the twelve basic principles of green chemistry. Green synthetic methods.

Module 2: Materials for green chemistry and technology:
Catalysis, environmental friendly catalysts, Biocatalysis, biodegradable polymers, alternative solvents, ionic liquids.

Module 3: Nonconventional energy sources:
Thermo-chemical conversion; direct combustion, gasification, pyrolysis and liquefaction, Bioenergy, Bio photolysis: Hydrogen generation from algae biological pathways; Storage and transportation; Applications.
.

Module 4: Green Synthetic Methods & Catalysis:
The design and development of environmentally friendly chemical pathways, Microwave synthesis, electro-organic synthesis, Supercritical fluids (SCFs): examples and properties, Extraction with SCFS.

Module-5: Green Chemistry & Sustainable development:
Green chemistry in batteries, production and recycling, Fuel cell and electric vehicles, Solar energy and hydrogen production, biodiesel, bio-hydrogen, Anaerobic digestion, alcohol production from biomass; Chemical conversion process: hydrolysis and hydrogenation; Best practices in Green Chemistry for sustainable development with suitable examples.

Text Books:

1. "Green Chemistry an Introductory Text", Lancaster, M., Royal Society of Chemistry, Cambridge, UK 2002.

2. “Real World Cases in Green Chemistry”, Cann M.C.; Connelly, M.E. American Chemical Society: Washington DC. 2000.
3. **Reference Books:**

1. “Green Chemistry: Theory and Practice”, Anastas, P.; Warner, J. Oxford University Press: London, 1998.
2. “The 12 Principles of Green Engineering as a Foundation for Sustainability" in Sustainability Science and Engineering: Principles. Zimmerman, J.B.; Anastas, P.T. Ed. Martin Abraham, Elsevier Science. available 2005.
3. “Design through the Twelve Principles of Green Engineering," Anastas, P.; Zimmerman, J. Environmental Science and Technology, 37, 94A - 101A, 2003.
4. “Green Chemistry Challenging Perspectives” ,Tundro, P.; Anastas, P., Oxford Press, Oxford, 2000.
5. “Introduction to Green Chemistry”, Matlack, A.S., Marcel Dekker, Inc., New York, 2001.

E - Resources:

1. https://pubs.rsc.org/en/journals/journalissues/gc#!recentarticles&adv
2. https://www.sciencedirect.com/topics/chemistry/green-chemistry
3. https://www.intechopen.com/books/green-chemistry/introductory-chapter-principles-of-green-chemistry
4. https://www.sigmaaldrich.com/chemistry/greener-alternatives/green-chemistry.html
5. https://science.sciencemag.org/content/367/6476/397
6. **Course Outcomes:**

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

1. **Understand** of Green Chemistry & Green Eng. Principles.
2. **Know** the applications of green routes for synthesis of chemicals.
3. **Use** better awareness about global environmental concerns and green remedies to address these concerns.
4. **Appraise** about tenets of sustainable development and its integration with Green practices.
5. **Realise** about reflections of Green Chemistry on sustainable development initiatives.

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	-	-	-	-	-	-	-	2	-	-
CO2	1	2	-	-	-	-	-	-	-	-	-	1	1	-
CO3	1	1	-	-	-	-	-	-	-	-	-	2	1	-
CO4	2	2	-	-	-	-	-	-	-	-	-	1	1	-
CO5	2	-	1	-	-	-	-	-	-	-	-	2	2	-
Average	1.6	1.2	1	1	-	-	-	-	-	-	-	1.2	1.25	-

AY 2020-21 onwards	J. B. INSTITUTE OF ENGINEERING AND TECHNOLOGY (UGC Autonomous)	B.Tech III Year – II Sem			
Course Code:	**TECHNICAL WRITING SKILLS (COMMON TO ALL)**	**L**	**T**	**P**	**D**
Credits: 3		**3**	**0**	**0**	**0**

Pre-Requisites: Nil

Course Objectives:

The students will

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.

E-Resources:

1. https://clickhelp.com/clickhelp-technical-writing-blog/11-skills-of-a-good-technical-writer/

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*	
	PO 1	PO 2	P O3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO1 2	PS O1	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	-	-

<table>
<tr><td>AY 2020-21 onwards</td><td>J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B.Tech
III Year – II Sem</td></tr>
<tr><td>Course Code:</td><td rowspan="2">RESEARCH METHODOLOGY
(Open Elective - II)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-Requisites: Nil

Course Objectives: To Understand the

1. Concept / fundamentals of research and their types
2. Practical application of various research techniques
3. Importance of measurement techniques and sampling techniques
4. Importance of coding, editing, tabulation and analysis in doing research
5. Applying the concept of statistical analysis which includes various parametric test and non-parametric test and ANOVA technique and understand technique of report writing

Module 1:

Research— concepts – research methodology – approaches to business research – scientific methods – types of research – research design.

Module 2:

Formulation and planning of research - selection of research problem – literature review - setting of objectives - formulation of hypotheses – measurement of variables – research plan — conducting the research

Module 3:

Data collection– methods and techniques of primary data & secondary data – interviews – surveys – census and sample surveys – Editing, classification and codification of data – using computer packages.

Module 4:

Data Analysis – qualitative data analysis – descriptive quantitative data analysis – tests of measurement and quality – using computer packages

Module 5:

Writing and presenting the report—planning report writing —report format – footnotes and bibliography - references and citations presentation

Text Books:

1. Mathew David & Carole D. Sutton, Social Research: The Basics, Sage Publications, New Delhi
2. O.R. Krishnaswami, Methodology of Research in Social Sciences, Himalaya Publishing House, Mumbai.
3. Ajai S. Gaur and Sanjaya S. Gaur: Statistical methods for practice and Research, Sage Publishers.
4. Deepak Chawla & Neena Sondhi, Research Methodology, Vikas Publishers, 2011

Reference Books:

1. Naval Bajpai, Business Research Methods, Pearson, 2013
2. CR Kothari, Research Methods and Techniques, New Age International, New Delhi.

E-Resources:

1. https://nptel.ac.in/courses/121/106/121106007/

Course outcomes:

Students should be able to

1. **Gain** Knowledge of concept / fundamentals for different types of research
2. **Apply** relevant research techniques
3. **Basics** of Research Methodology and Research Design
4. **Apply** Data Collection methods and the tools for analysis and interpretation
5. **Know** the importance of presentation of data analysis and report writing including referencing style.

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

<table>
<tr><td>AY 2020-21 onwards</td><td>J. B. Institute of Engineering and Technology (UGC Autonomous)</td><td colspan="4">B.Tech IV Year – I Sem</td></tr>
<tr><td>Course Code: J41OA</td><td rowspan="2">WASTE MANAGEMENT
(Open Elective-III)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits:3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Nil

Course Objectives:
This course will enable students to:
1. Study about handling of solid waste from cradle to grave.
2. Explain the design and construction of the solid waste treatment system.
3. Study the residue disposed of in an environmentally sound way.
4. Study the design and maintenance of different techniques
5. Discuss about waste minimization.

Module 1:
Unit-1 Introduction
Definition of solid waste, garbage, rubbish-Sources and Types of solid wastes Municipal waste, industrial waste, plastic waste, electronic waste, bio-medical waste and hazardous waste - Characteristics of Solid Wastes: Physical, chemical and biological characteristics- Problems due to improper disposal of solid waste.

Module 2:
Unit 1: Functional Elements of Solid Waste Management
Waste generation and handling at source-onsite storage-Collection of solid wastes Collection methods and services-storage of solid waste- guidelines for collection route layout.

Module 3:
Unit 1: Transfer and Transport of Wastes
Transfer station-types of vehicles used for transportation of solid waste-Processing and segregation of the solid waste- various methods of material segregation. Processing and Transformation of Solid Wastes. Recycling and recovery principles of waste
Unit 2: Management- Composting: definition methods of composting-advantages of composting-Incineration: Definition, methods of Incineration, advantages and disadvantages of incineration.

Module 4:
Unit 1: Treatment and Disposal of Solid Waste
Volume reduction, Open dumping, land filling techniques, Landfills: Classification, Design and Operation of landfills, Land Farming, Deep well injection.

Module 5:
Unit 1: **Waste Minimization**
Introduction to waste minimization, waste minimization techniques-5R (refuse, reduce, reuse, recover, recycle), municipal waste minimization.

Text Books

1. "Integrated Solid Waste Management" by Tchobanognous, Theissen& Vigil
2. McGraw Hill Publication, 3rd Edition, 2014.
3. "Solid and hazardous waste management" by M.N.Rao and Razia sultana, BS publications.
4. Environmental Engineering by Howard S.Peavy, Donald R.Rowe and George Tchobanognous

Reference Books

1. Environmental engineering by Y.Anjaneyulu, B.Spublication.
2. Environmental Pollution Control Engineering by C.S. Rao; Wiley Eastern Ltd.,New Delhi.
3. Environmental engineering by Gerad Kiley, Tata Mc GrawHill

E-Resources

1. https://nptel.ac.in/courses/105/105/105105160/
2. https://nptel.ac.in/courses/105/106/105106056/
3. https://nptel.ac.in/courses/105/103/105103205/

Course Outcomes

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

1. **Recall** the components of solid waste management and the laws governing it
2. **Discuss** design, operation and maintenance of landfills, incinerators and composting units.
3. **Explain** the waste minimization.
4. **Discuss** the Reuse of materials as practicable.
5. **Discuss** about Recycle of waste that cannot be used and recovery of resources.

CO-PO/PSO Mapping Chart (Draft) (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	1
CO2	-	3	3	-	-	-	2	1	-	-	-	-	2	1
CO3	-	-	-	-	-	2	3	2	-	-	-	-	1	1
CO4	-	-	-	-	-	2	3	2	-	-	-	-	2	2
CO5	-	1	-	-	-	3	2	1	-	-	-	-	2	2
Average	-	0.6	0.6	-	-	1.8	1.2	1.8	-	-	-	-	1.8	1.4

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech IV Year – I Sem			
Course Code: J41OB	**ROAD SAFETY ENGINEERING** (Open Elective-III)	**L**	**T**	**P**	**D**
Credits:3		**3**	**0**	**0**	**0**

Pre-requisite: Nil

Course Objectives:
This course will enable students to:
1. Study the Fundamentals of Traffic Engineering
2. Explain the Accident Situations
3. Discuss Statistical measures of accident data
4. Explain different parameters responsible for providing road safety
5. Study about Accident prevention.

Module 1:
Unit-1: Fundamentals of Traffic Engineering
Road User Characteristics, Vehicular Characteristics, Applications of Traffic Control Devices, Traffic signs, Road Marking,

Module 2:
Unit-1: Introduction to Road Safety:
Accident Situation in India, International Comparison of Accident Data, Standard Definitions by IRC, Collection of Accident Data, Collision and Condition Diagrams,

Module 3:
Unit-1: Statistical Methods and Analysis of Accident Data:
Methods in Analysis of accident Data, Regression Method, Poisson Distribution, Chi- Squared Distribution, Statistical Comparisons, Black Spot Identification & Investigations,

Module 4:
Unit-1: Road & its Effect on Accidents:
Factors Causing Accidents, Skidding, Factors Determining Skid Resistance, Pedestrian Safety, Measures to Increase Pedestrian Safety, Safety Improvement Strategies, Case Studies

Module 5:
Unit-1: Mitigation Measures:
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
2. Road Safety by NCHRP.

E-Resources:

1. https://nptel.ac.in/courses/105/101/105101087/

Course Outcomes:

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

1. **Explain** the Traffic characteristics
2. **Analyze** Collision and Condition Diagrams.
3. **Analyze** Statistical Methods for accident data
4. **Describe** Road & its Effect on Accidents
5. **Explain** Accident preventions.

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

<table>
<tr><td>AY 2020-21 onwards</td><td>J. B. Institute of Engineering and Technology (UGC Autonomous)</td><td colspan="4">B.Tech
IV Year – I Sem</td></tr>
<tr><td>Course Code: J41OC</td><td rowspan="2">ELECTRICAL ENGINEERING MATERIALS
(Open Elective-III)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Basic Electrical and Electronics Engineering

Course Objectives:
The students will

1. To understand the importance of various materials used in electrical engineering.
2. To obtain a qualitative analysis of their behaviour and applications.
3. To understand Conducting and resistor materials, and their engineering application.
4. To understand Semiconducting materials, their properties and applications.
5. To understand Magnetic materials, Soft and hard magnetic materials and applications; Superconductors

MODULE - I
Unit-I: Dielectric Materials: Dielectric as Electric Field Medium, leakage currents, dielectric loss, dielectric strength, breakdown voltage, breakdown in solid dielectrics, flashover, liquid dielectrics, electric conductivity in solid, liquid and gaseous dielectrics.
Unit-II: Ferromagnetic materials, properties of ferromagnetic materials in static fields, spontaneous, polarization, curie point, anti-ferromagnetic materials, piezoelectric materials, pyro electric materials.

MODULE – II
Magnetic Materials: Classification of magnetic materials, spontaneous magnetization in ferromagnetic materials, magnetic Anisotropy, Magnetostriction, diamagnetism, magnetically soft and hard materials, special purpose materials, feebly magnetic materials, Ferrites, cast and cermet permanent magnets, ageing of magnets. Factors effecting permeability and hysteresis.

MODULE – III
Semiconductor Materials: Properties of semiconductors, Silicon wafers, integration techniques, Large and very large scale integration techniques (VLSI).

MODULE – IV
Unit-I:Materials for Electrical Applications: Materials used for Resistors, rheostats, heaters, transmission line structures, stranded conductors, bimetals fuses, soft and hard solders, electric contact materials, electric carbon materials, thermocouple materials.
Unit-I: Solid, Liquid and Gaseous insulating materials, Effect of moisture on insulation.

MODULE – V
Unit-I: Special Purpose Materials: Refractory Materials, Structural Materials, Radioactive Materials, Galvanization and Impregnation of materials, Processing of electronic materials.
Unit-II: Insulating varnishes and coolants, Properties and applications of mineral oils, Testing of Transformer oil as per ISI.

TEXT BOOKS:

1. “R K Rajput”, “A course in Electrical Engineering Materials”, Laxmi Publications, 2009.
2. “T K Basak”, “A course in Electrical Engineering Materials”, New Age Science Publications 2009.

REFERENCE BOOKS:

1. TTTI Madras, “Electrical Engineering Materials”, McGraw Hill Education, 2004.
2. “AdrianusJ.Dekker”, Electrical Engineering Materials, PHI Publication, 2006.
3. S. P. Seth, P. V. Gupta “A course in Electrical Engineering Materials”, Dhanpat Rai & Sons, 2011.

E - Resources:

1. https://nptel.ac.in/courses/112/108/112108150/

Course Outcomes:

After completion of this course, the student will be able to

1. **Understand** various types of dielectric materials, their properties in various conditions.
2. **Evaluate** magnetic materials and their behaviour.
3. **Evaluate** semiconductor materials and technologies.
4. **Acquire** Knowledge on Materials used in electrical engineering and applications
5. **Acquire** Knowledge on Smart materials: Sensors and actuators, piezoelectric, magnetostrictive and electrostrictive materials.

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

<table>
<tr><td>AY 2020-21 onwards</td><td>J. B. Institute of Engineering and Technology (UGC Autonomous)</td><td colspan="4">B.Tech IV Year – I Sem</td></tr>
<tr><td>Course Code: J41OD</td><td rowspan="2">NON CONVENTIONAL ENERGY SOURCES
(Open Elective-III)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Nil

Course Objectives:

The students will

1. elucidate the fundamentals of various sources of Non-Conventional Energy such as Wind, Solar, Biomass, Geo thermal and other renewable energy sources.
2. impart a thorough knowledge about the application of different types of Non-Conventional Energy systems.
3. inculcate the students on feasibility and limitations of various Non-Conventional Energy Systems.
4. Analyze the principle and operation of direct energy conversion.
5. Apply the renewable energy sources to real world electrical and electronics problems.

MODULE –I: WIND ENERGY

Unit-I: 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.

Unit-II: Basic principles of wind energy conversion –site selection consideration – types of wind mills – basic components of wind energy conversion systems (WECS) – types of WECS – applications of wind energy – safety system – environmental aspects.

MODULE –II: SOLAR ENERGY

Solar radiation - Physical principles of conversion of solar radiation into heat –Solar constant – Solar energy collectors - flat plate collector – collector efficiency –concentrating collector: focusing type – advantages of focusing collectors –cylindrical parabolic concentrating collector – selective absorber coatings – central receiver tower solar power plant – solar energy storage systems –types – solar driers – solar water heaters - principle of solar photo voltaic cell – solar photo voltaic power generation – MPPT (Maximum Power Point Tracking) – solar pump – solar
hydrogen energy.

MODULE –III: ENERGY FROM BIO-MASS

Bio mass conversion technologies - Bio gas generation principle – types of bio- gas plants – applications of bio-gas plants – bio-mass as a source of energy – energy plantation – thermal gasification of bio mass – energy from agricultural waste – agro thermal power plant – Bio gas-based cogeneration programme – integrated waste management – advantages and disadvantages.

MODULE –IV: GEO-THERMAL AND OCEAN ENERGY

Unit-I: Nature of geo-thermal energy – geo-thermal sources – prime movers for geo- thermal energy conversion – advantages and disadvantages of geo-thermal energy –application of geo-thermal energy.

Unit-II: Principle of ocean thermal energy conversion (OTEC) – open cycle OTEC system – closed cycle – hybrid cycle – prospects of OTEC in India -applications – basic principle and components of tidal power plant – single basin and double basin tidal power plants -site requirements – storage – advantages and limitations of tidal power generation – ocean wave energy conversion devices.

MODULE –V: OTHER ENERGY SOURCES

Unit-I: Basic principle and components of a fuel cell – types of fuel cell –conversion efficiency of fuel cell - advantages and disadvantages of fuel cell – conversion energy and application of fuel cell – basic battery theory – batteries applied for bulk energy storage. **Unit-II:** Hydrogen fuel – hydrogen production – methods - storage – transportation and utilization – hydrogen as alternative fuel for motor vehicle – safety management.

TEXT BOOKS:

1. Rai, G.D., 'Non-Conventional Energy Sources', Khanna Publishers, New Delhi, 4th Edition, 2004.
2. Gupta, B.R., 'Generation of Electrical Energy', S.Chand & Co. Ltd, New Delhi, 5th Edition, 2014.

REFERENCE BOOKS:

1. Agarwal, M.P., 'Future Sources of Electrical Power', S.Chand & Co. Ltd, New Delhi, 1999.
2. Hassan and D.K. Sharma 'Non-Conventional Energy Resources, S.K. Kataria and Sons Ltd, 2009
3. S.P. Sukhatme, 'Solar Energy: Principles of Thermal Collection and Storage,' Tata McGraw Hill, 2015.
4. B.K. Bansal 'Non-Conventional Energy Resources' Vikas Publishing Ltd, 2014.

E - Resources:

1. https://nptel.ac.in/courses/121/106/121106014/
2. http://ethesis.nitrkl.ac.in/218/1/Thesis.pdf

Course Outcomes:

The student will be able to

1. **Understand** the need of utilization of alternate energyresources&fundamentals of various non-conventional energy Systems.
2. **Analyse** the knowledge of Biomass and Geothermal energy sources
3. **Describe** the collection of solar energy, storage of solar energy and itsapplications.
4. **Illustrate** the potential of Wind and bio mass as a renewablesource.
5. **Understand** the potential of geothermal energy and ocean energy as a renewable source.

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

<table>
<tr><td>AY 2020-21
onwards</td><td>J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B.Tech:
IV Year – I Sem</td></tr>
<tr><td>Course Code:
J41OE</td><td rowspan="2">BASICS OF ROBOTICS
(Open Elective-III)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Engineering Mathematics

Course Objectives:
This course will enable students to:

1. Understand the theoretical aspects of Robotics
2. Acquire practical experience in the field of Robotics through design projects and case studies.
3. Understand the importance of robots in various fields of engineering.
4. Understand trajectory planning and types of motion
5. Expose to various robots and their operational details.

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-Sensors-Internal sensors: Position sensors & Velocity sensors, External sensors: Proximity sensors, Tactile Sensors, & Force or Torque sensors.

Module 2:
Unit 1: Grippers - Mechanical Gripper-Grasping force – Engelberger-g-factors-mechanisms for actuation, Magnetic gripper, vacuum cup gripper-considerations in gripper selection &design. Industrial robots specifications. Selection based on the Application.

Module 3:
Unit 1: Kinematics-Manipulators Kinematics, Rotation Matrix, Homogenous Transformation Matrix, D-H transformation matrix, 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, bleding scheme. Introduction Cartesian space scheme. Control-Interaction control, Rigid Body mechanics, Control architecture- position, path velocity, and force control systems, computed torque control, adaptive control, and Servo system for robot control.
Module 5:
Unit 1: Programming of Robots and Vision System-Lead through programming methods- Teach pendent-overview of various textual programming languages like VAL etc.
Unit 2: Introduction to Mobile Robots: A brief history of mobile robotics, applications and market. Recent advances in the mobile robotics for RISE (Risky Intervention and Surveillance Environment) applications.

Text Books:
1. Industrial Robotics / Groover M P /Mc Graw Hill
2. Introduction to Robotics / John J. Craig/ Pearson

Reference Books:
1. Theory of Applied Robotics /Jazar/Springer.H. Asada and J. J. E. Slotine, “Robot Analysis and Intelligence”, Wiley Inter-Science. 1986
2. Robotics / Ghosal / Oxford

E - Resources:
1. https://rb.gy/dw0rkv
2. https://rb.gy/iayh9d
3. https://nptel.ac.in/courses/112/105/112105249/
4. https://nptel.ac.in/courses/112/101/112101098/

Course Outcomes:

On completion of the course, the students will be able to:
1. **Apply** the basic components of robots.
2. **Differentiate** types of robots and robot grippers.
3. **Model** forward and inverse kinematics of robot manipulators.
4. **Analyze** forces in links and joints of a robot.
5. **Programme** a robot to perform tasks in differential applications.

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	1	2	2	2	-	-	-	-	-	-	2		
CO2	3	3	2	2	2	-	-	-	-	-	-	1		
CO3	3	2	2	2	2	-	-	-	-	-	-	1		
CO4	3	2	2	1	1	-	-	-	-	-	-	2		
CO5	1	2	1	2	2	-	-	-	-	-	-	2		
Average	2.6	2	1.8	1.8	1.8	-	-	-	-	-	-	1.6		

<table>
<tr><td>AY 2020-21 onwards</td><td>J. B. Institute of Engineering and Technology (UGC Autonomous)</td><td colspan="4">B.Tech
IV Year – I Sem</td></tr>
<tr><td>Course Code: J41OG</td><td rowspan="2">DIGITAL SYSTEMS USING VHDL
(Open Elective-III)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>1</td><td>0</td><td>0</td></tr>
</table>

Prerequisites: Nil

Course Objectives:
The students will

1. Learn how a Hardware Description Language (HDL) is used to describe and implement hardware.
2. Learn how to simulate and test that hardware and optimise their designs.
3. Learn in-depth study of combinatorial and sequential hardware systems and the use of finite state machines in the design of sequential systems.
4. To understand concept of Programmable Devices, PLA, PAL, CPLD and FPGA and implement digital system using VHDL.
5. To implement combinational and sequential circuits using VHDL.

Module 1
Unit I
Review of Logic Design Fundamentals: Combinational Logic, Boolean Algebra and Algebraic Simplification, Karnaugh maps, Designing with NAND and NOR Gates, Hazards in Combinational Networks, Flip-flops and latches, Mealy Sequential Network, Equivalent States and reduction of State Tables, Sequential Network Timing, Setup and Hold Times, Synchronous Design, Tristate Logic and Buses.

Module 2
Unit I
Introduction to VHDL: VHDL Description of Combinational Networks, Modeling Flip-flops using VHDL Process, VHDL Models for a Multiplexer, Compilation and Simulation of VHDL Code, Modeling a Sequential Machine, Variables, Signals and Constants, Arrays, operators, Functions, Procedures, Packages and Libraries, VHDL Model for a 74163 Counter.

Module 3
Unit I
Designing with Programmable Logic Devices: Read-Only Memories, Programmable Logic Arrays (PLAs), Programmable Array Logic (PALs) , Other Sequential Programmable Logic devices(PLDs),Design of a Keypad Scanner.

Unit II
Design of Networks for Arithmetic Operations: Design of a Serial Adder with Accumulator, State Graphs for Control Networks, Design of a Binary Multiplier, Multiplication of Signed Binary Numbers, Design of a Binary Divider.

Module 4

Unit I

Digital Design with SM Charts: State Machine Charts, Derivation of SM Charts, Realization of SM Charts, Implementation of the Dice Game, Alternative Realizations for SM Charts using Microprogramming, Linked State Machine.

Unit II

Designing with Programmable gate Arrays and Complex Programmable Logic Devices: Xilinx 3000 Series FPGAs, Designing with FPGAs, Xilinx 4000 Series FPGAs, Using a One-Hot State Assignment, Altera Complex Programmable Logic Devices(CPLDs),Altera FLEX 10K Series CPLDs

Module 5

Unit I

Floating-Point Arithmetic: Representation of Floating-Point Numbers, Floating-point Multiplication, Other Floating-Point Operations.

Unit II

Hardware Testing and Design for Testability: Testing Combinational Logic, Testing Sequential Logic, Scan Testing, Boundary Scan, Build-In Self-Test**.**

Text Books:

1. Charles H,Roth ,"Digital system design using VHDL" , 2nd Edition, PWS publishing co.
2. ZainalabedinNavabi, "VHDL analysis and modeling of digital systems",2nd Edition, MGH, 2004.

References Books:

1. Stphen Brown, "Fundamental of Digital logic with VHDL Design", Tata McGraw Hill, 2008.
2. J.Bhaskar ,"A VHDL primer",3rd edition 2004, Prentice Hall of India Limited.
3. Michael D.Ciletti, "Advanced Digital design with Verilog HDL", 2nd Edition, PHI Ltd, 2005.

E - Resources:

1. https://nptel.ac.in/courses/111/102/111102111/

Course Outcomes:

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

1. **develop** a digital logic and apply it to solve real life problems.
2. **practice** combinational and sequential digital circuits using different styles of modeling of VHDL.
3. **analyze**, design and implement sequential logic circuits.
4. **employ** digital system design using PLD.
5. **simulate and implement** combinational and sequential circuits using VHDL systems.

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	1	-	-	-	-	-	-	-	-	-	1	1	-
CO2	2	2	2	-	-	-	-	-	-	-	-	-	2	-
CO3	2	1	-	-	-	-	-	-	-	-	-	-	1	-
CO4	2	2	-	-	-	-	-	-	-	-	-	-	1	-
CO5	2	2	-	-	-	-	-	-	-	-	-	-	1	-
Average	2.2	2	2	-	-	-	-	-	-	-	-	1	1.2	-

<table>
<tr><td>AY 2020-21 onwards</td><td colspan="1">J. B. Institute of Engineering and Technology (UGC Autonomous)</td><td colspan="4">B.Tech IV Year – I Sem</td></tr>
<tr><td>Course Code: J41OH</td><td rowspan="2">MATLAB PROGRAMING LANGUAGE
(Open Elective-III)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Prerequisites: Nil

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
Unit-I: Introduction to MATLAB
Historical Background, Applications, Scope of MATLAB, Importance of MATLAB for Engineers, Features, MATLAB Windows (Editor, Work Space, Command History, Command Window).
Unit-2
Operations with Variables, Naming and Checking Existence, Clearing Operations, Commands, Data types, Operators.

Module-2
Unit-I: **Data Flow in MATLAB**
Vectors, Matrix Operations & Operators, Reshaping Matrices, Arrays, Colon Notations, Numbers, Strings, Functions, File Input-Output, Importing and Exporting of data.

Module-3
Unit-I: MATLAB Programming
Conditional Statements, Loops, Writing Script Files, Error Correction, Saving Files, Worked out Examples.

Module-4
Unit-I: **MATLAB Advanced**
Plotting, Graphics, Creating Plot & Editing Plot, GUI (Graphical User Interface).
Matlab- Algebra, Calculus, Differential, Integration, Polynomials, solving a system of linear equations.

Module-5

Unit-1: SIMULINK

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.

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:

By the end of this course, the student will be able to

1. **translate** mathematical methods to MATLAB code.
2. **generalize** results and represent data visually.
3. **apply** computer methods for solving a wide range of engineering problems.
4. **utilize** computer skills to enhance learning and performance in other engineering and science courses.
5. **acquire** knowledge of Advanced Matlab programming methods and Simulink.

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	1	-	-	-	-	-	-	-	-	-	1	1	-
CO2	2	2	-	2	-	-	-	-	-	-	-	-	2	-
CO3	2	1	-	-	-	-	-	-	-	-	-	-	1	-
CO4	2	2	-	-	-	-	-	-	-	-	-	-	1	-
CO5	2	2	-	-	-	-	-	-	-	-	-	-	1	-
Average	2.2	2	-	2	-	-	-	-	-	-	-	1	1.2	-

<table>
<tr><td>AY 2020-21
onwards</td><td colspan="1">J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B.Tech
IV Year – I Sem</td></tr>
<tr><td>Course
Code: J41OI</td><td rowspan="2">INTRODUCTION TO PYTHON PROGRAMMING
(Open Elective-III)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-Requisites:

1. Need basic knowledge about computer.
2. Need Basic understanding of Programming language.

Course objectives:

The Student will:

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

Module:1

Programming paradigms; Structured programming vs object-oriented programming, OOPs fundamentals-class, object, abstraction, encapsulation, polymorphism, and inheritance; Introduction to Python Getting started to Python- an interpreted high-level language, interactive mode and script mode. Variables, Expressions and Statements Values and types, Variables and keywords, statements, evaluating expressions, operators and operands, order of operations, composition. Functions function calls, type conversion, type coercion, pre-defined functions, composition, user define functions, flow of execution, passing parameters, function parameters and scope. Conditionals and recursion modulus operator, Boolean expression, logical operators, conditional execution, alternative execution, chained and nested conditionals, return statement; Recursion, infinite recursion.

Module 2:

Python data structures Strings Creating, initializing, and accessing the elements; String operators, comparing strings using relational operators; String functions and methods.

Lists: Concept of mutable lists, creating, initializing, and accessing the elements, traversing, appending, updating, and deleting elements; List operations; List functions and Methods, list parameters, nested lists, Matrices.

Dictionaries

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

Tuples

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

Module 3:
Object oriented programming using Python: creating python classes, classes and objects: user defined compound types, objects are mutable, copying; Access modifiers, classes and functions: pure function, modifiers, Classes and methods: object oriented features, optional arguments, initialization method, operator overloading and polymorphism.

Module 4:
Inheritance: Basic Inheritance: extending built-ins, overriding and super; Multiple inheritance: the diamond problem.

Module 5:
Files handling and Exceptions: Text files, writing variables, Directories, Pickling.
Exceptions: raising exceptions, handling exceptions, exception hierarchy.

Text Books:

1. Python Object Oriented Programming, Dusty Phillips, Packet Publishing, 2010.
2. Programming in Python 3 - A complete Introduction to the Python Language- Second Edition, Mark Summerfields, Addison-Wesley 2010.

Reference Books:

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

E - Resources:

1. https://www.youtube.com/watch?v=MLP1v80yU14
2. https://pythonprogramming.net/functions-python-3-basics-tutorial/
3. https://www.youtube.com/watch?v=QGLNQwfTO2w
4. https://www.youtube.com/watch?v=ZDa-Z5JzLYM
5. https://www.youtube.com/watch?v=M-t4ILRHnxE

Course Outcomes:
The students will be able to

1. Describe to design and program Python applications.
2. Analyse and conversion of to use lists, tuples, and dictionaries in Python programs.
3. Explain the concept to identify Python object types, Components, decision statements, pass arguments in Python.
4. Apply decision for building and package Python modules for reusability, design object-oriented programs with Python classes, use class inheritance in Python for reusability.
5. Apply file handling and Exception handling Concepts in real world using python.

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	2	1	-	-	-	-	-	-	-	-	-	2
CO2	3	2	-	3	-	-	-	-	-	-	-	-	2	2
CO3	3	2	2	3	-	-	-	-	-	-	-	-	1	2
CO4	3	2	1	2	-	-	-	-	-	-	-	-	-	3
CO5	3	2	2	2	-	-	-	-	-	-	-	-	-	3
Average	**3.0**	**2.0**	**1.8**	**2.2**	-	-	-	-	-	-	-	-	**1.5**	**2.4**

<table>
<tr><td>AY 2020-21 onwards</td><td>J. B. Institute of Engineering and Technology (UGC Autonomous)</td><td colspan="4">B.Tech
IV Year – I Sem</td></tr>
<tr><td>Course Code: J41OJ</td><td rowspan="2">INTRODUCTION TO MOBILE APPLICATION DEVELOPMENT
(Open Elective-III)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-Requisites: Basic Knowledge on Data base

Course objectives:
The Student will:
1. Evaluate a User Interface for a mobile application using J2ME.
2. Create a small but realistic working mobile application for small computing devices.
3. Categories the challenges posed by developing mobile applications and be able to propose and evaluate and select appropriate solutions.
4. Differentiate between high and low level display screens.
5. Familiar with record management systems.

Module 1:
J2ME Overview: Java 2 Micro Edition and the World of Java, Inside J2ME, J2ME and Wireless Devices Small Computing Technology: Wireless Technology, Radio Data Networks, Microwave Technology, Mobile Radio Networks, Messaging, Personal Digital Assistants

Module 2:
J2ME Architecture and Development Environment: J2ME Architecture, Small Computing Device Requirements, Run-Time Environment, MiDlet Programming, Java Language for J2ME, J2ME Software Development Kits, Hello World J2ME Style, Multiple MlDlets in a MIDlet Suite,J2MEWirelessToolkit J2ME Best Practices and Patterns: The Reality of Working in a J2ME World, Best Practices

Module 3:
Commands, Items, and Event Processing: J2ME User Interfaces, Display Class, The Palm OS Emulator, Command Class, Item Class, Exception Handling.

Module 4:
High-Level Display Screens: Screen Class, Alert Class, Form Class, Item Class, List Class, Text Box Class, Ticker Class. Low-Level Display Canvas: The Canvas, User Interactions, Graphics, Clipping Regions, Animation.

Module 5:
Record Management System- Record Storage, Writing and Reading Records, Record Enumeration, Sorting Records, Searching Records, Record Listener.

Text Books:
1. J2ME: The Complete Reference, James Keogh, Tata McGrawHjll.
2. Programming for Mobile and Remote Computers, G.T.Thampi, drearntec press.

Reference Books:
1. Enterprise J2ME: Developing Mobile Java Applications — Michael Juntao Yuan, Pearson Education, 2004
2. Beginning Java ME Plafform, Ray Rischpater, Apress, 2009

3. Beginning J2ME: From Novice to Professional, Third Edition, Sing Li, Jonathan B. Knudsen, Apress, 2005
4. Kicking Butt with MIDP and MSA:C,eating Great Mobile Applications, I edition, J.Knudsen, Pearson.

E - Resources:

1. https://www.smartzworld.com/notes/mobile-application-development-notes-pdf-mad-pdf-notes/
2. https://www.slideshare.net/ChromeInfotech/mobile-application-development-process
3. https://nptel.ac.in/courses/106/106/106106156/
4. http://w1236xz.website/j2ee-the-complete-reference-tata-mcgraw-hill pdf

Course outcomes:

The students will be able to

1. **Implement** a User Interface for a mobile application using J2ME.
2. **Design** a small but realistic working mobile application for small computing devices.
3. **Classify** the challenges posed by developing mobile applications and be able to propose and evaluate and select appropriate solutions.
4. **Classify** between high and low level display screens.
5. **Apply** the concepts on record management systems.

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

<table>
<tr><td>AY 2020-21 onwards</td><td colspan="4">J. B. INSTITUTE OF ENGINEERING AND TECHNOLOGY
(UGC Autonomous)</td><td colspan="4">B. Tech
IV Year – I Sem</td></tr>
<tr><td>Course Code: J41OK</td><td colspan="4" rowspan="2">FUNDAMENTALS OF OBJECT ORIENTED PROGRAMMING THROUGH C++
(Open Elective-III)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Fundamental Knowledge of Programming in C.

Course Objectives:
The students will

1. Be able to explain the difference between object oriented programming and procedural programming.
2. Be able to program using more advanced C++ features such as composition of objects, operator overloads, inheritance
3. Be able to build C++ classes using appropriate encapsulation and design principles.
4. Improve problem solving skills.
5. Be able to apply object oriented or non-object oriented techniques to solve bigger computing problems

Module I: Introduction
Unit 1:
What is object oriented programming? Why do we need object oriented Programming characteristics of object-oriented languages
Unit 2:
C++ Programming basics: Output using cout. Directives. Input with cin. Type bool. The setw manipulator. Type conversions.

Module II: Functions and Pointers
Unit 1:
Returning values from functions. Reference arguments. Overloaded function. Inline function. Default arguments. Returning by reference.
Unit 2:
Addresses and pointers. The address of operator and pointer and arrays. Pointer and action pointer and C-types string. Memory management: New and Delete, pointers to objects, debugging pointers.

Module III: Classes and Objects
Unit 1:
Making sense of core object concepts (Encapsulation, Abstraction, Polymorphism, Classes, Messages Association, Interfaces) Implementation of class in C++, C++ Objects as physical object, C++ object as data types constructor.
Unit 2: Object as function arguments. The default copy constructor, returning object from function. Structures and classes. Classes objects and memory static class data. Const. and classes.

Module IV: Arrays and Strings

Unit 1:

Arrays and string arrays fundamentals. Arrays as class Member Data : Arrays of object, string, The standard C++ String class

Unit 2:

Operator overloading: Overloading unary operations. Overloading binary operators, data conversion, pitfalls of operators overloading and conversion keywords. Explicit and Mutable.

Module V: Inheritance

Unit 1:

Concept of inheritance. Derived class and based class. Derived class constructors, member function, class hierarchies.

Unit 2:

Virtual Function, friend function, Static function, Assignment and copy initialization, this pointer, dynamic type information.

Text Books:

1. Object Oriented Programming with C++ by E. Balagurusamy, McGraw-Hill Education (India)
2. ANSI and Turbo C++ by Ashoke N. Kamthane, Pearson Education.

Reference Books:

1. C++ and Object Oriented Programming – Jana, PHI Learning.
2. Object Oriented Programming with C++ - Rajiv Sahay, Oxford

E-Resources:

1. https://nptel.ac.in/courses/106/105/106105151/

Course Outcomes:

The students will be able to

1. Articulate the principles of object-oriented problem solving and programming.
2. Outline the essential features and elements of the C++ programming language.
3. Apply the concepts of class, method, constructor, instance, data abstraction, function abstraction, inheritance, overriding, overloading.
4. Program with basic data structures using array.
5. Analyze, write, debug, and test basic C++ codes using the approaches introduced in the course.

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***	
	PO 1	**PO 2**	**P O3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO1**	**PSO 2**
CO1	2	1	3	-	2	-	-	-	-	-	-	-	2	2
CO2	1	2	3	-	2	-	-	-	-	-	-	-	2	2
CO3	-	2	2	-	1	-	-	-	-	-	-	-	1	1
CO4	2	1	2	-	1	-	-	-	-	-	-	-	1	1
CO5	1	2	1	-	2	-	-	-	-	-	-	-	2	1
Average	1.2	1.6	2.2	-	1.6	-	-	-	-	-	-	-	1.6	1.4

<table>
<tr><td>AY 2020-21
onwards</td><td colspan="1">J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B. Tech
IV Year – I Sem.</td></tr>
<tr><td>Course Code:
J41OL</td><td rowspan="2">FUNDAMENTALS OF
DATA SCIENCE
(Open Elective-III)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Good mathematical background and programming skills.

Course Objectives:

The students will

1. To explain how math and information sciences can contribute to building better algorithms and software.
2. To develop fundamental knowledge of concepts underlying data science projects.
3. To develop applied experience with data science software, programming, applications and processes.
4. To develop practical data analysis skills, which can be applied to practical problems.
5. To develop practical skills needed in modern analytics.

Module 1: Introduction to Data Science

What is Data Science? - Big Data VS Data Science, Datafication, Current landscape of perspectives and Skill sets needed.

Module 2: Statistics in Data Science

Statistical Inference, Populations and samples, Statistical modeling, probability distributions, fitting a model.

Module 3: Exploratory Data Analysis

Basic tools (plots, graphs and summary statistics) of EDA, Philosophy of EDA, The Data Science Process.

Module 4: Liner Regression for Data Science

Simple Linear Regression, Multiple Linear Regression, other Considerations in the Regression Model,

Module 5: Classification

An Overview of Classification, Why Not Linear Regression?, Logistic Regression, Linear Discriminant Analysis, A Comparison of Classification Methods.

Text Books:

1. Practical Data Science with R”. Nina Zumel, John Mount. Manning, 2014.

Reference Books:

1. Data Science for business”, F. Provost, T Fawcett, 2013.

E-Resources:

1. https://www2.cs.duke.edu/courses/compsci190/fall18

Course Outcomes:

1. **Know** basic notions and definitions in data analysis.
2. **Know** standard methods of data analysis
3. **Understand** and Apply Statistical Methods for Data Analysis.
4. **formulate** the problem of knowledge extraction.
5. **translate** a real-world problem into mathematical terms.

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***	
	PO 1	**PO 2**	**P O3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO1**	**PSO 2**
CO1	2	2	1	1									2	1
CO2	1	2	2	1									1	2
CO3	2	2	2	2									1	1
CO4	2	2	2	2									2	2
CO5	1	2	2	2									2	1
Average	1.6	2	1.8	1.6									1.6	1.4

AY 2020-21 onwards	**J. B. Institute of Engineering and Technology (UGC Autonomous)**	**B. Tech IV Year – I Sem.**			
Course Code: J41OM	**INTRODUCTION TO NEURAL NETWORKS** (Open Elective-III)	**L**	**T**	**P**	**D**
Credits: 3		**3**	**0**	**0**	**0**

Pre-requisite: Nill

Course Objectives:

The students will

1. Understand the differences and similarities neural network, human brain and feedback systems
2. Learn the different learning techniques
3. Familiar with the concept of single layer perceptron and its algorithms.
4. Familiar with the concept of multilayer perceptron and its algorithms
5. Know the self-organization mapping techniques.

Module 1:

Unit 1: Introduction: What is a neural network? Human Brain, Models of a Neuron, Neural networks viewed as Directed Graphs.

Unit 2 : Network Architectures, Knowledge Representation, Artificial Intelligence and Neural Networks.

Module 2:

Unit 1: Learning Process: Error Correction learning, Memory based learning, Hebbian learning, Competitive.

Unit 2 : Boltzmann learning, Credit Assignment Problem, Memory, Adaption, Statistical nature of the learning process.

Module 3:

Unit 1: Single layer perceptron's: Adaptive filtering problem, Unconstrained Optimization Techniques, Linear least square filters, least mean square algorithm, learning curves.

Unit 2 : Learning rate annealing techniques, perception-convergence theorem, Relation between perception and Bayes classifier for a Gaussian Environment.

Module 4:

Unit 1 : Multilayer Perceptron's: Back propagation algorithm XOR problem.

Unit 2 : Heuristics, Output representation and decision rule, computer experiment, feature detection

Module 5:

Unit 1: Self –Organization Maps: Two basic feature mapping models, Self-Organization maps, SOM algorithm.

Unit 2: Hopfield models: Hopfield models, computer experiment.

Text Books:

1. Neural networks A comprehensive foundation, Simon Hhaykin, PHI edition.
2. Artificial neural networks-B.Vegnanarayana Prentice Halll of India P Ltd 2005.

Reference Books:

1. Neural networks in Computer intelligence, Li Min Fu TMH 2003.
2. Neural networks James A Freeman David M S kapurapearson education 2004.

E-Resources:

1. https://towardsai.net/p/machine-learning/main-types-of-neural-networks-and-its-applications-tutorial-734480d7ec8e
2. http://neuralnetworksanddeeplearning.com/index.html
3. http://neuralnetworksanddeeplearning.com/chap2.html
4. http://neuralnetworksanddeeplearning.com/chap3.html
5. http://neuralnetworksanddeeplearning.com/chap4.html
6. http://neuralnetworksanddeeplearning.com/chap5.html
7. http://neuralnetworksanddeeplearning.com/chap6.html
8. http://neuralnetworksanddeeplearning.com/chap1.html

Course Outcomes:

Students will be able to:

1. **Know** differences and similarities between neural network, human brain and feedback systems
2. **Get** the knowledge of different learning techniques
3. **Describe** the concept of single layer perceptron and its algorithms.
4. **Describe** the concept of multilayer perceptron and its algorithms.
5. **Analyse** the self-organisation mapping techniques.

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	PS O 1	PS O 2
CO1	2	-	2	2	1	-	-	-	-	-	-	-	-	-
CO2	2	-	2	2	1	-	-	-	-	-	-	-	-	-
CO3	2	-	2	2	1	-	-	-	-	-	-	-	-	-
CO4	2	-	2	2	1	-	-	-	-	-	-	-	-	-
CO5	2	-	2	2	1	-	-	-	-	-	-	-	-	-
Average	2	-	2	2	1	-	-	-	-	-	-	-	-	-

<table>
<tr><td>AY 2020-21 onwards</td><td colspan="1">J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B. Tech
IV Year – I Sem.</td></tr>
<tr><td>Course Code: J41ON</td><td rowspan="2">IC APPLICATIONS
(Open Elective-III)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Electronic devices and circuits, Switching Theory & Logic Design, Pulse & Digital Circuits.

Course Objectives:

Students will learn to

1. Introduce the basic building blocks of linear integrated circuits.
2. Teach the linear and non – linear applications of operational amplifiers.
3. Introduce the theory and applications of analog multipliers and PLL.
4. Introduce the concepts of waveform generation and introduce some special function ICs.
5. Understand and implement the working of basic digital circuits

Module 1:

Unit 1: Introduction to Linear Integrated Circuits

Ideal and Practical Op-Amp, Op-Amp Characteristics, DC and AC Characteristics, Features of 741 Op-Amp, Modes of Operation - Inverting, Non-Inverting, Differential

Unit 2: Non-Linear Applications of OP-AMP

Instrumentation Amplifier, AC Amplifier, Differentiators and Integrators, Comparators, Schmitt Trigger, Introduction to Voltage Regulators, Features of 723 Regulator, Three Terminal Voltage Regulators.

Module 2:

Unit 1: Introduction to IC-555 Applications

Introduction to Active Filters, Characteristics of Band pass, Band reject and All Pass Filters, Analysis of 1st order LPF & HPF Butterworth Filters, Waveform Generators – Triangular, Saw tooth, Square Wave, IC555 Timer -Functional Diagram, Monostable, and Astable Operations, Applications.

Unit 2: Timer and Phase Locked Loops(PLL)

Applications

IC565 PLL – Block Schematic, Description of Individual Blocks, Applications.

Module 3:

Unit 1: Converters of DAC

Introduction, Basic DAC techniques, Different types of DACs-Weighted resistor DAC, R-2R ladder DAC, Inverted R-2R DAC

Unit 2: Converters of ADC

Different Types of ADCs – Parallel Comparator Type ADC, Counter Type ADC, Successive Approximation ADC and Dual Slope ADC, DAC and ADC Specifications.

Module 4:

Unit 1: Digital Integrated Circuits

Classification of Integrated Circuits, Comparison of Various Logic Families Combinational Logic ICs – Specifications and Applications of TTL-74XX

Unit 2: Applications of Digital ICs

Code Converters, Decoders, Demultiplexers, LED & LCD Decoders with Drivers, Encoders, Priority Encoders, Multiplexers, Demultiplexers, Priority Generators/Checkers, Parallel Binary Adder/Subtractor, Magnitude Comparators

Module 5:

Unit 1: Combinational Circuits Using TTL 74XX ICS

Familiarity with commonly available 74XX &
CMOS 40XX Series ICs – All Types of Flip-flops, Synchronous Counters, Decade Counters, Shift Registers.

Unit 2: Memories

Memories - ROM Architecture, Types of ROMS & Applications, RAM Architecture, Static& Dynamic RAMs.

Text Books:

1. Op-Amps & Linear ICs – Ramakanth A. Gayakwad, PHI, 2003.
2. Digital Fundamentals – Floyd and Jain, Pearson Education, 8th Edition, 2005

Reference Books:

1. Linear Integrated Circuits –D. Roy Chowdhury, New Age International (p) Ltd, 2ndEd., 2003.
2. Op Amps and Linear Integrated Circuits-Concepts and Applications James M. Fiore,Cengage Learning/ Jaico, 2009.
3. Operational Amplifiers with Linear Integrated Circuits by K. Lal Kishore – Pearson,2009.
4. Linear Integrated Circuits and Applications – Salivahanan, MC GRAW HILLEDUCATION.
5. Modern Digital Electronics – RP Jain – 4/e – MC GRAW HILL EDUCATION, 2010.

E-Resources:

1. http://fmcet.in/ECE/EC6404_uw.pdf
2. https://www.iare.ac.in/sites/default/files/lecture_notes/LDIC%20Lecture%20Notes.pdf.
3. http://smec.ac.in/sites/default/files/lecture_notes/Course%20File%20of%20LDIC(Linear%20 and%20Digital%20IC%20Applications).pdf
4. Integrated Circuits, MOSFETS, Op-Amps and their Applications: https://archive.swayam.gov.in/courses/4441-integrated-circuits-mosfets-op-amps-andtheir-applications

Course Outcomes:

Students will be able to

1. **Understanding** of operational amplifiers with linear integrated circuits.
2. **Apply** the knowledge of the different families of digital integrated circuits and their characteristics.
3. **Analyse** the functioning of various design circuits using operational amplifiers for various applications.
4. **Design** various techniques to develop a/d and d/a convertors.
5. **Acquire** hands-on laboratory experience on ic based project kits in above areas according to specifications.

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	2	-	-	-	-	-	-	-	-	-	-	2	-
CO2	2	2	2	-	-	-	-	-	-	-	-	-	3	3
CO3	1	2	2	-	-	-	-	-	-	-	-	-	1	2
CO4	1	2	1	-	2	-	-	-	-	-	-	1	1	2
CO5	2	2	2	-	-	-	-	-	-	-	-	-	-	3
Average	1.6	2	1.7	-	2	-	-	-	-	-	-	1	1.75	2.5

<table>
<tr><td>AY 2020-21 onwards</td><td colspan="1">J. B. Institute of Engineering and Technology (UGC Autonomous)</td><td colspan="4">B.Tech.
IV Year – I Sem</td></tr>
<tr><td>Course Code: J41OP</td><td rowspan="2">INTRODUCTION TO GEOLOGY
(Open Elective-III)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Nil

Course Objectives:
The students will
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
Unit - 1: Introduction, Definitions, Importance of geology in mining, Types of rocks, Physical properties of rocks.

Module 2
Unit - 1: Structural Geology: Definition, terminology, and Primary and secondary structures: Bedding, lineation, foliation, cleavage, Strike and dip.
Unit - 2: Definition of faults, folds and joints and their types, Unconformities and its kinds.

Module 3
Unit - 1: Ground Water: Introduction, Hydrological Cycle, origin and occurrence of groundwater, water table.
Unit - 2: Aquifers: Types of aquifers, confined and unconfined aquifers, perched aquifers.

Module 4
Unit - 1: Coal: Stages of formation, composition, theories of formation of coal.

Module 5
Unit - 1: Occurrence and distribution of important metallic mineral deposits in India: Iron, Copper, Lead, Zinc, Manganese, Aluminum, Chromium.
Unit - 2: 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.

E-resources:

1. http://www.publiclandsforthepeople.org/wp-content/uploads/2015/06/Introduction-to-Geology-and-Hard-Rock-Mining-2015.pdf
2. https://www.eolss.net/Sample-Chapters/C01/E6-15-08-03.pdf
3. https://pubs.usgs.gov/of/2001/0151/pdf/of01-151.pdf
4. https://digitalworks.union.edu/cgi/viewcontent.cgi?article=1008&context=ajes

Course Outcomes:

The student will be able to:

1. **Understand** about rocks and their properties
2. **Learn** about different structures occurring in rocks
3. **Understand** about ground water, water table and aquifers
4. **Learn** about coal and its formation theories
5. **Distinguish** metallic and non-metallic minerals.

1. 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	2	-	-	-	-	-	-	-	-	-	-	-
CO2	3	2	2	-	-	-	-	-	-	-	-	-	-	-
CO3	3	2	1	-	-	-	-	-	-	-	-	-	-	-
CO4	2	2	1	-	-	-	-	-	-	-	-	-	-	-
CO5	3	1	2	-	-	-	-	-	-	-	-	-	-	-
Average	3	2	1.6	-	-	-	-	-	-	-	-	-	-	-

<table>
<tr><td>AY 2020-21
Onwards</td><td>J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B.Tech
IV Year – I Sem</td></tr>
<tr><td>Course Code:</td><td rowspan="2">INTEGRAL TRANSFORMS AND INTEGRAL EQUATIONS
(Common to CE,EEE, ECE, ME, CSE,IT ,ECM & MIE)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Differential Equations

Course Objectives:
The students will

1. approximation of real-valued periodic functions to suitably restricted non-periodic functions f(x) defined for all real numbers
2. how to use Laplace transform methods to solve ordinary and partial differential equations
3. make them familiar with the methods of solving differential equations, partial differential equations.
4. the properties of Z-Transform and associating the knowledge of properties of ROC in response to different operations on discrete signals.
5. discretization techniques to find approximate solutions of differential equations different types of errors involved in such solutions, their measures and practical applications.

MODULE-I: Applications of Differential Equations
Basic introduction of the course using precise examples like periodic functions, signal propagation, solving mathematical models corresponding to Electrical Circuits.

MODULE-II: Laplace Transforms
UNIT-I: Laplace Transform (LT) – definition – linearity property of LT. Existence Theorem – First and Second Translation theorems. Change of scale property, LT of derivatives, multiplication by t and division by t – Initial and Final Value theorems.

UNIT-II: Inverse Laplace Transforms: definition – standard forms. First and Second shifting theorems. Change of scale property – Use of partial fractions, Inverse transforms of derivatives, Inverse Laplace Transform of integrals – definition of convolution – Convolution theorem

MODULE–III : Fourier Transforms
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.

MODULE–IV : Z-Transforms
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-V: Henkel Transforms
Henkel Transforms- Henkel Transform of the derivatives of a function.- Application of Henkel Transforms in boundary value problems.

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

REFERENCES:

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 this course students will be able to

1. understand the concepts of integral transforms
2. Determine Laplace transform of a function and understand the fundamental properties and apply Laplace transform in solving ODEs.
3. Determine Fourier and inverse Fourier transform of a function and understand the fundamental properties and apply Fourier transform in solving ODEs.
4. apply the Z transform techniques to solve second-order ordinary difference equations.
5. apply the Hankel transform in the infinite 2-dimensional plane

CO-PO/PSO Mapping Chart (Draft) (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	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	-	-

<table>
<tr><td>AY 2020-21 Onwards</td><td colspan="4">J. B. Institute of Engineering and Technology (UGC Autonomous)</td><td colspan="4">B.Tech IV Year – I Sem</td></tr>
<tr><td>Course Code:</td><td rowspan="2">NDT and VACUUM TECHNOLOGY
(Common to CE, EEE, ME, ECE, CSE, IT, ECM& MIE)
(Open Elective-III)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Nil

Course Objectives:

This course will enable students to:

1. study various Non Destructive Testing and types of defects.
2. know the basics of non-destructive techniques using ultrasonic interferometer.
3. provide a basic level of understanding on Vacuum technology.
4. understand the importance Pressure gauges.
5. introduce the fundamental concepts vacuum pumps.

Module 1: Introduction to Non-destructive testing

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

Liquid penetration method, Dye penetration method, Ultrasonic Inspection method, Pulse Echo method, Radiographic testing Magnetic particle testing, Eddy current Testing.

Module 3: Introduction to Vacuum Technology

Unit-1: 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.

Unit-2: Flow meters: Molar flow, Mass flow.

.

Module 4: Pressure gauges

Classification, Direct and indirect gauges, Indirect gauges – Pirani gauge, Thermocouple gauge, Ionization gauge, hot cathode gauge, Penning gauge.

Module-5: Vacuum Pumps

Introduction, Pumping speed, Rotary vane pump, Turbo molecular pump, Diffusion pumps.

Text Books:

1. "Engineering Physics",B K Pandey and S Chaturvedi, Cengage Learning India, Revised Edition, 2014.
2. "A User's guide to Vacuum technology", John. F. O'Hanlon, Wiley, 3rd Edition, 2003.

Reference Books:

1. "Physics for Engineers", R Srinivasan, New Age international, 1st reprint, 2007.
2. "Engineering Physics", R K Gaur and S L Gupta, Dhanpat rai, Reprint, 2006.
3. "Hand Book of Thin film deposition", Krishna Seshan, 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_
4. New_Applications.pdf
5. https://www.journals.elsevier.com/ndt-and-e-international/https://www.journals.elsevier.com/vacuum
6. http://nptel.ac.in/courses/114106035/35
7. http://nptel.ac.in/courses/112101004/37.

Course Outcomes:

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

1. **Describe** the Types of defects and analyze them.
2. **Analyze** the principles of NDT methods.
3. **Analyze** Vacuum technology and concepts of flow meters.
4. **Develop** pressure gauges.
5. **Understand** the concepts of different vacuum pumps.

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	-	-	-	-	-	-	-	-	-	-	-	-
CO2	3	2	-	-	-	-	-	-	-	-	-	-	1	-
CO3	3	2	-	-	-	-	-	-	-	-	-	-	1	-
CO4	2	2	-	-	2	-	-	-	-	-	-	-	1	-
CO5	2	2	-	-	2	-	-	-	-	-	-	-	1	-
Average	2.6	2	-	-	2	-	-	-	-	-	-	--	1	-

AY 2020-21 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech IV Year – I Sem			
Course Code:	**Nano Chemistry** (Common to CE, EEE, ME, ECE, CSE, IT, ECM& MIE) (Open Elective-III)	L	T	P	D
Credits: 3		3	0	0	0

Pre-requisite: Nil

Course Objectives:
This course will enable students to:
1. To know about the scope of Nanoscale materials and synthesis.
2. Understand the properties of Nanomaterials.
3. Give knowledge of various instrumental techniques to the analysis the Nanomaterials.
4. learn about the different applications of Nanomaterials.
5. Analyze the Nano technology in Environmental purpose.

Module 1: Synthesis of Nano materials:
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:
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 3: Instrumental Analysis:
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 4: Carbon Nano structures and Applications:
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:
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. “Nanomaterials: Synthesis, Characterization, and Applications”, A. K. Haghi, Ajesh K. Zachariah, Nandakumar Kalariakkal. Apple Academic Press, 2013.
2. “Nanomaterials and Nanochemistry”, Brechignac C., Houdy P., Lahmani M. (Eds.) (Springer,) 748p. ISBN 978-3-540-72993-8, 2007
3. “Principles of Nanotechnology”, Phanikumar. SciTech Publications 2nd Edition, 2010.
4. “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:

On completion 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 Nan 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.

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	2	1	-	-	-	-	-	-	-	2	-	-
CO2	3	-	2	-	-	-	-	-	-	-	-	1	-	-
CO3	2	2	-	1	-	-	-	-	-	-	-	2	-	-
CO4	2	2	1	-	-	-	-	-	-	-	-		-	-
CO5	1	1	-	-	-	-	-	-	-	-	-	2	-	-
Average	2.2	1.6	1.6	1	-	-	-	-	-	-	-	1.4	-	-

<table>
<tr><td>AY 2020-21
onwards</td><td colspan="1">J. B. INSTITUTE OF ENGINEERING AND TECHNOLOGY
(UGC Autonomous)</td><td colspan="4">B.Tech
IV Year – I Sem</td></tr>
<tr><td>Course Code:</td><td rowspan="2">TEAMWORK AND TEAM BUILDING
(COMMON TO ALL)
(Open Elective-III)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-Requisites: Nil

Objectives:
The students will
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.

E-Resources:
1. https://smallbusiness.chron.com/difference-between-team-building-teamwork-10981.html

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***	
	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	-	3	-	-
CO5	-	-	-	-	-	-	-	-	3	2	-	3	-	-
Total	-	-	-	-	-	-	-	-	3	2	-	3	-	-

<table>
<tr><td>AY 2020-21 onwards</td><td>J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B.Tech
IV Year – I Sem</td></tr>
<tr><td>Course Code:</td><td rowspan="2">INTELLECTUAL PROPERTY RIGHTS
(Open Elective - III)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-Requisites: Nil

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.

Module 1:

UNIT - I:

Introduction to Intellectual Property: Introduction, types of intellectual property, international organizations, agencies and treaties, importance of intellectual property rights.

Module 2:

UNIT - I:

Trade Marks: Purpose and function of trademarks, acquisition of trade mark rights, protectable matter.

UNIT – II: Selecting and evaluating trade mark, trade mark registration processes.

Module 3:

UNIT - I:

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.

UNIT - II

Law of patents: Foundation of patent law, patent searching process, ownership rights and transfer

Module 4:

UNIT - I:

Trade Secrets: Trade secretes law, determination of trade secretes status, liability for misappropriations of trade secrets, and protection for submission, trade secretes litigation.

UNIT - II:

Unfair competition: Misappropriation right of publicity, false advertising.

Module 5:

UNIT - I:

New development of intellectual property: New developments in trade mark law; copy right law, patent law, intellectual property audits.

UNIT – II:

International overview on intellectual property, international - trade mark law, copy right law, international patent law, and international development in trade secrets law.

Text Books:

1. Intellectual property right, Deborah, E. Bouchoux, cengage learning.
2. Intellectual property 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.

Reference Books:

1. Intellectual Property –Copyrights, Trademarks and patents by Richard Stim, Cengage Learning.
2. Niraj Pandey & Khushdeep Dharani –Intellectual Property rights
3. V.K. AHUJA – Law relating to Intellectual Property

E-Resources:

1. www.Ipindia.nic.in
2. www.Iprlwawindia.org
3. www.mondaq.com

Course outcomes:

The students once they complete their academic projects, they get:

1. **Awareness** of the legal environment.
2. **Understanding** of different acts under the national and international laws.
3. **Acquiring** the patent and copyright for their innovative works.
4. **Awareness** of trade secrets and method of advertising.
5. **Knowledge** of plagiarism in their innovations which can be questioned legally.

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	-	3	-	-
CO5	-	-	-	-	-	-	-	-	3	2	-	3	-	-
Total	-	-	-	-	-	-	-	-	3	2	-	3	-	-

AY 2020-21 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech IV Year – II Sem			
Course Code: J42OA	AIR POLLUTION & CONTROL (Open Elective-IV)	L	T	P	D
Credits:3		3	0	0	0

Pre-requisite: Environmental Science

Course Objectives:
This course will enable students to:

1. Introduce students to basic concepts of pollution.
2. understand the causes of air pollution.
3. Study about the health related to air pollution.
4. Develop skills relevant to control of air pollution.
5. understand the quality of air.

Module 1:
Unit-1:
Air Pollution – Definitions, Scope, Significance and Episodes, Air Pollutants – Classifications – Natural and Artificial – Primary and Secondary, point and Non-Point, Line and Areal Sources of air pollution-stationary and mobile sources

Module 2:
Unit-1: Effects of Air pollutants on man, material and vegetation; Global effects of air pollution – Green House effect, Heat Islands, Acid Rains, Ozone Holes etc.

Module 3:
Unit-1:
Thermodynamics and Kinetics of Air-pollution – Applications in the removal of gases like SO_x; NO_x; CO; HC etc., air-fuel ratio. Computation and Control of products of combustion. Meteorology and plume Dispersion; properties of atmosphere; Heat, Pressure, Wind forces, Moisture and relative Humidity; Influence of Meteorological phenomena on Air Quality-wind rose diagrams.

Module 4:
Unit-1: Lapse Rates, Pressure Systems, Winds and moisture plume behaviour and plume Rise Models; Gaussian Model for Plume Dispersion.
Control of particulates – Control at Sources, Process Changes, Equipment modifications, Design and operation of control. Equipment's – Settling Chambers, Centrifugal separators, filters Dry and Wet scrubbers, Electrostatic precipitators.

Module 5:
Unit-1: General Methods of Control of NO_x and SO_x emissions – In-plant Control Measures, process changes, dry and wet methods of removal and recycling.
Air Quality Management – Monitoring of SPM, SO_x; NO_x and CO Emission Standards.

Text Books:

1. Air pollution By M.N.Rao and H.V.N.Rao – Tata Mc.Graw Hill Company.
2. Air pollution by Wark and Warner.- Harper & Row, New York

Reference Books:

1. Air pollution and control By K.V.S.G. Murali Krishna, Kaushal Publishers. Kakinada

E-Resources:

1. http://mjcetenvsci.blogspot.in/2013/11/air-pollution-causes-effects-and.html
2. https://www.britannica.com/technology/air-pollution-control
3. http://www.yourarticlelibrary.com/air-pollution/5-effective-methods-to-control-air-pollution-explained-with-diagram/28360/
4. http://www.transportlinks.org/rtkb/english/Module%205%5C5_4a%20Environmental%20Impact%20Assessment.pdf

Course Outcomes:

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

1. **Acquired** knowledge on the basic elements of causes and occurrence of the air pollution.
2. **Have awareness** on the different causes of the air pollution.
3. **Have awareness** about different health related problems caused due to air pollution.
4. **develop** concepts in controlling and prevention of air pollution.
5. **analyse** air quality.

CO-PO/PSO Mapping Chart (Draft) (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	2	-	-	-	-	1	-	-
CO2	-	-	-	-	-	1	2	-	-	-	-	1	-	-
CO3	-	-	-	-	-	1	2	-	-	-	-	1	-	-
CO4	-	-	-	-	-	1	2	-	-	-	-	1	-	-
CO5	-	-	-	-	-	1	2	-	-	-	-	1	-	-
Average	0.2	-	-	-	-	1	2	-	-	-	-	1	-	-

<table>
<tr><td rowspan="1">AY 2020-21 Onwards</td><td>J. B. Institute of Engineering and Technology (UGC Autonomous)</td><td colspan="4">B.Tech
IV Year – II Sem</td></tr>
<tr><td>Course Code: J42OB</td><td rowspan="2">DISASTER MANAGEMENT
(Open Elective-IV)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits:3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Environmental Science

Course Objectives:
This course will enable students to:

1. Provide basic conceptual understanding the difference between the hazard and a disaster.
2. Knowledge about the various disasters and their impacts.
3. Provide basic understanding about the hazard and vulnerability profile of India.
4. Have conceptual understanding about the disaster management phases.
5. Approaches of Disaster Risk Reduction (DRR) and the relationship between vulnerability, Disasters, disaster prevention and risk reduction.

Module 1:
Unit-1: Understanding Disaster:
Concept of Disaster - Different approaches- Concept of Risk - Levels of Disasters - Disaster Phenomena and Events (Global, national and regional)
Unit-2: Hazards and Vulnerabilities:
Natural and man-made hazards; response time, frequency and forewarning levels of different hazards - Characteristics and damage potential or natural hazards; hazard assessment - Dimensions of vulnerability factors; vulnerability assessment - Vulnerability and disaster risk - Vulnerabilities to flood and earthquake hazards

Module 2:
Unit-1: Disaster Management Mechanism:
Concepts of risk management and crisis managements - Disaster Management Cycle - Response and Recovery - Development, Prevention, Mitigation and Preparedness - Planning for Relief

Module 3:
Unit-1: Capacity Building:
Capacity Building: Concept - Structural and Non-structural Measures Capacity Assessment; Strengthening Capacity for Reducing Risk - Counter-Disaster Resources and their utility in Disaster Management - Legislative Support at the state and national levels

Module 4:
Unit-1: Coping with Disaster: Coping Strategies; alternative adjustment processes - Changing Concepts of disaster management - Industrial Safety Plan; Safety norms and survival kits - Mass media and disaster management.

Module 5:

Unit-1: Planning for disaster management:

Strategies for disaster management planning - Steps for formulating a disaster risk reduction plan - Disaster management Act and Policy in India - Organizational structure for disaster management in India - Preparation of state and district disaster management plans

Text Books:

1. Manual on Disaster Management, National Disaster Management, Agency Govt of India.
2. Disaster Management by Mrinalini Pandey Wiley 2014. 3. Disaster Science and Management by T. Bhattacharya, McGraw Hill Education (India) Pvt Ltd Wiley 2015

Reference Books:

1. Earth and Atmospheric Disasters Management, N. Pandharinath, CK Rajan, BS Publications 2009.
2. National Disaster Management Plan, Ministry of Home affairs, Government of India (http://www.ndma.gov.in/images/policyplan/dmplan/draftndmp.pdf)

E-Resources:

1. https://nptel.ac.in/courses/105/104/105104183/
2. https://nptel.ac.in/courses/124/107/124107010/

Course Outcomes:

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

1. **Acquire** knowledge on various types of disasters and hazards
2. **Distinguish** between the hazard and a disaster can be analyzed
3. **Acquire** knowledge on the various approaches of Disaster Risk Reduction (DRR)
4. **Ability** to understand the relationship between vulnerability. disasters, disaster prevention and risk reduction
5. **Develop** ability to respond to different disasters

CO-PO/PSO Mapping Chart (Draft) (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	-	-	-	2	2	3	-	-	-	-	-	-
CO2	3	2	-	-	-	2	2	3	-	-	-	-	-	-
CO3	3	2	-	-	-	2	2	3	-	-	-	-	-	-
CO4	3	2	-	-	-	2	2	3	-	-	-	-	-	-
CO5	3	2	-	-	-	2	2	3	-	-	-	-	-	-
Average	3	2	-	-	-	2	2	3	-	-	-	-	-	-

<table>
<tr><td>AY 2020-21 onwards</td><td>J. B. Institute of Engineering and Technology (UGC Autonomous)</td><td colspan="4">B.Tech
IV Year – II Sem</td></tr>
<tr><td>Course Code: J42OC</td><td rowspan="2">SPECIAL ELECTRICAL MACHINES
(Open Elective-IV)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Prerequisite: Basic Electrical and Electronics Engineering

Course Objectives:

This course will enable students to:

1. Introduce the concepts of permanent magnets and to study the construction, operation, characteristics & control of PMBLDC motor.
2. Study construction, operation characteristics and control of PMSM.
3. Understand the construction, operation, characteristics, power controllers and control of SRM.
4. Study the operation of stepper motor, its types, control and its applications.
5. Understand the operation & characteristics of other special machines.

MODULE 1: PERMANENT MAGNET BRUSHLESS DC MOTORS

Fundamentals of permanent magnets – types - principle of operation- magnetic circuit analysis - EMF and torque equations, Characteristics and control.

MODULE 2: PERMANENT MAGNET SYNCHRONOUS MOTORS

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

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

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

Principle of operation and characteristics of Hysteresis motor – AC series motors – Linear induction motor – 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.

REFERENCES:

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:

The students will be able to:

1. **Analyze** given magnetic circuit and understand operation, characteristics and control of PMBLDC motor.
2. **Understand** the construction, operation performance characteristics of PMSM and its power controllers.
3. **Understand** the construction, operation and control of SRM drive and its power controllers.
4. **Understand** the construction, operation, characteristics and control of stepper motor.
5. **Understand** the operation & characteristics of other special electrical machines.

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	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

<table>
<tr><td>AY 2020-21 onwards</td><td colspan="4">J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B.Tech
IV Year – II Sem</td></tr>
<tr><td>Course Code: J42OD</td><td rowspan="2" colspan="4">ELECTRICAL SAFETY ENGINEERING
(Open Elective-IV)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Prerequisite: Basic Electrical and Electronics Engineering

Course Objectives

The students will

1. To expose the students to electrical hazards.
2. To impart knowledge on prevention of electrical shocks.
3. To create awareness about various first aid methods.
4. To study about Hazardous zones-causes of sparks and flash overs in electrical plants
5. To study about safety management.

MODULE –I: INTRODUCTION

Unit-I: General Background-Objectives of safety and security measures-Hazards associated with electric current and voltage-principles of electrical safety- Approaches to Prevent Accidents.

Unit-II: Fire Prevention and Fire Fighting-Objectives and scope of IE act and IE rules-General requirements for electrical safety as per IE rules.

MODULE –II: ELECTRICAL SHOCKS AND THEIR PREVENTION

Unit-I: Primary and Secondary Electric Shocks- Occurrence of Electric Shock -Shocks Due to Flashovers/Spark-overs- Lightning Strokes on Overhead Transmission Lines and Outdoor Substations.

Unit-II: 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 –III: FIRST AID

Unit-I: Introduction- Removal of Contact 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.

Unit-II: Use of Artificial Resuscitator- External Cardiac Massage- Cardiac Pulmonary Resuscitation- First aid treatment of Heat Exhaustion and heat stroke.

MODULE –IV: ELECTRICAL SAFETY IN HAZARDOUS AREAS

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 –V: ELECTRICAL SAFETY MANAGEMENT

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. S. Rao and H.L. Saluja, “Electrical Safety, Fire Safety and Safety Management”, Khanna Publishers, 2012.
2. W.F. Cooper, “
3. Electrical Safety Engineering”, Butterworth and Company, London, 1998.

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://onlinecourses.swayam2.ac.in/nou20_cs08/preview
2. https://npti.gov.in/electrical-safety-industries-and-accidents-prevention
3. https://www.kopykitab.com/Electrical-Safety-Fire-Safety-Engineering-And-Safety-Management-Second-Edition-by-S-Rao-Saluja

Course Outcomes:

The students will be able to:

1. **Learn** about Electrical safety, IE act and IE rules.
2. **Understand** Electrical shocks and their prevention
3. **Acquire** knowledge about various first aid measures.
4. **Familiarize** with electrical safety in hazardous areas.
5. **Get** introduced to safety management.

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	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	-

AY 2020-21 onwards	**J. B. Institute of Engineering and Technology (UGC Autonomous)**	**B.Tech IV Year – II Sem**			
Course Code: J42OE	**DIGITAL MANUFACTURING** (Open Elective-IV)	**L**	**T**	**P**	**D**
Credits: 3		**3**	**0**	**0**	**0**

Pre-requisite: Engineering Drawing, Basics of CAD modelling.

Course Objectives:
This course will enable students to:
1. Understand the need of digital fabrication
2. Understand about Two dimensional layer by layer techniques
3. Know about extrusion based systems, post processing and the software issues involved in digital fabrication
4. Know the applications of digital fabrication

Module - I:
Unit-1: Introduction to additive manufacturing: Introduction to AM, AM evolution, Classification of Additive Manufacturing, Distinction between AM & CNC Machining, Advantages of AM

Module - II:
Unit-1: Two- dimensional layer- by layer techniques: Stereo-lithography (SL), Solid Foil Polymerization (SFP), Selective Laser Sintering (SLS), Selective Powder Building (SPB), Ballistic Particle Manufacturing (PM)

Module - III:
Unit-1: Extrusion based systems: Introduction, basic principles, Fused Deposition Modeling, Materials, and Limitations of FDM
Unit-2: Post processing: Introduction, Support Material Removal, Surface Texture Improvements, Accuracy Improvements, Aesthetic Improvements

Module - IV:
Unit-1: Software issues for additive manufacturing: Introduction, Preparation of CAD Models: The STL file, Problems with STL files, STL file manipulation, Beyond the STL file, Additional software to assist AM

Module - V:
Unit-1: AM applications: Applications in design, Applications in Engineering Analysis and Planning
Unit-2: Medical Applications: Customized Implants and Prosthesis, Aerospace applications and Automotive Applications
Unit-3: Other Applications: Jewelry Industry, Coin Industry, Tableware Industry.

TEXT BOOKS:

1. Ian Gibson, David W Rosen, Brent Stucker, "Additive Manufacturing Technologies: Rapid Prototyping to Direct Digital Manufacturing", Springer 2010.
2. Chuaa Chee Kai, Leong Kah Fai, "Rapid Prototyping: Principles & Applications", World Scientific, 2010.

REFERENCES:

1. Ali K.Karmani, EmandAbouel Nasr, "Rapid Prototyping: Theory and Practice", Springer 2006.
2. Andreas Gebhardt, Understanding Additive Manufacture: Rapid Prototyping, Rapid Tooling and Rapid Manufacture, Hanser Publishers, 2013.
3. Hopkinson, N.Haque, and Dickens Rapid Manufacturing: Advanced Research in Virtual and Rapid Prototyping, Taylor and Francis, 2007.

E- Resources:

1. shorturl.at/qQT07
2. shorturl.at/etyzN
3. shorturl.at/hBOV6

Course Outcomes:

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

1. **Understand** the importance of digital fabrication
2. **Identify** different techniques involved in two dimensional layering
3. **Analyze** the software issues involved in digital fabrication and know about extrusion based systems and post processing
4. **Apply** the knowledge gained in the digital fabrication

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	3	3	3	3							3		
CO2	2	2	3	3	3							3		
CO3	2	2	3	3	3							3		
CO4	1	3	3	3	3							3		
CO5	1	2	2	2	2							3		
Average	1.4	2.4	2.8	2.8	2.8							3		

2020-21	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech IV Year – II Sem			
Course Code:J42OG	**CONSUMER ELECTRONICS** (Open Elective-IV)	**L**	**T**	**P**	**D**
Credits: 3		**3**	**1**	**0**	**0**

Prerequisites: Nil

Course Objectives:

The students will

1. Learn how a Consumer Product is developed
2. Learn how to simulate and test that designs.
3. Learn in-depth study of systems and the use of those.
4. To understand concept of Audio Systems.
5. To implement Television Receivers & Video Systems.

Module 1

UNIT-I

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

Types: carbon, condenser, crystal, electrets, tie- clip, wireless. Loud speaker: 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

UNIT-I

Audio systems: CD player, home theatre sound system, surround sound. Digital console: block diagram, working principle, applications.

UNIT-II

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

UNIT-I

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

Colour TV standards, colour theory, hue, brightness, saturation, luminance and chrominance. Different types of TV camera. Transmission standards: PAL system, channel bandwidth

Module 4

UNIT-I

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

Video interface: Composite, Component, Separate Video, Digital Video, SDI, HDMI Multimedia Interface) , Digital Video Interface . CD and DVD player: working principles, Interfaces.

Module 5

UNIT-I

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

Air conditioner and Refrigerators: Components features, applications, and technical specification. Digital camera and cam coder: - pick up devices - picture processing - picture storage.

Text Books:

1. Consumer Electronics, Bali S.P., Pearson Education India,2010.
2. Audio video systems : principle practices & troubleshooting, Bali R and Bali S.P., Khanna Book Publishing Co. (P) Ltd., 2010Delhi , India.

REFERENCES:

1. Intellectual Property in Consumer Electronics, Software and Technology Startups, Springer Nature; 2014th edition (24 September 2013),ISBN-10:9781461479116.
2. 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:

1. **Learn** how a Consumer Product is developed
2. **Analyze** how to simulate and test that designs.
3. **Apply** in-depth study of systems and the use of those.
4. **understand** concept of Audio Systems.
5. **Develope** Television Receivers & Video Systems.

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											
CO2	2	2		2										
CO3	3	2		3										
CO4	3	1												
CO5	2	2	3	3										
Average	**2.4**	**2.0**	**2.5**	**2.67**										

<table>
<tr><td>2020-21</td><td colspan="1">J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B.Tech
IV Year – II Sem</td></tr>
<tr><td>Course Code:J42OH</td><td rowspan="2">NANO ELECTRONICS
(Open Elective-IV)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>1</td><td>0</td><td>0</td></tr>
</table>

Prerequisites: Basic Electronics

Course Objectives:

The student will

1. understand the basic concepts of Nanotechnology and Nano machines.
2. understand the fundamental logic devices and the need of Quantum computing.
3. mathematically represent the 'Quantum tunneling'.
4. understand the mathematical treatment for the modeling and design of the carbon nanotubes.
5. study the applications such as MEMS, RAM, Mass Storage devices etc.

Module 1

UNIT-I

Background to nanotechnology: Types of nanotechnology and nanomachines – periodic table – atomic structure – molecules and phases – energy – molecular and atomic size –surface and dimensional space – top down and bottom up; Molecular Nanotechnology: Electron microscope

UNIT-II

scanning electron microscope – atomic force microscope –scanning tunnelling microscope – nanomanipulator – nanotweezers – atom manipulation– nanodots – self assembly – dip pen nanolithography. Nanomaterials: preparation –plasma arcing – chemical vapor deposition – sol-gels – electrodeposition – ball milling –applications of nanomaterials;

Module 2

UNIT-I

Fundamentals of logic devices:- Requirements – dynamic properties – threshold gates; physical limits to computations; concepts of logic devices:- classifications – two terminal devices – field effect devices – coulomb blockade devices – spintronics – quantum cellular automata – quantum computing –

UNIT-II

DNA computer; performance of information processing systems;- basic binary operations, measure of performance processing capability of biological neurons – performance estimation for the human brain. Ultimate computation:- power dissipation limit – dissipation in reversible computation – the ultimate computer.

Module 3

Silicon MOSFETS - Novel materials and alternate concepts:- fundamentals of MOSFET Devices- scaling rules – silicon-dioxide based gate dielectrics – metal gates – junctions & contacts – advanced MOSFET concepts. Quantum transport devices based on resonant tunneling:- Electron tunneling – resonant tunneling diodes – resonant tunneling devices; Single electron devices for logic applications:- Single electron devices – applications of single electron devices to logic circuits.

Module 4

Carbon Nanotube: Fullerenes - types of nanotubes – formation of nanotubes – assemblies – purification of carbon nanotubes – electronic propertics – synthesis of carbon nanotubes – carbon nanotube interconnects – carbon nanotube FETs – Nanotube for memory applications – prospects of an all carbon nanotube nanoelectronics.

Module 5

Electrodes & contacts – functions – molecular electronic devices – first test systems – simulation and circuit design – fabrication; Future applications: MEMS – robots – random access memory – mass storage devicesfor washing machine, technical specifications, types of washing machine, fuzzy logic.

Text Books:

1. 'Introduction to Nanoelectronics' by V. V. Mitin, V. Kochelap, Michel A Stroscio. Cambridge, 2007.
2. 'Fundamental of Nanoelectronics' by George W Hanson, Prentice Hall, 2008.

References Books:

1. Michael Wilson, KamaliKannangara, Geoff Smith, Michelle Simmons and Burkhard
2. Raguse, Nanotechnology: Basic Science and Emerging Technologies, Chapman & Hall / CRC, 2002.

E - Resources:

1. https://nptel.ac.in/courses/bjy/ab1011/102/111102111/

Course Outcomes:

1. **develop** the basic concepts of Nanotechnology and Nano machines.
2. **apply** fundamentals of logic devices and the need of Quantum computing.
3. **illustrate** the operation of Silicon MOSFETS.
4. **describe** the mathematical treatment for the modeling and design of the carbon nanotubes.
5. **understand** the applications such as MEMS, RAM, Mass Storage devices and gain knowledge on Electrodes and Contacts.

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	1	-	-	-	-	-	-	-	-	-	1	1	-
CO2	2	2	2	-	-	-	-	-	-	-	-	-	2	-
CO3	1	1	-	-	-	-	-	-	-	-	-	-	1	-
CO4	2	1	-	-	-	-	-	-	-	-	-	-	2	-
CO5	2	2	-	-	-	-	-	-	-	-	-	-	1	-
Average	2.2	2	2	-	-	-	-	-	-	-	-	1	1.2	-

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech IV Year – II Sem			
Course Code:J42OI	FUNDAMENTALS OF CLOUD COMPUTING (Open Elective-IV)	L	T	P	D
Credits: 3		3	0	0	0

Pre-Requisites:

1. A course on "Computer Networks".
2. A course on "operating systems".

Course objectives:

The Student will:

1. Understand the fundamentals of the Cloud Computing and strategies in the New Economy.
2. Provide a fundamental understanding of different types of cloud computing applications.
3. Provide insights to implement virtualization techniques.
4. Understand the design of cloud and its architecture.
5. Outlines the categories and multimedia in Cloud Computing.

Module 1:

Cloud Computing **Overview**- Origins of Cloud computing cloud components - Essential characteristics - On-demand self-service Broad network access Location independent resource pooling Rapid elasticity, Measured service.

Module 2:

Cloud scenarios - Benefits: scalability. Simplicity, vendor'ssecurity. Limitations - Sensitive information application development - Security concerns - privacy concern with a third party - security level of third party - security benefits Regularity issues: Government policies.

Module 3:

Cloud architecture: Cloud delivery model - SPI framework SPI evolution, SPI vs.traditional ITModel and Software as a Service (SaaS):SaaS service providers - Google App Engine, Salesforce. Coin, google plat form - Benefits - operational benefits Economic benefits - Evaluating SaaS Platform as a service (PaaS): PaaS service providers - Right Scale - Salesforce. Coin, Rackspace- Force .com, Services and Benefits.

Module 4:

Infrastructure as a Service (IaaS): IaaS service providers - Amazon EC2, GoGrid Microsoft soft implementation and support - Amazon EC service level agreement - Recent developments - Benefits

Cloud deployment model: Public clouds - Private clouds - Community clouds - Hybrid clouds - Advantages of cloud computing.

Module 5:

Virtualization: Virtualization and cloud computing - Need of virtualization – cost, administration. last deployment, reduce infrastructure cost - limitations

Types of hardware virtualization: Full virtualization - partial virtualization - para virtualization

Desktop virtualization: Software virtualization - Memory virtualization - Storage virtualization - Data virtualization - Network virtualization Micro soft Implementation: Microsoft Hyper V - Vmware features and infrastructure - Virtual Box.

Text Books:

1. Cloud computing a practical approach - Anthony T.Velte, Toby J. Velte Robert Elsenperer TATA McGraw- Hill, New Delhi – 2010.
2. Cloud Computing: Web-Based Application s That Change the Way You Work and Collaborate Online - Michael Miller - Que 2008.

Reference Books:

1. Cloud Computing: Arshdeep Bahga, Vijay Madisetti, 2014, University Press.
2. Mastering Cloud Computing: Raj Kumar buyya, Christian Vecchiola,selvi-2013.

E - Resources:

1. https://nptel.ac.in/courses/106/105/106105167/
2. https://sjceodisha.in/wp-content/uploads/2019/09/CLOUD-COMPUTING-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

Course outcomes:

The Student will be able to:

1. **Identify** different elements of cloud computing.
2. **Examine** the essential processes of a Cloud Computing system.
3. **Analyze** the impact of Cloud Computing on organizations and strategy.
4. **Learns** the various marketing strategies for an online business.
5. **Explain** the infrastructure and multimedia concepts.

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**

<table>
<tr><td>AY 2020-21 onwards</td><td>J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B.Tech
IV Year – II Sem</td></tr>
<tr><td>Course Code:J42OJ</td><td rowspan="2">INTRODUCTION TO BIG DATA ANALYTICS
(Open Elective-IV)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-Requisites: Database Management Systems, Cloud Computing.

Course objectives:
The Student will:
1. Understand the basics of Big Data and Big Data Platform
2. Attain the knowledge of Big Data analytics, Approaches and Tools
3. Describe Map Reduce fundamentals and HDFC File system
4. Differentiate between Hadoop and RDBMS concepts
5. Apply analytics on Structured and Unstructured Data.

Module 1:
UNIT-1:
Introduction to Big Data: Types of Digital Data**,** what is big data, History of Data Management; Characteristics of Data, Evolution of Big Data, Structuring Big Data; Elements of Big Data; Challenges with Big Data; Why Big Data; Traditional Business Intelligence (BI) versus Big Data.
UNIT-2:
Introduction to Data Analytics: What Big Data Analytics Isn't? Why this sudden Hype Around Big Data Analytics, Classification of Analytics, Greatest Challenges that Prevent Business from Capitalizing Big Data; Top Challenges Facing Big Data; Why is Big Data Analytics Important; Data Science; Data Scientist; Terminologies used in Big Data Environments; BASE; Few Top Analytics Tools.

Module 2:
UNIT-1:
Understanding Analytics and Big Data: Comparing Reporting and Analysis, Types of Analytics; Points to Consider during Analysis; Developing an Analytic Team; Understanding Text Analytics;
UNIT-2:
Analytical Approach and Tools to Analyze Data: Analytical Approaches; History of Analytical Tools; Introducing Popular Analytical Tools; Comparing Various Analytical Tools.

Module 3:
UNIT-1:
Understanding MapReduce Fundamentals and HBase: The MapReduce Framework; Techniques to Optimize MapReduce Jobs; Uses of MapReduce; Role of HBase in Big Data Processing; Storing Data in Hadoop
UNIT-2:
Introduction of HDFS: Architecture, HDFS Files, File system types, commands, org.apache.hadoop.io package, HDFS - High Availability; Introducing HBase, Architecture, Storing Big Data with

HBase,interacting with the Hadoop Ecosystem; HBase in Operations-Programming with HBase; Installation, Combining HBase and HDFS

Module 4:

UNIT-1:

Big Data Technology Landscape and Hadoop: NoSQL, Hadoop; RDBMS versus Hadoop; Distributed Computing Challenges; History of Hadoop; Hadoop Overview; Use Case of Hadoop; Hadoop Distributors;

UNIT-2:

HDFS (Hadoop Distributed File System): HDFS Daemons, read, write, Replica Processing of Data with Hadoop; Managing Resources and Applications with Hadoop YARN.

Module 5:

UNIT-1:

Social Media Analytics and Text Mining: Introducing Social Media; Key elements of Social Media; Text mining; Understanding Text Mining Process; Sentiment Analysis, Performing Social Media Analytics and Opinion Mining on Tweets;

UNIT-2:

Mobile Analytics: Introducing Mobile Analytics; Define Mobile Analytics; Mobile Analytics and Web Analytics; Types of Results from Mobile Analytics; Types of Applications for Mobile Analytics; Introducing Mobile Analytics Tools.

Text Books:

1. BIG DATA, Black BookTM, Dreamtech Press, 2015 Edition.
2. BUSINESS ANALYTICS 5e, BY Albright |Winston

Reference Books:

1. Rajiv Sabherwal, Irma Becerra- Fernandez,” Business Intelligence –Practice, Technologies and Management”, John Wiley 2011.
2. Lariss T. Moss, ShakuAtre, “Business Intelligence Roadmap”, Addison-Wesley It Service.
3. Yuli Vasiliev, “Oracle Business Intelligence: The Condensed Guide to Analysis and Reporting”, SPD Shroff, 2012.

E - Resources:

1. https://www.coursera.org/learn/big-data-introduction
2. https://www.tutorialspoint.com/big_data_analytics/index.htm
3. www.upgrad.com/Big-Data
4. https://www.javatpoint.com/what-is-big-data
5. https://www.edx.org/course/big-data-analytics-using-spark

Course outcomes:

The Student will be able to:

1. **Identify** the basics of Big Data and its environment
2. **Use** Big Data Analytics Tools and its Approaches
3. **Define** Map Reduce fundamentals and HDFC Architecture
4. **Distinguish** between Hadoop and RDBMS concepts
5. **Illustrate** analytics on Structured and Unstructured Data.

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	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	1	-	-	3	-	-	-	-	-	-	-	-	-
CO3	1	2	2	1	2	-	-	-	-	-	1	-	2	2
CO4	1	-	1	1	-	-	-	-	-	-	-	-	-	-
CO5	1	-	1	1	-	-	-	-	-	-	-	-	-	-
Average	**1.0**	**1.5**	**1.3**	**1.0**	**2.5**	**-**	**-**	**-**	**-**	**-**	**1.0**	**-**	**2.0**	**2.0**

<table>
<tr><td>AY 2020-21 onwards</td><td colspan="1">J. B. Institute of Engineering and Technology (UGC Autonomous)</td><td colspan="4">B. Tech
IV Year–II Sem.</td></tr>
<tr><td>Course Code:J42OK</td><td rowspan="2">FUNDAMENTALS OF
E-COMMERCE
(Open Elective-IV)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: NIL

Course Objectives:

The students will

1. Introduction to information systems for business and management.
2. to familiarize students with organizational and managerial foundations of systems,
3. to understand the technical foundation for understanding information systems.
4. To get Electronic payment systems.
5. To familiarize with cyber laws and cyber money.

Module 1: Introduction to E Commerce

Unit 1:

E-Commerce Definitions, Business models related to E Commerce, Technical and Economical Challenges.

Unit 2:

Actors and stake holders, Fundamental Sales Process and Technological Elements.

Module 2: B2C Business

Unit 1:

The Process Model and its variants, Pricing Challenge, Fulfilment challenge, Payment Challenge.

Unit 2:

B2C Business and CRM, B2C Software Systems.

Module 3: B2B Business

The Process Model and its variants, B2B Software Systems.

Module 4: Impact of E-commerce and Security

Unit 1:

Ethics Morale and Technology, Ethical aspects of ICT, Overall impacts of E-Commerce, Foundations of Risk Management.

Unit 2:

Information Security Management(ISM) and Legal aspects of E-Commerce.

Module 5: Electronic Payment

Business and money, the payment challenges, payment procedures and cyber money.

Text Books:

1. Introduction to E-Commerce by Martin Kutz.

Reference Books:

1. Ravi Kalakota, Andrew B. Whinston, "Electronic Commerce-A Manager's guide", Addison-Wesley.

E-Resources:

1. https://nptel.ac.in/courses/110/105/110105083/

Course Outcomes:

The students will be able to

1. **Understand** the basic concepts and technologies used in the field of E-Commerce
2. **Have** the knowledge of the different types of Business Systems.
3. **Understand** the processes involved in E Business Systems.
4. **Be aware** of the ethical, social, and security issues.
5. **Have** knowledge with Cyber laws and EPS.

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***	
	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	1	2	2	-	1	-	-	-	-	-	1	-
CO2	1	1	2	2	2	-	1	-	-	-	-	-	2	-
CO3	1	3	3	3	3	-	2	-	-	-	-	-	2	-
CO4	-	2	2	2	1	-	1	-	-	-	-	-	-	-
CO5	1	2	1	1	1	-	1	-	-	-	-	-	2	-
Average	1	2	1.8	2	1.8	-	1.2	-	-	-	-	-	1.4	-

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech IV Year – II Sem			
Course Code:J42OL	**E-WASTE MANAGEMENT** (Open Elective-IV)	L	T	P	D
Credits: 3		3	0	0	0

Pre-requisite: NIL

Course Objectives:

The students will

1. Know regarding E-Waste Management in India Global E-Waste Growth
2. Analyze the overview of WEEE.
3. Understanding scenarios for E-Waste management.
4. Visualize the basic concepts of E-Waste Regulation
5. Understand the basic concepts of Recycling technologies.

Module 1:

Unit 1:

Introduction to e-Waste Management in India Global e-waste growth, Dark shadows of digitization on Indian horizon, e-waste generation, migration, Present practice and systems, disposal methods, Present processing practices.

Unit 2:

Initiatives to manage e-waste, Strengths and weaknesses of the current system.

Module 2:

Unit 1:

WEEE (waste electrical and electronic equipment) - toxicity and health Hazardous substances in waste electrical and electronic equipment-toxicity and release.

Unit 2:

Occupational and environmental health perspectives of e-waste recycling.

Module 3:

Unit 1:

Options and Scenarios for e-Waste Management Actions to be considered to achieve goals of ewaste management, Collection/ take back system,

Unit 2:

Closing the Plastic loop: Turning the supply chain into a supply cycle by mining plastics from end-of-life electronics and other durable goods.

Module 4:

Unit 1:

E-waste legislation in the European Union and the Basel Convention. Regulating e-waste: a review of the international and national legal framework on e-waste Extended producer responsibility: a key tool for international rules and regulations on e-waste.

Module 5:

Unit 1:

Recycling technologies for e-waste Recycling of e-scrap in a global environment opportunities and challenges.

Unit 2:

Technologies for recovery of resources from e-waste. Reuse:A Bridge from Unsustainable e-waste to sustainable e-resources.

Text Books:

1. Rakesh Johri, E-waste: Implications, regulations, and management in India and current global best practices.
2. Klaus Hieronymi, Ramzy Kahhat, Eric Williams, E-Waste Management: from Waste to Resource

Reference Books:

1. Satish Sinha, Priti Mahesh,Waste Electrical and Electronic Equipment The EU and India.
2. By Ronald E. Hester, Roy M. Harrison , Electronic Waste Management.

E-Resources:

1. https://nptel.ac.in/courses/105/105/105105169/

Course Outcomes:

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

1. **Demonstrate** knowledge of E-Waste management.
2. **Implementing** environmental health perspectives of E-Waste recycling.
3. **Achieve** goals of E-Waste management.
4. **Develop** the skills in E-Waste extended producer responsibility.

Describe the technologies for recovery of resources from E-Waste.**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***	
	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**	**1**	**2**	**2**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**1**	**-**
CO2	**1**	**1**	**2**	**2**	**2**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**2**	**-**
CO3	**1**	**3**	**3**	**3**	**3**	-	**2**	**-**	**-**	**-**	**-**	**-**	**2**	**-**
CO4	**-**	**2**	**2**	**2**	**1**	-	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO5	1	**2**	**1**	**1**	**1**	-	**1**	**-**	**-**	**-**	**-**	**-**	**2**	**-**
Average	1	2	1.8	2	1.8	-	1.2	-	-	-	-	-	1.4	-

<table>
<tr><td>AY 2020-21 onwards</td><td>J. B. Institute of Engineering and Technology (UGC Autonomous)</td><td colspan="4">B. Tech
IV Year –II Sem.</td></tr>
<tr><td>Course Code: J42OM</td><td rowspan="2">INTRODUCTION TO EMBEDDED SYSTEMS
(Open Elective-IV)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>AY 2020-21 onwards</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Basics Computer Knowledge

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 1: Embedded Computing: Introduction, complex systems and microprocessor, the embedded system design process, formalisms for system design, design examples
Unit 2 : 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 1: Basic Assembly Language Programming Concepts: The assembly language programming process, programming tools and techniques, programming the 8051.
Unit 2 : Data transfer and logical instructions, arithmetic operations, decimal arithmetic, jump and call instructions.

Module 3:
Unit 1: 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 2 : 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 1 : Embedded Software Development Tools: Host and target machines, linker/locators for embedded software, getting embedded software into the target system.
Unit 2 : Debugging Techniques: Testing on host machine, using laboratory tools, an example system.

Module 5:

Unit 1: Introduction to advanced Architectures: ARM and SHARC, processor and memory organization and instruction level parallelism.

Unit 2: 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:

Students will be able to

1. **Program** an embedded system
2. **Analyze** Interfacing with keyboard, A/D & D/A conversions, serial data Communication, LCD and LED display.
3. **Illustrate** Tasks, Semaphores, Message queues, pipes, Timer functions.
4. **Design** embedded systems and real-time systems
5. **Compare** and contrast ARM, SHARC, internet enabled systems.

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	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

<table>
<tr><td>AY 2020-21 onwards</td><td colspan="1">J. B. Institute of Engineering and Technology (UGC Autonomous)</td><td colspan="4">B. Tech
IV Year –II Sem.</td></tr>
<tr><td>Course Code:J42ON</td><td rowspan="2">INTRODUCTION TO NETWORK SECURITY
(Open Elective-IV</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Nil

Course Objectives:
The students will
1. Learn about Information security, security attacks, threats, services, and mechanisms and Application of each of confidentiality, integrity, and availability.
2. Know the principles of public key encryption and private key encryption and the algorithms used for both.
3. Master in E-mail security understand the algorithms PGP, MIME and S/MIME
4. Analyse IP Security architecture and understand concepts of SSL (Secure socket layer), TLS (transport layer security) and SET (secure electronic transactions)
5. Become familiar with the basic categories of threats to computers and networks.

Module 1:
Unit 1: Attacks on Computers and Computer Security:
Introduction, The need for security, Security approaches, Principles of security.
Unit 2 Security Cryptography:
Concepts and Techniques: Introduction, plain text and cipher text, substitution techniques, transposition techniques encryption and decryption, symmetric and asymmetric key cryptography, stenography, key range and key size, possible types of attacks.

Module 2:
Unit 1: Symmetric key Ciphesrs:
Block Cipher principles & Algorithms (DES, AES, Blowfish), Differential and Linear Crypt Analysis Block cipher modes of operation, Stream ciphers, RC4, Location and placement of encryption, function, Key distribution.

Unit 2: Asymmetric key Ciphers:
Principles of public key crypto systems, Algorithms (RSA, Diffie- Hellman, ECC), Key Distribution.

Module 3:
Unit 1: Message Authentication Algorithms and Hash Functions:
Authentication requirements, Functions, Message authentication codes, Hash Functions, Secure hash algorithm, Whirlpool, HMAC, CMAC, Digital signatures, knapsack algorithm.

Module 4:

Unit 1: Data visualisation:

Introduction, Types of data visualisation, Data for visualisation:

Unit 2: Data Types and Methods :

Data types, Data encodings, Retinal variables, mapping variables to encodings, Visual encodings.

Module 5:

Unit 1:Applications:

Applications of Data Science, Technologies for visualisation, Bokeh (Python), recent trends in various data collection and analysis techniques

Unit 2: Technologies:

Various visualization techniques, application development methods of used in data science.

Text Books:

1. Cathy O'Neil, Rachel Schutt, Doing Data Science, Straight Talk from The Frontline. O'Reilly, 2013.

Reference Books:

1. Jure Leskovek, AnandRajaraman, Jeffrey Ullman, Mining of Massive Datasets. V2.1, Cambridge University Press, 2014.

Web Resources:

1. https://www.tutorialspoint.com/information_security_cyber_law/network_security.htm
2. https://www.tutorialspoint.com/information_security_cyber_law/cyber_security_strategies.htm
3. https://www.tutorialspoint.com/information_security_cyber_law/index.htm
4. https://www.tutorialspoint.com/information_security_cyber_law/cyber_law_objectives.htm
5. https://www.tutorialspoint.com/information_security_cyber_law/introduction.htm
6. https://www.tutorialspoint.com/information_security_cyber_law/intellectual_property_right.htm
7. https://www.tutorialspoint.com/information_security_cyber_law/policies_to_mitigate_cyber_risk.htm
8. https://www.tutorialspoint.com/information_security_cyber_law/information_technology_act.htm

Course Outcomes:

Students will be able to

1. **Understand** cyber-attacks and types of cybercrimes.
2. **Summarize** Cyber Laws and Cyber Forensics.
3. **Understand** frauds in Wireless era.
4. **Analyze** and evaluate the cyber security needs of an organization.
5. **Outline** Data Privacy and privacy policies.

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	2	1	-	-	-	-	1		
CO2	-	-	2	-	1	2	-	-	-	-	-	1		
CO3	2	3	1	-	2	1	1	-	-	-	-	-		
CO4	2	2	2	-	-	-	1	-	-	-	-	1		
CO5	-	-	-	-	-	1	2	-	-	-	-	2		
Average	1.2	1.4	1.4	-	1	1.2	1	-	-	-	-	1		

<table>
<tr><td rowspan="1">AY 2020-21 onwards</td><td>J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B.Tech.
IV Year – II Sem</td></tr>
<tr><td>Course Code: J42OP</td><td rowspan="2">INTRODUCTION TO MINE ENVIRONMENT
(Open Elective-IV)</td><td>L</td><td>T</td><td>P</td><td>D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Pre-requisite: Nil

Course Objectives:
The students will
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
Unit - 1: Atmosphere and mine air composition. Origin of gases, properties, limitations of gases in underground mines

Module 2
Unit - 1: Spontaneous Combustion: Factors, control measures.
Unit - 2: Explosions: Causes of firedamp explosion, preventive measures against firedamp explosion.

Module 3
Unit - 1: Dust: Sources in underground and opencast mines, standards and control measures.

Module 4
Unit - 1: Miners diseases, Lighting standards in underground and opencast mines.

Module 5
Unit - 1: 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.

E-Resources:

1. https://www.ltu.se/cms_fs/1.124549!/file/rapport%20Environmental%20Aspects%20of%20mining_low.pdf
2. https://pubs.usgs.gov/pp/1802/b/pp1802b.pdf
3. https://www.elaw.org/files/mining-eia-guidebook/Chapter1.pdf

Course Outcomes:

The student will be able to:

1. **Learn** about atmospheric and mine air
2. **Learn** about spontaneous combustion and explosion in coal mines
3. **Understand** about dust sources and its control in mines
4. **Learn** about miners' diseases, mine lighting and its standards
5. **Learn** about reclamation of mines, impacts of mining on environment and sustainable mining

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	2	-	-	-	-	-	-	-	-	-	-	-
CO2	3	2	2	-	-	-	-	-	-	-	-	-	-	-
CO3	3	2	1	-	-	-	-	-	-	-	-	-	-	-
CO4	2	2	1	-	-	-	-	-	-	-	-	-	-	-
CO5	3	1	2	-	-	-	-	-	-	-	-	-	-	-
Average	3	2	1.6	-	-	-	-	-	-	-	-	-	-	-