ACADEMIC REGULATIONS

COURSE STRUCTURE AND

DETAILED SYLLABUS

ELECTRONICS & COMMUNICATION ENGINEERING

B.TECH 4 YEAR UG COURSE

(Applicable for the batches admitted from 2020-2021)

REGULATION: R20

(I, II, III & IV Year Syllabus)

INSTITUTE-VISION AND MISSION

VISION:

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

MISSION:

M1: To **provide** world class engineering education, encourage research and development.
M2: To **evolve** innovative applications of technology and develop entrepreneurship.
M3: To **mould** the students into socially responsible and capable leaders.

DEPARTMENT - VISION AND MISSION

VISION:

To be a guiding force enabling multifarious applications in Electronics and Communications Engineering, promote innovative research in the latest technologies to meet societal needs.

MISSION:

M1: To **provide** and strengthen core competencies among the students through expert training and industry interaction**.**
M2: To **promote** advanced designing and modeling skills to sustain technical development and lifelong learning in ECE.
M3: To **promote** social responsibility and ethical values, within and outside the department.

Program Educational Objectives (PEOs):	
PEO 1	Practice Technical skills widely in industrial, societal and real time applications.
PEO 2	Engage in the pursuit of higher education, delve into extensive research and development endeavors, and explore creative and innovative ventures in the domains of science, engineering, technology.
PEO 3	Exhibit professional ethics and moral values and capability of working with professional skills to contribute towards the need of industry and society.

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

Program Specific Outcomes (PSO)	
PSO1	Carry out the Analysis and Design different Analog & Digital Circuits with given specificaions
PSO2	Construct and test different communicatin systems for various applications

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	Elective Courses (EℓC)	PE – Professional Electives	Includes elective subjects related to the parent discipline/ department/ branch of Engineering.
8		OE – Open Electives	Elective subjects which include inter- disciplinary subjects or subjects in an area outside the parent discipline/ department/ branch of Engineering.
9		Seminar	Seminar/ 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.

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.

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:

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

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.

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

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

where ‘M’ is the total no. of subjects (as specifically required and listed under the course structure of the parent department) the student has ‘registered’ i.e., from the 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 studentis 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 & TECHNOLOGY

(UGC Autonomous)

BOS Approved Syllabus

for

R20 B. Tech Regulation

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

2020

J. B. INSTITUTE OF ENGINEERING AND TECHNOLOGY

(UGC Autonomous)

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

R20 B. Tech 4 Years Course Structure

I YEAR – I SEMESTER

S. No	Code	Course Title	L	T	P	D	Credits
1	J110A	Differential Equations and Calculus	3	1	0	0	4
2	J110E	Engineering Chemistry	3	0	0	0	3
3	J112A	Basic Electrical Engineering	3	0	0	0	3
4	J1121	Chemistry Lab	0	0	2	0	1
5	J1103	Basic Electrical Engineering Lab	0	0	2	0	1
6	J1191	Engineering and IT Workshop	0	0	4	0	2
7	J1131	Engineering Drawing	0	0	0	6	3
8	-	Induction Program	-	-	-	-	-
Total			**9**	**1**	**8**	**6**	**17**

I YEAR – II SEMESTER

S. No	Code	Course Title	L	T	P	D	Credits
1	J120A	Linear Algebra and Advanced Calculus	3	1	0	0	4
2	J120E	Semiconductor Physics	3	0	0	0	3
3	J125B	English	3	0	0	0	3
4	J125A	Programming for Problem Solving	3	0	0	0	3
5	J124A	Basic Electronics Engineering	3	0	0	0	3
6	J1203	Physics Lab	0	0	2	0	1
7	J1202	English Language and Communication Skills Lab	0	0	2	0	1
8	J1251	Programming for Problem Solving Lab	0	0	4	0	2
9	J1241	Basic Electronics Engineering Lab	0	0	2	0	1
10	J12M2	Gender Sensitization	2	0	0	0	0
		Total	**17**	**1**	**10**	**0**	**21**

J. B. INSTITUTE OF ENGINEERING AND TECHNOLOGY

(UGC Autonomous)

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

R20 B. Tech 4 Years Course Structure

II YEAR – I SEMESTER

S. No	Code	Course Title	L	T	P	D	Credits
1	J210A	Complex Variables and Special Functions	3	1	0	0	4
2	J214A	Analog Circuits	3	0	0	0	3
3	J214B	Digital Electronics	3	0	0	0	3
4	J214C	Signals and Systems	3	0	0	0	3
5	J214D	Probability Theory and Stochastic Process	3	0	0	0	3
6	J2141	Analog Circuits Lab	0	0	3	0	1.5
7	J2142	Basic Simulation Lab	0	0	3	0	1.5
8	J2143	Digital Electronics Lab	0	0	2	0	1
9	J2144	Internship-I	0	0	2	0	1
10	J21M2	Environmental Science	2	0	0	0	0
Total			**17**	**1**	**10**	**0**	**21**

II YEAR – II SEMESTER

S. No	Code	Course Title	L	T	P	D	Credits
1	J224A	Analog and Digital Communications	3	0	0	0	3
2	J224B	Electromagnetic Waves and Transmission Lines	3	0	0	0	3
3	J222E	Network Analysis	3	0	0	0	3
4	J222F	Linear Control Systems	3	0	0	0	3
5	J224D	Integral Transforms	3	0	0	0	3
6	J224E	Microprocessors and Microcontrollers	3	0	0	0	3
7	J2241	Network Analysis Lab	0	0	2	0	1
8	J2242	Analog and Digital Communications Lab	0	0	2	0	1
9	J2243	Microprocessors and Microcontrollers Lab	0	0	2	0	1
9	J22M1	Professional Ethics	2	0	0	0	0
10	J2201	Soft Skills	2	0	0	0	0
Total			**22**	**0**	**6**	**0**	**21**

J. B. INSTITUTE OF ENGINEERING AND TECHNOLOGY

(UGC Autonomous)

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

R20 B. Tech 4 Years Course Structure

III YEAR – I SEMESTER

S. No	Code	Course Title	L	T	P	D	Credits
1	J314A	Antenna and Wave Propagation	3	0	0	0	3
2	J314B	Digital Signal Processing	3	1	0	0	4
3	J314C	IC Applications	3	0	0	0	3
4	J31EA	Managerial Economics And Management Science	3	1	0	0	4
5	BTECE O1	Open Elective I	3	0	0	0	3
6	J3141	IC Applications Lab	0	0	2	0	1
7	J3142	Digital Signal Processing Lab	0	0	2	0	1
8	J3143	Internship – II	0	0	2	0	1
9	J31M1	Artificial Intelligence	2	0	0	0	0
10	J3101	Employability Skills	2	0	0	0	0
Total			**19**	**1**	**8**	**0**	**20**

f III YEAR – II SEMESTER

S. No	Code	Course Title	L	T	P	D	Credits
1	J325F	Computer Networks	3	0	0	0	3
2	J324A	Microwave Engineering	3	1	0	0	4
3	J324B	Mobile Communication & Networks	3	0	0	0	3
4	BTECEO2	Open Elective –II	3	0	0	0	3
5	BTECEE1	Professional Elective – I	3	0	0	0	3
6	BTECEE2	Professional Elective – II	3	0	0	0	3
7	J3241	Microwave Engineering Lab	0	0	2	0	1
8	J3201	Life Skills and Professional Skills Lab	0	0	4	0	2
9	J32M2	Cyber Security	2	0	0	0	0
Total			**20**	**1**	**6**	**0**	**22**

J. B. INSTITUTE OF ENGINEERING AND TECHNOLOGY

(UGC Autonomous)

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

R20 B. Tech 4 Years Course Structure

IV YEAR – I SEMESTER

S. No	Code	Course Title	L	T	P	D	Credits
1	J414A	VLSI Design	3	0	0	0	3
2	J414B	Electronic Measurements & Instrumentation	3	0	0	0	3
3	BTECE E3	Professional Elective-III	3	0	0	0	3
4	BTECE E4	Professional Elective-IV	3	0	0	0	3
5	BTECE E5	Professional Elective-V	3	0	0	0	3
6	BTECE O2	Open Elective –III	3	0	0	0	3
7	J4141	VLSI Design Lab	0	0	2	0	1
8	J4142	Project Stage-I	0	0	6	0	2
9	J4143	Industry Oriented Mini Project	0	0	4	0	2
Total			**15**	**0**	**16**	**0**	**23**

IV YEAR – II SEMESTER

S. No	Code	Course Title	L	T	P	D	Credits
1	BTECE E6	Professional Elective - VI	3	0	0	0	3
2	BTECE O4	Open Elective - IV	3	0	0	0	3
3	J4241	Project Stage - II	0	0	16	0	8
4	J4242	Seminar	0	0	2	0	1
Total			**6**	**0**	**18**	**0**	**15**

Year-wise Credit Distribution

Year	Credits
I	38
II	42
III	42
IV	38
TOTAL	**160**

Professional Elective Courses (PEC)

S. No	Code	Course Title	L	T	P	D	Credits
Professional Elective Course – I							
1	J324D	Television Engineering	3	0	0	0	3
2	J324E	Embedded Systems Design	3	0	0	0	3
3	J324F	Digital Image Processing	3	0	0	0	3
Professional Elective Course – II							
1	J324G	Cellular & Mobile Communication	3	0	0	0	3
2	J324H	Speech and Audio Processing	3	0	0	0	3
3	J324I	Computer Architecture	3	0	0	0	3
Professional Elective Course – III							
1	J414B	Image and Computer Vision	3	0	0	0	3
2	J414C	Low Power VLSI	3	0	0	0	3
3	J414D	Adaptive Signal Processing	3	0	0	0	3
Professional Elective Course – IV							
1	J414E	Embedded Real Time Operating Systems	3	0	0	0	3
2	J414F	Telecommunication Switching System & Networks (TSSN)	3	0	0	0	3
3	J414G	Fibre Optic Communications	3	0	0	0	3
Professional Elective Course – V							
1	J414H	Mixed Signal Design	3	0	0	0	3
2	J414I	Satellite Communication	3	0	0	0	3

3	J414J	Information Theory and Coding	3	0	0	0	3
Professional Elective Course – VI							
1	F424D	Wireless Sensor Networks	3	0	0	0	3
2	F424E	Radar System	3	0	0	0	3
3	F424F	Wavelet Signal Processing	3	0	0	0	3

Open Elective Courses (OEC) Offered by Dept. of ECE

S. No	Code	Course Title	L	T	P	D	Credits
Open Elective Course – I							
1	J31OG	Principles of Sensors and their Application	3	0	0	0	3
2	J31OH	Principles of Communications	3	0	0	0	3
Open Elective Course – II							
1	J32OG	Software Defined Radio	3	0	0	0	3
2	J32OH	Basics of IC Technology	3	0	0	0	3
Open Elective Course – III							
1	J41OG	Digital Systems Using VHDL	3	0	0	0	3
2	J41OH	MATLAB Programming Language	3	0	0	0	3
Open Elective Course – IV							
1	J42OG	Consumer Electronics	3	0	0	0	3
2	J42OH	Nano Electronics	3	0	0	0	3

J.B INSTITUTE OF ENGINEERING & TECHNOLOGY
AUTONOMOUS
Bhaskar Nagar, Moinabad(M), RR Dist., Telangana-500075

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

B INSTITUTE OF ENGINEERING & TECHNOLOGY
AUTONOMOUS
Bhaskar Nagar, Moinabad(M), RR Dist., Telangana-500075

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	Numerical 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

J.B INSTITUTE OF ENGINEERING & TECHNOLOGY
AUTONOMOUS
Bhaskar Nagar, Moinabad(M), RR Dist., Telangana-500075

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

J.B INSTITUTE OF ENGINEERING & TECHNOLOGY
AUTONOMOUS
Bhaskar Nagar, Moinabad(M), RR Dist., Telangana-500075

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

I Year- I Sem

. No	Code	Course Title	L	T	P	D	Credits
1	J110A	Differential Equations and Calculus	3	1	0	0	4
2	J110E	Engineering Chemistry	3	0	0	0	3
3	J112A	Basic Electrical Engineering	3	0	0	0	3
4	J1103	Chemistry Lab	0	0	2	0	1
5	J1121	Basic Electrical Engineering Lab	0	0	2	0	1
6	J1191	Engineering and IT Workshop	0	0	4	0	2
7	J1131	Engineering Drawing	0	0	0	6	3
8	-	Induction Program	-	-	-	-	-
Total			**9**	**1**	**8**	**6**	**17**

<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
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, 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/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:

On completion of the course, 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	3	1
CO2	3	3	2	3								3	3	1
CO3	3	2	3	3								2	2	
CO4	3	3	2	3								2	1	
CO5	3	3	2	2								2	1	2
Average	**3.0**	**2.8**	**2.2**	**2.8**								**2.4**	**2.0**	**1.3**

2020-21 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech:ECE I Year – I Sem			
Course Code: J110E	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 KMnO4 and chromic acid. Reduction reactions: reduction of carbonyl compounds using LiAlH4& NaBH4.

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:

On completion of the course, 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. Apply the concepts of electrochemistry and corrosion.
4. Identify the basic concepts of spectroscopy.
5. Prepare the 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	3			3										
CO2	3			3		3						2		
CO3	3			3		3						2		
CO4	3			2										
CO5	3			2	2									
Average	**3.0**			**2.6**	**2.0**	**3.0**						**2.0**		

AY 2020-21 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech:ECE I Year – I Sem			
Course Code: J112A	BASIC ELECTRICAL ENGINEERING (Common to EEE, ECE, CSE, IT & ECM)	L	T	P	D
Credits: 3		3	0	0	0

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:

Unit 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.

MODULE –II:

Unit I : 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 RLC series ombinations, resonance in series RLC circuit. Three phase balanced circuits, voltage and current relations in star and delta connections.

MODULE -III:

Unit I: 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: Unit I: 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: Unit I: 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:

On completion of the course, 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. Aquire the knowledge on components of low voltage electrical installation.

CO-PO/PSO Mapping Chart
(3/2/1 indicates strength of correlation)
3 – Strong; 2 – Medium; 1 - Weak

Course Outcomes (COs)	Program Outcomes (POs)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3												
CO2	3													
CO3	3		3	2										
CO4	3													
CO5	3													
Average	**3.0**	**3.0**	**3.0**	**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 :ECE
I Year – I Sem</td></tr>
<tr><td>Course
Code:
J1103</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:

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

1. Estimate the parameters like hardness and chloride content in water.
2. Determine the rate constant of a reaction from concentration – time relationships. .
3. Measure the physical properties like adsorption and viscosity. .
4. Evaluate the Rf values of some organic molecules by TLC technique. .
5. Determine the partition coefficient of a organic compound in two immissible liquids.

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													
CO3	3													
CO4	3													
CO5	3													
Average	**3.0**					**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: ECE
I Year – I Sem</td></tr>
<tr><td>Course Code: J1121</td><td 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:

1. To analyse a given network by applying various electrical laws and network theorems.
2. To know the response of electrical circuits for different excitations.
3. To calculate, measure and know the relation between basic electrical parameters.
4. To analyse the performance characteristics of DC and AC electrical machines

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 student will be able to

1. Demonstrate electrical circuits with basic electrical laws.
2. Use different types of electrical circuits to different excitations.
3. Calculate the measurements and relation between the basic electrical parameters.
4. Illustrate the basic characteristics of transformers.
5. Test the performance of various 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								3					
CO2	3	3							3					
CO3	3	3	2						3					
CO4	3		2						3					
Average	**3**	**3**	**2**						**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: ECE
I Year – I Sem</td></tr>
<tr><td>Course Code:
J1191</td><td rowspan="2">ENGINEERING AND IT WORKSHOP
(Common ECE, CSE, IT, ECM)</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. it's 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

TEXT BOOKS:

1. P. N. Rao, “Manufacturing Technology”, Tata McGraw Hill, 4th Edition, 2013.
2. K. C. John, “Mechanical Workshop Practice”, PHI Publishers, 2nd Edition, 2010.
3. IT Essentials PC Hardware and Software Companion Guide Third Edition by Davis Anfinson and Ken Quamme CISC Press, Pearson Education.
4. PC Hardware and A+ Handbook – Kate J. Chase PHI (Microsoft)

Course Outcomes:

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

1. Identify trades and techniques used in Workshop to 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*

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			3		
CO2	3		2		2				3			3		
CO3	3		3		2				3			3		
CO4	3		3		2				3			3		
CO5	3		2		2				3			3		
Average	**3.0**		**2.4**		**2.0**				**3.0**			**3.0**		

<table>
<tr><td>AY 2020-21 onwards</td><td>J. B. Institute of Engineering and Technology (UGC Autonomous)</td><td colspan="4">B. Tech: ECE
I Year – I Sem</td></tr>
<tr><td>Course Code: J1131</td><td rowspan="2">ENGINEERING DRAWING
(Common to ECE, CSE, IT, ECM)</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:

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

1. **Identify the principals --of engineering drawings.**
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		3											
CO2	3		2		2		2							
CO3	3				3		2							
CO4	3	3		3	2		3			2				
CO5	3	3		3	2					3				
Average	**3.0**	**3.0**	**2.5**	**3.0**	**2.3**		**2.3**			**2.5**				

I Year- II sem

S. No	Code	Course Title	L	T	P	D	Credits
1	J120A	Linear Algebra and Advanced Calculus	3	1	0	0	4
2	J120E	Semiconductor Physics	3	0	0	0	3
3	J120B	English	3	0	0	0	3
4	J125A	Programming for Problem Solving	3	0	0	0	3
5	J124A	Basic Electronics Engineering	3	0	0	0	3
6	J1203	Physics Lab	0	0	2	0	1
7	J1202	English Language and Communication Skills Lab	0	0	2	0	1
8	J1251	Programming for Problem Solving Lab	0	0	4	0	2
9	J1241	Basic Electronics Engineering Lab	0	0	2	0	1
10	J12M2	Gender Sensitization	2	0	0	0	0
		Total	**17**	**1**	**10**	**0**	**21**

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

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

<table>
<tr><td>AY 2020-21
Onwards</td><td>J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B.Tech :ECE
I Year – II Sem</td></tr>
<tr><td>Course
Code:
J120E</td><td rowspan="2">Semiconductor Physics
(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: 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:

On completion of the course, 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	2									3	2	
CO2	3	3	2									3	2	
CO3	2	2	2									3	2	
CO4	2	2	2									3	2	
CO5	3	2	2									3	2	
Average	**2.4**	**2.2**	**2.0**									**3.0**	**2.0**	

2020-21 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech :ECE I Year – II Sem			
Course Code: J120B	**ENGLISH (COMMON TO CE, ME, MIE& EEE)**	**L**	**T**	**P**	**D**
Credits: 2		**2**	**0**	**0**	**0**

Course Objectives: To learn

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 –I:

'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 – II:

'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 – III:

'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 – IV:
'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 – V:
'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. Sudarshana, N.P. and Savitha, C. (2018). English for Engineers. Cambridge University Press.

REFERENCES:

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.

Course Outcomes: At the end of this course 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 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	PSO1	PSO2
CO1								2		3		3		
CO2								2		3		3		
CO3								2		3		3		
CO4								3		3		3		
CO5								2		3		3		
Average								**2.2**		**3.0**		**3.0**		

<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 ECE
I Year – II Sem</td></tr>
<tr><td>Course Code: J125A</td><td colspan="4" rowspan="2">PROGRAMMING FOR PROBLEM SOLVING
(Common to ECE, CSE, IT & ECM)</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-Requisites:

1. Mathematical Knowledge.
2. Analytical Skills.

Course objectives:
The Student will:

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

Module 1:

INTRODUCTION TO PROGRAMMING:

Introduction to components of a computer system: disks, primary and secondary memory, processor, operating system, compilers, creating, compiling and executing a program etc., Number systems.
Introduction to Algorithms: steps to solve logical and numerical problems. Representation of Algorithm, Flowchart/Pseudo code with examples, Program design and structured programming.
Introduction to C Programming Language: variables (with data types and space requirements), Syntax and Logical Errors in compilation, object and executable code, Operators, expressions and precedence, Expression evaluation, Storage classes (auto, extern, static and register), type conversion, The main method and command line arguments
Bitwise operations: Bitwise AND, OR, XOR and NOT operators Conditional Branching and Loops: Writing and evaluation of conditionals and consequent branching with if, if-else, switch-case, ternary operator, goto, Iteration with for, while, do- while loops.I/O: Simple input and output with scanf and printf, formatted I/O, Introduction to stdin, stdout and stderr.

Module 2:

ARRAYS, STRINGS, STRUCTURES AND PREPROCESSOR:

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

Module 3:

POINTERS AND FILE HANDLING IN C:
Pointers: Idea of pointers, defining pointers, Pointers to Arrays and Structures, Use of Pointers in self-referential structures, usage of self-referential structures in linked list (no implementation) Enumeration data type.
Files: Text and Binary files, Creating and Reading and writing text and binary files, Appending data to existing files, Writing and reading structures using binary files, Random access using fseek, ftell and rewind functions.

Module 4:

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

Module 5:

INTRODUCTION TO ALGORITHMS:

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

Text Books:

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

Reference Books:

1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language,
2. Prentice Hall of India
3. R.G. Dromey, How to solve it by Computer, Pearson (16th Impression)
4. Stephen G. Kochan, Programming in C, Fourth Edition, Pearson Education.
5. Herbert Schildt, C: The Complete Reference, McGraw Hill, 4th Edition
6. 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 for problem solving.
2. Use arrays, strings, and structures in C programs.
3. Implement the concepts of file handling and dynamic memory allocation.
4. Decompose a problem into functions to develop modular and reusable code.
5. Apply searching and sorting algorithms.

CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 - Weak														
Course Outcomes (COs)	Program Outcomes (POs)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	3									2		
CO2	3	3										2		
CO3	3	3	3									2		
CO4	3	3	3									2		
CO5	3	2	2									2		
Average	3.0	2.6	2.8									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 ECE
I Year – II Sem</td></tr>
<tr><td>Course Code: J124A</td><td rowspan="2">(F214A) BASIC ELECTRONIC ENGINEERING
(COMMON TO ECE, ECM, CSE)</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:

On completion of this course the student will

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 1

UNIT - I: P-N Junction diode **(8 hours)**

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.

UNIT - 2 Rectifiers

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 2

UNIT -I Special Diodes: **(10 hours)**

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.

UNIT -2 : 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 3

Field Effect Transistors (FET) (6 hours)

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 4

Biasing and Analysis of Transistor amplifiers (10 hours)

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 5

Integrated circuit fabrication process (6 hours)

Basic Monolithic Integrated Circuits, Integrated Resistors, Capacitors & inductors Epitaxial growth Masking and Etching oxidation, diffusion, ion implantation, photolithography.Monolithic circuit layout, chemical vapor 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.
3. D. Neamen, D. Biswas "Semiconductor Physics and Devices," McGraw-Hill Education
4. S. M. Sze and K. N. Kwok, “Physics of Semiconductor Devices,” 3rd edition, John Wiley &Sons, 2006.
5. C.T. Sah, “Fundamentals of solid state electronics,” World Scientific Publishing Co. Inc1991.

COURSE OUTCOMES:

On completion of this course 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.

MAPPING OF CO's WITH PO's &PSO's

POs/ PSOs	a	b	C	e	k	h	J	f	d	g	h	i	j	k
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	3	3	2	2							3	3	2
CO2	3	3	3	2	2							3	3	2
CO3	3	3	3	2	2							3	3	
CO4	3	3	3	2	2							3	3	2
CO5	2	2	3	2	2							3	3	2
Average	**2.8**	**2.8**	**3.0**	**2.0**	**2.0**							**3.0**	**3.0**	**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 ECE
I Year – II Sem</td></tr>
<tr><td>Course Code:
J1203</td><td rowspan="2">PHYSICS LABORATORY
(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>

Course Objectives: Students will:

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.

Text Books:

1.Dr. Narendra, L. Mathakari,"Experiments in Applied Physics" (Physics Lab Manual 4^{th}edition) ,

" Engineering Physics Lab Resources" By Department of Physics JBIET.

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

1. Learn the experimental concepts on in LED, Electric and Electronic materials.
2. Get the knowledge of fundamentals of Semiconductor physics.
3. Design, characterization and study of properties of material help the students to prepare new materials for various engineering applications.
4. Expose to the phenomena of electromagnetism and also to have exposure on magnetic materials and dielectric materials..
5. Apply Lasers and fibre optics to various systems like communications, solar cell, photo cells and so on.

CO-PO/PSO Mapping 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	3	
CO2	3	3		2					3			3	2	
CO3	3	2	2	2					3			3	3	
CO4	3	2	2	2					3			3	2	
CO5	3	2	2	2					3			3	2	
Average	**3.0**	**2.4**	**2.0**	**2.0**					**3.0**			**3.0**	**2.4**	

<table>
<tr><td>20-21
onwards</td><td>J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B.Tech ECE
I Year – II Sem</td></tr>
<tr><td>Course
Code:
J1202</td><td rowspan="2">ENGLISH LANGUAGE AND
COMMUNICATION SKILLS LAB
(COMMON TO 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: To learn

To facilitate computer-assisted multi-media instruction enabling individualized and independent language learning

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:

Exercise – I:

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.

Exercise – II:

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.

Exercise – III:

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.

Exercise – IV:

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.

Exercise – V:

CALL Lab:

Understand :Listening for Specific Details.

Practice: Listening Comprehension Tests.

ICS Lab:

Understand: Interview Skills.

Practice: Mock Interviews.

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 attain.

1. Develop correct pronunciation.
2. Use stress and intonation properly while speaking and writing.
3. Develop listening skills.
4. Acquire public speaking skills and structured talks.
5. Acquire debating and oral presentation skills.

CO-PO/PSO Mapping Chart 3/2/1 indicates the strength of the calculation 3-Strong, 2-Medium, 1-Low														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes***	
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1									3	3		3		
CO2									3	3		3		
CO3									3	3		3		
CO4									3	3		3		
CO5									3	3		3		
Average									**3.0**	**3.0**		**3.0**		

<table>
<tr><td>AY 2020-21
onwards</td><td>J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B.Tech ECE
I Year – II Sem</td></tr>
<tr><td>Course Code:
J1251</td><td rowspan="2">PROGRAMMING FOR PROBLEM SOLVING LAB
(common to ECE, CSE, IT & ECM)</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-Requisites:

1. Mathematical Knowledge.
2. Analytical Skills.

Course objectives:

The Student will:

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

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 sequenc are 0 and 1. Subsequent terms are found by adding the preceding two terms in th 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. The file name 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 same in both directions with or without a meaning like madam, civic, noon, abcba, etc.)
b) Write a C program to count the lines, words and characters in a given text.

6. SORTING AND SEARCHING:

a) Write a C program for using binary search method.
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 number is palindrome.
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 dimension array.
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 of names.

Reference Books:

1. B.A. Forouzan and R.F. Gilberg C Programming and Data Structures, Cengage Learning, (3^{rd}Edition)
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 (16^{th}Impression)
4. Stephen G. Kochan, Programming in C, Fourth Edition, PearsonEducation.
5. Herbert Schildt, C: The Complete Reference, McGrawHill, 4^{th}Edition

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. Formulate the algorithms for problem solving.
2. Identify syntax errors and rectify.
3. Implement the concepts of arrays, strings, and structures.
4. Implement the modular design using functions.
5. Interpret text and binary file handling.

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		
CO2	3	2							3			2		
CO3	3	2							3			2		
CO4	3	2							2			2		
CO5	3	2							2			2		
Average	**3.0**	**2.0**							**2.6**			**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 ECE
I Year – II Sem</td></tr>
<tr><td>Course Code:
J1241</td><td rowspan="2">(E2111) BASIC ELECTRONICS ENGINEERING LAB
(COMMON TO ECE, ECM, CSE)</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

On completion of this course the student will

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

On completion of this course the student 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		2						3	2	2
CO2	2			2								3	2	3
CO3	3	3	3	3	2							3	2	
CO4	3	3	3	3	2							3	2	2
CO5	3	3	3	2	2							3	2	
Average	2.6	3.0	3.0	2.4	2.0	2.0						3.0	2.0	2.3

<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 ECE
I Year – II Sem</td></tr>
<tr><td>Course Code:
J12M2</td><td colspan="4" rowspan="2">GENDER SENSITIZATION
(An Activity-based Course)
(Common to CSE, IT, ECE, & ECM)</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: To learn.

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

Module-I: UNDERSTANDING GENDER AND BIOLOGY-1

Gender: Why Should We Study It? (*Towards a World of Equals*: Unit -1)
Socialization: Making Women, Making Men (*Towards a World of Equals*: Unit -2)
Introduction. Preparing for Womanhood. Growing up Male. First lessons in Caste. Different Masculinities.

Module-II: UNDERSTANDING GENDER AND BIOLOGY-2

Missing Women: Sex Selection and Its Consequences (*Towards a World of Equals*: Unit -4)
Declining Sex Ratio. Demographic Consequences.

Gender Spectrum: Beyond the Binary (*Towards a World of Equals*: Unit -10)
Two or Many? Struggles with Discrimination.

Module – III: GENDER AND LABOUR

Housework: The Invisible Labour (*Towards a World of Equals*: Unit -3)
"My Mother doesn't Work." "Share the Load."

Women's Work: Its Politics and Economics (*Towards a World of Equals*: Unit -7)
Fact and Fiction. Unrecognized and Unaccounted work. Additional Reading: Wages and Conditions of Work.

Module – IV: ISSUES OF VIOLENCE-1
Sexual Harassment: Say No! (*Towards a World of Equals*: Unit -6)
Sexual Harassment, not Eve-teasing- Coping with Everyday Harassment- Further Reading: "*Chupulu"*.

Domestic Violence: Speaking Out (*Towards a World of Equals*: Unit -8)

Is Home a Safe Place? -When Women Unite [Film]. Rebuilding Lives. Additional Reading: New Forums for Justice.

Thinking about Sexual Violence (*Towards a World of Equals*: Unit -11)

Blaming the Victim- "I Fought for my Life…." - Additional Reading: The Caste Face of Violence.

Module – V: 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:

Essential Reading: All the Units in the Textbook, **"*Towards a World of Equals: A Bilingual Textbook on Gender*"** written by A.Suneetha, Uma Bhrugubanda, Duggirala Vasanta, Rama Melkote, Vasudha Nagaraj, Asma Rasheed, Gogu Shyamala, Deepa Sreenivas and Susie Tharu.

Course outcomes: At the end of this course students 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. Accept gender differences as positives rather than deterrents.
5. Create awerness about socialization of men and women.

Course Articulation Matrix:

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						3		3	3			3		
CO3						3		3	3			3		
CO4						3		3	3			3		
CO5						3		3	3			3		
Average						3.0		3.0	3.0			3.0		

II Year- I sem

S. No	Code	Course Title	L	T	P	D	Credits
1	J210A	Complex Variables and Special Functions	3	1	0	0	4
2	J214A	Analog Circuits	3	0	0	0	3
3	J214B	Digital Electronics	3	0	0	0	3
4	J214C	Signals and Systems	3	0	0	0	3
5	J214D	Probability Theory and Stochastic Process	3	0	0	0	3
6	J2141	Analog Circuits Lab	0	0	3	0	1.5
7	J2142	Basic Simulation Lab	0	0	3	0	1.5
8	J2143	Digital Electronics Lab	0	0	2	0	1
9	J2144	Internship-I	0	0	2	0	1
10	J21M2	Environmental Science	2	0	0	0	0
Total			**17**	**1**	**10**	**0**	**21**

<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:ECE
II Year – I Sem</td></tr>
<tr><td>Course Code:
J210A</td><td rowspan="2">Complex Variables and Special Functions
(COMMON TO EEE, ECE& ECM)</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. 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, 8th 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, 5th 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:

On completion of the course, 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="1">J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B.Tech:ECE
II Year – I Sem</td></tr>
<tr><td>Course Code:
J214A</td><td rowspan="2">ANALOG CIRCUITS
(COMMON TO EEE, ECE& 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: The Student will:

1. Understand the concept of high frequency multistage amplifiers and power amplifiers.
2. Learn the Different types of negative and positive feedback amplifier topologies.
3. Analysis of various Multivibrators.
4. Design of Timebase Generators.
5. Understand the concepts of Synchronization and Sweep Circuits.

Course outcomes: The student will be able to:

1. Design the Low frequency, High frequency Multi stage amplifiers and Power amplifiers.
2. Determine the gain, input and output resistance of different negative feedback amplifiers and design different types Oscillators.
3. Acquire Knowledge on Different types of Multivibrators.
4. Design of Timebase Generators.
5. Learn the concepts of Synchronization and Sweep Circuits.

MODULE 1:

Unit – 1: MULTISTAGE AMPLIFIERS

High frequency AC analysis of Common-Emitter BJT amplifier configuration using hybrid-π model, frequency response of Multi-stage amplifier configurations: CE - CE, CE - CC amplifiers- cascode amplifier.

Unit-2: POWER AMPLIFIERS: Various classes of operation (Class A, B, AB, C etc.), their power efficiency and linearity issues. calculation with practical circuits.

MODULE 2:

Unit-1: NEGATIVE FEEDBACK IN AMPLIFIERS AND OSCILLATORS

Feedback topologies: Voltage series, current series, voltage shunt, current shunt, effect of feedback on gain, bandwidth etc., Voltage amplifier, Current amplifier, Trans-conductance amplifier and trans-resistance amplifier.

Unit-2: OSCILLATORS

Review of the basic concept, Barkhausen criterion, RC oscillators (phase shift, Wien bridge etc.), LC oscillators (Hartley, Colpitts, Clapp etc.).

MODULE 3:

Unit –1: MULTIVIBRATORS
Analysis and Design of Bistable, Monostable, Astable Multivibrators and Schmitt trigger using Transistors.

MODULE 4:
Unit -1: TIME BASE GENERATORS
General features of a Time base Signal, Methods of Generating Time Base Waveform, Miller and Bootstrap Time base Generators-Basic Principles, Transistor Miller Time Base generator, UJT as relaxation oscillator, Transistor Bootstrap Time Base Generator, Transistor Current Time Base Generators.

MODULE 5:
Unit -1: SYNCHRONIZATION AND FREQUENCY DIVISION
Pulse Synchronization of Relaxation Devices, Frequency division in Sweep Circuit, Stability of Relaxation Devices, Astable Relaxation Circuits, Monostable Relaxation Circuits, Synchronization of a Sweep Circuit with Symmetrical Signals, Sine wave frequency division with a Sweep Circuit, A Sinusoidal Divider using Regeneration and Modulation.

TEXT BOOKS:

1. Electronic Devices and Circuits, Jacob Millmann and Halkias,TMH.
2. P. Horowitz and W. Hill, The Art of Electronics, 2nd edition, Cambridge University Press, 1989.
3. A.S. Sedra and K.C. Smith, Microelectronic Circuits, Saunder's College11 5. Publishing, Edition IV 6.
4. Millman's Pulse, Digital and Switching Waveforms –J. Millman, H. Taub., 2 ed., 2008, TMH.
5. Millman's Pulse, Digital and Switching Waveforms –J. Millman, H. Taub and Mothiki S. Prakash Rao, 2 ed., 2008, TMH

REFERENCES:

1. Electronic Circuit Analysis – K. Lal Kishore, BS Publications, 2004.
2. Electronic Devices and Circuits, Anil.K. Maini, Varsha Agrawal, 1st Edition, WILEY.
3. Pulse and Digital Circuits- B.N.Yoga Narasimha,
4. Pulse and Digital Circuits-Anand Kumar, PHI,Second Edition.

CO-Articulation Matrix														
CO-PO/PSO Mapping Chart 3/2/1 indicates the strength of the calculation 3-Strong, 2-Medium, 1-Low														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes***	
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3		3										3	
CO2	3.0	3.0											3	
CO3	3.0		3										3	
CO4	3.0													
CO5	2.0												3	
Average	**2.8**	**3.0**	**3.0**										**3.0**	

<table>
<tr><td>AY 2020-21 onwards</td><td>J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="3">B.Tech:ECE
II Year – I Sem</td></tr>
<tr><td>Course Code: J214B</td><td rowspan="2">DIGITAL ELECTRONICS</td><td>L</td><td>T</td><td>P/D</td></tr>
<tr><td>Credits: 3.</td><td>3</td><td>0</td><td>0/0.</td></tr>
</table>

Pre-requisite: Nil

Course Objectives:

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 II: 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

Unit I: Design of Half and Full Adders, Half and Full Subtractors, Binary Parallel Adder – Carry look ahead Adder, BCD Adder.
Unit II: 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. 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. Guttmann, "Digital Electronics- An introduction to theory and practice", PHI, 2^{nd} edition ,2006

E Resources:

http://www.inf.fu-berlin.de/lehre/WS00/19504-V/Chapter1.pdf

https://nptel.ac.in/courses/108/105/108105113/

Course Outcomes:

On completion of this course the student will be able to

1. **Understand various number systems and different binary codes, Demonstrate the basic theorems of Boolean algebra, logic gates, combinational and Sequential circuits**
2. **Apply** Boolean Algebra and K-Maps to minimize Boolean functions
3. Realize combinational circuits; learn basic sequential logic components such as SR Latch, D Flip-Flop, JK Flip-Flop and their usage.
4. **Analyze the design procedures of combinational & sequential logic circuits including FSMs**
5. Classify different logic families and interface, Semiconductor memories and PLD devices.

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										1	1	
CO3	2	2	2										2	
CO4	2	2	3										2	
CO5	3	3											1	
Average	**2.6**	**2.2**	**2.5**									**1.0**	**1.6**	

<table>
<tr><td rowspan="2">AY 2020-21
Onwards</td><td rowspan="2">J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B.Tech-ECE
II Year – I Sem</td></tr>
<tr></tr>
<tr><td>Course Code:
J214C</td><td rowspan="2">SIGNALS AND SYSTEMS</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: Mathematics

Course Objectives:

This course will enable students to:

1. Compare and represent various continuous and discrete-time signals and systems.
2. Emphasize on the concept and methods necessary for analysis of continuous time signals and systems.
3. Gain more familiarity with different types of transformation and their properties which include Fourier Transform, Laplace Transform and Z-Transform.
4. Get additional insight of sampling technique into various applications of signals and systems in different fields.

Module 1

Unit-1: Introduction to Signals and Systems

Types of signals: Energy and power signals, continuous and discrete time signals, continuous and discrete amplitude signals. System properties: linearity, additivity, homogeneity, shift-invariance, causality, stability, reliability. Linear Shift-Invariant (LSI) systems, characterization of causality and stability of LSI systems.

Unit-2: Signal Analysis

Analogy between Vectors and Signals, Orthogonal Signal Space, Signal approximation using Orthogonal functions, Mean Square Error, Closed or complete set of Orthogonal functions, Orthogonality in Complex functions, Exponential and Sinusoidal signals, Concepts of Impulse function, Unit Step function, Signum function.

Module 2

Unit-1: Fourier Analysis

Continuous time periodic signals, Fourier series representation. Trigonometric Fourier Series and Exponential Fourier Series, Properties of Fourier Series, Dirichlet's conditions, Complex Fourier spectrum.

Unit-2: Fourier Transform

Fourier Transform of arbitrary signal, standard signals, periodic signals, Fourier Transforms involving Impulse function and Signum function, Properties of Fourier Transform, Introduction to Hilbert Transform.

Module 3

Unit-1: Laplace Transforms

Review of Laplace Transforms (LT), Concept of Region of Convergence (ROC), Constraints on ROC for various classes of signals, Inverse Laplace Transform, Partial fraction expansion method for inverse LT. Properties of LT, Relation between LT and Fourier Transform.

Unit-2: Signal Transmission through Linear Systems

Transfer function of an LTI system, Filter characteristics of Linear Systems, Distortion less transmission through a system, Signal bandwidth, System bandwidth, Causality and Paley-Wiener criterion for physical realization.

Module 4

Unit-1: Convolution and Correlation of Signals

Concept of convolution in Time domain and Frequency domain, Graphical representation of Convolution, Cross Correlation and Auto Correlation of functions, Properties of Correlation function. Relation between Auto Correlation function and Energy/Power spectral density function

Unit-2: Detection of signals from Noise

Detection of periodic signals in the presence of Noise by Correlation, Extraction of signal from noise by filtering.

Module 5

Unit-1: Sampling

Sampling theorem, graphical and analytical proof for Band Limited Signals, Impulse Sampling, Natural and Flat top Sampling, Reconstruction of signal from its samples, Effect of under sampling, aliasing, Introduction to Band Pass sampling.

Unit-2: Z-Transforms

Z-Transform of a Discrete Time Sequence, concept of Region of Convergence (ROC), constraints on ROC for various classes of signals, Relation between Laplace, Fourier and Z-Transforms, Inverse Z-Transforms, Properties of Z-Transforms

Text Books:

1. "Signals, Systems & Communications" - B.P. Lathi, 2009, BSP
2. "Signals and Systems" – A. Rama Krishna Rao – 2008, TMH.

Reference Books:

1. "Fundamentals of Signals and Systems" - Michel J. Robert, 2008, MGH International Edition.
2. "Signals and Systems" - A.V. Oppenheim, A.S. Willsky and S.H. Nawab, 2nd ed., PHI
3. "Signals & Systems" - Simon Haykin and Van Veen,Wiley, 2nd ed. Wiley.

E - Resources:

1. https://ocw.mit.edu/resources/res-6-007-signals-and-systems-spring-2011/lecture-notes/
2. http://nptel.ac.in/courses/117101055
3. http://nptel.ac.in/courses/117104074
4. http://www.tutorialspoint.com/signals_and_systems/
5. https://www.academia.edu/37486178/Signals_and_Systems_2nd_Edition_by_Oppenheim_
6. https://mlichouri.files.wordpress.com/2013/10/fundamentals-of-signals-and-systems.pdf
7. http://ieeexplore.ieee.org/xpl/mostRecentIssue.jsp?reload=true&punumber=78
8. http://ieeexplore.ieee.org/xpl/RecentIssue.jsp?punumber=8919
9. http://ieeexplore.ieee.org/xpl/RecentIssue.jsp?punumber=82

10. https://www.globalspec.com/reference/81785/203279/digital-signal-processing-fundamentals-and-applications

Course Outcomes:

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

1. Understand signals and systems based on their characteristics.
2. Develop various transform techniques to analyze continuous time and discrete time signals.
3. State the conditions for transmission of signals through systems and importance of physical realization.
4. Apply operations such as convolution and correlation for continuous and discrete time system.
5. Explain the concept of sampling process and its importance in 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	3												2
CO2	3	3												2
CO3	3	3												2
CO4	3	3												2
CO5	3	3												2
Average	**2.8**	**3.0**												**2.2**

<table>
<tr><td>2020-21</td><td>J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B.Tech ECE
II Year – I Sem</td></tr>
<tr><td>Course Code:
J214D</td><td rowspan="2">PROBABILITY THEORY AND STOCHASTIC PROCESS</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: Probability, Differentiation, Integration

Course Objectives:

1. Understand mathematical background and sufficient experience so that the student can read, write, and prepare sentences in the language of probability theory, as well as solve probabilistic problems in signal processing and Communication Engineering.
2. Be introduced to the basic methodology of "probabilistic thinking" and to apply it to problems
3. Understand basic concepts of probability theory and random variables, how to deal with multiple random variables, Conditional probability and conditional expectation, joint distribution and independence, mean square estimation.
4. Analysis of random process and application to the signal processing in the communication system.
5. Learn how to apply sums and integrals to compute probabilities, means, and expectations

Module 1

Unit-1: Probability and Random Variable

Probability: Set theory, Experiments and Sample Spaces, Discrete and Continuous Sample Spaces, Events, Probability Definitions and Axioms, Mathematical Model of Experiments, Joint Probability, Conditional Probability, Total Probability, Bayes‘ Theorem, and Independent Events, Bernoulli‘s trials.

Unit-2:

The Random Variable: Definition of a Random Variable, Conditions for a Function to be a Random Variable, Discrete and Continuous, Mixed Random Variable

Module 2

Unit-1: Distribution and density functions and Operations on One Random Variable

Distribution and density functions: Distribution and Density functions, Properties, Binomial, Poisson, Uniform, Exponential Gaussian, Rayleigh and Conditional Distribution, Methods of defining Conditioning Event, Conditional Density function and its properties, problems.

Unit-2:

Operation on One Random Variable: Expected value of a random variable, function of a random variable, moments about the origin, central moments, variance and skew, characteristic function, moment generating function, transformations of a random variable, monotonic transformations for a continuous random variable, non monotonic transformations of continuous random variable, transformations of discrete random variable

Module 3

Unit-1: Multiple Random Variables and Operations on Multiple Random Variables

Multiple Random Variables: Vector Random Variables, Joint Distribution Function and Properties, Joint density Function and Properties, Marginal Distribution and density Functions, conditional Distribution and density Functions, Statistical Independence, Distribution and Density functions of Sum of Two Random Variables and Sum of Several Random Variables, Central Limit Theorem - Unequal Distribution, Equal Distributions, Markov, Chebyshev and Chernoff bounds.

Unit-2:

Operations on Multiple Random Variables: Expected Value of a Function of Random Variables, Joint Moments about the Origin, Joint Central Moments, Joint Characteristic Functions, and Jointly Gaussian Random Variables: Two Random Variables case and N Random Variable case, Properties, Transformations of Multiple Random Variables.

Module 4

Unit-1: Stochastic Processes-Temporal Characteristics

The Stochastic process Concept, Classification of Processes, Deterministic and Nondeterministic Processes, Distribution and Density Functions, Statistical Independence and concept of Stationary: First-Order Stationary Processes, Second-Order and Wide-Sense Stationary, Nth-Order and Strict-Sense Stationary, Time Averages and Ergodicity, Mean-Ergodic Processes, Correlation-Ergodic Processes Autocorrelation Function and Its Properties, Cross-Correlation Function and Its Properties, Covariance Functions and its properties, Gaussian Random Processes.

Linear system Response: Mean and Mean-squared value, Autocorrelation, Cross-Correlation Functions.

Module 5

Unit-1: Stochastic Processes-Spectral Characteristics

The Power Spectrum and its Properties, Relationship between Power Spectrum and Autocorrelation Function, the Cross-Power Density Spectrum and Properties, Relationship between Cross-Power Spectrum and Cross-Correlation Function.

Unit-2:

Spectral characteristics of system response: power density spectrum of response, cross power spectral density of input and output of a linear system

Text Books:

1. Probability, Random Variables & Random Signal Principles -Peyton Z. Peebles, TMH, 4th Edition,2001.
2. Probability and Random Processes-Scott Miller, Donald Childers, 2Ed,Elsevier,2012

References Books:

1. Theory of probability and Stochastic Processes-Pradip Kumar Gosh, UniversityPress
2. Probability and Random Processes with Application to Signal Processing - Henry Stark and John W. Woods, Pearson Education, 3rdEdition.
3. Probability Methods of Signal and System Analysis- George R. Cooper, Clave D. MC Gillem, Oxford, 3rd Edition,1999.

E - Resources:

1. https://nptel.ac.in/courses/111/102/111102111/

Course Outcomes:

The Student will be able to:

1. Apply the fundamentals of probability theory & problems, Describe applications of random variables.
2. Educate statistical properties & operations on Single random variables.
3. To Study statistical properties on multiple random variables.
4. Determine the temporal & stochastic characteristics of Random process.
5. Analyze problems on spectral density function & linear time invariant 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	2	1	-	-	-	-	-	-	-	-	-	-	1
CO2	2	2	2	-	-	-	-	-	-	-	-	-	-	2
CO3	2	2	2	-	-	-	-	-	-	-	-	-	-	1
CO4	2	2	-	2	-	-	-	-	-	-	-	-	2	-
CO5	3	2	2	-	-	1	-	-	-	-	-	-	-	1
Average	**2.2**	**2.0**	**1.8**	**2.0**		**1.0**							**2.0**	**1.0**

<table>
<tr><td>2020-21</td><td>J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B.Tech ECE
II Year – I Sem</td></tr>
<tr><td>Course Code:
J2141</td><td rowspan="2">ANALOG 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>

Minimum Twelve experiments to be conducted:
Design(any six) and Simulation (any six) using Multisim or Pspice or Equivalent Simulation Software:

List of the Experiments:

1. Common Emitter Amplifier (Simulation)
2. Common Collector Amplifier (Simulation)
3. Two Stage RC Coupled Amplifier
4. Current Series and Voltage Shunt Feedback Amplifier
5. Class B Complementary Symmetry Amplifier
6. Class A Power Amplifier (Transformer less)
7. RC Phase Shift, Wien Bridge Oscillator using Transistors
8. Hartley and Colpitt's Oscillator
9. Bistable Multivibrator.
10. Monostable Multivibrator.
11. Astable Multivibrator.
12. Schmitt Trigger.
13. Bootstrap Sweep Circuit

Equipments required for Laboratories:

1. For Hardware design of Electronic Circuits
    - RPS
    - CRO
    - Function Generators
    - Multimeters
2. For Software simulations of Electronic Circuits
    - Computer Systems with Latest Specifications.
    - Connected in Lan (Optional).

- Operating Systems Windows XP.
- Simulation Software (Multisim/Tinaroo) Package.

Course Outcomes:

The student will be able to:

1. Analyze different types of Multistage Amplifiers.
2. Determine performance of Positive and Negative Feedback Amplifiers.
3. Evaluate efficiency of Different Power Amplifiers.
4. Analyze the various Multivibrators.
5. Develop the applications using Timebase generators.

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	3	3	2	2								2	2	2
CO3	3	3	1	2								3	3	3
CO4	3	3	2	2								3	3	3
CO5		3	3	3								3	3	3
Average	**3.0**	**3.0**	**2.0**	**2.4**								**2.8**	**2.8**	**2.8**

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech II Year – ISem		
Course Code: J2142	**BASIC SIMULATION LAB**	**L**	**T**	**P/D**
Credits: 1.5		0	3	0

Course objectives: On completion of this Lab the student will:

1. gain fundamentals of MATLAB tool for the analysis and processing of signals and to generate various continuous and discrete time signals.
2. determine the frequency domain analysis of signals and to convert a continuous time signal to the discrete time and reconstruction using the sampling theorem.
3. gain the knowledge about continuous time LTI/LTV systems using convolution.
4. Use Laplace and Z-transforms for analyzing system function of different systems with pole zero plot (ROC).
5. To analyze the different type of transformation techniques like bilinear, impulse invariant etc.

List of Programmes:

1. Basic Operations on Matrices.
2. Generation of Various Signals and Sequences (Periodic and Aperiodic), such as Unit Impulse, Unit Step, Square, Saw tooth, Triangular, Sinusoidal, Ramp, Sinc.
3. Operations on Signals and Sequences such as Addition, Multiplication, Scaling, Shifting, Folding, Computation of Energy and Average Power.
4. Finding the Even and Odd parts of Signal/Sequence and Real and Imaginary parts of Signal.
5. Convolution between Signals and sequences.
6. Auto Correlation and Cross Correlation between Signals and Sequences.
7. Verification of Linearity and Time Invariance Properties of a given Continuous/Discrete System.

8. Computation of unit sample, unit step and sinusoidal responses of the given LTI system and verifying its physical realiazability and stability properties.
9. Gibbs Phenomenon
10. Finding the Fourier Transform of a given signal and plotting its magnitude and phase spectrum.
11. Waveform Synthesis using Laplace Transform.
12. Generation of Gaussian noise (Real and Complex), Computation of its mean, M.S. Value and its Skew, Kurtosis, and PSD, Probability Distribution Function.
13. Sampling Theorem Verification.
14. Removal of noise by Autocorrelation / Cross correlation.
15. Extraction of Periodic Signal masked by noise using Correlation.
16. Verification of Weiner-Khinchine Relations.
17. Checking a Random Process for Stationarity in Wide sense.

SOFTWARE REQUIRED: MATLAB/OCTAVE

Web Resources:

- https://nptel.ac.in/courses/108/104/108104100/
- https://nptel.ac.in/courses/117/101/117101055/
- https://nptel.ac.in/courses/108/101/108101113/
- https://nptel.ac.in/courses/108/102/108102096/

Course outcomes: After completing this lab the student will be able to:

1. analyze the generation of various signals and sequences in MATLAB, including the operations on Signals and Sequences.
2. determine the Convolution and Correlation between Signals and sequences.
3. verify the Linearity, Time Invariance and Stability Properties of a given Continuous/Discrete System.
4. analyze the Waveform Synthesis using Fourier, Laplace and Z-Transform.
5. locate the Zeros and Poles and plotting the Pole-Zero maps in S-plane and Z-Plane for the given transfer function.

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	3	2			3									2
CO3	3	2	2		3							2		3
CO4	3	2	2		3							2		3
CO5	3				3									3
Average	**3.0**	**2.0**	**2.0**		**3.0**							**2.3**		**2.8**

<table>
<tr><td>AY 2020-21
Onwards</td><td>J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="3">B.Tech:ECE
II Year – I Sem</td></tr>
<tr><td>Course Code:
J2143</td><td rowspan="2">DIGITAL ELECTRONICS LAB</td><td>L</td><td>T</td><td>P/D</td></tr>
<tr><td>Credits: 1.</td><td>0</td><td>0</td><td>2/0.</td></tr>
</table>

Pre-requisite: Nil

Course Objectives: On completion of this laboratory 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

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: On completion of this laboratory the student will

1. Understand the truth tables of logic gates, different Combinational & Sequential circuits.
2. Construct Boolean functions using logic gates.
3. Analyze different Combinational & Sequential circuits.
4. Design different combinational &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***	
	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									1	
CO2	1			3									2	
CO3	2				2							2		2
CO4	1		1		2							2	1	
Average	**1.5**		**1.0**	**3.0**	**2.0**							**2.0**	**1.3**	**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:ECE
I Year – II Sem</td></tr>
<tr><td>Course Code: J21M2</td><td rowspan="2">ENVIRONMENTAL SCIENCE
(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. 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 Erach Bharucha 2005, University Grants Commission, University Press**

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. 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		
CO2						3	3					2		
CO3	3	3	2	2			1					1		
CO4	3	3	2	2			1					1		
CO5						3	3					2		
Average	3.0	3.0	2.0	2.0		3.0	1.8					1.4		

II Year- II sem

S. No	Code	Course Title	L	T	P	D	Credits
1	J224A	Analog and Digital Communications	3	0	0	0	3
2	J224B	Electromagnetic Waves and Transmission Lines	3	0	0	0	3
3	J222E	Network Analysis	3	0	0	0	3
4	J222F	Linear Control Systems	3	0	0	0	3
5	J224D	Numerical Solution of Ordinary Differential Equations	3	0	0	0	3
6	J224E	Microprocessors and Microcontrollers	3	0	0	0	3
7	J2241	Network Analysis Lab	0	0	2	0	1
8	J2242	Analog and Digital Communications Lab	0	0	2	0	1
9	J2243	Microprocessors and Microcontrollers Lab	0	0	2	0	1
10	J22M1	Professional Ethics	2	0	0	0	0
11	J2201	Soft Skills	2	0	0	0	0
Total			**22**	**0**	**6**	**0**	**21**

<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:ECE
II Year – II Sem</td></tr>
<tr><td>Course
Code:
J224A</td><td rowspan="2">ANALOG & DIGITAL COMMUNICATIONS</td><td>L</td><td>T</td><td>P/D</td></tr>
<tr><td>Credits: 3</td><td>3</td><td>0</td><td>0/0</td></tr>
</table>

Course Objectives:

1. To understand the need for modulation
2. To understand the generation, detection of various analog and Digital modulation techniques and also perform the mathematical analysis associated with these techniques.
3. To acquire theoretical knowledge of different types of receivers and understand the pulse modulation techniques.
4. To gain knowledge on the concepts of Probability of error in different Digital modulations.
5. To study about different error detecting and error correcting codes

Module 1:

Unit 1 (**Introduction to Amplitude modulation)**, Introduction to communication system, Need for modulation, Time domain and frequency domain representation of Amplitude Modulation, DSB Modulation, SSB modulation. Generation and Reception of AM, DSB Modulation, SSB Modulation.

Unit 2(**Vestigial side band modulation**) Vestigial side band modulation**:** Frequency description, Generation of VSB Modulated wave, Time domain description, Applications of different AM Systems.

Module 2:

Unit 1 (**ANGLEMODULATION):** Basic concepts, Frequency Modulation: Single tone frequency modulation, Spectrum Analysis of Sinusoidal FM Wave, Narrow band FM, Wide band FM, Constant Average Power, Transmission bandwidth of FM Wave - Comparison of FM & AM.

Unit 2 (Generation & Reception of FM) Generation of FM Waves: Direct Method: Parametric Variation Method: Varactor Diode, Reactance Modulator, indirect Method: Armstrong Method, Detection of FM Waves: Balanced Frequency discriminator, Zero crossing detector, Phase locked loop, Foster Seeley Discriminator, Ratio detector.

Module 3:

Unit 1(**TRANSMITTERS, RECEIVERS & PULSE MODULATION**) Radio Transmitters-Classification of Transmitters, Radio Receiver - Receiver Types - Tuned radio frequency receiver, Superhetrodyne receiver, Introduction to noise.

Unit 2(**PULSE MODULATION and WAVEFORM CODING**) PAM, PWM and PPM, Introduction to Digital communication systems, PCM Generation and Reconstruction, Quantization Noise, Non Uniform Quantization and Companding, DPCM, DM, Noise in DM and Adaptive DM.

Module 4:

Unit 1 (Digital Modulation Techniques) Introduction, ASK,ASK Modulator, Coherent ASK Detector, Non-Coherent ASK Detector, Generation of FSK, Non Coherent FSK Detector, Coherent FSK Detector, FSK Detection using PLL, BPSK, Generation of PSK, Coherent PSK Detection, Differential PSK,QPSK , QAM

Unit 2(Baseband Transmission and optimal Reception of Digital Signal) A Baseband Signal Receiver, Probability of Error, Optimum Receiver, Optimal of Coherent Reception, Probability of Error and Eye Diagrams for ASK, PSK, FSK, Cross Talk.

Module 5:

Unit 1 (**Information Theory & Source coding)** Introduction to Information Theory and Entropy, Shannon Fano coding, Huffman Code, variable length coding

Unit 2 (Channel Coding Techniques) **Linear Block Codes:** Matrix Description of Linear Block codes, Error Detection and Error Correction Capabilities of Linear block Codes.

Cyclic Codes: Algebraic Structure, Encoding, Syndrome Calculation, Decoding.

Convolution Codes: Encoding, Decoding using State, tree and trellis Diagrams, Decoding using

Viterbi Algorithm. Comparison of error rated in Coded and Uncoded Transmission.

TEXTBOOKS:

1. Communication Systems - Simon Haykin, 2 Ed, Wiley Publications.
2. Principles of Communication Systems Herbert Taub, Donald I Schiling, Goutam Saha, 3rd Edition, Mcgraw- Hill, 2008.
3. Digital and Analog Communication Systems – Sam Shanmugani John Wiley, 2005.
4. Digital Communications – John G.Proakis , Masoud Salehi – 511 Edition, Mcgraw-Hill, 2008.

REFERENCES BOOKS:

1. Electronic Communication Systems - Modulation and Transmission - Robert J. Schoenbeck, 2nd Edition, PHI.
2. Electronics & Communication System – George Kennedy and Bernard Davis, TMH 2004.
3. Digital Communications – IanA.Glover, Peter M. Grant, 2nd Edition, Pearson Edu., 2008.
4. Communication Systems – B.P. Lathi, BS Publication, 2006.

Web Resources:

- http://nptel.ac.in/courses/117102062/4#
- https://nptel.ac.in/courses/117/101/117101051/
- https://nptel.ac.in/courses/117/105/117105144/
- https://nptel.ac.in/courses/108/101/108101113/
- https://nptel.ac.in/courses/108/102/108102096/

Course outcomes: The student will be able to:

1. Analyze and design various modulation and demodulation of analog and Digital systems.
2. Design low power AM and FM transmitters.
3. Analyze and design the various Pulse Modulation Systems.
4. Analyse the error performance of digital modulation techniques.
5. Know about different error detecting and error correcting codes like. block codes, cyclic codes and convolution codes

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	1	2
CO2	3	2	2	2	1							1	2	1
CO3	2	2	1	1	2								2	2
CO4	2	2	2	1	2								2	2
CO5	2	2	1	1	1							1	1	2
Average	**2.4**	**2.0**	**1.6**	**1.3**	**1.5**							**1.0**	**1.6**	**1.8**

AY 2020-21 Onwards	**J. B. Institute of Engineering and Technology (UGC Autonomous)**	**B.Tech:ECE II Year – II Sem**		
Course Code: J224B	**ELECTROMAGNETIC WAVES AND TRANSMISSION LINES**	**L**	**T**	**P/D**
Credits: 3		4	0	0/0

COURSE OBJECTIVES:

1. **To study the electrostatics applicable to maxwells equation.**
2. **To study the static magnetic fields applicable to maxwells equation.**
3. **To understand the maxwells equation in various forms and boundary conditions.**
4. **To illustrate the Electromagnetic wave propagation.**
5. **To analyse characteristics and wave propagation on high frequency transmission lines.**

UNIT I

ELECTROSTATICS : Coulomb's law, electric field intensity ,fields due to line and surface charge distributions, electric flux density, Gauss law and applications due to line charge, volume charge, electric potential.

Relations between E and V convection and conduction currents, Poisson's and Laplace's equations, capacitance, parallel plate and spherical capacitors.

UNIT II

STATIC MAGNETIC FIELDS : Biot-savart's law,magnetic field intensity due to line current, Ampere's circuital law and its applications.

Magnetic flux density, magnetic scalar and vector potentials, inductances.

UNIT III

MAXWELL'S EQUATIONS- Basic laws of electromagnetics, Maxwell's equations in point form, integral form and phasor form.

Electrical and Magnetic boundary conditions at media interface.

UNIT IV

UNIFORM PLANE WAVES - Uniform plane wave, propagation of wave, wave propagation in partially conducting, good conductors, good dielectrics, velocity, wavelength, skin depth in good conductors.

Power flow and pointing vector, plane waves at a media interface- reflection and refraction at dielectric interface, total internal reflection, snell's law.

UNIT V

TRANSMISSION LINES- Equations of voltage and current on Transmission line, primary and secondaryconstants,Reflection coefficient and VSWR.

Impedance transformation on loss-less and low loss transmission line, Smith chart construction only, single and double stub matching.

TEXT BOOKS:

1 Elements of Electromagnetics – Matthew N.O. Sadiku, 4 ed., 2008, oxford univ. press.
2 Engineering Electromagnetics – William h. haytjr. and John a. buck.
3 Networks, lines and fields – john d. ryder, 2 ed., 1999, phi.
4 Electromagnetics – Edminister - schauum series.

REFERENCE BOOKS:

1 E.C. Jordan & K.G. balmain, Electromagnetic Waves&Radiating Systems, Prentice hall, India.

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

1. Understand the basic concept of vector calculus and electromagnetic field.
2. Describe the physical concepts of Static electric fields and magnetic fields.
3. Apply Maxwell's equations to solve problems in electromagnetic field theory.
4. Analyze the propagation of waves in different media.
5. Determine the characteristics and parameters of Transmission line and solve the voltage and current 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	2	1	1	-	-	-	-	-	-	-	-	1	1	-
CO2	2	2	1	-	-	-	-	-	-	-	-	1	1	-
CO3	2	1	-	2	-	-	-	-	-	-	-	2	-	2
CO4	2	2	2	-	-	-	-	-	-	-	-	1	2	-
CO5	2	1	1	1	-	-	-	-	-	-	-	1	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 :ECE
II Year – II Sem</td></tr>
<tr><td>Course Code:</td><td rowspan="2">NETWORK ANALYSIS</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:

1. **To impart knowledge on Network topology associated with graphs.**
2. **To find solution of first and second order networks with differential equations**
3. **and Laplace transforms**
4. **To Study Sinusoidal steady state analysis using phasors**
5. **To analyse the Different types passive filters.**
6. **To educate on Two Port Network and Network Functions.**

MODULE 1: Network Topology:
Matrices associated with graphs Basic cutset , tie set fundamental circuit matrices for planar networks, Mesh and nodal Analysis, Concept of duality and dual networks

MODULE 2: Solution of First and Second order networks
Dc and Transient response of Series and parallel R-L, R-C, R-L-C circuits, using differential equations and using Laplace Transforms , initial and final conditions, forced and free response, time constants, , inverse Laplace transform, transformed network with initial conditions Transfer function representation. Poles and Zeros. , series and parallel resonances

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 ,

MODULE 3: 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.

MODULE 4: Passive filters:
Constant k- Filters- Low pass, high pass, band pass and band elimination filter design, m-derived low pass and high pass filter design, Composite filter design , attenuators

MODULE 5: Two Port Networks:
Impedance parameters (Z), admittance parameters (Y). Transmission parameters (ABCD) and hybrid parameters (h), terminal pairs, inter relationship of two port parameters, interconnections of two port networks , parallel combination of two port networks

Text Books:

1. M. E. Van Valkenburg, "Network Analysis", Prentice Hall, 2006.
2. Shyam Mohan , Sudhakar Electric Circuits Tata Mcgraw hill 3e
3. John D Ryder , Network lines & Fields

4 Edminister, Circuit theory , schauum series ,McGraw Hill Education, 2013

References Books:
1. K. V. V. Murthy and M. S. Kamath, "Basic Circuit Analysis", Jaico Publishers, 1999.
2 Hayt&Kammerly Electrical Circuits

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

1 Apply Network topology concepts associated with graphs to networks
2 solve first and second order networks with differential equations and Laplace transforms
3 To Study. Sinusoidal steady state analysis using phasors
4 To analyse the Different types passive filters.
5 To educate on 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**	
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	3	-	-	-	-	-	-	-	-	-	-	-	2
CO2	1	2	2	2	-	-	-	-	-	-	-	-	-	1
CO3	2	2	2	-	-	-	-	-	-	-	-	-	1	-
CO4	2	-	2	-	-	2	-	-	-	-	-	-	1	-
CO5	2	2	-	-	-	2	-	-	-	-	-	-	-	2
Average	**2.0**	**2.3**	**2.0**	**2.0**		**2.0**							**1.0**	**2.0**

<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: ECE
II Year – II Sem</td></tr>
<tr><td>Course Code:
J222F</td><td rowspan="2">LINEAR CONTROL
SYSTEMS
(Common to ECE&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:Network Theory and Mathematics

Course Objectives:

1. The different ways of system representations such as Transfer function representation.
2. Statespacerepresentationsandtoassessthesystemdynamicresponse.
3. Assess the system performance using time domain analysis and methods for improvingit
4. Stability of the systems by using different types of techniques.
5. Assess the system performance using frequency domain analysis and techniques for improving theperformance.

Module-1

UNIT–I:

Mathematical Modelling of physical Control Systems-I

Basic elements of control system –Classification–Open and closed loop systems: Position Control Systems, Missile direction Control system.

UNIT-II:

Transfer function– Mathematical Modelling of Electrical, Mechanical, electro mechanical Systems and Thermal Systems.

Module-2

UNIT–I:

Mathematical Modelling of physical Control Systems-II

Mathematical modeling of Synchronous – AC and DC servomotors– Block diagram Algebra– Signal flow graphs, Mason ‘s gain Formula.

UNIT–II:

State variables–State variable representation of continuous time system–state equations–transfer function from state variable representation–Solutions of the state equations

Module-3

UNIT–I:

Time Domain Analysis of Control Systems

Introduction–Typical test signals–Step response analysis of second order systems–Transient response specifications– steady state error constants– Generalized error series–Effect of P, PI & PID Controllers.

Module-4

UNIT–I:

Stability & Root Locus Techniques

Concept of BIBO stability-absolute stability–Routh-Hurwitz criterion –Root Loci theory–Application to systems stability studies–Illustration of the effect of addition of a zero and a pole.

Module-5

UNIT-I:

Frequency Domain Analysis & Design of Control Systems

Introduction– Polar plot –Nyquist stability criterion– Frequency domain indices (Gain margin, Phase margin and bandwidth) – Correlation between frequency and time response – Bode plot. Need of Compensators–Design of lag and lead compensators using Bode plots–Applications

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:

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

1. Identify the Transfer Function of Open Loop and Closed Loop for Different Control Systems using block diagram and Signal flow graph technique.
2. Estimate non-linear control system for multiple inputs and outputs using state space analysis.
3. Examine the performance of system in time domain and effect of different Controllers.
4. Analyze the system stability by applying different time domain techniques.
5. Analyze the system stability by applying different time domain 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	2	2	2										1	
CO2	1	2	1	1									1	
CO3		2		2	2								2	
CO4		2	3		2								2	
CO5			2	2	1								2	
Average	**1.5**	**2.0**	**2.0**	**1.7**	**1.7**								**1.6**	

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech II Year – II Sem			
Course Code:	**Integral Transforms (COMMON TO EEE & ECE**	**L**	**T**	**P**	**D**
Credits: 3		**3**	**0**	**0**	**0**

Pre-requisite: 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 1 : Introduction **(8L)**
Basic introduction of the course using precise examples like periodic functions, signal propagation, solving mathematical models corresponding to Electrical Circuits.

.

Module 2 : Laplace Transforms **(12L)**
Unit 1: 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 2: 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 3: Fourier Transforms (10L)
Fourier Transforms – Fourier integral formula, Inverse Theorem for Fourier Transform; Fourier Sine Transform, Inverse formula for Fourier Sine Transform; Fourier Cosine Transform, Inverse formula for Fourier Cosine Transform; linearity property, change of scale property, shifting property, Modulation Theorem.

Module 4: Z-Transforms **(9L)**

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

Module 5: Henkel Transforms **(9L)**

Henkel Transforms- Henkel Transform of the derivatives of a function.- Application of Henkel Transforms in boundary value problems-The finite Henkel Transform

Text Books:

1. "Integral Transforms", A.R.Vashista, Dr. R.K.Gupta, - Krishna Prakasham Mandirurray
2. "Theory and problems of Laplace transforms" .R.Spiegel, Shamus Outline Series Tata Mac Grawhill.
3.

Reference Books:

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

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:

On completion of the course, 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	**3.0**	**3.0**	**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:ECE
II Year – II Sem</td></tr>
<tr><td>Course Code:
J224E</td><td colspan="4" rowspan="2">Microprocessors and
Microcontrollers</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: MPMC, DSP

Course Objectives:

The Student will:

1. Understand the basic 16-bit microprocessor architecture and its functionalities.
2. Develop the microprocessor based programs for various applications.
3. Make the interfacing in between microprocessor and various peripherals.
4. Understand basic feature of 8051 controller.
5. To understand the concepts of ARM architecture

Module 1:

UNIT I: 8086 Architecture:

8086 Architecture: 8086 Architecture-Functional diagrams, Register organization, memory segmentation, programming model, memory addresses.

UNIT II: Pin description of 8086

Physical memory organization, signal descriptions of 8086-common function signals, Timing diagrams, interrupts of 8086.

Module 2:

UNIT I: Instruction set of 8086:

Instruction formats, addressing modes, instruction set, assembler directives, macros,

UNIT II: assembly language programming of 8086. Simple programs involving logical, Branch and call instructions, sorting, evaluating arithmetic expressions, string manipulations.

Module 3:

UNIT -I: Introduction to Microcontrollers:

Overview of 8051 Microcontroller, Architecture, I/O Ports, Memory Organization, Addressing Modes and Instruction set of 8051.

UNIT -II: 8051 Real Time Control:

Programming Timer Interrupts, Programming External Hardware Interrupts, Programming the Serial Communication Interrupts, Programming 8051 Timers and Counters

Module 4:

UNIT –I:

I/O And Memory Interface:

LCD, Keyboard, External Memory RAM, ROM Interface, ADC, DAC Interface to 8051.

UNIT –II:

Serial Communication and Bus Interface:

Serial Communication Standards, Serial Data Transfer Scheme, On board Communication Interfaces-I2C Bus, SPI Bus, UART; External Communication Interfaces-RS232,USB.

Module 5:

UNIT –I:

ARM Architecture:

ARM Processor fundamentals, ARM Architecture – Register, CPSR, Pipeline, exceptions and interrupts interrupt vector table.

UNIT –II: ARM instruction set:

ARM instruction set Data Processing, Branch instructions, load store instructions, Software interrupt instructions, Program status register instructions, loading constants, Conditional execution, Introduction to Thumb instructions.

Text Books:

1. D.V.Hall, Microprocessors and interfacing, TMGH,2nd Edition 2006.
2. ARM System Developers guide, Andrew N SLOSS, Dominic SYMES, Chris WRIGHT, Elsevier,2012

Reference Books:

1. Advanced Microprocessors and peripherals-A.K.Ray and K.M Bhurchandani, TMH,2 nd Edition 2006.
2. The 8051 Microcontrollers. Architecture and programming and applications- K.Uma Rao, Andhe Pallavi, Pearson, 2009.
3. Micro computer system 8086/8088 family architecture. Programming and design-Du and GA Gibson, PHI 2nd Edition.

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. Understand the evolution and architectures of 8086 ,8051&ARM processors.
2. Analyze and understand the instruction set of 8086, 8051& ARM.
3. Analyze and interface various peripherals for the design of processor/ controller-based systems.
4. Develop skill in program writing for 8086 &8051.
5. Understand serial communication standards.

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	1				3							2		1
CO3	1			3								1	1	
CO4	1		2		2							2		1
CO5	1				3							1		1
Average	**1.2**		**2.0**	**3.0**	**2.7**							**1.6**	**1.0**	**1.0**

<table>
<tr><td>AY 2020-21
onwards</td><td>J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B. Tech:ECE
II Year – II Sem</td></tr>
<tr><td>Course Code:
J2241</td><td rowspan="2">NETWORK ANALYSIS 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>

Pre-requisite: Basic Electrical Engineering Lab

Course Objectives:

1. To understand basic concepts of DC and AC Circuit behavior.
2. To develop and solve mathematical representations and characteristics of First and Second order systems.
3. To gain practical experience on electric circuits and verification of theorems.
4. To study the characteristics of filters practically.
5. To impart hands on experience in measurement of two port network parameters

List of Experiments

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

Course Outcomes:

The Student will be able to:

1. Apply the knowledge of basic circuital law and simplify the network using reduction techniques.
2. Analyze the circuit using Network simplification theorems.
3. Evaluate transient response, Steady state response for First and Second order systems.
4. Determine the parameters for the design of various filters.
5. Evaluate two-port network 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	
CO2	3	3		2									3	
CO3	3	3		2									3	
CO4	3	3	3	2									3	
CO5	3	3		2									3	
Average	**3.0**	**3.0**	**3.0**	**2.0**									**3.0**	

AY 2020-21 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech: ECE II Year – II Sem		
Course Code: J2242	**ANALOG & DIGITAL COMMUNICATIONS LAB**	**L**	**T**	**P/D**
Credits: 1		0	0	2/0

Course objectives: The Student will:

1. Understand all types of analog modulation / demodulation principles such as AM, DSB-SC, FM
2. Understand the need for Waveform coding Techniques such as PCM, DM, DPCM
3. Design modulation and demodulation circuits such, PAM, PWM&PPM circuits
4. Apply Sampling Theorem for an analog signal.
5. Apply modulation and demodulation on digital modulation Techniques such as ASK, FSK, PSK, DPSK, QPSK

List of the Experiments:

1. Amplitude modulation and demodulation.
2. DSB-SC Modulator & Detector
3. SSB-SC Modulator & Detector (Phase Shift Method)
4. Frequency modulation and demodulation.
5. Verification of Sampling Theorem
6. Pulse Amplitude Modulation & Demodulation
7. Pulse Width Modulation & Demodulation
8. Pulse Position Modulation & Demodulation
9. PCM Generation and Detection
10. Differential Pulse Code Modulation.
11. Delta Modulation
12. Amplitude shift keying : Generation and Detection
13. Frequency shift keying : Generation and Detection
14. Phase shift keying: Generation and Detection
15. Differential Phase shift keying: Generation and Detection
16. Quadrature phase shift keying

Note: Minimum 12 experiments should be conducted:

Web Resources:

- http://nptel.ac.in/courses/117102062/4#
- https://nptel.ac.in/courses/117/101/117101051/
- https://nptel.ac.in/courses/117/105/117105144/
- https://nptel.ac.in/courses/108/101/108101113/
- https://nptel.ac.in/courses/108/102/108102096/

Equipment required for Laboratories:

1.RPS - 0– 30 V
2.CRO - 0– 20 M Hz.
3. Function Generators - 0– 1 M Hz
4. RF Generators - 0– 1000 M Hz./0 – 100 M Hz.
5 Multimeters
6 Components
7 Spectrum Analyzer 1GHZ

Course outcomes: The Student will be able to:

1. Perform analog and digital modulation and demodulation circuits such as AM,DSB-SC,FM,ASK FSK,PSK.
2. Design the PAM, PWM and PPM circuits.
3. Gain practical knowledge on digital modulation and demodulation kits.
4. Analyse various wave coding Techniques such as PCM, DM, DPCM.
5. Analyse use of Sampling Theorem on analog signal.

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			3									3	
CO3	2				2							2		2
CO4	2				3								2	
CO5	3.0	3.0	3	2.0	2.0								3	3
Average	**2.6**	**3.0**	**3.0**	**2.3**	**2.3**							**2.0**	**2.5**	**2.5**

AY 2020-21 onwards	**J. B. Institute of Engineering and Technology (UGC Autonomous)**	**B.Tech:ECE II Year – II Sem**		
Course Code: J2243	**Micro Processors and Microcontrollers LAB**	**L**	**T**	**P/D**
Credits:1		0	0	2/0

Course objectives: On completion of this Lab the student will:

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 Programmes:

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.

SOFTWARE REQUIRED: MASM &KEIL

Web Resources:

- https://nptel.ac.in/courses/108/105/108105102/
- https://nptel.ac.in/courses/108/105/108105102/

Course outcomes: After completing this lab the student will be able to:

1. Write an arithmetic and logical assembly language program for 8086&8051.
2. Associate microcontrollers to various devices.
3. Analyze and develop various applications using microcontrollers.
4. Develope a 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			3	2									
CO2	1			2	1							1	1	
CO3	2				2							2		2
CO4	1		2		2									1
CO5				3	2									2
Average	**1.5**		**2.0**	**2.7**	**1.8**							**1.5**	**1.0**	**1.7**

<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: ECE
II Year – II Sem</td></tr>
<tr><td>Course Code: J22M1</td><td colspan="4" 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>

Pre-Requisites: Nil

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 1:

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 2:

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, professional rights. Professional etiquettes- Dress code, Telephone call, Email writing.

Module 3:

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 4:

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 5:

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:

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

Reference book:

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

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/**

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 rowspan="1">AY 2020-21
onwards</td><td>J. B. INSTITUTE OF ENGINEERING AND TECHNOLOGY
(UGC Autonomous)</td><td colspan="4">B.Tech :ECE
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>

Pre-Requisites: Nil

Course Objectives: To learn

1. Understand the importance of advanced communication skills.
2. Obtain knowledge on intra personal skills and inter personal skills.
3. Gain knowledge on design thinking.
4. Know about the neuro linguistic programming.
5. Learn 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.**

Web 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	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	-	-

III Year- I sem

S. No	Code	Course Title	L	T	P	D	Credits
1	J314A	Antenna and Wave Propagation	3	0	0	0	3
2	J314B	Digital Signal Processing	3	1	0	0	4
3	J314C	IC Applications	3	0	0	0	3
4	J31EA	Managerial Economics And Management Science	3	1	0	0	4
5	BTECE O1	Open Elective I	3	0	0	0	3
6	J3141	IC Applications Lab	0	0	2	0	1
7	J3142	Digital Signal Processing Lab	0	0	2	0	1
8	J3143	Internship – II	0	0	2	0	1
9	J31M1	Artificial Intelligence	2	0	0	0	0
10	J3101	Employability Skills	2	0	0	0	0
Total			**19**	**1**	**8**	**0**	**20**

<table>
<tr><td rowspan="2">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></td><td></td><td></td><td></td></tr>
<tr><td>Course Code: J314A</td><td rowspan="2">ANTENNA AND WAVE PROPAGATION</td><td>L</td><td>T</td><td>P/D</td></tr>
<tr><td>Credits: 4</td><td>3</td><td>1</td><td>0/0</td></tr>
</table>

COURSE OBJECTIVES:

The Student will:

1. study the different Antenna parameters applicable to antennas and to study thin Linear Wire Antenna
2. Obtain mathematical and physical background on radiation from antennas.
3. Understand various physical structure and radiation patterns of antennas.
4. Obtain ample knowledge in antenna arrays.
5. Understand various wave propagation techniques.

Module 1:

Unit I:

Antenna Basics :

Basic Antenna Parameters–Patterns, Beam width ,Beam Area, Radiation Intensity, Beam Efficiency, Directivity-Gain-Resolution, Antenna Apertures, Effective Height, Antenna Temperature, Front - to-back Ratio, Radiation Resistance , Illustrative Problems.

Unit II:

Thin Linear Wire Antennas :

Radiation from Small Electric Dipole, Half Wave Dipole – Current Distributions, Field Components, Radiated Power, Radiation Resistance, Beam Width, Directivity, Far Fields, and Patterns of Thin Linear Centre-fed Antennas of Different Lengths.

Module 2:

Unit I:

Loop Antennas :

Small Loop, Comparison of Far Fields of Small Loop and Short Dipole, Radiation Resistances and Directivities of Small Loops (Qualitative Treatment).

Unit II:

Antenna Arrays:

Point Sources–Definition, Patterns, arrays of 2 Isotropic Sources - Different Cases, Principle of Pattern Multiplication, Uniform Linear Arrays – Broadside Arrays, End fire Arrays, EFA with Increased Directivity, Broadside Arrays with Non-uniform Amplitude

Distributions – General Considerations and Binomial Arrays.

Module 3:
Unit I
VHF, UHF and Microwave Antennas:
Arrays with Parasitic Elements, Folded Dipoles and their Characteristics, Yagi-Uda Array, Helical Antennas, Monofilar Helical Antenna in Axial and Normal Modes.
Unit II:
Horn Antennas –Types, Fermat's Principle, Optimum Horns, Design Considerations of Pyramidal Horns, Microstrip Antennas–Introduction, Features, Advantages and Limitations, Rectangular Patch Antennas – Geometry and Parameters, Characteristics of Microstrip Antennas.

Module 4:
Unit I:
Reflector Antennas – Flar Sheet and Corner Reflectors, Paraboloidal Reflectors – Geometry, Pattern Characteristics, Feed Methods, Reflector Types – Related Features.
Unit II:
Lens Antennas – Geometry of Non-metallic Dielectric Lenses, Zoning, Tolerances, Applications.

Module 5:
Unit I:
Wave Propagation: Classifications: Ground Wave Propagation, Plane Earth Reflections, Space and Surface Waves, Wave Tilt, Curved Earth Reflections. Space Wave Propagation, Field Strength, Variation with Distance and Height, Effect of Earth's Curvature.
Unit II:
Sky Wave Propagation Structure of Ionosphere, Refraction and Reflection of Sky Waves by Ionosphere, Ray Path, Critical Frequency, MUF, LUF, OF, Virtual Height and Skip Distance, Relation between MUF and Skip Distance, Multi-hop Propagation, Energy Loss in Ionosphere.

TEXT BOOKS:
1. Antennas and Wave Propagation – J.D. Kraus, R.J. Marhefka and Ahmad S. Khan, TMH, New Delhi, 4th ed., 2010.
2. Electromagnetic Waves and Radiating Systems – E.C. Jordan and K.G. Balmain, PHI, 2nd ed., 2000.

REFERENCE BOOKS:
1. Antenna Theory - C.A. Balanis, John Wiley & Sons, 3rd ed., 2005.
2. Antennas and Wave Propagation – K.D. Prasad, SatyaPrakashan, Tech India Publications, New Delhi, 2001.

COURSE OUTCOMES:

The student will be able to:

1. Illustrate and learn various Antenna parameters.
2. Obtain mathematical and physical concepts in design of antennas.
3. Discuss various techniques in antenna array formation.
4. Understand and design antenna for different applications.
5. Understand and learn different wave propagation techniques.

MAPPING OF CO's WITH PO's &PSO's														
POs/ PSOs	A	b	c	e	k	h	j	f	d	g	h	i	j	k
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO1 0**	**PO1 1**	**PO1 2**	**PSO 1**	**PSO 2**
CO1	3	3	-	-	-	-	-	-	-	-	-	-	-	2
CO2	2	3	-	1	-	1	-	-	-	-	-	-	-	1
CO3	2	2	2	2	-	-	-	-	-	-	-	-	-	-
CO4	3	-	3	-	-	-	1	-	-	-	-	-	-	1
CO5	3	3	-	3	-	-	-	-	-	-	-	-	-	-
Average	**2.6**	**2.8**	**2.5**	**2.0**		**1.0**	**1.0**							**1.5**

Y 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech III Year – I Sem		
Course Code: J314B	**DIGITAL SIGNAL PROCESSING**	**L**	**T**	**P/D**
Credits: 4		3	1	0/0

Pre-requisite: Signals and Systems

Course Objectives:

The Student will:

1. get fundamental concepts of discrete time signals, impulse response, sequence, zero-state solutions.
2. understand DFT and FFT concepts and its applications.
3. analyze and design analog & digital IIR filters and application on DSP.
4. analyze and design digital FIR filters and application on DSP.
5. learn the concept of multi-rate signal processing

Module 1: Introduction to Digital Signal Processing

UNIT I: Discrete time signals and sequences, energy and power signals, periodicity, Discrete time systems, linear shift invariant systems, stability and causality, Linear constant coefficient difference equations.

UNIT II: Frequency domain representation of discrete time signals and systems, Discrete Fourier Series (DFS), Representation of Periodic Sequences using DFS.

Module 2: Discrete Fourier Transforms & Fast Fourier Transforms

UNIT I: Basics of Discrete Time Fourier Transforms (DTFT), Discrete Fourier Transforms (DFT), Properties of DFT, Relation between ZT, DTFT, and DFT. Linear convolution of sequences using DFT.

UNIT II: Computation of DFT using Over-lap Add method and Over-lap Save method. Fast Fourier Transforms (FFT), Radix-2 decimation-in-time and decimation-in-frequency FFT Algorithms, Inverse FFT.

Module 3: IIR Digital Filters

UNIT I: IIR Digital filters design from analog filters. Impulse invariant techniques, Step invariant techniques, Bilinear transformation method, Spectral transformations.

UNIT II: Butterworth and Chebyshev Analog filter approximations and design. Direct, Canonic, Cascade and Parallel form realization of IIR filters.

Module 4: FIR Digital Filters

UNIT I: Frequency response characteristics of FIR Digital Filters, Design of FIR Filters using Fourier Method, Window Techniques and Frequency Sampling Technique

UNIT II: Comparison of IIR & FIR filters. Direct, cascade and Linear phase realization of FIR Filters.

Module 5:

UNIT I: Down sampling, Decimation, Spectrum of Down sampled signals. Anti-aliazing filter, Up sampling, interpolation, Spectrum of Up sampled signals. Anti-imaging filter. Identities, Sampling Rate Conversion

UNIT II: Polyphase structure of decimator and interpolator. Polyphase decimator and interpolator using Z-Transform. Analysis filter bank, Synthesis filter bank, Sub-band coding filter bank, and, QMF filter bank.

TEXT BOOKS:

1. Digital Signal Processing, Principles, Algorithms, and Applications: John G. Proakis, Dimitris G. Manolakis, Pearson Education / PHI, 2007.
2. Digital Signal Processing - R.Ramesh Babu, SCITECH 5TH Ed.

REFERENCE BOOKS:

1. Fundamentals of Digital Signal Processing using Matlab – Robert J. Schilling, Sandra L. Harris, Thomson, 2007
2. Digital Signal Processing – Trun Kumar Rawat, Oxford Publications, 2015
3. Discrete Time Signal Processing – A. V. Oppenheim and R.W. Schaffer, PHI, 2009

COURSE OUTCOMES: The students will be able to

1. Define fundamental concepts of discrete time signals, impulse response, sequence, and zero-state solutions.
2. Apply the concept of zero state and zero input in system design.
3. Distinguish the results using Fourier transforms, Laplace Transform, Z-transform, and application of DFT and FFT in signal processing.
4. Design IIR& FIR Digital filters using different techniques.
5. Analyze multi-rate signal processing and its importance in 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***	
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	2	3												2
CO2		3												3
CO3	1	3	2											3
CO4		3	2											2
CO5		3	2											2
Average	**1.5**	**3.0**	**2.0**											**2.4**

AY 2020-21 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech: ECE III Year – ISem			
Course Code: J314C	**IC APPLICATIONS**	**L**	**T**	**P**	**D**
Credits: 3		3	0	0	0

Pre-requisite: Electronic devices and circuits
Switching Theory & Logic Design, Pulse & Digital Circuits

Course Objectives:

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, 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.

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%20and%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

SWAYAM/NPTEL:

1. Analog Electronic Circuits: https://swayam.gov.in/nd1_noc19_ee38/preview
2. Op-amp practical Applications: Design, Simulation and Implementation: https://onlinecourses.nptel.ac.in/noc18_ee10/preview
3. Integrated Circuits, MOSFETS, Op-Amps and their Applications: https://archive.swayam.gov.in/courses/4441-integrated-circuits-mosfets-op-amps-andtheir-applications

Journals/Magazines

1. IEEE transactions on Circuits and Systems
2. IEEE transactions on Circuit Theory
3. Electronics for You (EFY)
4. Electronics Maker

Course Outcomes:

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

1. Identify the internal circuit, parameters and features of op-amp.
2. Categorize the linear and non-linear circuits using op- amp.
3. Examine various applications using ICs, such as 741, 555.565 etc
4. Estimate specifications of digital IC and select appropriate IC based on specifications.
5. Analyze applications using different combinational and Sequential circuits (IC's)

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**	**PO4**	**PO5**	**PO 6**	**PO 7**	**PO 8**	**PO9**	**PO 10**	**PO 11**	**PO 12**	**PSO1**	**PSO2**
CO1	1	3											3	2
CO2		3	2	2	2								2	
CO3		2		2	2								2	2
CO4		3	3	3	2								2	2
CO5		2	2	2	1								2	2
Average	**1.0**	**2.6**	**2.3**	**2.0**	**1.8**								**2.2**	**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:ECE
III Year – I Sem</td></tr>
<tr><td>Course Code:
J31EA</td><td rowspan="2">MANAGERIAL ECONOMICS AND MANAGEMENT SCIENCE
(CSE, IT, ECE & ECM)</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-Requisites: Nil

Course objectives:

The Student will:

6. Learn principles and practices of the organization.
7. Learn preparation of balance sheet and accounting standards.
8. Understand the principles of management.
9. Gain knowledge on graphical presentation of improving the quality.
10. 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. Ambrish Guptha, 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:

5. https://nptel.ac.in/courses/110/101/110101005/
6. https://sites.google.com/site/economicsbasics/
7. 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

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>AY 2020-21
onwards</td><td colspan="4">J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B.Tech: ECE
IIIYear – I Sem</td></tr>
<tr><td>Course Code: J3141</td><td rowspan="2">IC APPLICATIONS 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>

Pre-requisite: Electronic devices and circuits

Switching Theory & Logic Design, Pulse & Digital Circuits

Course Objective: The Student will

1.Fundamentals of analog and digital integrated circuits.
2.Design methodologies using practical integrated circuits.
3.To Gain the practical hands-on experience on 723 Voltage Regulator and three terminal voltage regulators.
4.The application areas of integrated circuits.
5. To Gain the practical hands-on experience on 555 Timer applications.

List of Experiments:

1. Adder, Sub tractor, using IC 741 Op-Amp.

2. Inverting and Non Inverting Comparator using IC 741 Op-Amp.

3. Integrator and Differentiator using IC741 Op-Amp.

4. Active Low Pass & High Pass Butterworth (second Order).

5. Sample and Hold circuit using Op-Amp.

6. RC Phase Shift and Wien Bridge Oscillators using IC 741 Op-Amp.

7. Wave form generators using IC741.

8. IC 555 timer in Monostable and Astable operation.

9. Schmitt trigger circuits using IC 741 & IC 555.

10. IC 565 – PLL.

11. Voltage regulator IC 723, three terminal voltage regulators- 7805, 7809, 7912.

12. A/D and D/A converters.

Equipment Required:

1.20 MHz/ 40 MHz/60 MHz Oscilloscopes.
2.1 MHz Function Generator (Sine, Square, Triangular and TTL) .
3.Regulated Power Supply.
4.Multi meter / Voltmeter.

Course Outcomes:

The Student will be able to
1 Identify and use different IC's for the various linear applications of op-amp.
2.Design and analyse the various non-linear application of op-amp.
3. Design and analyse the various application of 555 timer like oscillators and multi vibrator circuits
4. Design and analyse various combinational logic circuits using Digital Integrated IC's.
5. Design and analyse various sequential logic circuits using Digital Integrated IC's.

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	
CO4	2	2	3									2	2	2
CO5	2		2										2	
Average	2.2	2	2.5									2	2	2

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech: ECE IIIYear – I Sem			
Course Code: J3142	**DIGITAL SIGNAL PROCESSING LAB**	**L**	**T**	**P**	**D**
Credits: 1		0	0	2	0

Course Objectives:
The Student will

1. apply theoretical knowledge on a practical basis
2. familiarize with knowledge of MATLAB programming & functions.
3. analyze and design different signals & filters using MATLAB
4. get the basic knowledge of trainer kit TMS320C6713 DSP Processors.
5. gain practical knowledge on implementation of different filters.

The programs shall be implemented in software (Using MATLAB / Lab view / C programming/OCTAVE Equivalent) and hardware (Using TI / Analog devices / Motorola / Equivalent DSP processors).

1. Generation of Sinusoidal waveform / signal based on recursive difference equations.
2. To find DFT / IDFT of given DT signal.
3. To find frequency response of a given system given in (Transfer Function/ Differential equation form).
4. Implementation of FFT of given sequence
5. Determination of Power Spectrum of a given signal(s).
6. Implementation of LP FIR filter for a given sequence.
7. Implementation of HP FIR filter for a given sequence.
8. Implementation of LP IIR filter for a given sequence
9. Implementation of HP IIR filter for a given sequence.
10. Generation of Sinusoidal signal through filtering.
11. Generation of DTMF signals.
12. Implementation of Decimation Process
13. Implementation of Interpolation Process
14. Implementation of I/D sampling rate converters.

15. Audio application such as to plot a time and frequency display of microphone plus a cosine using DSP. Read a .wav file and match with their respective spectrograms.
16. Noise removal: Add noise above 3 KHz and then remove, interference suppression using 400 Hz tone.
17. Impulse response of first order and second order systems.

Note: - Minimum of 12 experiments has to be conducted.

Course Outcomes:

The student will be able to

1. work with MATLAB functions.
2. analyze and design different signals and filters.
3. provide the basic knowledge of trainer kit TMS320C6713 DSP Processors.
4. gain practical knowledge on implementation of different filters.
5. design new DSP based 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	3	2		3	3									3
CO2	2	3	2											3
CO3	2	2		3	2									3
CO4	2	2	2											3
CO5	2	2												3
Average	**2.2**	**2.2**	**2.0**	**3.0**	**2.5**									**3.0**

<table>
<tr><td>AY 2020-21
Onwards</td><td>J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B.Tech: ECE
III Year – I Sem</td></tr>
<tr><td>Course Code:
J31M1</td><td rowspan="2">ARTIFICIAL INTELLIGENCE
(Common to CSE, IT, ECE, EEE& ECM in III-I)</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-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 1:

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

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

Module 2:

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

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

Module 3:

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

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

Module 4:

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

Module 5:

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

ks:

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

es Books:

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

E - Resources:

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

Course outcomes:

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**

<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: ECE
III Year – I Sem</td></tr>
<tr><td>Course Code:
J3101</td><td rowspan="2">EMPLOYABILITY 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: To learn

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:

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

Course outcomes: At the end of this course 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.

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		

III Year- II Sem

S. No	Code	Course Title	L	T	P	D	Credits
1	J325F	Computer Networks	3	0	0	0	3
2	J324A	Microwave Engineering	3	1	0	0	4
3	J324B	Mobile Communication & Networks	3	0	0	0	3
4	BTECE O2	Open Elective –II	3	0	0	0	3
5	BTECE E1	Professional Elective – I	3	0	0	0	3
6	BTECE E2	Professional Elective – II	3	0	0	0	3
7	J3241	Microwave Engineering Lab	0	0	2	0	1
8	J3201	Life Skills and Professional Skills Lab	0	0	4	0	2
9	J32M2	Cyber Security	2	0	0	0	0
Total			**20**	**1**	**6**	**0**	**22**

<table>
<tr><td>AY 2020-21
Onwards</td><td>J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B.Tech: ECE
III Year – II Sem</td></tr>
<tr><td>Course Code:J325F</td><td rowspan="2">COMPUTER NETWORKS
(Common to CSE ,IT & ECE)</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, Ethernet technologies and various internetworking devices.
3. Examine design issues of network layer, services provided to above layer and routing, and congestion control protocols.
4. Examine IP protocol, addressing, various protocols like CIDR, ICMP, ARP and RARP of internet Layer and examination of transport layer services.
5. Examine Transport layer protocols like TCP, UDP, RPC and various congestion controlling mechanisms, including application layer services, protocols like HTTP, FTP, E-Mail etc.

Module 1:

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

Physical Layer: Guided transmission media, wireless transmission media.

Module 2:

Data Link Layer: design issues, Framing, Error Detection and Error Correction, Block

Coding, Hamming Distance, CRC, Flow control and error Control.

Protocols: Noiseless Channels, Noisy Channels, HDLC, Point to Point Protocols.

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

Multi Access protocols- Random access - ALOHA, CSMA, CSMA/CD and CSMA/CA, Controlled access, Channelization. Ethernet IEEE 802.3, IEEE 802.5, IEEE 802.11

Module 3:

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

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

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

Module 5:

Application Layer: Introduction, services, Application layer paradigms.

Applications: DNS, WWW, HTTP, FTP, E-MAIL, TELNET, SNMP, SSH.

Text Books:

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

References:

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

E - Resources:

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

Course outcomes:

The Student will be able to:

1. Demonstrate the networking concepts, various Layering approaches, functionalities and some protocols of Link layer.
2. Identify how a medium can be shared among multiple devices, Ethernet technologies and internetworking devices used.
3. Identify how to do fragmentation, assigning of logical address and judge on routing, congestion.
4. Illustrate 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
CO2	2											2		
CO3	2		2	2								2		2
CO4	2		2	2								2	2	2
CO5	2			2								2	2	2
Average	**2.0**		**2.0**	**2.0**								**2.0**	**2.0**	**2.0**

AY 2020-21 Onwards R20	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech III Year – II Sem		
Course Code: J324A	**MICROWAVE ENGINEERING**	**L**	**T**	**P/D**
Credits:04		3	1	0/0

Pre-requisite: Electromagnetic theory and Transmission Lines (EMTL)

Course Objectives:

1. To study the waveguides and cavity resonators at microwave frequencies.
2. To acquire knowledge on operation of passive waveguide components.
3. To learn the performance of specialized microwave tubes such as klystron, reflex klystron, magnetron and Travelling wave tube.
4. To understand the concepts of microwave circuits using scattering parameters.
5. To learn the fundamentals of microwave components and circuits with standard microwave bench.

Module 1: [11 Hrs]

Unit 1: Introduction on microwave: Introduction, Microwave Spectrum and Bands, Applications of Microwaves. Rectangular Waveguides – Solution of Wave Equations in Rectangular Coordinates, TE/TM mode analysis, Expressions for Fields, Characteristic Equation and Cut-off Frequencies, Filter Characteristics, Dominant and Degenerate Modes, Impossibility of TEM Mode ,Sketches of TE and TM mode fields in the cross-section, Mode Characteristics – Phase and Group Velocities, , Illustrative Problems.

Unit 2: **Waveguides and micro strip lines:** Rectangular Guides - Cavity Resonators– Introduction, Rectangular Cavities, Dominant Modes and Resonant Frequencies, Q factor and Coupling Coefficients, Power Transmission and Power Losses, Micro strip Lines– Introduction, Zo Relations, Effective Dielectric Constant, Losses. Illustrative Problems

Module 2: [11 Hrs]

Unit 1: **Microwave devices:** Coupling Mechanisms – Probe, Loop, Aperture types. Waveguide Discontinuities – Waveguide Windows, Tuning Screws and Posts, Matched Loads. Waveguide Attenuators – Different Types, Resistive Card and Rotary Vane Attenuators; Waveguide Phase Shifters – Types, Dielectric and Rotary Vane Phase Shifters, Waveguide Multiport Junctions – E plane and H plane Tees, Magic Tee. Directional Couplers – 2 Hole, Bethe Hole types. Illustrative Problems.

Unit 2: **Waveguide Components And Applications :** Scattering Matrix– Significance, Formulation and Properties, S Matrix Calculations for – Two port Junctions, E plane and H plane Tees, Magic Tee, Circulator and Isolator Ferrites– Composition and Characteristics, Faraday Rotation; Ferrite Components – Gyrator, Isolator, Circulator. Scattering Matrix–. Illustrative Problems.

Module 3: [10 Hrs]

Unit 1: **Microwave Tubes:** Limitations and Losses of conventional tubes at microwave frequencies. Microwave tubes – O type and M type classifications. O-type tubes : Two Cavity Klystrons – Structure, Re-entrant Cavities, Velocity Modulation Process and Applegate Diagram, Bunching Process and Small Signal Theory – Expressions for o/p Power and Efficiency.

Unit 2: Reflex Klystrons – Structure, Velocity Modulation and Applegate Diagram, Mathematical Theory of Bunching, Power Output, Efficiency,. Illustrative Problems.

Module 4: [09 Hrs]

Unit 1: **M-Type Tubes:** Introduction, Cross-field effects, Magnetrons – Different Types, Cylindrical Traveling Wave Magnetron – Hull Cut-off and Hartree Conditions, Modes of Resonance and PI-Mode Operation, Separation of PI-Mode, o/p characteristics. Illustrative Problems.

Unit 2: **Helix TWTs:** Significance, Types and Characteristics of Slow Wave Structures; Structure of TWT and Amplification Process (qualitative treatment), Suppression of Oscillations, Gain Considerations.

Module 5: [09 Hrs]

Unit 1: **Microwave Solid State Devices:** Introduction, Classification, Applications. TEDs – Introduction, Gunn Diodes – Principle, RWH Theory, Characteristics, Basic Modes of Operation - Gunn Oscillation Modes, LSA Mode, Introduction to Avalanche Transit Time Devices-Introduction, IMPATT and TRAPATT Diodes– Principle of Operation and Characteristics.

Unit 2: **Microwave Measurements:** Description of Microwave Bench – Different Blocks and their Features, Errors and Precautions; Microwave Power Measurement – Bolometers. Measurement of Attenuation, Frequency Standing Wave Measurements – Measurement of Low and High VSWR, Cavity Q. Impedance Measurements.

Text Books:

1. Microwave Devices and Circuits – Samuel Y. Liao, Pearson, 3rd Edition, 2003.
2. Microwave Engineering by M Kulkarni,

References Books:

1. Foundations for Microwave Engineering – R.E. Collin, IEEE Press, John Wiley, 2nd Edition, 2002.
2. Microwave Circuits and Passive Devices – M.L. Sisodia and G.S.Raghuvanshi, Wiley Eastern Ltd., New Age International Publishers Ltd., 1995.
3. Microwave Principles – Herbert J. Reich, J.G. Skalnik, P.F. Ordung and H.L. Krauss, CBS Publishers and Distributors, New Delhi, 2004.

Web Resources:

https://nptel.ac.in/courses/108101112/

https://freevideolectures.com/course/4125/nptel-microwave-engineering

https://www.youtube.com/watch?v=_SNwJknISXA

Course Outcomes:

1. Recognize the waveguides and cavity resonators at Microwave frequencies.
2. Understand the operation of passive waveguide components.
3. Analyze the performance of specialized microwave tubes such as klystron, reflexKlystron, magnetron and travelling wave tube.
4. Analyze microwave circuits using scattering parameters
5. Test microwave components and circuits with standard microwave bench.

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	3		3											2
CO3	2	3												2
CO4	3											2		3
CO5	2		3											2
Average	**2.4**	**3.0**	**3.0**									**2.0**		**2.2**

AY 2020-21 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech ECE III Year – II Sem			
Course Code: J324B	MOBILE COMMUNICATIONS AND NETWORKS	L	T	P	D
Credits: 3		3	0	0	0

Pre-requisite: Analog and Digital Communications

Course Objectives:

This course will enable students to:

1. provide with an understanding of the cellular concept, frequency reuse, handoff strategies.
2. illustrate the concepts of Co-channel and Non Co-Channel interferences.
3. provide understanding of diversity techniques and channel assignment techniques.
4. get an understanding of various types of handoff.
5. understand challenges and application of Ad-hoc wireless Networks.

Module 1

Unit 1 (Introduction to Cellular Mobile Radio Systems)

Limitations of Conventional Mobile Telephone Systems. Basic Cellular Mobile System, First, Second, Third and Fourth Generation Cellular Wireless Systems. Uniqueness of Mobile Radio Environment-Fading-Tie Dispersion Parameters, Coherence Bandwidth, Doppler Spread and Coherence Time.

Unit 2 (Fundamentals of Cellular Radio System Design)

Concept of Frequency Reuse, Co-Channel Interference, Co-Channel Interference Reduction Factor, Desired C/I from a Normal Case in a Omni Directional Antenna System, System Capacity Improving Coverage and Capacity in Cellular Systems- Cell Splitting, Sectoring, Microcell Zone Concept.

Module 2

Unit 1 (Co-Channel Interference)

Measurement of Real Time Co-Channel Interference, Design of Antenna System, Antenna Parameters and their effects, diversity techniques-space diversity, polarization diversity, frequency diversity, time diversity.

Unit 2 (Non Co-Channel Interference)

Adjacent Channel Interference, Near end far end interference, cross talk, effects on coverage and interference by power decrease, antenna height decrease, effects of cell site components.

Module 3:

Unit 1 (Frequency Management and Channel Assignment)

Numbering and Grouping, Setup Access and Paging Channels, Channel Assignments to Cell Sites and Mobile Units.

Unit 2 (Multiple Access Techniques for Wireless Communication)

Introduction to multiple access, FDMA, TDMA, Spread spectrum multiple access, Space division multiple access, Packet radio, Capacity of a cellular systems.

Module 4:

Unit 1 (Handoffs)

Handoff Initiation, types of Handoff, Delaying Handoff, advantages of Handoff, Power Difference Handoff, Forced Handoff, Mobile Assisted and Soft Handoff, Intersystem handoff,

Unit 2 (Dropped Calls)

Introduction to Dropped Call Rates and their Evaluation.

Module 5:

Unit 1 (Ad Hoc Wireless Networks)

Introduction, Cellular and Ad Hoc wireless Networks, Applications and Ad Hoc Wireless Networks, Issues in Ad Hoc Wireless Networks, Ad Hoc Wireless Internet.

Unit 2 (Orthogonal Frequency Division Multiplexing)

Basic Principles of Orthogonality, Single Versus Multi channel Systems, OFDM Block Diagram and its explanation, OFDM Signal mathematical representation.

Text Books:

1. Mobile Cellular Telecommunications-W.C.Y. Lee, Mc Graw Hill, 2nd Edn., 1989.
2. Wireless Communications-Theodore. S. Rapport, Pearson Education, 2nd Ed., 2002.

Reference Books:

1. Ad Hoc Wireless Networks: Architectures and Protocols-C. Siva ram Murthy and B.S. Manoj, 2004, PHI.
2.Modern Wireless Communications-Simon Haykin, Michael Moher, Pearson Education, 2005.
3. Wireless Communications and Networking, Vijay Garg, Elsevier Publications, 2007.
4. Wireless Communications-Andrea Goldsmith, Cambridge University Press, 2005.

E - Resources:

1. https://www.electronics-notes.com/articles/connectivity/cellular-mobile-phone/handover-handoff.php
2. https://www.youtube.com/watch?v=whYljse4Abc
3. https://nptel.ac.in/courses/106/106/106106167/
4. https://www.coursera.org/learn/wireless-communications.

Course Outcomes:

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

1. Understand Basic Cellular System with fading and non-fading environment to develop a cellular system.
2. Design and Analyse the cellular radio system based on cell coverage and signal traffic.
3. Describe the concept of frequency reuse to increase the cellular capacity with interference.

4. Develop an efficient communication system by use of frequency management and diversity Multiple access techniques
5. Apply the Ad-hoc systems with the existing Mobile 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	-	-	-	-	-	-	-	-	-	-	-	2
CO2	-	3	2		-	-	-	-	-	-	-	-	-	2
CO3	-	2	2	2	-	-	-	-	-	-	-	-	2	-
CO4	2	2	-	2	-	-	-	-	-	-	-	-	-	2
CO5	-	-	3	3	-	-	-	-	-	-	-	-	-	2
Average	**2.5**	**2.5**	**2.3**	**2.3**									**2.0**	**2.0**

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech: ECE III Year – II Sem			
Course Code:BTECEE1	(E414M) TELEVISION ENGINEERING (Professional Elective-I)	L	T	P	D
Credits: 3		3	0	0	0

Course Objectives:
The Student will
1. gain comprehensive coverage of TV Systems with all the new developments in Television and Video Engineering.
2. study the analysis and synthesis of TV Pictures, Composite Video Signal.
3. study Receiver Picture tubes and Television Camera Tubes'
4. study the various Color Television systems with a greater emphasis on television standards.
   study the advanced topics in digital television and High definition television.

Module -1
Unit-1:
Introduction
TV transmitter and receivers, synchronization. Geometric form and aspect ratio, image continuity, interlaced scanning, picture resolution, Composite video signal, TV standards. Camera tubes: image Orthicon, Plumbicon, vidicon, silicon Diode Array vidicon, Comparison of camera tubes, Monochrome TV camera.
Unit-2:
TV Signal Transmission and Propagation: Picture Signal transmission, positive and negative modulation, VSB transmission, sound signal transmission, standard channel BW,TV transmitter, TV signal propagation, interference, TV broadcast channels, TV transmission Antennas.

Module -2
Unit-1:
Monochrome TV Receiver
RF tuner, IF subsystem, video amplifier, sound section, sync separation and processing, deflection circuits, scanning circuits, AGC, noise cancellation.
Unit-2:
Video and inter carrier sound signal detection, vision IF subsystem of Black and White receivers, Receiver sound system: FM detection, FM Sound detectors, and typical applications.

Module -3
Unit-1:
Sync Separation and Detection
TV Receiver Tuners, Tuner operation, VHF and UHF tuners, digital tuning techniques, remote control of receiver functions. Sync Separation, AFC and Deflection Oscillators.
Unit-2:

Synchronous separation, k noise in sync pulses, separation of frame and line sync pulses. AFC, single ended AFC circuit, Deflection Oscillators, deflection drive ICs, Receiver Antennas, Picture Tubes.

Module -4
Unit-1:
Color Television
Colour signal generation, additive colour mixing, video signals for colours, colour difference signals, encoding, Perception of brightness and colours luminance signal, Encoding of colour difference signals, formation of chrominance signals, color cameras, Colour picture tubes, colour specifications.
Unit-2:

Color Signal Encoding and Decoding: NTSC colour system PAL colour system, PAL encoder, PAL-D Decoder, chrome signal amplifiers, separation of U and V signals, colour burst separation, Burst phase discriminator, ACC amplifier, Reference oscillator, Indent and colour killer circuits, U& V demodulators, colour signal mixing.

Module -5
Unit-1:
Color Receiver
introduction to colour receiver, Electron tuners, IF subsystem, Y-signal channel, Chroma decoder, Separation of U & V Colour, Phasors, synchronous demodulators, Sub carrier generation, raster circuits.
Unit-2:
Introduction to Digital TV, Digital Satellite TV, Direct to Home Satellite TV, Digital TV Transmitter, Digital TV Receiver, Digital Terrestrial TV, LCD TV, LED TV, CCD Image Sensors, HDTV.

TEXT BOOKS:
1. Television and Video Engineering- A.M.Dhake, 2nd Edition.
   Monochrome and Colour TV- R.R. Gulati, New Age International Publication, 2002.

REFERENCE BOOKS:
1. Colour Television Theory and Practice- S.P. Bali, TMH, 1994.
2. Basic Television and Video Systems-B.Grob and C.E. Hemadon, McGraw Hill, 1999.
   Modern Television Practice – Principles, Technology and Service- R.R. Gallatin, New Age International Publication, 2002.

Course Outcomes:

The student will be able to

1. recognize the transmission of video signals and importance of television standards to effectively work with broadcasting applications.
2. understand different sections in monochrome TV receiver.
3. asses the traditional video formats and common modern digital formats.
4. analyze digital video transmission techniques based on applications.
5. describe principle and working of colour television and colour receiver with colour signalencoding and decoding.

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 rowspan="1">AY 2020-21
onwards</td><td>J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B.Tech: ECE
III Year – II Sem</td></tr>
<tr><td>Course
Code:BTECEE1</td><td rowspan="2">EMBEDDED SYSTEMS
(Professional 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>

Prerequisites: Microprocessors and Interfacing, Microcontrollers and Applications, ComputerOrganization

Course Objective: The Student will
1.understand the basic concepts of Embedded Systems.
2. get introduced with the Domain Specific Processors, ASICs, PLDs, Commercial Off-The-Shelf Components (COTS), Memory: ROM and RAM.
3.understand Embedded Firmware Design Approaches.
4. gain knowledge of Multiprocessing and Multitasking.
5. understand Remote Procedure Call and Sockets, Task Synchronization

MODULE 1:

UNIT1: Introduction to Embedded Systems

Definition of Embedded System, Embedded Systems Vs General Computing Systems, History ofEmbedded Systems, Classification, Major Application Areas,

UNIT2: Characteristics of Embedded Systems

Purpose of Embedded Systems, Characteristics and Quality Attributes of Embedded Systems.

MODULE 2:

UNIT1: Typical Embedded Systems

Core of the Embedded System General Purpose and Domain Specific Processors, ASICS, PLDS,Commercial Off-The-Shelf Components (COTS),

UNIT 2: Memory

ROM, RAM, Memory according to thetype of Interface, Memory Shadowing, Memory selection for Embedded Systems, Sensors andActuators, Communication Interface: Onboard and External Communication Interfaces.

MODULE 3:

UNIT1: Embedded Firmware:

Reset Circuit, Brown-out Protection Circuit, Oscillator Unit, Real Time Clock

UNIT2: Design Approaches

Watchdog Timer, Embedded Firmware Design Approaches and Development Languages.

MODULE 4:

UNIT 1: RTOS Based Embedded System Design:

Operating System Basics, Types of Operating Systems, Tasks, Process and Threads,

UNIT 2: Approaches of RTOS: Multiprocessing and Multitasking, Task Scheduling.

MODULE 5:

UNIT 1: Real-Time Operating Systems:

Shared Memory, Message Passing, Remote Procedure Call and Sockets, Task Synchronization: Task Communication/Synchronization Issues,

UNIT 2: Task Communication:

Task Synchronization Techniques, Device Drivers, How to Choose an RTOS.Queue, States, Content, Storage, Operations and Use

TEXTBOOKS:

1. Introduction to Embedded Systems - Shibu K.V, McGraw Hill.

2. Qing Li, Elsevier, “Real Time Concepts for Embedded Systems”, 2011.

REFERENCES:

1. Rajkamal, “Embedded Systems, Architecture, Programming and Design”, TMH, 2007.

2. Richard Stevens,“Advanced UNIX Programming”.138

E-RESOURCES:

1. http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.158.9376&rep=rep1&type=pdf
2. http://www.radio-electronics.com/info/processing-embedded/embedded-systems/basicstutorial.php
3. http://www.gian.iitkgp.ac.in/files/brochures/BR1458666215SESD_brochure_GIAN.pdf
4. http://www.engpaper.com/embedded-system-research-papers-and-projects-11.htm
5. http://www.scirp.org/journal/articles.aspx?searchCode=Embedded+RealTime+and+Operating+Systems+Program+(ERTOS)%2C+National+ICT+Australia+(NICTA)&searchField=affs&page=1&SKID=0
6. https://ts.data61.csiro.au/publications/papers/ERTOS_09.pdf
7. https://onlinecourses.nptel.ac.in/noc17_cs05/preview
8. https://www.youtube.com/watch?v=y9RAhEfLfJs
9. http://www.nptelvideos.in/2012/11/embedded-systems.html

Course Outcomes:

After completion of the course, students will be able to

1. Get Knowledge on Embedded System Concepts.
2. Use Different memories and core components in Embedded System to develop the Applications.
3. Develop and Implement different circuits and development designs in Embedded Applications
4 Demonstrate OS concepts and Commands
5 Work on Real Time Operating System Concepts used in Embedded 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	
CO3	2	3	2								2		3	
CO4	3										3		3	
CO5		3	3	3									2	
Average	**2.8**	**3.0**	**2.5**	**3.0**							**2.7**		**2.8**	**3.0**

<table>
<tr><td>AY 2020-21 onwards</td><td colspan="2">J. B. Institute of Engineering and Technology (UGC Autonomous)</td><td colspan="4">B.Tech: ECE
III Year – II Sem</td></tr>
<tr><td>Course Code:BTECEE1</td><td rowspan="2" colspan="2">DIGITAL IMAGE PROCESSING

(Professional 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>

Course Objectives:

The Student will be able to:

1. Understand the fundamentals of digital image.
2. Mathematically represent the various types of images and analyze them.
3. Process these images for the enhancement of certain properties or for optimized use of the resources.
4. Develop algorithms for image compression and coding.
5. Process the color images.

Course Outcomes:

At the end of the course, students will demonstrate the ability to:

1. Understand the fundamentals of digital image.
2. Mathematically represent the various types of images and analyze them.
3. Process these images for the enhancement of certain properties or for optimized use of the resources.
4. Develop algorithms for image compression and coding.
5. Process the color images.

Module -1

Unit-1

Digital Image Fundamentals-Elements of visual perception, image sensing andacquisition, image
sampling and quantization, basic relationships between pixels – neighborhood, adjacency, connectivity, distance measures.

Module -2

Unit-1

Image Enhancements and Filtering-Gray level transformations, histogramequalization and specifications, pixel-domain smoothing filters – linear and order-statistics, pixel-domainsharpening filters – first and second derivative, two-dimensional DFT and its inverse, frequency domain filters – low-pass and high-pass.

Module -3

Unit-1

Image Segmentation- Detection of discontinuities, edge linking and boundary detection, thresholding – global and adaptive, region-based segmentation.

Module -4

Unit-1

Image Compression-Redundancy–inter-pixel and psycho-visual; Lossless compression – predictive, entropy; Lossy compression- predictive and transform coding; Discrete Cosine Transform; Still image compression standards – JPEG and JPEG-2000.

Module -5

Unit-1

Color Image Processing-Color models–RGB, YUV, HSI; Color transformations– formulation, color complements, color slicing, tone and color corrections; Color image smoothing and sharpening, Color Segmentation.

TEXT BOOKS:

1. R.C. Gonzalez and R.E. Woods, Digital Image Processing, Second Edition, Pearson Education 3rd edition 2008.

REFERENCE BOOKS:

1. Anil Kumar Jain, Fundamentals of Digital Image Processing, Prentice Hall of India.2nd edition 2004.
2. Gerard Blanchet, Maurice Charbit, Digital signal and Image Processing using MATLAB, iSTE

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														
CO2	2											2	2	
CO3	2				3						3	2	3	3
CO4	2				3							3	3	3
CO5												1	1	1
Average	2				3						3	2	2.25	2.33

<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: ECE
III Year – II Sem</td></tr>
<tr><td>Course Code:BTECEE2</td><td rowspan="2">CELLULAR AND MOBILE COMMUNICATIONS
(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>

Course Objectives:

The Student will

1. have an overview of wireless and mobile communications in different generations.
2. understand mobile technologies like GSM and CDMA.
3. study the operation of basic cellular system and performance criterion, handoff mechanism.
4. understand the design of cellular mobile system.
5. develop the ability to search, select, organize and present information on new technologies in mobile and cellular communications.

Module-1:

Unit-I Introduction to Cellular Mobile Radio Systems

Limitations of conventional mobile telephone systems, Basic Cellular Mobile System, First, second, third and fourth generation cellular wireless systems, Uniqueness of mobile radio environment-Long term fading, Factors influencing short term fading.

Unit-2

Parameters of mobile multipath fading-Time dispersion parameters, Coherence bandwidth, Doppler spread and coherence time, Types of small scale fading.

Module-2:

Unit-I Fundamentals of Cellular Radio System Design

Concept of frequency reuse, Co-channel interference, Co-channel Interference reduction factor, Desired C/I from a normal case in a Omni directional antenna system, system capacity, Trunking and grade of service, Improving coverage and capacity in cellular systems- Cell splitting, Sectoring, Microcell zone concept.

Unit-2

Measurement of real time Co-Channel interference, Design of antenna system, Antenna parameters and their effects, Diversity techniques-Space diversity, Polarization diversity, Frequency diversity, Time diversity. Adjacent channel interference, Near end far end interference, Cross talk, Effects on coverage and interference by power decrease, Antenna height decrease, Effects of cell site components, UHF TV interference.

Module-3:
Unit-I Cell Coverage for Signal and Traffic

Signal reflections in flat and hilly terrain, Effect of human made structures, Phase difference between direct and reflected paths, Constant standard deviation, Straight line path loss slope.

Unit-2

General formula for mobile propagation over water and flat open area, Near and long distance propagation, Path loss from a point to point prediction model in different conditions, merits of Lee model.

Module-4:
Unit-I Cell Site and Mobile Antennas

Sum and difference patterns and their synthesis, Coverage-omni directional antennas.

Unit-2

Interference reduction- directional antennas for interference reduction, Space diversity

antennas, Umbrella pattern antennas, and Minimum separation of cell site antennas, mobile antennas.

Module-5:
Unit-1 Frequency Management and Channel Assignment& Handoffs

Numbering and grouping, Setup access and Paging channels, Channel assignments to cell sites and mobile units, Channel sharing and Borrowing, Sectorization, Overlaid cells, Non fixed channel assignment.

Unit-2

Handoff initiation, Types of handoff, Delaying handoff, Advantages of handoff, Power difference handoff, Forced handoff, Mobile assisted and soft handoff. Intersystem handoff, Introduction to dropped call rates and their evaluation.

TEXT BOOKS:

1. Mobile Cellular Telecommunications – W.C.Y. Lee, Mc Graw Hill, 2nd Edn., 1989. Wireless Communications - Theodore. S. Rapport, Pearson education, 2nd Edn., 2002.

REFERENCE BOOKS:

1. Principles of Mobile Communications – Gordon L. Stuber, Springer International, 2nd Ed., 2001.
2. Modern Wireless Communications-Simon Haykin, Michael Moher,Pearson Education, 2005.
3. Wireless communications theory and techniques, Asrar U. H .Sheikh, Springer, 2004.

Course Outcomes:

The Student will be able to

1. Illustrate the basic concepts of Cellular mobile radio systems.
2. Measure the performance of a cellular system.
3. Describe the concept of frequency reuse.
4. Gain knowledge about different mobile antennas.
5. Discuss the concept of channel assignment and handoff in wireless 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	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 rowspan="1">AY 2020-21
Onwards</td><td>J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B.Tech: ECE
III Year – II Sem</td></tr>
<tr><td>Course
Code:BTECEE2</td><td rowspan="2">SPEECH AND AUDIO PROCESSING
(Program 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>

Course Objectives:

The Student will:

1. obtain ample knowledge in the mathematical model of the speech signal.
2. understand various quantization process of speech.
3. gain the concept of linear prediction.
4. know the concept of the speech and audio signal enhancement.
5. get ample knowledge in Speech Coding Standards.

Module – 1:

Unit -1

Introduction- Speech production and modelling - Human Auditory System; General structure of speech coders; Classification of speech coding techniques – parametric, waveform and hybrid ; Requirements of speech codecs –quality, coding delays, robustness.

Unit -2

Speech Signal Processing- Pitch-period estimation, all-pole and all-zero filters, convolution; Power spectral density, periodogram, autoregressive model, autocorrelation estimation.

Module – 2:

Unit -1

Speech Quantization- Scalar quantization–uniform quantizer, optimum quantizer, logarithmic quantizer, adaptive quantizer, differential quantizers;

Unit -2

Vector quantization – distortion measures, code book design, codebook types.

Module –3:

Unit -1

Linear Prediction of Speech- Basic concepts of linear prediction;

Unit -2

Linear Prediction Analysis of non-stationary signals –prediction gain, examples; Levinson-Durbin algorithm; Long term and short term linear prediction models; Moving average prediction.

Module - 4:

Unit -1

Linear Prediction Coding- LPC model of speech production; Structures of LPC encoders and decoders; Voicing detection; Limitations of the LPC model. Scalar Quantization of LPC-Spectral distortion measures, Quantization based on reflection coefficient and log area ratio, bit allocation;

Unit -2

Line spectral frequency – LPC to LSF conversions. Introduction to speech recognition. Basics of MATLAB Speech and Audio Processing Toolbox.

Module – 5:

Unit -1

Code Excited Linear Prediction-CELP speech production model; Analysis-by-synthesis; Generic CELP encoders and decoders;

Unit -2

Excitation codebook search – state-save method, zero-input zero state method; CELP based on adaptive codebook, Adaptive Codebook search; Speech Coding Standards-An overview of ITU-T G.726, G.728 and G.729 standards.

TEXT BOOKS:

1. “Digital Speech” by A.M.Kondoz, Second Edition (Wiley Students Edition), 2004.
2. “Speech Coding Algorithms: Foundation and Evolution of Standardized Coders”, W.C. Chu, WileyInter science, 2003.
3. Introduction to Digital Speech Processing, Lawrence R. Rabiner and Ronald W. Schafer, now Publishers Inc., 2007.

REFERENCE BOOKS:

1. B.Gold and N.Morgan, “Speech and Audio Signal Processing”, Wiley and Sons, 2000.
2. L.R.Rabiner and R.W.Schaffer, "Digital Processing of Speech Signals", Prentice Hall,1978.
3. Mark Kahrs, Karlheinz Brandenburg, Applications of Digital Signal Processing to Audio and Acoustics, Kluwer Academic Publishers.
4. Udo Zölzer, "Digital Audio Signal Processing", Second Edition A John Wiley& sons Ltd.

Course Outcomes:

The Student will be able to

1. mathematically model the speech signal.
2. analyze the quality and properties of speech signal.
3. modify and enhance the speech and audio signals.
4. illustrate the concepts of linear prediction.
5. demonstrate Speech Coding Standards.

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														
CO2	2												2	
CO3	2			3							3		3	3
CO4	2			3									3	3
CO5													1	1
Average	2			3							3		2.25	2.33

<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: ECE
III Year – II Sem</td></tr>
<tr><td>Course
Code:BTECEE2</td><td rowspan="2">COMPUTER ARCHITECTURE
(Program 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>

Course Objectives:
The student will

1. learn how computers work.
2. know basic principles of computer's working.
3. analyze the performance of computers.
4. know how computers are designed and built.
5. understand issues affecting modern processors (caches, pipelines etc.).

Module-1
Unit-I
Basic Structure of Computers, Functional units, software, performance issues in software, machine instructions and programs, Types of instructions, Instruction sets: Instruction formats, Assembly language, Stacks, Ques, Subroutines.
Module-2

Unit-I
Processor organization, Information representation, number formats, Multiplication & division, ALU design, Floating Point arithmetic, IEEE 754 floating point formats.

Module-3
Unit-I
Control Design, Instruction sequencing, Interpretation, Hard wired control - Design methods and CPU control unit.
Unit-II

Microprogrammed Control - Basic concepts, minimizing microinstruction size, multiplier control unit. Microprogrammed computers - CPU control unit.

Module-4
Unit-I
Memory organization, device characteristics, RAM, ROM, Memory management, Concept of Cache & associative memories, Virtual memory.

Module-5
Unit-I
System organization, Input - Output systems, Interrupt, DMA, Standard I/O interfaces, Concept of parallel processing, Pipelining, Forms of parallel processing, interconnect network.

TEXT BOOKS:
1. V.Carl Hammacher, “Computer Organisation”, Fifth Edition.
2. A.S.Tanenbum, “Structured Computer Organisation”, PHI, Third edition.

REFERENCE BOOKS:
1. Y.Chu, "Computer Organization and Microprogramming”, II, Englewood Chiffs, N.J., Prentice Hall Edition.
2. M. Morris Mano, “Computer System Architecture”, 3rd Edition.
3. C.W.Gear, “Computer Organization and Programming”, McGraw Hill, N.V. Edition.
4. Hayes J.P, “Computer Architecture and Organization”, PHI, Second edition.

Course Outcomes:
The student will be able to
1. Examine basic structure of computers.
2. Describe the basics of processor organization.
3. Illustrate the functioning of control design.
4. Demonstrate working of memory organization.
5. Explain the system organization, interrupts and DMA.

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		1
CO2	3											3		2
CO3	2		2									2		1
CO4	2		3									2		
CO5	2		2	2								2		
Average	**2.2**		**2.3**	**2.0**								**2.4**		**1.0**

<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: ECE
III Year – II Sem</td></tr>
<tr><td>Course Code:J3241</td><td rowspan="2" colspan="4">MICROWAVE ENGINEERING 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>

LIST OF EXPERIMENTS

1. Study of microwave bench (cables, connectors, Adapters, wave-guides, components & passive devices.)
2. Measurement of gain and frequency characteristics of reflex klystron tube.
3. Gunn diode characteristics
4. Determination of standing wave ratio (VSWR) and reflection coefficient.
5. Study of microwave tee's
6. Attenuation measurement
7. Determination of characteristics of isolator
8. Determination of characteristics of circulator
9. Characteristics of multihole directional coupler
10. Measurement of wave impedance and wave length using slotted waveguide section
11. Study of propagation of microwaves using horn Antenna
12. Measurement of microwave power using a thermistor Mount/variable flap attenuator
13. Measurement of radiation pattern of a test antenna.
14. Determination of unknown load impedance of transmission line using smith chart

Equipment required for Laboratories:

- Microwave Bench set up with Klystron Power Supply
- Microwave Bench set up with Gunn Power Supply
- Micro Ammeter
- VSWR meter
- Microwave Components

Course Outcomes:

The student will be able to

1. Demonstrate the characteristics of Microwave sources.
2. Demonstrate the characteristics of directional couplers.
3. To test the characteristics of microwave components.
4. Analyse the radiation pattern of antenna.
5. To measure antenna, gain and practice Measurement procedures.

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														
CO2	2		2										2	
CO3	2		2		3						3		3	3
CO4	2		3		3								3	3
CO5			1										1	1
Average	**2.0**		**2.0**		**3.0**						**3.0**		**2.3**	**2.3**

J.B. INSTITUTE OF ENGINEERING & TECHNOLOGY UGC AUTONOMOUS			
B.Tech ECE	**L**	**T-P-D**	**C**
III Year – II Semester	**0**	**0-4-0**	**2**
(J3201) LIFE SKILLS AND PROFESSIONAL SKILLS LAB			

Course objectives:

The Student will :

List of Experiments:

1. Yoga & Meditation – Demonstration, Practice & Techniques
2. Introduction to PHP Programming.
3. Fire wall-Installation, Programming, Configuration & Management (PALO ALTO)
4. Introduction to Internet of Things
5. Interview Questions & Skills
6. Group Discussion
7. JAM Sessions
8. Interview Questions & Skills
9. Group Discussion
10. JAM Sessions
11. C#Sharp, ADO.NET
12. ASP.NET

Course Outcomes

The Student will be able to:

1. Practice the yoga and meditation for mental peace and good health.
2. Develop interpersonal skills for empowerment of self and others.
3. Adopt good leadership behaviour and qualities.
4. Set appropriate goals, manage stress and time effectively.
5. Develop professional skills that are useful for sucessful carreer.

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		1			
CO3							2		3		3			
CO4							3		3		3			
CO5							2		3		1			
Average							**2.2**		**3.0**		**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: J32M2</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, CIA Triad, Assets and Threat, motive of attackers, active attacks, passive attacks, Software attacks, hardware attacks, Spectrum of attacks, Taxonomy of various attacks, IP spoofing,

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 of International Law. The INDIAN Cyberspace, National Cyber Security Policy.

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

Module III: Cybercrime: Mobile and Wireless Devices

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

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

Module IV: Cyber Security: Organizational Implications

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

Unit-2: Introduction, intellectual property in the cyberspace, the ethical dimension 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, Data linking and profiling, privacy policies and their specifications, privacy policy languages, privacy in different 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 Sunit Belpure, Cyber Security Understanding Cyber Crimes, Computer Forensics 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

Web Resources

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

Course Outcomes

On completion of the course, 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					1		
CO3	2	3	1		2	1								
CO4	2	2	2				1					1		
CO5						2	2					2		
Average	**2.0**	**2.3**	**1.8**		**1.7**	**1.8**	**1.3**					**1.3**		

IV Year- I Sem

S. No	Code	Course Title	L	T	P	D	Credits
1	J414A	VLSI Design	3	0	0	0	3
2	J414B	Electronic Measurements & Instrumentation	3	0	0	0	3
3	BTECE E3	Professional Elective-III	3	0	0	0	3
4	BTECE 4	Professional Elective-IV	3	0	0	0	3
5	BTECE 5	Professional Elective-V	3	0	0	0	3
6	BTECE O2	Open Elective –III	3	0	0	0	3
7	J4141	VLSI Design Lab	0	0	2	0	1
8	J4142	Project Stage-I	0	0	6	0	2
9	J4143	Industry Oriented Mini Project	0	0	4	0	2
Total			**15**	**0**	**16**	**0**	**23**

S. No	Code	Course Title	L	T	P	D	Credits
Professional Elective Course - III							
1	BTECEE3	Image and Computer Vision	3	0	0	0	3
2	BTECEE3	Low Power VLSI	3	0	0	0	3
3	BTECEE3	Adaptive Signal Processing	3	0	0	0	3
Professional Elective Course - IV							
1	BTECEE4	Embedded Real Time Operating Systems	3	0	0	0	3
2	BTECEE4	Telecommunication Switching System & Networks (TSSN)	3	0	0	0	3
3	BTECEE4	Fibre Optic Communications	3	0	0	0	3
Professional Elective Course - V							
1	BTECEE5	Mixed Signal Design	3	0	0	0	3
2	BTECEE5	Satellite Communication	3	0	0	0	3
3	BTECEE5	Information Theory and Coding	3	0	0	0	3

J.B. INSTITUTE OF ENGINEERING & TECHNOLOGY UGC AUTONOMOUS			
B.Tech. ECE	**L**	**T-P-D**	**C**
IV Year - I Semester	**3**	**0-0-0**	**3**
(J414A**) VLSI DESIGN**			

Course Objectives:

The Student will

1. visualize MOS fabrication technologies and understand electrical properties of MOS, CMOS and Bi CMOS circuits.
2. draw integrated circuit layouts following design rules.
3. learn combinational circuit, do verification, power optimization and network testing.
4. use power optimization techniques.
5. design validation procedures and testing of sequential circuits.

Module-1

Unit-I- Introduction

Introduction to IC Technology-MOS, PMOS, NMOS, CMOS and Bi-CMOS.

Unit-II- Basic Electric Properties: Basic electrical Properties of MOS and Bi-CMOS Circuits: Ids-Vds relationships. MOS transistor threshold voltage, gm, gds, Figure of merit, pass transistor, NMOS Inverter, Various pull ups, CMOS Inverter analysis and design, Bi-CMOS inverters.

Module-2

Unit-I- VLSI Circuit Design Processes

VLSI Design Flow, MOS Layers, Stick Diagrams, Design Rules and layout, 2 µm CMOS design rules for wires.

Unit-II

Contacts and Transistors layout Diagrams for NMOS and CMOS Inverters and Gates, Scaling of MOS Circuits.

Module-3

Unit-I - Gate Level Design

Logic Gates and Other complex gates, Switch logic, alternate gate circuits , time delays

Driving large capacitive loads, wiring capacitance, Fan-in, Fan-out, Choice of layers.

Module-4

Unit-I- Data path Subsystems

Subsystems Design, Shifters, Adders, ALUs, Multipliers, Parity generators, comparators, Zero/One Detectors, Counters.

Unit-II Array Subsystems: SRAM, DRAM, ROM, Serial Access Memories.

Module-5

Unit-I- Programmable Logic Devices

PLAs, FPGAs, CPLDs, Standard Cells, Programmable Array Logic, design Approach, Parameters influencing low power design.

Unit-II- CMOS Testing: CMOS Testing, Need for testing, Test Principles, Design Strategies for test chip level Test Techniques.

TEXT BOOKS:

1. Essentials of VLSI circuits and systems-Kamran Eshraghian, Eshraghian Dougles and A.Pucknell, PHI, 2005 Edition.
2. CMOS VLSI Design-A Circuits and systems perspective,Neil H.E. Weste,David Harris, Ayan Banerjee, 3rd Ed, Pearson,2009.

REFERENCE BOOKS:

1. Introduction to VLSI Systems: A Logic Circuit and system perspectives-Ming-BO Lin, CRC Press, 2011.
2. CMOS Logic circuit design –John. P.Uyemura, Springer, 2007.
3. Modem VLSI Design-Wayne Wolf, Pearson Education, 3rd Edition 1997.

Course Outcomes:

The Student will be able to

1. interpret the steps taken for MOS fabrication technologies.
2. analyze electrical behaviour of MOS, CMOS and Bi CMOS circuits.
3. construct the layout of integrated circuits following design rules.
4. design combinational circuit and sequential circuits using different clocking disciplines.
5. compare various Programmable logic devices and perform CMOS testing.

CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 - Weak														
Course Outcomes (COs)	Program Outcomes (POs)												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3												
CO2			3		3								3	
CO3	2	3											2	
CO4			3										3	
CO5		2												
Average	**2.5**	**2.7**	**3.0**		**3.0**								**2.7**	

J.B. INSTITUTE OF ENGINEERING & TECHNOLOGY UGC AUTONOMOUS			
B.Tech. ECE	**L**	**T-P-D**	**C**
IV Year - I Semester	**3**	**0-0-0**	**3**
(J414B) ELECTRONIC MEASUREMENTS AND INSTRUMENTATION			

Course Objectives:

The Student will

1. basic concepts and definition in measurement.
2. understand and learn the different principles and instruments adopted for measurement of current, voltage, power, energy etc.
3. study different methods available for measurement of passive elements like resistance, inductance & capacitance.
4. have to gain knowledge about AC and DC bridges, Oscilloscopes and transducers.
5. study the storage of digital signal and analyzers for analyzing digital signals.

Module-1

UNIT - I:

Block Schematics of Measuring Systems, Performance characteristics, Static characteristics, Accuracy, Precision, Resolution, Types of Errors, Gaussian Error, Root Sum Squares formula, Dynamic Characteristics, Repeatability, Reproducibility, Fidelity, Lag; Measuring Instruments: DC Voltmeters, D' Arsonval Movement, DC Current Meters, AC Voltmeters and Current Meters, Ohmmeters.

UNIT - II:

Multimeters, Meter Protection, Extension of Range, True RMS Responding Voltmeters, Specifications of Instruments. Electronic Voltmeters, Multimeters, AC,DC Meters, Digital Voltmeters: Ramp Type, Staircase Ramp, Dual Slope Integrating type, Successive Approximation Type,Autoranging,$3^{1/2}$,$3^{3/4}$ Digit Display, Pico ammeter, High Resistance Measurements, Low current Ammeter, Applications.

Module-2

UNIT - I:

Signal Generators: AF, RF Signal Generators, Sweep Frequency Generators, Pulse and Square wave Generators, Function Generators, Arbitrary waveform Generator, Video Signal Generators, and Specifications.

UNIT - II:

Signal Analyzers, AF, HF Wave Analyzers, Harmonic Distortion, Heterodyne wave Analyzers, Spectrum Analyzers, Power Analyzers, Capacitance-Voltage Meters, Oscillaors.

Module-3

UNIT -I:
DC and AC Bridges: Wheat Stone Bridge, Kelvin Bridge, AC Bridges, Maxwell, Hay, Schering, Wien, Anderson Bridges.

UNIT -II:
Resonance Bridge, Similar Angle Bridge ,Wagner's ground connection, Twin T, Bridged T Networks, Detectors.

Module-4

UNIT - I:
Oscilloscopes: CRT, Block Schematic of CRO, Time Base Circuits, Lissajous Figures, CRO Probes, High Frequency CRO Considerations, Delay lines, Applications, Specifications.

UNIT -II:
Special Purpose Oscilloscopes: Dual Trace, Dual Beam CROs, Sampling Oscilloscopes, Storage Oscilloscopes, Digital Storage CROs, Frequency Measurement, Period Measurement, Errors in time/Frequency Measurements, universal counters, Extension of range; Recorders: Strip chart, X-Y, oscillographic recorders.

Module-5

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

UNIT -II:
Measurement of Physical Parameters: Flow Measurement, Displacement Meters, Liquid level Measurement, Measurement of Humidity and Moisture, Velocity, Force, Pressure - High Pressure, Vacuum level, Temperature - Measurements, Data Acquisition Systems.

TEXT BOOKS:

1. Electronic Measurements and Instrumentations by K. Lal Kishore, Pearson Education - 2010.
2. Electronic instrumentation: H.S.Kalsi - TMH, 2nd Edition 2004.

EFERENCE BOOKS:

1. Electronic Instrumentation and Measurements - David A. Bell, Oxford Uiv. Press, 1997.
2. Modern Electronic Instrumentation and Measurement Techniques: A.D. Helbincs, W.D. Cooper: PHI, 5th Edition, 2003.
3. Electronic Measurements and Instrumentation: B. M. Oliver, J. M. Cage TMH Reprint.
4. Industrial Instrumentation: T. R. Padmanabham Spiriger 2009.

Course Outcomes:

The Student will be able to

1. list the various measurement techniques available and analyze the basic working of instruments used for measurement.
2. compute the errors in measurements and their rectification.
3. analyse the working of AC and DC bridges.
4. illustrate the basic principle and working of Oscilloscopes.
5. distinguish different types of transducers.

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		1							1	1	
CO3	1	2	2									1		1
CO4	1	2			2							2		1
CO5	2		2									2		2
Average	**1.6**	**2.0**	**2.0**		**1.5**							**1.6**	**1.5**	**1.3**

<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: BTECEE3</td><td rowspan="2">IMAGE AND COMPUTER VISION
(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:

The Student will:

1. get an introduction to image analysis and computer vision.
2. obtain mathematical and physical background on image as a linear system.
3. understand various advanced segmentation techniques.
4. obtain ample knowledge in contour-based shape representation and description.
5. understand various techniques in object recognition.

COURSE OUTCOMES:

The Student will be able to:

1. Review image processing techniques for computer vision.
2. Obtain mathematical and physical background on image.
3. Understand advanced techniques in image segmentation.
4. Understand object recognition with emphasis on feature extraction.
5. Study some of computer vision algorithms.

Module-1

UNIT – I:

Cameras: Pinhole Cameras**,** Radiometry – Measuring Light**:** Light in Space, Light Surfaces,

Sources, Shadows, and Shading: Qualitative Radiometry, Sources and Their Effects, Local Shading Models, Application: Photometric Stereo, Inter reflections: Global Shading Models,

Unit-2

Color: The Physics of Color, Human Color Perception, Representing Color, A Model for Image Color, Surface Color from Image Color.

Module-2

UNIT – 1:

The image mathematical and physical background: Linearity, The Dirac distribution and convolution, Linear integral transforms, Images as linear systems,

Unit-2:

Introduction to linear integral transforms: 2D Fourier transform, Sampling and the Shannon constraint, Discrete cosine transform, Wavelet transform, Eigen-analysis, Singular value decomposition Principal component analysis, Other orthogonal image transforms, Images as stochastic processes.

Module-3

UNIT –1:

Image pre-processing: Scale in image processing, Canny edge detection, Parametric edge models, Edges in multi-spectral images, Pre-processing in frequency domain, Line detection, Corner detection, Maximally stable extremal regions,

Unit-2:

Image restoration: Degradations that are easy to restore, Inverse filtration, Wiener filtration

Basics of video processing systems in Matlab Compter vision toolbox.

Module-4

UNIT- I:

Advanced segmentation: Mean Shift Segmentation, Active contour models-snakes, Traditional snakes and balloons, Extensions, Gradient vector flow snakes, Geometric deformable models-level sets and geodesic active contours, Fuzzy Connectivity,

Unit-2:

Contour-based shape representation and description: Chain codes, Simple geometric border representation, Fourier transforms of boundaries, Boundary description using segment sequences, B-spline representation, Shape invariants.

Module-5

UNIT – 1:

Knowledge representation: Statistical pattern recognition, Classification principles, Classifier setting, Classifier learning, Support Vector Machines, Cluster analysis

Unit-2:

Neural networks: Feed-forward networks, Unsupervised learning, Hopfield neural networks

Optimization techniques in recognition: Genetic algorithms, Simulated annealing

TEXT BOOKS:

1. David A. Forsyth and Jean Ponce: Computer Vision – A Modern Approach, PHI Learning (Indian Edition), 2009.

2. Milan Sonka, Vaclav Hlavac , Roger Boyle“ Image Processing, Analysis, and Machine Vision”, Cengage Learning, 2014 or 3rd Edition, 2008ISBN:049508252X

REFERENCE BOOKS:

1. E. R. Davies: Computer and Machine Vision – Theory, Algorithms and Practicalities, Elsevier (Academic Press), 4th edition, 2013.

2. Scott.E.Umbaugh,“Computer Vision and Image Processing”,PrenticeHall, 1997.

3. A. K.Jain,“ Fundamentals of Digital Image Processing”,Pearson, 2004.

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	2	2												3
CO3	2	2		1										3
CO4			2	2			2							1
CO5			3	3										3
Average	**2.0**	**2.3**	**2.7**	**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 IV Year – I Sem</td></tr>
<tr><td>Course Code: BTECEE3</td><td rowspan="2" colspan="4">LOW POWER VLSI 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>

Course Objectives:

Student will

1. Gain Knowledge owing to technologies of Low power with power dissipation
2. Construct different combinational circuits architectures using Low Power
3. Apply Low Power concepts to SRAM/DRAM Memories
4. Solve a case study pertaining to Low Power Sub-System Design

Module-1

UNIT-I

Introduction: Historical Perspective and Future Trends in CMOS VLSI Circuit and System Design, A way of Designing Fast CMOS Circuits , Sources of Power Dissipation, Static Power Dissipation, Active Power Dissipation, Emerging Technologies for Low Power, Circuit Techniques for Leakage Power Reduction.

Module-2

UNIT-I

Adders: Standard Adder Cells, CMOS Adders Architectures, Low Voltage Low Power Design Techniques, Current Mode Adders

Module-3

UNIT-I

Multipliers: Types Of Multiplier Architectures; Braun, Booth Multipliers and their performance comparison, Low Voltage Low Power Design Techniques

Module-4

UNIT-I

Memories: Sources of power dissipation in SRAMs, Low power SRAM circuit techniques, Sources of power dissipation in DRAMs, Low power DRAM circuit techniques

Module-5

UNIT-1

Wires: Increased delays of wires, new materials for wires and dielectrics Basic background on testing, Low power and safely operating circuits, Case study – A Low power subsystem design.

Text Book:

1. Kiat Seng Yeo and Kaushik Roy, Low- Voltage, Low-Power VLSI Subsystems, Edition 2009, Tata Mc Graw Hill

Reference Books:

1. Soudris D, Piguet C and Goutis C, Designing CMOS Circuits for Low Power, Kluwer Academic Publishers, 2002

2. Jan Rabaey, Low Power Design Essentials, Springer.

Course Outcomes: At the end of the course the student will be able to:
CO1 Identify clearly the sources of power consumption in a given VLSI Circuit.
CO2 Design low power arithmetic circuits and systems.
CO3 Choose the types of SRAMs/ DRAMs for the given Low power applications.
CO4 Decide at which level of abstraction is advantageous to implement low power techniques in a VLSI system design.

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	2	
CO4	2	2	2	2	2							2	2	2
Average	2	2.2	2	2	2							2	2	2

<table>
<tr><td>Y 2020-21 onwards</td><td colspan="4">J. B. Institute of Engineering and Technology (UGC Autonomous)</td><td colspan="4">B.Tech: ECE
IV Year – I Sem</td></tr>
<tr><td>Course Code: BTECEE3</td><td rowspan="2" colspan="4">ADAPTIVE SIGNAL PROCESSING
(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>

Prerequisites: Microprocessors and Interfacing, Microcontrollers and Applications, ComputerOrganization

Course Objective: The Student will

1. understand the basic concepts of Random process and adaptive filtering.
2. understand the non-linear control and need and significance of changing the control parameters w.r.t. real-time situation.
3. mathematically represent the ‘adaptability requirement’.
4. understand the mathematical treatment for the modeling and design of the signal processing systems.
5. study the applications such as adaptive noise cancellation, interference canceling and system identification etc.

MODULE I:

Unit-1:
General concept of adaptive filtering and estimation, applications and motivation, Review of probability, random variables and stationary random processes, Correlation structures, properties of correlation matrices.

MODULE II:

Unit-1:
Optimal FIR (Wiener) filter, Method of steepest descent, extension to complex valued LMS algorithm (real, complex), convergence analysis, weight error correlation matrix, excess mean square error and mis-adjustment.

MODULE III:

Unit-1:
Variants of the LMS algorithm: the sign LMS family, normalized LMS algorithm, block LMS and FFT based realization, frequency domain adaptive filters, Sub-band adaptive filtering.
Unit-2:

Signal space concepts - introduction to finite dimensional vector space theory, subspace, basis, dimension, linear operators, rank and nullity, inner product space, orthogonality, Gram- Schmidt orthogonalization, concepts of orthogonal projection, orthogonal decomposition of vector spaces.

MODULE IV:

Unit-1:
Vector space of random variables, correlation as inner product, forward and backward projections, Stochastic lattice filters, recursive updating of forward and backward prediction errors, relationship with AR modeling, joint process estimator, gradient adaptive lattice

MODULE V

Unit-1:
Introduction to recursive least squares (RLS), vector space formulation of RLS estimation, pseudo-inverse of a matrix, time updating of inner products, development of RLS lattice filters, RLS transversal adaptive filters.
Unit-2:
Advanced topics: affine projection and subspace based adaptive filters, partial update algorithms, QR decomposition and systolic array.

TEXTBOOKS:

1. S. Haykin, Adaptive filter theory, Prentice Hall, 1986.Education 2010.

REFERENCES:

1. C. Widrow and S.D. Stearns, Adaptive signal processing, Prentice Hall, 1984.

E-RESOURCES:

1. https://onlinecourses.nptel.ac.in/noc17_cs05/preview
2. https://www.youtube.com/watch?v=y9RAhEfLfJs
3. http://www.nptelvideos.in/2012/11/embedded-systems.html

Course Outcomes:
The student will be able to
1. practice the basic concepts of Random process and adaptive filtering.
2. develop knowledge on optimal FIR filter.
3. establish knowledge on LMS algorithm.
4. employ the mathematical treatment for the modelling and design of the signal processing systems.
5. analyse working of Recursive Least Squares (RLS) method.

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														
CO2	2											2	2	
CO3	2				3						3	2	3	3
CO4	2				3							3	3	3
CO5												1	1	1
Average	2				3						3	2	2.25	2.33

<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: ECE
IV Year – I Sem</td></tr>
<tr><td>Course Code: BTECEE4</td><td rowspan="2">EMBEDDED REAL TIME OPERATING SYSTEMS
(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>

Course Objective: The Student will

1. learn the architecture and programming of ARM processor.
2. be familiar with the embedded computing platform design and analysis.
3. be exposed to the basic concepts of real time Operating system.
4. learn the system design techniques and networks for embedded systems.
5. understand the case study based on Embedded Real Time Operating Systems applications.

MODULE I:

INTRODUCTION TO EMBEDDED COMPUTING AND ARM PROCESSORS
Complex systems and micro processors– Embedded system design process –Design example: Model train controller- Instruction sets preliminaries – ARM Processor – CPU: programming input and output- supervisor mode, exceptions and traps – Co-processors- Memory system mechanisms – CPU performance- CPU power consumption.

MODULE II:

EMBEDDED COMPUTING PLATFORM DESIGN : The CPU Bus-Memory devices and systems–Designing with computing platforms – consumer electronics architecture – platform-level performance analysis – Components for embedded programs- Models of programs- Assembly, linking and loading – compilation techniques- Program level performance analysis – Software performance optimization – Program level energy and power analysis and optimization – Analysis and optimization of program size- Program validation and testing on Raspberry pie.

MODULE III:

PROCESSES AND OPERATING SYSTEMS: Introduction – Multiple tasks and multiple processes – Multirate systems- Preemptive real-time operating systems- Priority based scheduling- Interprocess communication mechanisms – Evaluating operating system performance- power optimization strategies for processes – Example Real time operating systems-POSIX-Windows CE.

MODULE IV:

SYSTEM DESIGN TECHNIQUES AND NETWORKS: Design methodologies- Design flows – Requirement Analysis – Specifications-System analysis and architecture design – Quality Assurance techniques- Distributed embedded systems – MPSoCs and shared memory multiprocessors.

MODULE V

CASE STUDY: Data compressor – Alarm Clock – Audio player – Software modem-Digital still camera – Telephone answering machine-Engine control unit – Video accelerator.

TEXTBOOKS:

1. Marilyn Wolf, "Computers as Components – Principles of Embedded Computing System Design", Third Edition "Morgan Kaufmann Publisher (An imprint from Elsevier), 2012.

REFERENCES:

1. Jonathan W.Valvano, "Embedded Microcomputer Systems Real Time Interfacing", Third Edition Cengage Learning, 2012.
2. David. E. Simon, "An Embedded Software Primer", 1st Edition, Fifth Impression, Addison-Wesley Professional, 2007.
3. Raymond J.A. Buhr, Donald L.Bailey, "An Introduction to Real-Time Systems- From Design to Networking with C/C++", Prentice Hall, 1999.
4. C.M. Krishna, Kang G. Shin, "Real-Time Systems", International Editions, Mc Graw Hill 1997.
5. K.V.K.K.Prasad, "Embedded Real-Time Systems: Concepts, Design & Programming", Dream Tech Press, 2005.
6. Sriram V Iyer, Pankaj Gupta, "Embedded Real Time Systems Programming", Tata Mc Graw Hill, 2004.

E-RESOURCES:

1. http://www.nptelvideos.in/2012/11/embedded-systems.html

Course Outcomes:

The student will be able to

1. Understand Building Blocks of Embedded System, Microcontrollers , ARM Programming model ,CPU Buses.
2. Classify Discuss various Memory devices in Embedded System, Compilation Techniques, Program level performance Analyze.
3. Describe Multitasking & Multi Processing, Inter Process Communication Mechanism, Shared Memory.
4. Analyze different Design Methodologies & impart knowledge in Various processor Scheduling algorithms.
5. Apply the concept of Real time Operating System, and Case Study of Alarm clock ,Digital Still camera

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														
CO2	2											2	2	
CO3	2				3						3	2	3	3
CO4	2				3							3	3	3
CO5												1	1	1
Average	2				3						3	2	2.25	2.33

J.B. INSTITUTE OF ENGINEERING & TECHNOLOGY UGC AUTONOMOUS			
B.Tech. ECE	**L**	**T-P-D**	**C**
IV Year - I Semester	**3**	**0-0-0**	**3**
(BTECEE4) Telecommunication Switching Systems and Networks **(Professional Elective-IV)**			

Course Objectives:

The student will

1. get knowledge about the telecommunication industry and its services and market.
2. Understand the operational characteristics of switching techniques.
3. study the working principle of different Switching types.
4. study the working principles of switching networks.
5. understand the working concept of Digital Subscriber Access.

Module-1:

UNIT I: Switching Systems

Evolution of Telecommunications; Basics of a switching system, functions of a switching system, Strowger switching components, step by step switching, Design parameters;100 line switching system;1000 line Blocking Exchange; 10,000 Line exchange, Principle of Crossbar switching; Crossbar switch configurations; Cross point Technology, Crossbar Exchange organization; A general trunking; Electronic and digital switching systems.

Telecommunications Traffic: Introduction; Unit of traffic; congestion; Traffic measurement; A Mathematical model; Lost-call systems-Theory; Traffic performance; Loss systems in Tandem; Use of traffic tables; Queuing systems-the second Erlang distribution ; Probability of Delay; Finite Queue capacity; some other useful results; Systems with a single server; Queues in tandem; Delay tables; Applications of Delay formulae.

Module-2:

UNIT I: Switching Networks

Introduction, Single stage networks; Grading Principles; Two, Three and four stage networks.

Time Division switching: Basic time division space switching; basic time division time switching; Time multiplexed space switching; Time multiplexed time switching; Combination switching; Three stage Combination switching.

Control of switching systems: call processing functions-sequence of operations; signal exchanges; State transition diagrams; common control; Reliability; Availability and security, Stored program control.

Module-3:

UNIT I: Signaling

Introduction; Customer Line signaling; Audio frequency Junctions and trunk circuits; FDM carrier systems-Out band signaling; Inland (VF) signaling; PCM signaling; Inter Register signaling.

UNIT II:

Common channel signaling principles- General signaling networks; CCITT signaling system number 6; CCITT signaling system number 7; High level data link control protocol; Signal units; The signaling information field.

Module-4:

UNIT I: Packet Switching

Introduction; Statistical multiplexing; Local and wide Area networks-Bus networks, Ring networks, comparison of bus and Ring networks, Optical fiber Networks; Large scale networks; Datagram and virtual circuits; Routing; Flow control; Standards; Frame relay; Broadband networks-General; Asynchronous Transfer mode; ATM switches.

Module-5:

UNIT I: Networks

Introduction, Analog Networks, Integrated Digital Networks, Integrated services Digital Networks; Cellular Radio Networks; Intelligent Networks; private Networks; charging; Routing-General, Automatic, Alternative routing.

Text Books:

1. Telecommunications Switching and Traffic Networks, J.E Flood, Pearson Eduction, 2006.
2. Telecommunications Switching systems and Networks, Tyagarajan Viswanathan, Prentice hall of India Pvt. Ltd., 2006.

References:

1. Digital Telephony, John C Bellamy, John Wiley International Student Edition, 3rd Edition, 2000.

2. Data Communications and Networking, Behrouz A. Ferouzan, TMH, 2nd Edition, 2000.

3. Introduction to Data Communications and Networking, Tomasi, Pearson Education, 1st Edition, 2007.

Course Outcomes:

The student will be able to:

1. demonstrate switching operation.
2. apply the concepts of probability to resolve traffic and network related issues.
3. solve problems in traffic engineering that covers various systems and blocking models, numbering plan, charging and organize an exchange.

4. analyze Switching hierarchy, routing and Transmission plan.
5. design ST/TS switches to meet the 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														
CO2	2											2	2	
CO3	2				3						3	2	3	3
CO4	2				3							3	3	3
CO5												1	1	1
Average	2				3						3	2	2.25	2.33

<table>
<tr><td>AY 2020-21 Onwards (R20)</td><td>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: BTECEE4</td><td rowspan="2">FIBER OPTIC COMMUNICATIONS
(Professional Elective-IV)</td><td>L</td><td>T</td><td>P/D</td></tr>
<tr><td>Credits: 03</td><td>3</td><td>0</td><td>0/0.</td></tr>
</table>

Pre-requisite:
Electromagnetic Fields and waves. Analog and Digital communications

Course Objectives:
OBJECTIVES:

1. To learn the basic elements of optical fiber transmission link, fiber modes configurations and structures
2. To understand the different kind of losses, signal distortion, and optical fiber coupling techniques
3. To learn about the various optical sources and transmission techniques
4. To learn the fiber optical receivers and noise performance in photo detector.
5. To enrich the knowledge about optical communication systems design considerations.

Module 1:

Unit 1:INTRODUCTION: The Electromagnetic Spectrum, Properties of Light, Dual Nature of Light Concept of a photon, Wave Model, Characteristics of light waves. Concepts of information, general communication systems, evolution of Basic Fiber Optic Communication System, Benefits and disadvantages of Fiber Optics. Transmission Windows. Transmission Through Optical Fiber, The Laws of Reflection and Refraction, Light rays and light waves, Reflection of light from optical surfaces, Refraction of light from optical interfaces, The Numerical Aperture (NA), The Optical Fiber, Types of Fiber.

Unit 2:Preparation of optical fiber: liquid-phase techniques, vapour phase deposition techniques, Connector Principles, Fiber End Preparation,

Module 2:

Unit 1:Signal Degradation in Optical Fiber: Information capacity determination, Group delay, Types of Dispersion: Material dispersion, Wave-guide dispersion, Polarization mode dispersion, Intermodal dispersion. Pulse broadening.

Unit 2: Optical fiber Connectors and Joints- Connector types, Single mode fiber connectors, Connector return loss. Fiber Splicing- Splicing techniques, splicing single mode fibers. Fiber alignment and joint loss- Multimode fiber joints, single mode fiber joints.

Module 3:

Unit 1: **Optical Sources:** Optical sources LEDs, Structures, Materials, Quantum efficiency, Power, Modulation, Power bandwidth product. Injection Laser Diodes- Modes, Threshold conditions, External quantum efficiency, Laser diode rate equations, Resonant frequencies. Reliability of LED and ILD.

Unit 2: Source to fiber power launching - Output patterns, Power coupling, Power launching, Equilibrium Numerical Aperture, Laser diode to fiber coupling.

Module 4:

Unit 1:Optical Detectors: Physical principles of PIN and APD, Detector response time, Temperature effect on Avalanche gain, Comparison of Photodetectors.

Unit 2: Optical receiver operation- Fundamental receiver operation, Digital signal transmission, error sources, Receiver configuration, Digital receiver performance, Probability of error, Quantum limit.

Module 5:

Unit 1:Advances In Optical Fiber Systems: Optical system design Considerations, Component choice, multiplexing. Point-to- point links, System considerations, Link power budget with examples, Overall fiber dispersion in Multi-mode and Single mode fibers, Rise time budget with examples.

Unit 2:Transmission: Transmissiondistance, Line coding in Optical links, WDM, Necessity, Principles, Types of WDM, Measurement of Attenuation and Dispersion, Eye pattern.

Text Books:

1. Optical Fiber Communications – Gerd Keiser, TMH, 4th Edition, 2008.
2. Optical Fiber Communications – John M. Senior, Pearson Education, 3rd Edition, 2009.

Reference Books:

1. Fiber Optic Communications – D.K. Mynbaev, S.C. Gupta and Lowell L.Scheiner, Pearson Education, 2005.
2. Text Book on Optical Fibre Communication and it’s Applications – S.C.Gupta, PHI, 2005.
3. Fiber Optic Communication Systems – Govind P. Agarwal, John Wiley, 3rd Ediition, 2004

Course Outcomes:

1. Demonstrate an understanding of optical fiber communication link, structure, propagation and transmission properties of an optical fiber.
2. Estimate the losses and analyze the propagation characteristics of an optical signal in different types of fibers.
3. Describe the principles of optical sources and power launching-coupling methods.
4. Compare the characteristics of fiber optic receivers.
5. Design a fiber optic link based on budgets.

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	
CO2	2	1											1	1
CO3	2	2							1	1		2		1
CO4	2	1								1				1
CO5	1	1							1	2		2	1	

<table>
<tr><td>AY 2020-21 Onwards (R20)</td><td>J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="3">B.Tech:ECE
IV Year – I Sem</td></tr>
<tr><td>Course Code: BTECEE5</td><td rowspan="2">MIXED SIGNAL DESIGN
(Professional Elective V)</td><td>L</td><td>T</td><td>P/D</td></tr>
<tr><td>Credits: 03</td><td>3</td><td>0</td><td>0</td></tr>
</table>

Course Objectives:

The student will

1. understand the Switched capacitors Circuits and Operation.
2. analyze PLLS in detail.
3. study Data Converter Fundamentals.
4. illustrate Nyquist Rate A/D Converters.
5. motivate the graduate students to study and analyze the oversampling converters.

Module 1:

Unit 1: Switched Capacitor Circuits: Introduction to Switched Capacitor circuits- basic building blocks, Operation and Analysis, Non-ideal effects in switched capacitor circuits, Switched capacitor integrators first order filters, Switch sharing, biquad filters.

Module 2:

Phased Lock Loop (PLL): Basic PLL topology, Dynamics of simple PLL, Charge pump PLLs-Lock acquisition, Phase/Frequency detector and charge pump, Basic charge pump PLL, Non-ideal effects in PLLs-PFD/CP non- idealities, Jitter in PLLs, Delay locked loops, applications.

Module 3:

Data Converter Fundamentals: DC and dynamic specifications, Quantization noise, Nyquist rate D/A converters- Decoder based converters, Binary-Scaled converters, Thermometer-code converters, Hybrid converters.

Module 4:

Nyquist Rate A/D Converters: Successive approximation converters, Flash converter, Two-step A/D converters, Interpolating A/D converters, Folding A/D converters, Pipelined A/D converters, Time-interleaved converters.

Module 5:

Oversampling Converters: Noise shaping modulators, Decimating filters and interpolating filters, Higher order modulators, Delta sigma modulators with multi-bit quantizers, Delta sigma D/A.

Text Books:

1. Design of Analog CMOS Integrated Circuits- Behzad Razavi, TMH Edition, 2002.
2. Analog Integrated Circuit Design- David A. Johns,Ken Martin, Wiley Student Edition, 2013.

Reference Books:

1. CMOS Mixed-Signal Circuit Design – R. Jacob Baker, Wiley Interscience, 2009.
2. CMOS Analog Circuit Design –Philip E. Allen and Douglas R. Holberg, Oxford University Press, International Second Edition/Indian Edition, 2010.
3. Introduction to Mixed-signal, Embedded design- Dr. Alex Doboli and Dr. Edward Currie, Springer, 2011.

E References:

1. www.nptel.com/mmsd/aybihj

Course Outcomes:

The student will be able to

1. illustrate the concepts of Switched Capacitor circuits.
2. design and analysis of Nyquist Rate A/D Converters.
3. extend the application of A/D converters for over sampling.
4. employ the Mixed Signal Design to Different Applications.
5. develop the concepts of Oversampling Converters.

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	
CO2	2	1											1	1
CO3	2	2							1	1		2		1
CO4	2	1								1				1
CO5	1	1							1	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 ECE
IV Year – I Sem</td></tr>
<tr><td>Course Code:
BTECEE5</td><td colspan="4" rowspan="2">SATELLITE COMMUNICATION
(Program 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: Digital Communication

Course Objectives:
This course will enable students to:
1. understand the basic concepts of Satellite communication.
2. explain operation of orbital mechanics and satellite sub-systems.
3. get introduced with phenomena in satellite communication and perform mathematical analysis.
4. gain knowledge about modulation and multiple access techniques.
5. understand different applications of satellite communication and phenomena behind Earth Station Technology.

Module 1
Unit-1: Introduction to Satellite Communication
Principles and architecture of satellite Communication, Brief history of Satellite systems, advantages, disadvantages, applications and frequency bands used for satellite communication.
Unit-2: Orbital Mechanics
Orbital equations, Kepler's laws, Apogee and Perigee for an elliptical orbit, evaluation of velocity, orbital period, angular velocity of a satellite, concepts of Solar day and Sidereal day.

Module 2
Unit 1 - Satellite Sub-systems
Study of Architecture and Roles of various sub-systems of a satellite system such as Telemetry, Tracking, Command and Monitoring (TTC & M), Attitude and orbit control system (AOCS), Communication sub-system, power sub-systems.

Module 3

Unit 1- Typical Phenomena in Satellite Communication

Solar Eclipse on satellite, its effects, remedies for Eclipse, Sun Transit Outage phenomena, its effects and remedies.

Unit 2 – Mathematical Analysis

Flux density and received signal power equations, Calculation of System noise temperature for satellite receiver, noise power calculation, Doppler frequency shift phenomena and expression for Doppler shift.

Module 4:

Unit 1- Modulation

Various modulation schemes used in satellite communication, Meaning of Multiple Access.

Unit 2- Multiple Access Schemes

Multiple access schemes based on time and frequency, Code sharing namely TDMA, FDMA and CDMA, Satellite link budget.

Module 5:

Unit 1- Earth Station Technology: Transmitters, Receivers, Tracking Systems, Terrestrial Interface, Power Test Methods, Lower Orbit Considerations.

Unit 2- Satellite Applications: VSAT, GPS, Direct Broadcast Satellite (DBS) Television, Orbital Spacing, Direct to Home Broadcast(DTH), Radarsat, Recent developments in Satellite Communication.

Text Books:

1. Timothy Pratt Charles W. Bostian, Jeremy E. Allnutt: Satellite Communications: Wiley India, 2nd edition 2002.

2. Satellite Communications Engineering – Wilbur L. Pritchard, Robert A Nelson and Henri G. Suyderhoud, 2nd Edition, Pearson Publications, 2003.

3. Dennis Roddy: Satellite Communication: 4th Edition, McGraw Hill,2009.

4. Tri T. Ha: Digital Satellite Communications: Tata McGraw Hill, 2009.

Reference Books:

1. Satellite Communications: Design Principles – M. Richharia, BS Publications, 2nd Edition, 2003.

2. Satellite Communication - D.C Agarwal, Khanna Publications, 5th Ed.

E - Resources:

2. https://www.coursera.org/learn/satellite-communications.
3. https://www.intelsat.com/resources/tools/satellite-101.
4. https://nptel.ac.in/noc/courses/noc17/SEM2/noc17-ec14/

5. http://www.digimat.in/nptel/courses/video/117105131/L19.html

Course Outcomes:

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

1. Visualize the architecture of satellite systems as a means of high speed, high range communication system.
2. Illustrate the basic concepts of Orbital mechanics.
3. State aspects related to sub-systems in a satellite and satellite link budget.
4. acquire knowledge about modulation and multiple access schemes.
5. Describe the typical phenomena in satellite communication and also its 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	2	2									1	1	
CO2	2	2	1									1	1	1
CO3	2	2	1									1	1	1
CO4	3	2	2									1	1	1
CO5	2	2	2										1	1
Average	**2.2**	**2.0**	**1.6**									**1.0**	**1.0**	**1.0**

<table>
<tr><td>2020-21</td><td>J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B.Tech ECE
IV Year – I Sem</td></tr>
<tr><td>Course Code:
BTECEE5</td><td rowspan="2">INFORMATION THEORY AND CODING
(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>

Course Objectives:

The Student will be able
1. To acquire knowledge about information and entropy
2. To learn Hamming weight, minimum distance decoding and different types of codes.
3. To learn about syndrome calculation and design of an encoder and decoder.
4. To study convolution coding. They also learn about sequential search and Viterbi algorithm.
5. To import image compression, graphics interchange format, JPEG and MPEG standards.
6. Text compression techniques, speech and audio coding.

Module 1

INFORMATION THEORY

Information – Entropy, Information rate, classification of codes, Kraft McMillan inequality, Source coding theorem, Shannon-Fano coding, Huffman coding, Extended Huffman coding - Joint and conditional entropies, Mutual information - Discrete memoryless channels – BSC, BEC – Channel capacity, Shannon limit.

Module 2

ERROR CONTROL CODING: BLOCK CODES

Definitions and Principles: Hamming weight, Hamming distance, Minimum distance decoding - Single parity codes, Hamming codes, Repetition codes - Linear block codes, Cyclic codes - Syndrome calculation, Encoder and decoder - CRC.

Module 3

ERROR CONTROL CODING: CONVOLUTIONAL CODES

Convolutional codes – code tree, trellis, state diagram - Encoding – Decoding: Sequential search and Viterbi algorithm – Principle of Turbo coding.

Module 4

SOURCE CODING: TEXT, AUDIO AND SPEECH

Text: Adaptive Huffman Coding, Arithmetic Coding, LZW algorithm – Audio: Perceptual coding, Masking techniques, Psychoacoustic model, MEG Audio layers I,II,III, Dolby AC3 - Speech: Channel Vocoder, Linear Predictive Coding**.**

Module 5

SOURCE CODING: IMAGE AND VIDEO

Image and Video Formats – GIF, TIFF, SIF, CIF, QCIF – Image compression: READ, JPEG – Video Compression: Principles-I,B,P frames, Motion estimation, Motion compensation, H.261, MPEG standard.

TEXT BOOKS :

1. R Bose, "Information Theory, Coding and Cryptography", TMH 2007
2. Fred Halsall, "Multidedia Communications: Applications, Networks, Protocols and Standards", Perason Education Asia, 2002.

REFERENCES:

1. K Sayood, "Introduction to Data Compression" 3/e, Elsevier 2006.
2. S Gravano, "Introduction to Error Control Codes", Oxford University Press 2007
3. Amitabha Bhattacharya, "Digital Communication", TMH 2006.

E - Resources:

6. https://nptel.ac.in/courses/ITC/ IIT Delhi/011/102/11111/

Course Outcomes:

The student will be able to:

1. To Analyze source coding methods and information
2. Define and solve channel coding methods
3. To analyze block codes and cyclic codes
4. To apply audio and text coding in communications
5. To apply speech and image coding in communications.

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 colspan="4">J. B. Institute of Engineering and Technology (UGC Autonomous)</td><td colspan="4">B.Tech ECE IV Year – II Sem</td></tr>
<tr><td>Course Code: J4141</td><td rowspan="2" colspan="4">(E4210) VLSI 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 the logic design of Digital circuits.
2. learn implementation of designs using Hardware description language.
3. learn the concept of timing simulation.
4. learn implementation of RTL codes using various simulation tools.
5. learn CAD tools for design and implementation using FPGA devices.

• Note: Minimum of 10 programs from Part –I and 2 programs from Part -II are to be conducted.
Design and implementation of the following CMOS digital/analog circuits using Cadence / Mentor Graphics / Synopsys / Equivalent CAD tools. The design shall include Gate-level design, Transistor-level design, Hierarchical design, Verilog HDL/VHDL design, Logic synthesis, Simulation and verification.
Part –I: VLSI Front End Design programs:
Programming can be done using any complier, and obtain the simulation, synthesis, place and route and implement into FPGA/CPLD boards. The performance testing may be done using pattern generator (32 channels) and logic analyzer apart from verification by simulation with any of the front end tools.
1. HDL code to realize all the logic gates.
2. Design and Simulation of adder.
3. Design of encoders and decoders.
4. Design of multiplexer and de-multiplexer.
5. Design of code converters and comparators.
6. Design of flip flops: SR, D, JK, T.
7. Design of register using latches and flip flops.
8. Design of shift register of serial- in serial –out, serial in parallel out, parallel in serial out and parallel in parallel out.
9.Design of synchronous and asynchronous counter.
10. Design of Sequence Detector (Finite State Machine- Mealy and Moore Machines).

Part –II: VLSI Back End Design programs:
Design and implementation of the following CMOS digital/analog circuits using Cadence tools. Layout, physical verification (DRC, LVS) DC/transient analysis, for complex design

of the following:

11. Introduction to layout design rules.

12. Layout, physical verification, Layout, for complex design of the following:

- Basic logic gates
- CMOS inverter
- CMOS NOR/NAND gates
- CMOS XOR
- CMOS MUX gates

Course Outcomes:

The student will be able to

1. write HDL codes for all digital designs and implement using simulation tools.
2. obtain timing simulation and calculate performance analysis.
3. synthesize combinational and sequential designs.
4. implement physical design in FPGA devices.
5. practice the test pattern generation for Digital 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		3				3					
CO2					3				3					
CO3					3									
CO4					3									
CO5			2											
Average			**2.0**		**3.0**				**3.0**					

IV Year II Sem

S. No	Code	Course Title	L	T	P	D	Credits
1	BTECE E6	Professional Elective – VI	3	0	0	0	3
2	BTECE O4	Open Elective – IV	3	0	0	0	3
3	J4242	Project Stage – II	0	0	16	0	8
4	J4241	Seminar	0	0	2	0	1
Total			**6**	**0**	**18**	**0**	**15**
Open Elective Course - IV							
1	BTECE O4	Consumer Electronics	3	0	0	0	3
2	BTECE O4	Nano Electronics	3	0	0	0	3
Professional Elective Course - VI							
1	BTECE E6	Wireless Sensor Networks	3	0	0	0	3
2	BTECE E6	Radar System	3	0	0	0	3
3	BTECE E6	Wavelet Signal Processing	3	0	0	0	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 ECE
IV Year – II Sem</td></tr>
<tr><td>Course Code:
BTECEE6</td><td rowspan="2">WIRELESS SENSOR NETWORKS
(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>

Pre-requisite: Computer Networks

Course Objectives:
This course will enable students to:
1. understand the basic WSN technology and supporting protocols, with emphasis on applications.
2. illustrate the medium access control protocols.
3. gain knowledge on operating system.
4. describe key routing protocols for sensor networks and main design issues.
5. illustrate the security and applications of Wireless Sensor Networks.

Module 1:
Unit 1 (Introduction to WSN)
Components of a wireless sensor node, Motivation for a Network of Wireless Sensor Nodes, Classification of sensor networks, Characteristics of wireless sensor networks, Challenges of wireless sensor networks, Comparison between wireless sensor networks and wireless mesh networks, Limitations in wireless sensor networks, Design challenges.
Unit 2 (Applications)
Structural Health Monitoring, Traffic Control, Health Care, Pipeline Monitoring, Precision Agriculture, Active Volcano, Underground Mining Node Architecture: The Sensing Subsystem, the Processor Subsystem, Communication Interfaces, Prototypes.

Module 2:
Unit 1 (Network Layer)
Routing Metrics, Flooding and Gossiping, Data-Centric Routing, Proactive Routing, On-Demand Routing, Hierarchical Routing, Location-Based Routing.
Unit 2 (Network management and Power Management)
QoS-Based Routing Protocols Node and Network Management: Power Management, Local Power Management aspects, Dynamic Power Management, Conceptual Architecture.

Module 3:

Unit 1 (MAC Protocols for Wireless Sensor Networks)

Issues in Designing a MAC protocol for Ad Hoc Wireless Networks, Design goals of a MAC Protocol for Ad Hoc Wireless Networks, Classifications of MAC Protocols, Contention – Based Protocols, Contention – Based Protocols with reservation Mechanisms, Contention – Based MAC Protocols with Scheduling Mechanisms, MAC Protocols that use Directional Antennas, Other MAC Protocols.

Unit 2 (Operating Systems for Wireless Sensor Networks)

Operating Systems for Wireless Sensor Networks: Introduction, operating system design issues, Examples of operating systems-TinyOS and nesC.

Module 4:

Unit 1 (Introduction to Routing Protocols)

Introduction, Issues in Designing a Routing Protocol for Ad Hoc Wireless Networks,

Unit 2 (Classification of Routing Protocols)

Classification of Routing Protocols, Table –Driven Routing Protocols, On – Demand Routing Protocols, Hybrid Routing Protocols, Routing Protocols with Efficient Flooding Mechanisms, Hierarchical Routing Protocols, Power – Aware Routing Protocols, Proactive Routing.

Module 5:

Unit 1 (Security in WSN)

Security in Ad Hoc Wireless Networks, Network Security Requirements, Issues and Challenges in Security Provisioning, Network Security Attacks, Key Management, Secure Routing in Ad Hoc Wireless Networks.

Unit 2 (Applications of WSN)

Ultra wide band radio communication, Wireless fidelity systems. Future directions, Home automation, smart metering Applications.

Text Books:

1.Wireless Ad- hoc and Sensor Networks: Protocols, Performance and Control – Jagannathan Sarangapani, CRC Press.

2.Waltenegus Dargie, Christian Poellabauer, “Fundamentals of Wireless Sensor Networks: Theory and Practice”, Wiley 2010.

3.Mohammad S. Obaidat, Sudip Misra, “Principles of Wireless Sensor Networks”, Cambridge, 2014.

Reference Books:

1. Ian F. Akyildiz, Mehmet Can Vuran , “Wireless Sensor Networks”, Wiley 2010.

2. C S Raghavendra, K M Sivalingam, Taieb Znati, "Wireless Sensor Networks", Springer, 2010.
3. C. Sivarm murthy & B.S. Manoj, "Adhoc Wireless Networks", PHI-2004.
4. FEI HU., XIAOJUN CAO, "Wireless Sensor Networks", CRC Press, 2013.
5. Kazem Sohrby, Daniel Minoli, "Wireless Sensor Networks": Technology, Protocols and Applications, Wiley-Inter science
6. Feng ZHAO, Leonidas GUIBAS, " Wireless Sensor Networks", ELSEVIER , 2004.

E - Resources:

7. https://nptel.ac.in/courses/106/105/106105160/.
8. https://rajivbhandari.files.wordpress.com/2018/11/nptel-4.pdf.
9. https://www.youtube.com/watch?v=uZjNNjyq25I.
10. http://www.digimat.in/nptel/courses/video/106105160/L22.html.
11. https://www.sciencedirect.com/science/article/pii/S1110016816302125.

Course Outcomes:

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

1. illustrate the Concepts, Network Architecture and Applications of Ad-hoc and Wireless Sensor Networks.
2. analyze the protocol design issues of wireless sensor Networks.
3. understand Medium Access Protocols and operating systems used for Wireless Sensor Networks.
4. apply the design of routing protocols for ad-hoc and wireless networks.
5. illustrate the security challenges in Wireless Sensor Networks.

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	-	-	-	-	-	-	-	-	3	-	1
CO2	3	1	2	2	-	-	-	-	-	1	1	1	-	2
CO3	2	1	1	1	-	-	-	-	-	-	1	2	-	1
CO4	3	2	2	1	-	-	-	-	-	1	2	1	-	-
CO5	2	2	2	-	-	-	-	-	-	-	-	2	-	1
Average	2.4	1.4	1.6	2	-	-	-	-	-	1	1.3	1.8	-	1.25

2020-21	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech ECE IV Year – II Sem			
Course Code: BTECEE6	RADAR SYSTEMS (Professional Elective VI)	L	T	P	D
Credits: 3		3	0	0	0

Course Objectives:

The Student will

1. derive the basic radar equation and its dependence on various parameters
2. study CW radar system and its application along with FMCW radar system for altimeter applications.
3. learn Doppler Effect and its applications with respect to pulsed Doppler radar.
4. understand moving target indicator and to study its application.
5. examine and understand the effect of noise on radar signal detection.

Module 1

Fundamentals of RADAR

Introduction, Maximum Unambiguous Range, Simple form of radar Equation, Radar block Diagram and Operation, Radar Frequencies and Applications. Prediction of Range Performance, Minimum Detectable Signal, Receiver Noise, Modified Radar Range Equation, SNR, Envelope Detector False Alarm Time and Probability, Integration of Radar Pulses, Radar Cross Section of Targets (simple targets - sphere, cone-sphere), Transmitter Power, PRF and Range Ambiguities, System Losses (qualitative treatment), Illustrative Problems.

Module 2

CW and FM-CW Radar

Doppler Effect, CW Radar Block Diagram, Isolation between Transmitter and Receiver, Non-zero IF Receiver, Receiver Bandwidth Requirements, Applications of CW radar. FM-CW Radar, Range and Doppler Measurement, Block Diagram and Characteristics, (Approaching/ Receding Targets), FM-CW altimeter, Multiple Frequency CW Radar**.** Illustrative Problems.

Module 3

MTI and Tracking Radar

Introduction, Principle, MTI Radar with - Power Amplifier Transmitter and Power Oscillator Transmitter, Delay Line Cancellers Filter Characteristics, Blind Speeds, Double Cancellation, Staggered PRFs. Range Gated Doppler Filters. MTI Radar Parameters, Limitations to MTI Performance, MTI versus Pulse Doppler Radar.Tracking with Radar, Sequential Lobing, Conical Scan, Monopulse Tracking Radar Amplitude Comparison Monopulse (one- and two-coordinates), Phase Comparison Monopulse, Tracking in Range, Acquisition and Scanning Patterns, Comparison of Trackers**.**

Module 4

Detection of Radar Signals in Noise

Introduction, Matched Filter Receiver Response Characteristics and Derivation, Correlation Function and Cross-correlation Receiver, Efficiency of Non-matched Filters, Matched Filter with Non-white Noise.

.

Module 5

RADAR Receivers

Noise Figure and Noise Temperature, Displays- types, Duplexers, Branch type and Balanced type, Circulators as Duplexers. Introduction to Phased Array Antennas- Basic Concepts, Radiation Pattern, Beam steering and Beam Width Changes, Applications, Advantages and limitations

Text Books:

1. Introduction to Radar Merill I. Skolnik, TMH Special.,systems Indian Edition,2nd 2007.

References Books:

1. Radar: Principles, Technology_Byron Edde, Pearson Applications Education,2004, Radar Peebles, Jr.,P.Z.,Wiley, New York.

E - Resources:

12. https://nptel.ac.in/courses/1RS/102/111102111/

Course Outcomes:

The Student will be able to

1. illustrate the basic principle of RADAR System.
2. illustrate the working principle of CW and Frequency Modulated Radar.
3. analyze the principle of each and every block of MTI and Pulse Doppler Radar and understand Tracking Radar principle.
4. calculate Noise Figure and Noise Temperature in Radar Receivers and can describe antennas used for.
5. obtain knowledge about radar receivers.

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="4">J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B.Tech ECE
IV Year – II Sem</td></tr>
<tr><td>Course Code:
BTECEE6</td><td colspan="4" rowspan="2">WAVELETS SIGNALPROCESSING
(Program 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>

Course Objectives: The Student will

1. understand the terminologies that are used in the wavelets literature.
2. Study the concepts and theory behind wavelets constructions form an interdisciplinary perspective that unifies harmonic analysis, filter banks and multi resolution analysis.
3. understand wavelets and multi resolution techniques to a problem at hand, and justify why wavelets provide the right tool.

Course Outcomes: The student will be able to

1. define the concept of different transform techniques and application areas.
2. analyze continuous wavelet transforms and its important in different communication areas.
3. design different filter banks using multirate analysis techniques.
4. derive the concept of different wavelet transform techniques.
5. gain knowledge about Multi Wavelets.

Module-1
UNIT -I
Introduction: Vector Space –dot product, orthogonality and orthonormality-relation between vectors and signals, concept of convergence. Fourier Theory, FT, STFT,
UNIT-II
Transforms: Walsh, Hadamard, Haar and Slant Transforms, DCT, DST, KLT, – definition, properties and applications.

Module-2
UNIT-I

Continuous Wavelet Transform (CWT): Short comings of STFT, Need for wavelets, Definition and Properties, Wavelet Basis Concept of Scale and its relation with frequency.
UNIT-2
Continuous time wavelet Transform Equation- Series Expansion using Wavelets- CWT- Tiling of time scale plane for CWT.

Module-3
UNIT-I

Multi Rate Analysis and DWT: Need for scaling function – Multi Resolution Analysis, Two-Channel Filter Banks, Perfect Reconstruction Condition, Relationship between Filter Banks and Wavelet Basis. DWT, Structure of DWT Filter Banks.

Module-4
UNIT-I

Daubechies Wavelet Function, Mallat's Algorithm for DWT –Multiband Wavelet Transforms Lifting Scheme-Wavelet Transform Using Polyphase.
UNIT-2
Matrix Factorization –Geometrical Foundations of Lifting Scheme –Lifting Scheme IN Z-Domain, Applications of DWT.

Module-5
UNIT-1

Special Topics: Wavelet Packet Transform, Multidimensional Wavelets, Bi-orthogonal basis-BSplines.

UNIT-2

Lifting Scheme of Wavelet Generation, Multi Wavelets

TEXT BOOKS:

1. Raghuveer M.Rao and Ajit S. Bopardikar, “Wavelet Transforms-Introduction theory and applications” Pearson Edu, Asia, New Delhi, 2003.
2. Soman. K. P, Ramachandran. K.I, “Insight into Wavelets from Theory to Practice” Printice Hall India, 1st Edition, 2004.

REFERENCE BOOKS:

1. Jaideva C Goswami, Andrew K Chan, “Fundamentals of Wavelets- Theory, Algorithms and Applications” John Wiley & Sons, Inc, Singapore, 1999.
2. Vetterli M. Kovacevic, “Wavelets and Sub-band Coding”, PJI, 1995.
3. C. Sydney Burrus, “Introduction to Wavelets and Wavelet Transforms”, PHI, 1st Edition, 1997.
4. Stephen G. Mallat,v, ”A Wavelet Tour of Signal Processing” , Academic Press, 2nd Edition
5. S.Jayaraman, S.Esakkirajan, T.Veera Kumar, “Digital Image Processing” , TMH, 2009.

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	-	-	-	-	-	-	-	-	3	-	1
CO2	3	1	2	2	-	-	-	-	-	1	1	1	-	2
CO3	2	1	1	1	-	-	-	-	-	-	1	2	-	1
CO4	3	2	2	1	-	-	-	-	-	1	2	1	-	-
CO5	2	2	2	-	-	-	-	-	-	-	-	2	-	1
Average	2.4	1.4	1.6	1.8	-	-	-	-	-	1	1.3	1.8	-	1

Open Elective Courses (OEC) Offered by Dept. of ECE

S. No	Code	Course Title	L	T	P	D	Credits
Open Elective Course – I							
1	J31OG	Principles of Sensors and their Application	3	0	0	0	3
2	J31OH	Principles of Communications	3	0	0	0	3
Open Elective Course – II							
1	J32OG	Software Defined Radio	3	0	0	0	3
2	J32OH	Basics of IC Technology	3	0	0	0	3
Open Elective Course – III							
1	J41OG	Digital Systems Using VHDL	3	0	0	0	3
2	J41OH	MATLAB Programming Language	3	0	0	0	3
Open Elective Course – IV							
1	J42OG	Consumer Electronics	3	0	0	0	3
2	J42OH	Nano Electronics	3	0	0	0	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:ECE
III Year – I Sem</td></tr>
<tr><td>Course Code: J31OG</td><td 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.
1. John Turner and Martyn Hill, "Instrumentation for Engineers and Scientists", Oxford Science Publications,1999.
2. Richard Zurawski, "Industrial Communication Technology Handbook" 2nd edition, CRC Press, 2015.

E-RESOURCES:

1. https://www.sciencelearn.org.nz/resources/1602-electricity-and-sensors
2. https://predictabledesigns.com/introduction-to-electronic-sensors/

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 colspan="1">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:</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>1</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 colspan="1">J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B.Tech: ECE
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 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.

Module -I:

Unit-1

Introduction: The Need for Software 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.

E-Resources

1. http://www.scielo.org.co/scielo.php?script=sci_arttext&pid=S0121-11292015000100007
2. https://www.electronicdesign.com/technologies/communications/article/21751431/the-elusive-softwaredefined-radio

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	1.5	1	-	2	-	-	-	2	2	2.2	-	1.4

<table>
<tr><td>AY 2020-21
Onwards</td><td colspan="2">J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="4">B.Tech: ECE
III Year – II Sem</td></tr>
<tr><td>Course Code:
J32OH</td><td colspan="2" 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%20 y% 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

Journals/Magazines

13. IEEE transactions on Circuits and Systems
14. IEEE transactions on Circuit Theory
15. Electronics for You (EFY)
16. Electronics Maker

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>2020-21</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: Digital Systems

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:ECE
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	-

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:

https://www.allaboutcircuits.com/videos/category/consumer-electronics/

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.TechECE
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	-

J.B INSTITUTE OF ENGINEERING & TECHNOLOGY
AUTONOMOUS
Bhaskar Nagar, Moinabad(M), RR Dist., Telangana-500075

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

J.B INSTITUTE OF ENGINEERING & TECHNOLOGY
AUTONOMOUS
Bhaskar Nagar, Moinabad(M), RR Dist., Telangana-500075

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	Numerical 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

J.B INSTITUTE OF ENGINEERING & TECHNOLOGY
AUTONOMOUS
Bhaskar Nagar, Moinabad(M), RR Dist., Telangana-500075

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

J.B INSTITUTE OF ENGINEERING & TECHNOLOGY
AUTONOMOUS
Bhaskar Nagar, Moinabad(M), RR Dist., Telangana-500075

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

Open Elective I

<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:
J31OA</td><td rowspan="2">ELEMENTS OF CIVIL 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-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	-	-	-	-	-	-	-	-

AY 2020-21 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech III Year – I Sem			
Course Code: J31OB	**ENVIRONMENTAL IMPACT ASSESSMENT** (Open Elective-I)	**L**	**T**	**P**	**D**
Credits:3		**3**	**0**	**0**	**0**

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" colspan="4">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, DhanpatRai& 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

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech III Year – I Sem			
Course Code: J31OE	AUTOMOTIVE TECHNOLOGY (Open Elective-I)	L	T	P	D
Credits: 3		3	0	0	0

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. MehrdadEhsani, YiminGao, 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 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:

6. To understand the concepts of measurement technology.
7. To learn the different sensors used to measure various physical parameters.
8. To Acquire knowledge on Optical sensors.
9. To understand the concepts Acoustic sensors.
10. 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:

3. Ernest O Doebelin, "Measurement Systems – Applications and Design", Tata McGraw-Hill,2009.
4. Sawney A K and PuneetSawney, "A Course in Mechanical Measurements and Instrumentation and Control", 12th edition, DhanpatRai& 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

6. provide the basic concepts of communication systems.
7. gain knowledge about Amplitude modulation and Angle Modulation.
8. study sampling and pulse modulation methods.
9. study and compare different binary digital modulation techniques.
10. 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 :

3. Communication Systems Analog and Digital – R.P. Singh and SD Sapre, TMH, 20th reprint, 2004.
4. Principles of Communications – H. Taub and D. Schilling, TMH, 2003.

REFERENCES:

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

E - Resources:

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

Course Outcomes:

The student will be able to:

6. **illustrate** the main concepts of analoge and digital communication systems.
7. **analyze** and design an AM and FM modulator/demodulator.
8. **explain**, discuss, and compare different binary digital modulation techniques.
9. **distinguish** different types of noise and explain the effects of noise on communication system.
10. **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, ElmasriNavrate 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**

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech III Year – I Sem			
Course Code:J31OJ	**PRINCIPLES OF OPERATING SYSTEMS** (Open Elective-I)	L	T	P	D
Credits: 3		3	0	0	0

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:

Security and Protection:

Security: Security Problem, Program Threats, System and Network Threats

Protection: Goals of protection, Principals of Protection, Protection Rings, Domain of Protection

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

E - Resources:

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

Course outcomes:

The Student will be able to

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

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 colspan="1">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

<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:J31OL</td><td rowspan="2">INTRODUCTION TO WEB DESIGN
(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. 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,PhpBlackBook.

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 rowspan="1">AY 2020-21 onwards</td><td>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**

<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
III Year – I Sem</td></tr>
<tr><td>Course Code:J31ON</td><td colspan="3" rowspan="2">FUNDAMENTALS OF DIGITAL LOGIC DESIGN
(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: 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.morrismano, pearson education/phi.
2. Fundamentals of logic design, roth, 5th edition,thomson.

Reference Books:

1. Switching and finite automata theory by zvi. Kohavi, tatamcgraw hill.
2. Switching and logic design, c.v.s. rao, pearson education
3. Digital principles and design – donaldd.givone, tatamcgraw hill, edition.
4. Fundamentals of digital logic & micro computer design , 5th edition, m. Rafiquzzaman john wiley

E-Resources:

1. https://nptel.ac.in/courses/106/105/106105185/
2. https://www.coursera.org/learn/digital-systems

Course Outcomes:

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 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: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	-	-	-	-	-	-	-	-	-	-	-

<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 – I Sem</td></tr>
<tr><td>Course Code:</td><td rowspan="2">NumericalSolution of Ordinary
Differential Equations
(Common to EEE,ECE, CSE, IT&ECM)
(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 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	-	-

<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">Number Theory & Cryptography
(Common to CE, EEE, ME, ECE, CSE, IT, ECM& 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. 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-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="1">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">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, DhanpatRai 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.SharmaandM.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 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:</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	-	-

<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 – I Sem</td></tr>
<tr><td>Course Code:</td><td rowspan="2">ENTREPRENEURSHIP
(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 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

Module 1:
UNIT - I:
Understanding Entrepreneurial Mindset- The revolution impact of entrepreneurship-Theevolution 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 themarket 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. MadhurimaLalShikhaSahai – 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	-	-

Open Elective II

<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:
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, SubhajitSaraswathi / 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 KChitkara

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>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, NanjundaRao 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 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:J32OC</td><td rowspan="2" colspan="4">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 conceptsofbatteriesandMotorsinthedesignofElectricandHybrid 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>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>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 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 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: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 course is

6. To provide fundamentals and state of the art concepts in software defined radio.
7. To Analyze the analog RF components as front end block in implementation of SDR.
8. To Visualize digital hardware architectures and development methods.
9. To Understand the radio recourse management in heterogeneous networks.
10. To Remember the object oriented representation of radio and network resources.

Module -I:

Unit-1

Introduction: The Need for Software 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 DACDistortion.

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, CommunicationClass 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 andApproaches, 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 TransceiverSubsystem, Spectrum Ware, CHARIOT.

TEXT BOOKS:

3. Software Defined Radio Architecture System and Functions- Markus Dillinger, KambizMadani, WILEY 2003
4. Software Defined Radio: Enabling Technologies- Walter Tuttle Bee, 2002, WileyPublications.

REFERENCE BOOKS:

5. Software Radio: A Modern Approach to Radio Engineering - Jeffrey H. Reed, 2002, PEAPublication.
6. Software Defined Radio for 3G - Paul Burns, 2002, Artech House.
7. Software Defined Radio: Architectures, Systems and Functions - Markus Dillinger,KambizMadani, Nancy Alonistioti, 2003, Wiley.
8. 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:

6. **Understand** the design principles of software defined radio.
7. **Analyze** the analog RF components as front end block in implementation of SDR.
8. **Visualize** digital hardware architectures and development methods.
9. **Understand** the radio recourse management in heterogeneous networks.
10. **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 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: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

6. To introduce the basic building blocks of linear integrated circuits.
7. To teach the linear and non – linear applications of operational amplifiers.
8. To introduce the theory and applications of analog multipliers and PLL.
9. To introduce the concepts of waveform generation and introduce some special function ICs.
10. 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:

3. Op-Amps & Linear ICs – Ramakanth A. Gayakwad, PHI, 2003.
4. Digital Fundamentals – Floyd and Jain, Pearson Education, 8th Edition, 2005

Reference Books:

6. Linear Integrated Circuits –D. Roy Chowdhury, New Age International (p) Ltd, 2ndEd., 2003.
7. Op Amps and Linear Integrated Circuits-Concepts and Applications James M. Fiore,Cengage Learning/ Jaico, 2009.
8. Operational Amplifiers with Linear Integrated Circuits by K. Lal Kishore – Pearson,2009.
9. Linear Integrated Circuits and Applications – Salivahanan, MC GRAW HILL EDUCATION.
10. Modern Digital Electronics – RP Jain – 4/e – MC GRAW HILL EDUCATION, 2010.

E - Resources:

17. http://fmcet.in/ECE/EC6404_uw.pdf
18. https://www.iare.ac.in/sites/default/files/lecture_notes/LDIC%20Lecture%20Notes.pdf.

19. http://smec.ac.in/sites/default/files/lecture_notes/Course%20File%20of%20LDIC(Linear %20 and%20Digital%20IC%20Applications).pdf
20. http://crectirupati.com/sites/default/files/lecture_notes/LDICA%20Lecture%20notes%20 y% 20A.Mounika.pdf
21. http://www.springer.com/engineering/electronics/journal/10470.
22. https://www.journals.elsevier.com/microelectronics-journal
23. http://nptel.ac.in/courses/117107094/
24. https://www.youtube.com/watch?v=NVj_Eu3sJL4
25. http://freevideolectures.com/Course/2915/Linear-Integrated-Circuits
26. Analog Electronic Circuits: https://swayam.gov.in/nd1_noc19_ee38/preview
27. Op-amp practical Applications: Design, Simulation and Implementation: https://onlinecourses.nptel.ac.in/noc18_ee10/preview
28. 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:

6. **understanding** of operational amplifiers with linear integrated circuits.
7. **Apply** the knowledge of the different families of digital integrated circuits and their characteristics.
8. **Analyse** the functioning of various design circuits using operational amplifiers for various applications.
9. **Design** various techniques to develop A/D and D/A convertors.
10. **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 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: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>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:
J32OK</td><td rowspan="2" colspan="4">COMPUTER ORGANIZATION
(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 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 1Basic structures of Computers
Computer Types, Functional unit, Basic operational concepts, Bus structures, software, Performance, multiprocessors and multi computers.
Unit 2Data Representation
Fixed point representation, Floating point representation, Error detection codes.

Module II:
Unit 1Register 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 2Basic computer organization and Design
Instruction codes, computer registers, computer instructions, Timing and control, instruction cycle

Module III:

Unit 1Computer Arithmetic

Introduction, Addition and Subtraction, Multiplication Algorithms, Division Algorithms, Floating-point arithmetic operations, Decimal arithmetic unit, Decimal arithmetic operations.

Module IV:

Unit 1The 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 1Input/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>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: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, GreGoryd, 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	-

<table>
<tr><td>AY 2020-21
onwards</td><td>J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="3">B.Tech
III Year – II Sem</td></tr>
<tr><td>Course Code:J32OM</td><td rowspan="2">INTRODUCTION TO MICROPROCESSORS AND MICRO CONTROLLERS
(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-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.UmaRao, AndhePallavi,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)**											**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	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>AY 2020-21
Onwards</td><td colspan="3">J. B. Institute of Engineering and Technology
(UGC Autonomous)</td><td colspan="3">B. Tech
III Year – II Sem</td></tr>
<tr><td>Course Code: J32ON</td><td rowspan="2" colspan="3">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:

1. Students will learn to
2. Understand the basic building blocks of IoT.
3. Analyze the difference between M2M and IoT along with IoT system Management
4. Extend the knowledge in Logical Design of IoT System using Python.
5. Acquire knowledge about IoT Physical Devices and End points.
6. 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: Cloud Computing, Sensor-Cloud, Smart Cities and Smart Homes, Connected Vehicles

Unit 2: Smart Grid, Industrial IOT, Case Study: Agriculture, Healthcare, Activity Monitoring

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**	**PSO 1**	**PSO 2**
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**

<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:
J32OP</td><td rowspan="2">INTRODUCTION TO SURFACE MINING
(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 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 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 colspan="4" 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>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">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, DhanpatRai 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 colspan="2">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 colspan="2" 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.

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

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	-

<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:</td><td rowspan="2">TECHNICAL WRITING 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. 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 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:</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&NeenaSondhi, 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	-	-

Open Elective III

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech IV Year – I Sem			
Course Code: J41OA	**WASTE MANAGEMENT** (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 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 GeradKiley, Tata McGrawHill

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

<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: J41OB</td><td rowspan="2">ROAD SAFETY ENGINEERING
(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 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 ParthaChakroborty&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 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: 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", DhanpatRai& 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 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: 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 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: 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 /McGraw Hill
2. Introduction to Robotics / John J. Craig/ Pearson

Reference Books:

1. Theory of Applied Robotics /Jazar/Springer.H. Asada and J. J. E. Slotine, “Robot Analysis and Intelligence”, Wiley Inter-Science. 1986
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

6. Learn how a Hardware Description Language (HDL) is used to describe and implement hardware.
7. Learn how to simulate and test that hardware and optimise their designs.
8. Learn in-depth study of combinatorial and sequential hardware systems and the use of finite state machines in the design of sequential systems.
9. To understand concept of Programmable Devices, PLA, PAL, CPLD and FPGA and implement digital system using VHDL.
10. 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:

3. Charles H,Roth ,"Digital system design using VHDL" , 2nd Edition, PWS publishing co.
4. ZainalabedinNavabi, "VHDL analysis and modeling of digital systems",2nd Edition, MGH, 2004.

References Books:

4. Stphen Brown, "Fundamental of Digital logic with VHDL Design", Tata McGraw Hill, 2008.
5. J.Bhaskar ,"A VHDL primer",3rd edition 2004, Prentice Hall of India Limited.
6. Michael D.Ciletti, "Advanced Digital design with Verilog HDL", 2nd Edition, PHI Ltd, 2005.

E - Resources:

2. https://nptel.ac.in/courses/111/102/111102111/

Course Outcomes:

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

6. **develop** a digital logic and apply it to solve real life problems.

7. **practice** combinational and sequential digital circuits using different styles of modeling of VHDL.
8. **analyze**, design and implement sequential logic circuits.
9. **employ** digital system design using PLD.
10. **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="2">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" colspan="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

6. To understand the basic principles of programming and of implementing mathematical concepts in MATLAB.
7. To write numerical algorithms with MATLAB Programming language.
8. To evaluate the computational results using graphical representations.
9. To gain knowledge about advanced MATLAB Programming methods.
10. To gain knowledge on Simulink used in MATLAB.

Module-1
Unit-I: Introductionto 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:

3. Getting Started WithMatlab: A Quick Introduction For Scientists And Engineers (English) by RudraPratap, OXFORD University Press.
4. MATLAB Programming by Y. Kirani Singh, B.B. Chaudhuri, PHI Publication.

REFERENCE BOOKS:

3. MATLAB® Programming For Engineers, Fourth edition by Stephen J. Chapman.
4. 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

6. **translate** mathematical methods to MATLAB code.
7. **generalize** results and represent data visually.
8. **apply** computer methods for solving a wide range of engineering problems.
9. **utilize** computer skills to enhance learning and performance in other engineering and science courses.
10. **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>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 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. Thesetw 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="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: 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

<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: J41OM</td><td rowspan="2" colspan="4">INTRODUCTION TO NEURAL NETWORKS
(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: 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	PSO 1	PSO 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 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">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 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:

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>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, Dhanpatrai, 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	-

<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">Nano Chemistry
(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. 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, NandakumarKalariakkal. 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 rowspan="1">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	-	-

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech IV Year – I Sem			
Course Code:	**INTELLECTUAL PROPERTY RIGHTS** (Open Elective - III)	L	T	P	D
Credits: 3		3	0	0	0

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. NirajPandey&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	-	-

Open Elective IV

<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:
J42OA</td><td rowspan="2">AIR POLLUTION & CONTROL
(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. 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. **Haveawareness** on the different causes of the air pollution.
3. **Haveawareness** 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	-	-

AY 2020-21 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech IV Year – II Sem			
Course Code: J42OB	**DISASTER MANAGEMENT** (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. 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 MrinaliniPandey 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	-	-	-	-	-	-

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech IV Year – II Sem			
Course Code:J42OC	SPECIAL ELECTRICAL MACHINES (Open Elective-IV)	L	T	P	D
Credits: 3		3	0	0	0

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 McGraw 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 flashovers 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	-

<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:J42OE</td><td rowspan="2">DIGITAL MANUFACTURING
(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: 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. ChuaaChee 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		

<table>
<tr><td>2020-21</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:J42OG</td><td rowspan="2">CONSUMER 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: Nil

Course Objectives:

The students will

6. Learn how a Consumer Product is developed
7. Learn how to simulate and test that designs.
8. Learn in-depth study of systems and the use of those.
9. To understand concept of Audio Systems.
10. 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:

3. Consumer Electronics, Bali S.P., Pearson Education India,2010.
4. 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:

6. **Learn** how a Consumer Product is developed
7. **Analyze** how to simulate and test that designs.
8. **Apply** in-depth study of systems and the use of those.
9. **understand** concept of Audio Systems.
10. **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	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	3	2											
CO2	2	2		2										
CO3	3	2		3										
CO4	3	1												
CO5	2	2	3	3										
Average	**2.4**	**2.0**	**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

6. understand the basic concepts of Nanotechnology and Nano machines.
7. understand the fundamental logic devices and the need of Quantum computing.
8. mathematically represent the 'Quantum tunneling'.
9. understand the mathematical treatment for the modeling and design of the carbon nanotubes.
10. 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:

3. 'Introduction to Nanoelectronics' by V. V. Mitin, V. Kochelap, Michel A Stroscio. Cambridge, 2007.
4. 'Fundamental of Nanoelectronics' by George W Hanson, Prentice Hall, 2008.

References Books:

3. Michael Wilson, KamaliKannangara, Geoff Smith, Michelle Simmons and Burkhard
4. Raguse, Nanotechnology: Basic Science and Emerging Technologies, Chapman & Hall / CRC, 2002.

E - Resources:

2. https://nptel.ac.in/courses/bjy/ab1011/102/111102111/

Course Outcomes:

6. **develop** the basic concepts of Nanotechnology and Nano machines.
7. **apply** fundamentals of logic devices and the need of Quantum computing.
8. **illustrate** the operation of Silicon MOSFETS.

9. **describe** the mathematical treatment for the modeling and design of the carbon nanotubes.
10. **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 benefitsRegularity issues: Government policies.

Module 3:

Cloud architecture: Cloud delivery model - SPI framework SPI evolution, SPI vs.traditionalITModel and Software as a Service (SaaS):SaaS service providers - Google App Engine, Salesforce. Coin, google plat form - Benefits - operational benefits Economic benefits - Evaluating SaaS Platform as a service (PaaS): PaaS service providers - Right Scale - Salesforce. Coin, Rackspace- Force .com, Services and Benefits.

Module 4:

Infrastructure as a Service (IaaS): IaaS service providers - Amazon EC2, GoGrid Microsoft soft implementation and support - Amazon EC service level agreement - Recent developments - Benefits

Cloud deployment model: Public clouds - Private clouds - Community clouds - Hybrid clouds - Advantages of cloud computing.

Module 5:

Virtualization: Virtualization and cloud computing - Need of virtualization – cost, administration. last deployment, reduce infrastructure cost - limitations

Types of hardware virtualization: Full virtualization - partial virtualization - para virtualization

Desktop virtualization: Software virtualization - Memory virtualization - Storage virtualization - Data virtualization - Network virtualization Micro soft Implementation: Microsoft Hyper V - Vmware features and infrastructure - Virtual Box.

Text Books:

1. Cloud computing a practical approach - Anthony T.Velte, Toby J. Velte Robert Elsenperer TATA McGraw- Hill, New Delhi – 2010.
2. Cloud Computing: Web-Based Application s That Change the Way You Work and Collaborate Online - Michael Miller - Que 2008.

Reference Books:

1. Cloud Computing: ArshdeepBahga, Vijay Madisetti, 2014, University Press.
2. Mastering Cloud Computing: Raj Kumar buyya, Christian Vecchiola,selvi-2013.

E - Resources:

1. https://nptel.ac.in/courses/106/105/106105167/
2. https://sjceodisha.in/wp-content/uploads/2019/09/CLOUD-COMPUTING-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**	
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
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. YuliVasiliev, "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="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:J42OK</td><td colspan="4" 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*	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
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 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:J42OL</td><td rowspan="2" colspan="4">E-WASTE 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: 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. RakeshJohri, E-waste: Implications, regulations, and management in India and current global best practices.
2. Klaus Hieronymi, RamzyKahhat, Eric Williams, E-Waste Management: from Waste to Resource

Reference Books:

1. SatishSinha, PritiMahesh,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.
5. **Describe** the technologies for recovery of resources from E-Waste.

CO-Articulation Matrix														
CO-PO/PSO Mapping Chart **3/2/1 indicates the strength of the calculation** **3-Strong, 2-Medium, 1-Low**														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes***	
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	**2**	**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>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 visualization:

Introduction, Types of data visualization, Data for visualization:

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, Anand Rajaraman, 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.
6.

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>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: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	-	-	-	-	-	-	-	-	-	-	-