J.B. INSTITUTE OF ENGINEERING AND TECHNOLOGY

(UGC AUTONOMOUS)

Bhaskar Nagar, Moinabad Mandal, R.R. District, Hyderabad -500075

DEPARTMENT OF CIVIL ENGINEERING

COURSE STRUCTURE FOR

M. Tech – STRUCTURAL ENGINEERING (SE): R-20

M.TECH REGULAR TWO-YEAR DEGREE PROGRAMME FOR

THE BATCHES ADMITTED FROM THE ACADEMIC YEAR

2020 -2021

Vision and mission of the Institution

Vision

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

Mission

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

Vision and Mission of the Department

Vision

To be a centre for excellence in civil Engineering education with a thrust on fundamentals, spirit of innovation and to meet the changing needs of local and global industry.

Mission

1. To achieve academic excellence by imparting sound technical knowledge based on strong fundamentals of science and engineering that leads to higher education and research
2. To imbibe the spirit of innovation by being responsive to the needs of industry and promoting industry institute interaction, ensuring social relevance and professional ethics
3. To equip students with leadership qualities to become entrepreneurs and take up technologies that cater to the changing demands of society.

PEOs:

Graduates will

1. Formulate technologies and optimal solutions to the structural engineering issues in infrastructural and housing development that has high impact on sustainable development of society
2. Conduct independent research in the emerging areas of structural engineering to address local and global infrastructure & industrial development problems and offer innovative and cost-effective solutions.
3. Demonstrate leadership qualities and critical thinking through lifelong learning, teamwork, professional ethics and entrepreneurial skills.

Program Outcomes (POs):

After completion of the program graduates will be able to

1. Independently carry out research /investigation and development work to solve practical problems in Structural Engineering.
2. Write and present a substantial technical report/document.
3. Demonstrate sufficient mastery over the structural engineering courses. They can independently analyze study and carryout lifelong learning in the different topics of the program as they are applied to the infrastructure development and other demonians of national development.
4. Identify, formulate, and solve engineering problems in the domain of structural engineering field and use different software tools for Analysis and Design various structural engineering systems.
5. Design and conduct experiments, analyze, and interpret data, for development of simulation models.
6. Function as a member of a multidisciplinary team with sense of ethics, integrity, and social responsibility.

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(UGC AUTONOMOUS)

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

Academic Regulations– JBIET - R20

Applicable to

M.Tech Regular Two Year Degree Programme

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

J. B. INSTITUTE OF ENGINEERING & TECHNOLOGY
UGC AUTONOMOUS
(Permanently Affiliated to JNTUH, Approved By AICTE, New Delhi and Accredited By NBA, NAAC)

Academic Regulations of M.Tech (Regular/Full Time) Programmes, 2020-21 (R20)
(CBCS)
(Effective for the students admitted into I year from the Academic Year 2020-21 and onwards)

1.0 Post-Graduate Degree Programmes in Engineering & Technology (PGP in E & T)

J. B. Institute of Engineering and Technology (JNTUH) offers **Two** Years (**Four** Semesters) full-time Master of Technology (M. Tech.) Degree programmes, under Choice Based Credit System (CBCS) in the following branches of Engineering and Technology with different specializations as mentioned below:

Computer Science & Engineering	Computer Science & Engineering
Electronics & Communication Engineering	VLSI System Design
Electrical & Electronics Engineering	Electrical Power Systems
Mechanical Engineering	CAD / CAM
Civil Engineering	Structural Engineering

2.0 Eligibility for Admissions

2.1 Admission to the PGPs shall be made subject to eligibility, qualification and specializations prescribed by the University from time to time, for each specialization under each M.Tech programme.

2.2 Admission to the post graduate programme shall be made on the basis of either the merit rank or Percentile obtained by the qualified student in the relevant qualifying GATE Examination/ the merit rank obtained by the qualified student in an entrance test conducted by Telangana State Government (PGCET) for M.Tech. programmes.

2.3 The medium of instructions for all PG Programmes will be **ENGLISH** only.

3.0 M.Tech. Programme (PGP in E & T) Structure

3.1 The M.Tech Programmes in E & T of JBIET are of Semester pattern, with **Four** Semesters consisting of **Two** academic years, each academic year having **Two** Semesters (First/Odd and Second/Even Semesters). Each Semester shall be of 22 weeks duration (inclusive of Examinations), with a minimum of 90 instructional days per Semester.

3.3 **UGC/AICTE** specified definitions/descriptions are adopted appropriately for various terms and abbreviations used in these PG academic regulations, as listed below:

3.3.1 Semester Scheme

Each Semester shall have 'Continuous Internal Evaluation (CIE)' and 'Semester End Examination (SEE)'. Choice Based Credit System (CBCS) and Credit Based Semester System (CBSS) are taken as 'references' for the present set of Regulations. The terms 'SUBJECT' and 'COURSE' imply the same meaning here and refer to 'Theory Subject', or Lab Course', or 'Design/Drawing Subject', or 'Seminar', or 'Comprehensive Viva', or 'Project', or 'Technical Paper Writing' as the case may be.

3.3.2 Credit Courses

All subjects/courses are to be registered by the student in a semester to earn credits which shall be assigned to each subject/course in an L: T: P: C (Lecture Periods: Tutorial Periods: Practical Periods: Credits) structure based on the following general pattern:

- One credit for one hour/week/semester for theory/lecture (L) courses
- One credit for two hours/ week/semester for laboratory/ practical (P) courses or tutorials (T)
- Other student activities like study tour, guest lecture, conference/workshop participations, technical paper presentations, and identified mandatory courses, if any, will not carry credits.

3.3.3 Subject Course Classification

All subjects / courses offered for the Post-Graduate Programme in E & T (M.Tech Degree Programme) are broadly classified as follows. The institute has followed in general the guidelines issued by AICTE/UGC.

S.No.	Broad Course Classification	Course Group/ Category	Course Description
1	Core Courses (CoC)	PC- Professional Core	Includes subjects related to .the parent discipline/department/ branch of Engineering.
		Project Work	M.Tech Project or PG Project or Major Project
		Seminar, Technical	Seminar/Colloquium based on core contents related to parent discipline/department/branch of Engineering.

		Paper Writing	
		Comprehensive Viva-Voce	Viva-voce covering all the PG subjects studied during the course work and related aspects
2	Elective Courses (EtE)	PE - Program Electives	Includes elective subjects related to the parent discipline/department/branch of Engineering.
		OE - Open Electives	Elective subjects which include inter-disciplinary subjects or subjects in an area outside the parent discipline/department/ branch of Engineering.
Total number of Credits = 68			

4.0 Course Registration

4.1 A 'Faculty Advisor or Counselor' shall be assigned to each specialization, who will advise on the Post Graduate Programme (PGP), its Course Structure and Curriculum, Choice/Option for Subjects/ Courses, based on his competence, progress, pre-requisites and interest.

4.2 The Department invites 'Registration Forms' from students. Registration requests for any 'CURRENT SEMESTER' shall be completed BEFORE the commencement of SEEs (Semester End Examinations) of the 'PRECEDING SEMESTER'.

4.3 A Student can apply for Registration, ONLY AFTER obtaining the 'WRITTEN APPROVAL' from his Faculty Advisor, which should be submitted to the Department

4.4 If the Student submits ambiguous choices or multiple options or erroneous entries during Registration for the Subject(s) / Course(s) under a given/ specified Course Group/ Category as listed in the Course Structure, only the first mentioned Subject/ Course in that Category will be taken into consideration.

4.5 Subject/ Course Options exercised through Registration are final and CANNOT be changed, nor can they be inter-changed; further, alternate choices also will not be considered. However, if the Subject/ Course that has already been listed for Registration by the Department in a Semester could not be offered due to unforeseen or unexpected reasons, then the Student will be allowed to have alternate choice either for a new Subject, if it is offered, or for another existing Subject (subject to availability of seats). Such alternate arrangements will be made by the Head of Department, with due notification and time-framed schedule, within the FIRST WEEK from the commencement of Class-work for that Semester.

4.6 Open electives: The students have to choose one open elective (OE-I) from the list of open electives given in II year I semester.

4.7 Program electives: The students have to choose 5 Program electives (PE-I to V) from the list of program electives given. (2 PEs in I Semester, 2 PEs in II Semester and 1 in III Semester)

5.0 Attendance Requirements

The programmes are offered on the basis of a unit system with each subject being considered a unit.

5.1 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) for that semester..

5.2 Shortage of attendance in aggregate up to 10% (65% and above, and below 75%) in each semester may be condoned on medical grounds.

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

5.4 Students whose shortage of attendance is not condoned in any semester are not eligible to take their end examinations of that semester.

5.5 A student fulfills the attendance requirement in the present semester, shall not be eligible for readmission into the same class.

5.6 A prescribed fee per subject shall be payable for condoning shortage of attendance.

6.0 Academic Requirements

The following academic requirements have to be satisfied, in addition to the attendance requirements mentioned in item no. 5. The performance of the candidate in each semester shall be evaluated subject-wise, with a maximum of 100 marks per subject / course (theory / practical), on the basis of Internal Evaluation and Semester End Examination.

6.1 A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/course, if he secures not less than 40% of marks (28 out of 70 marks) in the End Semester Examination, and a minimum of 50% of marks in the sum total of CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

6.2 A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to a subject/ course, if he secures not less than 50% of the total marks. The student is deemed to have failed, if he (i) does not attend the comprehensive viva-voce as per the schedule given, or (ii) does not present the seminar as required, or (iii) does not present the Technical Paper Writing as required. In such a case, he may reappear for comprehensive viva-voce in supplementary examinations and for seminar/ technical paper writing, in the subsequent semesters, as and when scheduled.

6.3 A student shall register for all subjects for total of 68 credits as specified and listed in the course structure for the chosen specialization, put in required the attendance and fulfill the academic requirements for securing 68 credits obtaining a minimum of 'B' Grade or above in each subject, and all 68 credits securing Semester Grade Point Average **(SGPA) 6.0** (in

each semester) and final Cumulative Grade Point Average **(CGPA)** (i.e., CGPA at the end of PGP**) 6.0**, to complete the PGP successfully.

6.4 Marks and Letter Grades obtained in all those subjects covering the above specified 68 credits alone shall be considered for the calculation of final CGPA, which will be indicated in the Grade Card /Marks Memo of second year second semester.

6.5 If a student registers for extra subject(s) (in the parent department or other departments/ branches of Engineering) other than those listed subjects totalling to 68 credits as specified in the course structure, the performance in extra subject(s) (although evaluated and graded using the same procedure as that of the required 68 credits) will not be taken into account while calculating the SGPA and CGPA. For such extra subject(s) registered, a certificate will be issued with a letter grade indicated as a performance measure, subject to completion of the attendance and academic requirements as stated in items 5 and 6.1 - 6.3.

6.6 A student eligible to appear for the Semester End Examination in any subject, but absent from it or failed (failing to secure 'B' Grade or above), may reappear for that subject at the supplementary examination as and when conducted. In such cases, his Internal Marks assessed earlier for that subject will be carried over, and added to the marks secured in the supplementary examination, for the purpose of evaluating his performance in that subject.

6. 7 A Student who fails to earn 68 credits as per the specified course structure, and as indicated above, within **four** academic years from the date of commencement of his first year first semester, shall forfeit his seat in M.Tech. programme and his admission **shall stand cancelled.**

7.0 Evaluation - Distribution and Weightage of Marks

7.1 The performance of a student in every subject/course (including practicals) will be evaluated for 100 marks each, with 30 marks allotted for CIE (Continuous Internal Evaluation) and 70 marks for SEE (Semester End-Examination).

7.2 For theory courses, during the semester there are 2 mid-term examinations (internal exams of 25 marks each) and 2 assignments carrying 5 marks each.

7.3 Each mid-term examination will be of 1 hour 20 minutes consisting of Part-A (short answer questions) for 10 marks and Part-B (long answer) for 15 marks. Part-A consists of 5 two marks questions and Part- B consists of 4 questions carrying 5 marks each and student should answer 3 questions.

7.4 First mid-term examination is conducted for first 2 units of syllabus and second mid-term examination is conducted for remaining 3 units of syllabus.

7.5 The Continuous Internal Evaluation for theory course shall be made as average of marks obtained in CIE – I and CIE –II as detailed in the table below.

CIE – I	Marks	CIE - II	Marks
MID – I	25	MID - II	25
Assignment – I	5	Assignment - II	5
Total	30	Total	30

7.6 If a student is absent for any test/assignment, he is awarded zero marks for that test/assignment. However a candidate may be permitted on genuine grounds provided he/she has taken permission before the mid-term examination from the Head of the Department. Moreover, he/she has to apply for makeup examinations within a week after completion of mid-term examinations. A subcommittee will be constituted with the following composition to look into such cases.

Subcommittee-composition:

S.No	Faculty Member	Designation
1	Concern Head of the Department	Chairman
2	Senior faculty nominate by Principal	Member
3	One Senior faculty member of the concern department	Member
4	One faculty member of the other department	Member
5	Additional Controller of Examinations	Convener

7.7 The details of the Question Paper pattern for Semester End Examination (Theory) are given below:

The Semester End Examination will be conducted for 70 marks. It consists of two parts. i).Part A for 20 marks, ii). Part B for 50 marks.

- Part A is compulsory and consists of 5 questions, one from each unit and carrying 4 marks each.
- Part-B consists of five questions carrying 10 marks each. Each of these questions is from one unit and may contain sub-questions. For each question there will be an "either" "or" choice, which means that there will be two questions from each unit and the student should answer either of the two questions.

7.8 For practical subjects, 70 marks shall be awarded for performance in the Semester End Examinations and 30 marks shall be awarded as Internal Marks. Out of the 30 marks for internal evaluation, day-to-day work in the laboratory is evaluated for 20 marks and internal practical examination is evaluated for 10 marks conducted by the laboratory teacher concerned.

7.9 The semester end examination is conducted with an external examiner and the laboratory teacher. The external examiner is selected and appointed by the Principal from the list submitted by Head of the Department.

7.10 There shall be a Seminar presentation during II Year I semester. For Seminar student under the supervision of a faculty member shall collect literature on a topic and critically review the

literature and submit a report to the Department. Upon acceptance of the report by the Department committee candidate shall make an oral presentation before the Department Commitee. The Department Committee comprising of Head of The Department, supervisor, and two other senior faculty members of the Department shall evaluate for 50 marks. There is no external Evaluation for the Seminar.

7.11 There shall be a mini project preferably suggested by the industry of their specialization. The mini project shall be carried out during the summer vacation between I Year II Semester and II year I Semester is evaluated for 50 marks in the II Year I Semester by the Head, Supervisor/ mentor and a senior faculty of the department. A candidate has to secure a minimum of 50% of marks (*25 out of 50*) to be declared successful. If he fails to obtain the minimum marks, he has to reappear for the same during the supplementary examinations as and when conducted, subject to item 3.2.

7.12 There shall be a dissertation/major project work of one-year duration which contributes strong weightage in the curriculum in the II year. It is expected to undertake industrially relevant problem to develop an optimal solution through extensive research work. The students and faculty can design the research project in consultation with industry preferably in the region. The planning of laboratory work/modelling/computational work with execution schedule is suggested at the beginning of the programme to ensure expected outcome. This will lead to creation of patents from the result of the programme.

7.13 Every candidate shall be required to submit a thesis or dissertation on a topic approved by the Project Review Committee.

7.14 A Project Review Committee (PRC) shall be constituted with the Head of the Department as Chairperson, Project Coordinator and one senior faculty member of the Departments offering the M. Tech. programme.

7.15 Registration of Project Work: A candidate is permitted to register for the project work after satisfying the attendance requirement in all the subjects, both theory and practicals.

7.16 After satisfying 7.15, a candidate has to present in Project Work Review I, in consultation with his Project Supervisor, the title, objective and plan of action of his project work to then Project Work Review Committee (PRC) for approval within four weeks from the commencement of Second Year First Semester. Only after obtaining the approval of the PRC can the student initiate the Project work.

7.17 If a candidate wishes to change his supervisor or topic of the project, he can do so with the approval of the PRC. However, the PRC shall examine whether or not the change of topic/supervisor leads to a major change of his initial plans of project proposal. If yes, his date of registration for the project work starts from the date of change of Supervisor or topic as the case may be.

7.18 A candidate is permitted to submit Project Thesis only after successful completion of all theory and practical courses with the approval of PRC not earlier than 40 weeks from the date of approval of the project work. For the approval of PRC the candidate shall submit the draft copy of thesis to the Head of the Department and make an oral presentation before the PRC.

7.19 The major project work shall be carried out in two stages: Project Stage – I during II Year I Semester, Project Stage – II during II Year II Semester. Each stage will be evaluated for 100 marks. Student has to submit project work report at the end of each semester. First report includes project work carried out in II Year I semester and second report includes project work carried out in II Year I & II Semesters. SEE for both project stages shall be completed before the commencement of SEE Theory examinations.

7.20 For Project Stage – I, the Project Review Committee shall evaluate the project work for 50 marks and project supervisor shall evaluate for 50 marks. 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, or (ii) secures less than 50% 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 he fails in such 'one reappearance' evaluation also, he has to reappear for the same in the next subsequent semester, as and when it is scheduled.

7.21 For Project Stage – II, the external examiner shall evaluate the project work for 50 marks and the project supervisor shall evaluate it for 50 marks. The student is deemed to have failed, if he (i) does not submit a report on Project Stage - II, or does not make a presentation of the same before the external examiner as per schedule, or (ii) secures less than 50% marks in the sum total of the CIE and SEE taken together. For conducting viva-voce of project stage – II, Principal selects an external examiner from the panel of experts in the relevant branch submitted by the HOD.

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.

7.22 After approval from the PRC, the soft copy of the thesis should be submiitted to the Department for ANTI-PLAGIARISM for the quality check and the plagiarism report should be included in the final thesis. If the copied information is less than 30%, then only thesis will be accepted for submission.

7.23 Three copies of the Project Thesis certified by the supervisor shall be submitted to the College, after submission of a research paper related to the project work in a UGC approved journal. A copy of the submitted research paper shall be attached to thesis.

7.24 The Project Viva-Voce External examination marks must be submitted to the Exam Branch on the same day of the examination.

8.0 Re-Admission/Re-Registration

8.1 Re-Admission for Discontinued Student

A student, who has discontinued the M.Tech. degree programme due to any reason whatsoever, may be considered for '**readmission'** into the same degree programme (with the same

specialization) with the academic regulations of the batch into which he gets readmitted, with prior permission from the authorities concerned, subject to item 6.6.

9.0 Examinations and Assessment - The Grading System

9.1 Grades will be awarded to indicate the performance of each student in each Theory Subject, or Lab/Practicals, or Seminar, or Technical Paper Writing or Project, etc., based on the % of marks obtained in CIE + SEE (Continuous Internal Evaluation + Semester End Examination, both taken together) as specified in Item 7 above, and a corresponding Letter Grade shall be given.

9.2 As a measure of the student's performance, a 10-point Absolute Grading System using the following Letter Grades (UGC Guidelines) and corresponding percentage of marks shall be followed:

% of Marks Secured in a subject/Course (Class Intervals)	**Letter Grade (UGC Guidelines)**	**Grade Points**
90% and above (≥90% , ≤ 100%)	O (Outstanding)	10
Below 90% but not less than 80% (≥80% , <90%)	A^+ (Excellent)	9
Below 80% but not less than 70% (≥ 70% , <80%)	A (Very Good)	8
Below 70% but not less than 60% (≥60% , <70%)	B^+ (Good)	7
Below 60% but not less than 50% (≥50% , <60%)	B (above Average)	6
Below 50% (< 50%)	F (FAIL)	0
Absent	**Ab**	**0**

9.3 A student obtaining F Grade in any Subject is deemed to have 'failed' and is required to reappear as 'Supplementary Candidate' for the Semester End Examination (SEE), as and when conducted. In such cases, his Internal Marks (CIE Marks) in those subjects will remain as obtained earlier.

9.4 If a student has not appeared for the examinations, 'Ab' Grade will be allocated to him for any subject and shall be considered 'failed' and will be required to reappear as 'Supplementary Candidate' for the Semester End Examination (SEE), as and when conducted.

9.5 A Letter Grade does not imply any specific marks percentage; it is only the range of percentage of marks.

9.6 In general, a student shall not be permitted to repeat any Subject/ Course (s) only for the sake of 'Grade Improvement' or 'SGPA/ CGPA Improvement'.

9.7 A student earns Grade Point (GP) in each Subject/ Course, on the basis of the Letter Grade obtained by him in that Subject/ Course. The corresponding 'Credit Points' (CP) are computed by multiplying the Grade Point with Credits for that particular Subject/ Course.

Credit Points (CP) = Grade Point (GP) x Credits …. For a Course

9.8 The student passes the Subject/ Course only when he **gets GP $\geq$ 6 (B Grade or above).**

9.9 The Semester Grade Point Average (SGPA) is calculated by dividing the Sum of Credit Points (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 :

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

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 Gi represents the grade points (GP) corresponding to the letter grade awarded for that i^{th} subject.

9.10 The Cumulative Grade Point Average (CGPA) is a measure of the overall cumulative performance of a student over 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 Second Semester onwards, at the end of each Semester, as per the formula mentioned below:

$$\text{CGPA} = \{ \sum_{j=1}^{M} C_j G_j \} / \{ \sum_{j=1}^{M} C_j \} \text{ … for all S semesters registered}$$

(i.e., up to and inclusive of S semesters, S $\geq$ 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' for from the 1^{st} Semester onwards upto and inclusive of the Semester S (obviously M > N), 'j' is the Subject indicator index (taking into account all Subjects from 1 to S Semesters), C is the no. of Credits allotted to the j^{th} Subject, and G 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 however, 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*8 = 32
Course 2	4	O	10	4*10 = 40
Course 3	4	B	6	4*6 = 24
Course 4	3	B	6	3*6 = 18
Course 5	3	A+	9	3*9 = 27
Course 6	3	B	6	3*6 = 18
	21			159

Illustration of calculation of CGPA

Semester	Credits	SGPA	Credits * SGPA
Semester I	24	7	24*7 = 168
Semester II	24	6	24*6 = 144
Semester III	24	6.5	24*6.5 = 156
Semester IV	24	6	24*6 = 144
	96		612

CGPA = 612/96 = 6.37

10.0 Award of Degree and Class

10.1 If a student who registers for all the specified Subjects/ Courses as listed in the Course Structure, satisfies all the Course Requirements, and passes the examinations prescribed in the entire PG Programme (PGP), and secures the required number of **68** Credits (with CGPA 6.0), shall be declared to have 'QUALIFIED' for the award of the M.Tech. Degree in the chosen Branch of Engineering and Technology with the specialization that he was admitted into.

10.2 Award of Class

After a student has earned the requirements prescribed for the completion of the programme and is eligible for the award of M.Tech. Degree, he shall be placed in one of the following three classes based on the CGPA:

Class Awarded	CGPA
First Class with Distinction	≥ 7.75
First Class	$6.75 \leq$ CGPA < 7.75
Second Class	$6.00 \leq$ CGPA < 6.75

A student with final CGPA (at the end of the **PGP) < 6.00** shall not be eligible for the Award of Degree.

11 Withholding of Results

If the student has not paid the dues, if any, to the Institution or if any case of indiscipline is pending against him, the result of the student will be withheld and he will not be allowed into the next semester.

12.0. Transitory Regulations

12.1 A student who has been detained in any semester of I Year of Previous Regulations due to lack of attendance, shall be permitted to join the same semester of I Year of R20 Regulations and he is required to complete the study of M.Tech programme within the stipulated period of four academic years from the date of first admission in I Year I semester. The R20 Academic Regulations under which a student has been readmitted shall be applicable to that student from that semester.

12.3 For student readmitted to R20 Regulations, the maximum credits that a student acquires for the award of the degree, shall be the sum of the total number of credits secured in previous regulations of his/her study including R20 Regulations.

12.4 If a student readmitted to R20 Regulations, has any subject with 80% of syllabus common with his/her previous regulations, that particular subject in R20 regulations will be substituted by another subject to be suggested by the Concerned Board Of Studies (BOS).

13 General

13.1 The academic regulation should be read as a whole for the purpose of any interpretation.

13.5 In case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Institution is final.

13.6 The Institution may change or amend the academic regulations or syllabi at any time and the changes or amendments made shall be applicable to all the students with effect from the dates notified by the Institution.

MALPRACTICE RULES

DISCIPLINARY ACTION FOR CONDUCT IN EXAMINATION

	Nature of Malpractices/Improper conduct	**Punishment**
	if the candidate:	
1.(a)	Possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, Cell phones, pager, palm computers or any other form of material concerned with or related to the subject of the examination (theory or practical) in which he is appearing but has not made use of (material shall include any marks on the body of the candidate which can be used as an aid in the subject of the examination).	Expulsion from the examination hall and cancellation of the performance in that subject only.
1.(b)	Gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or communicates through cell phones with any candidate or persons in or outside the exam hall in respect of any matter.	Expulsion from the examination hall and cancellation of the performance in that subject only of all the candidates 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 candidate is appearing.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate 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. The Hall Ticket of the candidate is to be cancelled.
3	Impersonates any other candidate in connection with the examination.	The candidate who has impersonated shall be expelled from examination hall. The candidate is also debarred and forfeits the seat. The performance of the original candidate who has been impersonated, shall be cancelled in all the subjects of the examination (including practical's and project work) already appeared and shall not be allowed to appear for examinations of the remaining subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all end semester examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. If the imposter is an outsider, he will be handed over to the police and a case is registered against him.

4	Smuggles in the Answer book or additional sheet or takes out or arranges to send out the question paper during the examination or answer book or additional sheet, during or after the examination.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate 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 candidate is also debarred for two consecutive semesters from class work and all end semester examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
5	Uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks.	Cancellation of the performance in that 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 shall be expelled from examination halls and cancellation of their performance in that subject and all other subjects the candidate(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the subjects of that semester/year. The candidates 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 of 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 candidate 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 candidate is also debarred for two consecutive semesters from class work and all end semester examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
8	Possess any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate 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 candidate is also debarred and forfeits the seat.
9	If student of the college, who is not a candidate for the particular examination or any person not connected with the college indulges in any malpractice or improper conduct mentioned in clause 6 to 8.	Student of the colleges expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate 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 candidate 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 candidate 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.
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 candidate 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 reported to the Examination Result Processing Committee (ERPC) for further action to award suitable punishment.	

J. B. INSTITUTE OF ENGINEERING AND TECHNOLOGY

(UGC Autonomous)

Bhaskar Nagar, Moinabad(M), RR Dist., Telangana-500075

DEPARTMENT OF CIVIL ENGINEERING

M. TECH (STRUCTURAL ENGINEERING)

R20 COURSE STRUCTURE (2020-2021)

I YEAR I – SEMESTER

Course Code	Course Title	L	T	P	Credits
JM31A	Advanced Structural Analysis	3	0	0	3
JM31B	Theory of Elasticity	3	0	0	3
JM31C JM31D JM31E	1. Advanced Reinforced Concrete Design 2. Structural Health Monitoring 3. Rehabilitation of Structures	3	0	0	3
JM31F JM31G JM31H	1. Advanced Concrete Technology 2. Design of Industrial Structures 3. Theory and Applications of Cement Composites	3	0	0	3
JM31I	Advanced Concrete Technology lab	0	0	4	2
JM31J	Computational Mathematics Lab	0	0	4	2
JM91A	Soft Skills	2	0	0	0
	Total	**14**	**0**	**8**	**16**

I YEAR II – SEMESTER

Course Code	Course Title	L	T	P	Credits
JM32A	Theory of Plates and shells	3	0	0	3
JM32B	Structural Dynamics	3	0	0	3
JM32C JM32D JM32E	1. Precast Concrete and Pre-Engineered Buildings 2. Bridge Design 3. High rise structures	3	0	0	3
JM32F JM32G JM32H	1. Soil Dynamics and Machine Foundation 2. Theory of Structural Stability 3. Energy Audit, Sustainable Materials& Green buildings.	3	0	0	3
JM32I	Structural Modeling & Design Lab	0	0	4	2
JM32J	Numerical Analysis (FEM) Lab	0	0	4	2
JM92A	Research Methodology &IPR	2	0	0	2
JM92B	Personality Development and Professional Value	2	0	0	0
	Total	**16**	**0**	**8**	**18**

J. B. INSTITUTE OF ENGINEERING AND TECHNOLOGY
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DEPARTMENT OF CIVIL ENGINEERING
M. TECH (STRUCTURAL ENGINEERING)

R20 COURSE STRUCTURE (2020-2021)

II YEAR I – SEMESTER

Course Code	Course Title	L	T	P	Credits
JM33A JM33B JM33C	1. Earthquake Resistant Design of Structures 2. Reliability Analysis of Structures 3. Soil Structure Interaction	3	0	0	3
OEC	Open Elective	3	0	0	3
JM33D	Mini Project	0	0	4	2
JM33E	Technical Seminar	0	0	2	1
JM33F	Project Dissertation Phase -I	0	0	18	9
	Total	**6**	**0**	**24**	**18**

II YEAR II – SEMESTER

Course Code	Course Title	L	T	P	Credits
JM34A	Project Dissertation Phase -II	0	0	32	16
	Total	**0**	**0**	**32**	**16**

Grand Total Credits=68

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

R20 COURSE STRUCTURE (2020-2021)

S.No	Course Code	Course Title	Name of the BOS offering the Subject
1	JM1OA	Industrial Safety	MECH
2	JM2OA	Renewable Energy Technologies and Battery Storage	EEE
3	JM2OB	Power Plant Engineering	EEE
4	JM3OA	Disaster Management	CIVIL
5	JM3OB	Precast &Prefabricated Construction	CIVIL
6	JM6OA	Clean Room Technology And Maintenance	ECE
7	JM6OB	Principles Of Computer Communication And Networks	ECE
8	JM7OA	Python Programming	CSE
9	JM7OB	E-Commerce	CSE

AY 2020-21 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	M. Tech-SE I Year – I Sem			
Course Code: JM31A	ADVANCED STRUCTURAL ANALYSIS (Professional Core – I)	L	T	D	P
Credits:3		3	0	0	0

Pre-requisite: Structural Analysis-I

Course Objectives:

This course will enable students to:

1. Emphasize the concepts of matrix methods of analysis and equip them with the knowledge to independently handle the problems of structural analysis.
2. Explain the element stiffness matrix and direct stiffness method.
3. Analysis the plane frame and grids by flexibility methods.
4. Analysis plane truss and continuous beams by Stiffness method.
5. Study the structural behavior of shear walls.

Module 1:

Unit 1: Introduction to matrix methods of analysis - statical indeterminacy and kinematical indeterminacy - degree of freedom - coordinate system - structure idealization stiffness and flexibility matrices - suitability element stiffness equations - elements flexibility equations - mixed force - displacement equations - for truss element, beam element and torsional element. Transformation of coordinates - element stiffness matrix - and load vector - local and global coordinates.

Module 2:

Unit 1: Assembly of stiffness matrix from element stiffness matrix - direct stiffness method - general procedure - banded matrix - semi bandwidth - assembly by direct stiffness matrix method Stiffness matrix method-Analysis of plane truss - continuous beam - plane frame and grids by stiffness methods. Introduction to flexibility matrix method.

Module 3:

Unit 1: Basic Finite Element Method – Principle of minimum PE – Formulation of structural mechanics problems – Reyleigh Ritz method – Weighted residual method, Galerkin approach – Bars, beams

Module 4:

Unit 1: 2D and 3D elements - Iso-parametric elements. Plane stress and plane strain- Axi Symmetric Problems- Plate Bending-Triangular and rectangular plate elements. Nonlinear analysis using FEM.

Module 5:

Unit 1: Shear walls- Necessity - structural behaviour of large frames with and without shear walls - approximate methods of analysis of shear walls.

Text Books:

1. Matrix Analysis of Frames structures by William Weaver J.R and James M. Gere, CBS publications.
2. Advanced Structural Analysis by Ashok. K.Jain, New Channel Brothers.
3. Matrix method of S.A by Pandit & Gupta.

Reference Books:

1. Structural Analysis Vol –I & II by V.N.Vazirani and M.M.Ratwani, Khanna Publishers.
2. Structural Analysis Vol I & II by G.S.Pandit and S.P.Gupta, Tata McGraw Hill Education Pvt. Ltd.

Course Outcomes:

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

1. Evaluate the continuous beams, rigid jointed frames and pin jointed structures in terms matrix method.
2. Solve the elements of the structure by direct stiffness method.
3. Analyze the plane trusses, continuous beams and plane frames by flexibility methods and stiffness methods
4. Evaluate static condensation and apply special analysis procedures to compute Initial and thermal stresses.
5. Demonstrate the necessity of structural behavior of shear walls in buildings.

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	M. Tech-SE I Year – I Sem			
Course Code: JM31B	THEORY OF ELASTICITY (Professional Core – II)	L	T	D	p
Credits:3		3	0	0	0

Pre-requisite:

Course Objectives:

This course will enable students to:

1. Describe the stress and strain at a point in elastic material and their relationships.
2. Evaluate the stress at a point in two-dimensional rectangular co-ordinate system.
3. Evaluate the stress at a point in two-dimensional polar co-ordinate system.
4. Explain about the stress state in three-dimensional body.
5. Describe the torsion behavior of straight prismatic bar & shaft.

Module 1:

Unit 1: Introduction:

Elasticity - notation for forces and stress - components of stresses - components of strain - Hooks law. Plane stress and plane strain analysis - differential equations of equilibrium 2D & 3D - boundary conditions – Strain Displacement Relations - compatibility equations – stress tensor and strain tensor- Differential equation of equilibrium in terms of Airy's stress function

Module 2:

Unit 1: Two dimensional problems in rectangular coordinates:

Solution by polynomials - Saint-Venant's principle - determination of displacements - bending of simple beams– Simply Supported and Cantilever Beams. –narrow rectangular cross section- Solution by Fourier series

Module 3:

Unit 1: Two dimensional problems in polar coordinates:

General solution of two-dimensional problem in polar coordinates-stress distribution symmetrical about an axis - pure bending of curved bars - strain components in polar coordinates - displacements for symmetrical stress - Edge Dislocation -- bending of curved bar-cantilever-effect of Circular Holes on stress distribution in plates– Rotating Disk- Effect of Point load on a straight boundary.

Module 4:

Unit 1: Analysis of stress and strain in three dimensions:

Principal stress - stress ellipsoid - director surface - determination of principal stresses Stress Invariants - max shear stresses - Homogeneous deformation - principal axes of strain-rotation. General Theorems: Differential equations of equilibrium - conditions of compatibility - determination of displacement - equations of equilibrium in terms of displacements - principle of super position - uniqueness of solution - the reciprocal theorem -Strain Energy-Bending of Prismatic Bars - 3D solution for displacements-circular cross section - elliptical cross section.

Module 5:

Unit 1: **Torsion of shafts:**

Torsion of Straight Prismatic Bars – Saint Venant's Method - bars with elliptical cross sections - membrane analogy - torsion of a bar of narrow rectangular section - torsion of hollow shafts, tubes, rolled steel sections etc.

Text Books:

1. Theory of Elasticity by Timoshenko, McGraw-Hill Publications

Reference Books:

1. Theory of Elasticity by Y.C. Fung.
2. Theory of Elasticity by Gurucharan Singh.

Course Outcomes:

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

1. Explain about the stress, strain, equilibrium and compatibility at a point in elastic material -derive their relationships.
2. Evaluate the stress& strain at a point in rectangular two dimensional and polar co-ordinate system.
3. Solve the problems of elasticity and be able to apply numerical methods to solve Continuum problems.
4. Explain about the stress strain behaviour in three-dimensional system.
5. Explain the torsion behaviour - circular shaft - St.Venant's Principle- straight prismatic bars.

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	M.Tech I Year – I Sem			
Course Code: JM31C	ADVANCED REINFORCED CONCRETE DESIGN (Professional Elective-I)	L	T	P	D
Credits:3		3	0	0	0

Pre-requisite: Structural Engineering –I (RCC)

Course Objectives:

This course will enable students to:

1. Impart knowledge on the limit state behaviour of RC structural members-plastic hinge formation moment redistribution.
2. Perform yield line analysis &equilibrium methods for square, circular, Rectangular, Triangular and Hexagonal slabs with simple and continuous end conditions.
3. Design Ribbed slabs and flat slabs for moment and shear.
4. Study the Detailing of deep beams and Forces in a Corbels.
5. Design of slender columns and foundations.

Module 1:

Unit I: Limit Analysis of R.C. Structures: Rotation of a plastic hinge, Redistribution of moments, moment rotation characteristics of RC member, I.S. code provisions, loading pattern, Bending Moment Envelope, Application for Fixed Beams and Continuous Beams. Inelastic Analysis of Slabs, Moment Redistribution in Columns, Limit Analysis with Torsional Hinges.

Module 2:

UNIT I: Yield line analysis for slabs: Yield line criterion – Virtual work and equilibrium methods of analysis – For square, circular, Rectangular, Triangular and Hexagonal with simple and continuous end conditions.

Module 3:

UNIT I: Ribbed slabs: Analysis of the Slabs for Moment and Shears, Ultimate Moment of Resistance, Design for shear, Deflection, Arrangement of Reinforcements.

UNIT II: Flat slabs: Direct design method – Distribution of moments in column strips and middle strip-moment and shear transfer from slabs to columns – Shear in Flat slabs-Check for one way and two way shears. Introduction to Equivalent frame method. Limitations of Direct design method- sketch showing reinforcement details.

Module 4:

UNIT I: Design of Reinforced Concrete Deep Beams & Corbels: Steps of Designing Deep Beams, Design by IS 456. Checking for Local Failures, Detailing of Deep Beams, Analysis of Forces in a Corbels, Design of Procedure of Corbels, Design of Nibs.

Module 5:

UNIT I: Design of Slender Columns – Slenderness limits, Methods of Design of Slender Columns, Additional Moment Method, Design of Slender Columns

UNIT II: Design of Foundations – Types of combined footings; Design of strap footing for two columns, Raft Foundations: Flat Slab Rafts for Framed Buildings -Design of the Beam and Slab Raft under uniform Pressure.

Text Books:

1. Reinforced Concrete Design" S. Unnikrishna Pillai &Devdas Menon; Tata Mc. Graw-Hill Publishing Company Ltd. New Delhi 2010.
2. "Advanced Reinforced Concrete" P.C. Varghese Prentice Hall of INDIA Private Ltd. 2008.
3. Reinforced concrete design by N. Krishna Raju and R.N. Pranesh, New age International Publishers, NewDelhi

Reference Books:

1. "Limit State Theory and Design of Reinforced Concrete" Dr. S. R. Karve and V.L Shah. Standard Publishers, PUNE 2004.
2. "Design of Reinforced Concrete Structures" by N.Subramanian, Oxford University Press.
3. Reinforced concrete structural elements – behaviour, Analysis and design by P. Purushotham, Tata Mc.Graw-Hill, 1994.
4. Design of concrete structures – Arthus H. Nilson, David Darwin, and Chorles W. Dolar, Tata Mc. Graw-Hill, 3rd Edition, 2005.
5. Reinforced Concrete design by KennathLeet, Tata Mc. Graw-Hill International, editions, 2nd edition, 1991.
6. "Design Reinforced Concrete Foundations" P.C. Varghese Prentice Hall of INDIA Private Ltd.
7. IS 456- 2000 PLAIN and Reinforced concrete book of Practice.
8. SP 16 - Design Aids for Reinforced Concrete to IS 456.
9. SP 34 - Hand Book as Concrete Reinforcement and retaining.

Web Resources:

Course Outcomes:

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

1. Describe the limit state behaviour of RC structural members-plastic hinge formation moment redistribution.
2. Apply equilibrium methods for square, circular, Rectangular, Triangular and Hexagonal slabs with simple and continuous end conditions.
3. Evaluate the Ribbed slabs and flat slabs for moment and shear.
4. Examine the Detailing of deep beams and Forces in Corbels.
5. Evaluate the slender columns and combined and raft foundations.

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	M. Tech-SE I Year – I Sem			
Course Code: JM31D	STRUCTURAL HEALTH MONITORING (Professional Elective-I)	L	T	P	D
Credits:3		3	0	0	0

Pre-requisite: Concrete Technology.

Course Objectives:

This course will enable students to:

1. Explain the fundamentals of structural health monitoring.
2. Study the various vibration-based techniques for structural health monitoring.
3. Discuss the structural health monitoring using fibre-optic and Piezoelectric sensors.
4. Study the structural health monitoring using electrical resistance and electromagnetic techniques.
5. Study the theoretical considerations on electromagnetic theory - Maxwell ‘s equations.

Module 1:

Unit 1: Introduction to Structural Health Monitoring

Definition of structural health monitoring (SHM) - Motivation for SHM - SHM as a way of making materials and structures smart - SHM and biomimetics - Process and pre- usage monitoring as a part of SHM - SHM as a part of system management - Passive and active SHM-NDE - SHM and NDECS - Variety and multidisciplinary - The most remarkable characters of SHM Birth of the SHM community.

Module 2:

Unit 1: Vibration-based techniques for SHM

Basic vibration concepts for SHM - Local and global methods - Damage diagnosis as an inverse problem - Model-based damage assessment - Mathematical description of structural systems with damage - General dynamic behaviour - State- space description of mechanical systems - Modelling of damaged structural elements - Linking experimental and analytical data - Modal Assurance Criterion (MAC) for mode pairing - Modal Scaling Factor (MSF) - Co-ordinate Modal Assurance Criterion (COMAC) - Damping - Expansion and reduction - Updating of the initial model - Damage localization and quantification.

Module 3:

Unit 1: Fiber-optic sensors

: Classification of fiber-optic sensors - Intensity-based sensors - Phase- modulated optical fiber sensors - or interferometers - Wavelength based sensors - or Fiber Bragg Gratings (FBG) - The fiber Bragg grating as a strain and temperature sensor - Response of the FBG to uniaxial

uniform strain fields - Sensitivity of the FBG to temperature - Response of the FBG to a non-uniform uni-axial strain field - Response of the FBG to transverse stresses – Photo-elasticity in a plane stress state - Structures with embedded fiber Bragg gratings - Orientation of the optical fiber optic with respect to the reinforcement fibers - Ingress-egress from the laminate - Fiber Bragg gratings as damage sensors for composites

Module 4:

Unit 1: SHM with piezoelectric sensors

The use of embedded sensors as Acoustic Emission (AE) detectors - Experimental results and conventional analysis of acoustic emission signals - Algorithms for damage localization - Algorithms for damage characterization - Available industrial AE systems ,New concepts in acoustic emission - State-the-art and main trends in piezoelectric transducer-based acousto-ultrasonic SHM research - Lamb wave structure interrogation - Sensor technology - Tested structures (mainly metallic or composite parts) - Acousto-ultrasonic signal and data reduction methods - The full implementation of SHM of localized damage with guided waves in composite materials.

Module 5:

Unit 1: SHM using electrical resistance

Composite damage - Electrical resistance of unloaded composite - Percolation concept - Anisotropic conduction properties in continuous fiber reinforced polymer - Influence of temperature - Composite strain and damage monitoring by electrical resistance - 0° uni-directional laminates - Multidirectional laminates - Randomly distributed fiber reinforced polymers - Damage localization.

Unit 2: Low frequency electromagnetic techniques

Theoretical considerations on electromagnetic theory - Maxwell‘s equations - Dipole radiation - Surface impedance - Diffraction by a circular aperture - Eddy currents

Textbooks:

1. “Structural Health Monitoring” by Daniel Balageas, Claus-Peter Fritzen and Alfredo Guemes John Wiley-ISTE, London, 6th edition Oct 2015.
2. “Health Monitoring of Structural Materials and Components - Methods with Applications”, by Douglas E Adams, John Wiley & Sons, New York, 3th edition Jan 2017.

Reference Books:

1. “Structural Health Monitoring and Intelligent Infrastructure” Vol.-1 by J.P. Ou, H. Li and Z. D. Duan, Taylor & Francis, London, 2nd edition, Apr 2005.
2. “Structural Health Monitoring with Wafer Active Sensors” by Victor Giurglutiu, Academic Press Inc, 3rd edition Nov 2015.

Web Resources:

1. https://nptel.ac.in/courses/112/104/112104160/

2. https://nptel.ac.in/courses/105/106/105106202/

Course Outcomes:

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

1. **Describe** the fundamentals of maintenance and repair strategies.
2. **Discuss** for serviceability and durability aspects of concrete.
3. **Explain** the materials and techniques used for repair of structures.
4. **Analyze** the appropriate repair, strengthening, rehabilitation and retrofitting technique required for a case study building.
5. **Explain** the theoretical considerations on electromagnetic theory - Maxwell ‘s equations.

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	M. Tech-SE I Year – I Sem			
Course Code: JM31E	REHABILITATION OF STRUCTURES (Professional Elective-I)	L	T	P	D
Credits:3		3	0	0	0

Pre-requisite: Concrete Technology, Building Materials, Rehabilitation and Retrofitting of structures.

Course Objectives:

This course will enable students to

1. Discuss the causes for distress and deterioration of structures.
2. Demonstrate the field monitoring and non-destructive evaluation of concrete structures.
3. Explain about the repair management of structures.
4. Study about Retrofitting strategies and Strengthening the structures.
5. Determine the guidelines for repair management of deteriorated structures.

Module 1:

Unit-I: Introduction - Present repair practices, Distress identification and repair management - Causes of distress in concrete structures-Holistic Models for deterioration of concrete, Permeability of concrete, Aggressive chemical agents, Durability aspects. Condition Survey-objectives, different stages-Preliminary inspection, planning stage, Visual inspection, Field laboratory testing stage, Consideration for repair strategy.

Module 2:

Unit-I: Non-Destructive evaluation tests- Rebound hammer test-Ultrasonic pulse velocity tests, Penetration resistance, Pull out tests, Core sampling and testing. Chemical Tests-Carbonation tests and chloride content, Corrosion potential assessment- Cover meter survey, Half-cell potentiometer test, resistivity measurement.

Module 3:

Unit-I: Case studies of RCC buildings subjected to distress-Identification and estimation of damage - Fire damage assessment, Structural integrity and Soundness assessment, Interpretation and evaluation of results.Evaluation of reserve strength of existing structures, active and passive repairs, modeling of repaired composite structures - Selection of repair materials for concrete-Essential parameters for repair materials-Strength and durability aspects, cost and suitability aspects.

Module 4:

Unit-I: Materials for repair-Premixed cement concrete and mortars, polymer modified mortars and concrete, epoxy and epoxy systems, polyester resins, coatings - Rehabilitation and retrofitting methods-repair options, performance requirements of repair systems, important factors to be considered for selection of repair methods. Identifying a suitable repair option for certain damage in a structure - Repair stages, Repair methods-guniting, shortcreting, polymer

concrete system, reinforcement replacement, strengthening concrete by surface impregnation, polymer and epoxy overlays.

Module 5:

Unit-I: Repair methods- Resin/polymer modified slurry injection, plate bonding technique, ferrocement jacketing, RCC jacketing, propping and supporting - Repair methods- fiber wrap technique, Carbon wrap (FCRP) foundation rehabilitation methods. Chemical and electrochemical method of repair – Repair/Rehabilitation strategies- Stress reduction technique, repair and strengthening of columns and beams - Rehabilitation Strategies- Compressive strength of concrete, cracks/joints, masonry, foundation, base isolation.

Text Books:

1. "Deficiencies in Design, Construction and Service" R.N. Raikar, "Learning from failures - Rand Centre (SDCPL), Aikar Bhavan, Bombay, (1987).
2. "Concrete Technology" by A.R. Shantha Kumar, Publisher : Oxford University Press (1 April 2018).
3. "Maintenance and Repair of Civil Structures", B.L. Gupta and Amit Gupta, Standard Publications (2009).
4. "Repair and Rehabilitation of Structures" by Dr.K.Sumitra, Sree Kamalmani Publishing (2019).

Reference Books:

1. "Defects and Deterioration in Buildings" by Barry Richardson, Consulting Scientist, Winchester, UK. Publisher: Routledge (30 November 2000)
2. "Acoustic Emission and Related Non-destructive Evaluation Techniques in the Fracture Mechanics of Concrete: Fundamentals and Applications by Masayasu Ohtsu(1 October 2020) Woodhead Publishing.
3. Non-Destructive Evaluation of Concrete Structures by Bungey, Woodhead Publishing (4June 2010)
4. "CPWD Handbook on Repair and Rehabilitation of RCC buildings", Govt of India Press, New Delhi, 2014.
5. ACI Handbook on Repair and Rehabilitation of RCC buildings.
   ICI Handbook on Repair and Rehabilitation of RCC buildings.

Course Outcomes:

The student will able to:

1. Evaluate the causes for distress and deterioration of structures.
2. Analyze the field monitoring and non-destructive evaluation of concrete structures.
3. Discuss about the repair management of structures
4. Explain about Retrofitting strategies and Strengthening the structures.
5. Formulate the guidelines for repair management of deteriorated structures.

Web Resources:

1. https://nptel.ac.in/courses/105/102/105102176/
2. https://nptel.ac.in/courses/105/106/105106202/
3. https://nptel.ac.in/courses/105/104/105104030/

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	M. Tech-SE I Year –I Sem			
Course Code: JM31F	ADVANCED CONCRETE TECHNOLOGY (Professional Elective-II)	L	T	D	P
Credits:3		3	0	0	0

Pre-requisite: Concrete Technology

Course Objectives:

This course will enable students to:

1. Study the properties of Cement and different grades of cement, Admixtures and Aggregates
2. Evaluate the properties of fresh concrete, hardened concrete.
3. Study the properties of High Strength Concrete and High-Performance Concrete
4. Compare the different types of special concretes, quality control and assurance of concrete mix design.
5. Describe the types formwork and formwork system.

Module 1:

Unit 1: STRUCTURE OF CONCRETE: Introduction, significance, complexities, structural levels, structure of concrete in Nanometer scale C-S-H-structure, Transition zone in concrete. Transition Zone improvement, scanning Electron Microscopy, Effect of polymers in micro-structural Engineering.

Module 2:

Unit 1 ADMIXTURES AND MIX DESIGN: Classification of admixtures, various mineral and chemical admixtures, Influence of admixtures on properties of concrete and field applications.

Mix Design: Basic considerations, mix design process, factors in choice of mix design and their influence. Comparison of mix design – using I.S.Code, ACI & DOE methods. Statistical quality control of concrete.

Module 3:

Unit 1: DURABILITY OF CONCRETE: Durability and impermeability , Factors governing durability of concrete, cracking, carbonation, Alkali-silica reaction, chemical attack and physical Aggression- Delayed Ettringite Formation.

FRACTURE MECHANICS: Introduction, Linear elastic fracture Mechanics, the crack tip plastic zone, crack tip opening displacement, Fracture process in Concrete.

Module 4:

Unit 1: ADVANCED CONCRETES: Fibre reinforced cementitious composites: Introduction, factors influencing properties, fibre-cements properties and Mechanical Properties - Hybrid fiber reinforced concrete SIFCON, SIMCON-Ultra high strength concrete-composition, Micro structure, Brittleness and application. Self-compacting concrete (SCC) –

Materials for SCC, Requirements of SCC, production and placing, Mix Design, tests in fresh state of SCC (as per EFNARC specification) complexity in making SCC, New generation super plasticizers and viscosity modifiers for SCC, Economy of SCC & applications. Introduction to other special concretes such as Bacterial concrete, Bendable concrete, pervious concrete and translucent concrete.

Module 5:

Unit 1: FORM WORK AND SCAFFOLDING: Form work: Materials, forces on form work, structural requirements, connection, form work system, special forms such as slip forms & permanent forms, specification, design, shores, removal of forms and shores, reshoring, construction loads, failure of form work, economy.

Scaffoldings: Importance – Types of scaffoldings and their safety requirements.

Text Books:

1. "Properties of Concrete" by A.M.Neville, "English Language Book Society/Longman Pub, 1988
2. "Concrete – Microstructure – Properties and Material" by P.K.Mehta and J.M.M.Paulo, ICI, Indian First Edition, Reprint 1999.

Reference Books:

1. "Advanced Concrete Technology" by Zongjin Li, John Wiley & Sons, INC, Newjersy, 2011.
2. "Concrete Technology" by M.S. Shetty, S. Chand & Company Ltd., New Delhi, 2013.
3. "Concrete Technology" by A.R. Santhakumar, Oxford University press, New Delhi, 2009.

Web Resources:

1. https://nptel.ac.in/courses/105/104/105104030/

Course Outcomes:

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

1. Acquire knowledge on properties of Cement and different grades of cement, Admixtures and Aggregates.
2. Acquire and apply comprehensive knowledge in the fresh and hardened properties of concrete.
3. Understand the High Strength Concrete, High-Performance Concrete and design Considerations.
4. Comprehend the various types of special concrete and mix proportions for design as per IS code.
5. Design the forms for a specific work and decide the time of removal of forms for the different elements in different situations.

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	M.Tech: SE I Year – I Sem			
Course Code: JM31G	DESIGN OF INDUSTRIAL STRUCTURES (Professional Elective-II)	L	T	D	P
Credits:3		3	0	0	0

Course Objectives:

This course enables the student to,

1. Study the types of industrial structures and different components of industrial structures.
2. Design the Steel Structural Frames.
3. Perform analysis & design of RC Bunkers and Silos.
4. Formulate the design loading for Chimneys.
5. tudy the design Principles of Cylindrical Shells.

Module 1:

UNIT-I: Planning of Industrial Structures

Types of industrial structures – different components of industrial structures – Bracings of Industrial Buildings – equipment, process and service loads and special considerations in design of steel industrial buildings.

Module 2:

UNIT-I: Thin Walled / Cold Formed Steel Members

Definitions – Local Bucking of Thin-Elements Post Buckling of Thin-Elements – Light Guage Steel Columns and Compression Members – Form-Factor for Columns and Compression Members – Behaviour of Stiffened Elements Under Uniform Compression – Multiple Stiffened Compression Elements –Effective Length of Light Gauge Steel Compression Members – Light Gauge Steel Tension Members.

Module 3:

UNIT-I: RC Bunkers & Silos

Introduction – Janssen's Theory – Airy's Theory – Design of Square, Rectangular and Circular Bunkers; Design of Silos.

Module 4:

UNIT-I: RC Chimneys: Introduction – Wind Pressure – Stresses in Chimney Shaft Due to Self-Weight and Wind – Stresses in Horizontal Reinforcement Due to Wind Shear – Stresses Due to Temperature Difference – Combined Effect of Self Load, Wind and Temperature – Temperature Stresses in Horizontal Reinforcement Problems.

Module 5:

UNIT-I: Cylindrical shell

Design Principles of Cylindrical Shells & Design Problems.

TEXTBOOKS:

1. B. C. Punmia, Ashok Kr. Jain, Arun Kr. Jain, "Design of Steel Structure", 2nd Edition, Lakshmi Publishers, 1998.
2. Punmia B.C, Ashok Kr. Jain, Arun Kr. Jain, "RCC Designs (Reinforced Concrete Design)", 10th Edition, Lakshmi Publishers, 2006.
3. Ram Chandra, "Design of Steel Structures", 12th Edition, Standard Publishers, 2009.

REFERENCES:

1. Advanced Reinforced Concrete Design, By N. Krishna Raju (CBS Publishers & Distributors) 2005.
2. Design of Steel Structures, By Ram Chandra and Virendra Gehlot vol-II, 2007.
3. Design of Steel Structures, By Duggal - Tata McGraw-Hill publishers – 2010

Web Resources:

1. https://nptel.ac.in/courses/105/106/105106113/
2. https://nptel.ac.in/courses/105/106/105106112/
3. https://www.epictraining.ca/course-catalogue/civil/12326/structural-design-of-industrial-buildings

Course outcomes:

The student will be able to:

1. Apply the types of industrial structures and different components of industrial structures.
2. Design the Steel Structure Frames.
3. Design RCC structures as Bunkers and Silos.
4. Formulate the design loading for Chimneys.
5. Design Principles of Cylindrical Shells

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	M. Tech-SE I Year I Sem			
Course Code: JM31H	THEORY AND APPLICATIONS OF CEMENT COMPOSITES	L	T	D	P
Credits:3	(Professional Elective-II)	3	0	0	0

Pre-requisite: Concrete Technology

Course Objectives:

This course will enable students to:

1. Study classification and characteristics of composite material.
2. Explain the Mechanical Behaviour and Elasticity Solutions
3. Study the Types of Cement Composites, Materials, and their Properties
4. Discuss the mechanical properties of cement composites.
5. Study applications in the diverse construction field.

Module 1:

Unit 1: Introduction: Classification and Characteristics of Composite Materials- Basic Terminology, Advantages. Stress-Strain Relations- Orthotropic and Anisotropic Materials, Engineering Constants for Orthotropic Materials, Restrictions on Elastic Constants, Plane Stress Problem, Biaxial Strength, Theories for an Orthotropic Lamina.

Module 2:

Unit 1: Mechanical Behaviour: Mechanics of Materials Approach to Stiffness- Determination of Relations between Elastic Constants, Elasticity Approach to Stiffness- Bounding Techniques of Elasticity, Exact Solutions - Elasticity Solutions with Continuity, Halpin, Tsai Equations, Comparison of approaches to Stiffness.

Module 3:

Unit 1: Cement Composites: Types of Cement Composites, Terminology, Constituent Materials And their Properties, Construction Techniques for Fibre Reinforced Concrete Ferro cement, SIFCON, Polymer Concretes, Preparation of Reinforcement, Casting and Curing.

Module 4:

Unit 1: Mechanical Properties of Cement Composites: Behavior of Ferrocement, Fiber Reinforced Concrete in Tension, Compression, Flexure, Shear, Fatigue and Impact, Durability and Corrosion.

Module 5:

Unit 1: Application of Cement Composites: FRC and Ferrocement- Housing, Water Storage, Boats and Miscellaneous Structures. Composite Materials- Orthotropic and Anisotropic behaviour, Constitutive relationship, Elastic Constants.

Unit 2: Analysis and Design of Cement Composite Structural Elements – Ferro cement, SIFCON and Fibre Reinforced Concrete

Text Books:

1. “Mechanics of Composite Materials”, Jones R. M, 2nd Ed., Taylor and Francis, BSP Books, 1998.
2. “Ferrocement – Theory and Applications”, Pama R. P., IFIC,1980.
3. New Concrete Materials, Swamy R.N., 1stEd., Blackie, Academic and Professional, Chapman &Hall,1983.

Reference Books:

1. “Mechanics of Laminated Composites Plates and Shells”, Reddy J. N., CRC Press.
2. “Theory and analysis of elastic plates and shells”, J.N Reddy, CRC Press

Course Outcomes:

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

1. Analyze the strain- stress behavior and classification and characteristics of composite material
2. Analyze the mechanical properties of cement composites.
3. Classify the materials as per Orthotropic and anisotropic behavior.
4. Analyze strain constants using theories applicable to composite materials.
5. Analyze and design structural elements made of cement composites.

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	M. Tech-SE I Year – I Sem			
Course Code: JM31I	ADVANCED CONCRETE TECHNOLOGY LAB	L	T	D	P
Credits:2		0	0	0	4

Course Objectives:

This course will enable students to:

1. Design high grade concrete and study the parameters affecting its performance.
2. Conduct Non Destructive Tests on existing concrete structures.\
3. Apply engineering principles to understand behavior of structural/ elements

LIST OF EXPERIMENTS:

1. Air entrainment test on fresh concrete
2. Accelerated curing of control mix and Self-Compacting Concrete (SCC)
3. Marsh cone test on concrete
4. Fresh properties of self-compacting concrete
5. Workability of Fiber Reinforced Concrete (FRC)
6. Non-destructive testing of concrete
7. Modulus of elasticity of SCC and FRC
8. Permeability of concrete
9. Tensile strength of fiber reinforced concrete
10. Drying shrinkage of fiber reinforced concrete

Course Outcomes:

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

1. Understand high grade concrete and study the parameters affecting its performance.
2. Perform Non Destructive Tests on existing concrete structures.
3. understand the engineering principles and behaviour of structural/ elements

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	M. Tech-SE I Year – I Sem			
Course Code: JM31J	COMPUTATIONAL MATHEMATICS LAB	L	T	D	P
Credits:2		0	0	0	4

Pre-requisite:

Course Objectives:

This course will enable students to:

1. Explain various computational methods of mathematics
2. Provide hand-on experience in writing computer programs for different numerical methods and computational techniques.
3. Explain the application of computational or numerical methods to civil engineering problems

LIST OF EXPERIMENTS:

1. Write a program for Truncation and rounding errors, Fixed and floating-point arithmetic, Propagation of errors and corresponding errors
2. Program to find the roots of the given linear equations using
   i. Bisection and ii. Newton Raphson's method and iii. Iteration method
3. Program to find the solution of given system of linear equations using LU decomposition method.
4. Program to find the solution of given system of linear equations using Gaussian Elimination, Gauss Jordon and Gauss Seidal methods
5. Solve homogeneous equation for Eigen values using power method
6. Program to determine y for a given x, if two array of x and y of same size using
   i. Newton's forward ii. Newton's backward and iii. Central difference methods.
7. Program to determine y for a given x, if two array of x and y of same size using
   i. Lagrange's interpolation ii. Newton's divided interpolation method
8. Program to determine integral using
   i. Trapezoidal rule, ii. Simpson's $1/3^{rd}$ rule and iii. Simpson's $3/8^{th}$ rule
9. Program to solve given differential equations using
   i. Modified Euler's method ii. Runge- Kutta method
10. Write a program to demonstrate statistical distributions i. Mean and ii. Variance iii. To fit Binomial and Poisson distributions.

Course Outcomes:

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

1. Explain various techniques or methods in computational mathematics
2. Write computer programs to execute various mathematical computational techniques.
3. Apply concepts of computational mathematics to engineering problems

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	M. Tech-SE I Year I Sem			
Course Code: JM91A	SOFT SKILLS	L	T	D	P
Credits:0		2	0	0	0

Pre-requisite: English

Course Objectives:

This course will enable students to:

1. Study the Positivity, Motivation and developing positive thinking and attitude.
2. Summarize the listening skills and essential formal writing skills.
3. Explain the Time Management and Personality Development.
4. Describe the Decision-Making and Problem-Solving Skills.
5. Study the Psychometric Analysis and Mock Interview Sessions.

Module 1:

Unit 1 : Soft Skills: An Introduction – Definition and Significance of Soft Skills; Process, Importance and Measurement of Soft Skill Development. Self-Discovery: Discovering the Self; Setting Goals; Beliefs, Values, Attitude, Virtue. Positivity and Motivation: Developing Positive Thinking and Attitude; Driving out Negativity; Meaning and Theories of Motivation; Enhancing Motivation Levels.

Module 2:

Unit 1: Interpersonal Communication: Interpersonal relations; communication models, process, and barriers; team communication; developing interpersonal relationships through effective communication; listening skills; essential formal writing skills; corporate communication styles – assertion, persuasion, negotiation. Public Speaking: Skills, Methods, Strategies and Essential tips for effective public speaking. Group Discussion: Importance, Planning, Elements, Skills assessed; Effectively disagreeing, Initiating, Summarizing and Attaining the Objective. Non-Verbal Communication: Importance and Elements; Body Language. Teamwork and Leadership Skills: Concept of Teams; Building effective teams; Concept of Leadership and honing Leadership skills.

Module 3:

Unit 1: Interview Skills: Interviewer and Interviewee – in-depth perspectives. Before, During and After the Interview. Tips for Success. Presentation Skills: Types, Content, Audience Analysis, Essential Tips – Before, During and After, Overcoming Nervousness. Etiquette and Manners – Social and Business. Time Management – Concept, Essentials, Tips. Personality Development – Meaning, Nature, Features, Stages, Models; Learning Skills; Adaptability Skills.

Module 4:

Unit 1: Decision-Making and Problem-Solving Skills: Meaning, Types and Models, Group and Ethical Decision-Making, Problems and Dilemmas in application of these skills. Conflict Management: Conflict - Definition, Nature, Types and Causes; Methods of Conflict Resolution. Stress Management: Stress - Definition, Nature, Types, Symptoms and Causes; Stress Analysis Models and 8 Impact of Stress; Measurement and Management of Stress, Leadership and Assertiveness Skills: A Good Leader; Leaders and Managers; Leadership Theories; Types of Leaders; Leadership Behaviour; Assertivness Skills. Emotional Intelligence: Meaning, History, Features, Components, Intrapersonal and Management Excellence; Strategies to enhance Emotional Intelligence.

Module 5:

Unit 1: Employability Skills: Resume buildings – Facing the Personal Interview (HR and Technical)- Psychometric Analysis- Mock Interview Sessions.

Text Books:

1. Managing Soft Skills for Personality Development –edited by B.N.Ghosh, McGraw Hill India, 2012.
2. English and Soft Skills – S.P.Dhanavel, Orient Blackswan India, 2010.

Course Outcomes:

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

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

1. Describe the Positivity, Motivation and developing positive thinking and attitude.
2. Explain the listening skills and essential formal writing skills.
3. Discuss the Time Management and Personality Development.
4. Illustrate the Decision-Making and Problem-Solving Skills.
5. Describe the Psychometric Analysis and Mock Interview Sessions.

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	M. Tech-SE I Year II Sem			
Course Code: JM32A	THEORY OF PLATES AND SHELLS (Professional Core – III)	L	T	D	P
Credits:3		3	0	0	0

Pre-requisite:

Course Objectives:

This course will enable students to:

1. Study the Strain Displacement Relations and stress strain relations in plates.
2. Explain Kirchoff's assumptions and thin plate bending theory.
3. Explain the behaviour of Rectangular plates under various loading conditions.
4. Study the behavior of thin shells & methods of analysis of shells.
5. Solve Differential equations to analyze the Symmetrical bending of circular plates.

Module 1:

Unit 1 : Introduction: Space Curves, Surfaces, Shell Co-ordinates, Strain Displacement Relations, Assumptions in Shell Theory, Displacement Field Approximations, Stress Resultants, Equation of Equilibrium using Principle of Virtual Work, Boundary Conditions.

Module 2:

Unit 1: Theory of Plates – Approximate Methods - Introduction to thin plates under small deflection theory - Kirchoff's assumptions - Lame's parameters - Development of strain – displacement relationships - stress-strain relationships – Pure bending of plates – Small deflections of laterally loaded plates.

Module 3:

Unit 1: Fourier series of loadings- Rectangular plates - Differential equation - Solution of simply supported plates under various loading conditions - Uniformly distributed load – Hydrostatic pressure and a concentrated load - Navier and Levy types of solutions**.**

Module 4:

Unit 1: Shells – functional behaviour – examples – structural behaviour of shells classification of shells –Definitions – various methods of analysis of shells – merits and demerits of each method – 2D. Membrane equation. Equations of equilibrium: Derivation of stress resultants – cylindrical shells – Flugges simulations equations.

Module 5:

Unit 1: Symmetrical bending of circular plates - Differential equations - Uniformly loaded and
concentrically loaded plates with various boundary conditions.

Text Books:

1. G.S. Ramaswamy, "Design and Construction of Concrete Shell Roofs", 1st Edition, CBS
2. Publishers, 2005.
3. R. Szilard, "Theory and Analysis of Plates - Classical and Numerical Methods", Prentice

4. Hall, 1974.
5. S Timoshenko and Krierger, “Theory of Plates and Shells”, 2nd Edition, Tata McGraw Hill, 2017.
6. Chandrashekhara, “Theory of Plates”, Universities Press, 2000.
7. A C Ugural, “Plates and Shells: Theory and Analysis”, 4th edition CRC Press; 2017.

REFERENCES:

1. Theory of Plates & Shells –Stephen, P. Timoshenko, S. Woinowsky-Krieger – Tata MCGraw Hill Edition
2. Analysis and design of concrete shell roofs By G.S. Ramaswami. CBS publications.
3. Design of concrete shell roofs By Billington – Tata MC Graw Hill, New York
4. Shell Analysis By N.K. Bairagi. Khanna Publishers, New Delhi.
5. Design of Shells and Folded Plates by P.C. Varghese, PHI Learning Pvt. Ltd
6. Design of concrete shell roofs By Chaterjee. Oxford and IBH.,

Course Outcomes:

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

1. Describe the Strain Displacement Relations and stress strain relations in plates.
2. Discuss Kirchoff’s assumptions and thin plate bending theory.
3. Analyze the behaviour of Rectangular plates under various loading conditions
4. Evaluate the behavior of thin shells & methods of analysis of shells.
5. Evaluate Differential equations to analyze the Symmetrical bending of circular plates.

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	M. Tech-SE I Year II Sem			
Course Code: JM32B	STRUCTURAL DYNAMICS (Professional Core – IV)	L	T	D	P
Credits:3		3	0	0	0

Pre-requisite:

Course Objectives:

This course will enable students to:

1. Describe the theory of vibrations.
2. Explain the basics of structural dynamics.
3. Explain the Single and Multi-Degree of freedom.
4. Explain the vibration analysis.
5. Describe the earthquake analysis of structures.

Module 1:

Unit 1 : Theory of vibrations: Introduction - Elements of vibratory system - Degrees of Freedom - Continuous System - Lumped mass idealization - Oscillatory motion - Simple Harmonic motion - Vectorial representation of S.H.M. - Free vibrations of single degree of freedom system - undamped and damped vibrations - critical damping - Logarithmic decrement - Forced vibration of SDOF systems - Harmonic excitation - Vibration Isolation - Dynamic magnification factor – Phase angle.

Module 2:

Unit 1: Introduction to Structural Dynamics: Fundamental objectives of dynamic analysis -Types of prescribed loading - Methods of discretization - Formulation of equations of motion by different methods – Direct equilibration using Newton's law of motion / D'Alembert's principle, Principle of virtual work and Hamilton principle. Single Degree of Freedom Systems: Formulation and solution of the equation of motion - Free vibration response - Response to Harmonic, Periodic, Impulsive and general dynamic loadings - Duhamel integral.

Module 3:

Unit 1: Multi Degree of Freedom Systems: Selection of the degrees of Freedom - Evaluation of structural property matrices - Formulation of the MDOF equations of motion -Undamped free vibrations - Solutions of Eigen value problem for natural frequencies and mode shapes - Analysis of Dynamic response – Normal co-ordinates - Uncoupled equations of motion - Orthogonal properties of normal modes - Mode superposition procedure.

Module 4:

Unit I: Practical Vibration Analysis: Introduction - Stodola method - Fundamental mode analysis - Analysis of second and higher modes - Holzer method - Basic procedure.

Unit II: Continuous Systems: Introduction - Flexural vibrations of beams - Elementary case – Derivation of governing differential equation of motion - Analysis of undamped free

vibrations of beams in flexure - Natural frequencies and mode-shapes of simple beams with different end conditions - Principles of application to continuous beams.

Module 5:

Unit 1: Introduction to Earthquake Analysis: Deterministic Earthquake Response: Systems on Rigid Foundations: Types of Earthquake Excitations – Lumped SDOF Elastic Systems, Translational Excitations Grreliyed – coordinate SDOF Elastic Systems, Translational Excitations, Linear Static Method – Analysis for obtaining response of multi storeys RC Building.

Text Books:

1. Dynamics of Structures by Clough & Penzien, McGraw Hill, New York
2. Dynamics of Structures by Anil K. Chopra, Pearson Education (Singapore), Delhi.

REFERENCES:

1. Structural Dynamics by Mario Paz, C.B.S Publishers, New Delhi.
2. Theory of vibrations by W.T. Thomson CBS Publishers and Distributors.
3. Structural Dynamics by Roy. R. Craig John willy & fours. I.S: 1893 (Part 1) - 2016, "Code of practice for Earthquake resistant design of Structures"

Course Outcomes:

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

1. Explain the theories of vibration.
2. Explain the basic concept of structural dynamics.
3. Analyze the responses of system for Single and Multi-degree of Freedom.
4. Explain the vibration analysis.
5. Explain the system responses to the earthquake loading.

AY 2020-21 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	M. Tech-SE I Year – II Sem			
Course Code: JM32C	PRECAST CONCRETE AND PRE-ENGINEERED BUILDINGS (Professional Elective-III)	L	T	P	D
Credits:3		3	0	0	0

Pre-requisite: Concrete Technology

Course Objectives:

This course will enable students to:

1. Study the various precast structural and non-structural elements.
2. Explain the Prefabricated building using precast load bearing and non-load bearing wall panels, flooring systems.
3. Evaluate the design considerations and requirements of prefabricated buildings.
4. Differentiate between Conventional Steel Buildings and Pre-Engineered buildings.
5. Describe the primary and secondary frame system in Pre-engineered buildings.

Module 1:

Unit1: Precast concrete Elements:

Introduction**,** Advantages, and disadvantages of Precast concrete members. Materials used- PCC, RCC, PSC, SCC, Ferro Cement, Aerated and Foam concrete. Non- Structural Precast Elements- Paver blocks, fencing poles, Manhole covers, Hollow and Solid Blocks, Door and Window frames. Structural Precast Elements: Tunnel linings, Canal lining, Box culvert, Bridge panels, Sheet Piles.Codal Provision for precast construction, Modular coordination.

Module 2:

Unit 1: Prefabricated Building:

Precast Structural Building components such as slab panels, beams, columns, footings, walls, lintel and chajjas, staircase elements.

Prefabricated building using precast load bearing and non-load bearing wall panels, flooring systems. Material Characteristics, plan, and standard specifications. Casting Tolerance for above elements. Prefab systems and structural schemes and their classification.

Module 3:

Unit 1:

Design considerations and requirements of Prefabricated buildings, Joints-requirement of structural joints and their design consideration of above elements. Manufacturing, curing, storage, transportation and erection of above elements, equipment needed. Introduction to mixed and composite construction.

Module 4:

Unit 1: Introduction to Pre-Engineered Buildings:

Introduction, History, Advantages of PEB, Applications of PEB, Materials used for manufacturing of PEB. Difference between Conventional Steel Buildings and Pre-Engineered buildings.MBMA specifications. IS codes on light gauge and cold formed steel.

Module 5:

Unit 1: **Pre-Engineered Building Components:**

Primary System: Main frames, Gable End Frame - Secondary frame system: Sizes and Properties of Purlins & Girts – Bracing System: Rod, angle, Portal, Pipe bracing – Sheeting and Cladding: Roof Sheeting and Wall sheeting – Accessories: Turbo Ventilators, Ridge vents, Sky Lights, Louvers, Insulation, and Stair cases.

Text Books:

1. Alexander Newman, Metal Building Systems Design and Specifications, 2nd Edition.
2. Precast Concrete Structures- Elliott, Kim S, CRC Press, New York, 2011.
3. Handbook on Precast concrete buildings- Indian Concrete Institute.

Reference Books:

1. K.S.Vivek & P.Vaishavi– Pre Engineered Steel Buildings, Lambert Academic Publishing.

Web Resources:

Course Outcomes:

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

1. Recall the various precast structural and non-structural elements.
2. Illustrate the Prefabricated building using precast load bearing and non-load bearing wall panels, flooring systems.
3. Outline the design considerations and requirements of prefabricated buildings.
4. Compare between Conventional Steel Buildings and Pre-Engineered buildings.
5. Describe the primary and secondary frame system in Pre-engineered buildings

AY 2020-21 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	M. Tech-SE I Year – II Sem			
Course Code: JM32D	BRIDGE DESIGN (Professional Elective-III)	L	T	P	D
Credits:3		3	0	0	0

Course Objectives:

The course will enable Students to:

1. Illustrate and explain the different components of bridges and various loads acting on them.
2. Explain the design considerations for solid slab, girder and continuous bridges.
3. Explain the design considerations for prestresses concrete bridges.
4. Explain the design procedureof Steel truss girder bridge.
5. Describe the sub structure design of bridges

Module 1

UNIT-I: Concrete Bridges:

Introduction-Types of Bridges-Economic span length-Types of loading-Dead load live load-Impact Effect-Centrifugal force-wind loads-Lateral Loads-Longitudinal forces-Seismic loads Frictional resistance of expansion bearings-Secondary Stresses-Temperature Effect-Erection Forces and effects-Width of roadway and footway-General Design Requirements – IRC Standards – Railway loading-EUDL-Railway bridge manual.

Module 2

UNIT-I: Solid slab, Girder Bridges & Continuous Bridges:

Slab bridges and Box culverts-Method of Design. Girder Bridges - Introduction-Method of Design-Courbon's Theory. Continuous Bridges - Introduction- Span lengths Analysis of Continuous Bridges-Decking of Girders with constant Moment of Inertia-Continuous bridges with variable Moment of Inertia-Method of Analysis -Girders with Parabolic Soffit-Method of plotting Influence lines-Girders with Straight Haunches-Design steps for Continuous Bridges.

Module 3

UNIT-I: Pre-Stressed Concrete Bridges:

Basic principles- Method of Pre-stressing-Pretensioning and Posttensioning- Comparison-Freyssinet Method-Magnel-Blanet System-Lee-Mc call system-Basic Assumptions-Losses in Prestress-Equation based on Initial and final stress conditions-Cable Zone Design of selections-Condition of first crack- Ultimate load design-Shear-Vertical Prestressing Diagonal Tension in I-section-End Block-Magnel's method-Empirical Method-General Design requirements-Mild steel reinforcement in prestressed concrete member-Concrete cover and

spacing of pre-stressing steel-Slender beams-Composite Section-Propped-Design of Propped Composite Section-Unpropped composite section-Two-stage Prestressing-Shrinking stresses-General Design requirements for Road Bridges.

Module 4

UNIT-I: Design principles of Steel truss girder bridge- Structural elements and design principles for Cable stayed & suspended bridges-long span bridges – New technologies.

Module 5

UNIT-I: Sub-structure of bridges: Substructure- Beds Block-Piers- Pier Dimensions-Design loads for piers Abutments- Design loads for Abutments

TEXT BOOKS:

1. Essentials of Bridge Engineering, D.J.Victor, Oxford & IBH Pub, N. Delhi.
2. Design of Bridges, N. Krishna Raju, Oxford & IBH, N. Delhi

REFERENCES:

1. Design of Concrete Bridges by M.G. Aswani, V.N. Vazirani and M.M. Ratwani.
2. Bridge Deck Behaviour by E.C. Hambly.
3. Concrete Bridge Design and Practice by V.K.Raina.

Course outcomes:

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

1. Explain the types of bridges and their components and various loads acting on them
2. Design the solid slab, girder and continuous bridges
3. Analyse the design considerations for Prestressed concrete bridges
4. Analyse the design procedure of Steel truss girder bridge.
5. Design of sub structure for a bridge.

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	M. Tech-SE I Year – II Sem			
Course Code: JM32E	HIGH RISE STRUCTURES (Professional Elective-III)	L	T	P	D
Credits:3		3	0	0	0

Course Objectives:

This course will enable students to:

1. Explain the behaviour of buildings under lateral loads.
2. Summarize the Structural behavior of Rigid frames.
3. Analyze the Load resisted by different shear walls and frames.
4. Illustrate the various flooring systems in concrete and steel.
5. Determine the slope, deflection, and displacement of Tall buildings by Stiffness method.

UNIT-I: Introduction: Evolution of tall buildings – Classification of Buildings – Low-rise, medium-rise, high rise – Ordinary framed buildings & Shear-wall buildings –Behaviour of buildings under lateral loads like Wind loads, Earthquake loads & Blast loads – Basic structural & functional design requirements – Strength, Stiffness & Stability. Assembly of building and site investigation – Building Performance - Cost, Quality and Time.

UNIT-II: Structural forms and flooring system: Introduction – Evolution of various structural forms and their importance to high rise architecture- Introduction to various flooring systems in concrete and steel.

UNIT-III: Lateral load resisting elements: Frames, Shear walls & Tubes – Shear, Bending & combine modes of deformation – Structural behavior of Rigid frames – Simplified methods of analysis – Substitute frame method, Portal method, Cantilever method, Equivalent frame method –Structural behaviour of Shear walls – Approaches of analysis – Elastic continuum approach & Discrete approach — Structural behavior of Tubes –Actions.

UNIT-IV: Choice of System for a Building: Frame building, Shear wall building, Shear walls acting with frames, Single framed tubes – Other structural forms – Staggered Wall-beam system, Tube-in-tube system, Bundled Tube- Outrigger truss System- Diagrid Structures.

Base isolation technique for earthquake resistance. Load distribution in a tall building – Load resisted by different shear walls & frames – Determinate & Indeterminate problems – Equivalent Stiffness method.

UNIT-V: Modern Methods: Analysis of Tall buildings by Stiffness method plastic hinge formation-mecahnism- Available Softwares for analysis of tall buildings.

IS Codal Provision for IS 16700- deflection- shear walls, Material and Construction Technologies/Practices

TEXTBOOKS:

1. Taranath B, Steel, Concrete and Composite Design of Tall Buildings, 2nd Edition, McGraw Hill, 1998
2. White and Salmon, Building Structural Design Handbook, John Wiley and Sons, 1987.

REFERENCES:

1. Wolfgang Schueller, The Design of building Structures, Prentice Hall, New Jersey, 1996.

Course outcomes:

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

1. Describe the behaviour of buildings under lateral loads.
2. Examine the Structural behavior of Rigid frames.
3. Compare the Load resisted by different shear walls and frames.
4. Identify the various flooring systems in concrete and steel.
5. List the slope, deflection, and displacement of Tall buildings by Stiffness method

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	M. Tech-SE I Year – II Sem			
Course Code: JM32F	SOIL DYNAMICS AND MACHINE FOUNDATION (Professional Elective-IV)	L	T	P	D
Credits:3		3	0	0	0

Pre-requisite: Engineering Mechanics, Soil Mechanics.

Course Objectives:

This course will enable students to:

1. Discuss the concepts in soils like damping, wave propagation, resonance, and effect of modes of vibrations
2. Dynamic soil properties. Determination of dynamic properties by field and laboratory tests
3. Discuss the effect of liquefaction and anti-liquefaction measures
4. Assess the effect of shape of the footing on vibration response.
5. Discus the analysis of machine foundation on pile.

Module 1:

Unit 1: Fundamentals of Vibration

Definitions, Simple harmonic motion, Response of SDOF systems of Free and Forced vibrations with and without viscous damping, Frequency dependent excitation, Systems under transient loads, Rayleigh's method of fundamental frequency, Logarithmic decrement, Determination of viscous damping, Transmissibility, Systems with Two and Multiple degrees of freedom, Vibration measuring instruments.

Module 2:

Unit 1: Wave Propagation and Dynamic Soil Properties

Propagation of seismic waves in soil deposits Attenuation of stress waves, Stress strain behavior of cyclically loaded soils, Strength of cyclically loaded soils.

Unit 2: Dynamic soil properties

Laboratory and field-testing techniques, Elastic constants of soils, Correlations for shear modulus and damping ratio in sand, gravels, clays and lightly cemented sand. Liquefaction of soils, introduction and evaluation using simple methods

Module 3:

Unit 1: Vibration Analysis

Types, General Requirements, Permissible amplitude, Allowable soil pressure, Modes of vibration of a rigid foundation block, Methods of analysis, Lumped Mass models, elastic half space method, elasto-dynamics, effect of footing shape on vibratory response, dynamic response of embedded block foundation, Vibration isolation

Module 4:

Unit 1: Design of Machine Foundations

Analysis and design of block foundations for reciprocating engines, Dynamic analysis, and design procedure for a hammer foundation, IS code of practice design procedure for foundations of reciprocating and impact type machines.

Module 5:

Unit 1: **Machine Foundations on Piles**

Introduction, Analysis of piles under vertical vibrations, Analysis of piles under translation and rocking, Analysis of piles under torsion, Design procedure for a pile supported machine foundation.

Text Books:

1. "Principles of Soil Dynamics" Braja M.Das, G.V Ramana, Cengage Learning, 2nd (Jan 2014)
2. "Advanced Soil Dynamics and Earthquake Engineering" Bharat Bhushan Prasad, PHI Learning, 1st edition (Sep 2011)

Reference Books:

1. "Vibrations of Soils and Foundations" Richarts F.E, Jr.Hall J.R, Woods R.D, Prentice Hall International Series, 1st edition (1970)
2. "Vibration Analysis and Foundation Dynamics" Kameshwar Rao, Wheeler Publishing, 1st edition (Mar 1998)

Web Resources:

1. https://nptel.ac.in/courses/105/101/105101005/
2. https://www.kau.edu.sa/Files/0001553/files/SoilMechBook.pdf

Course Outcomes:

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

1. Describe fundamental concepts of vibration.
2. Explain classical geotechnical failures due to liquefaction and mitigate the same.
3. Analyze the effect of footing shape on vibratory response and dynamic response of embedded block foundations.
4. Design of foundations in large structures like power plants, other industrial buildings etc., for analyzing the vibrating waves which can be isolated and measures for achieving safety of the adjacent foundations
5. Develop a mechanism to design the foundations for resisting vibrations and achieve static equilibrium conditions of structures

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	M. Tech-SE I Year – II Sem			
Course Code: JM32G	THEORY OF STRUCTURAL STABILITY (Professional Elective-IV)	L	T	P	D
Credits:3		3	0	0	0

Course Objectives:

This course will enable students to:

1. Study the elastic stability theory of structure.
2. Explain the stability behaviour of columns under different actions
3. Describe the different approaches to achieve stability of frames
4. Study the different approaches to stability of beams and frames against buckling
5. Discuss the Inelastic buckling ad Dynamic stability.

Module 1:

UNIT –I: Criteria for Design of Structures: Stability, Strength, and Stiffness, Classical Concept of Stability of Discrete and Continuous Systems, Linear and nonlinear behavior.

Introduction to elastic stability concept.

Module 2:

UNIT –I: Beam columns- elastic buckling of bars and frames

Stability of Columns: Axial and Flexural Buckling, Lateral Bracing of Columns, Combined Axial, Flexural and Torsion Buckling.

Module 3:

UNIT –I: Stability of Frames: Member Buckling versus Global Buckling, Slenderness Ratio of Frame Members.

Module 4:

UNIT –I: Stability of Beams: Lateral torsion buckling.

UNIT –II: Stability of Plates: Axial flexural buckling, shear flexural buckling, buckling under combined loads.

Module 5:

UNIT –I: Introduction to Inelastic Buckling and Dynamic Stability.

TEXTBOOKS:

1. Theory of elastic stability, Timoshenko and Gere, Tata Mc Graw Hill,1981.

Structural Stability of columns and plates, Iyengar, N. G. R., Eastern west press

Reference Books:

1. Theory of elastic stability, Timoshenko and Gere, Tata Mc Graw Hill,1981.
2. Principles of Structural Stability Theory, Alexander Chajes, Prentice Hall, New Jersey.
3. Strength of Metal Structures, Bleich F. Bucking, Tata McGraw Hill, New York.

Course Outcomes:

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

1. Explainthe elastic stability theory of discrete and continuous systems.
2. Describe the stability behaviour of columns under different actions
3. Discuss the stability criteria for analyzing frames.
4. List out the various types of buckling failures.
5. Explain the inelastic buckling and dynamic stability

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	M. Tech-SE I Year – II Sem			
Course Code: JM32H	ENERGY AUDIT, SUSTAINABLE MATERIALS AND GREEN BUILDINGS (Professional Elective-IV)	L	T	P	D
Credits:3		3	0	0	0

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-I: Energy Scenarios: Energy Conservation-Energy Audit-Energy Consumption-Energy Security-Energy Strategy-Clean Development Mechanism.

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-I: Environmental Audit and Environmental Impact Assessment: 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.

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-I: Energy and Energy conservation: Renewable and Non-renewable sources of energy - Coal, Petroleum, Nuclear, Wind, Solar, Hydro, Geothermal sources, potential of these sources, hazards.

Energy Conservation: Introduction-Specific objectives-need of energy conservation-LEED India rating system and Energy Efficiency

Module 4:

UNIT-I: 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-1V: 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).

TEXTBOOKS:

1. Sustainable construction: Green Building design and delivery- Kibert, C.J, John Wiley Hoboken, New Jersey; 2016
2. Non-Conventional Energy resources- Chauhan, D S Sreevasthava, S K; New Age International Publishers, New Delhi; 2006
3. Alternative Building Materials and Technologies-Jagadeesh, K S, Reddy Venkatta Rama, Nanjunda Rao K S; New Age International Publishers, New Delhi; 2017
4. Green Buildings- By Gevorkian, McGraw hill publication; 2009.

REFERENCES:

1. Handbook of Green Building Design and Construction- Sam Kubba; Butterworth-Heinemann; 2012
2. Emerald Architecture: case studies in green buildings, The Magazine of Sustainable Design; 2008
3. Energy Conservation Building Code 2017.

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.

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	M. Tech-SE I Year – II Sem			
Course Code: JM32I	STRUCTURAL MODELING & DESIGN LAB	L	T	P	D
Credits:2		0	0	4	0

Course Objectives:

This course will enable students to:

1. **Impart** knowledge on analysis and design of concrete and steel structures and develop software skills.
2. **Apply** the software tools available for design and detailing of structural members.
3. **Study** the detailing of structural members to meet the drawing standard requirements.
4. **Create** the structural drawings with detailing by applying engineering drawing principles using software.

List of Experiments/Assignments:

1. Modeling and analysis of a plane frame for DL, LL, seismic loading & Winding Loading – RCC
2. Modeling and analysis of a plane truss structure – steel.
3. Modeling, analysis and design of an industrial bent (portal frame)
4. Modeling and analysis of a retaining wall.
5. Analysis and design of a 3- D frame – RCC
6. Modeling and analysis of building frame with shear walls.
7. Analysis and design of canopy structure.
8. Modeling of wall and slab panels.
9. Analysis and design of foundation.
10. Analysis of a bridge deck

Course outcomes:

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

1. **Analyze** the basic structural systems and interpret the results.
2. **Perform** Design of structural frames by using software.
3. **Evaluate** results of different structural models under different loads and load combinations
4. **Design** 2D & 3D structural systems
5. **Design** truss and industrial bends in steel

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	M. Tech-SE I Year – II Sem			
Course Code: JM32J	NUMERICAL ANALYSIS (FEM) LAB	L	T	P	D
Credits:2		0	0	4	0

Course Objectives:

This course will enable students to:

1. **Understand** the various software used to solve engineering problems
2. **Introduce** the fundamentals of numerical methods used for the solution of Structural engineering problems

Write a program for analysis of

1. Bar Element (uniformly varying cross-section and a stepped bar) with temperature loading.
2. Beam element and Continuous beam.
3. 2D Truss
4. Plane stress / plane strain problem with triangular element
5. 2D Plane Frame
6. 3D Truss
7. 3D Frame
8. Axi-Symmetric problem – Thick cylinder
9. Triangular plate bending element.
10. Rectangular plate element bending element.

Course outcomes:

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

1. **Use** numerical methods to solve engineering problems.
2. **Apply** numerical methods to obtain approximate solutions to structural engineering problems

AY 2020 -21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	M. Tech: SE I Year – II Sem			
Course Code: JM92A	RESEARCH METHODOLOGY & INTELLECTUAL PROPERTY RIGHTS	L	T	P	D
Credits: 2		2	0	0	0

Pre-requisite: NIL

Course objectives:

This course will enable students to:

1. Develop with orientation towards research related activities
2. recognizing the ensuing knowledge as Intellectual Property.
3. It will create consciousness for Intellectual Property Rights and its constituents.
4. Learners will be able to perform documentation and administrative procedures relating to IPR in India as well as abroad.

Module 1:

Meaning of research problem, Sources of research problem, Criteria characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem

Approaches of investigation of solutions for research problem, data collections, analysis, interpretation, necessary instrumentation

Module 2:

Effective literature studies approaches, Analysis, Plagiarism, Research ethics

Module 3:

Effective technical writing, how to write report, Paper developing by research proposal, Format of research proposal. A presentation and assessment by a review committee

Module 4:

Nature of intellectual property: Patent, designs trade and copy right. Process of patenting and development: Technological research, innovation, patenting, development.

International scenario: International cooperation on intellectual property. Procedure for grants of patents, patenting under PCT

Module 5:

Patent Rights: Scope of Patent Rights. Licensing and transfer of technology.

Patent information and data bases, Geographical indications

New Developments in IPR: Administration of patent system. IPR of Biological systems, Computer software etc. Traditional knowledge case studies, IPR and IITs

REFERENCES:

1. Stuart Melville and Wayne Goddard, Research Methodology: An introduction for science and engineering students
2. Wayne Goddard and Stuart Melville, Research methodology and introduction
3. Ranjit Kumar 2nd Edition, Research methodology: a step by step Guide for beginners
4. Halbert, Resisting intellectual property, Taylor and Francis Ltd,2007.

5. Mayall, Industrial design, McGraw Hill,1992.

Course Outcomes:

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

1. Understanding and formulation of research problem.
2. Analyze research related information.
3. Understand plagiarism and follow research ethics
4. Understand that today's world is controlled by Computer, Information Technology, but tomorrow world will be ruled by ideas, concept, and creativity.
5. Understanding that when IPR would take such important place in growth of individuals & nation, it is needless to emphasis the need of information about Intellectual Property Right to be promoted among students in general & engineering in particular.

AY 2020 -21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	M. Tech: SE I Year – II Sem			
Course Code: JM92B	PERSONALITY DEVELOPMENT AND PROFESSIONAL VALUE	L	T	P	D
Credits: 0	(Mandatory Course – II)	2	0	0	0

Course Objectives:

This course will enable students to:

1. Study the sensitization towards gender equality, physically challenged, intellectually challenged.
2. Summarize the Leadership and qualities of a successful leader.
3. Explain the Modern Challenges of Adolescent Emotions and behaviour.
4. Describe the Personality Development Body language.
5. Study the Workplace Rights & Responsibilities.

Module 1:

UNIT-I: Concept of Human Values, Value Education Towards Personal Development: Aim of education and value education; Evolution of value-oriented education; Concept of Human values; types of values; Components of value education.

UNIT-II: Personal Development: Self-analysis and introspection; sensitization towards gender equality, equitability, physically challenged, intellectually challenged. Respect to - age, experience, maturity, family members, neighbors, co-workers.

UNIT-III: Character Formation Towards Positive Personality: Truthfulness, Constructivity, Sacrifice, Sincerity, Self-Control, Altruism, Tolerance, Scientific Vision.

Module 2:

UNIT-I: Aspects of Personality Development -Body language - Problem-solving - Conflict and Stress Management - Decision-making skills - Leadership and qualities of a successful leader – Character building -Team-work s - Positive attitude – Advantages –Negative attitude- Disadvantages– Time management - Work ethics –Good manners and etiquette.

Module 3:

UNIT-I: Professional Practices in Engineering: Professions and Norms of Professional Conduct, Norms of Professional Conduct vs. Profession; Responsibilities, Obligations and Moral Values in Professional Ethics, Professional codes of ethics, the limits of predictability and responsibilities of the engineering profession. Central Responsibilities of Engineers - The

Centrality of Responsibilities of Professional Ethics; lessons from 1979 American Airlines DC-10 Crash and Kansas City Hyatt Regency Walk away Collapse.

Module 4:

UNIT-I: Workplace Rights & Responsibilities, Ethics in changing domains of Research, Engineers and Managers; Organizational Complaint Procedure, difference of Professional Judgment within the Nuclear Regulatory Commission (NRC), the Hanford Nuclear Reservation.

Module 5:

UNIT-I: Impact of Global Development on Ethics and Values

Conflict of cross-cultural influences, mass media, cross-border education, materialistic values, professional challenges, and compromise. Defining the difference between aggressive, submissive, and assertive behaviours.

Modern Challenges of Adolescent Emotions and behaviour; Sex and spirituality: Comparison and competition; positive and negative thoughts. Adolescent Emotions, arrogance, anger, sexual instability, selfishness, defiance.

TEXTBOOKS:

1. Hurlock, E.B (2006). Personality Development, 28th Reprint. New Delhi: Tata McGraw Hill.
2. Stephen P. Robbins and Timothy A. Judge(2014), Organizational Behavior 16th Edition: Prentice Hall.

REFERENCES:

1. Andrews, Sudhir. How to Succeed at Interviews. 21st (rep.) New Delhi, Tata McGraw-Hill 1988.
2. Heller, Robert.Effective leadership. Essential Manager series. Dk Publishing, 2002
3. Hindle, Tim. Reducing Stress. Essential Manager series. Dk Publishing, 2003
4. Lucas, Stephen. Art of Public Speaking. New Delhi. Tata - Mc-Graw Hill. 2001

Course outcomes:

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

1. Describe the sensitization towards gender equality, physically challenged, intellectually challenged.
2. Explain the Leadership and qualities of a successful leader.
3. Discuss the Modern Challenges of Adolescent Emotions and behaviour.
4. Illustrate the Personality Development Body language.
5. Identify the Workplace Rights & Responsibilities

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	M.Tech: SE II Year I Sem			
Course Code: JM33A	EARTHQUAKE RESISTANT DESIGN OF STRUCTURES	L	T	D	P
Credits:3	(Professional Elective – V)	3	0	0	0

Course Objectives:

The Student will be able to

1. Explain the principles of engineering seismology.
2. Study of seismic design requirements of regular and irregular configurations.
3. Discuss the basic principles of Earthquake resistant design of buildings and the different elements, shear wall design
4. Explain the ductility and ductile detailing
5. Discuss Capacity based design and the design principles.

Module 1:

UNIT-1: Engineering Seismology

Earthquake phenomenon cause of earthquakes-Faults- Plate tectonics- Seismic waves-Terms associated with earthquakes-Magnitude of an earthquake-scales-Energy released-Earthquake measuring instruments-Seismoscope, Seismograph, accelerograph-Characteristics of strong ground motions- Seismic zones of India.

Introduction-Functional Planning-Continuous load path-Overall form-simplicity and symmetry-elongated shapes-stiffness and strength - Seismic design requirements-regular and irregular configurations-basic assumptions.

Module 2:

UNIT-I: Conceptual Design

Horizontal and Vertical Load Resisting Systems - System and Members for Lateral Loads and High Rise / Tall Structures.

Twisting of Buildings – Flexible Building and Rigid Building Systems.

UNIT-II: Strength and Stiffness

Ductility – Definition – Ductility Relationships – Choice of construction Materials – Unconfined Concrete & Confined Concrete – Masonry, Steel Structures. Design Earthquake Loads – Basic Load Combinations – Permissible Stresses. **UNIT-III: Seismic Methods of Analysis** – Static Method – Equivalent Lateral Force Method. Dynamic Analysis – Response Spectrum Method – Modal Analysis Torsion.

Module 3:

UNIT-I: Introduction to Earthquake Resistant Design

Seismic Design Requirements and Methods. RC Buildings – IS Code based Method.-Vertical Irregularities – Mass Irregularity Torsional Irregularity - Plan Configuration Problem - Design Lateral Force, Base Shear Evaluation – Lateral Distribution of Base Shear

– Structural Walls Strategies and the Location of Structural Walls – Sectional Shapes – Behaviour of Unreinforced and Reinforced Masonry Walls – Behaviour of Walls Box Action and Bands – Behaviour of infill Walls - Non Structural Elements – Failure Mechanism of Nonstructural Elements – Effects of Nonstructural Elements on Structural System – Analysis – Prevention of Damage to Nonstructural Elements – Isolation of Non-Structures.

Module 4:

UNIT-I: Design of Shear walls

Classification according to Behavior, Loads in Shear walls, Design of Rectangular and Flanged Shear walls, Derivation of Formula for Moment of Resistance of Rectangular Shear walls – Coupled Shear Walls.

Module 5:

UNIT-I: Ductility Design

Ductility Considerations in Earthquake Resistant Design of RC Buildings: Introduction Impact of Ductility- Requirements for Ductility- Assessment of Ductility- Factors affecting Ductility- Ductile detailing considerations as per IS 13920. Behavior of beams, columns and joints in RC buildings during earthquakes-Vulnerability of open ground storey and short columns during earthquake- Seismic Evaluation and Retrofitting.

UNIT-II: Capacity Based Design

Introduction to Capacity Design, Capacity Design for Beams and Columns-Case studies.

UNIT-III: Perform based design

Pushover analysis

TEXT BOOKS:

1. Earthquake Resistant Design of structures – S. K. Duggal, Oxford University Press
2. Earthquake Resistant Design of structures – Pankaj Agarwal and Manish Shrikhande, Prentice Hall of India Pvt. Ltd.
3. Seismic Design of Reinforced Concrete and Masonry Building – T. Paulay and M.J.N. Priestly, John Wiley & Sons
4. Masory and Timber structures including earthquake Resistant Design –Anand S.Arya, Nemchand& Bros
5. Earthquake –Resistant Design of Masonry Building –MihaTomazevic, Imperial college Press.

Design of Reinforced Concrete Structures by N.Subramanian, Oxford University Press.

REFERENCES:

1. IS: 1893 (Part-1) -2002. “Criteria for Earthquake Resistant – Design of structures.” B.I.S., New Delhi
2. IS:4326-1993, “Earthquake Resistant Design and Construction of Building”, Code of Practice B.I.S., New Delhi.
3. IS:13920-1993, “Ductile detailing of concrete structures subjected to seismic force” – Guidelines, B.I.S., New Delhi.

Web Resources:

1. https://nptel.ac.in/courses/105/101/105101004/
2. https://nptel.ac.in/courses/105/107/105107204/

Course outcomes:

The student will be able to:

1. Describe the principles of engineering seismology.
2. Discuss of seismic design requirements of regular and irregular configurations.
3. Compare the basic principles of Earthquake resistant design of buildings and the different elements, shear wall design.
4. Describe the ductility and ductile detailing.
5. Analyze Capacity based design and the design principles.

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	M. Tech-SE II Year – I Sem			
Course Code: JM33B	RELIABILITY ANALYSIS OF STRUCTURES (Professional Elective – V)	L	T	P	D
Credits:3		3	0	0	0

Pre-requisite:

Course Objectives:

1. To impart the concept knowledge on data analysis and probability in the context of structural engineering.
2. To demonstrate uncertainty in structural engineering with respect to randomness of variables and knowledge of probability distributions.
3. To demonstrate principles of structural reliability in order to assess safety due to randomness of variables.
4. To perform computations of structural reliability using various methods at component and system level.

Module 1:

Unit-I: Preliminary Data Analysis: Graphical representation- Histogram, frequency polygon, Measures of central tendency- grouped and ungrouped data, measures of dispersion, measures of asymmetry. Curve fitting and Correlation: Fitting a straight line, curve of the form y = abx, and parabola, Coefficient of correlation.

Module 2:

Unit-I : Probability Concepts: Random events-Sample space and events, Venn diagram and event space, Measures of probability interpretation, probability axioms, addition rule, multiplication rule, conditional probability, probability tree diagram, statistical independence, total probability theorem and Bayshore.

Module 3:

Unit-I: Random variables: Probability mass function, probability density function, Mathematical expectation, Chebyshev's theorem. Probability distributions: Discrete distributions- Binomial and Poison distributions, Continuous Distributions-Normal, Log normal distributions.

Module 4:

Unit-I: Reliability Analysis: Measures of reliability-factor of safety, safety margin, reliability index, performance function and limiting state. Reliability Methods-First Order Second Moment Method (FOSM), Point Estimate Method (PEM), and Advanced First Order Second Moment Method (Hasofer-Lind's method).

Module 5:

Unit-I: Simulation Techniques: Monte Carlo simulation- Statistical experiments, Confidence limits, sample size and accuracy, Generation of random numbers- random numbers with

standard uniform distribution, continuous random variables (normal and lognormal), discrete random variables. System reliability: series, parallel and combined systems.

TEXT BOOKS:

1. "Structural Reliability Analysis And Design"- Jaicopublishing house, Mumbai, India. Ranganathan, R. (1999).
2. "Reliability Based Analysis And Design For Civilengineers", I.K. International Publishing House Pvt. Ltd, India. Devaraj.V & Ravindra.R,(2017),
3. "Probability Concepts In Engineeringplanning And Design"- Volume –I, John Wiley and sons, Inc, New York. Ang, A. H. S., and Tang, W. H. (1984).
4. "Probability Concepts In Engineeringplanning And Design"-Volume –II, John Wiley and sons, Inc, New York. Ang, A. H. S., and Tang, W. H. (1984).

REFERENCES:

1. "Reliability Based Design In Civil Engineering"- Mc GrawHill book Co. Milton, E. Harr (1987).
2. "Statistics, Probability And Reliability For Civil And Environmental Engineers"- Mc Graw Hill international edition, Singapore. Nathabandu, T., Kottegoda, and Renzo Rosso (1998).
3. "Probability, Reliability And statistical Methods In Engineering Design"- John Wiley and Sons. Inc. Achintya Haldar and Sankaran Mahadevan (2000).

Course outcomes:

1. Students will be able to
2. Understand the concepts of statistics for probabilistic analysis and importanceof uncertainty (randomness) in structural analysis and design.
3. Apply the theoretical principles of randomness of variables in structuralengineering through density functions.
4. Analyze components of structure to assess safety using concepts related tostructural reliability by various methods.
5. Evaluate the safety reliability index at system level.

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	M. Tech-SE II Year – I Sem			
Course Code: JM33C	SOIL STRUCTURE INTERACTION (Professional Elective-V)	L	T	P	D
Credits:3		3	0	0	0

Pre-requisite: Engineering Mechanics, Soil Mechanics.

Course Objectives:

The course will enable students to

1. Study the basics of soil structure interaction.
2. Analyze the behaviour of the beam subjected to various loading condition
3. Study the numerical analysis of finite plates
4. Study the Elastic Analysis of Pile.
5. Analyze the load deflection pattern for laterally loaded piles

Module 1:

Unit 1: Soil-Foundation Interaction

Introduction to soil-foundation interaction problems, Contact pressure and soil structure interaction for foundation, Scope of soil foundation interaction analysis, soil response models, Winkler, Elastic continuum, Two parameter elastic models, Elastic-plastic behaviour, Time dependent behaviour.

Module 2:

Unit 1: Beams on Elastic Foundation

Soil Models, Infinite beam, Two parameters, Isotropic elastic half space, Analysis of beams of finite length, Classification of finite beams in relation to their stiffness, Analysis through application packages.

Module 3:

Unit 1: Plates on Elastic Medium

Infinite plate, Winkler, Two parameters, Isotropic elastic medium, Thin and thick plates, Analysis of finite plates, Rectangular and circular plates – Numerical analysis of finite plates, Simple solutions, Analysis of braced cuts, Application packages.

Module 4:

Unit 1: Elastic Analysis of Pile

Elastic analysis of single pile, Theoretical solutions for settlement and load distributions, Analysis of pile group, Interaction analysis, Load distribution in groups with rigid cap.

Module 5:

Unit 1: **Laterally Loaded Pile**

Load deflection prediction for laterally loaded piles, Subgrade reaction and elastic analysis, Interaction analysis, Pile-raft system, Solutions through influence charts.

Text Books:

1. “Soil Foundation Structure Interaction”, Rolando P. Orense, Nawawi Chouw & Michael J.Pender, CRC Press, 2nd edition, (Jan 2010)
2. “Elastic Analysis of Soil Foundation Interaction” A.P.S Selvadurai, Elsevier Scientific Publishing Company, 1st edition (Mar 1979)

Reference Books:

1. “Principles of Foundation Engineering “, Braja M. Das, Cengage Learning, 7th edition (Jan 2011)
2. “Foundation Analysis & Design” Bowles J.E, McGraw-Hill Companies, Inc, 5th edition (June 1996).

Web Resources:

1. https://nptel.ac.in/courses/105/105/105105200/
2. http://nptel.ac.in/courses/105101005/
3. https://www.iitk.ac.in/nicee/wcee/article/13_1546.pdf

Course Outcomes:

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

1. Apply different soil response models for specific problem based on the requirement.
2. Analyze footings/rafts resting on soil as beams/plates on elastic foundation and work out design bending moments/shear and displacements.
3. Apply finite difference method for soil structure interaction problems
4. Estimate interaction parameters under static and dynamic loading conditions.
5. Predict the load deflection behaviour for laterally loaded pile.

AY 2020 – 21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	M. Tech:-MECH II Year – I Sem			
Course Code: JM1OA	INDUSTRIAL SAFETY Open Elective	L	T	P	D
Credits: 3		3	0	0	0

Pre-requisite: Engineering Chemistry, Probability and Statistics.

Course Objectives:

This course will enable students to:

1. Study mechanical and electrical hazards and it's preventive methods in an industry.
2. Correlate primary and secondary functions with responsibilities of maintenance department.
3. Attain basic knowledge of chemical corrosion, it's types and reduction methods.
4. Adapt to a new technology of fault tracing and decision tree.
5. Recognize the importance of periodic and preventive maintenance.

Module 1:

Unit 1: Industrial safety: Accident, causes, types, results and control, mechanical and electrical hazards, types, causes and preventive steps/procedure.

Unit 2: Describe salient points of factories act 1948 for health and safety, wash rooms, drinking water layouts, light, cleanliness, fire, guarding, pressure vessels, etc, Safety color codes. Fire prevention and fire fighting, equipment and methods, overview of OHSAS 18000 and ISO 14000.

Module 2:

Unit 1: Fundamentals of maintenance engineering: Definition and aim of maintenance engineering, Primary and secondary functions and responsibility of maintenance department.

Unit 2: Types of maintenance, Types and applications of tools used for maintenance, Maintenance cost & its relation with replacement economy, Service life of equipment, failure rate analysis, reliability of systems

Module 3:

Unit 1: Wear and Corrosion and their prevention: Wear- types, causes, effects, wear reduction methods, lubricants-types and applications, Lubrication methods, general sketch, working and applications, i. Screw down grease cup, ii. Pressure grease gun, iii. Splash lubrication, iv. Gravity lubrication, v. Wick feed lubrication vi. Side feed lubrication, vii. Ring lubrication,

Unit 2: Definition, principle and factors affecting the corrosion. Types of corrosion, corrosion prevention methods

Module 4:

Unit 1: Fault tracing: Fault tracing-concept and importance, decision tree concept, need and applications, sequence of fault finding activities, show as decision tree, draw decision tree for problems in machine tools.

Unit 2: Hydraulic, pneumatic, automotive, thermal and electrical equipment's like i. Any one machine tool, ii. Pump iii. Air compressor, iv. Internal combustion engine, v. Boiler, vi. Electrical motors, Types of faults in machine tools and their general causes.

Module 5:

Unit 1: Periodic and preventive maintenance: Periodic inspection-concept and need, degreasing, cleaning and repairing schemes, overhauling of mechanical components, overhauling of electrical motor, common troubles and remedies of electric motor, repair complexities and its use, definition, need, steps and advantages of preventive maintenance.

Unit 2: Steps/procedure for periodic and preventive maintenance of: I. Machine tools, ii. Pumps, iii. Air compressors, iv. Diesel generating (DG) sets, Program and schedule of preventive maintenance of mechanical and electrical equipment, advantages of preventive maintenance. Repair cycle concept and importance

Text Books:

1. Lindly R. Higgins, R. Keith mobley,"Maintenance Engineering Handbook", McGraw - Hill Professional, 6th edition, 2001.
2. Er. H. P. Garg, "Maintenance Engineering", S. Chand Publishing, 2010.

Reference Books:

1. Frank Duncan Graham, "Pumps hydraulics air Compressors", Theo Audel & CO publishers, 1965.
2. Hans F. Winterkom, Hsal - Yang Fang, "Foundation Engineering Handbook", Galgotia Booksource, 2010.

E- Resources:

1. https://www.google.co.in/books/edition/Industrial_Safety_and_Risk_Management/_Rr_BRvp30EC?hl=en&gbpv=1
2. https://www.google.co.in/books/edition/Industrial_Safety_Management/FDQ8DwAAQBAJ?hl=en&gbpv=1
3. https://nptel.ac.in/courses/110/105/110105094/
4. https://www.coursera.org/specializations/energy-industry
5. https://www.sciencedirect.com/bookseries/industrial-safetyseries/vol/8/suppl/C

Course Outcomes:

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

1. Relate factories act with each equipment and fire prevention methods.
2. Calculate service life of an equipment with replacement economy.
3. Layout different lubrication methods to reduce wear and corrosion.
4. Infer decision tree for various Engineering equipments.
5. Construct a schedule for periodic and preventive maintenance for mechanical and electrical equipments.

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	M.Tech-EPS II Year – I Sem			
Course Code: JM2OA	RENEWABLE ENERGY TECHNOLOGIES AND BATTERY STORAGE SYSTEMS (Open Elective)	L	T	P	D
Credits:3		3	0	0	0

Course Objectives:

1. To explain the concepts of Non-renewable and renewable energy systems.
2. To outline utilization of renewable energy sources for both domestic and industrial applications.
3. To analyze the environmental and cost economics of renewable energy sources in comparison with fossil fuels.
4. To enable the student to understand the need for energy storage.

Outcomes:

1. An understanding of renewable energy sources.
2. Knowledge of working principle of various energy systems.
3. A capability to carry out basic design of certain renewable energy systems.
4. Analyze the characteristics of energy from various sources and need for storage.

UNIT - I

Fundamentals of Energy: Energy consumption and standard of living, Oil crisis, Classification of energy resources, Consumption trend of primary energy resources, conventional energy sources and their distribution, Energy chain, common forms of energy, importance and salient features of nonconventional energy resources, environmental aspects of energy, Environment-economy-energy and sustainable development, Energy densities of various fuels, World energy status, Energy scenario in India.

UNIT - II

Solar energy: Solar energy basics, Sun-Earth relation spectrum, Terrestrial and extra-terrestrial radiation, spectral energy distribution of solar radiation, Depletion of solar radiation, measurement of solar radiation, solar radiation data, Solar time, Solar radiation geometry, Solar day length, Empirical equations for estimation of solar radiation on horizontal surfaces, Global, diffused and beam radiation, Solar radiation on inclined surface (Problems on energy availability on surfaces)

UNIT - III

Wind Energy: Wind origin, nature, types, Wind data and wind rose, wind speed variation, Wind siting Wind turbine classification and types of rotors, Wind turbine aerodynamics, power extraction from wind, Betz criteria, Axial thrust on the turbine, torque developed by the turbine, Dynamic matching, speed control strategies, Wind turbine operational characteristics, wind energy conversion systems, environmental aspect, Wind energy potential and installation in India (Problems on energy Conversion)

UNIT - IV

Biomass Energy: Biomass resources and their classification**,** Biomass conversion technologies: Thermochemical conversion - Direct combustion - biomass gasification - pyrolysis and liquefaction - biochemical conversion - anaerobic digestion – operational parameters of biogas plants, Types of biogas Plants and biogas plant design – Alcohol production from biomass - Bio diesel production - Urban waste to energy conversion - Biomass energy program in India (Problems on biogas plant design)

UNIT – V

Electrical Energy Storage Technologies: Characteristics of electricity, Electricity and the roles of EES, High generation cost during peak-demand periods, Need for continuous and flexible supply, Long distance between generation and consumption, Congestion in power grids, Transmission by cable.

TEXT BOOKS:

1. Renewable Energy Sources, Twidell, J.W. and Weir, A., EFN Spon Ltd., 1986.
2. Renewable Energy Engineering and Technology, Kishore VVN, Teri Press, New Delhi, 2012
3. "James M. Eyer, Joseph J. Iannucci and Garth P. Corey ", "Energy Storage Benefits and Market Analysis", Sandia National Laboratories, 2004.

REFERENCE BOOKS:

1. Solar Energy - Principles of thermal collection and storage, S. P. Sukhatme
2. Solar Engineering of Thermal Processes, J. A. Duffie and W. A. Beckman
3. Principles of Solar Engineering, Kreith, F and Kreider, J. F., McGraw-Hill, 1978.
4. Power Plant Technology, J Wakil
5. Non-Conventional Energy Sources, G.D Rai
6. "Jim Eyer, Garth Corey", Energy Storage for the Electricity Grid: Benefits and Market Potential Assessment Guide, Report, Sandia National Laboratories, Feb 2010.

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	M.Tech-EPS II Year – I Sem			
Course Code: JM2OB	POWER PLANT ENGINEERING (Open Elective)	L	T	P	D
Credits:3		3	0	0	0

Course Objectives:

- To provide the knowledge on principles of solar radiation & solar energy collection & storage and applications.
- To prepare graduates to express the Knowledge on wind energy, geo-thermal energy, and ocean energy plants.
- To understand the behaviour of different power plants.

Course Outcomes:

- Analyze different types of steam cycles and it's efficiencies in a steam power plant.
- Describe basic working principles of gas turbine and diesel engine power plants. Define the performance characteristics and components of such power plants.
- List the principal components and types of nuclear reactors.
- List types, principles of operations, components and applications of steam turbines, steam generators, condensers, feed water and circulating water systems.
- Estimate different efficiencies associated with power plant systems.

UNIT I: Thermal power plants: Basic thermodynamic cycles, Various components of steam power plant- Layout- Pulverized coal burners- Fluidized bed combustion - Coal Handling systems - Ash handling systems - Forced draft and induced draft fans- Boilers- Feed pumps- Super heater- Regenerator - Condenser- Dearearators - Cooling tower.

UNIT II: Hydroelectric power plants: Layout- Dams -Selection of water turbines – types - Pumped storage hydel plants

UNIT III: Nuclear power plants: Principles of nuclear energy- Fission reactions - Nuclear reactor- Nuclear power plants

UNIT IV: Gas and diesel power plants: Types, Open and closed cycle gas turbine, Work output & thermal efficiency, Methods to improve performance-reheating, Inter-coolings, Regeneration- Advantage and disadvantages - Diesel engine power plant, Component and layout.

UNIT V: Non-conventional power generation: Solar energy collectors, OTEC, Wind power plants, Tidal power plants and geothermal resources, Fuel cell, MHD power generation - Principle, Thermoelectric power generation, Thermionic power generation.

TEXT BOOKS

1. Arora and Domkundwar, "A Course in Power Plant Engineering" Dhanpat Rai and Co.Pvt. Ltd., New Delhi.
2. P.K. Nag, "Power Plant Engineering", Tata McGraw Hill, Second Edition, Fourth reprint 2003.

REFERENCE BOOKS:

1. Bernhardt G.A. Skrotzki and William A. Vopat, "Power Station Engineering and Economy", Tata McGraw Hill Publishing Company Ltd., New Delhi, 20th reprint 2002.
2. G.D. Rai, "An Introduction to Power Plant Technology", Khanna Publishers, Delhi- 110 005.
3. M.M. El-Wakil, "Power Plant Technology", Tata McGraw Hill, New Delhi,

AY 2020-21 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	M.Tech-SE II Year – I Sem			
Course Code: JM3OA	DISASTER MANAGEMENT (Open Elective)	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 Nonstructural 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:

Planning for disaster management: Strategies for disaster management planning - Steps for formulating a disaster risk reduction plan - Disaster management Act and Policy in India - Organizational structure for disaster management in India - Preparation of state and district disaster management plans

Text Books:

1. Manual on Disaster Management, National Disaster Management, Agency Govt of India.
2. Disaster Management by Mrinalini Pandey Wiley 2014. 3. Disaster Science and Management by T. Bhattacharya, McGraw Hill Education (India) Pvt Ltd Wiley 2015

Reference Books:

1. Earth and Atmospheric Disasters Management, N. Pandharinath, CK Rajan, BS Publications 2009.
2. National Disaster Management Plan, Ministry of Home affairs, Government of India (http://www.ndma.gov.in/images/policyplan/dmplan/draftndmp.pdf)

Web 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. Acquired knowledge on various types of disasters and hazards
2. Distinguish between the hazard and a disaster can be analyzed
3. Acquired 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

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	M.Tech-SE II Year – I Sem			
Course Code: JM3OB	PRECAST & PREFABRICATED CONSTRUCTION (Open Elective)	L	T	P	D
Credits:3		3	0	0	0

Pre-requisite: STRUCTURAL ENGINEERING –I (RCC)

Course Objectives:

This course will enable students to:

1. Study the Precast Footings, Beams, Columns, Slab, Shear walls, Partition Walls.
2. Explain the precast construction methodology.
3. Discuss about the principles, materials in Prefabrication.
4. Study the behaviour of structural components of Prefabrication.
5. Describe the Positioning of Building components.

Module 1:

UNIT I: Introduction to Precast Technology: Definition-Advantages-Difference between Precast and Conventional Buildings-Precast slab-wall panels-Footings-Beams-Columns-Slab- Non- Structural Precast Elements- Paver blocks, fencing poles, Manhole covers, Hollow and Solid Blocks, Door and Window frames - Connections between precast elements-Standard dimensions and tolerances.

Module 2:

UNIT I: Precast construction methodology: Casting Methods-Curing-Stacking-lifting-transportation-Construction Considerations-Sequence of Work-Procedure-Post Installation-Constraints and Solutions-Comparison between Cast-in-situ and Precast Building Designs.

Module 3:

UNIT I: Modular Co-ordination: Introduction-Aim and Basics-Modular Reference System-Positioning of Building components (Structural Components, Non-Structural Components and Finishes)

Module 4:

UNIT I: Introduction to Prefabrication: Introduction-Need for prefabrication-Principles, materials-standardization-system-production-transportation-erection.

Module 5:

UNIT I: Prefabricated components: Behaviour of structural components-Large panel construction of roof and floor slabs-wall panels-columns.

UNIT II: Prefabrication construction methods: Panelized Wood Framing, Timber Framing, Concrete Systems,Steel Framing

Text Books:

1. Precast Concrete Structures- Elliott, Kim S, CRC Press, New York; 2011.
2. Pre Engineered Steel Buildings–K.S.Vivek & P.Vaishavi– Lambert Academic Publishing; 2017
3. “Structural design manual”, Precast concrete connection details, Society for the studies in the use of precast concrete, Netherland Betor Verlag, 2009.

Reference Books:

1. "Manual of precast concrete construction", Vol. I, II and III, Koncz T., Bauverlag, GMBH, 1976.
2. CBRI, Building materials and components, India, 2017.

Web Resources:

1. https://www.iiti.ac.in/public/storage/events/new_Short%20Term%20Course%20on%20Precast%20and%20Prefabricated%20Buildings.pdf

Course Outcomes:

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

1. Apply the concept of prestressing and determine the losses of prestress.
2. Analyze the prestressed concrete beam and suggest the cable profile for beam.
3. Evaluate the prestressed concrete beam for flexure and shear.
4. Apply skills to satisfy the serviceability and strength provisions of the Indian Standards (IS: 1343-2012).
5. Examine the principles of design of composite sections and their advantages.

AY 2020-21 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	M.Tech-VLSISD II Year – I Sem			
Course Code: JM6OA	CLEAN ROOM TECHNOLOGY AND MAINTENANCE (Open Elective)	L	T	P	D
Credits: 3		3	0	0	0

Pre-requisite: No Pre-requisite

Course Objectives:

1. To introduce cleanroom classification and its standards.
2. To gain knowledge about design of cleanrooms.
3. To illustrate the clean room testing and monitoring.
4. To analyze air quantities, pressure differences and clean room disciplines.
5. To describe the clean room operation and cleaning.

Module 1

Unit-1: Introduction

Introduction, Cleanroom Classification Standards, Unidirectional air flow Cleanroom.

Unit-2: Standards

Basis of Clean room standards, Federal Standards 209, ISO standard 14644-1:1999, Cleanroom classification (Pharmaceutical, cleanrooms).

Module 2

Unit-1: Design of Cleanrooms

Design of Turbulently Ventilated and Ancillary Cleanrooms, Mini environments, isolators and RABS, Containment zone, Construction and clean build.

Unit-2: Design of Unidirectional Cleanrooms

Design of Unidirectional Cleanrooms, High Efficiency Air filtration, Particle removal mechanisms, Testing of high efficiency filters.

Module 3

Unit-1: Cleanroom Testing and Monitoring

Cleanroom Testing and Monitoring, Principles of cleanroom testing, Testing in relation to room type and occupation state, Monitoring of cleanroom.

Module 4

Unit-1: Measurement in Clean Room

Measurement of Air Quantities and Pressure Differences, Air movement control, Recovery test methods, Cleanroom containment leak testing.

Module 5

Unit-1: Clean Room Operation

Filter Installation leak testing, Operating a clean room, Materials, equipment and machinery, Clothing, masks and gloves, Cleaning a Cleanroom.

Text Books:

1. William White, Cleanroom Technology: Fundamentals of Design, Testing and Operation, 2nd Edition, Wiley, 2010.
2. Matts Ramstorp, Introduction to Contamination Control and Cleanroom Technology, Wiley, 2008.

Reference Books:

1. Wani-Kai Chen (editor), The VLSI Hand book, CRI/IEEE press, 2000.

E - Resources:

1. https://nptel.ac.in/content/storage2/courses/113106062/Lec30.pdf .
2. https://www.cmmonline.com/articles/infographic-basic-cleanroom-requirements-and-classifications.
3. https://www.terrauniversal.com/blog/6-really-cool-cleanroom-videos-will-awe/.

Course Outcomes:

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

1. specify cleanroom standards and ancillary cleanrooms.
2. identify fabrication materials and surface finishes
3. illustrate the clean room testing and monitoring.
4. analyze air quantities, pressure differences and clean room disciplines.
5. gain knowledge about operation of clean room.

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	M.Tech-VLSISD II Year – I Sem			
Course Code: JM6OB	PRINCIPLES OF COMPUTER COMMUNICATION AND NETWORKS (Open Elective)	L	T	P	D
Credits: 3		3	0	0	0

Pre-requisite: Analog and Digital Signals concepts, Computer Networks

Course Objectives:

1. To understand the Analog and Digital Communication concepts.
2. To understand the concept of computer communication.
3. To illustrate about the networking concept, layered protocols.
4. To understand various communications concepts.
5. To gain knowledge of various networking equipments.

Module 1

Unit-1: Analog and Digital Signal Representation

Representing data as analog signals, representing data as digital signals, frequency analysis of signals.

Unit-2: Communication Concepts

Data rate and bandwidth reduction, Digital Carrier Systems.

Module 2

Unit-1: Overview of Computer Communications

Introduction to Computer Communications and Networking, Introduction to Computer Network, Types of Computer Networks.

Unit-2: Overview of Computer Networking

Network Addressing, Routing, Reliability, Interoperability and Security, Network Standards, The Telephone System and Data Communications.

Module 3:

Unit-1: Protocols and Models

Computer Applications and Application protocols, Computer Communications and Networking models, Communication Service Methods and data transmission modes.

Unit-2: Multiplexing & OSI Model

Analog and Digital Communications, Speed and capacity of a Communication Channel, Multiplexing and switching, Network architecture and the OSI reference model.

Module 4

Unit-1: Physical layer Concepts

The Physical and Electrical Characteristics of wire, Copper media, Fiber optic media, Wireless Communications.

Unit-2: Data link layer Concepts

Introduction to data link Layer, the logical link control and medium access control sub-layers.

Module 5

Unit-1: Network Hardware Components

Introduction to Connectors, Transreceivers and media convertors, repeaters, network interference cards and PC cards, bridges, switches, Switches vs Routers.

Unit 2: Application Layer

Domain name space, DNS in Internet, FTP, WWW, Electronic mail, HTTP, SNMP.

Text Books:

1. "Computer Communications and Networking Technologies", Michel A. Gallo and William H. Hancock, Thomson Brooks / Cole.
2. "Data Communications and Networking" – Behrouz A. Forouzan, Fourth Edition MC GRAW HILL EDUCATION, 2006.

Reference Books:

1. "Principles of Computer Networks and Communications", M. Barry Dumas, Morris Schwartz, Pearson.
2. "Computer Networking: A Top-Down Approach Featuring the Internet", James F. Kurose, K. W. Ross, 3rd Edition, Pearson Education.
3. "Modern Digital and Analog Communication Systems", B.P.Lathi ,3rd edition, Oxford University Press.

E - Resources:

1. https://link.springer.com/bookseries/4198.
2. https://link.springer.com/book/10.1007%2Fb101863.
3. https://learn.saylor.org/course/cs402 .

Course Outcomes:

After completion of the course, the students will be able to

1. explain the networking of computers and data transmission between computers.
2. exposure about the various communication concepts.
3. analyse about the structure and equipment of computer network structures.
4. illustrate the Physical and data link layer concepts.
5. get knowledge about network hardware components.

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	M.Tech-CSE II Year – I Sem			
Course Code: JM7OA	PYTHON PROGRAMMING (Open Elective)	L	T	P	D
Credits: 3		3	0	0	0

Course objectives:

This course will enable students to:

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

Course outcomes:

Students will abel to:

1. Describe to design and program Python applications.
2. Analyze and conversion of to use lists, tuples, and dictionaries in Python programs.
3. Explain the concept to identify Python object types, Components
4. ,decision statements, pass arguments in Python.
5. Apply decision for building and package Python modules for reusability, design object-oriented programs with Python classes,use class inheritance in Python for reusability.

UNIT - I:

Programming paradigms; Structured programming vs object oriented programming, OOP sfundamentals-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.

UNIT - II:

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.

UNIT - III:

Object oriented programming using Python: creating python classes, classes and objects: user defined compound types, attributes, instances as arguments, instances as return values, objects are mutable, copying; classes and functions: pure function, modifiers; Exceptions: raising exceptions, handling exceptions, exception hierarchy.

UNIT - IV:

Classes and methods: object oriented features, optional arguments, initialization method, operator overloading and polymorphism. Inheritance: Basic Inheritance: extending built-ins, overriding and super; Multiple inheritance: the diamond problem, different sets of arguments.

UNIT - V:

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

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

Text Books:

1. **Python 3 Object Oriented Programming,** Dusty Phillips, Packet Publishing, 2010.
2. **Programming in Python 3** – A complete Introduction to the Python Language- Second Edition, Mark Summerfiels, 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.

AY 2020-21 onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	M.Tech-CSE II Year – I Sem			
Course Code: JM7OB	E-COMMERCE (Open Elective)	L	T	P	D
Credits: 3		3	0	0	0

Course objectives:

At the end of the course, students will:

1. Gain knowledge of E Commerce Frame work Applications, Business Models
2. Learn about Consumer Oriented Applications, Electronic Payment Systems
3. Learn about EDI Applications, Supply Chain Management
4. Know about Document Library, Advertising and Marketing
5. Know about Consumer Search and Resource Discovery, Key Multimedia concepts.

Course outcomes:

Students will be able to:

1. Demonstrate an understanding of the foundations and importance of e-commerce.
2. Demonstrate an understanding of retailing in e-commerce by:
   a. Analyzing branding and pricing strategies,
   b. Using and determining the effectiveness of market research.
   c. Assessing the effects of disintermediation.
3. Analyze the impact of e-commerce on business models and strategy.
4. Describe internet trading relationships including business-to-business, intra-organizational
5. Describe the infrastructure for E-Commerce.

UNIT-I:

Introduction, Electronic Commerce Framework, The Anatomy of E- Commerce applications, E-Commerce Consumer applications, E- Commerce organization applications.

UNIT-II:

Consumer Oriented Applications, mercantile process models, mercantile models from the consumer's perspective, Mercantile from the merchant's perspective.

Types of Electronic Payment Systems, Digital Token-Based Electronic Payment Systems, Smart Cards & Electronic Payment Systems, Credit Card- Based Electronic Payment Systems, Risk & Electronic Payment Systems, Designing Electronic Payment Systems.

UNIT-III:

Electronic Data Interchange, EDI Applications in Business, EDI implementation, MIME, and value added networks.

Intra organizational E-Commerce, Macro forces and Internal Commerce, Work flow automation and Coordination, Customization and Internal Commerce, Supply Chain Management(SCM).

UNIT-IV:

Making a business case for a Document Library, Digital document types, Corporate Data warehouses, Advertising and Marketing, the new age of Information Based Marketing, advertising on Internet, charting the Online marketing process, Market Research

UNIT-V:

Consumer Search and Resource Discovery, information search and Retrieval, Electronic commerce catalogs or directories, Information Filtering.

Multimedia and Digital video, Key Multimedia concepts, Digital Video & Electronic Commerce, Desktop Video Processing, Desktop Video Conferencing.

Text Books

1. "Frontiers of electronic commerce" – Kalakota, Whinston, Pearson
2. "E-Commerce", S.Jaiswal – Galgotia

References

1. Ravi Kalakota, Andrew Winston, "Frontiers of Electronic Commerce", Addison-Wesley.
2. Goel, Ritendra "E-commerce", New Age International
3. Laudon," E-Commerce: Business, Technology, Society", Pearson Education.