ACADEMIC REGULATIONS

COURSE STRUCTURE AND

DETAILED SYLLABUS

STRUCTURAL ENGINEERING

M.TECH 2 YEAR PG COURSE

(Applicable for the batches admitted from 2024-2025)

REGULATION: R24

(I & II Year Syllabus)

J. B.INSTITUTE OF ENGINEERING & TECHNOLOGY
AUTONOMOUS
Bhaskar Nagar, Moinabad Mandal, R.R. District,
Hyderabad – 500 075, Telegana State, India.

JBIET Academic Regulations - R24

Applicable to

Master of Technology
(M. Tech)
Regular Two-Year Degree Programme

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

J.B. INSTITUTE OF ENGINEERING AND TECHNOLOGY

(UGC AUTONOMOUS)

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

J.B. INSTITUTE OF ENGINEERING AND TECHNOLOGY

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JBIET Academic Regulations - R24

Applicable to

M. Tech Regular Two-Year Degree Programme

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

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

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

J. B. Institute of Engineering and Technology (JBIET) 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 either on the basis of 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 instruction 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.

3.2 A student shall be declared eligible for the award of the M. Tech. Degree, if he pursues a course of study in not less than two and not more than four academic years. However, student is permitted to write the examinations for two more years after four academic years of course work, failing which he / she shall forfeit his/her seat in M. Tech. programme.

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 'Seminar', or 'Comprehensive Viva', or 'Project' 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
- 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 Mandatory Courses: A student shall register for all mandatory courses mentioned in the curriculum and get minimum pass marks (i.e., 40% of total marks through internal evaluation only) to get the degree. Grade points obtained in these courses will not be considered for awarding class.

3.3.4 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 paper writing	Seminar/Colloquium based on core contents related to parent discipline/department/ Branch of Engineering
		Comprehensive Viva-Voce	Viva-voce covering all the PG subjects studied during the course work and related aspects
2	Elective Courses (EIE)	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
3	Mandatory Courses (MC)	--	Mandatory Courses (Non-credit)
Total number of Credits = 68			

4.0. Course Registration

4.1 A 'Faculty Advisor or Counsellor' 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 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).

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

5.7 A student shall put in a minimum required attendance in at least three theory subjects (excluding mandatory (non-credit audit) course) in first Year I semester for promotion to first Year II Semester.

5.8 A student shall put in a minimum required attendance in at least three theory subjects (excluding mandatory (non-credit audit) course) in first Year II semester for promotion to second Year I Semester.

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 (24 out of 60 marks) in the Semester End Examination;
- 40% of Marks (Average of 10 out of 25 marks) from two mid-term examinations;
- 40% of Marks in the internal examinations (16 out of 40 marks allotted for CIE); and
- A minimum of 50% of marks in the sum total of CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together; in terms of Letter Grades this implies securing 'B' Grade or above in a subject.

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, nd shall pass all the mandatory Audit Courses to complete the PGP successfully.

Note: (1) The SGPA will be computed and printed on the marks memo only if the candidate passes in all the subjects offered and gets minimum B grade in all the subjects.

(2) CGPA is calculated only when the candidate passes in all the subjects offered in all the semesters.

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 40 marks allotted for Continuous Internal Evaluation (CIE) and 60 marks for Semester End Examination (SEE).

7.2 For theory courses, during the semester there are **2 mid-term** examinations (internal exams of **25 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 Five two marks questions and Part- B consists of five questions carrying 5 marks each and student should answer 3 questions. Student shall have to earn 40%, i.e 10 marks out of 25 marks from average of two mid-term examinations (I Mid-Term & II Mid-Term).

7.4 The remaining 15 marks of Continuous Internal Assessment (out of 40) are distributed as:

- Assignment for 5 marks. (Average of 2 Assignments each for 5 marks)
- Subject Viva-Voce/PPT/Poster Presentation/ Case Study on a topic in the concerned subject for 10 marks.

7.5 The student has to get minimum of 40% of Marks in the internal examinations (16 out of 40 marks allotted for CIE).

7.4 First mid-term examination is conducted from first 2 Units of syllabus and second mid-term examination is conducted for remaining 3 Units of syllabus during the last week of instruction.

7.5 Five (5) marks are allocated for assignments (as specified by the subject teacher concerned). The first assignment should be submitted before the conduct of the first mid-term examination, and the second assignment should be submitted before the conduct of the second mid-term examination. The average of the two

assignments shall be taken as the final marks for assignment (for 5 marks).

7.6 Subject Viva-Voce/PPT/Poster Presentation/ Case Study on a topic in the concerned subject for 10 marks before II Mid-Term Examination.

7.7 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.

S. No	Component	Frequency of Evaluation	Marks for Each test	Final Marks (Average)
1	**Mid Examinations**	**2**	**25**	**25**
2	**Assignments**	**2**	**5**	**5**
4	**Viva-Voce/PPT/Poster Presentation/ Case Study**	**1**		**10**
			Total	**40**

7.8 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 nominated 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	Member

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

The Semester End Examination will be conducted for **60 marks**. It consists of two parts. i) Part A for **10 marks**, ii) Part B for **50 marks**.

- Part-A is a compulsory question which consists of ten sub-questions from all units carrying equal marks.
- Part-B consists of five questions 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. The duration of Semester End Examination is 3 hours.

7.10 For practical subjects, **60 marks** shall be awarded for performance in the Semester End Examinations and **40 marks** shall be awarded as Internal Marks. Out of the **40 marks** for internal evaluation,

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

2. 10 marks for viva-voce (or) tutorial (or) case study (or) application (or) poster presentation of the course concerned.

3. Internal practical examination conducted by the laboratory teacher concerned shall be evaluated for 10 marks.

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

7.11 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.

7.12 In the Semester End Examination, held for 3 hours, total 60 marks are divided and allocated as shown below:

1. 10 marks for write-up

2. 15 marks for experiment/program

3. 15 marks for evaluation of results

4. 10 marks for presentation on another experiment/program in the same laboratory course and

5. 10 marks for viva-voce on concerned laboratory course

7.13 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.

7.14 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.

7.15 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.

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

7.17 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.

7.18 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.

7.19 After satisfying 7.18, 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, the student can initiate the Project work.

7.20 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.

7.21 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.

7.22 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.

7.23 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.

7.24 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.

7.25 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.

7.26 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.

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

7.28 For mandatory non-credit Audit courses, a student has to secure 40 marks out of 100 marks (i.e. 40% of the marks allotted) in the continuous internal evaluation for passing the subject/course. These marks should also be uploaded along with the internal marks of other subjects.

7.29 No marks or letter grades shall be allotted for mandatory non-credit Audit Courses. Only Pass/Fail shall be indicated in Grade Card.

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
Greater than or equal to 90%	O (Outstanding)	10
80 and less than 90%	A+ (Excellent)	9
70 and less than 80%	A (Very Good)	8
60 and less than 70%	B+ (Good)	7
50 and less than 60%	B (Above Average)	6
Below 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 ≥ 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

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

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

9.10 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

$$\text{CGPA} = \left\{ \frac{\sum_{J=1}^{M} C_J G_J}{\sum_{J=1}^{N} C_J} \right\}$$ **..... FOR ALL "S" SEMESTERS REGISTERED**

(I.E., UP TO AND INCLUSIVE OF S SEMESTER, S ≥ 2),

where 'M' is the TOTAL no. of Subjects (as specifically required and listed under the Course Structure of the parent Department) the Student has 'REGISTERED' for from the 1st Semester onwards up to 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_i is the no. of Credits allotted to the j^{th} Subject, and C_i 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 x 8 = 32
Course 2	4	O	10	4 x 10 = 40
Course 3	4	C	5	4 x 5 = 20
Course 4	3	B	6	3 x 6 = 18
Course 5	3	A+	9	3 x 9 = 27
Course 6	3	C	5	3 x 5 = 15
	21			152

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

Illustration of calculation of CGPA:

Semester	Credits	SGPA	Credits*SGPA
Semester-I	16	7	16 x 7 = 112
Semester-II	18	6	18 x 6 = 108
Semester-III	18	6.5	18x 6.5 = 117
Semester-IV	16	6	16 x 6 = 96
	68		433

$$CGPA = \frac{433}{68} = 6.37$$

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≤ CGPA < 7.75
Second Class	6.00≤ 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.

11.0 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 R24 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 R24 Academic Regulations under which a student has been readmitted shall be applicable to that student from that semester.

12.2 For student readmitted to R24 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 R24 Regulations.

12.3 If a student readmitted to R24 Regulations, has any subject with 80% of syllabus

common with his/her previous regulations, that particular subject in R24 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.

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

13.3 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.

MALPRACTICES RULES

DISCIPLINARY ACTION FOR / IMPROPER CONDUCT IN EXAMINATIONS

	Nature of Malpractices/Improper conduct	Punishment
	If the student:	
1.(a)	Possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, cell phones, pager, palm computers or any other form of material concerned with or related to the subject of the examination (theory or practical) in which student is appearing but has not made use of (material shall include any marks on the body of the student which can be used as an aid in the subject of the examination)	Expulsion from the examination hall and cancellation of the performance in that subject only.
(b)	Gives assistance or guidance or receives it from any other student orally or by any other body language methods or communicates through cell phones with any student or persons in or outside the exam hall in respect of any matter.	Expulsion from the examination hall and cancellation of the performance in that subject only of all the students involved. In case of an outsider, he will be handed over to the police and a case is registered against him.

2.	Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the subject of the examination (theory or practical) in which the student is appearing.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the student has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the subjects of that semester/year.
3.	Impersonates any other student in connection with the examination.	The student who has impersonated shall be expelled from examination hall. The student is also debarred and forfeits the seat. The performance of the original student who has been impersonated, shall be cancelled in all the subjects of the examination (including practicals and project work) already appeared and shall not be allowed to appear for examinations of the remaining subjects of that semester/year. The student is also debarred for two consecutive semesters from class work and all End examinations. The continuation of the course by the student is subject to the academic regulations in connection with forfeiture of seat. 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 student has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The student is also debarred for two consecutive semesters from class work and all End examinations. The continuation of the course by the student is subject to the academic regulations in connection with forfeiture of seat.
5.	Uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks.	Cancellation of the performance in that subject.

6.	Refuses to obey the orders of the chief superintendent /assistant superintendent / any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out, or threatens the officer-in charge or any person on duty in or outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the officer-in-charge, or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction of property in the examination hall or any part of the college campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination.	In case of students of the college, they shall be expelled from examination halls and cancellation of their performancein that subject and all other subjects the student(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the subjects of that semester/year. The students also are debarred and forfeit their seats. In case of outsiders, they will be handed over to the police and a police case is registered against them.
7.	Leaves the exam hall taking away answer script or intentionally tears off the script or any part there of inside or outside the examination hall.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the student has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The student is also debarred for two consecutive semesters from class work and all End examinations. The continuation of the course by the student is subject to the academic regulations in connection with forfeiture of seat.

8.	Possesses any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the student has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The student is also debarred and forfeits the seat.
9.	If student of the college, who is not a student for the particular examination or any person not connected with the college indulges in any malpractice or improper conduct mentioned in clause 6 to 8.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the student has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The student is also debarred and forfeits the seat. Person(s) who do not belong to the college will be handed over to the police and, a police case will be registered against them.
10.	Comes in a drunken condition to the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the student has already appeared for 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 student has appeared for 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 a suitable punishment.	

JBIET-R24	J. B. Institute of Engineering and Technology (UGC Autonomous)	M. Tech-SE
M. Tech Course Structure		

I Year I Semester

S. No	Code	Course Title	L	T	P	D	Credits	Category	common Subject (Y/N)	Approving BOS
1	MM31A	Advanced Structural Analysis	3	0	0		3	core	N	
2	MM31B	Theory of Elasticity	3	0	0		3	core	N	
3	MM31C	Advanced Reinforced Concrete Design	3	0	0		3	Professional Elective	N	
4	MM31D	Rehabilitation, Retrofitting and Structural Health Monitoring								
5	MM31E	High rise structures								
6	MM31F	Advanced Concrete Technology	3	0	0		3	Professional Elective	N	
7	MM31G	Design of Industrial Structures								
8	MM31H	Theory and Applications of Cement Composites								
9	MM311	Advanced Concrete Technology lab	0	0	4		2	Practical	N	
10	MM312	Computational Mathematics Lab	0	0	4		2	Practical	N	
11	MM91A	Soft Skills & Personality Development	2	0	0		0	Add on course	Y	
		Total	**14**	**0**	**8**		**16**			

M. Tech Course Structure

I Year II Semester

S. No	Code	Course Title	L	T	P	D	Credits	Category	common Subject (Y/N)	Approving BOS
1	MM32A	Theory of Plates and shells	3	0	0		3	Core	N	
2	MM32B	Structural Dynamics	3	0	0		3	Core	N	
3	MM32C	Precast Concrete and Pre-Engineered Buildings	3	0	0		3	Professional Elective	N	
4	MM32D	Bridge Design								
5	MM32E	Low cost housing Techniques								
6	MM32C	Reliability Analysis of Structures	3	0	0		3	Professional Elective	N	
7	MM32D	Theory of Structural Stability								
8	MM32E	Energy Audit, Sustainable Materials& Greenbuildings								
9	MM321	Structural Modelling & Design Lab	0	0	4		2	Practical	N	
10	MM322	Numerical Analysis (FEM) Lab	0	0	4		2	Practical	N	
11	MM92A	Research Methodology and IPR	2	0	0		2	Elective	Y	
12	MM92B	Professional Value and Ethics	2	0	0		0	Add on course	Y	
		Total	**16**	**0**	**8**		**18**			

M. Tech Course Structure

II Year I Semester

S. No	Code	Course Title	L	T	P	D	Credits	Category	common Subject (Y/N)	Approving BOS
1	MM32C	Earthquake Resistant Design of Structures	3	0	0		3	Professional Elective	N	
2	MM32D	Construction project Management and Technical consulting								
3	MM32E	Soil Structure Interaction								
4		Open Elective	3	0	0		3	Open Elective	N	
5	MM331	Mini Project	0	0	4		2	Practical	N	
6	MM332	Technical Seminar	0	0	2		1	Practical	N	
7	MM333	Project Dissertation Phase -I	0	0	18		9	Practical	N	
		Total	**6**	**0**	**24**		**18**			

II Year II Semester

S. No	Code	Course Title	L	T	P	D	Credits	Category	common Subject (Y/N)	Approving BOS
1	MM341	Project Dissertation Phase -II	0	0	32		16	Practical	N	
		Total	**0**	**0**	**32**		**16**			

R24 COURSE STRUCTURE (2024-2025)

Open Elective-I

S. No.	Code	Course Title	L	T	P	D	Credits	Category	Common Subject (Y/N)
1	MM3OA	Disaster Management	3	0	0	0	3	OEC	CE
2	MM3OB	Precast &Prefabricated Construction	3	0	0	0	3	OEC	CE
3	MM6OA	Clean Room Technology and Maintenance.	3	0	0	0	3	OEC	ECE
4	MM6OB	Principles of Computer Communications and Networks.	3	0	0	0	3	OEC	ECE
5	MM2OA	Renewable Energy Technologies and Battery Storage	3	0	0	0	3	OEC	EEE
6	MM2OB	Solar and Energy Storage Systems	3	0	0	0	3	OEC	EEE
7	MM1OA	Industrial Safety	3	0	0	0	3	OEC	MECH
8			3	0	0	0	3	OEC	CSE
9			3	0	0	0	3	OEC	CSE

AY: 2024-25 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	M. Tech SE I Year-I Sem			
Course Code: MM31A	**ADVANCED STRUCTURAL ANALYSIS (Professional Core – I)**	L	T	P	D
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 behaviour 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.

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. Analyse 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 behaviour of shear walls in buildings.

CO-PO/PSO Mapping

Course Outcomes	Program Outcomes(POs)					
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**
CO1	2	-	2	3	-	-
CO2	-	-	2	2	-	1
CO3	1	-	2	-	3	-
CO4	-	-	2	3	-	1
CO5	-	3	2	-	-	-
Average	**1.5**	**3**	**2**	**2.6**	**3**	**1**

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

AY: 2024-25 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	M. Tech SE I Year-I Sem			
Course Code: MM31B	**THEORY OF ELASTICITY**	L	T	P	D
Credits: 3	**(Professional Core – II)**	**3**	**0**	**0**	**0**

Pre requisite: Engineering Mechanics and Strength of Materials

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.

CO-PO/PSO Mapping

Course Outcomes	Program Outcomes(POs)					
	PO1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**
CO1	1	3	3	3		2
CO2	1		3	3	3	1
CO3	3	1		3	3	
CO4		3	3	3		2
Average	**1.,67**	**2.3 3**	**3**	**3**	**3**	**1.66**

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

AY: 2024-25 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	M. Tech SE I Year-I Sem			
Course Code: MM31C	**ADVANCED REINFORCED CONCRETE DESIGN (Professional Elective-I)**	L	T	P	D
Credits: 3		**3**	**0**	**0**	**0**

Pre-requisite: Structural Engineering –I (RCC)

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.

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.

CO-PO/PSO Mapping

Course Outcomes	Program Outcomes(POs)					
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**
CO1	3	2	3			1
CO2	1			3	3	
CO3	3	1	2	3		2
CO4			3			
CO5	3	1		1		1
Average	**2.5**	**1.33**	**2.67**	**2.33**	**3**	**1.33**

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

AY: 2024-25 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	M. Tech SE I Year-I Sem			
Course Code: MM31D	**Rehabilitation, Retrofitting and Structural Health Monitoring of Concrete structures**	L	T	P	D
Credits: 3	**(Professional Elective)**	**3**	**0**	**0**	**0**

Pre-requisite: Concrete Technology, Building Materials,

Course Objectives:
This course will enable students to
1. Explain about the repair management of structures.
2. Study about Retrofitting strategies and Strengthening the structures.
3. Determine the guidelines for repair management of deteriorated structures.
4. Study the various vibration-based techniques for structural health monitoring.
5. Discuss the structural health monitoring using fibre-optic and Piezoelectric sensors.
6. Study the structural health monitoring using electrical resistance and electromagnetic techniques.

Unit-1

Introduction - An overview of present repair practices, distress identification and repair management - Causes of distress in concrete structures

Discussion of 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

Unit-2

Evaluation of reserve strength of existing structures, analysis necessary to identify critical sections, active and passive repairs, modelling of repaired composite structures - Selection of repair materials for Concrete-Essential parameters for repair Materials-Strength and durability aspects, cost and suitability aspects.

Unit-3

Rehabilitation and retrofitting methods-repair options, performance requirements of repair systems, important factors to be considered for selection of repair methods - Discussion of case studies-RCC buildings, water tanks, industrial structures- Identifying a suitable repair option for certain damage in a structure.

Unit-4

Repair Methods-Resin/polymer modified slurry injection, plate bonding technique, fibrocement jacketing, RCC jacketing, propping and supporting - Repair methods- fibre wrap technique, 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.

Unit-5

Structural Health monitoring(SHM) - Introduction - Definition of SHM - Motivation for structural health monitoring - Assessment by NDT equipment's.

Remote Structural health monitoring - Remote Structural Health Monitoring - Importance and Advantages – Methodology - Hardware for Remote data acquisition systems. RF/PSTN/GSM/Satellite Communications - Networking of sensor - Data compression technique - Case Studies

Textbooks:

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).
5. "Structural Health Monitoring" by Daniel Balageas, Claus-Peter Fritzen and Alfredo Guemes John Wiley-ISTE, London, 6th edition Oct 2015.
6. "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. "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.
6. "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.
7. "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. Formulate the guidelines for repair management of deteriorated structures.

5. **Analyse** the appropriate repair, strengthening, rehabilitation and retrofitting technique required for a case study building.

CO-PO/PSO Mapping

Course Outcomes	Program Outcomes(POs)					
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**
CO1	2	-	2	3	-	-
CO2	-	-	2	2	-	1
CO3	1	-	2	-	3	-
CO4	-	-	2	3	-	1
CO5	-	3	2	-	-	-
Average	**1.5**	**3**	**2**	**2.67**	**3**	**1**

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

AY: 2024-25 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	M. Tech SE I Year-I Sem			
Course Code: MM31E	**HIGH RISE STRUCTURES (Professional Elective-III)**	L	T	P	D
Credits: 3		**3**	**0**	**0**	**0**

Pre-requisite: Structural Analysis and RCC

Course Objectives:

This course will enable students to:

1. Explain the behaviour of buildings under lateral loads.
2. Summarize the Structural behaviour of Rigid frames.
3. Analyse 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 behaviour 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 behaviour 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 Soft wares 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 behaviour 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

CO-PO/PSO Mapping

Course Outcomes	Program Outcomes(POs)					
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**
CO1	3		3	3		
CO2	3	3				2
CO3	3	3		3	2	1
CO4	3	3	1	3		1
CO5	1	3	1	3	2	
Average	**2.6**	**3**	**1.67**	**3**	**2**	**1.33**

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

AY: 2024-25 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	M. Tech SE I Year-I Sem			
Course Code: MM31F	**ADVANCED CONCRETE TECHNOLOGY (Professional Elective-II)**	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 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 Nanometre 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) –Analysis of Workability and Mechanical Properties of Alkali-Activated-Concrete.

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.

CO-PO/PSO Mapping

Course Outcomes	Program Outcomes(POs)					
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**
CO1	3	3		3	1	
CO2	3		3	2	2	1
CO3		3	3	3		
CO4	1		3		3	
CO5	3			3		1
Average	**2.5**	**3**	**3**	**2.75**	**2**	**1**

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

AY: 2024-25 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	M. Tech SE I Year-I Sem			
Course Code: MM31G	**DESIGN OF INDUSTRIAL STRUCTURES (Professional Elective-II)**	L	T	P	D
Credits: 3		**3**	**0**	**0**	**0**

Pre-requisite: Concrete Technology

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. Study 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

CO-PO/PSO Mapping

Course Outcomes	Program Outcomes(POs)					
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**
CO1	3		3	1		3
CO2			3	2	3	1
CO3			3	2	3	
CO4	3	3	3	3		1
CO5			3		3	
Average	**3**	**3**	**3**	**2**	**3**	**1**

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

AY: 2024-25 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	M. Tech SE I Year-I Sem			
Course Code: MM31H	**THEORY AND APPLICATIONS OF CEMENT COMPOSITES**	L	T	P	D
Credits: 3	**(Professional Elective-II)**	**3**	**0**	**0**	**0**

Pre-requisite: Concrete Technology

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: Behaviour of Ferro cement, Fibre Reinforced Concrete in Tension, Compression, Flexure, Shear, Fatigue and Impact, Durability and Corrosion.

Module 5:

Unit 1: Application of Cement Composites: FRC and Ferro cement- 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

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

CO-PO/PSO Mapping

Course Outcomes	Program Outcomes(POs)					
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**
CO1	3	2	3	3		1
CO2	3		3	3		
CO3		3	3		3	2
CO4	3		3	3		1
CO5	3	2	3	3		1
Average	**3**	**2.33**	**3**	**3**	**3**	**1.25**

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

AY: 2024-25 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	M. Tech SE I Year-I Sem			
Course Code: MM311	**ADVANCED CONCRETE TECHNOLOGY LAB**	L	T	P	D
Credits: 2		**0**	**0**	**4**	**0**

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 behaviour 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

CO-PO/PSO Mapping

Course Outcomes	Program Outcomes(POs)					
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**
CO1	3	3	1		1	3
CO2	1	3	1	3		2
CO3	3		3		1	3
Average	**2.3**	**3**	**1.6**	**3**	**1**	**2.67**

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

AY: 2024-25 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	M. Tech SE I Year-I Sem			
Course Code: MM312	**COMPUTATIONAL MATHEMATICS LAB**	L	T	P	D
Credits: 2		**0**	**0**	**4**	**0**

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

CO-PO/PSO Mapping

Course Outcomes	Program Outcomes(POs)					
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO1	3	2	3	3		2
CO2	1	3	3	3	1	1
CO3	1	2		2		2
Average	**1.67**	**2.33**	**3**	**2.67**	**1**	**1.67**

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

AY: 2024-25 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)				M. Tech SE I Year-I Sem
Course Code: MM91A	SOFT SKILLS & PERSONALITY DEVELOPMENT (Mandatory Course – I)	L	T	P	D
Credits: 2		3	0	0	0

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.

UNIT-I: 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.

UNIT-II: 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.

UNIT-III: 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.

UNIT-IV: 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; Assertiveness Skills. Emotional Intelligence: Meaning, History, Features, Components, Intrapersonal and Management Excellence; Strategies to enhance Emotional Intelligence.

UNIT-V: Employability Skills: Resume Buildings – Facing the Personal Interview (HR and Technical)- Psychometric Analysis- Mock Interview Sessions.

REFERENCES:

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 BlackswanIndia, 2010.

Course outcomes:

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: 2024-25 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	M. Tech SE I Year-I Sem			
Course Code: MM32A	**THEORY OF PLATES AND SHELLS**	L	T	P	D
Credits: 3	**(Professional Core – III)**	**3**	**0**	**0**	**0**

Pre-requisite: Theory of Elasticity

Course Objectives:

This course will enable students to:

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

CO-PO/PSO Mapping

Course Outcomes	Program Outcomes(POs)					
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**
CO1		3	3			1
CO2		3	3			2
CO3		3	3		3	
CO4	3			3	3	
CO5	3			3	3	1
Average	**3**	**3**	**3**	**3**	**3**	**1.33**

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

AY: 2024-25 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	M. Tech SE I Year-II Sem			
Course Code: MM32B	**STRUCTURAL DYNAMICS**	L	T	P	D
Credits: 3	**(Professional Core – IV)**	**3**	**0**	**0**	**0**

Pre-requisite: Engineering Physics

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. Analyse 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.

CO-PO/PSO Mapping

Course Outcomes	Program Outcomes(POs)					
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**
CO1	3	3	3		1	1
CO2	3	3	3		2	2
CO3	1		3	3	3	1
CO4	3	3	3		1	1
CO5		1		3	3	1
Average	**3.33**	**3.33**	**3**	**3**	**2**	**1.2**

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

AY: 2024-25 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	M. Tech SE I Year-I Sem			
Course Code: MM32C	**PRECAST CONCRETE AND PRE-ENGINEERED BUILDINGS**	L	T	P	D
Credits: 3	**(Professional Elective-III)**	**3**	**0**	**0**	**0**

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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.

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.

CO-PO/PSO Mapping

Course Outcomes	Program Outcomes(POs)					
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**
CO1		3	3	3		1
CO2			3	3		2
CO3		3			3	2
CO4	3	3	3	3		1
CO5	3	3	3	3		2
Average	**3**	**3**	**3**	**3**	**3**	**1.6**

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

AY: 2024-25 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	M. Tech SE I Year-II Sem			
Course Code: MM32D	**BRIDGE DESIGN (Professional Elective-III)**	L	T	P	D
Credits: 3		**3**	**0**	**0**	**0**

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Pre-requisite: RCC

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 procedure of 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-Un propped 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

CO-PO/PSO Mapping

Course Outcomes	Program Outcomes(POs)					
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO1	3		3			1
CO2		2		3	3	
CO3	3	1	2	3	3	1
CO4	3	1		3	3	1
CO5	3		2	3		1
Average	**3**	**1.33**	**2.33**	**3**	**3**	**1**

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

AY: 2024-25 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	M. Tech SE I Year-II Sem			
Course Code: MM32E	**LOWCOST HOUSING TECHNIQUES (Professional Elective)**	L	T	P	D
Credits: 3		**3**	**0**	**0**	**0**

Pre requisite: Building materials and construction planning, Concrete Technology

COURSE OBJECTIVES:

1. The objective of the course is to train the students to have a comprehensive knowledge of planning, design, evaluation, construction and financing of housing projects.
2. The course focuses on cost effective construction materials and methods.
3. Emphasis is given on the principles of sustainable housing policies and programmes

Module-1

HOUSING SCENARIO

Introduction - Status of urban housing - Status of Rural Housing

HOUSING FINANCE

Introduction to - Existing finance system in India - Government role as facilitator- Status of Rural Housing Finance - Impediments in housing finance and related Issues

Module-2

LAND USE AND PHYSICAL PLANNING FOR HOUSING

Introduction - Planning of urban land - Urban land ceiling and regulation act - Efficiency of building bye laws - Residential Densities

HOUSING THE URBAN POOR

Introduction - Living conditions in slums - Approaches and strategies for housing urban poor

Module-3

DEVELOPMENT AND ADOPTION OF LOW COST HOUSING TECHNOLOGY

Introduction - Adoption of innovative cost-effective construction techniques -Adoption of precast elements in partial prefatroices - Adopting of total prefactcation of mass housing in India- General remarks on pre cast roofing/flooring systems

Economical wall system - Single Brick thick load bearing wall - 19cm thick load bearing masonry walls - Half brick thick load bearing wall - Fly ash gypsum brick for masonry -Stone Block masonry - Adoption of precast R.C. plank and join system for roof/floor in the building

Module-4

ALTERNATIVE BUILDING MATERIALS FOR LOW COST HOUSING

Introduction - Substitute for scarce materials – Ferro cement - Gypsum boards - Timber substitutions - Industrial wastes - Agricultural wastes – Alternative building maintenance

LOW COST INFRASTRUCTURE SERVICES: Introduction to - Present status - Technological options - Low cost sanitation - Domestic wall - Water supply, energy

Module-5

RURAL HOUSING:

Introduction to traditional practice of rural housing-continuous Mud Housing Technology, Mud roofs - Characteristics of mud - Fire treatment for thatch roof – Soil stabilization - Rural Housing programs

HOUSING IN DISASTER PRONE ARES

Introduction – Earthquake - Damage to houses - Disaster prone areas - Type of Damages and Repairs of non-engineered buildings - Repair and restoration of earthquake Damaged non -engineered buildings recommendations for future constructions Requirements of structural safety of thin precast roofing units against Earthquake Forces Status of R& D in earthquake strengthening measures - Floods, cyclone, future safety

TEXT BOOKS

1. Building materials for low – income houses – International council for building research studies and documentation.
2. Hand book of low cost housing by A.K. Lal – Newage international publishers.
3. Properties of concrete – Neville A.M. Pitman Publishing Limited, London.
4. Light weight concrete, Academic Kiado, Rudhai.G – Publishing home of Hungarian Academy of Sciences.
5. Low cost Housing – G.C. Mathur.
6. Modern trends in housing in developing countries – A.G. Madhava Rao, D.S. Ramachandra Murthy & G. Annamalai.

COURSE OUTCOMES:

1. The students will have a comprehensive knowledge of planning, design, evaluation, construction and financing of housing projects with cost effective housing techniques.
2. The student can be in a position to adopt the suitable techniques in rural and disaster prone areas by using locally available materials.

CO-PO/PSO Mapping

Course Outcomes	Program Outcomes(POs)					
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**
CO1	2	-	2	3	-	2
CO2	-	-	3	2	2	1
CO3	1	-	2	-	2	-
CO4	-	-	3	3	-	1
CO5	-	3	3	-	-	-
Average	**1.5**	**3**	**2.6**	**2.67**	**2**	**1.33**

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

AY: 2024-25 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	M. Tech SE I Year-II Sem			
Course Code: MM32F	**RELIABILITY ANALYSIS OF STRUCTURES (Professional Elective-IV)**	L	T	P	D
Credits: 3		**3**	**0**	**0**	**0**

Pre-requisite: No

Course Objectives:

1. To impart the concept knowledge on data analysis and probability in the contextof structural engineering.
2. To demonstrate uncertainty in structural engineering with respect to randomnessof 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 formy = 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"- Me 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

CO-PO/PSO Mapping

Course Outcomes	Program Outcomes(POs)					
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**
CO1	3		3	3	1	2
CO2		3	3		1	2
CO3	3	3	3			
CO4		3		3	1	2
Average	**3**	**3**	**3**	**3**	**1**	**2**

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

AY: 2024-25 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	M. Tech SE I Year-II Sem			
Course Code: MM32G	THEORY OF STRUCTURAL STABILITY (Professional Elective-IV)	L	T	P	D
Credits: 3		3	0	0	0

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Pre-requisite: Structural Analysis

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 behaviour.

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

CO-PO/PSO Mapping

Course Outcomes	Program Outcomes(POs)					
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**
CO1	3		3	3	1	2
CO2		3	3		1	2
CO3	3	3	3			
CO4		3		3	1	2
Average	**3**	**3**	**3**	**3**	**1**	**2**

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

AY: 2024-25 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	M. Tech SE I Year-II Sem			
Course Code: MM32H	**ENERGY AUDIT, SUSTAINABLE MATERIALS AND GREEN BUILDINGS (Professional Elective-IV)**	L	T	P	D
Credits: 3		**3**	**0**	**0**	**0**

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Pre-requisite: Building Materials and Construction Planning

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.

CO-PO/PSO Mapping

Course Outcomes	Program Outcomes(POs)					
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**
CO1	3	3	3	3	1	
CO2		3		3		3
CO3		3		3		2
CO4	3	3	3	3	1	1
CO5	2	2	3	3	1	1
Average	**2.67**	**2.8**	**3**	**3**	**1**	**1.75**

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

AY: 2024-25 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	M. Tech SE I Year-II Sem			
Course Code: MM321	STRUCTURAL MODELING & DESIGN LAB	L	T	P	D
Credits: 2		0	0	4	0

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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. **Analyse** 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

CO-PO/PSO Mapping

Course Outcomes	Program Outcomes(POs)					
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**
CO1	3			3	3	1
CO2		3	3	3		1
CO3		2	3	3	3	
CO4	3	2	3	2	3	1
CO5	3		3		3	1
Average	**3**	**2.33**	**3**	**2.75**	**3**	**1**

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

AY: 2024-25 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	M. Tech SE I Year-II Sem			
Course Code: MM322	**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

Course Outcomes	Program Outcomes(POs)/Program Specific Outcomes(PSOs)					
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**
CO1	3	3	3	3		2
CO2	3		3	3	3	2
Average	**3**	**3**	**3**	**3**	**3**	**2**

AY: 2024-25 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	M. Tech SE I Year-II Sem			
Course Code: MM92A	RESEARCH METHODOLOGY AND IPR CORE: (Common to M.Tech - EPS, VLSISD, CAD-CAM, CSE & SE)	L	T	P	D
Credits: 2		2	0	0	0

Course Objectives:

- To understand the basic concept of research problem formulation.
- To be exposed to effective research report writing and research design.
- To investigate the various methods of data collection and analysis.
- To understand the various fields of Industrial Property and PCT.
- To be exposed to administration of IP and new developments in IPR.

Course Outcomes:

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

- Understand the basic concept of research problem formulation.
- Develop an effective research proposal and research report.
- Identify appropriate method for data collection and analysis for effective research.
- Apply for Patent Filing and other fields of IP.
- Make use of new developments in IPR.

UNIT-I:

Introduction

Meaning and Objectives of Research, Types of Research, Research Approaches, Research Methods Vs Methodology, Research Process, Criteria of Good Research.

Research Problem

Meaning of Research Problem, Steps involved in Selecting a Research Problem, Scope and Objectives of Research Problem, Sources of Research Problem, Characteristics of a Good Research Problem, Steps involved in Defining a Research Problem. Design thinking approach to formulate a research problem.

UNIT II

Effective technical writing

Importance of Literature Review, Steps involved in conducting a Literature Review, Research Report, Characteristics of a Good Report, Layout of a Research Report, Writing a Journal Paper, Writing a Research Proposal, Format of Research Proposal, Plagiarism and Research Ethics.

Research Design

Need for Research Design, Features of a Good Design, Important Concept Relating to Research Design, Design thinking principles, Categories of Research Design. Design thinking approach

UNIT-III

Data Collection

Methods of Primary Data Collection – Observation Method, Interview Method, Collection of Data through Questionnaire and Schedule, Collection of Secondary Data, Selection of Appropriate Method for Data Collection – Bibliometric Analysis.

Data Processing and Analysis

Processing Operations, Problems in Processing, Types of Analysis, Multivariate Analysis, Correlation Analysis, Regression Analysis.

UNIT-IV:

Fields of Intellectual Protection

Patents - Conditions of Patentability, Drafting and Filing a Patent Application, Examination of a Patent Application; Copyright - Copyright Protection, Subject Matter of Copyright Protection, Ownership of Copyright, Limitations on Copyright Protection; Trademarks - Definitions, Criteria of Protectability, Protection of Trademark Rights; Industrial Designs; Geographical Indications.

International cooperation on intellectual property

World Intellectual Property Organization (WIPO) - Patenting under PCT; Patent information and databases; Licensing and transfer of technology.

Unit V

Administration of Industrial Property

Administrative Structure in the Industrial Property Office, Patent Office, Trademark Office, Industrial Designs Office, Patent and Trademark Attorney.

New Developments in IPR

Technological and Legal Developments in Intellectual Property, Traditional Knowledge, Case Studies.

TEXT BOOKS:

1. Stuart Melville and Wayne Goddard, "Research Methodology: An Introduction for Science & Engineering Students'', Juta & Co. Ltd Publishers, Revised Second Edition, 2006.
2. Halbert, "Resisting Intellectual Property", Routledge, Taylor & Francis Ltd, First Edition, 2007.
3. C. R. Kothari, "Research Methodology: Methods and Techniques", New Age International Publications, Revised Second Edition, 2004.

REFERENCE BOOKS:

1. Ranjit Kumar, "Research Methodology: A Step by Step Guide for beginners", British Library Publishers, Fourth Edition, 2014.
2. Robert P. Merges, Peter S. Menell, Mark A. Lemley, "Intellectual Property in New Technological Age",Wolters Kluwer Law & Business Publishers, 2016.

T. Ramappa, "Intellectual Property Rights Under WTO", S. Chand Publications, First Edition, 2008

AY: 2024-25 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	M. Tech SE I Year-II Sem			
Course Code: MM92B	**PROFESSIONAL VALUE AND ETHICS (Mandatory Course – II)**	L	T	P	D
Credits: 0		**2**	**0**	**0**	**0**

Course Objectives:

This course will enable students to:

1. Study the Professionalism, Communication and Professional Etiquettes.
2. Study the importance of Professional Values and Dedication.
3. Understand the Professional Ethics and Responsibilities
4. Study the Workplace Rights & Responsibilities.
5. Understand the Global Ethics and Values

UNIT-I: Profession & Professionalism

Definition of profession, Criteria of a profession - Definition and characteristics ofprofessionalism, Concepts, attributes and indicators ofprofessionalism, Challenges of professionalism: Personal identity vs Professional identity, Communication & Relationship withteam members: Respectful and open communication and relationship pertaining to relevant interests for ethical decision making, Professional Conduct: Following ethical principles, Adhering to policies, rules andregulation of the institutions, Professional etiquettes and behaviours, Professional grooming: Uniform, Dresscode.

UNIT-II: Professional Values

Values: Definition and characteristicsof values, Value clarification, Personal and Professional values, Professional socialization: Integration of professional values with personal values, Importance of professional values, Compassion: Sympathy vs Empathy,Altruism, Dedication/Devotion to work, Respect for the Person-Human dignity, Privacy and confidentiality: Incidentaldisclosure, Honesty and integrity: Truth telling, Trust and credibility: Fidelity, Loyalty

UNIT-III: 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.

UNIT-IV: 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.

UNIT-V: 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:

Text book on Professional ethics and human values by R.S.Nagarajan, New age international.
Professional ethics and human value by D.R.Kiran, Tata McGraw Hills education.
Ethics in engineering by Mike W. Martin and Roland Schinzinger, Tata McGraw Hills education.
Hurlock, E.B (2006). Personality Development, 28th Reprint. New Delhi: Tata McGraw Hill.
Stephen P. Robbins and Timothy A. Judge(2014), Organizational Behavior 16th Edition: Prentice Hall

REFERENCES:

Andrews, Sudhir. How to Succeed at Interviews. 21st (rep.) New Delhi, Tata McGraw-Hill 1988.
Heller, Robert. Effective leadership. Essential Manager series. Dk Publishing, 2002
Hindle, Tim. Reducing Stress. Essential Manager series. Dk Publishing, 2003
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. He / She will be good professional etiquettes.
2. Student will be a knowing professional values and dignity.
3. Student will be understanding professional ethics and responsibilities
4. Student will understand the Workplace Rights & Responsibilities.
5. He / She will understand the Global Ethics and Values

AY: 2024-25 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	M. Tech SE II Year-I Sem			
Course Code: MM33A	**EARTHQUAKE RESISTANT DESIGN OF STRUCTURES**	L	T	P	D
Credits: 3	**(Professional Elective – V)**	**3**	**0**	**0**	**0**

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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 Non-structural Elements – Effects of Non-structural Elements on Structural System – Analysis

– Prevention of Damage to Non-structural Elements – Isolation of Non-Structures.

Module 4:

UNIT-I: Design of Shear walls

Classification according to behaviour, 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. behaviour 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.

CO-PO/PSO Mapping

Course Outcomes	Program Outcomes(POs)					
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**
CO1	3	3		3		1
CO2		2	3		3	1
CO3	3	2	3		3	
CO4	1		3	3		2
Average	**2.33**	**2.33**	**3**	**3**	**3**	**1.33**

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

AY: 2024-25 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	M. Tech SE II Year-I Sem			
Course Code: MM33B	**CONSTRUCTION PROJECT MANAGEMENT AND TECHNICAL CONSULTING**	L	T	P	D
Credits: 3	**(Professional Elective)**	**3**	**0**	**0**	**0**

Pre requisite: Building materials and construction planning

COURSE OBJECTIVES:

1. To train the students with the latest and the best in the rapidly changing fields of Construction Engineering, Technology and Management.
2. To prepare the students to be industry leaders who implement the best engineering and management practices and technologies in the construction industry.
3. To continually work with industry to enhance the program's effectiveness and the opportunities for innovation in the construction industry.
4. To conduct research to develop advanced technologies and management approaches.

Unit-I

INTRODUCTION – Types constructions - public and private contract managements – scrutinizing tenders and acceptance of tenders, contracted, changes and terminating of contract - subcontracts.

Construction organizations – organizational Chart-Decentralization payrolls and records – organization chart of a construction company.

Unit-II:

CONSTRUCTION PRACTICES–Time Management–bar chart, CPM, PERT–Progress report.

RESOURCES MANAGEMENT AND INVENTORY - Basic concepts - equipment management, material management and inventory control.

Unit-III

COST AND FINANCIAL MANAGEMENT – Cost volume relationship, cost control system, budget concept of valuation, cost of equity capital management cash.

Labour and industrial Laws – payment of wages act. Contract labour, workmen’s compensation, insurance, industrial disputes act.

Unit-IV

Overview of Technical Consulting - Types, Services, Selection methods, Consulting Contracts. Skill & Competencies required for technical consulting

Unit-V

Client Interface and Management for Technical Consultant – Preparation of Proposal Including costing consulting services.

REFERENCES:

1. Barcus, S.W. and Wilkinson.J.W., "Hand Book of Management Consulting Services", McGraw Hill, New York, 1986.
2. Joy P.K., "Total Project Management - The Indian Context", New Delhi, Macmillan India Ltd., 1992 3. Prasanna Chandra, "Projects – Planning, Analysis, Selection, Implementation Review", McGraw Hill Publishing Company Ltd., New Delhi. 2006.

3. "United Nations Industrial Development Organisation (UNIDO) Manual" for the Preparation of Industrial Feasibility Studies, (IDBI Reproduction) Bombay, 1987.
4. Calin M. Popescu, Chotchai Charoenngam, "Project Planning, Scheduling and Control in Construction: An Encyclopedia of terms and Applications", Wiley, New York, 1995.
5. Chitkara, K.K. "Construction Project Management: Planning, Scheduling and Control", McGraw-Hill Publishing Company, New Delhi, 1998.
6. Chris Hendrickson and Tung Au, "Project Management for Construction – Fundamental Concepts for Owners, Engineers", Architects and Builders, Prentice Hall, Pittsburgh, 2000.
7. Halpin, D. W., "Financial and Cost Concepts for Construction Management", John Wiley & Sons, New York, 1985.
8. Willis, E. M., "Scheduling Construction Projects", John Wiley & Sons, 1986.
9. Gajaria G.T., "Laws Relating to Building and Engineering" Contracts in India,
10. Jimmie Hinze, "Construction Contracts", McGraw Hill, 2001.
11. Joseph T. Bockrath, "Contracts and the Legal Environment for Engineers and Architects", McGraw Hill, 2000. 14
12. Kwaku, A., Tenah,P.E. Jose M.Guevara, P.E.,"Fundamentals of Construction Management and Organisation", Printice Hall, 1985.M.M.Tripathi Private Ltd., Bombay, 1982.
13. Patil. B.S, "Civil Engineering Contracts and Estimates", Universities Press (India) Private Limited, 2006.

COURSE OUTCOMES:

On successful completion of the programme, the students will

1. Be able to apply theoretical and practical aspects of project management techniques to achieve project goals.
2. Possess organizational and leadership capabilities for effective management of construction projects.
3. Be able to apply knowledge and skills of modern construction practices and techniques.
4. Have necessary knowledge and skills in accounting, financing, risk analysis and contracting.
5. Be capable of using relevant software packages for planning, scheduling, executing and controlling of construction projects.

CO-PO/PSO Mapping

Course Outcomes	Program Outcomes(POs)					
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**
CO1	2	-	2	3	-	-
CO2	-	-	2	2	-	1
CO3	1	-	2	-	3	-
CO4	-	-	2	3	-	1
CO5	-	3	2	-	-	-
Average	**2**	**3**	**2**	**2.67**	**3**	**1**

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

AY: 2024-25 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	M. Tech SE II Year-I Sem			
Course Code: MM33C	SOIL STRUCTURE INTERACTION (Professional Elective-V)	L	T	P	D
Credits: 3		3	0	0	0

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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. Analyse 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.

CO-PO/PSO Mapping

Course Outcomes	Program Outcomes(POs)					
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**
CO1	3	3	3			1
CO2			3	3	2	
CO3	3	3	3			1
CO4	3		3	2	2	
CO5	3			2		2
Average	**3**	**3**	**3**	**2.33**	**2**	**1.33**

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

AY: 2024-25 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	M. Tech SE II Year-I Sem			
Course Code: MM3OA	**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:

Unit1:

Capacity Building: Capacity Building: Concept - Structural and Non-structural Measures Capacity Assessment; Strengthening Capacity for Reducing Risk - Counter-Disaster Resources and their utility in Disaster Management - Legislative Support at the state and national levels

Module 4:

Unit 1: Coping with Disaster: Coping Strategies; alternative adjustment processes - Changing Concepts of disaster management - Industrial Safety Plan; Safety norms and survival kits - Mass media and disaster management

Module 5:

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 analysed
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

CO-PO/PSO Mapping

Course Outcomes	Program Outcomes(POs)					
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**
CO1	3	2	3			1
CO2	1			3	3	
CO3	3	1	2	3		2
CO4			3			
CO5	3	1		1		1
Average	**2.5**	**1.33**	**2.67**	**2.33**	**3**	**1.33**

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

AY: 2024-25 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	M. Tech SE II Year-I Sem			
Course Code: MM3OA	**PRECAST & PREFABRICATED CONSTRUCTION**	L	T	P	D
Credits: 3	**(Open Elective)**	**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: Panelised 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.

4. 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:

2.

Students will be able to:

1. Apply the concept of prestressing and determine the losses of prestress.
2. Analyse 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.

CO-PO/PSO Mapping

Course Outcomes	Program Outcomes(POs)					
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**
CO1	3		3	1		3
CO2			3	2	3	1
CO3			3	2	3	
CO4	3	3	3	3		1
CO5			3		3	
Average	**3**	**3**	**3**	**2**	**3**	**1**

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