AUDISANKARA COLLEGE OF ENGINEERING & TECHNOLOGY

(AUTONOMOUS)

(Approved by AICTE | Accredited by NAAC | Affiliated to JNTUA)

Gudur, Nellore Dist - 524101, A.P (India)

OUTCOME BASED EDUCATION

WITH

CHOICE BASED CREDIT SYSTEM

MASTER OF TECHNOLOGY

STRUCTURAL ENGINEERING

ACADEMIC REGULATIONS

UNDER AUTONOMOUS STATUS

M.Tech Regular Two Year PG Programme

(for the batches admitted from the academic year 2018 - 2019)

ACADEMIC REGULATIONS (R18) FOR M.TECH. REGULAR STUDENTS WITH EFFECT FROM ACADEMIC YEAR 2018-2019

1.0 Post- Graduate Degree Programme in Engineering & Technology

1.1 These academic rules and regulations are applicable to the students admitted from the academic year 2018-19 onwards into 2 year (4 Semesters) M.Tech Programmes under Choice Based Credit System(CBCS) at its autonomous institution with effect from the academic year 2018-19 in the following specializations of Engineering:

M.Tech Specializations offered

1. Embedded Systems (ES)
2. VLSI (VL)
3. Electrical Power Systems (EP)
4. Power Electronics (PE)
5. Computer Science & Engineering (CO)
6. Software Engineering (SE)
7. Structural Engineering (ST)

2.0	**Eligibility for admission**
2.1	Admission to the post graduate programme shall be made either on the basis of the merit rank obtained by the qualified student in entrance test PGECET conducted by the Andhra Pradesh State Government as per the norms of Andhra Pradesh State Council of Higher Education (APSCHE)
2.2	The medium of instructions for the entire post graduate programme in Engineering & Technology will be English only.
3.0	**M.Tech. Programme Pattern**
3.1	A student after securing admission shall pursue the post graduate programme in M.Tech in a minimum period of two academic years (4 semesters), and a maximum period of four academic years (8 semesters) starting from the date of commencement of first year first semester, failing which student shall forfeit the M.Tech course. Each semester is structured to around 20 credits, totaling to 78 credits for the entire M.Tech programme. Each student shall secure 78 credits required for the completion of the post graduate programme and award of the M.Tech degree.
3.2	A student eligible to appear for the end examination in a course, but absent or has failed in the end examination may appear for that course at the next supplementary examination when offered
3.3	When a student is detained due to lack of shortage of attendance he/she may be re-admitted when the semester is offered after fulfillment of academic regulations. In such case, he/she shall be in the academic regulations into which he/she is readmitted.

3.4	UGC/ AICTE specified definitions/ descriptions are adopted appropriately for various terms and abbreviations used in these academic regulations/ norms, which are listed below.
3.5	**Semester scheme** Each under graduate programme is of 2 academic years (4 semesters) with the academic year being divided into two semesters of 16 weeks (around 90 instructional days) each and semester having – Continuous Internal Evaluation (CIE) and Semester End Examination (SEE). Choice based Credit System (CBCS) and Credit Based Semester System (CBSS) as indicated by UGC and curriculum / course structure as suggested by AICTE are followed.
3.6	**Credit courses** All subjects/ courses are to be registered by the student in a semester to earn credits which shall be assigned to each subject/ course in an L: T: P: C (lecture periods: Tutorial periods: Practical periods: Credits) structure based on the following general pattern. • One credit for one hour/ week/ semester for theory/ lecture (L) courses. • One credit for two hours/ week/ semester for laboratory/ practical (P) courses or Tutorials (T).
3.7	**Subject Course Classification** All subjects/ courses offered for the post graduate programme in Engineering & Technology (M.Tech. degree programmes) are broadly classified as follows. The ASCET has followed almost all the guidelines issued by AICTE/UGC.
4.0	**Attendance requirements:**
4.1	A student shall be eligible to appear for the semester end examinations, if student acquires a minimum of 75% of attendance in aggregate of all the subjects/ courses for that semester.
4.2	Shortage of attendance in aggregate up to 10% (65% and above, and below 75%) in each semester may be condoned by the college academic committee on genuine and valid grounds, based on the student's representation with supporting evidence.
4.3	A stipulated fee shall be payable towards condonation for shortage of attendance to the institute as decided by the College Academic Committee.
4.4	Shortage of attendance below 65% in aggregate shall in no case be condoned.
4.5	Students whose shortage of attendance is not condoned in any semester are not eligible to take their end examinations of that semester. They get detained and their registration for that semester shall stand cancelled. They will not be promoted to the next semester. They may seek re-registration for all those subjects registered in that semester in which student was detained, by seeking re-admission into that semester as and when offered; in case if there are any professional electives and/ or open electives, the same may also be re-registered if offered. However, if those electives are not offered in later semesters, then alternate electives may be chosen from the same set of elective subjects offered under that category.
4.6	A student fulfilling the attendance requirement in the present semester shall not be eligible for readmission into the same class.
5.0	**Academic requirements** The following academic requirements have to be satisfied, in addition to the attendance requirements mentioned in item no.4.

5.1	A student shall be deemed to have satisfied the minimum academic requirements and earned the credits allotted to each theory, practical, design, drawing subject or project if he secures not less than 40% of marks (i.e., 24) in the end semester examination and a minimum of 50% of marks (i.e., 50) in the sum total of the internal evaluation and end examination taken together.
5.6	A student shall register and put up minimum attendance in all 78 credits and earn all the 78 credits. Marks obtained in all 78 credits shall be considered for the calculation of aggregate percentage of marks obtained
5.7	Students who fail to earn 78 credits as indicated in the course structure within eight academic years from the year of their admission shall forfeit their seat in M.Tech. Course and their admission shall stand cancelled
6.0	**Distribution and Weightage of marks**
6.1	The performance of a student in each semester shall be evaluated through internal evaluation and /or an external evaluation conducted semester wise.
6.2	The performance of a student in every theory course shall be evaluated for total of 100 marks each, of which the relative weightage for Continuous Internal Evaluation and Semester End Examination shall be 40 marks and 60 marks respectively.
6.3	The performance of a student in every practical course shall be evaluated for total of 75 marks each, of which the relative weightage for Continuous Internal Evaluation and Semester End Examination shall be 25 marks and 50 marks respectively.
6.4	**Internal Evaluation for Theory Course:** The total internal weightage for theory courses is 40 marks with the following distribution. ➢ 30 marks for Mid-Term Examination ➢ 10 marks for Assignment Test While the first mid-term examination shall be conducted on the 50% of the syllabus (Unit-I, Unit-II, & 50% of Unit-III), the second mid-term examination shall be conducted on the remaining 50% of the syllabus (50 % of Unit III, Unit-IV & Unit-V). 10 marks are allocated for assignment test (as specified by the subject teacher concerned). The first assignment should be conducted after completion of Unit-I for 5 marks and the second assignment should be conducted after completion of Unit- IV for 5 marks. The final Assignment Test marks will be the addition of these two. Two midterm examinations each for **30 marks** with the duration of 90 minutes each will be conducted for every theory course in a semester. The midterm examination marks shall be awarded giving a weightage of 80% in the midterm examination in which the student scores better performance and 20% in the remaining midterm examination. The final mid-term marks obtain by the addition of these two (80% + 20%). **Example**: If a student scores 33 marks and 34 marks in the first and second mid-term examinations respectively, then Weighted Average Marks = 34 x 0.8 + 33 x 0.2 = 33.8, rounded to 34 Marks. **Note**: The marks of any fraction shall be rounded off to the next higher mark.
6.5	**Pattern of the midterm examination question paper is as follows:** ➢ A total of three questions ➢ Question paper contains six questions are to be designed taking three questions from

	each unit (Unit Wise - Either or type) of the three units. (3X10=30 Marks) **Pattern of the Assignment Test is as follows:** ➢ Five assignment questions are given in advance, out of which two questions given by the concerned teacher has to be answered during the assignment test ➢ Sum of Assignment Tests marks is considered. **Note:** A student who is absent for any Mid-Term Examination/ Assignment Test, for any reason whatsoever, shall be deemed to have scored zero marks in that Mid-Term Examination/ Assignment Test and no make-up test shall be conducted.
6.6	**Internal Evaluation for Practical Course:** For practical subjects there shall be a Continuous Internal Evaluation during the semester for 25 internal marks. Out of the 25 marks for internal evaluation, day-today assessment in the laboratory shall be evaluated for 10 marks and internal practical examination shall be evaluated for 15 marks conducted by the laboratory teacher concerned.
6.7	**Internal Evaluation for Term Paper:** The Term Paper is a self study report and shall be carried out either during II semester along with other lab courses. Every student will take up this term paper individually and submit a report. The scope of the term paper could be an exhaustive literature review choosing any engineering concept with reference to standard research papers or an extension of the concept of earlier course work in consultation with the term paper supervisor. The term paper reports submitted by the individual students during the II semester shall be evaluated for a total of 50 marks for continuous assessment; it shall be conducted by two Examiners, one of them being term paper supervisor as internal examiner and an external examiner nominated by the Principal from the panel of experts recommended by HOD.
6.8	**Project Work:** The Project work is spread over to two semesters having Project Work Phase-I and Project Work Phase-II. Project Work Phase-I is included in III Semester and Project Work Phase-II in IV Semester as detailed below: A student has to select topic of his Project Work based on his interest and available facilities, in the III semester which he will continue through IV semester also.
6.9	**External Evaluation for Theory Course - Semester End Examination:** The Semester End Examination in each theory subject shall be conducted for 3 hours duration at the end of the semester for 60 marks. **Pattern of the Semester End Examination question paper is as follows:** ➢ Question Paper contains ten questions are to be designed taking two questions from each unit (Unit Wise - Either or type) of the total five units. (5X12=60 Marks) A student has to secure not less than a minimum of 40% of marks (24 marks) exclusively at the Semester End Examinations in each of the theory subjects in which the candidate had appeared. However, the candidate shall have to secure a minimum of 50% of marks (50 marks) in both external and internal components put together to become eligible for passing in the subject.
6.10	**External Evaluation for Practical Course** Out of 50 marks **35** marks are allocated for experiment (procedure for conducting the experiment carries 15 marks & readings, calculation and result-20) and **10** marks for viva-

voce examination with **5** marks for the record.

Each Semester External Lab Examination shall be evaluated by an Internal Examiner along with an External Examiner appointed by the Principal.

A candidate shall be declared to have passed in individual lab course if he secures a minimum of 50% aggregate marks (38 marks) (Internal & Semester External Examination marks put together), subject to a minimum of 50% marks (25 marks) in the semester external examination.

6.11 Project Work Phase-I:

Every candidate shall be required to submit thesis or dissertation after taking up a topic approved by the college/ concerned department.

- **Registration of Project work**: A candidate is permitted to register for the project work phase-I after satisfying the attendance requirement of all the courses (theory and practical courses of I & II Semesters).
- An Internal Departmental Committee (I.D.C) consisting of HOD, Supervisor/ Guide and one Internal senior expert shall monitor the progress of the project work.
- The work on the project work phase-I shall be initiated in the III semester and continued in the final semester. The candidate can submit Project work phase-I dissertation with the approval of I.D.C. after 18 weeks from the date of registration at the earliest from the date of registration for the project work phase-I.
- The student must submit status report at least in three different phases during the project work period. These reports must be approved by the I.D.C before submission of the Project Report.
- Three copies of the Dissertation certified in the prescribed form by the supervisor and HOD shall be submitted to the HOD.
- The semester end examination for project work phase-I done during III Semester, shall be conducted by a Project Review Committee (PRC). The evaluation of project work shall be conducted at the end of the III Semester.
- The PRC comprises of an External examiner appointed by the Principal, Head of the Department and Project Guide/Supervisor to adjudicate the dissertation. The PRC shall jointly evaluate candidates work and award grades as given below.

S.No	Description	Grade	Grade Point (GP) Assigned
1	Very Good	Grade A	10
2	Good	Grade B	9
3	Satisfactory	Grade C	8
4	Not satisfactory	Grade D	0

If the report of the viva-voce is not satisfactory (Grade D) the candidate will retake the viva-voce examination after three months. If he fails to get a satisfactory report at the second viva-voce examination he will not be eligible for the award of the degree unless the candidate is permitted to revise and resubmit the dissertation.

6.12 Project Work Phase-II:

Every candidate shall be required to submit thesis or dissertation after taking up a topic approved by the college/ concerned department.

- **Registration of Project work**: A candidate is permitted to register for the project work phase-I after satisfying the attendance requirement of all the courses (theory and practical courses of I & II Semesters)
- An Internal Departmental Committee (I.D.C) consisting of HOD, Supervisor/ Guide and one Internal senior expert shall monitor the progress of the project work.
- The work on the project work phase-II shall be initiated in the IV semester. The candidate can submit Project work phase-II dissertation with the approval of I.D.C. after 18 weeks from the date of registration at the earliest from the date of registration for the project work phase-I.

- The student must submit status report at least in three different phases during the project work period. These reports must be approved by the I.D.C before submission of the Project Report.
- Three copies of the Dissertation certified in the prescribed form by the supervisor and HOD shall be submitted to the HOD.
- The semester end examination for project work phase-I done during III Semester, shall be conducted by a Project Review Committee (PRC). The evaluation of project work shall be conducted at the end of the IV Semester.
- The PRC comprises of an External examiner appointed by the Principal, Head of the Department and Project Guide/Supervisor to adjudicate the dissertation. The PRC shall jointly evaluate candidates work and award grades as given below

S.No	Description	Grade	Grade Point (GP) Assigned
1	Very Good	Grade A	10
2	Good	Grade B	9
3	Satisfactory	Grade C	8
4	Not satisfactory	Grade D	0

If the report of the viva-voce is not satisfactory (Grade D) the candidate will retake the viva-voce examination after three months. If he fails to get a satisfactory report at the second viva-voce examination he will not be eligible for the award of the degree unless the candidate is permitted to revise and resubmit the dissertation.

6.13 <u>Re-Registration For Improvement of Internal Evaluation Marks:</u>

Following are the conditions to avail the benefit of improvement of internal evaluation marks.

- The candidate should have completed the course work and obtained examinations results for I, II & III semesters.
- He should have passed all the subjects for which the internal evaluation marks secured are more than 50%.
- Out of the subjects the candidate has failed in the examination due to Internal evaluation marks secured being less than 50%, the candidate shall be given one more chance for each Theory subject and for a maximum of **<u>three</u>** Theory subjects for Improvement of

Internal evaluation marks.

- ❖ The candidate has to re-register for the subjects so chosen and fulfill all the academic requirements.
- ❖ For each subject, the candidate has to pay a fee equivalent to one third of the semester tuition fee and the amount is to be remitted in the form of D.D. in favour of **'The Principal, Audisankara College of Engineering & Technology' payable at Gudur** along with the requisition through the Controller of the Examinations of the college.
- ❖ In the event of availing the Improvement of Internal evaluation marks, the internal evaluation marks as well as the End Examinations marks secured in the previous attempt(s) for the reregistered subjects stand cancelled.

7.0 **SEMESTER – WISE DISTRIBUTION OF CREDITS**

Semester	Theory	Practicals	Credits
M.Tech I Semester	5	2	22
M.Tech II Semester	4	2 + Term Paper	22
M.Tech III Semester	2	Project Work Phase-I	18
M.Tech IV Semester	0	Project Work Phase-II	16
		Total	78

8.0 **GRADING PROCEDURE**

Grades will be awarded to indicate the performance of students in each theory subject, laboratory / practicals, Term Paper and project Work Phase-I & II. Based on the percentage of marks obtained (Continuous Internal Evaluation plus Semester End Examination, both taken together) as specified in item 6 above, a corresponding letter grade shall be given.

8.1 As a measure of the performance of a student, a 10-point absolute grading system using the following letter grades (as per UGC/AICTE guidelines) and corresponding percentage of marks shall be followed:

Marks Range	Letter Grade	Grade Points
91-100	S (Superior)	10
81-90	A (Excellent)	9
70-80	B (Very Good)	8
60-69	C (Good)	7
55-59	D (Average)	6
50-54	E (Pass)	5
<50	F (FAIL)	0
Ab (Absent)	Ab	0

8.2	A student who has obtained an 'F' grade in any subject shall be deemed to have 'failed' and is required to reappear as a 'supplementary student' in the semester end examination, as and when offered. In such cases, internal marks in those subjects will remain the same as those obtained earlier
8.3	To a student who has not appeared for an examination in any subject, 'Ab' grade will be allocated in that subject, and he is deemed to have 'failed'. A student will be required to reappear as a 'supplementary student' in the semester end examination, as and when offered next. In this case also, the internal marks in those subjects will remain the same as those obtained earlier.
8.4	A letter grade does not indicate any specific percentage of marks secured by the student, but it indicates only the range of percentage of marks.
8.5	A student earns grade point (GP) in each subject/ course, on the basis of the letter grade secured 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
8.6	A student passes the subject/ course only when GP ≥5 ('E' grade or above)
8.7	➢ A student obtaining Grade F shall be considered failed and will be required to reappear for that subject when the next supplementary examination offered. ➢ For Mandatory courses "Satisfactory" or "Unsatisfactory" shall be indicated instead of the letter grade and this will not be counted for the computation of SGPA/CGPA.
8.8	**Semester Grade Point Average (SGPA) and Cumulative Grade Point Average (CGPA):** The Semester Grade Point Average (SGPA) is the ratio of sum of the product of the number of credits with the grade points scored by a student in all the courses taken by a student and the sum of the number of credits of all the courses undergone by a student, i.e. $$SGPA = \sum_{i=1}^{n}(Ci \times Gi) / \sum_{i=1}^{n} Ci$$ Where, Ci is the number of credits of the i^{th} subject, Gi is the grade point scored by the student in the i^{th} course and n is the number of subjects. The Cumulative Grade Point Average (CGPA) will be computed in the same manner taking into account all the courses undergone by a student over all the semesters of a program, i.e. $$CGPA = \sum_{i=1}^{n}(Ci \times Si) / \sum_{i=1}^{n} Ci$$ Where 'Si' is the SGPA of the i^{th} semester, Ci is the total number of credits in that semester and n is the number of semesters. Both SGPA and CGPA shall be rounded off to 2 decimal points and reported in the transcripts. While computing the SGPA the subjects in which the student is awarded Zero grade points will also be included. ***Grade Point:*** It is a numerical weight allotted to each letter grade on a 10-point scale.

	Letter Grade: It is an index of the performance of students in a said course. Grades are denoted by letters as mentioned in the above table.
9.0	**Award of Class**
9.1	After a student has satisfied the requirement prescribed for the completion of the program and is eligible for the award of M.Tech. Degree he/she shall be placed in one of the following four classes:

Class Awarded	CGPA Secured
First class with Distinction	>= 8
First class	>= 7 and < 8
Second class	>= 5 and < 7

10.0	**Transitory regulations**
10.1	For students detained due to shortage of attendance: 1. A Student who has been detained in I year of R16 Regulations due to lack of attendance, shall be permitted to join I year I Semester of R18 Regulations and he is required to complete the study of M.Tech/ programme with in the stipulated period of eight academic years from the date of first admission in I year. 2. A student who has been detained in any semester of II, III and IV years of R16 regulations for want of attendance, shall be permitted to join the corresponding semester of R18 regulations and is required to complete the study of M.Tech within the stipulated period of eight academic years from the date of first admission in I Year. The R18 Academic Regulations under which a student has been readmitted shall be see rule 10.3 for further Transitory Regulations.
10.2	For students detained due to shortage of credits: A student of R16 Regulations who has been detained due to lack of credits, shall be promoted to the next semester of R18 Regulations only after acquiring the required credits as per the corresponding regulations of his/her first admission. The student is required to complete the study of M.Tech. within the stipulated period of eight academic years from the year of first admission. The R18 Academic Regulations are applicable to a student from the year of readmission onwards. See rule 10.3 for further Transitory Regulations.
10.3	For readmitted students in R18 Regulations: 1. A student who has failed in any subject under any regulation has to pass those subjects in the same regulations. 2. The maximum credits that a student acquires for the award of degree, shall be the sum of the total number of credits secured in all the regulations of his/her study including R18 Regulations. 3. If a student readmitted to R18 Regulations, has any subject with 80% of syllabus common with his/her previous regulations, that particular subject in R18 Regulations will be substituted by another subject to be suggested by the College standing committee. Note: If a student readmitted to R18 Regulations, has not studied any subjects/topics in

	his/her earlier regulations of study which is prerequisite for further subjects in R18 Regulations, the department HOD concerned shall conduct remedial classes to cover those subjects/topics for the benefit of the students.
11.0	**Supplementary Examinations:** Apart from the regular End Examinations the institute may also schedule and conduct supplementary examinations for all subjects for the benefit of students with backlogs. Such students writing supplementary examinations as supplementary candidates may have to write more than one examination per day.
12.0	**Student Transfers** Student transfers shall be as per the guidelines issued by the Government of Andhra Pradesh from time to time.
13.0	**With–Holding of Results** If the candidate has any dues not paid to the institute or if any case of indiscipline or malpractice is pending against him/her, the result of the candidate shall be withheld and he/she will not be allowed / promoted into the next higher semester. The issue of awarding degree is liable to be withheld in such cases.
12.0	**Conduct and Discipline** ➢ Students shall conduct themselves within and outside the premises of the Institute in a descent and dignified manner befitting the students of Audisankara College of Engineering & Technology. ➢ As per the order of the Honorable Supreme Court of India, ragging in any form is considered a criminal offence and is totally banned. Any form of ragging will be severely dealt with The following acts of omission and / or commission shall constitute gross violation of the code of conduct and are liable to invoke disciplinary measures with regard to ragging. (i) Lack of courtesy and decorum; indecent behavior anywhere within or outside the college campus. (ii) Damage of college property or distribution of alcoholic drinks or any kind of narcotics to fellow students / citizens. ➢ Possession, consumption or distribution of alcoholic drinks or any kind of narcotics or hallucinogenic drugs. ➢ Mutilation or unauthorized possession of library books. ➢ Noisy and unruly behavior, disturbing studies of fellow students. ➢ Hacking in computer systems (such as entering into other person's areas without prior permission, manipulation and / or damage of computer hardware and software or any other cyber crime etc. ➢ Usage of camera /cell phones in the campus. ➢ Plagiarism of any nature. ➢ Any other act of gross indiscipline as decided by the college academic council from time to time.

	➢ Commensurate with the gravity of offense, the punishment may be reprimand, fine, expulsion from the institute/ hostel, debarring from examination, disallowing the use of certain facilities of the Institute, rustication for a specified period or even outright expulsion from the Institute, or even handing over the case to appropriate law enforcement authorities or the judiciary, as required by the circumstances. ➢ For an offence committed in (i) a hostel (ii) a department or in a class room and (iii) elsewhere, the chief Warden, the concern Head of the Department and the Principal respectively, shall have the authority to reprimand or impose fine. ➢ Cases of adoption of unfair means and/ or any malpractice in an examination shall be reported to the principal for taking appropriate corrective action. ➢ All cases of serious offence, possibly requiring punishment other than reprimand, shall be reported to the Academic council of the college. ➢ The Institute Level Standing Disciplinary Action Committee constituted by the academic council shall be the authority to investigate the details of the offence, and recommend disciplinary action based on the nature and extent of the offence committed. ➢ The Principal shall deal with any problem, which is not covered under these rules and regulations. ➢ **"Grievance and Redressal Committee" (General)** constituted by the Principal shall deal with all grievances pertaining to the academic / administrative / disciplinary matters. ➢ All the students must abide by the code and conduct rules prescribed by the college from time to time.
13.0	**General** ➢ s/he represents "she" and "he" both ➢ Where the words 'he', 'him', 'his', occur, they imply 'she', 'her', 'hers' also. ➢ The academic regulations should be read as a whole for the purpose of any interpretation. ➢ In the case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Chairman, Academic Council will be final. The college may change or amend the academic regulations or syllabi from time to time and the changes or amendments made shall be applicable to all the students with effect from the dates notified by the institute.

RULES FOR
DISCIPLINARY ACTION FOR MALPRACTICES / IMPROPER CONDUCT IN EXAMINATIONS

	Nature of Malpractices/Improper conduct	Punishment
1. (a)	Possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, Cell phones, pager, palm computers, blue tooth or any other form of material concerned with or related to the course of the examination (theory or practical) in which he/she is appearing but has not made use of (material shall include any marks on the body of the candidate which can be used as an aid in the course of the examination)	Expulsion from the examination hall and cancellation of the performance in that course only.
(b)	Gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or communicates through cell phones with any candidate or persons in or outside the examination hall in respect of any matter.	Expulsion from the examination hall and cancellation of the performance in that course only of all the candidates involved. In case of an outsider, he/she 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 course of the examination (theory or practical) in which the candidate is appearing.	Expulsion from the examination hall and cancellation of the performance in that course and all other courses the candidate has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the courses of that Semester/year. The Hall Ticket of the candidate is to be cancelled.
3	Impersonates any other candidate in connection with the examination	The candidate who has impersonated shall be expelled from examination hall. The Candidate is also debarred for four consecutive semesters from class work and all end examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with for feature of seat. The performance of the original candidate, who has been impersonated, shall be cancelled in all the courses of the examination (including practicals and project work) already appeared and shall not be allowed to appear for examinations of the remaining courses of that Semester/year. The candidate is also debarred for four consecutive Semesters from class work and all Semester end examinations if his involvement is established. Otherwise the candidate is debarred for two consecutive

		semesters from class work and all end examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. If the imposter is an outsider, he/she 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 course and all the other courses the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the courses of that Semester/year. The candidate is also debarred for two consecutive Semesters from class work and all Semester end examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
5	Uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks.	Cancellation of the performance in that course.
6	Refuses to obey the orders of the any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walkout or instigates others to walk out, or threatens the officer-in charge or any person on duty in or outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the officer-in-charge, or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction of property in the examination hall or any part of the College campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination.	In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that course and all other courses the candidate(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the courses of that Semester. If candidate physically assaults the invigilator or/officer in charge of the examination, then the candidate is also barred 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 examination hall taking away answer script or intentionally tears of the script or any part thereof inside or outside the examination hall.	Expulsion from the examination hall and cancellation of performance in that course and all the other courses the candidate has already appeared including practical examinations

		and project work and shall not be permitted for the remaining examinations of the courses of that Semester/year. The candidate is also debarred for two consecutive Semesters from class work and all Semester end examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
8	Possess any lethal weapon or firearm in the examination hall	Expulsion from the examination hall and cancellation of the performance in that course and all other courses the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the courses of that Semester/year. The candidate is also debarred and forfeits the seat.
9	If student of the college, who is not a candidate for the particular examination or any person not connected with the college indulges in any malpractice or improper conduct mentioned in clause 6 to 8.	Student of the colleges expulsion from the examination hall and cancellation of the performance in that course and all other courses the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the Courses of that Semester/year. The candidate is also debarred and forfeits the seat. Person(s) who do not belong to the College will be handed over to police and, a police case will be registered against them.
10	Comes in a drunken condition to the examination hall.	Expulsion from the examination hall and cancellation of the performance in that course and all other courses the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the courses 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 course and all other courses the candidate has appeared including practical examinations and project work of that Semester examinations depending on the recommendation of the committee.
12	If any malpractice is detected which is not covered in the above clauses 1 to 11 shall be reported to the Principal for further action to award suitable punishment.	

Note:

i. All malpractices cases are to be handled by the Chief Controller with a committee consist of Controller of Examinations, HOD concerned and subject expert.

ii. Whenever the performance of a student is cancelled in any course/ courses due to Malpractice, he has to register for the End Examination in those course/courses consequently and has to fulfill all the norms required for award of Degree.

COURSE STRUCTURE

M.Tech I Semester – Structural Engineering

S.No	Course Code	Course Title	Hours per Week			Marks			Credits
			L	T	P	IM	EM	T	
1	18ST101	Advanced Structural Analysis	4	0	0	40	60	100	4
2	18ST102	Theory of Elasticity and Plasticity	4	0	0	40	60	100	4
3	**Elective-I**								
	18ST103	Theory and Analysis of Plates	4	0	0	40	60	100	4
	18ST104	Maintenance and Rehabilitation of Structures							
	18ST105	Stability of Structures							
4	**Elective-II**								
	18ST106	Soil Structure Interaction	4	0	0	40	60	100	4
	18ST107	Bridge Engineering							
	18ST108	Prefabricated Structures							
5	18AS101	Research Methodology and IPR	2	0	0	40	60	100	2
6	18ST110	Concrete Technology Lab-I	0	0	4	25	50	75	2
7	18ST111	Computational Lab	0	0	4	25	50	75	2
		Total	**18**	**0**	**8**	**250**	**400**	**650**	**22**

M.Tech II Semester – Structural Engineering

S.No	Course Code	Course Title	Hours per Week			Marks			Credits
			L	T	P	IM	EM	T	
1	18ST201	Finite Element Method	4	0	0	40	60	100	4
2	18ST202	Structural Dynamics	4	0	0	40	60	100	4
3	**Elective-III**								
	18ST203	Advanced Steel Design	4	0	0	40	60	100	4
	18ST204	Earthquake Resistant Structures							
	18ST205	Design of High rise structures							
4	**Elective-IV**								
	18ST206	Design of Advanced Concrete Structures	4	0	0	40	60	100	4
	18ST207	Design of Industrial Structure							
	18ST208	Advanced Foundation Engineering							
5	18ST209	Concrete technology Lab-II	2	0	0	40	60	100	2
6	18ST210	Structural Engineering Lab	0	0	4	25	50	75	2
7	18ST211	Term Paper	0	0	4	50	-	50	2
		Total	**18**	**0**	**8**	**275**	**350**	**625**	**22**

M.Tech III Semester – Structural Engineering

S.No	Course Code	Course Title	Hours per Week			Marks			Credits
			L	T	P	IM	EM	T	
1		**Open Elective**	4	0	0	40	60	100	4
2	**Elective-V**								
	18ST304	Design of Prestressed Concrete Structures	4	0	0	40	60	100	4
	18ST305	Analysis of Shells and Folded Plates							
	18ST306	Available MOOCS							
3	18ST307	Project Work Phase-I	0	0	20	Grade			10
		Total	**8**	**0**	**8**	**80**	**120**	**200**	**18**

M.Tech IV Semester – Structural Engineering

S.No	Course Code	Course Title	Hours per Week			Marks			Credits
			L	T	P	IM	EM	T	
1	18ST401	Project Work Phase-II	0	0	32	Grade			16
		Total	**0**	**0**	**32**	**Grade**			**16**

Open Electives – Structural Engineering

S.No	Course Code	Course Title
1	18ST301	Industrial Safety
2	18ST302	Cost Management of Engineering Projects
3	18ST303	Composite Materials

ADVANCED STRUCTURAL ANALYSIS

M.Tech I Semester: Structural Engineering								
Course code	**Category**	**Hours/week**			**Credits**	**Maximum Marks**		
18ST101	**Core**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**TOTAL**
		4	0	0	4	40	60	100
Contact Classes:60	**Tutorial Classes: -**	**Practical Classes: Nil**			**Total Classes:60**			

OBJECTIVES:

The course should enable the students to:

1. To determine the static and kinematic indeterminacy and introduction to matrix method of analysis.
2. To analyse the continuous beams by flexibility and stiffness method.
3. To analyse two dimensional frames by flexibility and stiffness method.
4. To analyse pin jointed trusses by flexibility and stiffness method.

UNIT-I — **Classes:12**

INDETERMINACY: Determination of static and kinematic indeterminacies of two-dimensional and three-dimensional portal frames, pin jointed trusses.

INTRODUCTION TO MATRIX METHODS OF ANALYSIS: Flexibility and stiffness matrices-Force displacement relationships for axial force, couple, stiffness method of analysis and flexibility method of analysis.

UNIT-II — **Classes:12**

ANALYSIS OF CONTINUOUS BEAMS- (stiffness method): continuous beams of two and three spans with different end conditions-internal hinges.

ANALYSIS OF CONTINUOUS BEAMS-(flexibility method): continuous beams of two and three spans with different end conditions-internal hinges

UNIT-III — **Classes:12**

ANALYSIS OF TWO DIMENSIONAL PORTAL FRAMES (stiffness method): Analysis of 2D portal frames with different end conditions-plotting of bending moment diagrams.

ANALYSIS OF TWO DIMENSIONAL PORTAL FRAMES(flexibility method): Analysis of 2D portal frames with different end conditions-plotting of bending moment diagrams

UNIT-IV — **Classes:12**

ANALYSIS OF TWO-DIMENSIONAL PINJOINTED TRUSSES (stiffness method): computation of joint displacement and member forces.

ANALYSIS OF TWO-DIMENSIONAL PINJOINTED TRUSSES (flexibility method): Computation of joint displacement and member forces.

UNIT-V — **Classes:12**

TRANSFORMATION OF CO-ORDINATES: Local and Global co-ordinate systems-transformation of matrices from local to global coordinates of element stiffness matrix-direct stiffness method of analysis-assembly of global stiffness matrix from element stiffness matrices – static condensation-sub-structuring

Text Books:

1. Structural Analysis by Pundit & Gupta.
2. Structural Analysis by C.S.Reddy.

Reference Books:

1. Structural Analysis by S.Ramamrutham.
2. Structural Analysis – R.C.Hibbeler.

Web References:

1. https://nptel.ac.in/syllabus/105101085/
2. https://nptel.ac.in/downloads/105105109/

E-Text Books:

1. https://books.google.co.in/books?isbn=0495295671
2. https://books.google.co.in/books?isbn=0198069189

Outcomes:

At the end of the course students able to

1. Determine the static and kinematic indeterminacy and introduction to matrix method of analysis
2. Analyse the continuous beams by flexibility and stiffness method
3. Analyse two dimensional frames by flexibility and stiffness method
4. Analyse pin jointed trusses by flexibility and stiffness method

THEORY OF ELASTICITY AND PLASTICITY

M.Tech I Semester: Structural Engineering								
Course code	**Category**	**Hours/week**			**Credits**	**Maximum Marks**		
18ST102	**Core**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**TOTAL**
		4	0	0	4	40	60	100
Contact Classes:60	**Tutorial Classes: -**	**Practical Classes: Nil**			**Total Classes:60**			

OBJECTIVES:

The course should enable the students to:

1. To know about principle stresses and principle strains
2. To derive general equations of polar co-ordinates
3. To know the general theorems
4. To know the concepts of plasticity and applications.

UNIT-I — **Classes:12**

INTRODUCTION: Elasticity, Notation for forces and stresses, Components of stresses, components of strain, Hooke's law.

PLANE STRESS AND PLANE STRAIN ANALYSIS: Plane stress, plane strain, Differential equations of equilibrium, Boundary conditions, Compatibility equations, stress function, Boundary conditions.

UNIT-II — **Classes:12**

TWO DIMENSIONAL PROBLEMS IN RECTANGULAR COORDINATES: Solution by polynomials-Saint Venant's principle-Determination of displacements-bending of simple beams-application of Fourier series for two dimensional problems - gravity loading.

TWO DIMENSIONAL PROBLEMS IN POLAR COORDINATES : General Equation in polar co-ordinates - stress distribution symmetrical about an axis – Pure bending of curved bars-strain components in polar coordinates-Displacements for symmetrical stress distributions-simple symmetric and asymmetric problems-General solution of two dimensional problem in polar coordinates

UNIT-III — **Classes:12**

ANALYSIS OF STRESS AND STRAIN IN THREE DIMENSIONS: Principle stress, ellipsoid and stress-director surface, Determination of principle stresses, Maximum shear stresses, Homogeneous deformation, principle axis of strain rotation.

UNIT-IV — **Classes:12**

GENERAL THEOREMS: Balance laws, Differential equations of equilibrium, conditions of compatibility, Determination of displacement, Equations of equilibrium in terms of displacements, principle of superposition, Uniqueness of solution, the Reciprocal theorem.

UNIT-V — **Classes:12**

TORSION OF PRISMATICAL BARS: Torsion of prismatic bars, Elliptical cross section, other elementary solutions, membrane anology, Torsion of rectangular bars-solution of torsional problems by energy method

THEORY OF PLASTICITY: Introduction, concepts and assumptions, yield criterions.

Text Books:

1. Timoshenko, S., Theory of Elasticity and Plasticity, McGraw Hill Book company..
2. Adavnced Strength of materials by Papoov, McGraw Hill Book company.

Reference Books:

1. Theory of Elasticity and Plasticity by Sadhu Singh. Khanna Publishers.
2. Advanced Mechanics of Solids by L.S. Srinath

Web References:

1. https://www.cet.edu.in/noticefiles/260_Lecturer%20Notes%20on%20AEP-ilovepdf-compressed.pdf
2. https://lecturenotes.in/subject/247/theory-of-elasticity-and-plasticity-tep

E-Text Books:

1. https://books.google.co.in/books?isbn=0070701229
2. https://books.google.co.in/books?isbn=8120352831

Outcomes:

At the end of the course students able to

1. Know about principle stresses and principle strains
2. Derive general equations of polar co-ordinates
3. Know the general theorems
4. Know the concepts of plasticity and applications

THEORY AND ANALYSIS OF PLATES
(Elective – I)

M.Tech I Semester: Structural Engineering								
Course code	**Category**	**Hours/week**			**Credits**	**Maximum Marks**		
18ST103	**Core**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**TOTAL**
		4	0	0	4	40	60	100
Contact Classes:60	**Tutorial Classes: -**	**Practical Classes: Nil**			**Total Classes:60**			

OBJECTIVES:

The course should enable the students to:

1. To derive plate equations in bending and plates under different loading conditions
2. To derive equations for circular plates under different loading conditions
3. To derive equations governing simultaneous bending and stretching
4. To know numerical and approximate method of analysis for plate problems

UNIT-I — **Classes:12**

DERIVATION OF PLATE EQUATIONS: In plane bending and transverse bending effects. **RECTANGULAR PLATES:** Plates under various loading conditions like concentrated, U.D.L and hydrostatic pressure, Navier and Lev's type of solutions for various boundary conditions.

UNIT-II — **Classes:12**

CIRCULAR PLATES: Symmetrically loaded circular plates under various loading conditions, annular plates

UNIT-III — **Classes:12**

PLATES UNDER SIMULTANEOUS BENDING AND STRECTHING: Derivation of the governing equation and application to simple cases.

UNIT-IV — **Classes:12**

ORTHOTROPIC PLATES: Derivation of the governing equation, applications togrillage problems as equivalent orthotropic plates

UNIT-V — **Classes:12**

NUMERICAL AND APPROXIMATE METHODS: Energy solutions by variational methods, finite difference and finite element methods of analysis for plate problems.
LARGE DEFLECTION THEORY OF PLATES: Study of few simple cases.

Text Books:

1. Timoshenko, S., and Krieger, S.W., Theory of plates and shells, McGraw Hill Book Company
2. Szilard, R., Theory and Analysis of Plates, Prentice Hall Inc

Reference Books:

1. N.K.Bairagi, Plate analysis, Khanna Publishers, Delhi.
2. . Theory and analysis of elastic plates by J.N.Reddy

Web References:

1. https://nptel.ac.in/courses/105105041/module%206.pdf
2. https://nptel.ac.in/noc/individual_course.php?id=noc18-me65

E-Text Books:

1. https://books.google.co.in/books?isbn=0203908724
2. https://books.google.co.in/books?isbn=084938415X

Outcomes:

At the end of the course students able to

1. Derive plate equations in bending and plates under different loading conditions
2. Derive equations for circular plates under different loading conditions
3. Derive equations governing simultaneous bending and stretching
4. Know numerical and approximate method of analysis for plate problems

MAINTENANCE AND REHABILITATION OF STRUCTURES
(Elective – I)

M.Tech I Semester: Structural Engineering								
Course code	**Category**	**Hours/week**			**Credits**	**Maximum Marks**		
18ST104	**Core**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**TOTAL**
		4	0	0	4	40	60	100
Contact Classes:60	**Tutorial Classes: -**	**Practical Classes: Nil**			**Total Classes:60**			

OBJECTIVES:

The course should enable the students to:

1. To learn quality assurance of concrete and influence on serviceability and durability
2. To know different materials for repair of RC structures
3. To know the techniques for repair and retrofit of structures
4. To know the case studies in repair

UNIT-I — **Classes:12**

GENERAL: Quality assurance for concrete construction, As built concrete properties, strength, Permeability, Volume changes, Thermal properties, Cracking.

INFLUENCE ON SERVICEABILITY AND DURABILITY: Effects due to climate, temperature, chemicals, wear and erosion, design and construction errors, Corrosion mechanism, Effects of cover thickness and cracking, Methods of corrosion protection, Inhibitors, Resistant steels, Coatings, Cathodic protection.

UNIT-II — **Classes:12**

MATERIALS FOR REPAIR: Special concretes and mortar, Concrete chemicals, Special elements for accelerated strength gain, Expansive cement, Polymer concrete, Sulphur infiltrated concrete, Ferro cement, Fibre reinforced concrete.

UNIT-III — **Classes:12**

TECHNIQUES FOR REPAIR & RETROFIT: Rust eliminators and polymers coating for rebars during repair, foamed concrete, mortar and dry pack, vacuum concrete, Gunite and shotcrete Epoxy injection, Mortar repair for cracks, shoring and underpinning, Fibre reinforced polymer

UNIT-IV — **Classes:12**

MAINTENANCE AND REPAIR STRATEGIES: Inspection, Structural Appraisal, Economic appraisal, Components of quality assurance, Conceptual bases for quality assurance schemes.

UNIT-V — **Classes:12**

CASE STUDIES: Repairs to overcome low member strength, Deflection, Cracking, Chemical disruption, Weathering, Wear, Fire, Leakage, Marine exposure

Text Books:

1. MS. Shetty, Concrete Technology – Theory and practice, S.Chand and company, New Delhi.
2. Santhakumar, A.R.Training Course notes on damage assessment and Repair in low cost housing RHDC-NBO Anna University, Madras.

Reference Books:

1. A.R. Santha kumar, Concrete chemicals – Theory and applications, Indian society for construction Engineering and Technology, Madras.
2. N.Palaniappan, Estate Management, Anna Institute of Management, Madras.

Web References:

1. http://fmcet.in/CIVIL/CE2071_uw.pdf
2. https://www.alameen.ac.in/images/QUESTIONBANK/CIVIL/IVYEAR/CE-6021-RRS-QB.pdf

E-Text Books:

1. https://books.google.co.in/books?isbn=8120352149
2. https://books.google.co.in/books?isbn=8120349458

Outcomes:

At the end of the course students able to

1. Learn quality assurance of concrete and influence on serviceability and durability
2. know different materials for repair of RC structures
3. Learn techniques for repair and retrofit of structures
4. know the case studies in repair

STABILITY OF STRUCTURES
(Elective – I)

M.Tech I Semester: Structural Engineering								
Course code	**Category**	**Hours/week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CIA**	**SEE**	**TOTAL**
18ST105	**Core**	4	0	0	4	40	60	100
Contact Classes:60	**Tutorial Classes: -**	**Practical Classes: Nil**			**Total Classes:60**			

OBJECTIVES:

The course should enable the students to:

1. To determine the buckling of bars with different load conditions
2. To determine the buckling of beam-column connections with different load conditions
3. To determine the equations for torsional buckling of bars
4. To determine the buckling of rectangular bars and beams

UNIT-I — **Classes:12**

ELASTIC BUCKLING OF BARS: Buckling of a bar with intermediate compressive forces and distributed axial loads, Buckling of bars with change in cross section, Effect of shear force on critical load, Built up columns, Elastic buckling of straight columns, Effect of shear stress on buckling, Eccentrically and laterally loaded columns, energy methods, Buckling of a bar on elastic foundation

UNIT-II — **Classes:12**

FORMULATIONS RELATED TO BEAM COLUMNS: Concept of Stability, Differential equation for beam columns –Beam column with concentrated loads, continuous lateral load, couples, beam column with built in ends, continuous beams with axial load, application of Trignometric series –Determination of allowable stresses.

INELASTIC BUCKLING: Buckling of straight bars, Double modulus theory**,** Tangent modulus theory.

UNIT-III — **Classes:12**

MATHEMATICAL TREATMENT OF STABILITY PROBLEMS: Buckling problem orthogonality realation –Ritz method-Timoshenko method, Galerk in method.

UNIT-IV — **Classes:12**

TORSIONAL BUCKLING: Pure torsion of thin walled bar of open cross section-Non–Uniform torsion of thin walled bars of open cross section-Torsional buckling –Buckling under Torsion and Flexure.

UNIT-V — **Classes:12**

LATERAL BUCKLING OF SIMPLY SUPPORTED BEAMS: Beams of rectangular cross section subjected for pure bending

BUCKLING OF SIMPLY SUPPORTED RECTANGULAR PLATES: Derivationof equation of plate subjected to constant compression in two directions and one direction.

Text Books:

1. Stability of metalic structure by Bleich –Mc Graw hill
2. Theory of Beam columns Vol I by chen & Atsuta Mc.Graw Hill

Reference Books:

1. Z.P. Bazant- Stability structures, CRC-Press
2. Elastic stability by Bleaigh

Web References:

1. https://lecturenotes.in/materials/20550-note-of-structural-stability-by-sunil-senthili
2. https://www.sciencedirect.com/topics/engineering/structural-stability

E-Text Books:

1. http://www.civil.northwestern.edu/people/bazant/PDFs/Papers/B2-Stability-of-Structures-2ndEd-Dover2003.pdf
2. https://books.google.co.in/books?isbn=0750678755

Outcomes:

At the end of the course students able to

1. Determine the buckling of bars with different load conditions
2. Determine the buckling of beam-column connections with different load conditions
3. Determine the equations for torsional buckling of bars
4. Determine the buckling of rectangular bars and beams

SOIL STRUCTURE INTERACTION
(Elective – II)

M.Tech I Semester: Structural Engineering								
Course code	**Category**	**Hours/week**			**Credits**	**Maximum Marks**		
18ST106	**Core**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**TOTAL**
		4	0	0	4	40	60	100
Contact Classes:60	**Tutorial Classes: -**	**Practical Classes: Nil**			**Total Classes:60**			

OBJECTIVES:

The course should enable the students to:

1. To understand the concept of interaction, linear and non-linear behavior of soil.
2. To design beams and slabs using Winkler foundation model
3. To do the elastic analysis of piles and pile groups
4. To understand the design criteria of foundations.

UNIT-I — **Classes:12**

SOIL-FOUNDATION INTERACTION: Introduction to soil-Foundation interaction problems, soil behaviour, Foundation behaviour, Interface behaviour, Scope of soil foundation interaction analysis, soil response models, Winkler, Elastic continuum, Two parameter elastic models, Elastic plastic behaviour, Time dependent behaviour

UNIT-II — **Classes:12**

BEAM ON ELASTIC FOUNDATION-SOIL MODELS: Infinite beam, Two parameters, Isotropic elastic half space, Analysis of breams of finite length, Classification of finite beams in relation to their stiffness.

UNIT-III — **Classes:12**

PLATE 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

UNIT-IV — **Classes:12**

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

UNIT-V — **Classes:12**

LATERALLY LOADED PILE AND PILED RAFT: Non-linear load – deflection response P-Y reactions, non-linear soil properties lift capacity of piles and anchors, Piles raft system – soil structure interaction in framed structures. FEM modules use of approximately software packages

Text Books:

1.Selva durai, A.P.S, "Elastic Analysis of Soil Foundation Interaction" Elsevier, 1979
2. Poulos, H.G., and Davis, E. H., "Pile Foundation Analysis and Design", John Wiley, 1980

Reference Books:

1. Scott, R.F., "Foundation Analysis", Prentice Hall, 1981
2. Structure Soil Interaction-State of Art Report", Institution of Structural Engineers. 1978
336.2R-88: Suggested Analysis and Design Procedures for Combined Footings and Mats

Web References:

1. https://www.nehrp.gov/pdf/nistgcr12-917-21.pdf
2. https://nptel.ac.in/courses/105101004/6

E-Text Books:

1. https://books.google.co.in/books?isbn=0419190708
2. https://books.google.co.in/books?isbn=044460040

Outcomes:

At the end of the course students able to

1. Understand the concept of interaction, linear and non-linear behavior of soil
2. Design beams and slabs using Winkler foundation model
3. Do the elastic analysis of piles and pile groups
4. Learn the behavior of laterally loaded piles

BRIDGE ENGINEERING
(Elective – II)

M.Tech I Semester: Structural Engineering								
Course code	**Category**	**Hours/week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CIA**	**SEE**	**TOTAL**
18ST107	**Core**	4	0	0	4	40	60	100
Contact Classes:60	**Tutorial Classes: 5**	**Practical Classes: Nil**			**Total Classes:80**			

OBJECTIVES:

The course should enable the students to:

1. To know different loading conditions and design of box culvert.
2. To design T-bridges and slab bridges
3. To know about different bridge bearings and prestressed bridge decks
4. To understand the stability of piers

UNIT-I — **Classes:12**

INTRODUCTION: Classification, investigations and planning, choice of type, economic span length, IRC specifications for road bridges, standard live loads, other forces acting on bridges, general design considerations.

DESIGN OF BOX CULVERTS: General aspects**,** Design loads**,** Design moments, shear sand thrusts, Design of critical section

UNIT-II — **Classes:12**

DESIGN OF SLAB BRIDGES: Effective width of analysis**,** workings stress design and detailing of slab bridges for IRC loading.

T-BEAM BRIDGES: Introduction**,** wheel load analysis**,** B.M. in slab**,** Pigaud"s theory, analysis of longitudinal girders by Courbon's theory working stress design and detailing of reinforced concrete T-beam bridges for IRC loading

UNIT-III — **Classes:12**

PRESTRESSED CONCRETE BRIDGES: General features–Advantages of Prestressed concrete bridges – pretensioned Prestressed concrete bridges – post tensioned Prestressed concrete Bridge decks. Design of post tensioned Prestressed concrete slab bridge deck.

UNIT-IV — **Classes:12**

BRIDGE BEARINGS: General features–Types of bearings–forces on bearings basis for selection of bearings – Design principles of steel rocker and roller bearings and its design – Design of elastometric pad bearing detailing of elastometric pot bearings.

UNIT-V — **Classes:12**

PIERS AND ABUTMENTS –General features–Bed block–Materials for piers and abutments – types of piers – forces acting on piers – Design of pier – stability analysis of piers – general features of abutments – forces acting on abutments – stability analysis of abutments.

BRIDGE FOUNDATIONS –General Aspects–Types of foundations–Pile foundations–well foundations – caisson foundations.

Text Books:

1. Design of concrete bridges MC aswanin VN Vazrani, MM Ratwani, Khanna publishers.
2. Design of Bridges – N.Krishna Raju – Oxford & IBH.

Reference Books:

1. BRowe, R.E., Concrete Bridge Design, C.R.Books Ltd., London.
2. Essentials of bridges engineering – D.Hohnson Victor oxford & IBH publishers co-Private Ltd..

Web References:

1. https://nptel.ac.in/syllabus/105999906/
2. https://nptel.ac.in/syllabus/105999906/

E-Text Books:

1. https://books.google.co.in/books?isbn=8120417410
2. https://books.google.co.in/books?isbn=8120403444

Outcomes:

At the end of the course students able to

1. Know different loading conditions and design of box culvert
2. Design T-bridges and slab bridges
3. Know about different bridge bearings and prestressed bridge decks
4. Understand the stability of piers

PREFABRICATED STRUCTURES
(Elective – II)

M.Tech I Semester: Structural Engineering								
Course code	**Category**	**Hours/week**			**Credits**	**Maximum Marks**		
18ST108	**Core**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**TOTAL**
		4	0	0	4	40	60	100
Contact Classes:60	**Tutorial Classes: 5**		**Practical Classes: Nil**			**Total Classes:80**		

OBJECTIVES:

The course should enable the students to:

1. To know general civil engineering requirements for prefabricated structures.
2. To know about prefabricated reinforced concrete components of structures.
3. To know about prefabricated wall panels and shear walls.
4. Basics of Industrial buildings and shell roofs

UNIT-I — **Classes:12**

DESIGN PRINCIPLES: General Civil Engineering requirements, specific requirements for planning and layout of prefabrication plant. IS Code specifications, Modular co-ordination, standardization, Disuniting of Prefabricates, production, transportation, erection, stages of loading and code provisions, safety factors, material properties, Deflection control, Lateral load resistance, Location and types of shear walls.

UNIT-II — **Classes:12**

REINFORCED CONCRETE: Prefabricated structures - Long wall and cross wall, large panel buildings, one way and two way prefabricated slabs, Framed buildings with partial and curtain walls, Connections – Beam to column and column to column

UNIT-III — **Classes:12**

WALLS: Types of wall panels, Blocks and large panels, Curtain, Partition and load bearing walls, load transfer from floor to wall panels, vertical loads, Eccentricity and stability of wall panels, design curves, types of wall joints, their behavior and design, Leak prevention, joint sealants, sandwich wall panels, approximate design of shear walls.

UNIT-IV — **Classes:12**

INDUSTRIAL BUILDINGS AND SHELL ROOFS: Components of single-storey industrial sheds with crane gantry systems, R.C. Roof Trusses, Roof Panels, corbels and columns, wind bracing design. Cylindrical, Folded plate and hyper-prefabricated shells, Erection and jointing, joint design, hand book based design.

UNIT-V — **Classes:12**

HANDLING AND ERECTION STRESSES: Application of pre stressing of roof members, Floor systems, Two way load bearing slabs, Wall panels Dimensioning and detailing of joints for different structural connections, Construction and expansion joints

Text Books:

1. Koncz.T., Manual of Precast Concrete Construction, Vol.I II and III & IV Bauverlag, GMBH, 1971..
2. Laszlo Mokk, Prefabricated Concrete for Industrial and Public Structures, Akademiai Kiado, Budapest, 2007.

Reference Books:

1. Lewicki.B, Building with Large Prefabricates, Elsevier Publishing Company, Amsterdam/ London/New York, 1998.
2. Dr.R.Ganweshan, Prefabricated structures,Sri kamalamani publications

Web References:

1. www.mathplanet.com
2. www.mathworld.com

E-Text Books:

1. https://books.google.co.in/books?isbn=1118587359
2. https://books.google.co.in/books?isbn=1498724000

Outcomes:

At the end of the course students able to

1. know general civil engineering requirements for prefabricated structures
2. know about prefabricated reinforced concrete components of structures
3. know about prefabricated wall panels and shear walls
4. Learn Industrial buildings and shell roofs

RESEARCH METHODOLOGY AND IPR

M.Tech I Semester: Common to all Branches								
Course code	**Category**	**Hours/week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CIA**	**SEE**	**TOTAL**
18AS101	**Core**	4	0	0	4	40	60	100
Contact Classes:60	**Tutorial Classes: -**	**Practical Classes: Nil**			**Total Classes:60**			

OBJECTIVES:

The course should enable the students to:

1. Understand research problem formulation.
2. Analyze research related information
3. Follow research ethics
4. Understand that today's world is controlled by computer, Information Technology, but tomorrow world will be ruled by ideas, concept, and creativity.
5. Understanding that when IPR would take such important place in growth of individuals & nation, it is needless to emphasis the need of information about Intellectual Property Right to be promoted among students in general & engineering in particular.
6. Understand the IOR protection provides an incentive to inventors for further research work and investment in R&D, which leads to creation of new and better products, and in turn brings about, economic growth and social benefits.

UNIT-I — **Classes:12**

Research Methodology:

Meaning of research, Objectives of Research, Motivation in Research, Types of Research, Research Approaches, Significance of Research, Research Methods versus Methodology, Research and Scientific Method, Importance of Knowledge how Research is done, Research Process, Criteria of Good Research, Problems Encountered by Researchers in India.

Research Design:

Meaning of Research Design, Need for Research Design, Features of Good Design, Important concepts relating to Research Design, Different Research Designs, Basic principles of experimental designs.

UNIT-II — **Classes:12**

Methods of Data Collection:

Collection of Primary Data, Observation Method, Interview Method, Collection of Data through Questionnaires, Collection of Data through Schedules, Difference between Questionnaires and Schedules, Some other methods of data collection, Collection of secondary data, Selection of appropriate method for data collection, Case study method.

UNIT-III — **Classes:12**

Testing of Hypotheses:

What is a Hypothesis, Basic concepts concerning testing of hypothesis, Procedure for hypothesis testing, Flow diagram for hypothesis testing, Measuring the power of a hypothesis test, Tests of hypotheses, Importance of Parametric Tests, Hypothesis testing of means, Hypothesis testing for differences between means, Hypothesis testing for comparing two related samples, Hypothesis testing of proportions, Hypothesis testing for difference between proportions, Hypothesis testing for comparing a variance some hypothesized population variance, Testing and equality of variances of two normal populations, Hypothesis testing of correlation coefficients, Limitations of the tests of Hypotheses.

UNIT-IV	Classes:12

Interpretation and Report Writing:

Meaning of Interpretation, Why Interpretation?, Technique of Interpretation, Precaution in Interpretation, Significance of Report Writing, Different steps in writing report, Layout of the Research Project, Types of reports, Oral presentation, Mechanics of writing a research report, Precautions for writing research reports.

UNIT-V	Classes:12

Intellectual Property Rights:

Module I- Introduction

1) Intellectual property: meaning, nature and significance
2) Various forms of intellectual properties: copyright, patent, trademark, design, geographical indication, semiconductor and plant variety
3) Major international instruments relating to the protection of intellectual properties

Module II- Copyright

1) Copyright: meaning ,scope
2) Subject matter of copyright: original literary, dramatic, musical, artistic works; cinematograph films and sound recordings
3) Ownership of copyright , Assignment and licence of copyright
4) Infringement and exceptions of infringement of copyright and remedies against infringment of copyright: civil, criminal and administrative.

Module III – Trade Marks

1. Trade mark: meaning,scope
2. Absolute and relative grounds of refusal
3. Doctrine of honest concurrent user
4. Procedure for registration and term of protection
5. Rights of holder and assignment and licensing of marks
6. Infringement and remedies
7. Trade marks registry and appellate board

Module IV- Patents

1. Patent: meaning
2. Criteria for patentability and non-patentable inventions
3. Procedure for registration and term of protection
4. Grants of patent, rights of patentee and revocation of patent
5. Compulsory licence and government use of patent
6. Infringement, exceptions to infringement of patent and remedies
7. Patent office and Appellate Board

Text Books

1. Kothari. C.R, 1990,"Research methodology: Methods and Techniques. New Age International, 418P
2. Wayne Goddard and Stuart Melville, "Research Methodology: An Introduction"
3. Ranjit Kumar, 2nd Edition, "Research Methodology: A step by Step Guide for beginers"

Reference Books:

1. Halbert, "Resisting Intellectual Property", Taylor & Francis Ltd. 2007
2. Mayall, "Industrial Design", McGraw Hill, 1974.
3. Niebel, "Product Design", McGraw Hill, 1974.
4. Asimov, "Introduction to Design", Prentice Hall, 1962.
5. Robert P.Merges, Peter S. Menell, Mark A. Lemley, " Intellectual Property in New Technological Age", 2016.
6. T.Ramappa, "Intellectual Property Rights Under WTO", S.Chand, 2008

CONCRETE TECHNOLOGY LABORATORY - I

M.Tech I Semester – Structural Engineering								
Course Code	**Category**	**Hours / Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
18ST110	**Core**	-	-	4	2	25	50	75
Contact Classes: Nil	**Tutorial Classes: Nil**	**Practical Classes: 36**			**Total Classes: 36**			

OBJECTIVES:

The course should enable the students to:

1. Do compressive strength on hardened concrete
2. Design mix for high strength concrete
3. Do flexure test on RCC beams

LIST OF EXPERIMENTS

Expt. 1

Workability test on concrete.
- (a) Slump Test
- (b) Compaction Factor Test
- (c)Vee-Bee Test

Expt. 2

Flakiness test

Expt. 3

Elongation Test.

Expt. 4

Specific gravity of
- (a) Cement
- (b) Fine aggregate
- (c) Coarse aggregate

Expt. 5

Bulk density of
- (a) Fine aggregate.
- (b) Coarse aggregate

Expt. 6

Fineness Modulus of
- (a) Fine aggregate
- (b) Coarse aggregate

Expt. 7

Compressive strength of Cement.

Expt. 8

Mix Design of Concrete and Casting of Specimen

Expt. 9
Young's Modulus of Concrete
Reference Books:
1. MS. Shetty, Concrete Technology – Theory and practice, S.Chand and company, New Delhi..
Web References:
1. http://www.atri.edu.in/images/pdf/departments/CT%20Lab%20Manual.pdf 2. https://nptel.ac.in/courses/105102012/
Course Home Page
SOFTWARE AND HARDWARE REQUIREMENTS FOR A BATCH OF 18 STUDENTS: **SOFTWARE:**NIL **HARDWARE:** Slump cone test, vee-bee consistometer, flakiness, elongation trays, trowels, compacting rod
Course Outcome: **At the end of the course student will be able to:** 1.Test compressive strength of hardened concrete by NDT methods 2. Accelerated curing test on concrete 3.do permeability test on concrete 4.test flexural strength of concrete

COMPUTATIONAL LABORATORY

M.Tech I Semester – Structural Engineering								
Course Code	**Category**	**Hours / Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
18ST111	**Core**	-	-	4	2	25	50	75
Contact Classes: Nil	**Tutorial Classes: Nil**		**Practical Classes: 36**			**Total Classes: 36**		

OBJECTIVES:

The course should enable the students to:

1. Design beams and slabs using STAAD.Pro
2. Design footings using STAAD.Pro
3. Design multistoreyed building using STAAD.Pro

LIST OF EXPERIMENTS

Expt. 1

Analysis and Design of Singly reinforced concrete beam

Expt. 2

Analysis and Design of Doubly reinforced concrete beam

Expt. 3

Analysis and Design of One way slab

Expt. 4

Analysis and Design of Two way slab

Expt. 5

Analysis and Design of Trusses

Expt. 6

Analysis and Design of Isolated footing

Expt. 7

Analysis and Design of Combined Footing

Expt. 8

Analysis and Analysis of 3-D Frames

Reference Books:

1. Sham ticoo, Learning bently staad.pro for structural analysis

Web References:

1. https://www.pinterest.com/pin/470204017329831369/

Course Home Page:

SOFTWARE AND HARDWARE REQUIREMENTS FOR A BATCH OF 18 STUDENTS:

SOFTWARE: STAAD.Pro v8i

Course Outcome:

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

1. Analyse and design singly and doubly reinforced beams
2. Analyse and design slabs and footings
3. Analyse multistoreyed building

FINITE ELEMENT METHODS

M.Tech II Semester: Structural Engineering								
Course code	**Category**	**Hours/week**			**Credits**	**Maximum Marks**		
18ST201	**Core**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**TOTAL**
		4	0	0	4	40	60	100
Contact Classes:60	**Tutorial Classes: -**		**Practical Classes:**			**Total Classes:60**		

OBJECTIVES:

The course should enable the students to:

1. To know the basic concept of FEM and axi semmetric loading.
2. To formulate stiffness matrix for bar and beam elements
3. To Generate element stiffness and nodal load matrices
4. Formulation of hexahedral and isoparametric solid element

UNIT-I — **Classes:12**

INTRODUCTION: Concepts of FEM**,** steps involved merits &demerits**,** energy principles, Discretization, Rayleigh-Ritz method of functional approximation.

ELASTIC FORMULATIONS: Stress equations-strain displacement relationships in matrix form-plane stress, plane strain and Axi-symmetric bodies of revolution with axi symmetric loading.

UNIT-II — **Classes:12**

ONE DIMENSIONAL FEM: Stiffness Matrix for Beam and Bar elements shape functions for ID elements, static condensation of global stiffness matrix-solution –Initial strain and temperature effects.

ISOPARAMETRIC FORMULATION: Concept, Different isoparametric elements for2d analysis, Formulation of 4-noded and 8-noded isoparametric quadrilateral elements, Lagrangian elements-serendipity elements.

UNIT-III — **Classes:12**

TWO DIMENSIONAL FEM: Different types of elements for plane stress and plane strain analysis, Displacement models, generalized coordinate, shape functions, convergent and compatibility requirements, Geometric Invariance, Natural coordinate system-area and volume coordinates-Generation of element stiffness and nodal load matrices , static condensation.

UNIT-IV — **Classes:12**

AXI SYMMETRIC ANALYSIS: Bodies of revolution-axi symmetric modeling**,** strain displacement relationship-formulation of axi symmetric element.

UNIT-V — **Classes:12**

THREE DIMENSIONAL FEM: Different 3-D elements, 3D strain**,** displacement relationship- formulation of hexahedral and isoparametric solid element.

Text Books:

1. Finite element analysis -Theory & programming by G.S.Krishna murthy.
2. Finite element methods by P.Seshu..

Reference Books:

1. Hinton and Owen, Finite Element Programming, Academic Press, London.
2. Gallagher R.H., & Wilson Finite Element Analysis Fundamentals, Prentice Hall Inc.,.

Web References:

1. https://lecturenotes.in/subject/201/finite-element-methods-fem
2. https://nptel.ac.in/courses/112104116/

E-Text Books:

1. https://books.google.co.in/books?isbn=8131724646
2. https://books.google.co.in/books?isbn=097900490X

Outcomes:

At the end of the course students able to

1. know the basic concept of FEM and axi semmetric loading
2. formulate stiffness matrix for bar and beam elements
3. Generate element stiffness and nodal load matrices
4. Formulate hexahedral and isoparametric solid element

STRUCTURAL DYNAMICS

M.Tech II Semester: Structural Engineering								
Course code	**Category**	**Hours/week**			**Credits**	**Maximum Marks**		
18ST202	**Core**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**TOTAL**
		4	0	0	4	40	60	100
Contact Classes:60	**Tutorial Classes: -**	**Practical Classes: Nil**			**Total Classes:60**			

OBJECTIVES:

The course should enable the students to:

1. To have basic knowledge of SDOF,MDOF and formulation of equations of motion
2. To know about SDOF and MDOF.
3. IS method of analysis of structures
4. Analysis of undamped free shapes of simple beams with different end conditions

UNIT-I — **Classes:12**

THEORY OF VIBRATIONS: Introduction**,** Elements of a vibratory system**,** degrees of freedom, continuous systems, lumped mass idealization, Oscillatory motion –Simple harmonic motion, pictorial representation of S.H.M , free vibrations of single degree of Freedom (SDOF) systems, Undamped and Damped –Critical damping, Logarithmic decrement, Forced vibrations of SDOF systems, Harmonic excitation, Dynamic magnification factor- Bandwidth

INTRODUCTION TO STRUCTURAL DYNAMICS: Fundamental objective of dynamic analysis, Types of prescribed loading- Methods of discretization- Formulation of the equations of motion.

UNIT-II — **Classes:12**

SINGLE DEGREE OF FREEDOM SYSTEM: Formulation and solutions of the equation of motion, free Vibration response, response to harmonic, periodic, Impulsive and general Dynamic loading, Duhamel integral.

MULTI DEGREE OF FREEDOM SYSTEM: selection of the degree of freedom**,** Evaluation of structural property matrices, Formulation of the MDOF equations of motion, Undamped free vibrations, Solution of Eigen value problem for natural frequencies and mode shapes, Analysis of dynamic response, Normal coordinates, Uncoupled equations of motion, Orthogonal properties of normal modes-mode superposition procedure

UNIT-III — **Classes:12**

PRACTICAL VIBRATION ANALYSIS: Stodola method, Fundamental model analysis – analysis of second and higher modes, Holzer‟s method –basic procedure – transfer matrix procedure

UNIT-IV — **Classes:12**

INTRODUCTION TO EARTHQUAKE ANALYSIS: Introduction Response spectrum, Excitation by rigid base translation, Lumped mass approach -SDOF and MDOF system, I.S code methods of analysis.

UNIT-V — **Classes:12**

CONTINUOUS SYSTEM: Introduction**,** Flexural vibrations of beams, Elementary case-Equation of motion, Analysis of undamped free shapes of simple beams with different end conditions, principles of application to continuous beams.

Text Books:

1. Dynamics of structures by Clough & Penziem.
2. A.K.Chopra, “Structural Dynamics for Earthquake Engineering”,Prentice Hall.

Reference Books:

1. I.S:1893(latest)“ code of practice for earthquakes resistant design of stuctures.
2. Anderson R.A fundamentals of vibration, Amerind Pulblishing Co.

Web References:

1. https://nptel.ac.in/courses/105101006/
2. https://lecturenotes.in/subject/522/structural-dynamics-sd

E-Text Books:

1. https://books.google.co.in/books?isbn=1139499920
2. https://books.google.co.in/books?id=M0JHAQAAIAAJ

Outcomes:

At the end of the course students able to

1. Have basic knowledge of SDOF,MDOF and formulation of equations of motion
2. Know about SDOF and MDOF
3. Analyse structure by IS method
4. Analyse of undamped free shapes of simple beams with different end conditions

ADVANCED STEEL DESIGN
(Elective – III)

M.Tech II Semester: Structural Engineering								
Course code	**Category**	**Hours/week**			**Credits**	**Maximum Marks**		
18ST203	**Core**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**TOTAL**
		4	0	0	4	40	60	100
Contact Classes:60	**Tutorial Classes: -**	**Practical Classes: Nil**			**Total Classes:60**			

OBJECTIVES:

The course should enable the students to:

1. General principle in the design of steel structures
2. Know various types of connections.
3. Learn the loads on steel transmission line towers
4. Know plastic method of structural analysis

UNIT-I	**Classes:12**

GENERAL: Beams subjected to biaxial bending, Built-up Purlins, Various types and design, Design of Wind girders, Beam-columns, With various support conditions, Design of foundations, with lateral forces

UNIT-II	**Classes:12**

CONNECTIONS: Bearing type joints, Unstiffened and stiffened seat connections, moment resisting connection of brackets-bolted and welded, semi-rigid connections

UNIT-III	**Classes:12**

TOWERS: Basic structural configurations, free standing and guyed towers, loads on towers, wind loads, foundation design, design criteria for different configurations and transmission line towers

UNIT-IV	**Classes:12**

PLASTIC ANALYSIS: Theory of plastic bending, Plastic hinge concept, Mechanism method Application to continuous beams and portal frames, Plastic moment distribution, Analysis of Gable frames, instantaneous centre of rotation Connections.

UNIT-V	**Classes:12**

INDUSTRIAL BUILDINGS: Industrial buildings, braced and unbraced, Gable frames with gantry, Rigid industrial frames, Fire resistant design, Fatigue resistant design.

Text Books:

1. N.Subramanian, "Design of Steel Structures: Theory and Practice", Oxford university Press, U.S.A, Third Edition, 2011.
2. Duggal.S.K, "Design of Steel Structures", McGraw Hill New Delhi, 2010.

Reference Books:

1. Dayaratnam P. "Design of Steel Structures," S. Chand Limited, New Delhi. 2008.
2. Neal. B.G., "Plastic Method of Structural Analysis",Taylor & Francis,Third Edition, 1985.

Web References:

1. http://web.iitd.ac.in/~matsagar/QIP-CEPsteel2012.pdf
2. https://civilread.com/download-design-steel-structures-text-book/

E-Text Books:

1. https://books.google.co.in/books?id=-l-3AAAAIAAJ
2. https://books.google.co.in/books?isbn=8170080932

Outcomes:

At the end of the course students able to

1. Know the general principle in the design of steel structures
2. Know Various types of connections
3. Know Steel transmission line towers
4. Know Plastic method of structural analysis

EARTHQUAKE RESISTANT STRUCTURES
(Elective – III)

M.Tech II Semester: Structural Engineering								
Course code	**Category**	**Hours/week**			**Credits**	**Maximum Marks**		
18ST204	**Core**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**TOTAL**
		4	0	0	4	40	60	100
Contact Classes:60	**Tutorial Classes: -**	**Practical Classes: Nil**			**Total Classes:60**			

OBJECTIVES:

The course should enable the students to:

1. To know basics of seismology and vibration of structure
2. To know design approaches
3. To design earthquake resistant structures
4. To learn fundamentals of seismic planning.

UNIT-I — **Classes:12**

ENGINEERING SEISMOLOGY :

Earthquake, Causes of earthquake, earthquakes and seismic waves, scale and intensity of earthquakes, seismic activity, Measurements of earth quakes, Seismometer, strong motion accelerograph / field observation of ground motion-Parameters – analysis of earthquakes waves, earth quake motion, amplification of characteristics of surface layers, earthquake motion on the ground surface.

UNIT-II — **Classes:12**

VIBRATION OF STRUCTURES UNDER GROUND MOTION:

Elastic vibration of simple structures, modelling of structures and equations of motion, freevibrations of simple structures, steady state forced vibrations, Response spectrum representations; Relation between the nature of the ground motion and structural damage.

DESIGN APPROACHES: Methods of analysis**,** selection of analysis**,** equivalent lateral force procedure seismic base shear, seismic design co-efficient, vertical distribution of seismic forces and horizontal shear, twisting moment, Overturning moment, vertical seismic load and orthogonal effects lateral deflection, P- Δ characteristics effect, soil structure Interaction

UNIT-III — **Classes:12**

EARTHQUAKE RECORDS FOR DESIGN: Factors affecting Accelerogram characteristics, artificial Accelerogram, zoning map.

DYNAMIC ANALYSIS PROCEDURE: Model analysis, Inelastic – time history analysis Evaluation of the result

UNIT-IV — **Classes:12**

EARTHQUAKE – RESISTANT DESIGN OF STRUCTURAL COMPONENTS AND SYSTEMS: Introduction, monolithic reinforced , concrete structures, precast concrete structures, Prestressed concrete structures, steel structures, composite structures, masonry structures , Timber structures.

UNIT-V — **Classes:12**

FUNDAMENTALS OF SEISMIC PLANNING: Selection of materials and types of construction form of superstructure, framing systems and seismic units, devices for reducing. Earthquake loads.

Text Books:

1. Design of earthquake resistant structures by Minoru Wakabayashi.
2. R.W.Clough and Penzium, Dynamics of structures". Mc Graw – Hill, 2nd edition.

Reference Books:

1. I.S.Codes No. 1893,4326,13920
2. N.M Newmark and E.Rosenblueth, "Fundamentals of Earthquake Engineering" prentice hall.

Web References:

1. https://www.slideshare.net/vikskyn/earthquake-resistant-structure
2. https://sjce.ac.in/wp-content/uploads/2018/01/EQ4-Earthquake-Resistant.pdf

E-Text Books:

1. https://books.google.co.in/books?isbn=8120328922
2. https://books.google.co.in/books?isbn=0080949444

Outcomes:

At the end of the course students able to

1. Know basics of seismology and vibration of structure
2. Know design approaches
3. Design earthquake resistant structures
4. Know fundamentals of seismic planning

DESIGN OF HIGH RISE STRUCTURES
(Elective – III)

M.Tech I Semester: Structural Engineering								
Course code	**Category**	**Hours/week**			**Credits**	**Maximum Marks**		
18ST205	**Core**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**TOTAL**
		4	0	0	4	40	60	100
Contact Classes:60	**Tutorial Classes: -**	**Practical Classes: Nil**			**Total Classes:60**			

OBJECTIVES:

The course should enable the students to:

1. To introduce various systems of tall buildings
2. To know about different types of loads, materials and design philosophy
3. Various structural systems with their behaviour are introduced
4. To impart knowledge about static, dynamic and stability analysis of various systems

UNIT-I — **Classes:12**

INTRODUCTION: Design Philosophy - History - advantages and disadvantages - Vertical city concepts - essential amenities - fire safety - water supply - drainage and garbage disposal - service systems - structural and foundation systems. Factors affecting height, growth and form - Human comfort criteria.

UNIT-II — **Classes:12**

LOADS AND MATERIALS: Gravity loading - Dead and Live load - calculation - Impact and construction loads. Wind loading - static and dynamic approach - Analytical and wind tunnel experimental method. Earthquake loading - Equivalent lateral force, Modal analysis - combination of loading in various design philosophies. Materials for tall buildings - High strength concrete - Light weight concrete - Fibre reinforced concrete Composite Materials.

UNIT-III — **Classes:12**

STRUCTURAL SYSTEMS: Behavior of High Rise structures - Different system for load distribution in steel and concrete - Vertical and horizontal load resistant systems - Rigid frames - braced frames - infilled frames - shear walls - wall frames - tubular systems - outrigger braced systems - Mega systems.

UNIT-IV — **Classes:12**

ANALYSIS AND DESIGN: Analysis and Design principles of various horizontal load transfer systems - approximate methods - Modelling for accurate analysis - 3D analysis - Member forces - displacements. Analysis for various secondary effects - Creep, shrinkage and temperature. Stability Analysis - Overall buckling analysis of frames, wall frames, approximate methods, second order effects of gravity loading, P - effect and various methods of analysis - influence of foundation instability, out of plumb effects - Elastic Deformations. Dynamic Analysis - Principles of design of tall braced frames for earthquake and blast resistant design

UNIT-V — **Classes:12**

STABILITY OF TALL BUILDINGS: Overall buckling analysis of frames, wall-frames, Approximate methods, second order effects of gravity of loading, P-Delta analysis, simultaneous first-order and P-Delta analysis, Translational, Torsional instability, out of plumb effects, stiffness of member in stability, effect of foundation rotation.

Text Books:

1. Schuller.W.G., "High Rise Building Structures", John Wiley & sons, 1977.
2. Lynn.S. Beedle, "Advances in Tall Buildings", CBS Publishers and Distributors, New Delhi, 1996.

Reference Books:

1. Taranath .B.S., "Structural Analysis and Design of Tall Buildings", Mc Graw Hill Co. 1988.
2. Gupta.Y.P.,(Editor), “Proceedings of National Seminar on High Rise Structures - Design and Construction Practices for Middle Level Cities”, New Age International Limited, New Delhi,1995.

Web References:

1. http://www.byggmek.lth.se/fileadmin/byggnadsmekanik/publications/tvsm5000/web5213.pdf
2. http://www.byggmek.lth.se/fileadmin/byggnadsmekanik/publications/tvsm5000/web5210.pdf

E-Text Books:

1. https://books.google.co.in/books?isbn=3639272862
2. https://books.google.co.in/books?id=zIBSAAAAMAAJ

Outcomes:

At the end of the course students able to

1. Know various systems of tall buildings
2. know about different types of loads, materials and design philosophy
3. Know Various structural systems with their behaviour are introduced
4. Impart knowledge about static, dynamic and stability analysis of various systems

DESIGN OF ADVANCED CONCRETE STRUCTURES
(Elective – IV)

M.Tech II Semester: Structural Engineering								
Course code	**Category**	**Hours/week**			**Credits**	**Maximum Marks**		
18ST206	**Core**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**TOTAL**
		4	0	0	4	40	60	100
Contact Classes:60	**Tutorial Classes: -**	**Practical Classes: Nil**			**Total Classes:60**			

OBJECTIVES:

The course should enable the students to:

1. Design of concrete members subjected to torsion, flexure and shear
2. Design of special RC structures like RC walls, corbels, shear walls.
3. To know detailing of structures
4. To know moment redistribution in continuous beams

UNIT-I — **Classes:12**

INTRODUCTION: Review of Basic Concepts - Behavior and Design of Reinforced Concrete members considering flexure, Torsion, combined with flexure and flexural shear, axial compression deflection and crack width as per IS:456-2000, Comparative study with BS 8110 and ACI - 318

UNIT-II — **Classes:12**

DESIGN OF SPECIAL R.C. ELEMENTS: Behavior and Design of Slender Columns - Design of R.C.Walls - Ordinary and Shear walls - Design of Corbels - Deep beams and grid floors

UNIT-III — **Classes:12**

FLAT SLABS AND FLAT PLATES: Design of flat slabs and flat plate - According to ACI method - Design of shear - Reinforcement and Edge (Spandrel) beams - yield line theory & Hiller borg method of design of slabs

UNIT-IV — **Classes:12**

DESIGN AND DETAILING OF STRUCTURES: Detailing for ductility - Fire Resistance of buildings - Field control of concrete - Strengthening of existing structures - Design and detailing of structures according to different codes.

UNIT-V — **Classes:12**

DESIGN OF SPECIAL R.C. ELEMENTS: Limit Analysis of Concrete beams - moment - rotation curves - moment redistribution in continuous beams - Baker's method of plastic design - Design of cast in - situ frames.

Text Books:

1. Varghese.P.C., "Advanced Reinforced Concrete Design", Prentice Hall of India, Second Edition, 2009.
2. Pillai.S.V and Menon.D, "Reinforced Concrete Design", Tata McGraw Hill Book Co. first Edition, 2002.

Reference Books:

1. Purushothaman.P. "Reinforced Concrete Structural Elements", Behaviour, Analysis and Design. Tata Mc Graw Hill 1986.
2. Park.R & Paulay.T, "Reinforced Concrete Structures", John Wiley and Sons, 1975.

Web References:

1. https://lecturenotes.in/subject/179/design-of-advanced-concrete-structures-dacs
2. https://lecturenotes.in/download/note/3246?utm_source=material-page&utm_medium=web&utm_campaign=download-page

E-Text Books:

1. https://books.google.co.in/books?isbn=812032787X
2. https://books.google.co.in/books?isbn=1420088920

Outcomes:

At the end of the course students able to

1. Design of concrete members subjected to torsion, flexure and shear
2. Design of special RC structures like RC walls, corbels, shear walls
3. Know detailing of structures
4. Know moment redistribution in continuous beams

DESIGN OF INDUSTRIAL STRUCTURES
(Elective – IV)

M.Tech II Semester: Structural Engineering								
Course code	**Category**	**Hours/week**			**Credits**	**Maximum Marks**		
18ST207	**Core**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**TOTAL**
		4	0	0	4	40	60	100
Contact Classes:60	**Tutorial Classes: -**	**Practical Classes: Nil**			**Total Classes:60**			

OBJECTIVES:

The course should enable the students to:

1. To know the requirements of various industries.
2. To get an idea about the materials used and planning.
3. To know the construction techniques
4. To understood the functional requirements.

UNIT-I	**Classes:12**

General-Specific requirements for industries like textile, sugar, cement, chemical, etc - Site layout and external facilities. Planning of Building Work – Standards - Structural materials including plastics – Polymers - Fibre glass - Pressed card boards, etc

UNIT-II	**Classes:12**

Multi-storey buildings - Steel skeletal structures - Reinforced concrete frames – Workshops - Ware houses - Single storey buildings - Sheds in steel and reinforced concrete - North-lights - Single span spherical and other special constructions

UNIT-III	**Classes:12**

Cooling towers and chimneys - Bunkers and silos' prefabrication - Construction. Construction Techniques - Expansion joints - Machine foundations - Other foundations - Water proofing - Roofs and roofing - Roof drainage - Floors and flooring joists - Curtain walling - Outer wall facing - Sound and shock proof mountings - Use of modern hoisting and other construction equipments

UNIT-IV	**Classes:12**

Circulation - Communication and Transport - Fixed points (central cores) – Staircases - Grid floor sections - Lifts refuse disposals - Utilization of waste materials – Cranes - Continuous conveyors - Mobile cranes – Transporters – Doors - Sliding gates

UNIT-V	**Classes:12**

Functional requirements- lighting: Natural lighting - Protection from the sun - sly lights - window cleaning installations -Services: Layout – wiring – fixtures - cable and pipe bridges - electrical installations - lighting substation - Effluent. Ventilation and fire protection: Ventilation - Air-conditioning - Fire escapes and chutes - Fire alarms - Extinguishers and hydrants.

Text Books:

1. Dunham, (2002), Planning of industrial structures, Tata McGraw Hill.
2. Water Henn, (1998), Buildings for industry, John Wiley and Sons.

Reference Books:

1. Glover, (1997), Structural Pre cast Concrete, Tata McGraw Hill.
2. Design of industrial structures, Mohamed AL reedy

Web References:

1. https://nptel.ac.in/courses/105106113/3
2. https://www.outsource2india.com/structural-design/industrial-structures-design-analysis-services.asp

E-Text Books:

1. https://books.google.co.in/books?isbn=143981600X
2. https://books.google.co.in/books?isbn=3319908324

Outcomes:

At the end of the course students able to

1. Know the requirements of various industries.
2. Get an idea about the materials used and planning.
3. Know the construction techniques
4. Understood the functional requirements.

ADVANCED FOUNDATION ENGINEERING
(Elective – IV)

M.Tech II Semester: Structural Engineering								
Course code	**Category**	**Hours/week**			**Credits**	**Maximum Marks**		
18ST1208	**Core**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**TOTAL**
		4	0	0	4	40	60	100
Contact Classes:60	**Tutorial Classes: -**	**Practical Classes: Nil**			**Total Classes:60**			

OBJECTIVES:

The course should enable the students to:

1. To learn types of foundations and bearing capacities of shallow foundations.
2. To have knowledge about deep foundations
3. To know about well foundations and sheet piles
4. To learn about foundations on problematic soils

UNIT-I — **Classes:12**

SHALLOW FOUNDATIONS-I: General requirements of foundations. Types of shallow foundations and the factors governing the selection of type of shallow foundation. Bearing capacity of shallow foundations by Terzaghi's theory and Meyerho's theory (derivation of expressions and solution to problems based on these theories). Local shear and general shear failure and their identification

SHALLOW FOUNDATIONS-II: Bearing capacity of isolated footing subjected to eccentric and inclined loads. Bearing capacity of isolated footing resting on stratified soils-Butto's theory and Siva reddy analysis. Analysis and structural design of R.C.C isolated, combined and strap footings

UNIT-II — **Classes:12**

DEEP FOUNDATIONS-I: Pile foundations-types of pile foundations. Estimation of bearing capacity of pile foundation by dynamic and static formulae. Bearing capacity and settlement analysis of pile groups. Negative skin Friction, Pile load tests.

UNIT-III — **Classes:12**

DEEP FOUNDATIONS-II: Well foundations-Elements of well foundation. Forces acting on a well foundation. Depth and bearing capacity of well foundation. Design of individual components of well foundation (only forces acting and principles of design). Problems associated with well sinking

UNIT-IV — **Classes:12**

SHEET PILE WALLS: Cantilever sheet piles and anchored bulkheads, Earth Pressure diagram, Determination of depth of embedment in sands and clays-Timbering of trenches-Earth Pressure diagrams-forces in struts.

UNIT-V — **Classes:12**

FOUNDATIONS IN PROBLEMATIC SOILS: Foundations in black cotton soils, basic foundation problems associated with black cotton soils. Lime column techniques, principles and execution. Under reamed piles, principle of functioning of under reamed pile, Analysis and structural design of under reamed pile. Use of Cohesive Non Swelling (CNS) layer below shallow foundations

Text Books:

1. Geotechnical Engg – C.Venkatramaiah.
2. Foundation Design-Teng.

Reference Books:

1. Foundation Design and Construction-Tomlinson.
2. Analysis and Design of Foundations-J.E.Bowl.

Web References:

1. https://nptel.ac.in/courses/105108069/
2. https://nptel.ac.in/downloads/105108069/

E-Text Books:

1. https://books.google.co.in/books?isbn=1498796842
2. https://books.google.co.in/books?isbn=8123915063

Outcomes:

At the end of the course students able to

1. Know types of foundations and bearing capacities of shallow foundations
2. have knowledge about deep foundations
3. Understand about well foundations and sheet piles
4. Know about foundations on problematic soils

CONCRETE TECHNOLOGY LABORATORY - II

M.Tech II Semester – Structural Engineering

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
18ST209	Core	-	-	4	2	25	50	75
Contact Classes: Nil	Tutorial Classes: Nil	Practical Classes: 36				Total Classes: 36		

OBJECTIVES:

The course should enable the students to:

1. Do compressive strength on hardened concrete
2. Design mix for high strength concrete
3. Do flexure test on RCC beams

LIST OF EXPERIMENTS

Expt. 1

Accelerated curing test on Concrete cubes.

Expt. 2

Non destructive test on concrete

Expt. 3

Study of effect of dosage of super plasticizer on Strength and workability of concrete.

Expt. 4

Mix design of high strength concrete including casting and testing of specimens

Expt. 5

Mix design of fly ash concrete including casting and testing of specimens.

Expt. 6

Determination of coefficient of permeability of concrete.

Expt. 7

Determination of drying shrinkage of concrete.

Expt. 8

Bending test on a RCC beam under.

a) single point load
b) Three point load

Reference Books:

1. MS. Shetty, Concrete Technology – Theory and practice, S.Chand and company, New Delhi.

Web References:

1. http://www.atri.edu.in/images/pdf/departments/CT%20Lab%20Manual.pdf
2. https://nptel.ac.in/courses/105102012/

Course Home Page

SOFTWARE AND HARDWARE REQUIREMENTS FOR A BATCH OF 18 STUDENTS:

SOFTWARE:NIL

HARDWARE: Accelerated curing tank, cement. Fine aggregate, coarse aggregate, Super plasticizer, Cube moulds, NDT equipment, beam moulds, flexure testing equipment, trays, trowels, compacting rod

Course Outcome:

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

1. Test compressive strength of hardened concrete by NDT methods
2. Accelerated curing test on concrete
3. Do permeability test on concrete
4. Test flexural strength of concrete

STRUCTURAL ENGINEERING LABORATORY

M.Tech II Semester – Structural Engineering								
Course Code	**Category**	**Hours / Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
18ST210	**Core**	-	-	4	2	25	50	75
Contact Classes: Nil	**Tutorial Classes: Nil**	**Practical Classes: 36**				**Total Classes: 36**		

OBJECTIVES:

The course should enable the students to:

1. Analyse and design beams and slabs using STAAD.Pro and spread sheets
2. Analyse and design Columns using STAAD.Pro and spread sheets
3. Analyse and design footings using STAAD.Pro and spread sheets
4. Analyse Multistoried space frame, using STAAD Pro

LIST OF EXPERIMENTS

Expt. 1

Program for Design of Slabs using Excel and analysis by STAAD.Pro.

Expt. 2

Program for Design of Beams using Excel and analysis by STAAD.Pro.

Expt. 3

Program for Design of Columns using Excel and analysis by STAAD.Pro.

Expt. 4

Program for Design of Isolated Footings using Excel and analysis by STAAD.Pro

Expt. 5

Program for Design of Combined footings using Excel and analysis by STAAD Pro.

Expt. 6

Analysis of Multistoried space frame, using STAAD Pro.

Reference Books:

1. Varghese.P.C., "Advanced Reinforced Concrete Design", Prentice Hall of India, Second Edition, 2009.

Web References:
1. https://civilengineeringbible.com/files.php?i=17
Course Home Page
SOFTWARE AND HARDWARE REQUIREMENTS FOR A BATCH OF 18 STUDENTS: **SOFTWARE:** STAAD.Pro, Systems with MS office
Course Outcome: **At the end of the course student will be able to:** 1. Design beams and slabs 2. Design Columns 3. Design footings

TERM PAPER

M.Tech II Semester: Structural Engineering								
Course code	**Category**	**Hours/week**			**Credits**	**Maximum Marks**		
18ST211	**Core**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**TOTAL**
		0	0	4	2	50	-	50
Contact Classes: Nil	**Tutorial Classes: Nil**		**Practical Classes:20**			**Total Classes:20**		

The Term Paper is a self study report and shall be carried out either during II semester along with other lab courses. Every student will take up this term paper individually and submit a report. The scope of the term paper could be an exhaustive literature review choosing any engineering concept with reference to standard research papers or an extension of the concept of earlier course work in consultation with the term paper supervisor. The term paper reports submitted by the individual students during the II semester shall be evaluated for a total of 50 marks for continuous assessment; it shall be conducted by two Examiners, one of them being term paper supervisor as internal examiner and an external examiner nominated by the Principal from the panel of experts recommended by HOD.

INDUSTRIAL SAFETY
(Open Elective)

M.Tech III Semester: Structural Engineering								
Course code	**Category**	**Hours/week**			**Credits**	**Maximum Marks**		
18ST301	**Core**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**TOTAL**
		4	0	0	4	40	60	100
Contact Classes:60	**Tutorial Classes: -**	**Practical Classes: Nil**			**Total Classes:60**			

OBJECTIVES:

The course should enable the students to:

1. To know industrial safety measures
2. Know fundamentals of maintenance engineering
3. Learn about wear and corrosion and their preventive measures
4. About fault tracing in machines

UNIT-I	Classes:12

INDUSTRIAL SAFETY: Accident, causes, types, results and control, mechanical and electrical hazards, types, causes and preventive steps/procedure, describe salient points of factories act 1948 for health and safety, wash rooms, drinking water layouts, light, cleanliness, fire, guarding, pressure vessels, etc, Safety color codes. Fire prevention and firefighting, equipment and methods.

UNIT-II	Classes:12

FUNDAMENTALS OF MAINTENANCE ENGINEERING: Definition and aim of maintenance engineering, Primary and secondary functions and responsibility of maintenance department, Types of maintenance, Types and applications of tools used for maintenance, Maintenance cost & its relation with replacement economy, Service life of equipment.

UNIT-III	Classes:12

WEAR AND CORROSION AND THEIR PREVENTION: Wear- types, causes, effects, wear reduction methods, lubricants-types and applications, Lubrication methods, general sketch, working and applications, i. Screw down grease cup, ii. Pressure grease gun, iii. Splash lubrication, iv. Gravity lubrication, v. Wick feed lubrication vi. Side feed lubrication, vii. Ring lubrication, Definition, principle and factors affecting the corrosion. Types of corrosion, corrosion prevention methods

UNIT-IV	Classes:12

FAULT TRACING: Fault tracing, concept and importance, decision tree concept, need and applications, sequence of fault finding activities, show as decision tree, and draw decision tree for problems in machine tools, hydraulic, pneumatic, automotive, thermal and electrical equipment's like, i. Any one machine tool, ii. Pump iii. Air compressor, iv. Internal combustion engine, v. Boiler, vi. Electrical motors, Types of faults in machine tools and their general causes.

UNIT-V	Classes:12

PERIODIC AND PREVENTIVE MAINTENANCE: Periodic inspection-concept and need, degreasing, cleaning and repairing schemes, overhauling of mechanical components, overhauling of electrical motor, common troubles and remedies of electric motor, repair complexities and its use, definition, need, steps and advantages of preventive maintenance. Steps/procedure for periodic and preventive maintenance of: I. Machine tools, ii. Pumps, iii. Air compressors, iv. Diesel generating (DG) sets, Program and schedule of preventive maintenance of mechanical and electrical equipment, advantages of preventive maintenance. Repair cycle concept and importance

Text Books:

1. Maintenance Engineering Handbook, Higgins & Morrow, Da Information Services.

Reference Books:

1. Maintenance Engineering, H. P. Garg, S. Chand and Company

Web References:

1. https://lecturenotes.in/materials/14344-note-of-industrial-safety-engineering-by-rak-p-r
2. https://lecturenotes.in/download/material/14344-note-of-industrial-safety-engineering-by-rak-p-r

E-Text Books:

1. https://books.google.co.in/books?isbn=0888643942
2. https://books.google.co.in/books?isbn=1598888102

Outcomes:

At the end of the course students able to

1. Know industrial safety measures
2. Know fundamentals of maintenance engineering
3. Know about wear and corrosion and their preventive measures
4. Detect fault tracing in machines

COST MANAGEMENT OF ENGINEERING PROJECTS
(Open Elective)

M.Tech III Semester: Structural Engineering								
Course code	**Category**	**Hours/week**			**Credits**	**Maximum Marks**		
18ST302	**Core**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**TOTAL**
		4	0	0	4	40	60	100
Contact Classes:60	**Tutorial Classes: -**	**Practical Classes: Nil**			**Total Classes:60**			

OBJECTIVES:

The course should enable the students to:

1. To know cost concepts in decision-making
2. To know about project an its execution
3. Cost Behavior and Profit Planning Marginal Costing
4. Quantitative techniques for cost management

UNIT-I — **Classes:12**

Cost concepts in decision-making; Relevant cost, Differential cost, Incremental cost and Opportunity cost. Objectives of a Costing System; Inventory valuation; Creation of a Database for operational control; Provision of data for Decision-Making

UNIT-II — **Classes:12**

Project: meaning, Different types, why to manage, cost overruns centres, various stages of project execution: conception to commissioning. Project execution as conglomeration of technical and nontechnical activities. Detailed Engineering activities. Pre project execution main clearances and documents

UNIT-III — **Classes:12**

Project team: Role of each member. Importance Project site: Data required with significance. Project contracts. Types and contents. Project execution Project cost control. Bar charts and Network diagram. Project commissioning: mechanical and

UNIT-IV — **Classes:12**

Process Cost Behavior and Profit Planning Marginal Costing; Distinction between Marginal Costing and Absorption Costing; Break-even Analysis, Cost-Volume-Profit Analysis. Various decision-making problems. Standard Costing and Variance Analysis. Pricing strategies: Pareto Analysis. Target costing, Life Cycle Costing. Costing of service sector. Just-in-time approach, Material Requirement Planning, Enterprise Resource Planning, Total Quality Management

UNIT-V — **Classes:12**

Quantitative techniques for cost management, Linear Programming, PERT/CPM, Transportation problems, Assignment problems, Simulation, Learning Curve Theory

Text Books:

1. Cost Accounting A Managerial Emphasis, Prentice Hall of India, New Delhi
2. Charles T. Horngren and George Foster, Advanced Management Accounting

Reference Books:

1. Robert S Kaplan Anthony A. Alkinson, Management & Cost Accounting
2. Ashish K. Bhattacharya, Principles & Practices of Cost Accounting A. H. Wheeler publisher.

Web References:

1. https://www.designingbuildings.co.uk/wiki/Cost_control_in_building_design_and_construction

2. https://www.cmu.edu/cee/projects/PMbook/12_Cost_Control,_Monitoring,_and_Accounting.html

E-Text Books:

1. https://books.google.co.in/books?isbn=1118473809
2. https://books.google.co.in/books?isbn=1118473779

Outcomes:

At the end of the course students able to

1. To know cost concepts in decision-making
2. Know Cost Behavior and Profit Planning Marginal Costing
3. know about project an its execution
4. Know quantitative techniques for cost management

COMPOSITE MATERIALS
(Open Elective)

M.Tech III Semester: Structural Engineering								
Course code	**Category**	**Hours/week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CIA**	**SEE**	**TOTAL**
18ST303	Core	4	0	0	4	40	60	100
Contact Classes:60	**Tutorial Classes: -**	**Practical Classes: Nil**			**Total Classes:60**			

OBJECTIVES:

The course should enable the students to:

1. To learn basics of composite materials
2. To learn different types of fibres
3. To learn manufacturing of m metal matrix composites
4. To know about manufacturing of polymer matrix composites

UNIT-I — **Classes:12**

INTRODUCTION: Definition – Classification and characteristics of Composite materials. Advantages and application of composites. Functional requirements of reinforcement and matrix. Effect of reinforcement (size, shape, distribution, volume fraction) on overall composite performance.

UNIT-II — **Classes:12**

REINFORCEMENTS: Preparation-layup, curing, properties and applications of glass fibers, carbon fibers, Kevlar fibers and Boron fibers. Properties and applications of whiskers, particle reinforcements. Mechanical Behavior of composites: Rule of mixtures, Inverse rule of mixtures. Isostrain and Isostress conditions.

UNIT-III — **Classes:12**

MANUFACTURING OF METAL MATRIX COMPOSITES: Casting – Solid State diffusion technique, Cladding – Hot isostatic pressing. Properties and applications. Manufacturing of Ceramic Matrix Composites: Liquid Metal Infiltration – Liquid phase sintering. Manufacturing of Carbon – Carbon composites: Knitting, Braiding, Weaving. Properties and applications

UNIT-IV — **Classes:12**

MANUFACTURING OF POLYMER MATRIX COMPOSITES: Preparation of moulding compounds and prepregs – hand layup method – Autoclave method – Filament winding method – Compression moulding – Reaction injection moulding. Properties and applications

UNIT-V — **Classes:12**

STRENGTH: Laminar Failure Criteria-strength ratio, maximum stress criteria, maximum strain criteria, interacting failure criteria, hygrothermal failure. Laminate first play failure-insight strength; Laminate strength-ply discount truncated maximum strain criterion; strength design using caplet plots; stress concentrations

Text Books:

1. Material Science and Technology – Vol. 13 – Composites by R.W.Cahn – VCH, West Germany
2. Materials Science and Engineering, An introduction. WD Callister, Jr., Adapted by R. Balasubramaniam, John Wiley & Sons, NY, Indian edition, 2007

Reference Books:

1. Hand Book of Composite Materials-ed-Lubin.
2. Composite Materials – K.K.Chawla.

Web References:

1. https://nptel.ac.in/courses/101104010/
2. https://nptel.ac.in/downloads/101104010/

E-Text Books:

1. https://books.google.co.in/books?isbn=8173714770
2. https://books.google.co.in/books?isbn=1600860400

Outcomes:

At the end of the course students able to

1. Learn basics of composite materials
2. Learn different types of fibres
3. Learn manufacturing of m metal matrix composites
4. Know about manufacturing of polymer matrix composites

DESIGN OF PRESTRESSED CONCRETE STRUCTURES
(Elective – V)

M.Tech III Semester: Structural Engineering								
Course code	**Category**	**Hours/week**			**Credits**	**Maximum Marks**		
18ST304	**Core**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**TOTAL**
		4	0	0	4	40	60	100
Contact Classes:60	**Tutorial Classes: -**	**Practical Classes: Nil**			**Total Classes:60**			

OBJECTIVES:

The course should enable the students to:

1. To have basic knowledge about prestress concrete and types and losses of prestress
2. Learn Shear and bond stresses and bearing stresses.
3. Analysis of sections for flexure and deflection.
4. To learn about circular prestressing.

UNIT-I — **Classes:12**

INTRODUCTION: Development of prestressed concrete**,** Advantages and disadvantages of PSC over RCC, General principles of pre-stressing, pre tensioning and post tensioning, Materials used in PSC-high strength concrete, High tension steel, Different types /methods/systems of prestressing.

LOSSES OF PRESTRESS: Estimation of the loss of prestress due to various causes like elastic shortening of concrete, creep of concrete, shrinkage of concrete, relaxation of steel, slip in anchorage, friction etc.,

UNIT-II — **Classes:12**

SHEAR AND BOND: Shear in PSC beams**,** Principal stresses, Conventional elastic design for shear, transfer of prestress in pretensioned members-transmission length, Bond stresses

BEARING AND ANCHORAGE: Bearing at anchorage, Anchorage zone stresses in post-tensioned members, Analysis and design of end blocks by Guyon, Magnel and approximate methods, Anchorage zone reinforcements.

UNIT-III — **Classes:12**

FLEXURE: Analysis of sections for flexure in accordance with elastic theory, Allowable stresses, Design criteria as per I.S code of practice, Elastic design of Beams (rectangular, I and T sections) for Flexure, Introduction to partial prestressing.

DEFLECTIONS: Introduction, Factors influencing deflections-short term and longterm deflections of uncracked and cracked members

UNIT-IV — **Classes:12**

STATISTICALLY INDETERMINATE STRUCTURES: Introduction**,** advantages and disadvantages of continuity, Layouts for continuous beams-primary and secondary moments, Elastic analysis of continuous beams, Linear transformation-Concordant cable profile-Design of continuous beams.

UNIT-V — **Classes:12**

CIRCULAR PRESTRESSING: Introduction**,** Circumferential prestressing, Design of Prestressed concrete tanks, vertical prestressing in tanks, Dome prestressing.

Text Books:

1. Prestressed Concrete by S. Krishnam raju.
2. Edward P.Nawy, Prentise Hall – Prestressed Concrete.

Reference Books:

1. Prestressed Concrete – by Raj Gopalan.

2. Prestressed Concrete by S. Ramamrutham.

Web References:

1. https://nptel.ac.in/courses/105106117/
2. https://easyengineering.net/design-of-prestressed-concrete-structures-by-lin/

E-Text Books:

1. https://books.google.co.in/books?id=jP5RAAAAMAAJ
2. https://books.google.co.in/books?isbn=0471867241

Outcomes:

At the end of the course students able to

1. Calculate losses in prestressing concrete
2. Learn about Shear and bond stresses and bearing stresses
3. Analyse sections for flexure and deflection
4. Understand and design circular prestressing structures

ANALYSIS OF SHELLS AND FOLDED PLATES
(Elective-V)

M.Tech III Semester: Structural Engineering								
Course code	**Category**	**Hours/week**			**Credits**	**Maximum Marks**		
18ST305	**Core**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**TOTAL**
		4	0	0	4	40	60	100
Contact Classes:60	**Tutorial Classes: -**	**Practical Classes: Nil**			**Total Classes:60**			

OBJECTIVES:

The course should enable the students to:

1. To derive equations of equilibrium and DKJ equation for bending theory.
2. To derive equations of equilibrium of shells of double curvature
3. Derivation of equilibrium equations by membrane theory
4. Analysis of different types of folded plates

UNIT-I — **Classes:12**

EQUATIONS OF EQUILIBRIUM: Introduction, classification, derivation of stress resultants, Principles of membrane theory and bending theory.

UNIT-II — **Classes:12**

CYLINDRICAL SHELLS: Derivation of governing DKJ equation for bending theory, details of Schorer‟s theory, Applications to the analysis and design of short shells and long shells.

UNIT-III — **Classes:12**

INTRODUCTION TO SHELLS OF DOUBLE CURVATURE: (other than shells of revolution :) Geometry and analysis of elliptic paraboloid, rotational paraboloid and hyperbolic paraboloid shapes by membrane theory.

UNIT-IV — **Classes:12**

SHELLS OF DOUBLE CURVATURE-Surfaces of revolution .Derivation ofequilibrium equations by membrane theory, Applications to spherical shell and rotational Hyperboloid

UNIT-V — **Classes:12**

FOLDED PLATES: Folded plate theory, plate and slab action, Whitney‟s theory,Simpson‟s theory for the analysis of different types of folded plates (Design is not included)

Text Books:

1. Design and construction of concrete shell roofs by G.S. Rama Swamy – CBS Publishers & Distributors, 485, Jain Bhawan Bhola Nath Nagar, shahotra, Delhi..
2. N.k.Bairagi, Shell analysis, Khanna Publishers, Delhi..

Reference Books:

1. Billington, Ithin shell concrete structures, Mc Graw Hill Book company, New york, St. Louis, Sand Francisco, Toronto, London..

Web References:

1. https://www.scribd.com/document/232071008/Analysis-and-Design-of-Shells-and-Folded-Plates
2. https://www.ijser.org/researchpaper/Study-of-Fold-and-Folded-Plates-in-Structural-Engineering.pdf

E-Text Books:

1. https://books.google.co.in/books?isbn=9401712271
2. https://books.google.co.in/books?isbn=8120341112

Outcomes:

At the end of the course students able to

1. Derive equations of equilibrium and DKJ equation for bending theory

2. Derive equations of equilibrium of shells of double curvature\
3. Derive of equilibrium equations by membrane theory\
4. Analyse of different types of folded plates

AVAILABLE MOOCs
(Elective – V)

<table>
<tr><td colspan="9">M.Tech III Semester: Structural Engineering</td></tr>
<tr><td>Course code</td><td>Category</td><td colspan="3">Hours/week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">18ST306</td><td rowspan="2">Core</td><td>L</td><td>T</td><td>P</td><td>C</td><td>CIA</td><td>SEE</td><td>TOTAL</td></tr>
<tr><td>4</td><td>0</td><td>0</td><td>4</td><td>40</td><td>60</td><td>100</td></tr>
<tr><td colspan="2">Contact Classes:-</td><td colspan="3">Tutorial Classes: -</td><td colspan="2">Practical Classes: Nil</td><td colspan="2">Total Classes:-</td></tr>
<tr><td colspan="9">Meeting with the global requirements, to inculcate the habit of self learning and incompliance with UGC guidelines, MOOC (Massive Open Online Course) courses have been introduced as electives. The main intension to introduce MOOCs is to obtain enough exposure through online tutorials, self-learning at one’s own pace, attempt quizzes, discuss with professors from various universities and finally to obtain certificate of completion for the course from the MOOCs providers
Regulations for MOOCs
➢ The respective departments shall give a list from NPTEL or any other standard providers, whose credentials are endorsed by the HOD.
➢ Each department shall appoint Coordinators/Mentors and allot the students to them who shall be responsible to guide students in selecting online courses and provide guidance for the registration, progress and completion of the same.
➢ A student shall choose an online course (relevant to his/her programme of study) from the given list of MOOCs providers, as endorsed by the teacher concerned, with the approval of the HOD.
➢ The details of MOOC(s) shall be displayed in Grade card of a student, provided he/she submits the proof of completion of it to the department concerned through the Coordinator/Mentor.
➢ Student can get certificate from SWAYAM/NPTEL or any other standard providers, whose credentials are endorsed by the HOD. The course work should not be less than 12 weeks or student may appear for end examination conducted by the Institute.
➢ There shall be one Mid Continuous Internal Examination (Quiz exam for 40 marks) after 9 weeks of the commencement of the course and semester end examination (Descriptive exam for 60 marks) shall be done along with the other regular courses.
➢ Three credits will be awarded upon successful completion of each MOOC courses having minimum of 8 weeks duration.</td></tr>
</table>

PROJECT WORK PHASE – I

M.Tech III Semester: Structural Engineering								
Course code	**Category**	**Hours/week**			**Credits**	**Maximum Marks**		
18ST307	**Core**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**TOTAL**
		0	0	20	10	Grade		
Contact Classes:-	**Tutorial Classes: -**	**Practical Classes: 40**			**Total Classes:40**			

Every candidate shall be required to submit thesis or dissertation after taking up a topic approved by the college/ concerned department.

- **Registration of Project work**: A candidate is permitted to register for the project work phase-I after satisfying the attendance requirement of all the courses (theory and practical courses of I & II Semesters).
- An Internal Departmental Committee (I.D.C) consisting of HOD, Supervisor/ Guide and one Internal senior expert shall monitor the progress of the project work.
- The work on the project work phase-I shall be initiated in the III semester and continued in the final semester. The candidate can submit Project work phase-I dissertation with the approval of I.D.C. after 18 weeks from the date of registration at the earliest from the date of registration for the project work phase-I.
- The student must submit status report at least in three different phases during the project work period. These reports must be approved by the I.D.C before submission of the Project Report.
- Three copies of the Dissertation certified in the prescribed form by the supervisor and HOD shall be submitted to the HOD.
- The semester end examination for project work phase-I done during III Semester, shall be conducted by a Project Review Committee (PRC). The evaluation of project work shall be conducted at the end of the III Semester.
- The PRC comprises of an External examiner appointed by the Principal, Head of the Department and Project Guide/Supervisor to adjudicate the dissertation. The PRC shall jointly evaluate candidates work and award grades as given below.

S.No	Description	Grade	Grade Point (GP) Assigned
1	Very Good	Grade A	10
2	Good	Grade B	9
3	Satisfactory	Grade C	8
4	Not satisfactory	Grade D	0

If the report of the viva-voce is not satisfactory (Grade D) the candidate will retake the viva-voce examination after three months. If he fails to get a satisfactory report at the second viva-voce examination he will not be eligible for the award of the degree unless the candidate is permitted to revise and resubmit the dissertation.

PROJECT WORK PHASE – II

M.Tech IVSemester: Structural Engineering								
Course code	**Category**	**Hours/week**			**Credits**	**Maximum Marks**		
18ST401	**Core**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**TOTAL**
		0	0	32	16	Grade		
Contact Classes:-	**Tutorial Classes: -**		**Practical Classes: 60**			**Total Classes:60**		

Every candidate shall be required to submit thesis or dissertation after taking up a topic approved by the college/ concerned department.

- **Registration of Project work**: A candidate is permitted to register for the project work phase-I after satisfying the attendance requirement of all the courses (theory and practical courses of I & II Semesters)
- An Internal Departmental Committee (I.D.C) consisting of HOD, Supervisor/ Guide and one Internal senior expert shall monitor the progress of the project work.
- The work on the project work phase-II shall be initiated in the IV semester. The candidate can submit Project work phase-II dissertation with the approval of I.D.C. after 18 weeks from the date of registration at the earliest from the date of registration for the project work phase-I.
- The student must submit status report at least in three different phases during the project work period. These reports must be approved by the I.D.C before submission of the Project Report.
- Three copies of the Dissertation certified in the prescribed form by the supervisor and HOD shall be submitted to the HOD.
- The semester end examination for project work phase-I done during III Semester, shall be conducted by a Project Review Committee (PRC). The evaluation of project work shall be conducted at the end of the IV Semester.
- The PRC comprises of an External examiner appointed by the Principal, Head of the Department and Project Guide/Supervisor to adjudicate the dissertation. The PRC shall jointly evaluate candidates work and award grades as given below

S.No	Description	Grade	Grade Point (GP) Assigned
1	Very Good	Grade A	10
2	Good	Grade B	9
3	Satisfactory	Grade C	8
4	Not satisfactory	Grade D	0

If the report of the viva-voce is not satisfactory (Grade D) the candidate will retake the viva-voce examination after three months. If he fails to get a satisfactory report at the second viva-voce examination he will not be eligible for the award of the degree unless the candidate is permitted to revise and resubmit the dissertation.