SRINIVASA EDUCATIONAL SOCIETY'S

PACE INSTITUTE OF TECHNOLOGY & SCIENCES

(AUTONOMOUS)

Approved by AICTE, UGC, New Delhi & Govt. of Andhra Pradesh | Permanently Affiliated to JNTUK, Kakinada, A.P.

ACCREDITED BY **NAAC** WITH **'A'** GRADE | ACCREDITED BY **NBA**

An ISO 9001 : 2008 Certified Institution |'A' Grade Engineering College by Government of A.P.

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DEPARTMENT OF

CIVIL ENGINEERING

MASTER OF TECHNOLOGY

IN

STRUCTURAL ENGINEERING

ACADEMIC REGULATIONS

AND

COURSE STRUCTURE & SYLLABI

(For the students admitted to

M.Tech Regular Two Years Programme from the Academic Year 2018-19

ACADEMIC REGULATIONS

For the students admitted to

M. Tech Regular Two Years Programme from the Academic Year 2018-19

ACADEMIC REGULATIONS R-18 FOR M. Tech (REGULAR)

(CHOICE BASED CREDIT SYSTEM)

Applicable for the students of M. Tech (Regular) from the Academic Year 2018-19

1. ELIGIBILITY CRITERIA FOR ADMISSION

The eligibility criteria for admission into M. Tech programme shall be as per the guidelines issued by the Andhra Pradesh State Council of Higher Education (APSCHE) and/or by any other competent authority.

2. PROGRAMMES OFFERED (POST GRADUATE)

A student shall be offered admission into any one AICTE-approved programme as given below:

S.No	PROGRAMME
01	Structural Engineering (SE)
02	Power Electronics (PE)
03	Machine Design (MD)
04	VLSI & Embedded Systems (VLSI&ES)
05	Computer Science and Engineering (CSE)

3. AWARD OF DEGREE

A student will be declared eligible for the award of M. Tech. degree, if he/she fulfils the following academic requirements:

i. 2 Year M. Tech Programme:

- The Student shall study a course for not less than two academic years and not more than four academic years.
- The student shall register for 68 credits and secure all the 68 credits.
- The students, who fail to fulfill all the academic requirements for the award of degree within four academic years from the year of their admission, shall forfeit their seat in M.Tech Programme.
- No disciplinary action shall be in pending against the student by the time of the completion of his/her course. If any disciplinary action is pending against any student, he/she should not be awarded with the degree.

4. MEDIUM OF INSTRUCTION

The medium of instruction shall be English in all academic activities.

5. MINIMUM INSTRUCTION DAYS

The minimum instruction days for each Semester shall be 90.

6. CATEGORIZATION OF COURSES

The curriculum of each programme shall contain various courses indicated in the following categories to train the students for employment, higher learning, research and entrepreneurship.

i. **Professional Core (PC):** These courses are the core courses that provide the requisitefoundation in the chosen Branch of Engineering.

ii. **Professional Elective (PE):** These courses are the elective courses opted by thestudents relevant to the chosen branch of engineering that provides the requisite foundation in a specific area of specialization.

iii. **Mandatory Courses (MC):** The Research Methodology andIntellectual Property Right is credit course relevant to the Research orientation.

iv. **Audit Courses (AC):** English for Research Paper Writing, Personality Development through Life Enlightenment Skills are non-credit courses relevant to the value education and also for enhancing employability skills.

7. CREDIT ASSIGNMENT

Each course is assigned a certain number of credits based on the following criteria.

Contact hours per week			
L	**T**	**P**	Credits
1	0	0	1
0	1	0	1
0	0	2	1

8. SEMESTER-WISE DISTRIBUTION OF CREDITS

The entire programme of study is for two academic years and is on semester pattern. The distribution of credits in each semester is as following.

Semester	Credits
I	22-24
II	22-24
III	10
IV	12
Total	**68**

9. ASSESSMENT AND EVALUATION

The performance of a student in each course shall be evaluated based on Continuous Internal Evaluation (CIE) and Semester End Examination (SEE) or only Continuous Internal Evaluation

S.No	Category of Course	Marks	
		CIE	SEE
1	Theory Courses	40	60
2	Laboratory Courses	40	60
3	Mandatory Courses	100	
4	Audit Courses	--	
5	Project Work Phase-I	50	--
	Project Work Phase-II	30	120

9.1 THEORY COURSES

9.1.1 Continuous Internal Evaluation (CIE):

Mid Term Examinations (40 Marks):

There shall be two mid-term descriptive examinations of 120 minutes each. The mid-term examinations shall be conducted with syllabi from units I,II & first half of III for the first mid and second half of III, IV & V units for the second mid. In each theory course, the question paper for the mid-term descriptive examination consists of four questions. A student is required to answer all four questions for maximum 40 marks.

CIE is computed as following: Finalized internal marks can be calculated with average of two mid term examinations marks and they shall be considered for marks of 40.

9.1.2Semester End Examinations (SEE)

The semester end examinations for theory courses will be conducted covering all the units for 60 Marks. 5 Questions out of 8 Questions are to be answered of which each carries 12 Marks.

9.2 LABORATORY COURSES

9.2.1 Continuous Internal Evaluation (CIE)

The continuous internal evaluation for laboratory courses is based on the following parameters:

Parameter	Marks
Day-to-day Work	20
Internal Test	10
Record	05
Viva Voce	05
Total	40

9.2.2 Semester End Examinations (SEE)

The performance of the student in laboratory courses shall be evaluated jointly by internal and external examiners for 3 hours duration as per the parameters indicated below:

Parameter	Marks
Procedure/Algorithm	10
Experimentation/Program execution	15
Observations/Calculations/Testing	15
Result/Inference	10
Viva voce	10
Total	**60**

9.3MANDATORY COURSES (CREDIT COURSES)

Mandatory courses are evaluated by the mode of a Presentation/ Comprehensive-Viva Voce/ Evaluation of Assignments. A student shall secure a minimum 50% of marks to get two credits. However, a student who securesless than 50 marks /abstains shall reappear in the subsequent semester(s).

9.4 **AUDIT COURSES (NON CREDIT COURSES)**

Audit courses are evaluated by the mode of a Presentation/ Comprehensive-Viva Voce/ Evaluation of Assignments. A student shall secure a minimum 50% of marks to get a satisfactory grade (SA). Otherwise unsatisfactory grade (US) will be indicated. However, a student who secures"US" grade /abstains shall reappear in the subsequent semester(s).

9.5 Project/Dissertation Work

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

i. A Project Review Committee (PRC) shall be constituted with Head of the Department and two other senior faculty members.

ii. Registration of Project Work: A candidate is permitted to register for the project work after satisfying the attendance requirement of all the courses, both theory and practical upto II Semester.

iii. After satisfying 9.5 (ii), a candidate has to submit the project in consultation with his project supervisor, the title, objective and plan of action of his project work for approval. The student can initiate the project work, only after obtaining the approval from the Project Review Committee (PRC).

iv. If a candidate wishes to change his/her supervisor or topic of the project, he/she can do so with the approval of the Project Review Committee (PRC). However, the Project Review Committee (PRC) shall examine whether or not allow the change of topic/supervisor which may lead to a major change of his/her initial plans of project proposal. If yes, his/her date of registration for the project work starts from the date of change of Supervisor or topic as the case may be.

v. The work on the project shall be initiated at the begging of the II year and the duration of the project is two semesters.

vi. **Project Work (CIE) Assessment:**

- **Literature Review (CIE):**

  The performance of a student in project survey shall be evaluated by PRC within 8 weeks from the beginning of III Semester based on the following parameters:

Parameter	Marks
Literature Review	10
Presentation	05
Viva Voce	05
Total	20

- **Project Implementation-I (CIE):**

  The performance of a student in project implementation-I shall be evaluated at the end of III Semester. A student shall make a presentation on the project work Implementation-I before PRC. The evaluation criterion of review is based on the following parameters:

Parameter	Marks
Contribution	10
Innovation	10
Presentation	05
Viva Voce	05
Total	**30**

- **Project Implementation-II (Final) (CIE):**

  The performance of a student in project implementation-II (Final) shall be evaluated within 12 Weeks from the beginning of IV Semester. A student shall give a presentation on the final project work before PRC. The evaluation criterion of review is based on the following parameters:

Parameter	Marks
Contribution	10
Innovation	10
Presentation	05
Viva Voce	05
Total	**30**

vii. A candidate is permitted to submit the Project Thesis after satisfying the following conditions.

  a. Successful completion of theory and practical courses.

b. Not earlier than 40 weeks from the date of registration of the project work. The candidate has to pass all the theory and practical subjects before submission of the Thesis.

c. A student shall secure a minimum 50% of marks in CIE to award as satisfactory grade (SA). Otherwise unsatisfactory grade (US) will be indicated. However, a student who secures"US" grade /abstains shall reappear in the subsequent semester(s).

d. A candidate shall publish his/her project work in a reputed journal.

e. A candidate shall take approval of PRC.

viii. Four copies of the Project Thesis certified by the Supervisor shall be submitted to the Institute.

ix. The thesis shall be adjudicated by an External Examiner approved by the Principal from a panel of 4 Examiners who are eminent in the field, submitted by the Department. The Head of the Department shall coordinate and make arrangements for the conduct of Viva Voce examination.

x. **Project Work Viva Voce (SEE) Assessment:**

A student shall submit a duly-certified project report to the department in a specified time. He/She shall give presentation on the project work before the board consisting of the Supervisor, the Head of the Department and the examiner who adjudicated the Thesis. The performance of the student is evaluated as per the following parameters:

Parameter	Marks
Project report	40
Innovation	30
Presentation	20
Viva Voce	15
Research Publication (Seminar/Conference/Symposium/Journal)	10
Scope of Implementation	05
Total	**120**

- **AWARD OF LETTER GRADES**

A letter grade and grade points shall be awarded to a student based on his/her performance in Project Viva Voce (120 M) as given below.

% Marks	Marks	Letter Grade	Level
≥ 90	≥ 108	A	Outstanding
70 to <90	84 to <108	B	Excellent
50 to <70	60 to <84	C	Good
<50	<60	F	Fail
--	--	Ab	Absent

A student who secures "F" grade in any course shall be considered "Failed" and is required to reappear as "Supplementary student" in SEE, as and when offered. In such cases, his/her CIE marks in those courses will remain same as obtained earlier. A student, who is absent for any examination shall be treated as "Failed".

If the report of the examiner is favorable, Viva-Voce examination shall be conducted by the board consisting of the Supervisor, the Head of the Department and the examiner who adjudicated the Thesis. The board shall jointly report the candidate's work as one of the following:

A: Excellent

B: Good

C: Satisfactory

D: Unsatisfactory

If the report of the Viva-Voce is unsatisfactory, the candidate shall retake the Viva Voce examination only after three months. If he/she fails to get a satisfactory report at the second Viva-Voce examination, the candidate has to re-register for the project and complete the project within the stipulated time after taking the approval from the PRC.

10. ATTENDANCE REQUIREMENTS

a. A student is eligible to write the Semester End Examinations if he acquires a minimum of 75% of attendance in aggregate of all the subjects.

b. Condonation of shortage of attendance in aggregate up to 10% (65% and above and below 75%) in each semester may be granted by the College Academic Committee on medical grounds.
c. A stipulated fee shall be payable towards condonation of shortage of attendance.
d. If any candidate fulfills the attendance requirement in the present semester, he shall not be eligible for readmission into the same class.
e. Shortage of Attendance below 65% in aggregate shall not be condoned.
f. A student who is shortage of attendance in semester may seek re-admission into that semester when offered within one week from the date of the commencement of class work.
g. Students whose shortage of attendance is not condoned in any semester are not eligible to write their Semester End Examination of that class.

11. MINIMUM ACADEMIC REQUIREMENTS

The following academic requirements have to be satisfied in addition to the attendance requirements mentioned in item no.10.

a. A student shall be deemed to have satisfied the minimum academic requirements, if he/she gains the credits allotted to each course and secures not less than a minimum 40% of marks exclusively at the Semester End Examination. However, the student should secure minimum 50% of marks in both CIE and SEE put together to be eligible for passing the course.
b. The Students, who fail to earn 68 credits as indicated in the course structure within 4 academic years from the year of admission, shall forfeit their seat in M.Tech programme and admission stands cancelled.

12. PROCEDURES FOR SEMESTER END EXAMINATIONS

i. **Supplementary examinations:** There shall be supplementary examinations along withregular semester end examinations for a student to reappear in the course(s) he/she failed or not attempted.
ii. **Recounting:** A student, who wishes to verify the total marks obtained by him/her in anytheory course in SEE can apply for recounting in response to the notification along with the prescribed fee. The outcome of the recounting gets reflected in the results sheet and grade card.

iii. **Revaluation:** A student who wishes to apply for revaluation of a theory course in SEEcan submit an application along with the prescribed fee as per the notification issued.

a. If the variation in marks of the first valuation and revaluation is ≤ 15% of the total marks, then the better of the two evaluations shall be considered as final marks.

b. If the variation of marks between the first valuation and revaluation is >15% of the total marks, there shall be a third evaluation by another examiner. The average marks of two nearer evaluations shall be taken into consideration. In case of any fractional value of marks, it can be rounded off to the next integer value.

c. If a student secures a higher grade in the revaluation, that grade will be declared as the final grade. Otherwise, the original grade will remain valid.

13. AWARD OF LETTER GRADES

A letter grade and grade points shall be awarded to a student in each course based on his/her performance as per the 10-point grading system given below.

Marks (Max:100)	Letter Grade	Grade Point	Level
≥ 90	O	10	Outstanding
80 to <90	S	9	Excellent
70 to <80	A	8	Very Good
60 to <70	B	7	Good
50 to <60	C	6	Pass
<50	F	0	Fail
--	Ab	0	Absent

Marks (Max:100)	Letter Grade	Grade Point	Level
≥ 50	SA	-	Satisfactory
< 50	US	-	Unsatisfactory
--	Ab	-	Absent

a. A student who secures "F" grade in any course shall be considered "Failed" and is required to reappear as "Supplementary student" in SEE, as and when offered. In such cases, his/her CIE marks in those courses will remain same as obtained earlier.

b. A student, who is absent from any examination shall be treated as "Failed".

c. In general, a student shall not be permitted to repeat any course (s) for the sake of "Grade improvement" or "SGPA/CGPA improvement".

14. COMPUTATION OF SGPA & CGPA

a. Semester Grade Point Average (SGPA)

The performance of each student at the end of each semester is indicated in terms of SGPA. The SGPA is the ratio of sum of the product of the number of credits and the grade points scored by a student in all the courses to the sum of the number of credits of all the courses.

$$\mathbf{SGPA\ (S_i) = \Sigma\ (C_i\ x\ G_i)\ /\ \Sigma C_i}$$

Where C_i is the number of credits of the i^{th} course and G_i is the grade point scored by the student in the i^{th} course.

b. Cumulative Grade Point Average (CGPA)

The CGPA is a measure of the overall cumulative performance of a student. The CGPA is calculated in the same manner taking into account all the courses undergone by a student over all the semesters of a programme.

$$\mathbf{CGPA = \Sigma\ (C_i\ x\ S_i)\ /\ \Sigma C_i}$$

Where S_i is the SGPA of the i^{th} semester and C_i is the total number of credits in that semester.

c. The SGPA and CGPA are rounded off to 2 decimal points and reported in grade cards.

15. AWARD OF CLASS

A student who satisfies the minimum requirements prescribed for the completion of a programme is eligible for the award of M.Tech degree and he/she shall be placed in one of the following four classes on a 10 point scale.

Class Awarded	CGPA to be secured	From the CGPA secured from 68 Credits
First Class with Distinction	≥ 7.5 with no subject failures	
First Class	≥ 6.5 with subject failures	
Second Class	≥ 5.5 to < 6.5	
Pass Class	> 5.0	

16. DISCIPLINE

a. A student is required to observe discipline and decorum both inside and outside the college and not to indulge in any activity that may tarnish the prestige of the college. The head of the institution shall constitute a disciplinary committee to enquire into acts of indiscipline and notify the college about the disciplinary action taken. In case of any serious disciplinary action, which leads to suspension or dismissal, a committee shall be constituted by head of the institution for taking final decision.

b. Those students who indulge in examination related malpractices shall be punished as per the scale of punishment notified in Annexure-I.

c. Those students involved in the illegal acts of ragging shall be punished as per the provisions of Act 26, 1997 of Govt. of Andhra Pradesh (Annexure-II).

17. REVISION OF REGULATIONS, CURRICULUM AND SYLLABI

The college may revise, amend or change the regulations, curriculum, syllabus and scheme of examinations from time to time subject to decisions/recommendations of Board of Studies and the College Academic Council.

18. WITHHOLDING OF RESULTS

If a student fails to clear dues, if any, payable to the institution or any case of indiscipline is pending against him, the result of the student will be withheld, and also the award of his/her degree shall be withheld in such cases.

19.TRANSITORY REGULATIONS

a. A student, who is detained or discontinued in the semester, on readmission shall be required to do all the courses in the curriculum prescribed for the batch of students in which the student joins

subsequently. However, exemption will be given to those students who have already passed the courses in the earlier semester(s) he/she is originally admitted into and substitute courses are offered in place of them as approved by the Board of Studies.

b. In general, after transition, there will be a fitment formula approved by the competent authority in order to balance course composition and the number of credits.
c. Students admitted by transfer from other institutions shall follow transitory regulations with suitable fitment formulae approved by the competent authority.
d. A student who is seeking readmission shall apply in the prescribed format within one week after the commencement of the class work. However, the readmission of a student shall be approved by the competent authority.

20.COURSE CODE

The Course Codes will be given by the departments concerned to the subject. Each course code contains 8 characters. The 8 characters for each subject will be filled as per the following description:

1	2	3	4	5	6	7	8	9

1 Character : Institute Name as '**P**"

2 Character : Post Graduation Name as '**P**"

3,4 Characters: Year of Commencement of Regulations as '**18**'

5,6 Characters: Subject/Branch Category such as

CE for Civil Engineering Courses

EE for Electrical & Electronics Engineering Courses

ME for Mechanical Engineering Courses

EC for Electronics & Communication Engineering Courses

CS for Computer Science & Engineering Courses

MC for Mandatory Courses

7 Character: Mode of Subject Learning and Evaluation such as

T for Theory Courses

L for Laboratory Courses

S for Seminar

P for Project

M for Mini Project

V for Viva Voce

E for Professional Elective Courses

O for Open Elective Courses

A for Audit Course

8,9 Characters: Serial number of the course taught by the department in that Semester such 01, 02, 03,..... etc

21. GENERAL

- Wherever the words "he", "him", "his", occur in the regulations, they include "she", "her", "hers".
- The academic regulations should be read as a whole for the purpose of any interpretation.
- In case of any doubt or ambiguity in the interpretation of the above rules, decision of the competent authority is final and binding.
- The college may change or amend academic regulations or syllabi at any time subject to approval of the competent authority and the changes or may apply the amendments made to all students with effect from the dates notified.

22. STATUTORY DECLARATION

In case the regulations do not specify application of an appropriate rule in a unique case, the decision of the competent authority of the college shall be final.

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ANNEXURE-I

MALPRACTICE RULES

DISCIPLINARY ACTION FOR MALPRACTICE/IMPROPER CONDUCT IN EXAMINATIONS

S.No	Nature of Malpractices/Improper Conduct	Punishment
1 (a)	If a student possesses or tries to access any paper, note book, programmable calculators, Cell phones, pager, palm computers or any other form of material concerned with or related to the subject of the examination (theory or practical) in which he is appearing but has not made use of (material shall include any marks on the body of the candidate which can be used as an aid in the subject of the examination)	Expulsion from the examination hall and cancellation of the performance in that subject only.
(b)	If a student gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or communicates through cell phones with any candidate or persons in or outside the exam hall in respect of any matter.	Expulsion from the examination hall and cancellation of the performance in that subject only of all the candidates involved. In case of an outsider, he will be handed over to the police and a case is registered against him.
2.	If a student is found to have copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the subject of the examination (theory or practical) in which the candidate is appearing.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work, and shall not be permitted to appear for the remaining examinations of the subjects of that Semester. The Hall Ticket of the candidate is to be cancelled.
3.	Impersonates any other candidate in connection with the examination	The candidate who has impersonated shall be expelled from examination hall. The candidate is also debarred and forfeits the seat. The performance of the original candidate, who has been impersonated, shall be cancelled in all the subjects of the Examination (including practicalsand project work) already appeared and shall not be allowed to appear for examinations of the remaining subjects of that semester. 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. If the imposter is an outsider, he will be handed over to the police and a case is to be registered against him.
4.	If a student smuggles inside the exam hall an Answer book or additional sheet or takes out or Arranges to send out the question paper or answer book or additional sheet, during or after the examination.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester. 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.	If a student 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 the subject.
6.	If a student refuses to obey the orders of the Chief Superintendent/Controller of Examinations / any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out, or threatens the officer-in charge or any person on duty in or outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the officer-in-charge, or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction of property in the examination hall or any part of the College campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination.	Such a student(s) shall be expelled from examination halls and cancellation of their performance in that subject and all other subjects the candidate(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the subjects of that semester. The candidates also are to be debarred and forfeited their seats. In case of outsiders, they will be handed over to the police and a police case is to be registered against them.

7.	If a student leaves the exam hall taking away answer script or intentionally tears the script or any part thereof inside or outside the examination hall.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinationsof the subjects of that semester. The candidate is also debarred for two consecutive semesters from class work and Semester End Examinations. The continuation of the course by the candidate is subjected to the academic regulations in connection with forfeiture of the seat .
8.	If a student possesses any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinationsof the subjects of that semester. The candidate is also to be debarred and forfeited the seat.
9.	If a 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 shall be expelled from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinationsand project work and shall not be permitted for the remaining examinations of the subjects of that semester. The candidate is also to be debarred and forfeited the seat. Person(s) who do not belong to the College will be handed over to police and, a police case shall be registered against them.
10.	If a student comes in a drunken condition to the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester.
11.	If copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny.	Cancellation of the performance in that subject and all other subjects the candidate has appeared including practical examinationsand project work of that semester examinations.

Malpractices identified by squad or special invigilators

- Punishments to the candidates are as per the above guidelines.
- Punishment to institutions : (if the squad reports that the college is also involved in encouraging malpractices)
    i. A show cause notice shall be issued to the college.
    ii. Impose a suitable fine on the college.
    iii. Shifting the examination centre from the college to another college for a specific period of not less than one year.

ANNEXURE-II

Prohibition of ragging in educational institutions Act 26 of 1997

Salient Features

- Ragging within or outside any educational institution is prohibited.
- Ragging means doing an act which causes or is likely to cause Insult or Annoyance of Fear or Apprehension or Threat or Intimidation or outrage of modesty or Injury to a student

	Imprisonment upto		Fine Upto
Teasing, Embarrassing and Humiliation	6 Months	+	Rs. 1,000/-
Assaulting or Using Criminal force or Criminal intimidation	1 Year	+	Rs. 2,000/-
Wrongfully restraining or confining or causing hurt	2 Years	+	Rs. 5,000/-
Causing grievous hurt, kidnapping or Abducts or rape or committing unnatural offence	5 Years	+	Rs. 10,000/-
Causing death or abetting suicide	10 Years	+	Rs. 50,000/-

In Case of Emergency CALL TOLL FREE NO. : 1800 - 425 - 1288

ABSOLUTELY NO TO RAGGING

1. Ragging is prohibited as per Act 26 of A.P. Legislative Assembly, 1997.
2. Ragging entails heavy fines and/or imprisonment.
3. Ragging invokes suspension and dismissal from the College.
4. Outsiders are prohibited from entering the College and Hostel without permission.
5. Girl students must be in their hostel rooms by 7.00 p.m.
6. All the students must carry their Identity Cards and show them when demanded
7. The Principal and the Wardens may visit the Hostels and inspect the rooms any time.

DEPARTMENT OF CIVIL ENGINEERING

R18 Regulations M. Tech. (Structural Engineering) Course Structure

I YEAR I SEMESTER								
S.No.	**Code**	**Course**	**L**	**T**	**P**	**Credits**	**Internal**	**External**
1	PP18CET01	Advanced Mathematics	3	0	0	3	40	60
2	PP18CET02	Theory of Elasticity	3	1	0	4	40	60
3	PP18CET03	Matrix Analysis of Structures	3	0	0	3	40	60
4	PP18CET04	Structural Dynamics	3	1	0	4	40	60
5	**Professional Elective- I**		3	1	0	4	40	60
	PP18CEE01	Experimental Stress Analysis						
	PP18CEE02	Sub Structure Design						
	PP18CEE03	Theory and Applications of Cement Composites						
	PP18CEE04	Advanced Steel Design						
6	**Professional Elective –II**		3	1	0	4	40	60
	PP18CEE05	Structural Health Monitoring						
	PP18CEE06	Plastic Analysis and Design						
	PP18CEE07	Analytical and Numerical Methods						
	PP18CEE08	Design of Advanced Concrete Structures						
7	PP18CEA01	English for Research Paper Writing	2	0	0	0	0	0
8	PP18CEL01	Advanced Concrete Lab	0	0	3	1.5	40	60
Total			**20**	**4**	**3**	**23.5**	**280**	**420**

I YEAR II SEMESTER								
S.No.	**Code**	**Course**	**L**	**T**	**P**	**Credits**	**Internal**	**External**
1	PP18CET05	Finite Element Method	3	1	0	4	40	60
2	PP18CET06	Earthquake Resistance Design	3	1	0	4	40	60
3	PP18CET07	Stability of Structures	3	0	0	3	40	60
4	PP18CET08	Advanced Design of Foundations	3	1	0	4	40	60
5		**Professional Elective –III**	3	0	0	3	40	60
	PP18CEE09	Pre-stressed Concrete						
	PP18CEE10	Mechanics of Composite Structures						
	PP18CEE11	Advanced Concrete Technology						
	PP18CEE12	Fracture Mechanics						
6		**Professional Elective –IV**	3	0	0	3	40	60
	PP18CEE13	Industrial Structures						
	PP18CEE14	Bridge Engineering						
	PP18CEE15	Earth Retaining Structures						
	PP18CEE16	Theory of Plates and Shells						
7	PP18CEA02	Personality Development through Life Enlightenment Skills	2	0	0	0	0	0
8	PP18CEL02	Advanced Structural Analysis and Design lab	0	0	3	1.5	40	60
Total			**20**	**3**	**3**	**22.5**	**280**	**420**

II Year – I Semester								
S.No	**Course Code**	**Course Name**	**L**	**T**	**P**	**Credits**	**Internal**	**External**
1	PP18MCT01	Research Methodology and IPR	2	0	0	2	100	0
2	PP18CEP01	Project Work Phase- I	0	0	0	8	50	0
Total						**10**	**150**	**0**

II Year - II Semester								
S.No	**Course Code**	**Course Name**	**L**	**T**	**P**	**Credits**	**Internal**	**External**
1	PP18CEP02	Project Work Phase- II	0	0	0	12	30	120
Total						**12**	**30**	**120**

M. Tech. I Year I Semester **Course Structure**

L	T	P	C
3	0	0	3

ADVANCED MATHEMATICS

Internal Marks: 40

Course Code: PP18CET01 **External Marks: 60**

Course Prerequisite: Engineering mathematics-I, II

Course Objectives:

1. To make the students to learn heat equation and Laplace equation.
2. To impart the knowledge on numerical solutions to heat and Laplace equations.
3. To illustrate the concept of statistical methods and applications to engineering problems such as regression, correlation analysis.
4. To enable the students to apply statistical concepts including measures of analysis of variance, correlation and regression analysis and multiple regression.
5. To enable to solve linear, non- linear programming problems by various methods.

Course Outcomes:

After completion of the course the student will be able to

1. Solve heat equation and Laplace equation in different co-ordinate system.
2. Calculate numerical solutions to the problems on heat and Laplace equations using various methods.
3. Analyze statistical data using various mathematical techniques.
4. Interpret the results of bi-variate regression and correlation analysis for solving engineering problems.
5. Solve linear and non-linear programming problems using different methods

UNIT-I (10 Lectures)

Applied Partial Differential Equations

One-dimensional Heat equation Cartesian, cylindrical and spherical coordinates (problems having axi-symmetry). Two-dimensional LaplaceEquation in Cartesian, cylindrical and spherical coordinates (problems having axi-symmetry) - Analytical solution by separation of variables technique.

UNIT-II (09 Lectures)

Numerical Solutions & Implicit Methods

Numerical solutions to Heat and Laplace Equations in Cartesian coordinates using finite -differences. Implicit methods, Crank Nicholson Method, Jacobi Method, Guass-Seidal method.

UNIT-III (10 Lectures)

Applied Statistics

Regression and correlation analysis - Method of Least squares - Curve fitting - Curvilinear Regression - Non-linear curves - correlation coefficient - Correlation of grouped bi-variate data - coefficient of determination Multiple Regression - partial Regression coefficients

UNIT–IV (10 Lectures)

Tests of Significance

Tests of significance-Analysis of variance for regression-Multiple correlation coefficients-Multiple linear regressions with two independent variables.

UNIT – V (09 Lectures)

Linear Programming

Linear Programming Problem Formation, Graphical Method, Simplex method, artificial variable method-Big-M method-Two Phase Method. Non Linear Programming Problem Gradient method, Steepest Ascent Descent Methods

Text Books

1. Solutions of Partial Differential Equations" - Duffy, D.G. CBS Publishers, 1988
2. Introductory Methods of Numerical Analysis – Sastry, S.S.Prentice-Hall, 2nd Edition, 1992
3. Higher Engineering Mathematics by BS GREWAL.

ReferenceBooks

1. Basic Statistics - Agarval, B.L., Wiley 1991, 2nd edition.
2. Operations Research - Hamdy A, Taha.OptimizationTechniques.-S.S.Rao:.

Web References

1. http://mec.nit.ac.ir/file_part/master_doc/20149281833165301436305785.pdf
2. https://www.scribd.com/doc/226446085/Introductory-Methods-of-Numerical-Analysis-by-S-S-Sastry
3. https://www.math.ucla.edu/~yanovsky/handbooks/PDEs.pdf

M. Tech. I Year I Semester **Course Structure**

L	T	P	C
3	1	0	4

THEORY OF ELASTICITY

Internal Marks: 40

Course Code: PP18CET02 **External Marks: 60**

Course Prerequisite: Advanced Structural Analysis

Course Objectives:

1. To make students to learn principles of analysis of Stress and Strain
2. To introduce the airy stress functions for 2-D plane stress and plane strain problems in Cartesian and cylindrical coordinate systems.
3. To impart the knowledge on evaluating the stress and strain parameters and their inter relations of the continuum.
4. To introduce to the student the analysis of linear elastic solids under mechanical and thermal loads.
5. To guide the students to analyze the torsion of a prismatic bar using membrane analogy.

Course Outcomes:

After completion of the course the student will be able to

1. Explain the theory of elasticity including strain/displacement and Hooke's law relationships.
2. Apply Fourier series for two-dimensional problems for gravity loading.
3. Develop general equations for two dimensional problems in polar-coordinates.
4. Determine principal stress and shear stress using general theorems.
5. Develop Solutions for torsion problems by energy method

UNIT-I (09 Lectures)

Elasticity

Elasticity - Notation for forces and stresses - components of stresses and strains - Hooke's Law - Plane Stress - Plane strain - Differential Equations of equilibrium - Boundary conditions - Compatibility equations - Stress function - Boundary Conditions.

UNIT-II (10 Lectures)

2-D Problems In Rectangular Co-Ordinates

Two dimensional problems in rectangular co-ordinates - Solution by polynomials - Saint Venant's principle - Determination of displacements - Bending of simple beams - Application of Fourier series for two dimensional problems for gravity loading.

UNIT-III (9 Lectures)

2-D Problems In Polar Co-Ordinates

Two dimensional problems in polar co-ordinates - General equations in polar co-ordinates -Stress distribution for problems having symmetrical about an axis - Strain components in polar co-ordinates - Displacements for symmetrical stress distributions - Stresses for plates with circular holes subjected to far field tension - stress concentration factor.

UNIT–IV (10 Lectures)

Stresses And Strains In 3-D

Analysis of stress and strain in three dimension - Principal stresses - Stress ellipsoid and stress director surface - Determination of principal stresses - Maximum shear stress - Homogeneous Deformation - General Theorems - Differential equations of equilibrium - Conditions of compatibility - Equations of equilibrium in terms of displacements - Principle of superposition - Uniqueness of solution -Reciprocal theorem.

UNIT – V (10 Lectures)

Torsion Of Prismatic Bars

Torsion of prismatic bars - Bars with elliptical cross section - Other elementary solution -Membrane analogy - Torsion of rectangular bars - Solution of torsional problems by energy method.

Text Books:

1. Theory of Elasticity, Timoshenko S. and GoodierJ. N., McGraw Hill, 1961.
2. Elasticity,Sadd M.H.,Elsevier,2005.
3. Engineering Solid Mechanics, RagabA.R., BayoumiS.E., CRC Press,1999.
4. Computational Elasticity, AmeenM., Narosa,2005.
5. Solid Mechanics, KazimiS. M. A., Tata McGraw Hill,1994.
6. Advanced Mechanics of Solids, SrinathL.S., Tata McGraw Hill,2000.

Reference Books:

1. Theory of Elasticity- Timoshenko & Goodier
2. Elasticity: Theory, Applications and Numeric- Martin H. Sadd

Web References:

1. http://sciold.ui.ac.ir/~sjalali/PhD.Students/quantum.theory.of.solids/6.pdf
2. http://solidmechanics.org

M. Tech. I Year I Semester **Course Structure**

L	T	P	C
3	0	0	3

MATRIX ANALYSIS OF STRUCTURES

Internal Marks: 40

Course Code: PP18CET03 **External Marks:60**

Course Prerequisite: Structural Analysis -II

Course Objectives:

1. To enable the students to implement matrix analysis principles through stiffness matrix & flexibility matrix.
2. To discuss with students to know global stiffness matrix equation &structure stiffness matrix Equations.
3. To enable students to apply stiffness method for grid element, tapered and curved beams.
4. To make the students to know analysis of elastic foundation by stiffness method.
5. To impart the knowledge on space truss and frames & analysis simple truss, beams and frames.

Course Outcomes:

After completion of the course the student will be able to

1. Calculate element stiffness for truss, beam & torsional element.
2. Analyze simple pin-jointed truss, continuous beams &frames.
3. Solve grid element problem, tapered and curved beams.
4. Illustrate band width, static condensation, sub-structuring &support displacement.
5. Examine space truss & space frames

UNIT-I (10 Lectures)

Introduction

Introduction of matrix methods of analysis - Static and kinematic indeterminacy - Degree of freedom – Structure idealization-stiffness and flexibility methods - Suitability: Element stiffness matrix for truss element, beam element and Torsional element- Element force - displacement equations

UNIT-II (10 Lectures)

Stiffness Method

Stiffness method - Element and global stiffness equation - coordinate transformation and global assembly - structure stiffness matrix equation - analysis of simple pin jointed trusses – continuous beams- rigid jointed plane frames.

UNIT-III (09 Lectures)

Stiffness Method For Grid Elements

Stiffness method for Grid elements - development of stiffness matrix - coordinate transformation. Examples of grid problems - tapered and curved beams

UNIT–IV (10 Lectures)

Stiffness Method For Various Joints

Additional topics in stiffness methods - discussion of band width - semi band width - static condensation - sub structuring -Loads between joints-Support displacements-inertial and thermal stresses-Beams on elastic foundation by stiffness method.

UNIT – V (09 Lectures)

Analysis Of Trusses And Frames

Space trusses and frames - Member stiffness for space truss and space frame-Transformation matrix from Local to Global - Analysis of simple trusses, beams and frames

Text Books:

1. Matrix analysis of structures- Robert E Sennet- Prentice Hall-Englewood cliffs-New Jercy
2. Advanced structural analysis-Dr. P. Dayaratnam- Tata McGraw hill publishing company limited.
3. Indeterminate Structural analysis- C K Wang

Reference Books:

1. Analysis of tall buildings by force - displacement - Method M. Smolira – Mc. Graw Hill.
2. Foundation Analysis and design - J.E. Bowls.

Web References:

1. https://www.researchgate.net/publication/322721792_Matrix_Structural_Analysis_Lecture_Notes_Handwritten
2. https://www.scribd.com/doc/176013125/Statically-Indeterminate-Structures-Chu-Kia-Wang-Ph- D-R

M.Tech. I Year I Semester

Course Structure

L	T	P	C
3	1	0	4

STRUCTURAL DYNAMICS

Internal Marks: 40

Course Code: PP18CET04 **External Marks: 60**

Course Prerequisite: Basics in Earthquake Resistance Design

Course Objectives:

1. To make students to learn principles of structural dynamics.
2. To impart the knowledge of SDOF through different methods and to apply the same for free and forced vibration of structures.
3. To enable the students to evaluate the dynamic characteristics of the structures
4. To make students to study the SDOF and MDOF system response.
5. To impart the knowledge on SDOF and MDOF concepts of free and forced vibration of structures

Course Outcomes:

After completion of the course the student will be able to

1. Illustrate the principles of structural dynamics.
2. Explain the elements of a vibratory system.
3. Determine the SDOF system response subjected to different loadings.
4. Develop the solution techniques for dynamics of multi-degree freedom systems.
5. Describe the concepts of damping in structures.
6. Solve the solution techniques for dynamics of continuous systems.

UNIT-I (10 Lectures)

Introduction

Introduction to Structural Dynamics: Fundamental objective of Dynamic Analysis Types of prescribed loadings - methods of Discretization – Formulation of the Equations of Motion**.**

UNIT-II (10 Lectures)

Theory of Vibrations

Introduction - Elements of a Vibratory system- Degrees of Freedom of continuous systems -Oscillatory motion - Simple Harmonic Motion - Free Vibrations of Single Degree of Freedom (SDOF) systems – Un damped and Damped -Critical damping - Logarithmic decrement - Forced vibrations of SDOF systems - Harmonic excitation - Dynamic magnification factor - Band width.

UNIT-III (10 Lectures)

Single Degree of Freedom System

Formulation and Solution of the equation of Motion-Free vibration response - Response to Harmonic, Periodic, Impulsive and general dynamic loadings - Duhamel integral.

UNIT–IV (09 Lectures)

Multi Degree of Freedom System

Selection of the Degrees of Freedom- Evaluation of Structural Property Matrices - Formulation of the MDOF equations of motion- Un damped free vibrations - Solution of Eigen value problem for natural frequencies and mode shapes - Analysis of dynamic response - Normal coordinates.

UNIT – V (09 Lectures)

Continuous Systems

Introduction- Flexural vibrations of beams -Elementary case -Equation of motion - Analysis of un damped free vibration of beams in flexure – Natural frequencies and mode shapes of simple beams with different end conditions.

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Text Books:

1.Dynamics of Structures by Clough & Penzien.

Reference Books:

1.Structural Dynamics A K Chopra

Web References:

1. www2.ce.ntu.edu.tw/~dynamics/dynamics/hw99/43-utline%20and%20content.pdf
2. www.dphu.org/uploads/attachements/books/books_2607_0.pdf

M.Tech. I Year I Semester **Course Structure**

L	T	P	C
3	1	0	4

EXPERIMENTAL STRESS ANALYSIS
(Professional Elective-I)

Internal Marks: 40
Course Code: PP18CEE01 **External Marks:60**

Course Prerequisite: Advanced Concrete Technology, Advanced Structural Analysis

Course Objectives:

1. To make the students to know relation between the mechanics theory and experimental stress analysis.
2. To enable students to know the fundamental concepts and newly experimental techniques.
3. To equip the students with all necessary knowledge to use experimental techniques for solving problems.
4. To impart knowledge on NDT instruments and its applications.
5. To help the students learn concepts of photo elasticity and its applications.

Course Outcomes:

After completion of the course the student will be able to

1. Explain strain measurement methods.
2. Examine strain using electrical resistance strain gauges.
3. Experiment with Non-destructive testing.
4. Explain different methods of photo-elasticity for strain measurement.
5. Apply photo elasticity concepts on two dimensional problems

UNIT– I (10 lectures)

Introduction and Strain Measurement Methods

Introduction and Strain measurement methods - Model & Prototype- Dimensional analysis-Factors influencing model design - Scale factors and Model material properties - Methods of model design. Definition of strain and its relation to experimental determinations - properties of strain gauge systems - Mechanical, Optical, Acoustic and Pneumatic types

UNIT– II (09 lectures)

Electrical Resistance Strain Gages

Electrical resistance strain gages: Introduction - gauge construction- strain gauge adhesives - mounting methods- gauge sensitivities and gage factor-performance characteristics of wire and foil strain gauges - environmental effects. Analysis of strain gauge data-the three element rectangular rosette- the delta rosette - correction for transverse sensitivity.

UNIT– III (09 lectures)

Non - Destructive Testing

Non - destructive testing: Introduction - objectives of non destructive testing. Ultrasonic pulse velocity method - Rebound Hammer method (Concrete hammer) - Acoustic Emission-application to assessment of concrete quality

UNIT– IV (10 lectures)

Theory of Photo Elasticity

Introduction - temporary double refraction- Index ellipsoid and stress ellipsoid - the stress optic law - effects of stressed model in a Polari scope for various arrangements - fringe sharpening.

UNIT– V (10 lectures)

Two Dimensional Photo Elasticity

Introduction - iso-chromatic fringe patterns - isoclinic fringe patterns - compensation techniques - calibration methods - separation methods materials for photo- elasticity - properties of photo-elastic materials

Text Books:

1. Experimental Stress Analysis- Riley and Dally
2. Experimental Stress Analysis - L.S. Srinath

Reference Books:

1.Experimental Stress Analysis – Lee
2.Experimental Stress Analysis- Sadhu Singh

Web Resources:

1. http://202.53.81.85/syllabus_R10/ane/4-1/experimental%20stress%20analysis.pdf
2. https://archive.org/details/handbookofexperi00het

M.Tech. I Year I Semester **Course Structure**

L	T	P	C
3	1	0	4

SUB STRUCTURE DESIGN
(Professional Elective-I)

Internal Marks: 40
Course Code: PP18CEE02 **External Marks:60**

Course Prerequisite: Geotechnical Engineering-II

Course Objectives:

1. To enable the students to know field and laboratory investigations carried on the soil.
2. To equip the students with necessary knowledge on methods of soil sampling.
3. To familiarize students to know factors that influences the bearing capacity in different soils for shallow foundations.
4. To make the students learn purposes of different foundation systems.
5. To impart knowledge on behaviour of pile foundations in different soils.

Course Outcomes:

After completion of the course the student will be able to

1. Discuss the soil exploration methods.
2. Classify soil sampling techniques to be considered for accurate results.
3. Demonstrate factors that influence the bearing capacity in different soils for shallow foundations.
4. Design mat and floating foundations.
5. Design pile `foundation

UNIT– I (10 lectures)

Soil Exploration

Soil Exploration - Importance, Terminology, planning- Geophysical methods. Borings, location, spacing and depth, methods of boring including drilling, stabilization of boreholes, boring records.

UNIT– II (10 lectures)

Soil Sampling

Soil sampling - Methods of sampling -Types of samples and samplers-cleaning of bore holes, preservation, labeling and shipment of samples - Design considerations of open drive samplers.

UNIT– III (10 lectures)

Shallow Foundations

Shallow Foundations -Bearing capacity - General bearing capacity equation, Meyerhof's, Hansen's and Vesic's bearing capacity factors - Bearing capacity of stratified soils - Bearing capacity based on penetration resistance- safe bearing capacity and allowable bearing pressure. (Ref: IS -2131 & IS 6403)

UNIT– IV (09 lectures)

Design of Foundations

Types and choice of type. Design considerations including location and depth, Proportioning of Shallow foundations- isolated and combined footings and mats - Design procedure for mats. Floating foundation- Fundamentals of beams on Elastic foundations. .(Ref: IS -456 & N.B.C. Relevant volume).

UNIT– V (09 lectures)

Pile Foundations

Pile foundations-Classification of piles-factors influencing choice-Load carrying capacity of single piles in clays and sands use static pile formulae- á - â - and λ - methods -Dynamic pile formulae-limitations-Monotonic and cyclic pile load tests - Under reamed piles. Pile groups -Efficiency of pile groups-Different formulae-load carrying capacity of pile groups in clays and sands - settlement of pile groups in clays and sands - Computation of load on each pile in a group

Text Books:

1. Principles of Foundation Engineering by Braja M. Das.
2. Soil Mechanics in Engineering Practice by Terzagi and Peck
3. Foundation Design by Wayne C. Teng, John Wiley & Co.,
4. Foundation Analysis and Design by J.E. Bowles McGraw Hill Publishing Co.,

Reference Books:

1. Analysis and Design of sub structures by Swami Saran
2. Foundation Design and Construction by MJ Tomlinson - Longman Scientific
3. A short course in Foundation Engineering by Simmons and Menzes - ELBS.

Web References:

1. https://library.ctr.utexas.edu/digitized/texasarchive/phase2/1410-2f.pdf
2. https://www1.maine.gov/mdot/bdg/docs/bpdg/chpt3.pdf

M.Tech. I Year I Semester **Course Structure**

L	T	P	C
3	1	0	4

THEORY AND APPLICATIONS OF CEMENT COMPOSITES
(Professional Elective-I)

Internal Marks: 40

Course Code: PP18CEE03 **External Marks:60**

Course Prerequisite: Concrete Technology, Strength of Materials.

Course Objectives:

1. To make students to learn constitutive behaviour of composite materials – Ferro-cement, SIFCON and Fibre Reinforced Concrete - by understanding their strain-stress behaviour.
2. To impart the knowledge of the materials as per orthotropic and anisotropic behaviour
3. To enable the students Estimate the strain constants using theories applicable to composite materials
4. To make students to evaluate Analysis and design of structural elements made of cement Composites.

Course Outcomes:

After completion of the course the student will be able to

1. Formulate constitutive behaviour of composite materials – Ferro-cement, SIFCON
2. Fibre Reinforced Concrete - by understanding their strain- stress behaviour.
3. Classify the materials as per orthotropic and anisotropic behaviour.
4. Estimate strain constants using theories applicable to composite materials.
5. Analysis and design structural elements made of cement composites

UNIT– I (09 lectures)

Introduction

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

UNIT– II (10 lectures)

Mechanical Behavior

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

UNIT– III (10 lectures)

Cement Composites

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

UNIT– IV (10 lectures)

Mechanical Properties Of Cement Composites

Behavior of Ferro cement, Fiber Reinforced Concrete in Tension, Compression, Flexure, Shear, Fatigue and Impact, Durability and Corrosion. Application of Cement Composites: FRC and Ferro cement- Housing, Water Storage, Boats and Miscellaneous Structures. Composite Materials- Orthotropic and Anisotropic behavior, Constitutive relationship, Elastic Constants.

UNIT– V (09 lectures)

Analysis And Design

Analysis and Design of Cement Composite Structural Elements - Ferro cement, SIFCONAnd Fiber Reinforced Concrete.

Text Books:

1. Mechanics of Composite Materials, Jones R. M,, 2nd Ed., Taylor and Francis, BSP Books,
2. Ferro cement – Theory and Applications, Pama R. P., IFIC, 1980.

Reference Books:

1. New Concrete Materials, Swamy R.N., 1stEd., Blackie, academic and Professional, Chapman &Hall, 1983.

Web References:

1. https://download-plaza.com/download/book/Fiber-2.Reinforced%20Cement%20Composites.html?aff.id=9325&aff.subid=9362

M.Tech. I Year I Semester **Course Structure**

L	T	P	C
3	1	0	4

ADVANCED STEEL DESIGN
(Professional Elective-I)

Internal Marks: 40
Course Code: PP18CEE04 **External Marks: 60**

Course Prerequisite: Design and drawing of Steel Structures

Course Objectives:

1. Analyse and Design the Truss type Rolling Stock and Pedestrian bridges
2. Analyse and design High Tension Transmission line towers
3. Analyse and design Self-supporting steel chimneys for Industrial purposes
4. Analyse and design North light roof trusses and Lattice girders for Industrial buildings.
6. Associate and perform analysis and design of elevated steel water tanks to store water.

Course Outcomes:

After completion of the course the student will be able to

1. Analyse and design the Truss type Rolling stock (moving vehicles) and Pedestrian bridges.
2. Analyse and design High Tension Transmission line towers.
3. Analyse and design Self-supporting steel chimneys for Industrial purposes
4. Analyse and design North light roof trusses and Lattice girders for Industrial buildings.
5. Associate and perform analysis and design of elevated steel water tanks to store water.

UNIT– I ` (10 lectures)

Pedestrian Bridge

Design of pedestrian Bridge (N-Truss), Design of through type truss bridge member for dead load and equivalent live load including top, bottom bracings.

UNIT– II (9 lectures)

Transmission Line Tower

Analysis and design for transmission line tower.

UNIT– III (10 lectures)

Steel Chimneys

Design of self supporting steel chimneys including foundations.

UNIT– IV (10 lectures)

Girders

Design of North light trusses and Lattice girder.

UNIT– V (09 lectures)

Elevated Water Tanks

Design of elevated water storage steel tanks. Design for web crippling and lateral torsional buckling for girders

Text Books:

1. Ram Chandra. "Design of Steel Structures Vol. I & II", 3 rd Edition, Standard Book House, Delhi,
2. Duggal, S.K., "Design of Steel Structures", 3rd Edition, Tata McGraw-Hill Publications, 2006

Reference Books:

1. Indian Standard Code 800-2007.
2. Bureau of Indian Standard Code, Special Publications 36.
3. MBMA and AISC Hand Books

Web References:

1. https://archive.org/details/DesignOfSteelStructuresSKDuggalIndian
2. https://www.smartzworld.com/notes/steel-structures-design-drawing-notes-pdf-ssdd/
3. https://easyengineering.net/steel-structures-books-collection-pdf/

M.Tech. I Year I Semester **Course Structure**

L	T	P	C
3	1	0	4

STRUCTURAL HEALTH MONITORING
(Professional Elective-II)

Internal Marks: 40
Course Code: PP18CEE05 **External Marks: 60**

Course Prerequisite: Repairs and rehabilitation of Structures

Course Objectives:

1. To make students to learn the distress in the structure, causes and Factors
2. To impart the knowledge of the health of structure using static field methods
3. To enable the student's health of structure using dynamic field tests.
4. To make students to study repairs and rehabilitation measures of the structure.

Course Outcomes:

After completion of the course the student will be able to

1. Diagnosis the distress in the structure understanding the causes and factors.
2. Assess the health of structure using static field methods.
3. Assess the health of structure using dynamic field tests.
4. Suggest repairs and rehabilitation measures of the structure

UNIT– I (09 lectures)

Introduction

Structural Health: Factors affecting Health of Structures, Causes of Distress, Regular Maintenance.

Structural Health Monitoring: Concepts, Various Measures, Structural Safety in Alteration.

UNIT– II (10 lectures)

Structural Audit

Assessment of Health of Structure, Collapse and Investigation- Management, SHM procedure

UNIT– III (09 lectures)

Static Field Testing

Types of Static Tests, Simulation and Loading Methods, sensor systems and hardware requirements, Static Response Measurement.

UNIT– IV (10 lectures)

Dynamic Field Testing

Types of Dynamic Field Test&Response Methods, Stress History Data, Hardware for

Remote Data Acquisition Systems, Remote Structural Health Monitoring.

UNIT– V (10 lectures)

Introduction to R & Rs

Case Studies (Site Visits), piezo–electric materials and other smart materials, electro– mechanical impedance (EMI) technique, adaptations of EMI technique.

Text Books:

1. Structural Health Monitoring, Daniel Balageas, Claus Peter Fritzen, Alfredo Güemes, John Wiley
2. Health Monitoring of Structural Materials and Components Methods with Applications,Douglas E Adams, John Wiley and Sons, 2007.

Reference Books:

1. Structural Health Monitoring and Intelligent Infrastructure, Vol1, J. P. Ou, H. Li and Z. D. Duan, Taylor and Francis Group, London, UK, 2006.
2. Structural Health Monitoring with Wafer Active Sensors, Victor Giurglutiu, Academic Press Inc, 2007.

Web References:

1. https://www.sciencedirect.com/science/book/9780124186910
2.http://fmcet.in/CIVIL/CE2071_uw.pd

M.Tech. I Year I Semester **Course Structure**

L	T	P	C
3	1	0	4

PLASTIC ANLAYSIS AND DESIGN
(Professional Elective-II)

Internal Marks: 40
Course Code: PP18CEE06 **External Marks: 60**

Course Prerequisite: Advanced structural analysis and design

Course Objectives:

1. To make the students to know the fundamentals of plastic analysis.
2. To impart knowledge on limit state design theorems.
3. To enable the students to apply the concept of design principles.
4. To make the students to know Load deflection relations for beams and frames.
5. To impart knowledge on concept of minimum weight design.

Course Outcomes:

After completion of the course the student will be able to.

1. Explain the fundamentals of plastic analysis.
2. Determine collapse load of a given structural model based on limit theorems.
3. Apply different methods for the design of continuous beams and simple frames.
4. Determine the deflection in plastic beams and frames.
5. Discuss minimum weight design functions.

UNIT– I (10 lectures)

Introduction

Concepts of stress and strain - relation of steel Moment curvature relation- basic difference between elastic and plastic analysis with examples- Yield condition, idealizations, collapse criteria- Virtual work in the elastic-plastic state-Evaluation of fully plastic moment and shape factors for the various practical sections.

UNIT– II (10 lectures)

Method of Limit Analysis

Introduction to limit analysis of simply supported fixed and continuous beams, Effect of partial fixity and end, invariance of collapse loads, basic theorems of limit analysis, rectangular portal frames, gable frames, grids, superposition of mechanisms, drawing statistical BM diagrams for checks.

UNIT– III (10 lectures)

Limit Design Principles

Basic principles, limit design theorems, application of limit design theorems, trial and error method, method of combining mechanisms, plastic moment

distribution method, load replacement method, continuous beams and simple frames designs using above principles.

UNIT– IV (09 lectures)

Deflection In Plastic Beams And Frames

Deflection in Plastic beams and frames: Load deflection relations for simply supported beams,=deflection of simple pin based and fixed based portal frames, method of computing deflections.

UNIT– V (09 lectures)

Minimum Weight Design

Introduction to minimum Weight and linear Weight functions-Foulkes theorems and its geometrical analogue and absolute minimum weight design.

Text Books:

1. Plastic Methods of Structural analysis- B G Neal, Chapman and Rall publications

Reference Books:

1. Plastic analysis and Design - C E Messennet, M A Seve

Web References:

1.https://www.researchgate.net/.../257725332_Plastic_Analysis_of_Steel_Frame_Structure…

2. www.mu.edu.et/iphc/images/liblary/...and.../Theory.../theorys_of_structures.pdf

3. http://www.steel-insdag.org/TeachingMaterial/chapter35.pdf

M.Tech. I Year I Semester **Course Structure**

L	T	P	C
3	1	0	4

ANALYTICAL AND NUMERICAL METHODS
(Professional Elective-II)

Internal Marks: 40

Course Code: PP18CEE07 **External Marks: 60**

Course Prerequisite: Advanced Mathematics

Course Objectives:

1. To make students to learn Solve ordinary and partial differential equations in structural mechanics using numerical methods
2. To impart the knowledge of to solve a mathematical problem
3. To enable the student about engineering mathematics and polynomial functions.

Course Outcomes:

1. After completion of the course the student will be able to
2. At the end of the course, students will be able to solve ordinary and partial differential equations in structural mechanics using Numerical methods.
3. Write a program to solve a mathematical problem.

UNIT– I (10 lectures)

Fundamentals

Error Analysis, Polynomial Approximations and Interpolations, Curve Fitting;Interpolation and extrapolation. Solution of Nonlinear Algebraic and Transcendental Equations.

UNIT– II (09 lectures)

Elements of Matrix Algebra

Solution of Systems of Linear Equations, Eigen Value Problems.

UNIT– III (10 lectures)

Numerical Differentiation & Integration

Solution of Ordinary and Partial Differential Equations.

UNIT– IV (09 lectures)

Finite Difference Scheme

Implicit & Explicit scheme.

UNIT– V (10 lectures)

Computer Algorithms

Numerical Solutions for Different Structural Problems, Fuzzy Logic and Neural Network.

Text Books:

1.An Introduction to Numerical Analysis, AtkinsonK.E., J. Wiley and Sons, 1989.
2.Theory and Problems of Numerical Analysis, Scheid F, McGraw Hill Book .

Reference Books:

1. Introductory Methods of Numerical Analysis, Sastry S. S, Prentice Hall of India, 1998.

Web References:

1.http://www.byggmek.lth.se/fileadmin/byggnadsmekanik/publications/tvsm3000/web3075.pdf
2. https://www.l5.pk.edu.pl/images/skrypty/MN_skrypt

M.Tech. I Year I Semester **Course Structure**

L	T	P	C
3	1	0	4

DESIGN OF ADVANCED CONCRETE STRUCTURES
(Professional Elective-II)

Internal Marks: 40

Course Code: PP18CEE08 **External Marks: 60**

Course Prerequisite: Concrete Technology

Course Objectives:

1. To make students to learn crack width and deflection with regard to the serviceability.
2. To impart the knowledge of analysis and design a grid floor system
3. To enable the students to evaluate analysis and design a flat slab system
4. To make students to study fire and seismic resistance of concrete structures
5. To impart the knowledge on analysis and design bunkers silos and chimneys.

Course Outcomes:

1. At the end of the course the student will be able to
2. Estimate the crack width and deflection with regard to the serviceability.
3. Analysis and design a grid floor system.
4. Analysis and design a flat slab system.
5. Discuss fire and seismic resistance of concrete structures.
6. Analysis and design bunkers, silos and chimneys.

UNIT– I (10 lectures)

Deflection and Crack Width Estimation

Deflection of Reinforced Concrete Beams and Slabs: Introduction, Short-term deflection of beams and slabs, Deflection due to imposed loads, Short-term deflection of beams due to applied loads, Deflection of slabs by IS 456 and comparison with foreign codes. Estimation of Crack width in Reinforced Concrete Members: Introduction, Factors affecting crack width in beams, Mechanisms of flexural cracking, Calculation of crack width, Simple empirical method, Estimation of crack width in beams by IS 4

UNIT– II (9 lectures)

Analysis and Design Of Grid Floors

Introduction, Analysis of flat grid floors, Analysis of rectangular grid floors by Timoshenko's plate theory. Analysis of grid by stiffness matrix method, Detailing of steel in flat grids.

UNIT– III (10 lectures)

Analysis & Design of Flat Slabs

Introduction, Proportioning of flat slabs, Determination of bending moment by direct design method, slab reinforcement details. Design for punching shear.

UNIT– IV (10 lectures)

Fire and Seismic Resistance of Concrete Structures

Design of Reinforced Concrete Members for Fire Resistance: Introduction, ISO 834 standard heating conditions, Grading or classifications, Effect of high temperature on steel and concrete, Effect of high temperatures on different types of structural members, Analytical determination of the ultimate bending moment, Capacity of reinforced concrete beams under fire.Ductile Detailing of Frames for Seismic Forces: Introduction, General principles, Factors that increase ductility, Specifications of materials for ductility, ductile detailing of beams – Requirements, Ductile detailing of columns and frame members with axial load (P) and moment (M) – Requirements.

UNIT– V (09 lectures)

Bunkers and Silos

Introduction, Design of rectangular bunkers, circular bunkers and silos.

Chimney-Introduction, Design factors, Stresses due to self weight, wind and temperature, Combinations of stresses.

Text Books:

1. Bhavikatti S. S. “Advance RCC Design”, 3rdEdition, New Age International Private Limited,2008
2. Krishnam Raju, N. “Design of Reinforced ConcreteStructures”,2ndEdition, CBS Publishers and Distributors, New Delhi, 2007.

Reference Books:

1. Varghese P.C.“Advanced ReinforcedConcreteDesign”,2ndEdition, Prentice - Hall of India,08
2. Indian Standard Code 456 2000, “Code of Practice for plan & reinforced centre”, British StandardCode-2000.
3. Special Publications -16, “Design Aids for Reinforced Concrete”, to IS:456.

Web References:

1. http://www.vssut.ac.in/lecture_notes/lecture1424356121.pdf
2 . http://www.ce.memphis.edu/4135/PDF/Notes/Chapter1-0%20.pdf

M.Tech. I Year I Semester **Course Structure**

L	T	P	C
2	0	0	0

ENGLISH FOR RESEARCH PAPER WRITING

Internal Marks: 0

Course Code: PP18CEA01 **External Marks:0**

Course objectives:

Students will be able to

1. Understand that how to improve your writing skills and level of readability
2. Learn about what to write in each section
3. Understand the skills needed when writing a Title Ensure the good quality of paper at very first-time submission

Course Outcomes:

1. How to improve your writing skills and level of readability
2. Understand about what to write in each section
3. Understand the skills needed when writing a Title Ensure the good quality of paper at very first-time submission.

UNIT-I

Planning and Preparation, Word Order, Breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness

UNIT-II

Clarifying Who Did What, Highlighting Your Findings, Hedging and Criticizing, Paraphrasing and Plagiarism, Sections of a Paper, Abstracts. Introduction

UNIT-III

Review of the Literature, Methods, Results, Discussion, Conclusions, The Final Check**.**

UNIT-IV

key skills are needed when writing a Title, key skills are needed when writing an Abstract, key skills are needed when writing an Introduction, skills needed when writing a Review of the Literature.

UNIT-V

skills are needed when writing the Methods, skills needed when writing the Results, skills are needed when writing the Discussion, skills are needed when writing the Conclusions useful phrases, how to ensure paper is as good as it could possibly be the first- time submission.

Text Books:

1. Goldbort R (2006) Writing for Science, Yale University Press (available on GoogleBooks)
2. Day R (2006) How to Write and Publish a Scientific Paper, Cambridge UniversityPress

Reference Books:

1. Highman N (1998), Handbook of Writing for the Mathematical Sciences, SIAM. Highman'sbook.
2. Adrian Wallwork , English for Writing Research Papers, Springer New York Dordrecht Heidelberg London,2011

Web References:

1. https://www.springer.com/cda/content/.../Free+Download++Useful+Phrases.pdf?...
2.https://www.amazon.com/English-Writing-Research-Papers-Academic/.../3319260928
3. https://www.editage.com/insights/how-to-write-a-research-paper-in-english

M.Tech. I Year I Semester **Course Structure**

L	T	P	C
0	0	3	1.5

ADVANCED CONCRETE LAB

Internal Marks: 40

Course Code: PP18CEL01 **External Marks: 60**

Course Prerequisite: Concrete Technology

Course Objectives:

1. To equip the students to conduct all fundamental experiments.
2. The impart adequate knowledge on various design principles by experimenting.
3. To enable the students to investigate the performance of structural elements.
4. To make the students to investigate the materials for sustainable constructions.

Course Outcomes:

At the end of the Course, Student will be able to

1. Explain Knowledge of design and development of experimenting skills.
2. Describe the principles for the design of experiments.
3. Evaluate the materials for sustainable constructions.
4. Summarize the testing methods and equipments.
5. Analyze the performance of structural elements.

Syllabus:

1. Strain measurement - Electrical resistance strain gauges
2. Non destructive testing- Impact Hammer test, UPV test
3. Qualifications tests on Self C. Concrete- L Box test, J Box test, U box test, Slump test
4. Tests on Buckling of columns – South well plot
5. Repair and rehabilitation of concrete beams
6. Chemical Analysis of water for suitability in concreting with and without Reinforcement.
7. Chemical Analysis of sand and Aggregate for Suitability in Construction.

NOTE: A minimum of five experiments from the above set have to be conducted

Web References:

1. http://www.sginstitute.in/Downloads/Civil_Downloads/Manual_ConcreteTech.pdf
2.www.cittumkur.org/manuals/civil/5th%20sem%20concrte%20LAB%20MANUAL.pdf

M.Tech. I Year II Semester **Course Structure**

L	T	P	C
3	1	0	4

FINITE ELEMENT METHOD

Internal Marks: 40

Course Code: PP18CET05 **External Marks: 60**

Course Prerequisite: Structural Analysis-II

Course Objectives:

1. To enable the students to learn the principles and concepts related to finite element methods.
2. To make the students to model, analyze, and interpret results to realistic engineering problems.
3. To equip the students with necessary knowledge to formulate beam elements using FEM.
4. To enable the students to formulate plane stress plain strain axi symmetric problem.
5. To impart knowledge to judge the quality of the numerical solution and improve accuracy in an efficient manner by optimal selection of solution variables.

Course Outcomes:

At the end of the Course, Student will be able to

1. Summarize direct and formal methods for deriving finite element equations.
2. Solve truss elements using the finite element method.
3. Apply finite element methods for analysis of beam and frame elements.
4. Analyze plane stress, plane strain, axi symmetric problems element method.
5. Analyze iso-parametric formulations

UNIT– I (10 lectures)

Introduction

Review of stiffness method- Principle of Stationary potential energy-Potential energy of an elastic body- Rayleigh-Ritz method of functional approximation - variational approaches -weighted residual methods.

UNIT– II (9 lectures)

Finite Element formulation of truss element

Stiffness matrix- properties of stiffness matrix - Selection of approximate displacement functions-solution of a plane truss- transformation matrix and stiffness matrix for a 3-D truss- Inclined and skewed supports- Galerkin's method for 1-D truss - Computation of stress in a truss element. Theory and Analysis of grid by stiffness matrix method, Detailing of steel in flat grids.

UNIT– III (10 lectures)

Finite element formulation of Beam elements

Beam stiffness-assemblage of beam stiffness matrix- Examples of beam analysis for concentrated and distributed loading- Galerkin's method - 2-D Arbitrarily oriented beam element - inclined and skewed supports - rigid plane frame examples

UNIT– IV (10 lectures)

CST And LST

Finite element formulation for plane stress, plane strain and axis symmetric problems-Derivation of CST and LST stiffness matrix and equations-treatment of body and surface forces-Finite Element solution for plane stress and axis symmetric problems- comparison CST and LST elements -convergence of solution- interpretation of stresses.

UNIT– V (09 lectures)

Iso-parametric Formulation

An iso-parametric bar element- plane bilinear iso-parametric element - quadratic plane element - shape functions, evaluation of stiffness matrix, consistent nodal load vector - Gauss quadrature- appropriate order of quadrature - element and mesh instabilities – spurious zero energy modes, stress computation- patch test.

Text Books:

1. Concepts and applications of Finite Element Analysis - Robert D. Cook, Michael E Plesha,John Wiley & sons Publications
2. A first course in the Finite Element Method - Daryl L. Logan, Thomson Publications.

Reference Books:

1. Introduction to Finite Elements in Engineering- Tirupati R. Chandrupatla, Ashok D. Belgunda, PHI publications.

Web References:

1. http://sv.20file.org/up1/658_0.pdf
2. http://www.dschool.ir/images/introduction%20to%20finite%20elements%20in%20engineering,%203rd%20ed,%20t.r.chandrupatla.pdf

M.Tech. I Year II Semester **Course Structure**

L	T	P	C
3	1	0	4

EARTHQUAKE RESISTANCE DESIGN

Internal Marks: 40

Course Code: PP18CET06 **External Marks: 60**

Course Prerequisite: Structural Dynamics

Course Objectives:

1. To make students to learn basic principles of engineering seismology.
2. To enable the students to learn design concepts of earthquake resistant high-rise buildings.
3. To impart the knowledge on design and ductile detailing of different structural members.
4. To make the students learn Elastic behavior of different materials subjected to cyclic loading.
5. To facilitate the students with all necessary knowledge to choose efficient structural systems and structural layouts.

Course Outcomes:

At the end of the Course, Student will be able to

1. Demonstrate knowledge on seismic effects on various structures.
2. Develop the seismic design concepts for different kinds of building systems.
3. Examine 3D modeling of building systems.
4. Analyze the concepts of elastic behavior of different materials subjected to cyclic loading.
5. Categorize the Seismic evaluation and retrofitting of structures

UNIT– I (10 lectures)

Introduction

Engineering seismology - rebound theory - plate tectonics - seismic waves - earthquake sizeand various scales - local site effects - Indian seismicity - seismic zones of India - theory of vibrations - near ground and far ground rotation and their effects

UNIT– II (10 lectures)

Seismic Design Concepts

Seismic design concepts - EQ load on simple building - load path - floor and roof diaphragms- seismic resistant building architecture- plan configuration - vertical configuration-pounding effects - mass and stiffness irregularities - torsion in structuralsystem- Provision of seismic code (IS 1893 & 13920) - Building system - frames - shear wall - braced frames -layout design of Moment Resisting Frames(MRF) - ductility of MRF - Infill wall - Non-structural elements.

UNIT– III (10 lectures)

Shear Walls

Calculation of EQ load - 3D modeling of building systems and analysis (theory only) Design and ductile detailing of Beams and columns of frames Concept of strong column weak beams, Design and ductile detailing of shear walls.

UNIT– IV (09 lectures)

Base Isolation

Cyclic loading behavior of RC, steel and pre- stressed concrete elements - modern concepts-Base isolation - Adaptive systems - case studies.

UNIT– V (09 lectures)

Retrofitting

Retrofitting and restoration of buildings subjected to damage due to earthquakes- effects ofearthquakes - factors related to building damages due to earthquake- methods of seismic retrofitting- restoration of buildings

Text Books:

1.Pankaj Agarwal and Manish Shri Khande, Earthquake Resistant Design of Structures, Prentic- Hall of India, 2007, New Delhi.

2. Bullen K.E., Introduction to the Theory of Seismology, Great Britain at the University Printing houses, Cambridge University Press 1996.

Reference Books:

1. Relevant code of practices. IS 1893-2002

Web References:

1. https://www.scribd.com/document/339796689/Earthquake-resistant-design-of-structures-by-pankaj-agarwal-pdf
2. http://www.ndma.gov.pk/sep/books/b2.pdf
3. http://rahat.up.nic.in/sdmplan/Earthquake/AnnexureI-V/AnnexureII_earthqk.%20prac.-1.pdf-- Code Book

M.Tech. I Year II Semester **Course Structure**

L	T	P	C
3	0	0	3

STABILITY OF STRUCTURES

Internal Marks: 40
Course Code: PP18CET07 **External Marks: 60**

Course Prerequisite: Theory of Elasticity

Course Objectives:

1. To make students to learn the behavior of beam columns for different loading conditions.
2. To discuss the basic principles of stability and buckling and to apply equilibrium and energy approaches for the buckling of different types of members.
3. To enable the students evaluate the elastic buckling behavior of bars.
4. To impart the knowledge of buckling of bars under torsion.
5. To enable the students to study lateral buckling of simply supported beams.

Course Outcomes:

At the end of the Course, Student will be able to

1.Analyze the behavior of beam columns for different loading conditions.
2. Examine the principles of strength, stability, elastic buckling behavior of bars.
3. Design in elastic buckling behavior of structural members.
4. Examine buckling behavior of thin walled bars of open cross section under torsion.
5. Analyze beams subjected to lateral buckling

UNIT– I (10 lectures)

Beam Columns

Differential equation for beam columns - Beams column with concentrated loads - continuous lateral load - couples - Beam column with built in ends - continuous beams with axial load - application of Trigonometric series - Determination of allowable stresses.

UNIT– II (09 lectures)

Elastic Buckling Of Bars

Elastic buckling of bars : Elastic buckling of straight columns - Effect of shear stress on buckling - Eccentrically and laterally loaded columns -Sway &Non Sway mode - Energy methods - Buckling of a bar on elastic foundation - Buckling of 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 - Effect of Initial curvature on bars - Buckling of frames - Sway &Non Sway mode.

UNIT– III (10 lectures)

In-Elastic Buckling

Buckling of straight bars - Double modulus theory Tangent modulus theory. Experiments and design formulae: Experiments on columns - Critical stress diagram - Empirical formulae of design - various end conditions - Design of columns based on buckling. Mathematical Treatment of stability problems: Buckling problem orthogonality relation - Ritz method -Stiffness method andformulation of Geometric stiffness matrix- Applications to simple frames.

UNIT– IV (09 lectures)

Torsional Buckling

Pure torsion of thin walled bars of open cross section - Non uniform torsion of thin walled bars of open cross section - Torsional buckling - Buckling of Torsion and Flexure.

UNIT– V (10 lectures)

Lateral Buckling of simply supported Beams

Beams of rectangular cross section subjected for pure bending, Buckling of I Section subjected to pure bending.

Text Books:

1. Theory of Elastic stability by Timshenko& Gere-Mc Graw Hill.

Reference Books:

1. Theory of Stability of Structures by Alexander ChaJes.

Web References:

1. www.kstr.lth.se/fileadmin/kstr/pdf_files/forsk_kurs/Intro.pdf
2. nptel.ac.in/courses/105106116/10

M.Tech. I Year II Semester **Course Structure**

L	T	P	C
3	1	0	4

ADVANCED DESIGN OF FOUNDATIONS

Internal Marks: 40

Course Code: PP18CET08 **External Marks: 60**

Course Prerequisite: Geotechnical Engineering

Course Objectives:

1. To know the suitability of soil strata for different projects
2. To familiar with shallow foundations deciding the bearing capacity of soil
3. To analyze the pile foundation.

Course Outcomes:

At the end of the Course, Student will be able to:

1. Decide the suitability of soil strata for different projects.
2. Design shallow foundations deciding the bearing capacity of soil.
3. Analyze and design the pile foundation.
4. Understand analysis methods for well foundation.

UNIT– I (09 lectures)

Soil Exploration

Planning of Soil Exploration for Different Projects, Methods of Subsurface Exploration, Methods ofBorings along with Various Penetration Tests.

UNIT– II (10 lectures)

Shallow Foundations

Shallow Foundations, Requirements for Satisfactory Performance of Foundations, Methods ofEstimating Bearing Capacity, Settlements of Footings and Rafts, Proportioning of Foundations usingField Test Data, Pressure - Settlement Characteristics from Constitutive Laws.

UNIT– III (10 lectures)

Pile Foundations

Pile Foundations, Methods of Estimating Load Transfer of Piles, Settlements of Pile Foundations,Pile Group Capacity and Settlement, Laterally Loaded Piles, Pile Load Tests, Analytical Estimationof Load- Settlement Behavior of Piles, Proportioning of Pile Foundations, Lateral and Uplift Capacity of Piles.

UNIT– IV (09 lectures)

Well Foundations

Well Foundation, IS and IRC Code Provisions, Elastic Theory and Ultimate Resistance Methods.Tunnels and Arching in Soils, Pressure Computations around Tunnels.

UNIT– V (10 lectures)

Open Cuts

Open Cuts, Sheeting and Bracing Systems in Shallow and Deep Open Cuts in Different Soil Types. Cofferdams: Stability, bearing capacity, settlements (qualitative treatment only, no designs).

Text Books:

1. Design of foundation system, N.P. Kurian, Narosa Publishing House
2. Foundation Analysis and Design, J. E. Bowles, Tata McGraw Hill New York

Reference Books:

1. Analysis and Design of Substructures, Sawmi Saran, Oxford and IBH Publishing Co. Pvt. Ltd.

Web References:

1. nptel.ac.in/courses/105108069/mod02/lec02.pdf
2. nptel.ac.in/courses/105105104/pdf/m11l29.pdf
3. https://www.researchgate.net/.../309011326_Advanced_Foundation_Engineering_Dr_P

M.Tech. I Year II Semester **Course Structure**

L	T	P	C
3	0	0	3

PRE-STRESSED CONCRETE
(Professional Elective-III)

Internal Marks: 40
Course Code: PP18CEE09 **External Marks: 60**

Course Prerequisite: Reinforced Concrete Structures.

Course Objectives:

1. To enable the students to illustrate the general mechanical behavior of pre stressed concrete.
2. To make the students to know the principles of pretension and post tension.
3. To make the students to analyze and design pre stressed concrete flexural members.
4. To enable the students to evaluate deflection and crack control of pre stressed concrete members.
5. To train the students to analyze and design simple connections of pre stressed concrete members.

Course Outcomes:

At the end of the Course, Student will be able to

1. Explain methods of pre stressing of concrete.
2. Determine various losses in both pre-tension &post-tension sections.
3. Analysis the members for flexure, shear, torsion in pre stressed members.
4. Analyze and design for deflection and crack control of pre stressed concrete members.
5. Illustrate simple connections of pre stressed concrete members.

UNIT– I (10 lectures)

Introduction

General principles of Pre-stressing- Pre-tensioning and Post tensioning - Pre tensioning andPost tensioning methods- Different systems of Pre-stressing- Analysis of pre-stress and Bending stresses- Resultant - stress at a section - pressure line - concept of load balancing - stresses in tendons.

UNIT– II (09 lectures)

Losses of Pre-stressing

Losses of Pre-stressing- Loss of Pre-stress in pre-tensioned and post tensioned members due to various causes -Elastic shortening, shrinkage of concrete, creep of concrete, Relaxation of steel, slip in anchorage, differential shrinkage- bending of members and frictional & Long term losses.

UNIT– III (10 lectures)

Failures

Flexural, shear; Torsional resistance and design of Pre-stressed concrete section. Types offlexural failure - code procedures-shear and principal stresses – Pre-stressed concrete members in torsion - Design of sections for flexure, Axial Tension, Compression and bending, shear, Bond.

UNIT– IV (10 lectures)

Deflections of Pre-Stressed Concrete Beams

Analysis of continuous beams -Elastic theory- Linear transformation and Concordant tendons-Deflections of pre-stressed concrete beams: Importance of control of deflections- factors influencing deflections-short term deflections of un-cracked member - prediction of long term deflections

UNIT– V (09 lectures)

Analysis of End Blocks

By Guyon's method and Magnel's method, Anchorage zone stresses- Approximate method of design- anchorage zone reinforcement- transfer of pre stresses- pre tensioned members-Composite sections: Introduction-Analysis for stresses- differential shrinkage- general design considerations.

Text Books:

1.Pre-stressed Concrete- N. Krishna Raju
2.Pre-stressed Concrete- S. Ramamrutham

Reference Books:

1.Pre-stressed Concrete- P. Dayaratnam
2.Pre-stressed Concrete- T.Y.Lin

Web References:

1.https://drive.google.com/file/d/1q273r_kykMnH3JI4WcFyxZjy0HNAWgZc/view
2.https://www.scribd.com/doc/132460689/Design-of-Prestressed-Concrete-Structures-3rd-Edition

M.Tech. I Year II Semester **Course Structure**

L	T	P	C
3	0	0	3

MECHANICS OF COMPOSITE STRUCTURES
(Professional Electives-III)

Internal Marks: 40

Course Code: PP18CEE10 **External Marks: 60**

Course Prerequisite: Reinforced Concrete Structures.

Course Objectives:

1. To make the students to know the properties of fiber and matrix materials used in Commercial composites.
2. To enable the students to know the elastic stiffness of laminate based on the elastic moduli of individual laminas and the stacking sequence.
3. To impart knowledge on significance of stiffness, and hydrothermal and mechanical Response of special cases of laminates.
4. To make the students to know nine mechanical and four hydro thermal constants.
5. To train the students on mechanical and hydrothermal loads applied to a laminate to strains and stresses in each lamina.

Course Outcomes:

At the end of the Course, Student will be able to

1. Illustrate the properties of fiber and matrix materials used in commercial composites, as well as some common manufacturing techniques.
2. Analyze problems on macro mechanical behavior of lamina.
3. Determine stresses and strains in composites.
4. Apply hook's law for a two dimensional angle lamina.
5. Explain failure criteria and critically evaluate the result.

UNIT– I (10 lectures)

Introduction to Composite Materials

Classification: Polymer Matrix Composites, Metal Matrix Composites, Ceramic Matrix Composites, Carbon-Carbon Composites, Fiber-Reinforced Composites and nature-made composites, and application- Reinforcements: Fibers- Glass, Silica, Kevlar, carbon, boron, silicon carbide, and born carbide fibers. Particulate composites, Polymer composites, Thermoplastics, Thermosetts, Metal matrix and ceramic composites.-Manufacturing methods: Autoclave, tape production, moulding methods, filament winding, man layup, pultrusion, RTM.

UNIT– II (09 lectures)

Macro mechanical Analysis of a Lamina

Introduction, Definitions: Stress, Strain,Elastic Moduli, Strain Energy. Hooke's Law for Different Types of Materials, Hooke's Law for a Two-Dimensional Unidirectional Lamina, Plane Stress Assumption, Reduction of Hooke's Law in Three Dimensions to Two Dimensions, Relationship of Compliance and Stiffness Matrix to Engineering Elastic Constants of a Lamina,

UNIT– III (10 lectures)

Failure Theories

Hooke's Law for a Two-Dimensional Angle Lamina, Engineering Constants of an Angle Lamina, Invariant Form of Stiffness and Compliance Matrices for an Angle Lamina Strength Failure Theories of an Angle Lamina : Maximum Stress Failure Theory Strength Ratio, Failure Envelopes, Maximum Strain Failure Theory ,Tsai-Hill Failure Theory, Tsai-Wu Failure Theory, Comparison of Experimental Results with Failure Theories. Hygro-thermal Stresses and Strains in a Lamina: Hygro-thermal Stress-Strain Relationships for a Unidirectional Lamina, Hygro-thermal Stress-Strain Relationships for an Angle Lamina.

UNIT– IV (10 lectures)

Micromechanical Analysis of a Lamina

Introduction, Volume and Mass Fractions, Density, and Void Content, Evaluation of the Four Elastic Moduli, Strength of Materials Approach, Semi-Empirical Models, Elasticity Approach, Elastic Moduli of Lamina with Transversely Isotropic Fibers, Ultimate Strengths of a Unidirectional Lamina, Coefficients of Thermal Expansion, Coefficients of Moisture Expansion.

UNIT– V (09 lectures)

Macro mechanical Analysis of Laminates

Introduction ,Laminate Code , Stress-Strain Relations for a Laminate, In-Plane and Flexural Modulus of a Laminate, Hygro thermal Effects in a Laminate, Warpage of Laminates -Failure,

Analysis and Design of Laminates: Introduction , Special Cases of Laminates, Failure Criterion for a Laminate, Design of a Laminated Composite.

Text Books:

1. Engineering Mechanics of Composite Materials by Isaac and M Daniel, Oxford University Press, 1994.
2. B. D. Agarwal and L. J. Broutman, Analysis and performance of fibre Composites, Wiley-Interscience, New York, 1980.

Reference Books:

1. Mechanics of Composite Materials, Second Edition (Mechanical Engineering), By Autar K. Kaw ,Publisher: CRC

Web References:

1. https://sarrami.iut.ac.ir/sites/sarrami.iut.ac.ir/files//files_course/01mechanics_of_composite_materials_sbookfi.org_.pdf
2. https://sarrami.iut.ac.ir/sites/sarrami.iut.ac.ir/files//files_course/01mechanics_of_composite_materials_sbookfi.org_.pdf
3. https://soaneemrana.org/onewebmedia/analysis%20and%20performance%20of%20fiber%20composites%20by%20bhagwan%20d.%20agarwal.pdf

M.Tech. I Year II Semester **Course Structure**

L	T	P	C
3	0	0	3

ADVANCED CONCRETE TECHNOLOGY
(Professional Elective-III)

Internal Marks: 40

Course Code: PP18CEE11 **External Marks: 60**

Course Prerequisite: Concrete Technology.

Course Objectives:

1. To know the concrete ingredients and its influence at gaining strength.
2. To Familiar with Design of concrete mix and grade as per IS codes.
3. To Apply FRC based on different uses.

Course Outcomes:

At the end of the Course, Student will be able to

1. Discuss the concrete ingredients and its influence at gaining strength.
2. Design of concrete mix and grade as per IS codes.
3. Summarize the concepts of conventional concrete and its differences with other Concretes like no fines, light weight etc.
4. Describe the application and use of fiber reinforced concrete.
5. Design and develop the self compacting and high performance concrete

UNIT– I (10 lectures)

Introduction

Properties of cement, fine aggregate and coarse aggregates, Additive sand Admixtures in Concrete, Rheology of Concrete.

UNIT– II (09 lectures)

Mix Design

Manufacturing and methods of concreting, Properties of fresh and hardened concrete, mix design by I.S. method.

UNIT– III (10 lectures)

Manufacture of Concrete

Design and manufacture of normal concrete, light weight concrete –Cellular concrete – No fines concrete – Aerated & foamed concrete

UNIT– IV (09 lectures)

Fiber Reinforced Concrete

Design and manufacture of fiber reinforced concrete – Polymer &Fly ash concretes.

UNIT– V (10 lectures)

Self Compacting Concrete

Design and manufacture of Self compacting concrete – High performance concrete – Very high strength concrete – High density concrete.

Text Books:

1.Neville, A.M. and Brookes, J.J., "Concrete Technology", 2ndEdition, Pearson Education, 2010.

2. Gambhir, M.L., "Concrete Technology", 2nd Edition, Tata McGraw Hill Publishers, New Delhi.

Reference Books:

1.Krishna Raju. N, "Design of Concrete Mixes", 2nd Edition, CBSPublishers and Distributors, 2009.

2. Shetty, M.S., "Concrete Technology", 3rd Edition, S.ChandPublications, 2008

Web References:

1. http://engineeringbookspdf.com/download/2018/02/190218/Advanced%20Concrete%20Technology20Concrete%20Properties%20By%20John%20Newman%20an%20Ban%20Seng%20Choo.pdf
2. http://engineeringbookspdf.com/download/2017/08/210817/Advanced%20Concrete%20.
3. http://engineeringbookspdf.com/download/2017/09/200917/Advanced%20Concree%20Technology%20Testing%20and%20Quality%20by%20John%20Newman.pdf

M.Tech. I Year II Semester **Course Structure**

L	T	P	C
3	0	0	3

FRACTURE MECHANICS
(Professional Elective-III)

Internal Marks: 40

Course Code: PP18CEE12 **External Marks: 60**

Course Prerequisite: Plastic Analysis and Design.

Course Objectives:

1. To impart knowledge on computing the stress intensity factor, strain energy release rate,and the stress and strain fields around a crack tip for linear and non linear materials.
2. To make the students to Know experimental methods to determine the fracture toughness.
3. To enable the students to know the concepts of Mixed mode crack propagation.
4. To make the students to know structures using fracture mechanics approaches.
5. To enable the students to apply the design principles.

Course Outcomes:

At the end of the Course, Student will be able to

1. Explain fundamentals of fracture mechanics, yield criteria & flow-rules.
2. Describe the experimental methods to determine the fracture toughness.
3. Apply principles of fracture mechanics.
4. Solve real problems related to plastic fracture mechanics.
5. Design structures using fracture mechanics approaches.

UNIT– I (10 lectures)

Introduction

Fundamentals of elastic and plastic behavior of materials- stresses in a plate with a hole – Stress Concentration factor-modes of failure- Brittle fracture and ductile fracture- history of fracture mechanics-Griffiths criteria for crack propagation cracks-Energy release rate, G_I G_{II} and G_{III} - Critical energy release rate G_{Ic} ,G_{IIc} and G_{IIIc} - surface energy – R curves - compliance

UNIT– II (10 lectures)

Principles of Linear Elastic Fracture Mechanics

SOM vs Fracture Mechanics -stressed based Criteria for fracture- Stress Intensity Factors- K_I K_{II} and K_{III} - Critical stress Intensity Factors, $K_{Ic}K_{IIc}$ and K_{IIc} - crack tip plastic zone - Erwin's plastic zone correction –Critical crack length-Load carrying capacity of a cracked component- Design of components based on fracture mechanics.

UNIT– III (10 lectures)

CTOD and CMOD

Mixed mode crack propagation- Maximum tangential stress criterion - crack propagation angle-Material characterization by Crack Tip Opening Displacements (CTOD)- Crack Mouth Opening Displacement (CMOD)- Critical crack tip opening displacement ($CTOD_c$) -critical Crack Mouth Opening Displacement ($CMOD_c$).

UNIT– IV (09 lectures)

Fatigue

Fatigue Crack propagation- Fatigue load parameters Fatigue crack growth curve – Thresholdstress intensity factor-Paris law- Retardation effects.

UNIT– V (09 lectures)

Applications of Fracture Mechanics

Applications of fracture Mechanics to concrete- reasons -strain softening behavior -Bazant's size effect law.

Text Books:

1.Elementary engineering fracture mechanics - David Broek - Sijthoff & Noordhoff -Netherlands.
2.Elements of Fracture Mechanics - Prasanth Kumar, wiley Eastern Publications.

Reference Books:

1.Fracture Mechanics: Fundamentals and applications - T. L. Andrason, PhD, CRC publications
2.Fracture Mechanics of Concrete: Applications of fracture mechanics to concrete.

Web References:

1. https://www.springer.com/la/book/9783319249971
2. https://www.springer.com/la/book/9781402048364
3. https://www.springer.com/la/book/9781402028632
4. http://www.mate.tue.nl/~piet/edu/frm/pdf/frmsyl1213.pdf

M.Tech. I Year II Semester **Course Structure**

L	T	P	C
3	0	0	3

INDUSTRIAL STRUCTURES
(Professional Elective-IV)

Internal Marks: 40
Course Code: PP18CEE13 **External Marks: 60**

Course Prerequisite: Structural Analysis, RCC

Course Objectives:

1. To make students to learn principles of design of industrial building.
2. To enable students to design different components of industrial structure sand to detail the structures.
3. To impart knowledge on evaluating the performance of the pre engineered buildings.
4. To illustrate the concept of power plant structures- bunkers and silos chimney and cooling towers.
5. To train the students to distinguish the power transmission structures, transmission line towers and tower foundations.

Course Outcomes:

At the end of the Course, Student will be able to

1. Illustrate the planning and functional requirements of industrial building.
2. Analyze the components of industrial building.
3. Design different folded plates of industrial structures and detailing.
4. Distinguish the principles of power plant structures-bunkers and silos-chimney and cooling towers.
5. Summarize the power transmission structures, transmission line towers and tower foundations

UNIT – I (10 lectures)

Introduction

Planning and functional requirements- classification of industries and industrial structures-planning for layout- requirements regarding lighting ventilation and fire safety- protection against noise and vibrations.

UNIT – II (09 lectures)

Roofs and Design of Gantry Girder

Industrial buildings- roofs for industrial buildings (Steel) - design of gantry girder- design ofcorbels and nibs- machine foundations

UNIT – III (10 lectures)

Design of Folded plates

Design of Folded plates- Design considerations- analysis of folded plates- analysis of multi-bayFolded plates- design of diaphragm beam

UNIT – IV (10 lectures)

Power Plant Structures

Power plant structures- Bunkers and silos- chimney and cooling towers-Nuclear containment Structures

UNIT – V (09 lectures)

Power Transmission Structures

Power transmission structures- transmission line towers- tower foundations- testing towers

Text Books:

1. Advanced reinforced concrete design- N. Krishnam Raju
2. Handbook on machine foundations- P. Srinivasulu and C.V. Vaidyanathan
3. Tall Chimneys- Design and construction - S.N. Manohar

Reference Books:

1. Transmission Line Structures- A.R. Santakumar and S.S. Murthy
2. P 32: 1986, Handbook on functional requirements of Industrial buildings
3. Design of shells- K. Chandrasekhara

Web References:

1. https://authors.library.caltech.edu/26539/1/Tangshan/Volume4_Chapter_6.pdf
2. https://www.scribd.com/doc/127930829/Advanced-Reinforced-Concrete-Design-by-Krishna-Raju

M.Tech. I Year II Semester **Course Structure**

L	T	P	C
3	0	0	3

BRIDGE ENGINEERING
(Professional Elective-IV)

Internal Marks: 40
Course Code: PP18CEE14 **External Marks: 60**

Course Prerequisite: Pre stressed Concrete, DDSS

Course Objectives:

1. To make students to learn principles of bridge design.
2. To enable the students to know different types of bridge designing methods.
3. To impart the knowledge on different methods of inspection of bridge sand maintenance.
3. To equip the students with necessary knowledge to analysis and design various bridges.
4. To make the students to learn the concept of stability analysis of piers and abutments .

Course Outcomes:

At the end of the Course, Student will be able to

1. Illustrate principles of designing of bridges.
2. Describe the different types of bridge designing methods.
3. Select different methods of inspection of bridges and maintenance.
4. Evaluate performance of the structures
5. Demonstrate stability analysis of pier sand abutments and foundation of bridges

UNIT – I (10 lectures)

Masonry Arch Bridge Design

Masonry arch Bridge design details- Rise, radius, and thickness of arch- Arch ring-Dimensioning of sub structures- Abutments pier and end connections.(Ref: IRC-SP-13)

UNIT – II (10 lectures)

Super Structure

Slab bridge- Wheel load on slab- effective width method- slabs supported on two edges- cantilever slabs- dispersion length- Design of interior panel of slab- Pigeaud's method- design of longitudinal girders- Guyon-Messonet method- Hendry Jaegar method-Courbon's theory. (Ref: IRC-21), voided slabs, T-Beam bridges.

UNIT – III (09 lectures)

Plate Girder Bridges

Plate girder bridges- Elements of plate girder and their design-web-flange-intermediate stiffener- vertical stiffeners- bearing stiffener-design problem

UNIT – IV (10 lectures)

Pre-Stressed Concrete And Composite Bridges

Pre-stressed Concrete and Composite bridges- Preliminary dimensions-flexural and torsional parameters- Courbon's Theory - Distribution coefficients by exact analysis- design of girder section- maximum and minimum pre-stressing forces- eccentricity- live load and dead load shear forces- cable zone in girder- check for stresses at various sections- check for diagonal tension- diaphragms and end block design- short term and long term deflections- Composite action of composite brides- shear connectors- composite or transformed section- design problem. (Ref: IRC: Section-VI).

UNIT – V (09 lectures)

Analysis Of Abutments And Piers

Sub structure- Abutments- Stability analysis of abutments- piers- loads on piers - Analysis ofpiers- Design problem(Ref: IRC-13, IRC-21, IRC-78)- Pipe culvert- Flow pattern in pipe culvers- culvert alignment-culvert entrance structure- Hydraulic design and structural design of pipe culverts- reinforcements in pipes .(Ref: IRC: SP-13)

Text Books:

1. Design of concrete bridges- Aswini, Vazirani, Ratwani
2. Essentials of bridge engineering- Jhonson Victor D

Reference Books:

1. Design of bridges- Krishna Raju

Web References:

1. http://engineeringbookspdf.com/download/2017/11/181117/
2.Bridge%20Engineering%20Substructure%20Design%20By%20Lian%2 Duan%20W%20F%20Chen.pdf

M.Tech. I Year II Semester **Course Structure**

L	T	P	C
3	0	0	3

EARTH RETAINING STRUCTURES
(Professional Elective-IV)

Internal Marks: 40

Course Code: PP18CEE15 **External Marks: 60**

Course Prerequisite: Geotechnical Engineering.

Course Objectives:

1. To make the students to know earth pressure theories.
2. To enable the students to judge the stability of retaining walls.
3. To train the students be knowledgeable of current US guidelines regarding the design of earth retaining structures.
4. To enable the students to analysis sheet pile structures.
5. To help the students design the most technically appropriate and cost effective type of retaining wall.

Course Outcomes:

At the end of the Course, Student will be able to

1. Solve earth pressure on various earth retaining structures such as gravity retainingwalls,Sheet pile, bulkheads, bracing/struts and cofferdams.
2. Evaluate the mechanical properties of geo synthetics used for soil reinforcement. Constructing of sheet pile with and without anchors.
3. Select the most technically appropriate type of retaining wall for the application.
4. Summarize the current guidelines regarding the design of earth retaining structures.

UNIT– I (10 lectures)

Earth Pressures

Earth pressures - Different types and their coefficients- Classical Theories of Earth pressure -Rankine's and Coulomb's Theories for Active and Passive earth pressure- Computation of Lateral Earth Pressure in Homogeneous and Layered soils- Graphical solutions for Coulomb's Theory in active and passive conditions

UNIT– II (09 lectures)

Retaining Walls

Retaining walls - different types - Type of Failures of Retaining Walls - Stability requirements – Drainage behind Retaining walls - Provision of Joints - Relief Shells.

UNIT– III (10 lectures)

Sheet Piles

Sheet Pile Structures - Types of Sheet piles - Cantilever sheet piles in sands and clays - Anchored sheet piles - Free earth and Fixed earth support methods - Row's moment reduction method - Location of anchors, Forces in anchors.

UNIT– IV (09 lectures)

Earth Reinforcement

Soil reinforcement - Reinforced earth - Different components - their functions - Mechanics ofreinforced earth - Failure modes-Failure theories - Design of Embankments on problematic soils.

UNIT– V (10 lectures)

Braced cuts and Cofferdams

Lateral Pressure in Braced cuts - Design of Various Components of a Braced cut - Stability of Braced cuts - Bottom Heave in cuts. - types of cofferdam, suitability, merits and demerits - Design of single - wall cofferdams and their stability aspects- TVA method and Cummins' methods.

Text Books:

1.Principles of Foundation Engineering by Braja M. Das.
2.Foundation analysis and design - Bowles, JE - McGraw Hill

Reference Books:

1.Soil Mechanics in Engineering Practice - Terzaghi, K and Rolph, B. peck 2nd Edn. - JohnWiley & Co.,
2. Analysis and Design of Foundations and Retaining Structures, Prakash, S - Saritha Prakashan,

Web References:

1. https://www.cedengineering.com/userfiles/Geol%20Eng%20-%20Earth%20Retaining%20Structures.pdf
2. http://engineeringbookspdf.com/download/2017/08/310817/Soil%20Retaining%20Structures%20Development%20of%20Models%20for%20Structural%20Analysis.pdf
3. https://www.pdfdrive.com/geotechnical-engineering-d33654601.html

M.Tech. I Year II Semester **Course Structure**

L	T	P	C
3	0	0	3

THEORY OF PLATES AND SHELLS
(Professional Elective-IV)

Internal Marks: 40

Course Code: PP18CEE16 **External Marks: 60**

Course Prerequisite: Theory of Elasticity.

Course Objectives:

1. To make the students to know the classical theory of elastic plates and address various boundary condition.
2. To demonstrate the students to known the analysis of circular plates under various loading conditions.
3. To impart the knowledge on analysis of shells using principles of membrane theory & bending theory.
4. To discuss the students to know the analysis& design cylindrical shells.
5. To impart the knowledge on design of cylindrical shells by geometry analysis & membrane theory.

Course Outcomes:

At the end of the Course, Student will be able to

1. Explain the behavior of rectangular plates under various loading conditions.
2. Evaluate the internal parameters in circular plates & annular plates.
3. Examine shells using principles of membrane theory & bending theory.
4. Illustrate applications of short and long shells.
5. Analyze cylindrical shells of different shapes by membrane theory.

UNIT– I (10 lectures)

Rectangular Plates

Derivation of governing differential equation for plate- in plane bending and transverse bending effects- Rectangular plates: Plates under various loading conditions like concentrated, uniformly distributed load and hydrostatic pressure. Navier and Levy's type of solutions for various boundary condition.

UNIT– II (09 lectures)

Circular plates

Symmetrically loaded, circular plates under various loading conditions, annular plates.

UNIT– III (09 lectures)

Shells

Introduction to Shells- Single and double curvature- Equations of Equilibrium of Shells Derivation of stress resultants, Principles of membrane and bending theory's.

UNIT– IV (10 lectures)

Cylindrical Shells

Derivation of the governing DKJ equation for bending theory, details of Schorer's theory. Application to the analysis and design of short and long shells. Use of ASCE Manual coefficients for the design.

UNIT– V (10 lectures)

Beam theory of cylindrical shells

Beam and arch action. Design of diaphragms – Geometry analysis and design of elliptic Paraboloid, Conoidal and Hyperbolic Paraboloid shapes by membrane theory.

Text Books:

1.Theory of Plates and Shells - Timoshenko and Krieger, McGraw-Hill book company,NY..

Reference Books:

1. IS CODE 2210
2. A Text Book of Plate Analysis - Bairagi, K, Khanna Publisher, New Delhi.
3. Design and Construction of Concrete Shell Roofs - Ramaswamy, G.S, Mc Graw - Hill, NewYork.

Web References:

1. http://www.cap-recifal.com/ccs_files/articles/cuveaqua1_denisio/Timoshenko_-_Theory_of_ plates_and_shells.pdf
2. http://homepage.tudelft.nl/p3r3s/MSc_projects/reportKanta.pdf

M.Tech. I Year II Semester **Course Structure**

L	T	P	C
2	0	0	0

PERSONALITY DEVELOPMENT THROUGH LIFE ENLIGHTENMENT SKILLS

Internal Marks: 0

Course Code: PP18CEA02 **External Marks: 0**

Course Objectives

1. To learn to achieve the highest goal happily
2. To become a person with stable mind, pleasing personality and determination
3. To awaken wisdom in students

Course Outcomes

Students will be able to

1. Study of Shrimad-Bhagwad-Geeta will help the student in developing his personality and achieve the highest goal in life
2. The person who has studied Geeta will lead the nation and mankind to peace and prosperity
3. Study of Neeti shatakam will help in developing versatile personality of students.

UNIT– I

Neetisatakam-Holistic development of personality

i. Verses- 19,20,21,22 (wisdom)
ii. Verses- 29,31,32 (pride & heroism)
iii. Verses- 26,28,63,65 (virtue)
iv. Verses- 52,53,59 (dont's)
v. Verses- 71,73,75,78 (do's)

UNIT– II

- Approach to day to day work and duties.
- Chapter 3-Verses 13, 21, 27, 35, Chapter 6-Verses 5,13,17, 23, 35,

UNIT– III

- Statements of basic knowledge.
- Shrimad BhagwadGeeta: Chapter2-Verses 56, 62, 68
- Chapter 12 -Verses 13, 14, 15, 16,17, 18

UNIT– IV

- Personality of Role model. Shrimad BhagwadGeeta: Chapter2-Verses 17,
- Chapter 3- Verses 36,37,42,
- Chapter18 – Verses 37,38,63

UNIT– V

- Shrimad BhagwadGeeta : Chapter 2-Verses 41, 47,48,
- Chapter 18-Verses 45, 46, 48.
- Chapter 4-Verses 18, 38,39

Text books:

1. "Srimad Bhagavad Gita" by Swami SwarupanandaAdvaita Ashram (Publication Department),Kolkata

Reference books:

1. Bhartrihari's Three Satakam (Niti-sringar-vairagya) by P.Gopinath, Rashtriya Sanskrit Sansthanam, NewDelhi.

Web Reference:

1. http://enlightenmentportal.com/development/personality-development-tips/
2. ncte-india.org/ncte_new/.../Yoga%20Education%20-%20M.Ed%20-%20English.pdf
3.https://www.quora.com/Why-should-I-pursue-spiritual-enlightenment-when-I-am-working-on-my-personal-development-to-increase-my-performance

M.Tech. I Year II Semester **Course Structure**

L	T	P	C
0	0	3	1.5

ADVANCED STRUCTURAL ANALYSIS AND DESIGN LAB

Internal Marks: 40

Course Code: PP18CEL02 **External Marks: 60**

Course Prerequisite: Structural Analysis

Course Objectives:

1. To make the students to analyze the various structural members.
2. To enable the students learn the procedure to assign various loads on to the members under various load condition.
3. To equip the students with all necessary knowledge to evaluate the performance of structural elements.
4. To impart knowledge on evaluating the mode shapes and frequencies of tall buildings.

Course Outcomes:

At the end of the Course, Student will be able to

1. Illustrate the knowledge of skills formed for structural engineering.
2. Understand the principles of structural analysis and design.
3. Analyze the various structural member using advanced software like REVIT, STAAD etc.
4. Evaluate the mode shapes and frequencies of tall buildings.

Syllabus:

Analysis and Design using STADD, STRAP, STRUDS, ANSYS

1. Programming for beams subject to different loading (mandatory).
2. Analysis of reinforced concrete multi-storied building of foundation (foundation Design)
3. Analysis of steel transmission line tower
4. Analysis of plane and space truss
5. Analysis of plane and space frame
6. Determination of mode shapes and frequencies of tall buildings using lumped mass (stick model) approximation
7. Wind analysis on tall structure
8. Analysis of pre stressed concrete bridge girder
9. Analysis of Cylindrical shell
10. Modal Analysis of a Cantilever Beam

NOTE: A minimum of eight (including item 1) from the above set have to be conducted.

Web References:

1. https://www.multisoftvirtualacademy.com/cad-cam-cae/staad-pro-online-training
2. https://rcplindia.in/course/revit-architecture-staad-pro

M.Tech. II Year I Semester **Course Structure**

L	T	P	C
2	0	0	2

RESEARCH METHODOLOGY AND IPR

Internal Marks:100

Course Code: PP18CEMC01 **External Marks: 0**

Course Prerequisite: IPR & P

Course Objectives:

1. To familiarize students with the different aspects of research.
2. To provide an idea of good scientific writing and proper presentation skills.
3. To provide an understanding of philosophical questions behind scientific research.
4. To provide a brief background on the historical legacy of science
5. To familiarize students with the different aspects of research.

Course Outcomes:

At the end of the Course, Student will be able 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.
5. Understanding that when IPR would take such important place in growth of individuals.

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UNIT– I

Research Problems

Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem. Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, Necessary instrumentations

UNIT– II

Research Ethics

Effective literature studies approaches, analysis Plagiarism, and Research ethics.

UNIT– III

Report Writing

Effective technical writing, how to write report, Paper Developing a Research Proposal, Format of research proposal, a presentation and assessment by a review committee

UNIT– IV

Nature of Intellectual Property

Patents, Designs, Trade and Copyright. Process of Patenting and Development: technological research, innovation, patenting, development. International Scenario: International cooperation on Intellectual Property. Procedure for grants of patents, Patenting under PCT.

Patent Rights

Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications.

UNIT– V

New Developments in IPR

Administration of Patent System. New developments in IPR; IPR of Biological Systems, Computer Software etc. Traditional knowledge Case Studies, IPR and IITs.

Text Books:

1. Stuart Melville and Wayne Goddard, "Research methodology: an introduction for science& engineering students'"
2.Wayne Goddard and Stuart Melville, "Research Methodology: An Introduction" Model Curriculum of Engineering & Technology PG Courses [Volume -II]
3. Ranjit Kumar, 2nd Edition, "Research Methodology: A Step by Step Guide for beginners"
4.Halbert, "Resisting Intellectual Property", Taylor & Francis Ltd ,2007.

Reference Books:

1. Mayall , "Industrial Design", McGraw Hill, 1992.
2. Niebel , "Product Design", McGraw Hill, 1974.
3. Asimov , "Introduction to Design", Prentice Hall, 1962.
4. Robert P. Merges, Peter S. Menell, Mark A. Lemley, " Intellectual Property in N.TAge", 2016.
5. T. Ramappa, "Intellectual Property Rights Under WTO", S. Chand, 2008

Web References:

1. http://www2.hcmuaf.edu.vn/data/quoctuan/Research%20Methodology%20-%20Methods%20and%20Techniques%202004.pdf
2. https://photos.state.gov/libraries/korea/49271/dwoa_122709/Focus-On-Intellectual-Property-Rights.pdf.