GOKUL GLOBAL UNIVERSITY

Approved By Govt. of Gujarat
(Recognized by UGC under Section 22 & 2(f) of 1956)
(Gujarat Private State University Act 4 of 2018)

COURSE STRUCTURE

Master of Engineering

(Structural Engineering)

Civil Engineering

Under

Choice Based Credit System (CBCS)

Faculty of Engineeering
Hansaba College of Engineering & Technology
University Campus, State Highway-41, Siddhpur - 384151, Dist. Patan, Gujarat, INDIA
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Semester -I

SR.NO	SEMESTER	SUBJECT CODE	SUBJECT NAME	CREDIT	CATEGORY
1	I	FEM110001	Research skill and Methodology	2(1+0+2)	MLC
2	I	FEM110002	Disaster Management	0(2+0+0)	Audit 1
3	I	FEM115201	Advanced Concrete Design	4(3+0+2)	Core 1
4	I	FEM115202	Advanced Structural Analysis	4(3+0+2)	Core 2
5	I	FEM115203 FEM115204	1. Analytical and Numerical methods for Structural Engg. 2. Theory of Structural Stability	4(3+0+2)	Program Elective I
6	I	FEM115205 FEM115206	1. Structural Health Monitoring And Retrofitting Of Structures 2. Structural Optimization	4(3+0+2)	Program Elective II
TOTAL				18	

Semester -II

SR	SEMESTER	SUBJECT CODE	SUBJECT NAME	CREDIT	CATEGORY
1	II	FEM120001	Research Paper Writing	0(2+0+0)	Audit 2
2	II	FEM125201	Advanced Steel Design	4(3+0+2)	Core III
3	II	FEM125202	Structural Dynamics	4(3+0+2)	Core IV
4	II	FEM125203 FEM125204	1. Design of High rise structures 2. Design Of Masonary Structure	4(3+0+2)	Program Elective III
5	II	FEM125205 FEM125206	1. Design of Bridge Structures 2. Soil structure interaction	4(3+0+2)	Program Elective IV
6	II	FEM125207	Mini Project With Seminar	2(0+0+4)	Core
TOTAL				18	

Semester -III

SR	SEMESTER	SUBJECT CODE	SUBJECT NAME	CREDIT	CATEGORY
1	III	FEM135201	Internal Review 1	2 (0+0+4)	Internal Review 1
2	III	FEM135202	Dissertation Phase I	8 (0+0+16)	Dissertation
3	III	FEM135203 FEM135204	1.Industrial Safety 2.Operation Research	3 (3+0+0)	Open Elective
4	III	FEM135205 FEM135206	1.Design of Prestressed Concrete structures 2.Earthquake Resistant Design of structures	3(3+0+0)	Program Elective V
TOTAL				16	

Semester -IV

SR	SEMESTER	SUBJECT CODE	SUBJECT NAME	CREDIT	CATEGORY
1	IV	FEM145201	Internal Review - 2	2 (0+0+4)	Dissertation
2	IV	FEM145202	Dissertation Phase II	14 (0+0+28)	Dissertation
TOTAL				16	

RESEARCH SKILL AND METHODOLOGY (FEM110001)

Credit-2 **L:T:P -:1:0:2**

Unit No	Subject Content	Teaching Hours	(%) Weightage
1	**Introduction to Research:** Nature and Scopeof Research, Information Based Decision Making and Source of Knowledge. The ResearchProcess, Basic approaches and Terminologies used inResearch, Defining Research Problem and FramingHypothesis, Preparing a Research Plan **Defining the Research Problem and Research Design** What is a Research Problem?, Selecting the Problem, Necessity of Defining the Problem, Meaning of Research Design, Need for Research Design, Future of a Good Design, Important Concepts Relating to Research Design, Different Research Design, Basic Principals of Experimental Designs	13	31
2	**Sampling Design** Census and sample survey, Implications of a Sample Design, Steps in sampling Design, Criteria of Selecting a Sampling Procedure, Characteristics of a Good Sample Design, Different Types of sample Designs, How to Select a Random Sample? ,Random Sample from an Infinite Universe, Complex Random Sampling Designs **Methods of Data Collection** Collection of Primary Data, Observation Method, Interview Method, Collection of Data through Questionnaires, Collection of Data through Schedules, Difference between Questionnaires and Schedules, Some Other Methods of Data Collection, Collection of Secondary Data, Selection of Appropriate Method for Data Collection	14	34
3	**Data Analysis** Data Analysis and Presentation Editing and coding of data, tabulation, graphic presentation of data, cross tabulation, Testing of hypotheses; Parametric and nonparametric tests for Univariate and Bivariate data. Tests of association; simple linear regression and other non-parametric tests, Sampling techniques, Probability, Probability Distributions, Hypothesis Testing, Level of Significance	7	12

	and Confidence Interval, t-test, ANOVA, Correlation, Regression Analysis		
4	**Interpretation of Data and Paper Writing** Layout of a Research Paper, Journals in Computer Science, Impact factor of Journals, When and where to publish? Ethical issues related to publishing, Plagiarism and Self-Plagiarism, Use of Encyclopedias, Research Guides, Handbook etc., Academic Databases for Computer Science Discipline.	**4**	**10**
5	**Report Writing** Significance of Report Writing, Deferent Steps in Writing Report. Layout of the Research Report, Types of Report, Oral Presentation, Mechanics of Writing a Research Report, Precautions for Writing a Research Report **Patent Rights** Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications	**4**	**13**

- **Reference Books:**

1. Research Methodology Methods and Techniques by C. R. Kothari, New Age International Publishers.
2. Research Methodology by D. K. Bhattacharyya, Excel Books Publications.
3. Research Methodology: A Guide for Researchers in Management and Social Sciences by Taylor, Sinha & Ghoshal, PHI Publications

- **Course outcome**

After completion of the course, the students will be able to:
CO-1: Conduct a quality literature review and find the research gap.
CO-2: Identify an original and relevant problem and identify methods to find its solution.
CO-3: Validate the model
CO-4: Present and defend the solution obtained in an effective manner in written or spoken form
CO-5 : take up and implement a research project/ study.

Course Outcomes	Expected Mapping with Programme Outcomes (1- Weak Correlation; 2- Medium correlation; 3- Strong Correlation)											
	PO-1	**PO-2**	**PO-3**	**PO-4**	**PO-5**	**PO-6**	**PO-7**	**PO-8**	**PO-9**	**PO-10**	**PO-11**	**PO-12**
CO-1	2	3	3	2	3	3	1	2	3	3	-	-
CO-2	2	3	3	2	3	3	1	2	3	3	-	-
CO-3	2	3	3	2	3	3	1	2	3	3	-	-
CO-4	2	3	3	2	3	3	1	2	3	3	-	-
CO-5	2	3	3	2	3	3	1	2	3	3	-	-

DISASTER MANAGEMENT(FEM110002

Credit-0 **L:T:P -:2:0:0**

Unit	Description in detail	Teaching Hours	Weightage
I	**Introduction:** Disaster: Definition, Factors And Significance; Difference Between Hazard And Disaster; Natural And Manmade Disasters: Difference, Nature, Types And Magnitude.	**04**	**17%**
II	**Repercussions Of Disasters and Hazards**: Economic Damage, Loss of Human and Animal Life, Destruction of Ecosystem. Natural Disasters: Earthquakes, Volcanisms, Cyclones, Tsunamis, Floods, Droughts and Famines, Landslides and Avalanches, Man-made disaster: Nuclear Reactor Meltdown, Industrial Accidents, Oil Slicks and Spills, Outbreaks of Disease and Epidemics, War And Conflicts	**04**	**17%**
III	**Disaster Prone Areas In India:** Study Of Seismic Zones; Areas Prone To Floods And Droughts, Landslides And Avalanches; Areas Prone To Cyclonic And Coastal Hazards With Special Reference To Tsunami; Post-Disaster Diseases And Epidemics	**04**	**17%**
IV	**Disaster Preparedness And Management:** Preparedness: Monitoring Of Phenomena Triggering A Disaster Or Hazard; Evaluation Of Risk: Application Of Remote Sensing, Data From Meteorological And Other Agencies, Media Reports: Governmental And Community Preparedness	**04**	**17%**
V	**Risk Assessment:** Disaster Risk: Concept And Elements, Disaster Risk Reduction, Global And National Disaster Risk Situation. Techniques Of Risk Assessment, Global Co-Operation In Risk Assessment And Warning, People's Participation In Risk Assessment. Strategies for Survival. **Disaster Mitigation:** Meaning, Concept And Strategies Of Disaster Mitigation, Emerging Trends In Mitigation. Structural Mitigation And Non-Structural Mitigation, Programs Of Disaster Mitigation In India.	**08**	**32%**

Reference Books :

1. R. Nishith, Singh AK, "Disaster Management in India: Perspectives, issues and strategies "'New Royal book Company
2. Sahni, PardeepEt.Al. (Eds.)," Disaster Mitigation Experiences And Reflections", Prentice Hall Of India, New Delhi.

3. Goel S. L. , Disaster Administration And Management Text And Case Studies" ,Deep &Deep Publication Pvt. Ltd., New Delhi.

Course Outcome:

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

CO-1: Learn to demonstrate a critical understanding of key concepts in disaster risk reduction and humanitarian response.

CO-2: Critically evaluate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.

CO-3: Develop an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations..

CO-4: Critically understand the strengths and weaknesses of disaster management approaches, planning and programming in different countries, particularly their home country or the countries they work in.

CO-5: Understand impact of Disasters and realization of societal responsibilities.

CO-6: Apply Disaster management principles

Course Outcomes	Expected Mapping with Programme Outcomes *(1- Weak Correlation; 2- Medium correlation; 3- Strong Correlation)*											
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12
CO-1	3	2	2	2	3	-	-	1	2	2	1	1
CO-2	3	2	2	1	2	-	-	1	3	2	2	1
CO-3	3	3	1	2	1	-	-	1	2	2	2	2
CO-4	3	3	3	2	2	-	-	-	2	3	2	-
CO-5	3	2	3	2	3	-	-	2	3	2	2	2
CO-6	1	3	2	2	2	-	-	1	3	3	1	2

ADVANCED CONCRETE DESIGN(FEM115201)

Credit-4 **L:T:P -:3:0:2**

Sr No.	Subject Content	Teaching Hours	(%) Weightage
1.	Design philosophy, Loads and load combinations, Material Characteristics ,Serviceability criteria: Deflection and crack width	05	15
2.	Design of slender columns ,Strut-and- Tie Method, Design of Deep Beam and Corbel	06	15
3.	Proportioning, analysis and design of flat slab by direct design method and detailing , Analysis and design of Grid floors by Rankine Grashoff Method, classical equivalent plate theory and IS:456 method.	09	20
4.	Design of rafts, Strip footing and pile cap. Design of Intz type shaft supported water tank	14	30
5	Design of Bunker and Silos, Design of Shear Walls, Compression Field Theory for Shear Design, Design against Torsion	12	20

References Books:

1. Advanced Design of Concrete Structures – Krishana Raju N., Tata Mc-Graw Hill, Delhi.
2. Reinforced Concrete Design – Sinha S. N., Tata Mc-Graw Hill, Delhi.
3. Limit State Design of Reinforced Concrete – Jain A. K., Nemchand & Bros., Roorkee.
4. Advanced Reinforced Concrete, Varghese A. V., Prentice Hall of India.
5. Reinforced concrete, Vol - I and II – Shah H. J., Charotar Pub., Anand.
6. Design of Multi-storied Building (G+3) - Shah and Karve, Structure Pub., Pune.
7. Reinforced Concrete Design, Pillai S. U. and MenonD., Tata McGraw-Hill, 3rd Ed, 1999.
8. Reinforced Concrete Structures, Park R.and PaulayT. , John Wiley & Sons, 1995.
9. Advanced Reinforced Concrete Design, Varghese P. C., Prentice Hall of India, New Delhi
10. Unified Theory of Concrete Structures, Hsu T. T. C. and Mo Y. L., John Wiley & Sons, 2010.
11. IS Codes : IS:456, IS:875, IS:1893, IS:4326, IS:13920, IS: 3370, IS: 4995 (I & II), SP:16, SP:34.

Course Outcome:

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

CO-1: Carry out load calculation, analysis, design and detailing of Slender Column, Corbel, Deep beams, flat slabs, water tanks, bunker and silos, Shear Walls as per relevant IS code of practice.,

CO-2: Analysis and design of raft foundation, strip footing and pile caps, Ensure serviceability criteria for reinforced concrete structural elements.

CO-3: Analyse and design a flat slab system.

CO-4: Discuss fire and seismic resistance of concrete structures..

CO-5: Analyse and design bunkers, silos and chimneys..

Course Outcomes	Expected Mapping with Programme Outcomes *(1- Weak Correlation; 2- Medium correlation; 3- Strong Correlation)*											
	PO-1	**PO-2**	**PO-3**	**PO-4**	**PO-5**	**PO-6**	**PO-7**	**PO-8**	**PO-9**	**PO-10**	**PO-11**	**PO-12**
CO-1	3	3	-	3	1	-	-	-	-	-	-	-
CO-2	3	3	-	3	2	-	-	-	-	--	-	-
CO-3	3	3	3	3	2	-	-	-	--	-	-	-
CO-4	2	2	-	2	2	-	-	-	-	-	-	-
CO-5	3	3	3	3	1	-	-	-	-	-	-	-

ADVANCED STRUCTURAL ANALYSIS(FEM115202)

Credit-4 **L:T:P -:3:0:2**

Sr No.	Subject Content	Teaching Hours	Weightage (%)
	Module – I: Stiffness Member Approach:		
1.	Principles of Virtual work, Basic concepts of flexibility and stiffness.	**01**	**35**
2.	Analysis of Continuous beam, Plane Truss, Plane Frame, Plane Grid including secondary effects such as Temperature changes, Prestrains and End-displacements.	**14**	
3.	Introduction to Non-linearity in structure and non-linear analysis.	**02**	**05**
	Module – II: Finite Element Method		
4.	Principles of discretization, Element stiffness mass formulation based on direct, variational and weighted residual techniques.	**03**	**09**
5.	Computations of element properties for bar elements, beam elements, truss elements, constant strain triangle and quadrilateral elements using generalized coordinates.	**09**	**22**
6.	Computations of element properties for bar elements, beam elements, truss elements, constant strain triangle and quadrilateral elements using natural coordinates; Iso-parametric formulation.	**10**	**22**
7.	Axisymmetric solids	**03**	**07**

References Books: -

1. Matrix Analysis of Framed Structure - Weaver W. and Gere J. M., CBS Publishers,Delhi.
2. Structural Analysis - Ghali&Nevelle, Spon Press, London.
3. Matrix Analysis of Structures - Aslam Kassimali, Cengage Learning, USA.
4. Elementary Matrix Analysis of Structures - H. Kardestuncer, Mc-Graw Hill, USA.
5. Matrix Analysis of Structures - Meghre& Deshmukh, Charotar Publication, Anand.
6. Computer Methods of Structural Analysis - Beaufait, Rowan, Hadley and Heckett
7. Linear Analysis of Frame works - Graves Smith
8. Computer Analysis of Structural Systems - Fleming J.F
9. A First Course in the Finite Element Method - D. L. Logan
10. Introduction to Finite Elements in Engineering - Chandrupatla, R.T. &Belegundu, A.D

11. Finite Element Analysis - S. S. Bhavikatti
12. Finite Element Method in Engineering - S.S.Rao
13. Finite Elements Methods - C.S.Krishnamurthy

Course outcome:

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

CO-1: Analyze skeleton structures using stiffness method
CO-2: Analyze skeleton structures having secondary effects using stiffness method.
CO-3: Derive element properties and analyze structure using finite element method
CO-4: Solve realistic engineering problems through computational simulations using finite element Code
CO-5: Apply energy principles for the analysis of determinate/indeterminate structures

Course Outcomes	Expected Mapping with Programme Outcomes *(1- Weak Correlation; 2- Medium correlation; 3- Strong Correlation)*											
	PO-1	**PO-2**	**PO-3**	**PO-4**	**PO-5**	**PO-6**	**PO-7**	**PO-8**	**PO-9**	**PO-10**	**PO-11**	**PO-12**
CO-1	3	3	3	2	1	-	-	-	--	-	-	-
CO-2	3	2	3	1	1	-	-	-	-	-	-	-
CO-3	3	2	1	1	-	-	-	-	-	-	-	-
CO-4	3	3	3	1	2	-	-	-	-	-	-	-
CO-5	3	3	2	2	1	-	-	-	-	-	-	-

ANALYTICAL AND NUMERICAL METHODS FOR STRUCTURAL ENGG.

(FEM115203)

Credit-4 **L:T:P -:3:0:2**

Sr No.	Subject Content	Teaching Hours	Weightage (%)
1	Errors: Error analysis, types of errors, accuracy & precision, stability in numerical analysis	2	5%
2	Interpolation and Curve Fitting: Empirical laws for curve fitting, general interpolation formulae. Homogeneous Linear ODEs with Constant Coefficients (Euler's formula and review of the circular	6	10%
3	Solution of Non-linear Algebraic and Transcendental Equations: Solution by graphical method, bisection method, Newton Raphson iterative method, Regula-Falsi method.	6	15%
4	Elements of Matrix Algebra: Solution of systems of linear equations, Eigen value problems. Applications to Structural Dynamic problems, stress problems, buckling of columns	8	20%
5	Numerical Differentiation & Integration: Solution of Ordinary and Partial Differential Equations, Euler's equation and other methods. Laplace equation - Properties of harmonic functions - Fourier transform methods for Laplace equation. Numerical Integration. Finite difference method: Finite difference technique, its applications to structural engineering problems. Computer Algorithms: Numerical solutions for different structural problems.	20	50%

Reference book:

1. Numerical methods in Engineering - Salvadori & Baron

2. Numerical methods – B S Grewal

3. Numerical Methods in Finite Element Analysis - Bathe & Wilson

4. Numerical methods for scientific and engineering computations – S R K Iyengar, R K Jain and Mahinder

COURSE OUTCOMES:

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

CO-1: Solve algebraic equations

CO-2: Obtain numerical solution of ordinary and partial differential equations

CO-3: Apply integration method/s for structural analysis

CO-4: Carry out interpolations and curve fitting

CO-5: Obtain solution of Eigen value problems and Fourier series for structural analysis

CO-6: Apply iterative and transformation methods in structural engineering

Course Outcomes	Expected Mapping with Programme Outcomes *(1- Weak Correlation; 2- Medium correlation; 3- Strong Correlation)*											
	PO-1	**PO-2**	**PO-3**	**PO-4**	**PO-5**	**PO-6**	**PO-7**	**PO-8**	**PO-9**	**PO-10**	**PO-11**	**PO-12**
CO-1	2	2	3	1	1	2	-	-	-	-	2	1
CO-2	3	2	2	1	3	-	1	-	-	1	-	1
CO-3	3	2	1	2	-	1	1	-	-	2	1	1
CO-4	3	2	-	-	3	2	2	-	-	3	2	1
CO-5	1	2	2	2	-	1	-	-	-	1	-	1
CO-6	3	1	-	3	2	1	-	-	-	2	2	1

STRUCTURAL HEALTH MONITORING AND RETROFITTING OF STRUCTURES (FEM115205)

Credit-4 **L:T:P -:3:0:2**

Sr No.	Subject Content	Teaching Hours	Weightage (%)
1.	**Structural Assessment& Need for retrofitting:** Introduction to health assessment of structures, structural damages & failures, Principles of structural assessment, Classification &levels of assessment, Current scenario of infrastructure through case studies	08	20
2.	**Introduction to SHM:** Introduction to global infrastructure crisis, Definition & Motivation for SHM, SHM versus Non-destructive evaluation, Concept of smart materials & smart structures with SHM,SHM & biomimetics, System components & categories of SHM, Classification of SHM systems, Methodologies and monitoring principles, Local & global Techniques for SHM, Advantages of SHM	12	30
3.	**Monitoring techniques of SHM:** A) Static field testing: Behavior tests, Diagnostic tests, Proof tests, Sensors & sensing technology for Structural monitoring, Structural responses B) Dynamic Field Testing: Stress history tests, Ambient vibration tests, Dynamic Load Allowance tests, Pull back (anchored cable tests) C) Periodic Monitoring: Field testing, tests to determine changes in structure Continuous monitoring: Active & Passive Monitoring	12	30
4.	**Concept of repair & retrofitting of structures:** Case studies of structural & foundation failure, performance problems, responsibility & accountability, causes of distress in structural members, design and material deficiencies, factors causing extensive deterioration. Retrofitting of structures: Fundamental of retrofitting, Flow of retrofitting process, Methods of retrofitting, Materials for retrofitting(conventional and smart materials), selection of retrofitting methods	10	20

References Books:-

1. Structural Health Monitoring, Daniel Balageas, Peter Fritzen, Alfredo Guemes, John Wiley & Sons, 2006.
2. Health Monitoring of Structural Materials and Components_Methods with Applications, Douglas E Adams, John Wiley and Sons, 2007.
3. Structural Health Monitoring and Intelligent Infrastructure, Vol1, J. P. Ou, H. Li and Z. D. Duan, Taylor and Francis Group, London, UK, 2006
4. Structural Health Monitoring with Wafer Active Sensors, Victor Giurglutiu, Academic Press Inc, 2007.

Course Outcome:

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

CO-1: Diagnose the distress and the cause of distress in the structure.

CO-2: Detect the changes in the characteristics of the structure.

CO-3: Assess the remaining performance capacity.

CO-4: Choose & apply the appropriate repair and retrofitting techniques for damaged structures.

CO-5: Identify suitable Sensors & Instruments required in SHM for in-service performance of structures.

Course Outcomes	Expected Mapping with Programme Outcomes (1- Weak Correlation; 2- Medium correlation; 3- Strong Correlation)											
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12
CO-1	3	-	-	-	-	3	3	3	3	3	3	3
CO-2	3	-	-	-	-	3	3	3	3	3	3	3
CO-3	3	-	-	-	-	3	3	3	3	3	3	3
CO-4	3	-	-	-	-	3	3	3	3	3	3	3
CO-5	3	-	-	-	-	3	3	3	3	3	3	3

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RESEARCH PAPER WRITING(FEM120001)

Credit-0 **L:T:P -:2:0:0**

Sr No	Subject Content	Teaching Hours	(%) Weightage
1.	Planning and Preparation, Word Order, Breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness	**4**	**17**
2.	Clarifying Who Did What, Highlighting Your Findings, Hedging and Criticising, Paraphrasing and Plagiarism, Sections of a Paper, Abstracts. Introduction	**4**	**17**
3.	Review of the Literature, Methods, Results, Discussion, Conclusions, The Final Check	**4**	**17**
4.	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	**4**	**17**
5.	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	**08**	**32**

Reference Books:

1. Goldbort R (2006) Writing for Science, Yale University Press (available on Google Books)
2. Day R (2006) How to Write and Publish a Scientific Paper, Cambridge University Press
3. Highman N (1998), Handbook of Writing for the Mathematical Sciences, SIAM. Highman'sbook
4. Adrian Wallwork , English for Writing Research Papers, Springer New York Dordrecht Heidelberg London, 2011

Course Outcome:

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

CO 1 Understand that how to improve your writing skills and level of readability.
CO 2 Learn about what to write in each section.
CO 3 Understand the skills needed when writing a Title.
CO 4 Ensure the good quality of paper at very first-time submission

CO 5 Relate the quantum concepts in electron microscopes
CO 6 Describe the unit cell characteristics and the growth of crystals

Course Outcomes	**Expected Mapping with Programme Outcomes** *(1- Weak Correlation; 2- Medium correlation; 3- Strong Correlation)*											
	PO-1	**PO-2**	**PO-3**	**PO-4**	**PO-5**	**PO-6**	**PO-7**	**PO-8**	**PO-9**	**PO-10**	**PO-11**	**PO-12**
CO-1	2	-	2	1	3	-	2	3	2	2	2	-
CO-2	3	2	-	-	-	-	-	3	2	-	1	-
CO-3	2	2	2	3	-	-	-	1	2	2	-	-
CO-4	2	-	1	2	-	-	-	3	-	2	-	-
CO-5	3	2	-	1	-	-	-	-	2	-	2	-
CO-6	2	2	3	-	-	-	-	3	2	3	2	-

ADVANCED STEEL DESIGN(FEM125201)

Credit-4 **L:T:P -:3:0:2**

Sr No.	Subject Content	Teaching Hours	(%) Weightage
1.	**Properties of Steel:** Mechanical Properties, Hysteresis, Ductility. Compactness and non-compactness, slenderness, residual stresses.	05	05%
2.	**Plastic Behaviour of Structural Steel :** Introduction, Plastic theory, Plastic hinge concept, Plastic collapse load, conditions of plastic analysis, Theorem of Plastic collapse, Methods of Plastic analysis.	08	15%
3.	**Design of Industrial Buildings:** Introduction, selection of bay width, structural framing, purlins, girts and eave strut, plane trusses, Design of Gantry girders.	10	20%
4.	**Design of cold formed sections:** Advantages, stiffened and un stiffened elements, local buckling and post buckling strength, shear lag and flange curling, unusually wide flange section, short span sections, members subjected to axial tension, compression and bending. Design of beams and columns, Introduction to pre-engineered buildings using cold formed sections.	12	25%
5.	**Design of Steel Stacks:** Introduction, Proportioning of stack, Codal provisions, Loads on Stacks, Load combinations, Stresses in Self-supporting stacks, Design procedure for self-supporting stacks, Guyed steel stacks **Design of composite structures:** Composite Floor and Roof System Design, Composite beam, Open web steel joist / joist girder, Serviceability requirements	12	35%

Reference Book:

1. N. Subramanian Design of Steel Structures: Theory and Practice, Oxford University.
2. V. L. Shah and Veena Gore, Limit State Design of Steel Structures IS : 800-2007, Structures.
3. S. S. Bhavikatti, Design of Steel Structures by Limit State Methods as Per IS 800-2007, I & K. International.
4. M. R. Shiyekar, Limit State Design in Structural Steel, PHI Learning.
5. S. K. Duggal, Limit State Design of Steel Structures, Tata McGraw Hill.
6. M. L. Gambhir, Fundamentals of Structural Steel Design, McGraw Hill Education.

7. IS Codes: IS: 800, IS: 875, SP: 6 and Steel Table.
8. Design of Steel Structures - Vol. II, Ramchandra. Standard Book House, Delhi.
9. Design of Steel Structures - Arya A. S., Ajmani J. L., Nemchand and Bros., Roorkee.

Course outcome:

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

CO-1: Apply unified code philosophy to steel building design
CO-2: Apply plastic method for design of beams and frames.
CO-3: Design & detail Industrial building, steel stacks & composite structures as per the IS code.
CO-4: Use of cold form sections in the steel structure including pre-engineered building.
CO-5: Develop design basis report.

Course Outcomes	Expected Mapping with Programme Outcomes *(1- Weak Correlation; 2- Medium correlation; 3- Strong Correlation)*											
	PO-1	**PO-2**	**PO-3**	**PO-4**	**PO-5**	**PO-6**	**PO-7**	**PO-8**	**PO-9**	**PO-10**	**PO-11**	**PO-12**
CO-1	3	3	3	1	2	-	-	-	-	-	-	3
CO-2	3	3	3	1	2	-	-	-	-	-	-	3
CO-3	3	3	3	1	2	-	-	-	-	-	-	3
CO-4	3	3	3	1	2	-	-	-	-	-	-	3
CO-5	3	3	3	1	2	-	-	-	-	-	-	3

STRUCTURAL DYNAMICS(FEM125202)

Credit-4 **L:T:P -:3:0:2**

Sr.	Content	Total Hrs	% Weightage
1	**Introduction:** Objectives, Importance of vibration analysis, Nature of exciting forces, Basic terminology related to vibration – natural frequency, natural period, resonance etc, Dynamic degree of freedom, Assumption to reduce dynamic DoF, Mathematical modeling of dynamic systems.	03	10
2	**Single Degree of Freedom System:** Free and forced vibration with and without damping, Response to Harmonic Loading, Response to general dynamic loading using Duhamel's integral, Numerical solution of response using Newmark's method & Direct Integration, Concept of response spectrum.	13	30
3	**Multiple Degree of Freedom System:** Equation of motion of symmetrical and un-symmetrical structures in plan, Natural frequencies and mode shapes of vibrating system, Orthogonality of modes, Dynamic response by Modal Superposition Method, Response Spectrum Analysis, Missing mass correction Introduction to multiple degree of freedom system with distributed mass and loading, Generalized Single Degree of Freedom System	20	40
4	**Special Topics in Structural Dynamics(Concepts only):** Dynamic effects of Wind loading, Moving loads, Vibrations caused by High Speed Traffic, Blasting and Pile driving, Foundations for industrial machinery, Base-isolation.	06	20

Reference Books:

1. Structural Dynamics and Introduction to Earthquake Engineering, Chopra A. K.

2. Dynamics of Structures, Clough R. W. and Penzien J., Mc Graw Hill
3. Dynamics of Structures, Humar J. L., Prentice Hall
4. Structural Dynamics - Theory and Computation, Paz Mario, CBS Publication
5. Dynamics of Structures, Hart and Wong
6. Vibration of Structures - Application in Civil Engineering Design, Smith J. W., Chapman and Hall

Course Outcome:

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

CO-1: Analyze and Interpret dynamics response of single degree freedom system using
CO-2: fundamental theory and experiments
CO-3: Analyze and Interpret dynamics response of Multi degree freedom system using
CO-4: fundamental theory and experiments
CO-5: Differentiate the effects of various types of dynamic loads Use structural engineering software for dynamic analysis
CO-6: Perform & interpret the results of various experiments on models to understand structural behavior of symmetrical & un-symmetrical structures

Course Outcomes	Expected Mapping with Programme Outcomes *(1- Weak Correlation; 2- Medium correlation; 3- Strong Correlation)*											
	PO-1	**PO-2**	**PO-3**	**PO-4**	**PO-5**	**PO-6**	**PO-7**	**PO-8**	**PO-9**	**PO-10**	**PO-11**	**PO-12**
CO-1	3	3	1	3	3	3	1	1	-	-	-	-
CO-2	3	3	1	3	3	3	1	1	-	-	-	-
CO-3	3	3	1	3	3	3	1	1	-	-	-	-
CO-4	3	3	1	3	3	3	1	1	-	-	-	-
CO-5	3	3	1	3	3	3	1	1	-	-	-	-
CO-6	3	3	1	3	3	3	1	1	-	-	-	-

DESIGN OF MASONARY STRUCTURE (FEM125204)

Credit-4 **L:T:P -:3:0:2**

Sr.	Content	Total Hrs	% Weightage
	Design of transmission/ TV tower, Mast and trestles: Configuration, bracing system, analysis and design for vertical transverse and longitudinal loads.	**10**	**18**
2	**Analysis and Design of RC and Steel Chimney**, Foundation design for varied soil strata.	**10**	**18**
3	**Tall Buildings**: **Introduction:** Why Tall Buildings, Factors affecting growth, Height and structural form. Design philosophy **Design Criteria:** Codal provisions for Loading, Sequential loading, Strength and Stability, Stiffness and drift limitations, Human Comfort criteria, Creep, Shrinkage and temperature effects, Fire. Foundation settlement and soil structure interaction. **Loading On Tall Structures :** a. Gravity loading:-Methods of live load reduction, Impact gravity loading, Construction loading. b. Wind loading:- Static loading, Dynamic loading. c. Earthquake loading:-Equivalent lateral force procedure, Modal analysis procedure. d. Combination of loading:-Working stress design, Limit Sate design; **Structural Form:** Braced frame structures, Rigid Frame structures, In filled-Frame structures, Flat plate- Flat slab structures, Shear wall structures, Wall frame structures, Framed tube structures, Suspended structures	**10**	**18**
4	**Application of software in analysis and design** **Approaches to analysis:**	**10**	**18**

	Preliminary analyses, Intermediate and final analysis, **Assumptions:** Materials, Participating components, Floor slabs, Negligible stiffness, Negligible deformations, Cracking, High-Rise Behavior, **Modeling for Approximate analyses:** Approximate Representation Bents, Approximate modeling of slabs, Modeling for continuum analyses, **Modeling for Accurate analyses:** Plane frames, Plane shear walls, Three dimensional frame and wall structures, P-Delta effects, The assembled model; **Braced Frames:** Types of bracings, Behavior of bracings, Behavior of bracing bents, **Methods of analysis:** member force analysis, Drift analysis, Worked example for calculating drift by approximate methods, use large scale bracing		
5	**Dynamic Analysis:** **Dynamic Response to Wind Loading:** Sensivity of structures wind forces, Dynamic structural response due to wind forces, Along wind response, Cross wind response, worked examples**,** **Dynamic response to Earthquake motions:** Response of Tall buildings to ground accelerations, response spectrum analysis, Empirical relations for fundamental natural frequency, Structural damping ratios **Comfort criteria:** Human perception of building motion, Perception thresholds, Use of comfort criteria in design	**16**	**28**

Reference Books:

1. Structural Design of Multi-storeyed Buildings, Varyani U. H., 2nd Ed., SouthAsian Publishers,New Delhi.
2. Structural Analysis and Design of Tall Buildings, Taranath B. S., Mc Graw Hill, 1988
3. Advanced Design of Concrete Structures – Krishana Raju N., Tata Mc-Graw Hill, Delhi
4. Design of Multi Storeyed Buildings, Vol. 1 & 2, CPWD Publications.
5. Tall Building Structures, Smith Byran S. and Coull Alex, Wiley India

6. High Rise Building Structures, Wolfgang Schueller, Wiley
7. Tall Building Structures on Elastic Subgrade and Research of Semi-Analytical method by Gong Yaoqing. Beijing: Tsinghua University
8. Tall Chimneys, Manohar S. N., Tata Mc Graw Hill Publishing Company, New Delhi
9. Advanced Reinforced Concrete, Varghese A. V., Prentice Hall of India.
10. Advanced Reinforced Concrete Design, Varghese P. C., Prentice Hall of India, New Delhi.
11. Unified Theory of Concrete Structures, Hsu T. T. C. and Mo Y. L., John Wiley & Sons, 2010. 12. IS Codes : IS:456, IS:875, IS:1893, IS:4326, IS:13920, IS: 3370, IS: 4995 (I & II), SP:16, SP:34.

Course outcomes:

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

CO-1: Analyze, design and detail Tall structures under different loading conditions by static and dynamic method of analysis.
CO-2: Use of computational software for analysis and design of high rise structures.
CO-3: Apply codal provisions for tall structures.
CO-4: Choose & apply appropriate structural systems for different size & height of structure Develop design basis report
CO-5: Describe the design criteria and loading conditions for buildings

Course Outcomes	Expected Mapping with Programme Outcomes (1- Weak Correlation; 2- Medium correlation; 3- Strong Correlation)											
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12
CO-1	3	3	3	1	3	-	-	-	-	-	1	2
CO-2	3	3	3	1	3	-	-	-	-	-	1	2
CO-3	3	3	3	1	3	-	-	-	-	-	1	2
CO-4	3	3	3	1	3	-	-	-	-	-	1	2
CO-5	3	3	3	1	3	-	-	-	-	-	1	2

DESIGN OF BRDGE(FEM125205)

Credit-4 **L:T:P -:3:0:2**

Sr.	Content	Total Hrs	(%) Weightage
1	Components of bridges and Classification of Bridges, Investigations and planning, Choice of type of bridges	2	5
2	I.R.C. and other international specifications on live loads for road bridges, Various forces acting on bridges, Load distribution theories: Courbon's Method, Hendry Jaeger Method, Grillage analogy, Pigeaud's curves	7	15
3	Superstructure: General design considerations, Analysis and design of reinforced concrete slab culverts, Tee beam and slab bridges, Design of prestressed concrete T beam bridges, Box girder bridges, Balanced cantilever bridges	15	35
4	Substructure : Various parts of substructures, Various types of substructures, Loads acting on substructures, Design of pier and pier cap, Design of different types of foundation – Open, pile & well foundation,	15	35
5	New era methodology/technology for design and construction of bridges, Seismic resistant design provisions, load test on bridges	3	10

Reference Books:

1. Krishnaraju, N., "Design of Bridges" Oxford and IBH Publishing Co., Bombay, Calcutta, New Delhi, 1988
2. Ponnuswamy, S., "Bridge Engineering", Tata McGraw Hill, 1989
3. Taylor, F.W., Thomson, S.E., and Smulski E., "Reinforced Concrete Bridges", John Wiley and Sons, New York
4. Raina V.K. "Concrete Bridge Practice", Tata McGraw Hill Publishing Company, New Delhi, 1991.
5. M.J. Ryall, G.A.R Parke, J.E. Harding, "The Manual of Bridge Engineering", Thomas Telford Publishers.
6. R. Rajagopalan, "Bridge Superstructure", Tata McGraw- Hills Publishing Company Limited
7. Chen Wai-Fah, Duan Lian, Bridge Engineering Handbook - Fundamentals, CRC Press.
8. Chen Wai-Fah, Duan Lian, Bridge Engineering Handbook - Superstructure Design,CRC Press.

9. Chen Wai-Fah, Duan Lian, Bridge Engineering Handbook - Construction & Maintenance, CRC Press.
10. Chen Wai-Fah, Duan Lian, Bridge Engineering Handbook - Seismic Design, CRC Press. 11. Chung C. Fu, Wang Shuqing, Computational Analysis & Design of Bridge Structures, CRC Press.
11. IRC: 5, 6, 78, 112-2011

Course outcome:

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

CO-1: Analyze and design small to medium span of reinforced concrete slab culverts, T beam bridges as per IRC specifications
CO-2: Apply design principles of pre-stressed concrete T beam bridges, box girder bridges and balanced cantilever bridges.
CO-3: Use of computational software for analysis & design of bridges
CO-4: Choose & apply appropriate structural form for different span of bridges Develop design basis report
CO-5: To familiarize with the usage of codal provisions in the design of bridges

Course Outcomes	Expected Mapping with Programme Outcomes *(1- Weak Correlation; 2- Medium correlation; 3- Strong Correlation)*											
	PO-1	**PO-2**	**PO-3**	**PO-4**	**PO-5**	**PO-6**	**PO-7**	**PO-8**	**PO-9**	**PO-10**	**PO-11**	**PO-12**
CO-1	3	3	3	3	3	-	-	-	-	-	-	-
CO-2	3	3	3	3	1	-	-	-	-	-	-	-
CO-3	3	3	3	3	3	-	-	-	-	-	-	-
CO-4	3	3	3	3	3	-	-	-	-	-	-	-
CO-5	3	3	3	3	3	-	-	-	-	-	-	-

MINI PROJECT WITH SEMINAR(FEM125207)

Sr No.	Subject Content	Teaching Hours	(%) Weightage
01	A mini project requires comparatively less time than major projects. They are comparatively simpler and have shorter duration. Mini Project helps students to explore and strengthen the understanding of fundamentals through practical application of theoretical concepts. Mini Project can help them to boost their skills and widen their horizon of thinking. It will act like a beginners guide to undertake the major project/dissertation during the final year and will ensure preparedness of students to undertake major projects/dissertation. Students will be required to select the topic relevant to their specialization and that has value addition. Students will get an opportunity to work in actual industrial environment if they opt for internship. Based on the selected topic student will also prepare seminar report based on the literature survey Mini Project will have mid semester presentation and end semester presentation. Mid semester presentation will include identification of the problem based on the literature review on the topic referring to latest literature available. End semester presentation should be done along with the report on identification of topic for the work and the methodology adopted involving scientific research, collection and analysis of data, determining solutions highlighting individuals' contribution. Continuous assessment of Mini Project at Mid Sem and End Sem will be monitored by the departmental committeeconcept to detailed design & drawing) from above topics along with cost estimation.	**56**	**100**

Course Outcomes: - At the end of the course, the student will be able to:
1. Identify engineering problems reviewing available literature.
2. Study different techniques used to analyze complex systems.
3. Solve a live problem using software/analytical/computational tools and present solution by using his/her technique applying engineering principles.
4. Learn to write technical reports and develop skills to present and defend their work in front of technically qualified audience.

Course Outcomes	Expected Mapping with Programme Outcomes (1- Weak Correlation; 2- Medium correlation; 3- Strong Correlation)											
	PO-1	**PO-2**	**PO-3**	**PO-4**	**PO-5**	**PO-6**	**PO-7**	**PO-8**	**PO-9**	**PO-10**	**PO-11**	**PO-12**
CO-1	2	1	3	3	-	-	-	-	-	--	-	-
CO-2	2	1	3	3	-	-	-	-	-	--	-	-
CO-3	1	1	2	2	3	-	-	1	1	-	--	-
CO-4	2	2	2	3	1	1	-	-	-	-	-	-

INTERNAL REVIEW -1(FEM135201)

Credit-2 **L:T:P -:0:0:4**

Sr No.	Subject Content
1.	**Course Objective**: To present a problem oriented in depth knowledge of Mid semester Thesis Progress Review. To address the underlying concepts and methods behind Mid semester Thesis Progress Review
2.	**Instructional Method & Pedagogy** At the start of course, the course delivery pattern, prerequisite of the subject will be discussed. Lecture may be conducted with the aid of multi-media projector, black board, OHP etc. & equal weightage should be given to all topics while teaching and conduction of all examinations. Attendance is compulsory in lectures and laboratory, which may carries five marks in overall evaluation. Assignment based on course content will be given to the student for each unit/topic and will be evaluated at regular interval. It may carry an importance of ten marks in the overall internal evaluation. Surprise tests/Quizzes/Seminar/Tutorial may be conducted and having share of five marks in the overall internal evaluation.

Course outcome:

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

CO-1: The student can identify different areas of mid semester Thesis Progress Review.

CO-2: Can find the applications of all the areas in day to day life.

Course Outcomes	Expected Mapping with Programme Outcomes (1- Weak Correlation; 2- Medium correlation; 3- Strong Correlation)											
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12
CO-1	2	1	3	3	-	-	-	-	-	--	-	-
CO-2	2	1	3	3	-	-	-	-	-	--	-	-

DISSERTATION PHASE I(FEM135202)

Credit-8 **L:T:P -:0:0:16**

Sr No.	Subject Content
1.	**Course Objective:** To select topic based on structural engineering related requirement as per the current scenario and work accordingly.
2.	**Instructional Method & Pedagogy** At the start of course, the course delivery pattern, prerequisite of the subject will be discussed. Lecture may be conducted with the aid of multi-media projector, black board, OHP etc. & equal weightage should be given to all topics while teaching and conduction of all examinations. Attendance is compulsory in lectures and laboratory, which may carries five marks in overall evaluation. Assignment based on course content will be given to the student for each unit/topic and will be evaluated at regular interval. It may carry an importance of ten marks in the overall internal evaluation. Surprise tests/Quizzes/Seminar/Tutorial may be conducted and having share of five marks in the overall internal evaluation.

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

CO-1: At the end of the course, students will gain an experience in reviewing various research papers, understanding various newer concepts of problem solving and finalizing the topic related to the course for the work.

Course Outcomes	Expected Mapping with Programme Outcomes *(1- Weak Correlation; 2- Medium correlation; 3- Strong Correlation)*											
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12
CO-1	1	1	1	3	2	3	3	-	3	-	-	-
CO-2												
CO-3												
CO-4												
CO-5												

OPERATION RESEARCH (FEM135204)

Credit-3 **L:T:P -:3:0:0**

Sr No.	Subject Content	Teaching Hours	(%) Weightage
1.	**Linear Programming Problems:** Formulation of a LPP, - graphical solution, simplex method, duality in LPP, sensitivity analysis, Integer linear programming, revised simplex method, parametric linear programming, Dynamic programming under certainty, Dynamic programming approach for solving LPP.	12	30
2.	**Project Management , Inventory Control and Decision Making:** CPM, PERT, Project time cost trade off, Resource allocation, Deterministic inventory control models, Probabilistic inventory control models, Decision making process, Decision making under uncertainty, Decision making under risk, Decision tree analysis, Theory of games, Pure strategies, Mix strategies, Solutions method games without saddle points.	10	25
3.	**Classical Optimization Methods:** Single variable optimization, Constrained and unconstrained multi-variable optimization, Direct substitution method, Lagrange's method of multipliers, Kuhn- Tucker conditions	06	12
4.	**Non-linear Programming:** **Constrained Optimization Techniques** Unimodal function, Unrestricted search, Exhaustive search, Dichotomous search, Interval halving method, Fibonacci method, Golden section method **Unconstrained Optimization Techniques** Direct Search Methods: Random search methods, Grid search method, Univariate method, **Constrained Optimization Techniques** Direct Methods: Random search method, Sequential linear programming.	10	25
5.	**Evolutionary Algorithms** An overview of evolutionary algorithms, Simulated annealing algorithm, Genetic algorithm, Particle swarm optimization	04	8

Reference Book:

1. J. K. Sharma, Operation Research, Theory and Application, Macmillan Publishers India Ltd,2013
2. H.A. Taha, Operations Research, An Introduction, PHI, 2008
3. S.S.Rao, Engineering Optimization Theory and Practice, New Age International (P) Ltd, Publishers.
4. H.M. Wagner, Principles of Operations Research, PHI, Delhi, 1982
5. Pannerselvam, Operations Research: Prentice Hall of India 2010
6. Harvey M Wagner, Principles of Operations Research: Prentice Hall of India 2010

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

CO-1: Students should able to apply the Liner programming techniques to solve problems of real life applications and carry out post optimality analysis.

CO-2: Students should able to apply the concepts of non-linear programming and apply them for real life problems.

CO-3: Students should able to obtain quantitative solutions in business decision making under conditions of certainty, risk and uncertainty

CO-4: Students should able to implement various scientific tools and models that are available in the subject to take decisions in a complex environment

CO-5: develop linear programming (LP) models for shortest path, maximum flow, minimal spanning tree, critical path, minimum cost flow, and transshipment problems.

Course Outcomes	**Expected Mapping with Programme Outcomes** *(1- Weak Correlation; 2- Medium correlation; 3- Strong Correlation)*											
	PO-1	**PO-2**	**PO-3**	**PO-4**	**PO-5**	**PO-6**	**PO-7**	**PO-8**	**PO-9**	**PO-10**	**PO-11**	**PO-12**
CO-1	3	2	3	1	3	-	-	-	--	-	-	-
CO-2	3	2	3	1	3	-	-	-	--	-	-	-
CO-3	3	2	3	1	3	-	-	-	--	-	-	-
CO-4	3	2	3	1	3	-	-	-	--	-	-	-
CO-5	3	2	3	1	3	-	-	-	--	-	-	-

DESIGN OF PRESTRESSED CONCRETE STRUCTURES(FEM135205)

Credit-3 **L:T:P -:3:0:0**

Sr No.	Subject Content	Teaching Hours	(%) Weightage
1.	**Introduction:** Principles of prestressing - types and systems of prestressing, need for High Strength materials, Loading stages, Determination of losses, deflection (short-long term), camber, cable layouts.	05	10
2.	**Statically determinate PSC beams**: Analysis and design for ultimate and serviceability limit states for flexure, shear, bond and torsion, code provisions.	06	15
3.	**Transmission of prestress:** Prestress Transmission in pre-tensioned members; Anchorage zone stresses and design for post-tensioned members. **Statically indeterminate structures:** Analysis and design of continuous beams, choice of cable profile, linear transformation and concordance	10	25
4	**Design of structural elements:** Analysis and design of various structural elements like slab, column, beam-column. Application in the design of prestressed pipes and prestressed concrete cylindrical water tanks.	10	25
5.	**Composite construction:** Analysis and design of precast PSC beams and cast in-situ RC slab, creep and shrinkage effects. Partial prestressing - principles, analysis and design concepts, crack width calculations. **Miscellaneous structures:** Introduction to the special prestressed structures like prestressed folded plates, Prestressed cylindrical shells, prestressed concrete poles.	10	25

Reference Books:

1. Prestressed concrete - Krishna Raju
2. Design of Prestressed Concrete Structures - T.Y.Lin
3. Fundamentals of Prestressed Concrete - N.C.Sinha & S.K.Roy S.Chand & Co.,
4. Prestressed Concrete- Design and Construction – Leonhardt F., Wilhelm Ernst and Shon, Berlin
5. Prestressed Concrete - Freyssinet
6. Prestressed Concrete, - Evans, R.H. and Bennett, E.W., Chapman and Hall

7. Prestressed concrete - Rajgopalan
8. IS:1343-Code for Practice for Prestressed Concrete.
9. IS:3370-3 (1967): Code of Practice Concrete structures for the storage of liquids, Part 3:Prestressed concrete structures

COURSE OUTCOME :

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

CO-1: Analyze and design for flexure shear, bond and torsion
CO-2: Design of tension members
CO-3: Design of compression members with and without flexure
CO-4: Analysis and design of composite beams
CO-5: Understand design principles of the special prestressed structures like prestressed folded plates, prestressed cylindrical shells, and prestressed concrete poles.

Course Outcomes	Expected Mapping with Programme Outcomes (1- Weak Correlation; 2- Medium correlation; 3- Strong Correlation)											
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12
CO-1	3	2	3	1	-	3	2	1	-	-	-	-
CO-2	3	2	3	1	-	3	2	1	-	-	-	-
CO-3	3	2	3	1	-	3	2	1	-	-	-	-
CO-4	3	2	3	1	-	3	2	1	-	-	-	-
CO-5	3	2	3	1	-	3	2	1	-	-	-	-

INTERNAL REVIEW – 2 (FEM145201)

Credit-2 **L:T:P -:0:0:4**

Sr No.	Subject Content
1.	**Course Objective**: To present a problem oriented in depth knowledge of Mid semester Thesis Progress Review. To address the underlying concepts and methods behind Mid semester Thesis Progress Review
2.	**Instructional Method & Pedagogy** At the start of course, the course delivery pattern, prerequisite of the subject will be discussed. Lecture may be conducted with the aid of multi-media projector, black board, OHP etc. & equal weightage should be given to all topics while teaching and conduction of all examinations. Attendance is compulsory in lectures and laboratory, which may carries five marks in overall evaluation. Assignment based on course content will be given to the student for each unit/topic and will be evaluated at regular interval. It may carry an importance of ten marks in the overall internal evaluation. Surprise tests/Quizzes/Seminar/Tutorial may be conducted and having share of five marks in the overall internal evaluation.

Course outcome :

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

CO-1: The student can identify different areas of mid semester Thesis Progress Review.

CO-2: Can find the applications of all the areas in day to day life.

Course Outcomes	Expected Mapping with Programme Outcomes (1- Weak Correlation; 2- Medium correlation; 3- Strong Correlation)											
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12
CO-1	3	2	1	3	3	3	1	-	-	-	--	-
CO-2	3	2	1	3	3	3	1	-	-	-	--	-

DISSERTATION PHASE II(FEM145202)

Sr No.	Subject Content
1.	**Course Objective**: To present a problem oriented in depth knowledge of Dissertation Phase II. To address the underlying concepts and methods behind Dissertation Phase II
2.	**Instructional Method & Pedagogy** At the start of course, the course delivery pattern, prerequisite of the subject will be discussed. Lecture may be conducted with the aid of multi-media projector, black board, OHP etc. & equal weightage should be given to all topics while teaching and conduction of all examinations. Attendance is compulsory in lectures and laboratory, which may carries five marks in overall evaluation. Assignment based on course content will be given to the student for each unit/topic and will be evaluated at regular interval. It may carry an importance of ten marks in the overall internal evaluation. Surprise tests/Quizzes/Seminar/Tutorial may be conducted and having share of five marks in the overall internal evaluation.

Course outcome:

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

CO-1: The student can identify different areas of Dissertation Phase II.
CO-2: Can find the applications of all the areas in day to day life .

Course Outcomes	Expected Mapping with Programme Outcomes (1- Weak Correlation; 2- Medium correlation; 3- Strong Correlation)											
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12
CO-1	3	1	1	1	3	3	1	-	-	-	-	-
CO-2	3	1	1	1	3	3	1	-	-	-	-	-