PG- Structural Engineering Syllabus Year 2016-17

(Batch 2016-2018)

2017-18

(Batch 2017-2019)

Date:8-9-2017

To,
The Dean Academics,
R.I.T., Rajaramnagar

Sub.: Submission of M Tech Civil Structural Engg CBCS curriculum 2017-18

Respected Sir,

We are herewith submitting hard copy of finalized and corrected structure and curriculum of M Tech Civil Structural Engg with all semester courses for the academic year 2017-18. Kindly acknowledge for the same.

Thanking you,

Yours faithfully,

Chairman,

BOS, Dept of Civil Engg

RAJARAMBAPU INSTT. OF TECHNOLOGY
RAJARAMNAGAR CIVIL ENGG. DEPT.

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K. E. Society's
Rajarambapu Institute of Technology, Rajaramnagar

CBCS Curriculum

Teaching Scheme and Structure

First Year M. Tech. Civil- Structural Engineering

Semester I

Course Code	Course	Teaching Scheme				Evaluation Scheme					
							Theory (Marks) %			Practical (Marks) %	
		L	T	P	Credits	Scheme	Max	Min % for Passing		Max	Min % for Passing
SH511	Advance Engineering Mathematics	2			2	ISE	20	40	40	--	--
						UT1	15				
						UT2	15				
						ESE	50	40			
CES1011	Advance Structural Analysis	3	1		4	ISE	20	40	40	--	--
						UT1	15				
						UT2	15				
						ESE	50	40			
CES1021	Structural Dynamics	3	1		4	ISE	20	40	40	--	--
						UT1	15				
						UT2	15				
						ESE	50	40			
CES1031	Advanced Design of Steel Structures	3	1		4	ISE	20	40	40	--	--
						UT1	15				
						UT2	15				
						ESE	50	40			
CES****	Program Elective I	3			3	ISE	20	40	40	--	--
						UT1	15				
						UT2	15				
						ESE	50	40			
CES****	Program Elective II	3			3	ISE	20	40	40	--	--
						UT1	15			--	--
						UT2	15			--	--
						ESE	50	40		--	--
CES1041	Computer Aided Analysis & Design of Steel Structures Lab			4	2	ISE	--	--	--	50	50
						ESE				50	50
CES1051	Seminar I/ Mini Project.			2	1	ISE	--	--	--	50	50
SHP551	Technical Communication	1		2	2	ISE	100	40	40	--	--
RIT-MT-LL	**Audit Course:** Liberal Learning	--	--	--	--	--	--	--	--	--	--
		18	3	8	25						

Total Credits: 25 **Total Contact Hours/Week: 29.**

Note:

1. Student must take at least one mini project in two semesters.

2. **Audit course:** Student should complete audit course within two years.

List of Program Elective I:

Course Code	Course
CES1061	Maintenance and Rehabilitation of Structure.
CES1071	Off Shore Structures
CES1081	Advanced Concrete Technology.
CES1091	Advanced Foundation Engineering.
CES1101	Analysis and Design of Plates and Shells
CES1111	Stability of Structures.
CES1121	Experimental Stress Analysis.

List of Program Elective II:

Course Code	Course
CES1131	Introduction to Project Management
CES1141	Finance Management
CES1151	Construction Contracts

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CBCS Curriculum

Teaching Scheme and Structure

First Year M. Tech. Civil- Structural Engineering

Semester II

Course Code	Course	Teaching Scheme				Evaluation Scheme				
		L	T	P	Credits	Scheme	Theory (Marks) % Max	Theory (Marks) % Min % for Passing	Practical (Marks) % Max	Practical (Marks) % Min % for Passing
CES2011	Finite Elements Analysis	3	1		4	ISE	20	40	--	--
						UT1	15		--	--
						UT2	15			
						ESE	50	40	--	--
CES2021	Advanced Design of Concrete Structures	3	1		4	ISE	20	40	--	--
						UT1	15		--	--
						UT2	15			
						ESE	50	40	--	--
CES2031	Theory of Elasticity and Plasticity	3	1		4	ISE	20	40	--	--
						UT1	15		--	--
						UT2	15			
						ESE	50	40	--	--
CES****	Program Elective III	3			3	ISE	20	40	--	--
						UT1	15		--	--
						UT2	15			
						ESE	50	40	--	--
CES****	Program Elective IV	3			3	ISE	20	40	--	--
						UT1	15		--	--
						UT2	15			
						ESE	50	40	--	--
CES2041	Computer Aided Analysis & Design of R.C.C. Structures Lab			4	2	ISE	--	--	50	50
						ESE			50	50
CES2051	Seminar II/ Mini Project.			2	1	ISE	--	--	50	50
CES2061	Research Methodology	1		2	2	ISE	--	--	50	50
						ESE			50	50
		16	3	8	23					

Total Credits: 23, **Total Contact Hours/Week: 27.**

(Note: Select any two course for Program Elective III and Elective IV)

List of Program Elective:

Course Code	Course
CES2071	Analysis and Design of Tall Building
CES2081	Pre-stress Concrete Structures
CES2091	Computer Aided Analysis and Design
CES2101	Wind and Cyclone Effects on Structures
CES2111	Design of Steel Concrete Composite Structure
CES2121	Earthquake Resistant Design of Structure
CES2131	Structure in Disaster Prone Areas
CES2141	Fracture Mechanics
CES2151	Industrial Safety and Risk Assessment
CES2161	Ground Improvement Techniques
CES2171	Industrial Structures
CES2181	Pre-cast Structures
CES2191	Pre-fabricated Structures
CES2201	Design of Bridges and Flyovers
CES2211	Hydraulic Structures

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CBCS Curriculum

Teaching Scheme and Structure

First Year M. Tech. Civil- Structural Engineering

Semester III

Course Code	Course		Evaluation Scheme				
			Contact Hours	Scheme	Credits	Practical (Marks)	
						Max	Min % for Passing
CES3011	**Industry Training (15 days)**		2	ISE	2	100	50
CES3021	**Self-Learning:** Course Related to Project Work (Certification Course/ Online Course)		2	ISE	2	50	50
CES3031	**Dissertation Phase-I**	**Industry Sponsored Project**	4	ISE	4	100	50
		Research Project Research Work in National Level Research Institutes					
		In house Project					
CES3041	**Dissertation Phase-II**	**Industry Sponsored Project**	10	ISE	4	100	50
CES3051		**Research Project** Research Work in National Level Research Institutes		ESE	6	100	50
		In house Project					

Total Credits: 18, **Total Contact Hours/Week: 18.**

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Teaching Scheme and Structure

First Year M. Tech. Civil- Structural Engineering

Semester IV

Course Code	Course	Evaluation Scheme				
		Contact Hours	Credits	Scheme	Practical (Marks)	
					Max	Min % for Passing
CES4011	Dissertation Phase-III	08	08	ISE	100	50
CES4021	Dissertation Phase-IV	10	10	ISE	100	50
CES4031				ESE	100	50

Total Credits: 18, Total Contact Hours/Week: 18.

Grand Total of hours and credits - 04 semesters course

Sr	Batch	Hours	Credits
1	F. Y. M. Tech, SEM-I	29	25
2	F. Y. M. Tech, SEM-II	27	23
Total		**56**	**48**
3	S. Y. M. Tech, SEM-III	18	18
4	S. Y. M. Tech, SEM-IV	18	18
Total		**36**	**36**
Grand Total of SEM -I to SEM -IV		**92**	**84**

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SEMESTER

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CBCS Curriculum

Teaching Scheme and Structure

First Year M. Tech. Civil- Structural Engineering

Semester I

Course Code	Course	Teaching Scheme				Evaluation Scheme					
							Theory (Marks) %			Practical (Marks) %	
		L	T	P	Credits	Scheme	Max	Min % for Passing		Max	Min % for Passing
SH511	Advance Engineering Mathematics	2			2	ISE	20	40	40	--	--
						UT1	15				
						UT2	15				
						ESE	50	40			
CES1011	Advance Structural Analysis	3	1		4	ISE	20	40	40	--	--
						UT1	15				
						UT2	15				
						ESE	50	40			
CES1021	Structural Dynamics	3	1		4	ISE	20	40	40	--	--
						UT1	15				
						UT2	15				
						ESE	50	40			
CES1031	Advanced Design of Steel Structures	3	1		4	ISE	20	40	40	--	--
						UT1	15				
						UT2	15				
						ESE	50	40			
CES****	Program Elective I	3			3	ISE	20	40	40	--	--
						UT1	15				
						UT2	15				
						ESE	50	40			
CES****	Program Elective II	3			3	ISE	20	40	40	--	--
						UT1	15			--	--
						UT2	15			--	--
						ESE	50	40		--	--
CES1041	Computer Aided Analysis & Design of Steel Structures Lab			4	2	ISE	--	--	--	50	50
						ESE				50	50
CES1051	Seminar I/ Mini Project.			2	1	ISE	--	--	--	50	50
SHP551	Technical Communication	1		2	2	ISE	100	40	40	--	--
RIT-MT-LL	**Audit Course:** Liberal Learning	--	--	--	--	--	--	--	--	--	--
		18	3	8	25						

Total Credits: 25 **Total Contact Hours/Week: 29.**

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Note:

1. Student must take at least one mini project in two semesters.

2. **Audit course:** Student should complete audit course within two years.

List of Program Elective I:

Course Code	Course
CES1061	Maintenance and Rehabilitation of Structure.
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CES1101	Analysis and Design of Plates and Shells
CES1111	Stability of Structures.
CES1121	Experimental Stress Analysis.

List of Program Elective II:

Course Code	Course
CES1131	Introduction to Project Management
CES1141	Finance Management
CES1151	Construction Contracts

First year M. Tech. Civil- Structural Engineering SEM - I

SHP511: ADVANCED ENGINEERING MATHEMATICS

Course	Teaching Scheme				Evaluation Scheme				
	L	T	P	Credits	Examination Scheme	Theory (Marks %)		Practical (Marks %)	
						Max	Min for Passing	Max	Min for Passing
Advanced Engineering Mathematics	2	--	--	2	ISE	20	40 %	--	--
					UT	30		--	--
					ESE	50		--	--

Course Description:

Advanced Engineering Mathematics is a core subject introduced at Semester I of first year M. Tech. Civil Structure. This course intends to build the competency in the students to apply the knowledge of mathematics to the solution of engineering problems and to analyze it.

Course Learning Outcomes:

After successful completion of this course students should be able to:-

CO-1 Apply the specific method of differential equations in modeling and solving the civil engineering problems.

CO-2 Estimate numerically the solution of given algebraic equation.

CO-3 Use the relevant method for solving the simultaneous linear equations and compute the Eigen values.

CO-4 Solve the problems in dynamics of rigid body by using technique of calculus of variations.

Pre-requisite:

Undergraduate Engineering Mathematics

Course Syllabus:

Unit No.	Details of Content	Hrs.
1.	**PARTIAL DIFFERENTIAL EQUATIONS** Preliminaries: Revisit Fourier series, Classification of second order partial differential Equations, Heat equation, Homogeneous boundary conditions, Non-homogeneous conditions, Wave Equation, Laplace Equation.	6
2.	**NUMERICAL METHODS** Muller's Method, Horner's Method, Multiple roots, Lin Bairtow's Method, Graeffe's Squaring Method.	6
3.	**SIMULTANEOUS LINEAR EQUATIONS**	6

Gaussian Elimination method, Gauss Jordan method, LU- decomposition from Gaussian Elimination method, Solution of Tridiagonal Systems, Eigen Value problems

4. **CALCULUS OF VARIATION** 6

Introduction, Functionals and extremals, Some classical Variational problems, Variational notations, Other types of functional, Isoperimetric problems, Rayleigh-Ritz approximation method, Hamilton's principle

Reference Books:

1. Larry C. Andrews, Ronald L. Phillips, Mathematical Techniques for Engineers and Scientists, Prentice Hall of India Private Ltd. New Delhi, ISBN-81-203-2826-14, 2005.
2. Gerald Wheatley, Applied Numerical Analysis, Sixth Edition, Pearson Education, 2006.
3. Dr. B. S. Grewal, Numerical Methods in Engineering and Science, Khanna Publishers, Seventh Edition.

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First year M. Tech. Structural Engineering SEM –I

CES1011: ADVANCE STRUCTURAL ANALYSIS

Teaching Scheme				Evaluation Scheme			
					Theory Marks		
L	T	P	Credits	Scheme	Max %	Min for Passing %	
3	1	--	4	ISE	20	40	40
				UT 1	15		
				UT 2	15		
				ESE	50	40	

Course Outcomes:

After successful completion of this course students will be able to:

1. State and Prove Muller Breslau Principle.
2. Construct of ILD for reactions, S.F. and B.M. for propped cantilever beam. fixed beam Portal frames and arches.
3. Draw SFD, BMD and TMD for beams curved in plan for various loading and support condition.
4. Derive expressions for deflection, foundation pressure, slope, BM and SF for long beam subjected to various loading and support.
5. Develop the expressions for max. B.M., slope, deflection for beam –column subjected to point load, UDL, UVL with different support condition.
6. Analyze structures for various loading by using member and structure oriented Stiffness matrix method.

Unit Wise Syllabus:

Unit 1 Influence Lines **(06)**

Muller Breslau's Principle, Moment distribution method, ILD for continuous beam, propped cantilever, fixed beams, portal frames and two hinged arches.

Unit 2 Beams Curved in Plan **(06)**

Analysis of Determinate and Indeterminate beams curved in plan such as cantilever circular arch, semicircular beams fixed at two ends subjected to point load and UDL, simply supported semicircular beams, circular ring beam.

Unit 3 Beams on Elastic Foundation **(06)**

Analysis of infinite and finite beams, differential equation, infinite beams with concentrated load, moment and finite UDL, semi-infinite beams with free and hinged ends subjected to finite uniformly distributed load.

Unit 4 Beam Columns **(06)**

Governing differential equation, geometric and material nonlinearity, analysis of beam- columns simply and fixed supported at ends with

concentrated load, moment and uniformly distributed load. Magnification factor.

Unit 5 Member Oriented Stiffness Matrix **(06)**

Stiffness matrices for beam, truss, plane frame, pin and rigid jointed space frame element on member axis, transformation of matrices on structure axes, overall joint stiffness matrix and nodal vector, assembly rules, calculation of member end forces.

Unit 6 Structure Oriented Stiffness Method **(06)**

Flexibility and stiffness matrices, analysis of continuous beams, trusses and plane frames by structure oriented approach

References:

1. Vazirani and Ratwani, - Advanced Theory of Structures & Matrix method, Khanna Publisher, Delhi.
2. Timoshcnko and Gere, - Strength of Materials Vol II, East West Press Ltd.
3. Gere and Weaver, - Matrix Analysis of Framed Structures, CBS Publishing, Delhi.
4. Pandit & Gupta, Structural Analysis - A matrix approach, Tata Mc Graw Hill, Delhi
5. Negi and Jangid, -Structural Analysis, Tata McGraw Hill Pub.Co.Delhi
6. C.S. Reddy,- Basic structural Analysis, Tata Mc Graw Hill, Delhi
7. Thimoshenko, Strength of Materials Vol. II, East-West Press ltd.
8. N. Krishnaraju and D.R. Gururaja, Advanced Mechanics of Solids & Structures, Narosa Pub. House delhi
9. C. K.Wang, Indterminate Structural Analysis

First year M. Tech. Structural Engineering SEM –I

CES1021: STRUCTURAL DYNAMICS

Teaching Scheme				Evaluation Scheme			
					Theory Marks		
L	T	P	Credits	Scheme	Max %	Min for Passing %	
3	1	--	4	ISE	20	40	40
				UT 1	15		
				UT 2	15		
				ESE	50	40	

Course Outcomes:

After successful completion of this course students will be able to:

1. Determine the response of single and multi-degree freedom systems.
2. Apply appropriate techniques to analyze and interpret data for solving problems related to single and multi-degree freedom systems and shear buildings
3. Demonstrate the knowledge and understanding of principles of dynamics under varying loading conditions.
4. Develop mathematical solutions to predict system response subjected to dynamic loads.
5. Apply clauses given in IS codes to increase resistance of structure to earthquake force.

Unit Wise Syllabus:

Unit 1 Introduction **(06)**

Introduction to dynamic problems of Civil Engineering, Concept of degrees of freedom, D'Alemberts principle, Principle of virtual displacement and energy, Single degree of freedom systems, Examples of Single degree of freedom systems in Engineering, Free vibration of damped and undamped systems.

Unit 2 Single degree of freedom systems **(06)**

Single degree of freedom systems subjected to sinusoidal loading, Resonance andits resonance diagram – support motion, Vibration isolation, transmissibility, Methods of damping measurements, Response of Single degree of freedom systems to arbitrary excitation, Duhamel integral solution, Response to suddenly applied load and triangular pulse loading, Principles of vibration measuring instruments.

Unit 3 Dynamics of multi-Degree of freedom system **(06)**

Natural Frequency and normal modes, Orthogonality of modal vectors, Shear building model without damping and with proportional damping,

Unit 4 Numerical methods: **(06)**

Numerical methods of frequency analysis, Rayleigh's method and matrix

iteration methods, Stadola method.

Unit 5 Continuous systems **(06)**

Flexural vibration of beams, Simply supported and cantilever beams, Longitudinal vibrations of bars, Longitudinal waves in bars, Waves and vibration response of simply supported beams under uniformly distributed triangular pulse loading, Matrix formulation of beams with lumped masses.

Unit 6 Elements of seismology **(06)**

Elements of seismology, Design philosophy, Principles of planning, Provisions of IS 1893 and 13920, Design Response spectrum.

References:

10. Structural Dynamics : Vibrations and Systems, Madhujit Mukophadhyay, Publisher: ANE Books ISBN: 9788180520907, 8180520900 Edition: 01, 2008.
11. Structural Dynamics: Theory and Computation, 2nd Edition, Mario Paz, CBS Publisher ISBN: 9788123909783, 8123909780
12. Dynamics of Structures, R,W.clough and J.Penzien, McGraw – Hill Education, 2nd revised Edition, 1993, ISBN -10: 0071132414, ISBN -13: 978-0071132411.
13. Theory of Vibration with applications, Willaim Thomson, CRC Press; 4th edition, 1996, ISBN -10: 0748743804, ISBN -13: 978-0748743803.

First year M. Tech. Civil- Structural Engineering SEM - I

CES1031: ADVANCED DESIGN OF STEEL STRUCTURES

Teaching Scheme				Evaluation Scheme					
					Theory Marks			Practical Marks	
L	T	P	Credits	Scheme	Max	Min for Passing		Max	Min for Passing
3	--	--	3	ISE	20		40%	--	--
				UT1	15			--	--
				UT2	15				
				ESE	50	40%		--	--

Course Outcomes:

After successful completion of this course students will be able to:

1. Assess design forces on structures
2. Analyze the structures for design forces
3. Design the members for the structures

Unit Wise Syllabus:

Unit 1: Trussed Girder Bridges **(06)**

Design of trussed girder deck type and through type bridges

Unit 2: Composite Beams **(06)**

Concrete-steel composite sections, elastic behavior of composite beams, behavior at ultimate load, design of composite beams, design of encased steel columns

Unit 3: Cold Formed Light Gauge Steel Members **(06)**

Design of cold formed light gauge steel compression members, beams, behavior under repetitive loads and temperature effects.

Unit 4: Indeterminate Beams **(06)**

Plastic analysis of beams, limit state design of indeterminate beams

Unit 5: Portal Frames **(06)**

Plastic analysis of portal frames, limit state design of portal frames

Unit 6: Pre-Engineered Buildings. **(06)**

Analysis and Design of Pre-Engineered Buildings.

References:

1. Dr. N. Subramanian, "Design of Steel Structures", Oxford University Press, New Delhi.
2. K. S. Sai Ram, "Design of Steel Structures", Pearson
3. "Limit State Design of Steel Structures",Dr V. L. Shah and Veena Gore, Structures Publications
4. M. R. Shiyekar ,"Limit State Design in Structural Steel", , PHI Learning

5. S. K. Duggal, "Design of Steel Structures", Tata Mc-Graw Hill publishing company Ltd., New Delhi.
6. Dayaratnam, "Design of Steel Structures", Wheeler Publishing, New Delhi.
7. Ram Chandra, "Design of Steel Structures",Vol. I & Vol. II - Standard Book House, New Delhi.
8. A.S.Arya and J.L. Ajamani, "Design of Steel Structures", Nemchand and Bros., Roorkee
9. Vazirani & Ratwani. "Design of Steel Structures",
10. B.C.Punmia, Jain & Jain "Design of Steel Structures", Laxmi Publication, New Delhi.
11. ",E.H.Gaylord and C.N. "Design of Steel Structures",Gaylord, Mc-Graw Hill, NewYork.
12. J.E.Lothers, "Design in Structural Steel Structures", Prentice Hall New Jersy.

First year M. Tech. Civil- Structural Engineering SEM - I

CES1041: COMPUTER AIDED ANALYSIS AND DESIGN OF STEEL STRUCTURES (LAB)

Teaching Scheme				Evaluation Scheme					
L	T	P	Credits	Scheme	Theory (Marks %)			Practical (Marks %)	
					Max	Min for Passing		Max	Min for Passing
--	--	4	2	ISE	--	--	--	50	50
				ESE	--	--	--	50	50

Course Description:
This course deals with design of steel structures like truss, building frame, hoardings etc. by using standard structural design software (STAAD Pro/ETABS).

Course Outcomes:
After successful completion of this course students will be able to:

1. Analyse and design of the steel structures such as truss, Towers, Steel Building Frame and Hoarding Board etc. using standard software.
2. Interpret the results obtained from the software.
3. Sketch the detailing of structural elements.

Laboratory Work:
Laboratory work shall consist of analysis and design of following structure using standard software and drawing of reinforcement detailing.

1. Roof Truss

2. Transmission Tower

3. Steel Building Frame.

4. Hoarding Board

5. Bridge structures and plate girders

Note: Student should able to prepare design and drawings similar to industry requirement/ professionals. Special help should be taken by professionals

References:

13. Dr. N. Subramanian, "Design of Steel Structures", Oxford University Press, New Delhi.
14. K. S. Sai Ram, "Design of Steel Structures", Pearson
15. "Limit State Design of Steel Structures",Dr V. L. Shah and Veena Gore, Structures Publications
16. M. R. Shiyekar ,"Limit State Design in Structural Steel", , PHI Learning
17. S. K. Duggal, "Design of Steel Structures", Tata Mc-Graw Hill publishing company Ltd., New Delhi.

18. Dayaratnam, "Design of Steel Structures", Wheeler Publishing, New Delhi.
19. Ram Chandra, "Design of Steel Structures",Vol. I & Vol. II - Standard Book House, New Delhi.
20. A.S.Arya and J.L. Ajamani, "Design of Steel Structures", Nemchand and Bros., Roorkee
21. Vazirani & Ratwani. "Design of Steel Structures",
22. B.C.Punmia, Jain & Jain "Design of Steel Structures", Laxmi Publication, New Delhi.
23. ",E.H.Gaylord and C.N. "Design of Steel Structures",Gaylord, Mc-Graw Hill, NewYork.
24. J.E.Lothers, "Design in Structural Steel Structures", Prentice Hall New Jersy.

First year M. Tech. Civil- Structural Engineering SEM - I

CES1051 - Mini Project

Teaching Scheme				Evaluation Scheme				
					Theory Marks		Practical Marks	
L	T	P	Credits	Scheme	Max	Min for Passing	Max	Min for Passing
--	--	2	1	ISE	--	---	100	50%

Course Outcomes:
After successful completion of this course students will be able to:

1. Identify research problem
2. Prepare and present statement of Purpose
3. Perform analysis work.
4. Communicate with outside agencies.
5. Write report and Present the work carried out.
6. Develop self-learning ability.

Laboratory Work:
Mini project shall be delivered on one of the advanced topics chosen in consultation with the supervisor, based on dissertation work/ societal problem / special structure. A hard copy of the report (25 to 30 pages A4 size, 12 fonts, Times New Roman, single spacing single side printed, preferably in TRM format) should be submitted to the Department Post Graduate Committee (DPGC) before delivering the seminar. A copy of the report in soft form must be submitted to the supervisor, along with other details, if any. Minimum 03 presentations should be delivered by the students.

First year M. Tech. Civil- Structural Engineering SEM -I

CES1051: Seminar

Teaching Scheme				Evaluation Scheme					
					Theory Marks			Practical Marks	
L	T	P	Credits	Scheme	Max	Min for Passing		Max	Min for Passing
--	--	2	1	ISE	--		---	100	50%

Course Outcomes:

After successful completion of this course students will be able to:

1. Identify research problem
2. Prepare and present statement of purpose,
3. Perform analysis work
4. Communicate with outside agencies
5. Write report and present

Laboratory work:

Seminar- I shall be delivered on one of the advanced topics chosen in consultation with the supervisor after compiling the information from the latest literature. The concepts must be clearly understood and presented by the student. All modern methods of presentation should be used by the student. Minimum 02 presentations are to be delivered by each student. A hard draft copy of the report (25 to 30 pages A4 size, 12 fonts, Times New Roman, single spacing one side printed, as per format) should be submitted to the Department Post Graduate Committee (DPGC) before delivering the final seminar. The final copy of the report in hard and soft form by incorporating corrections from DPGC must be submitted to the Supervisor along with other details.

First year M. Tech. Civil- Structural Engineering SEM – I

*Program Elective I

CES1061: MAINTENANCE AND REHABILITATION OF STRUCTURES

Teaching Scheme				Evaluation Scheme				
					Theory (Marks %)		Practical (Marks %)	
L	T	P	Credits	Scheme	Max	Min for Passing	Max	Min for Passing
3	-	--	3	ISE	20	40	--	--
				UT 1	15		--	--
				UT 2	15			
				ESE	50	40	--	--

Course Description:
Concrete structures are subjected to constant deterioration due to effects of ageing, inadequate maintenance, severe environmental exposure, penetration of catalytic agencies such as moisture, gases like CO2 & oxygen, chloride ions, industrial pollutants etc. This deterioration needs to be timely arrested before it leads to irreparable damage making it very important to repair and upgrade (retrofit/strengthening) the current stock of deteriorated and deficient structures. This course has been designed with an aim to give the students an insight into the subject of concrete repair, its protection and strengthening. This course focuses on various facets of maintenance and repairs of existing damaged structures. Various materials used in carrying out repair works forms the important aspect of this course. It also includes preventive measures on various aspects and provides the information on inspection, assessment procedure for evaluating a damaged structure, causes of deterioration and testing techniques. The course covers the basic principles and methods for strengthening the existing structures.

Pre-requisite:
Concrete technology, Structural Analysis, Design of Reinforced Concrete structure, Earthquake Engineering

Course Outcomes:
After successful completion of this course student will be able to:

1. Diagnose the causes of distress and deterioration of concrete structure
2. Identify the type of crack and suggest appropriate technique for its repair
3. Carry out the damage assessment and visual inspection of a building for detecting the possible cause /source of deterioration.
4. Suggest appropriate materials of repair to carry out the repair works
5. Describe the procedures of various repair techniques or methods used for carrying out repair works.
6. Suggest appropriate techniques for strengthening or retrofitting the existing structures.

Unit Wise Syllabus:

Unit I – Deterioration of Concrete Structures **(06)**

Distresses in concrete structures, Deterioration of Concrete Structures – signs, causes and symptoms, mechanism of deterioration; Physical deterioration due to moisture, temperature, shrinkage, exposure to severe environment; Chemical deterioration due to corrosion of reinforcement (chloride & carbonation induced),

alkali-silica reaction, sulphate attack, acid attack. Deterioration due to fire - aspects of fire and fire prevention on buildings;

Unit II – Building Cracks **(06)**

Cracks: types, causes, diagnosis, characteristics of cracking in various structural components like beam, column, slab, masonry walls; Measurement of cracks.
Moisture penetration: causes of dampness, ill effects of dampness, and methods of preventing dampness, damp-proofing materials, damp-proofing and waterproofing, components of a waterproofing system, requirements, water proofing types and applications.

Unit III – Maintenance And Diagnosis Of Failure **(06)**

Maintenance, phases of maintenance, maintenance jobs in buildings, Repair and rehabilitation, Facets of maintenance, importance of maintenance, various aspects of inspection – assessment procedure for evaluating a damaged structure, diagnosis of construction failures; condition survey and non-destructive evaluation of structures

Unit IV- Materials Of Repair **(06)**

Factors considered in the selection of repair method, repair stages. Materials for repair: desirable properties of materials, special mortar and concretes, concrete chemicals, special cements and high grade concrete – expansive cement, polymer concrete, sulphur infiltrated concrete, ferrocement, fiber reinforced concrete, admixtures of latest origin.

Unit V - Techniques of Repair and Protection Methods **(06)**

Rust eliminators and polymers coating for rebars during repair; foamed concrete, mortar and dry pack, Gunite and shotcrete, Repair of cracks in concrete and masonry: methods of repair- epoxy injection, mortar repair for cracks, shoring and underpinning. Methods of corrosion protection, corrosion inhibitors, corrosion resistant steels, coatings and cathodic protection.

Unit VI – Repairs, Rehabilitation And Retrofitting Of Structures **(06)**

Strengthening measures- flexural strengthening, beam shear capacity strengthening, column strengthening – jacketing, slab strengthening, Seismic retrofit of concrete structures-deficiencies in structure requiring seismic retrofit, techniques to enhance seismic resistance of structures, advanced techniques for making seismic resistant structures.

References:

1. Santhakumar, A.R., "*Concrete Technology*", Oxford University Press, 2009.
2. Shetty .M.S, *"Concrete, Technology"*, Theory and Practice, S.Chand and Company, New Delhi 2010.
3. Gambhir, M.L.(2005), 'Concrete Technology', Tata Mc Graw-Hill Publishing Company Limited, New Delhi, pp.1-642.
4. Raiker .R.N, *"Learning from Failures, Deficiencies in Design, Construction and Service"*, - R&D Centre (SDCPL), Raikar Bhavan, Bombay 1987.

5. *"Repair & Rehabilitation" "Compilation from The Indian Concrete Journal"*, - ACC - RCD Publication 2001.
6. *"Health Monitoring of Structures"* - A Proactive strategy - proceedings of the ISTE sponsored short course, organized by the Department of Civil Engineering, S.R.M. Engineering College, S.R.M. Nagar, January 2003.
7. Revision compbell, Allen and Itarold Roper, *"Concrete Structures Materials Maintenance and Repair"* Longman Scientific and Technical UK 1991.
8. Allen .R.T and Edwards .S.C, *"Repair of Concrete Structures"*, Blakie and Sons, UK 1987.

First year M. Tech. Civil- Structural Engineering SEM – I

*Program Elective I

CES1071: OFFSHORE STRUCTURES

Teaching Scheme				Evaluation Scheme				
L	T	P	Credits	Scheme	Theory (Marks %)		Practical (Marks %)	
					Max	Min for Passing	Max	Min for Passing
3	-	--	3	ISE	20	40	--	--
				UT 1	15		--	--
				UT 2	15			
				ESE	50	40	--	--

Course Outcomes

After successful completion of this course students will be able to:

1. To explain the concept of wave theories.
2. To determine the forces due to ocean waves and wind forces
3. To explain concept of offshore foundation modelling.
4. To analyse and design offshore structures like platform, helipads, jackets, towers etc.,

Unit Wise Syllabus:

Unit I: Wave Theories **(06)**

Wave generation process, small, finite amplitude and nonlinear wave theories.

Unit II: Forces of Offshore Structures **(06)**

Wind forces, wave forces on small bodies and large bodies - current forces and use of Morison equation.

Unit III: Offshore Soil And Structure Modelling **(06)**

Different types of offshore structures, foundation modelling, fixed jacket platform structural modelling.

Unit IV: Analysis Of Offshore Structures **(06)**

Static method of analysis, foundation analysis and dynamics of offshore structures.

Unit V: Design of Offshore Structures **(06)**

Design of platforms, helipads, Jacket tower, analysis and design of mooring cables and pipe lines.

Reference Books:

1. API RP 2A-WSD, Planning, Designing and Constructing Fixed Offshore Platforms - Working Stress Design - API Publishing Services, 2005

2. Chakrabarti, S.K., Handbook of Offshore Engineering by, Elsevier, 2005.

3. Chakrabarti, S.K., Hydrodynamics of Offshore Structures, WIT press, 2001.

4. Dawson.T.H., Offshore Structural Engineering, Prentice Hall Inc Englewood Cliffs, N.J. 1983.

5. James F. Wilson, Dynamics of Offshore Structures, John Wiley & Sons, Inc, 2003.

6. Reddy, D.V. and Arockiasamy, M., Offshore Structures, Vol.1 and Vol.2, Krieger Publishing Company, 1991.

7. Turgut Sarpkaya, Wave Forces on Offshore Structures, Cambridge University Press, 2010.

First year M. Tech. Civil- Structural Engineering SEM –I

* Program Elective – I

CES1081: ADVANCE CONCRETE TECHNOLOGY

Teaching Scheme				Evaluation Scheme				
L	T	P	Credits	Scheme	Theory (Marks %)		Practical (Marks %)	
					Max	Min for Passing	Max	Min for Passing
3	-	--	3	ISE	20	40	--	--
				UT 1	15		--	--
				UT 2	15			
				ESE	50	40	--	--

Course Description:
The course deals with different aspects of modern concrete technology that has evolved as a result of rapid developments in mechanized construction, use of mineral and chemical admixtures in concrete. The course focuses on all the stages of production of concrete. The course covers all kinds of tests on concrete specimens or elements for knowing the quality of concrete being produced. Special topics on formwork for concrete; and repair and rehabilitation of concrete structures have been introduced. Course also covers some special concretes that have gained more importance in the construction works of recent age. The course is designed as a core course for second year level degree students of civil engineering, who have a basic background of concrete constituents and properties.

Prerequisite:
Basic understanding of concrete - constituents, properties and test methods
A basic Civil Engineering Materials course

Course Outcomes:
After successfully completing the course, Student will able to:

1. Explain the properties of different materials used in the manufacture of different kinds of concretes and role played by them in developing strong, durable concretes.
2. Describe properties of various types of concretes in fresh and hardened state.
3. Discuss various formwork systems and design forms for beam and column elements
4. Design the normal strength concrete mixes of given grade using IS and ACI codes.
5. Discuss the properties, applications and concreting methods of special concretes
6. Illustrate various mechanisms causing the deterioration of concrete.

Unit Wise Syllabus:

Unit I: Constituent Materials
(06)

Cement- types, properties and applications. Aggregates - types, properties. Mineral admixtures - types, properties, manufacturing process (brief introduction), properties Chemical admixtures– plasticizers, superplasticizers - mechanisms of action, effects on workability.Water-General requirements & limiting values of impurities

Unit II: Properties of Fresh Concrete

(06)

Workability- factors affecting, methods of measurement, Segregation & Bleeding, Process of manufacture of concrete - batching, mixing, transportation, placing, compacting, curing, finishing, removal of formwork, Formwork - Materials, forces on formwork, formwork systems, structural requirements, construction loads, specifications, design of forms – column, beam.

Unit III: Properties Hardened Concrete

(06)

Strengths of hardened concrete (Tensile & Compressive strength, Flexural & Bond strength), standard test methods as per IS, Failure mechanism under compression & tension, Stress-strain behavior of concrete, Overview of Modulus of elasticity, Shrinkage- types. Non Destructive & Semi- destructive Testing

Unit IV: Mix Design of Concrete

(06)

Principles of mix design, factors influencing mix design, various methods of mix design, design of normal strength concrete using IS & ACI methods
Quality Control: Variation in strength and compliance requirements.

Unit V: Special Concretes

(06)

Properties and applications of: High Strength Concrete, High Performance Concrete, Self Compacting Concrete, Fiber Reinforced Concrete, Polymer modified concrete, Light Weight Concrete Special concreting methods: Pumped concrete, Ready mix concrete, Under-water concreting, Hot & cold weather concreting.

Unit VI: Durability of concrete

(06)

Durability of concrete – strength and durability relationship, volume change, types of cracks and causes, permeability, Carbonation induced and corrosion induced cracking, Alkali-aggregate reaction, and Sulphate attack, Repair and Rehabilitation.

References:

1. Santhakumar, A.R., "*Concrete Technology*", Oxford University Press, 2009.
2. Shetty .M.S, *"Concrete, Technology"*, Theory and Practice, S.Chand and Company, New Delhi 2010.

First year M. Tech. Civil- Structural Engineering SEM -I

* Program Elective – I

CES1091: ADVANCED FOUNDATION ENGINEERING

Teaching Scheme				Evaluation Scheme			
					Theory Marks		
L	T	P	Credits	Scheme	Max %	Min for Passing %	
3	--	--	3	ISE	20	40	40
				UT 1	15		
				UT 2	15		
				ESE	50	40	

Course Description

Foundation engineering is an important subject offered at 1st Semester of M. Tech Civil Structural Engineering course. The course consists of two basic modules. The first module focuses on various concepts and introductory information about different foundations. The second module includes design concepts of different types of foundations such as raft, pile and machine foundations. It also includes software applications. The idea behind these are the theory & numerical analysis, visit to site, model study & studying various practical and equipment related.

Course Outcomes:

After successful completion of this course students will be able to:

1. Explain various types of foundations and their design procedures.
2. Design different types of foundations.
3. Perform the analysis and design of various types of foundation using available softwares.

Pre-requisites

The prerequisite for this course is that the students should possess the basic knowledge of soil mechanics and design of structures.

Unit Wise Syllabus:

Unit 1: Introduction **(06)**

Introduction, Various types of advanced structures, general design requirements.

Unit 2: Design of sub structures **(06)**

Design of trapezoidal and raft foundation.

Unit 3: Multistoried structures (06)
Design of sub-structures and superstructures for multistoried building

Unit 4: Elastic foundations (06)
Design of sub-structures, frequency, amplitude, design parameters

Unit 5: Design of deep foundation (06)
Design of deep foundation- well, pile configuration.

Unit 6: Special structures (06)
Design of foundations for sea structures.

References:

1. Winterkorn H.F. and Fang H.Y Van, "Foundation Engineering Hand Book" Nostand Reinhold Company, 1975.
2. B.J. Kasmalkar, "Foundation Engineering" Pune Vidyarthi Griha Prakashan.
3. N.V .Naik, "Foundation Design Manual" Dhanpat Rai and sons.
4. Poulos, H. G. and Davis E.H. "R.C.C Design Dayaratnam" Tata McGraw Hill BookCompany, 1980.
5. John Wiley and Sons, "Pile Foundation Analysis and Design" New York
6. Mohan, Dinesh, "Pile Foundation" Oxford & IBH Pub.Co. Pvt. Ltd., Delhi 1990.
6 Saran, "Soil Dynamics and machine foundation" Galgotia Publications Pvt. Ltd., New Delhi
7 W. C. Teng, "Foundation Design" Prentice Hall of India Pvt. Ltd., New Delhi
8 P. Shrinivasu, "Hand Book of Machine Design" Tata McGraw Hill Book Company
9 Ronald F. Scott, "Foundation Analysis" Prentice Hall july 2014.

First year M. Tech. Civil- Structural Engineering SEM – I

* Program Elective -I

CES1101: ANALYSIS & DESIGN OF PLATES AND SHELLS

Teaching Scheme				Evaluation Scheme			
L	T	P	Credits	Scheme	Theory Marks Max %	Min for Passing %	
3	--	--	3	ISE	20	40	40
				UT 1	15		
				UT 2	15		
				ESE	50	40	

Course Description

This course is a Program offered Elective course in FY M Tech program in Semester I. This course, deals with the theory and design of thin plate and shell structures, using the membrane and bending theories for various types of shells and their applications. In this course, thin plate will be analyzed by Classical Plate Theory and Elementary concepts will be discussed for First order theory. Bending Buckling and Vibration problems will be discussed for Plates.

Course Outcomes:

After successful completion of this course student will be able to:

1. Write various theories based on plates and shells analysis.
2. Derive fundamental equations to analyze problems related with plates and shells.
3. To obtain general equations for equilibrium of structure
4. Obtain analytical solutions for plate and shell problems

Pre-requisites

Theory of Structural Analysis.

Unit Wise Syllabus

Unit 1: Fundamental concepts of continuum mechanics **06**

Elasticity approach to solution, Stress, Strain, Dimension reduction- Plane Stress and Strain, Constitutive relationships, Equilibrium Equations

Unit 2: Classical plate theory **06**

Assumptions, Displacement Model, Stress Resultants, Equilibrium Equations, Introduction to First Order Shear Deformation Theories.

Unit 3: Vibration and Buckling of Plates **06**

Vibration and buckling analysis of plates. Different loading conditions, numerical problems

Unit 4: Design of plate by Navier's and Levi's Solution **06**
Simply supported plates and various boundary and loading conditions. Design problems

Unit 5: Theory of Shells **06**
Introduction, Bending and membrane theory of cylindrical Shell ,folded plate

Unit 6: Design of Folded plate **06**
Various types , Design of folded plate by simple theory, Design of cylindrical shell

References:

1. Timoshenko, S. "Theory of plates and shells" McGraw Hills Book Comp 8th edition 2014
2. Chandrashekhar K, "Theory of Plates" Universities Press (India) Limited 9th edition 2013.
3. Chandrashekhar K, "Analysis of Thin Concrete Shells" New Age International (P) Ltd.
4. Ramaswamy , "Design of concrete shell" roofs CBS publishers and distributors New Delhi
5. Reddy, J. N. "Theory and analysis of elastic plates and shells" Taylor & Francis, 2007.

First year M. Tech. Civil- Structural Engineering SEM - I
* Program Elective -I

CES1111: STABILITY OF STRUCTURES

Teaching Scheme				Evaluation Scheme				
L	T	P	Credits	Scheme	Theory (Marks %)		Practical (Marks %)	
					Max	Min for Passing	Max	Min for Passing
3	-	--	3	ISE	20	40	--	--
				UT 1	15		--	--
				UT 2	15			
				ESE	50	40	--	--

Course Outcomes

On completion of this course student will be able to,

1. To explain the concept of buckling and analysis of structural elements
2. To explain the phenomenon of buckling.
3. To calculate the buckling load on column, beam – column, frames and plates using classical methods
4. To calculate the buckling load using approximate methods.

UNIT I BUCKLING OF COLUMNS **06**

States of equilibrium - Classification of buckling problems - concept of equilibrium, energy, imperfection and vibration approaches to stability analysis - Eigen value problem. Governing equation for columns - Analysis for various boundary conditions - using Equilibrium, Energy methods. Approximate methods - Rayleigh Ritz, Galerkins approach - Numerical Techniques - Finite difference method - Effect of shear on buckling.

UNIT II BUCKLING OF BEAM-COLUMNS AND FRAMES **06**

Theory of beam column - Stability analysis of beam column with single and several concentrated loads, distributed load and end couples Analysis of rigid jointed frames with and without sway – Use of stability function to determine the critical load.

UNIT III TORSIONAL AND LATERAL BUCKLING **06**

Torsional buckling – Combined Torsional and flexural buckling - Local buckling. Buckling of Open Sections. Numerical solutions. Lateral buckling of beams, pure bending of simply supported and cantilever beams.

UNIT IV BUCKLING OF PLATES **06**

Governing differential equation - Buckling of thin plates, various edge conditions -Analysis by equilibrium and energy approach – Finite difference method.

UNIT V INELASTIC BUCKLING **06**

Double modulus theory - Tangent modulus theory - Shanley's model - Eccentrically loaded inelastic column. Inelastic buckling of plates - Post buckling behaviour of plates.

REFERENCES:

1. Ashwini Kumar,"Stability Theory of Structures", Allied publishers Ltd., New Delhi, 2003.
2. Chajes, A. "Principles of Structures Stability Theory", Prentice Hall, 1974.
3. Gambhir, "Stability Analysis and Design of Structures", springer, New York, 2004.
4. Simitser.G.J and Hodges D.H, "Fundamentals of Structural Stability", Elsevier Ltd., 2006.
5. Timoshenko.S.P, and Gere.J.M,"Theory of Elastic Stability",McGraw Hill Book Company, 1963.

First year M. Tech. Civil- Structural Engineering SEM -I

*** Program Elective – I**

CES1121: EXPERIMENTAL STRESS ANALYSIS

Teaching Scheme				Evaluation Scheme				
L	T	P	Credits	Scheme	Theory (Marks %)		Practical (Marks %)	
					Max	Min for Passing	Max	Min for Passing
3	-	--	3	ISE	20	40	--	--
				UT 1	15		--	--
				UT 2	15			
				ESE	50	40	--	--

Course Outcomes:

After successful completion of this course student will be able to,

1. Know different methods of measurement of force and strain.
2. Know different methods of recording of force and strain
3. Explain different non-destructive testing methods.
4. Explain concept of photo-elasticity.

Unit No.	Content	Hrs
1	**Force and Strain Measurements** Basic Concept in Measurements, types of strain gauges, hydraulic jacks,, pressure gauges, proving rings,– electronic load cells, calibration of Testing Machines.	6
2	**Data Recording** Strain gauge circuits, potentiometer and Wheatstone bridge, use of lead wires switches, electrical resistance strain gauges in transducer applications, LVDT - Indicating and recording devices, static and dynamic data recording –Data (Digital and Analogue) acquisition and processing systems	6
3	**Distress Measurement & Control** Diagnosis of distress in structures, cracks in structures, formation of cracks, types of cracks, causes of cracks, crack measurement, monitoring and measurement of crack movement, Corrosion of reinforcement in RCC, half cell ,construction and use..	6
4	**N.D.T.Methods** Non-destructive testing techniques, load testing of structures, buildings, bridges and towers, holography, use of laser for structural testing, rebound hammer, ultrasonic testing – Principles, limitations and applications.	6
5	**Photo elasticity & Brittle coating** Photoelasticity, optics of photoelasticity, polariscope, isoclinics and Isochromatics, methods of stress separation, wind tunnel and its use in structural Brittle coating, stress coat - all temp, comparison of brittle coatings, evaluation of the coating.	6
6	**Model Analysis** Model laws, laws of similitude, model materials, model testing, necessity for Model analysis , Advantages, applications, structural problems	6

First year M. Tech. Civil- Structural Engineering SEM - I

* Program Elective -I

CES1131: INTRODUCTION TO PROJECT MANAGEMENT

Teaching Scheme				Evaluation Scheme				
					Theory (Marks %)		Practical (Marks %)	
L	T	P	Credits	Scheme	Max	Min For Passing	Max	Min For Passing
03	--	--	03	ISE	20	40	--	--
				UT 1	15		--	--
				UT 2	15		--	--
				ESE	50	40	--	--

Course Description

This is the elective course offered in first semester of M. Tech structural engineering. This course focuses on guidelines for managing individual projects, project management and financial management related key concepts.

Course Outcomes-

After successful completion of this course students will be able to-

1. Implement project management framework.
2. Define scope of project and develop different time schedules of project.
3. Identify and control project cost and human resources.
4. Identify and decide sources of finance.
5. Analyze and select the best project alternative on economic basis.

Syllabus Content

Unit 1: Project Management Framework and Project Time Management **6Hrs**

Concept of Project and Project Management. Project integration management: Project charter, project management plan, direct and manage project work, close of project, Project scope planning- Project requirements, WBS etc.

Unit 2: Project Time Management and Advanced Project Scheduling **6Hrs**

Project time management-defining activities, sequencing activities, estimating activity resources and durations. CPM scheduling.

Precedence network and it's applications. Linear scheduling, Multiple project scheduling.

Control of schedule-Earn value management.

Unit 3: Project Cost and Human Resource Management **6Hrs**

Planning project costs- estimating cost, determining budget and control costs.(Activity Base Costing)

Planning human resources-Acquire, develop and manage project team.

Unit:4 Financial management and Financing of Project **6Hrs**

Sources of finance: Long term and short term

Financial statements – balance sheet, profit & loss account statement of cash flows etc.

Financial Analysis- Ratios, du point analysis, standardized financial statement, application of financial analysis.

Unit: 5 Analyses of Engineering Projects **6Hrs**

Present worth analysis, Capitalized cost analysis, Annual worth analysis, Rate of return analysis.

Unit: 6 Evaluation of Engineering Project **6Hrs**

Benefit cost analysis, Breakeven, Sensitivity and payback analysis, Replacement and retention decisions, Inflation and its effects.

References

1. A Guide To A Project Management Body of Knowledge – Published By Project Management Institute – 5th edition
2. K. Chitakara "Construction Project Management (Planning, scheduling and controlling)" McGraw Hill Education (India),1998.
3. Sandra C Weber "Scheduling Construction Projects(Principle and Practices)", PEARSON, 1st Edition, 2004.
4. B. C. Punmia& K. K. Khandelwal
   Project Planning and Control with PERT & CPM.
5. Leland Blank and Anhony Tarquin "Basics of Engineering Economy", Tata McGraw Hill, New Delhi, 2nd Edition, 2013.
6. Prasanna Chandra "Financial Management - Theory and Practice", Tata McGraw Hill, New Delhi, Ninth Edition, 2015.
7. Prasanna Chandra "Projects: Planning, Analysis, Selection, Implementation and Review"
   Tata McGraw Hill, New Delhi, Eighth Edition, 2014.

First year M. Tech. Civil- Structural Engineering SEM - I
*** Program Elective -I**

CES1141: FINANCIAL MANAGEMENT

Teaching Scheme				Evaluation Scheme				
L	T	P	Credits	Scheme	Theory (Marks %)		Practical (Marks %)	
					Max	Min for Passing	Max	Min for Passing
3	-	--	3	ISE	20	40	--	--
				UT 1	15		--	--
				UT 2	15			
				ESE	50	40	--	--

Course Outcome:

After successful completion of this course student will be able to,

1. Explain concept of financial management.
2. Explain different sources of finance and its management.
3. Explain basic concept of taxation.

COURSE CONTENTS

UNIT NO. 1: **(07)**

Basic concepts, meaning and scope, forms of business organization; Interpretation of financial statement, ratio analysis.

UNIT NO. 2: **(07)**

Sources of finance, long-term and short-term finance; Working capital management, working capital policy and financing.

UNIT NO. 3: **(07)**

Cash management, cash budgeting and forecasting.

UNIT NO. 4: **(08)**

Cost of capital; Valuation of securities; Capital investment analysis, process of capital budgeting, techniques of evaluation, project cash flows, assessment of risk and appraisal.

UNIT NO. 5: **(08)**

Operating and financial leverages; Economic value added approach; Taxation concepts.

REFERENCES:

1. Myers, B., Allen, S., Mohanty, P. (2010). Principles of corporate finance. Tata McGraw - Hill, New Delhi.

2. Pandey, I. (2009). Financial management. Vikas Publishing, New Delhi.

3. Chandra, P. (2008). Financial management - Theory and practice. Tata McGraw - Hill, New Delhi.

4. Damodaran, A. (2008). Corporate finance theory and practice. Wiley India, New Delhi.

5. Khan, M., Jain, P. (2008). Financial management. Tata McGraw - Hill, New Delhi.

6. Vishwanath, S. (2007). Corporate finance theory and practice. Response Books, New Delhi.

7. Van, Home, J., Wachowicz, J. (2005). Fundamentals of financial management. Pearson, New Delhi.

8. Block, Stanley, B., Geoffrey, A. (2001). Foundations of financial management. McGraw-Hill, London.

First year M. Tech. Civil- Structural Engineering SEM - I
* Program Elective -I

CES1151: CONSTRUCTION CONTRACTS

Teaching Scheme				Evaluation Scheme				
					Theory (Marks %)		Practical (Marks %)	
L	T	P	Credits	Scheme	Max	Min For Passing	Max	Min For Passing
03	--	--	03	ISE	20	40	--	--
				UT 1	15		--	--
				UT 2	15		--	--
				ESE	50	40	--	--

Course Description

Construction Contracts and Administration is offered as regular subject for semester one, all disciplines of engineering work on contracts; Contracts are base for engineers. Aim of including
this subject is to make graduates familiar with contracts its contents, terms, regulation, limitations framework and different types of the contracts in civil engineering work. This course
will help graduates to understand, manage and control the contracts in appropriate manner. Divided into six units this takes care of major roles played by project managers.

Course Outcomes-

After successful completion of this course students will be able to-
1. Select the right strategic about arbitration.
2. Enhance processes and method related to various labor laws.
3. Improve project team collaboration
4. To know the process about Contract of Bailment and pledge

Syllabus Content

Unit 1: Contracts Administration **6Hrs**

The standard forms of building contracts, the rights of building owners, adjoining owners and third parties. The Indian Contract Act, Sale of Goods Act. Professional ethics.

Unit 2: Injunctions **6Hrs**

Types, Temporary, perpetual, mandatory, when referred

Unit 3: Industrial Act and Labour Laws **6Hrs**

Industrial Dispute Acts, payment of wages act, Minimum Wages Act, Indian Trade Union Act, Limitation Act, Workmen's Compensation Act.

Unit:4 Arbitration **6Hrs**

Awards & Dispute Resolving boards – Indian Arbitration Act, arbitration agreement, conduct of arbitration, power and duties of arbitrator, rules of evidence/ preparation and publication of awards,
methods of enforcement, impeding and award. Limitations of arbitration in the Indian context

(DRB's)Dispute resolving boards-necessity, formation, functioning advantages.

Unit: 5 Indemnity and Guarantee **6Hrs**

Difference between the two contracts of Guarantee and Indemnity. Consideration for gurantee, surety's liability, discharge of surety.

Unit: 6 Bailment **6Hrs**

Nature of transactions, delivery of bailee, care to be taken, Bailee's responsibility, Termination, Bailment of pledges.

References

1. Construction contracts and claims – Simon M.S., McGrawHill, New York
2. Construction contract management-NICMAR publication.
3. handbook of estimating & costing for Quantity Surveyors-P.T.Joglekar
4. Estimates and contracts B.S.Patil

Rajarambapu Institute of Technology, Sakharale

(An Autonomous Institute Affiliated to Shivaji University, Kolhapur)

M. Tech. P.G. All Programmes

Course Code: SHP551 **Course Title:** Technical Communication

Teaching Scheme and Credits:

L	T	P	C
1	0	2	2

Evaluation Scheme: ISE- 100% (Minimum Passing Marks: 50%)

	Details of the Content	**Hrs.**
1.	**Formal Written Communication**: - Resume Writing, e-Mails, Notices, Circulars, Memos.	2
2.	**Writing Project Proposal**: - Essentials, Aim, Background & significance, Design & methods, Abstract.	2
3.	**Report Writing**:- Types of reports (Seminar, Dissertation), Planning a report, Collection & organization of information.	2
4.	**Oral Presentation of Reports**: - Preparation, Understanding audience, Dos and Don'ts of Content Delivery, Handling questions and Feedback, Proofreading.	2
5.	**Interview Skills**:- Types, Dos and Don'ts, Answering FAQs.	2
6.	**Group Discussion**:- Structured and Unstructured GD, Opening and Closure, Showing Agreement and Disagreement.	2
	Total Hrs.	12

	List of Practical /Assignments	**Hrs.**
1.	Goal Setting, SWOT Analysis, and Self Introduction (in the industry context)	02
2.	Listening activities: Listen and reproduce, Listen and respond; Exercises on Graduate Record Examination [GRE] Word List	02
3.	Resume writing and writing e-Mails	02
4.	Drafting sample notices and circulars	02
5.	Mock Interview	02
6.	Participation in a structured GD	02
7.	Participation in an unstructured GD	02
8.	Writing a project proposal	02
9.	Writing various parts of a report	02
10.	Proofreading a sample report	02
11.	Preparing PPT Presentation	02
12.	Demo presentations by students and handling questions and feedback	02
	Total Hrs.	24

Reference Books:

1. John Seely, *Oxford Guide to Effective Writing and Speaking*; Oxford University Press, 2009.
2. Thomas N. Huckin and Leslie A. Olsen, *Technical Writing and Professional Communication for Nonnative Speakers of English*; Tata McGraw Hills, International Edition, 1991.
3. Jeff Butterfield, *Soft Skills for Everyone*, Cengage Learning India Private Limited, 2010.

Course Learning Outcomes: After successful completion of the course student will be able to-

1. Prepare documents those are structurally and technically appropriate.
2. Demonstrate skills desired in job screening.
3. Develop strategies for addressing multiple audiences for any given technical presentations.
4. Demonstrate use of English as a language of academic and profession.

Evaluation Method: In each session student should be assessed. Each assessment should be of minimum 10 marks. Out of 100 marks of ISE, 60 marks will be for continuous assessment and 40 marks will be for comprehensive assessment at the end of the semester.

K.E.Society's
Rajarambapu Institute of Technology, Rajaramnagar
(An Autonomous Institute)
Common to all M.Tech programs
Course &Course Code: LIBERAL LEARNING (RIT-MT-LL)

L	T	P	Audit	Evaluation Scheme
-	-	-	P/F	Certificate issued by competent authority

Course Rationale and Outcomes

The liberal learning course is introduced to provide knowledge, skills and experiences to the MTECH students that will ensure their success in professional and personal life. The liberal learning course will deepen their understanding of the world and society, help them to look at things from different perspectives and develop them as good human being.

This Course is being introduced as a self study (or online certification course) and is an Audit course. It is expected that students should complete the course within span of two years, before submission of dissertation thesis.

The course outcomes are

1. To enhance intellectual and scholarly growth of students
2. To create awareness of social responsibility among students
3. To provide strong foundation for life-long learning
4. To integrate engineering and liberal arts to compete in a highly competitive and technology based global economy

Some of the Areas of liberal learning (not limited to) are listed for reference:

1. **Agriculture** (Landscaping, Farming, etc.)
2. **Humanities and social sciences** (Literature, Applied linguistics etc)
3. **Management** (marketing research & analysis, Gender justice, corporate social responsibility etc.)
4. **Business** (Management, Entrepreneurship, etc.)
5. **Defense** (Study about functioning of Armed Forces)
6. **Education** (Education system, Policies, Importance, etc.)
7. **Fine Arts** (Painting, Sculpting, Sketching, etc.)
8. **Medicine and Health** (Diseases, Remedies, Nutrition, Dietetics, etc.)
9. **Performing Arts** (Music, Dance, Instruments, Drama, etc.)
10. **Social Sciences** (History, Political Sc., Archeology, Geography, Civics, Economics, NSS activities etc.)
11. **Biological sciences and Biotechnology** (Animal physiology, Forest biometry etc)
12. **Chemistry and biochemistry** (Analytical chemistry, Stereochemistry etc.)
13. **Sports** (participation in Cricket, Kho-kho, Basket ball etc.)

14. **Ant other relevant course suggested by Board of studies**

Methodology and Assessment:

1. Students individually have to select an area, subarea and identify a topic.
2. Students can complete the course by
    a. Enrolling for SWAYAM course, conducted online and obtain certificate of completion and submit copy of the same to department.
    b. Participating in NSS activities, Sports activities and competitions organized at Institute, University, State, National level and submit certificate issued by competent authority to the department.
3. Student should prepare action plan for completion of the course and submit the same to department after completion of Unit Test-1.
4. After submission of the certificate, department will send list of successful candidates to COE

SEMESTER II

K. E. Society's
Rajarambapu Institute of Technology, Rajaramnagar

CBCS Curriculum

Teaching Scheme and Structure

First Year M. Tech. Civil- Structural Engineering

Semester II

Course Code	Course	Teaching Scheme				Evaluation Scheme				
							Theory (Marks) %		Practical (Marks) %	
		L	T	P	Credits	Scheme	Max	Min % for Passing	Max	Min % for Passing
CES2011	Finite Elements Analysis	3	1		4	ISE	20	40	--	--
						UT1	15		--	--
						UT2	15			
						ESE	50	40	--	--
CES2021	Advanced Design of Concrete Structures	3	1		4	ISE	20	40	--	--
						UT1	15		--	--
						UT2	15			
						ESE	50	40	--	--
CES2031	Theory of Elasticity and Plasticity	3	1		4	ISE	20	40	--	--
						UT1	15		--	--
						UT2	15			
						ESE	50	40	--	--
CES****	Program Elective III	3			3	ISE	20	40	--	--
						UT1	15		--	--
						UT2	15			
						ESE	50	40	--	--
CES****	Program Elective IV	3			3	ISE	20	40	--	--
						UT1	15		--	--
						UT2	15			
						ESE	50	40	--	--
CES2041	Computer Aided Analysis & Design of R.C.C. Structures Lab			4	2	ISE	--	--	50	50
						ESE			50	50
CES2051	Seminar II/ Mini Project.			2	1	ISE	--	--	50	50
CES2061	Research Methodology	1		2	2	ISE	--	--	50	50
						ESE			50	
		16	3	8	23					

Total Credits: 23, **Total Contact Hours/Week: 27.**

(Note: Select any two course for Program Elective III and Elective IV)

List of Program Elective:

Course Code	Course
CES2071	Analysis and Design of Tall Building
CES2081	Pre-stress Concrete Structures
CES2091	Computer Aided Analysis and Design
CES2101	Wind and Cyclone Effects on Structures
CES2111	Design of Steel Concrete Composite Structure
CES2121	Earthquake Resistant Design of Structure
CES2131	Structure in Disaster Prone Areas
CES2141	Fracture Mechanics
CES2151	Industrial Safety and Risk Assessment
CES2161	Ground Improvement Techniques
CES2171	Industrial Structures
CES2181	Pre-cast Structures
CES2191	Pre-fabricated Structures
CES2201	Design of Bridges and Flyovers
CES2211	Hydraulic Structures

First year M. Tech. Civil Structure SEM – II

CES2011: FINITE ELEMENT ANALYSIS

Teaching Scheme				Evaluation Scheme				
L	T	P	Credits	Scheme	Theory (Marks %)		Practical (Marks %)	
					Max	Min for Passing	Max	Min for Passing
03	01	--	04	ISE	20	40	--	--
				UT 1	15		--	--
				UT 2	15			
				ESE	50	40	--	--

Course Outcomes:

After successful completion of this course, the student will able to:

1. Explain finite element method procedure and various variational methods of analysis.
2. Develop element stiffness matrix for beam, truss and plane frame.
3. Explain convergence requirement and develop element stiffness matrix of 3D problems.
4. Explain isoperimetric element, shape function and formulate stiffness matrix for axisymmetric elements
5. Formulate element stiffness matrix of any plate bending and shell element.
6. Apply finite element application to structural dynamics.

Unit No.	Content	Hrs
1	a)**Introduction** Finite element method procedure, background on variational calculus, Galerkin method, collocation method, Rayleigh Ritz method b) Principle of minimum potential energy, displacement function, formulation of element stiffness matrix, application to bars with constant and variable cross sections subjected to axial forces.	6
2	**Two dimensional elements** Plane stress /plane strain problems. CST, LST & rectangular elements, development of element stiffness matrix and nodal load vector for truss, beam and plane frame elements, transformation of matrices, relevant structural engineering applications.	6
3	a) **Three dimensional elements** Development of element stiffness matrix and nodal load vector for such as Tetrahydron, Hexahydron, b) Aspect ratio, use of polynomial displacement functions, Pascal triangle, requirements for convergence, geometric invariance, conforming & nonconforming elements.	6
4	a)**Shape functions**, Reletionship in cartesian & natural coordinate systems, shape functions for one & two dimensional elements. b)**Isoparametric elements**	6

Concept, formulation procedure for 2 D quadrilateral isoparametric element in plane elasticity problem, concept of four noded & eight noded isoparametric elements.

5 **Axisymmetric elements** 6

Axisymmetric problems, stress strain relations, triangular and quadrilateral elements, development of element stiffness matrix and nodal load vector.

6 a)**Thin plate bending elements,** 6

Various triangular and rectangular elements, ACM (Adini, Clough, Melosh) and BFS (Bogner, Fox, Schimdt) elements.

b)**Shell Elements**

Flat & curved shell element, elements for cylindered shells, curved solid element, Ahmad's degenerated solid element.

References:

1. O.C. Zienkiewicz & R.L. Taylor, The Finite Element Method Vol.I& II, Tata McGraw Hill 2. J.N. Reddy, An introduction to the Finite Element Method , Tata McGraw Hill Pub.

3. R. D. Cook, Concept and Application of Finite Element Analysis, John Wiley & sons

4. Hutton D.V., Fundamentals of Finite Element Analysis, Tata McGraw Hill Pub.

5. C. S. Desai & J. F. Abel, Introduction to the Finite Element Method, CBS Pub.

6. C. S .Krishnamoorthy, Programming in the Finite Element Method, Tata McGraw Hill

7. T.R. Chandrupatla and Belegundu, Introduction to the Finite Element in Engineering-

Prentice Hall of India, pvt.ltd

8. Bathe K.J., Finite Element Procedures, PHI learning pvt.ltd

9. Y.M. Desai, T.I Eldho, Finite Element Method with application in Engineering, Pearson ,

Delhi

First year M. Tech. Civil Structure SEM – II

CES2021: ADVANCED DESIGN OF CONCRETE STRUCTURES

Teaching Scheme				Evaluation Scheme				
L	T	P	Credits	Scheme	Theory (Marks %)		Practical (Marks %)	
					Max	Min for Passing	Max	Min for Passing
03	01	--	04	ISE	20	40	--	--
				UT 1	15		--	--
				UT 2	15			
				ESE	50	40	--	--

Course Description:
The course 'advanced design of concrete structures' mainly focuses on analysis and design of various concrete elements and structures subjected to different types of loads using latest methods of analysis and design.. The analysis and design of concrete structures namely bunkers, silos, water tanks, flat slabs, grid floor slabs etc. forms the core content of the course. The RCC structures exposed to higher temperatures or fire are also considered for analysis and determining their capacity in the event of fire.

Pre-requisite:
The student should possess fundamental knowledge of concrete technology, RCC, earthquake engneering and basic methods of analysis and design of RCC elements and structure.

Course Outcomes:
At the end of the course, the student will be able to:

1. Estimate the crack width and deflection with regard to the serviceability.
2. Analyse and design slabs of different shapes and edge conditions using yield line theory.
3. Determine the ultimate bending moment and capacity of RCC elements subjected to fire.
4. Analyse and design a grid floor system.
5. Analyse and design a flat slab system.
6. Analyse and design bunkers, silos and chimneys

Unit I
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 456.

Unit II
Yield line theory for analysis of slabs

Various patterns of yield lines, Assumptions in yield line theory, Equilibrium and virtual work method of analysis, Design of various slabs such as rectangular, triangular, circular with various edge conditions using yield line theory, Design for limit state of strength and serviceability orthotropically reinforced slabs.

Unit III

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.

Unit IV

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. Rigorous and approximate method of analysis design of grid floor by approximate method,

Analysis and 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 V

Elevated service reservoir – Rectangular and Circular type only flat bottom, Design of staging for wind and earthquake forces, Effect of joint reactions and continuity.

Unit VI

Design of Bunkers, Silos-

Introduction, Design of rectangular bunkers, circular bunkers and silos

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

Design of raft foundations, Pile foundations, single pile, group of piles, Pile cap

Design of Shear wall, design of form work for slabs, girders, columns etc.

REFERENCE BOOK:

1. Advance R.C.C. Design by S.S.Bhavikatti. New Age International Publishers
2. Reinforced Concrete Structures–Vol. II by B.C. Punmia, Ashok K. Jain, Arun K. Jain. Laxmi Publications, New Delhi.
3. Fundamentals of Reinforced Concrete by N.C. Sinha and S.K. Roy. S. Chand & Co. Ltd, New Delhi.Advanced Reinforced Concrete Design (2nd Edition) by P.C. Varghese, Prentice Hall of India, 2008.
4. Reinforced Concrete design by Dr. H. J. Shah, Charotar Publishing House
5. Design of R.C.C by S.Ramaamruthum. Dhanpat Rai Publications.
6. Reinforced Concrete Structural Elements (3rd Edition), by Purushothaman P. Tata Mc Graw- Hill Publishing Co, 2004.
7. Reinforced Concrete Design (2nd Edition) Pillai and Devadas Menon. Tata McGraw Hill Publishing Co. Ltd., 2003.

8. IS: 456-2000 Indian Standard code of practice for plain and reinforced concrete, Bureau of Indian Standards, New Delhi.
9. IS: 1893:-2002 Indian Standard Code of practice for criteria for Earthquake resistant design of Structures, Bureau of Indian Standards, New Delhi.
10. Special Publications -16, "Design Aids for Reinforced Concrete",IS: 456.
11. IS:3370-Indian Standard code of practice for concrete structures for storage of liquids, Bureau of Indian Standards, New Delhi

First year M. Tech. Civil Structure SEM-II

CES2031: THEORY OF ELASTICITY AND PLASTICITY

Teaching Scheme				Evaluation Scheme				
					Theory (Marks %)		Practical (Marks %)	
L	T	P	Credits	Scheme	Max	Min for Passing	Max	Min for Passing
3	1	--	4	ISE	20	40	--	--
				UT 1	15		--	--
				UT 2	15			
				ESE	50	40	--	--

Course Outcomes:

1. Formulate equilibrium and compatibility equations for 3D problems
2. Find out the stresses in bodies subjected to two-dimensional forces
3. Analyze various shaped bars subjected to torsion

Course Content

Unit 1.
Basic concepts of continuum, concept of stress, equilibrium equations, stress on oblique plane, stress transformation, principal stresses, stress invariants, deviatoric stresses, maximum shear stress, octahedral stresses, plane stress.

Unit 2.
Strain at a point, concept of strain, strain components, compatibility equations, strain transformation, principal strains, strain invariants, deviatoric strains, maximum shear strain, plane strain

Unit 3.
Stress-strain relations, generalized Hooke's law, stress strain relationship for isotropic material, Airy's stress function and its applications.

Unit 4.
Torsion: Shafts of non circular prismatic section, warping function approach, stress approach, membrane analogy.

Unit 5.
Plasticity: Strain-Hardening, Idealized stress-strain curve, Yield Criteria, von Mises Yield Criterion, Tresca Yield Criterion, Plastic Stress-Strain Relation.

Unit 6.
Elasto-Plastic loading- Beams under elasto-plastic condition, collapse load, plastic hinge, thick- walled cylinder, spherical shell, elasto-plastic deflections of beams of rectangular cross sections, residual stresses.

TEXT/REFERENCE BOOKS :

1. Theory of Elasticity, S. Timoshenko & N. Goodier, Mc Graw Hill.
2. Theory of Elasticity by Sadhu Singh. Khanna Publishers.
3. Theory of Plasticity by Sadhu Singh. Khanna Publishers.
4. Advanced Mechanics of Solids by L.S. Srinath.
5. Continuum Mechanics by Valiappan, Mc. Graw Hill
6. Advanced Machanics of Materials by Boresi.
7. Theory of Plasticity by Chakraborty

First year M. Tech. Civil Structure SEM – II

CES2041: COMPUTER AIDED ANALYSIS & DESIGN OF R.C.C. STRUCTURES LAB

Teaching Scheme				Evaluation Scheme					
L	T	P	Credits	Scheme	Theory (Marks %)			Practical (Marks %)	
					Max	Min for Passing		Max	Min for Passing
--	--	4	2	ISE	--	--	--	50	50
				ESE	--	--	--	50	50

COURSE DESCRIPTION

This course deals with design of special structures with respect to buildings, such as flat slab, retaining wall, overhead water tanks, foundation using any standard software.

COURSE OUTCOMES

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

1. Analyze and design the structures such as flat slab, retaining wall, overhead water tanks and foundation using software.
2. Sketch the detailing of the reinforcement
3. Demonstrate working in teams.

LABORATORY WORK

Laboratory work shall consist of analysis and design of following structure using standard software and drawing of reinforcement detailing.

1. Flat slab
2. Retaining wall
3. Overhead water tank
4. Foundation: Raft foundation and combined footing.

REFERENCES:

1. Sinha and Roy - Fundamentals of Reinforced Concrete, 3rd Edition, S. Chand and Company Ltd, New Delhi
2. A. K. Jain - Reinforced Concrete Design
3. Karve and Shah - Limit State Theory and Design, Structures Publications, Pune
4. P. C. Varghese - Limit State Design of Reinforced Concrete, 2nd Edition, Prentice Hall of India, New Delhi
5. IS: 456-2000
6. IS:3370- 1 to 4- Code of Practice for concrete structures for the storage of liquids.

7. N. Unnikrishna Pillai/ Devdas Menon - Reinforced Concrete Design, 3rd Edition, Tata McGraw-Hill Publishing Company Ltd, New Delhi
8. N. Krishna Raju - Advanced Reinforced Concrete Design, 2nd Edition, CBS Publishers Distributors Pvt. Ltd.
9. Chu-Kai Wang, Charles G. Salmon - Reinforced Concrete Design, 4th Edition, Harper International Edition
10. S. K. Mallick, A. P. Gupta - Reinforced Concrete, 2nd Edition, Oxford & IBH Publishing Company, Mumbai
11. P. Purushothaman - Reinforced Concrete Structural Elements, Tata McGraw- Hill Publishing Company Limited, New Delhi
12. Ferguson, Breen, Jivsa - Reinforced Concrete Fundamentals, 5th Edition, John Wiley & Sons, New York
13. T. S. MacGinley & B. S. Choo - Reinforced Concrete, 2nd Edition, E. & F. N. Spon, London
14. P. C. Varghese - Advanced Reinforced Concrete Design, 2nd Edition, Prentice- Hall of India, New Delhi

First year M. Tech. Civil Structural Engineering SEM – II

CES2051 - MINI PROJECT

Teaching Scheme				Evaluation Scheme				
					Theory Marks		Practical Marks	
L	T	P	Credits	Scheme	Max	Min for Passing	Max	Min for Passing
--	--	2	1	ISE	--	---	100	50%

Course Outcomes:

After successful completion of this course student will be able to,

1. Identify research problem
2. Prepare and present statement of Purpose
3. Perform analysis work.
4. Communicate with outside agencies.
5. Write report and Present the work carried out.
6. Develop self-learning ability.

Laboratory work:

Mini project shall be delivered on one of the advanced topics chosen in consultation with the supervisor, based on dissertation work/ societal problem / special structure. A hard copy of the report (25 to 30 pages A4 size, 12 fonts, Times New Roman, single spacing single side printed, preferably in TRM format) should be submitted to the Department Post Graduate Committee (DPGC) before delivering the seminar. A copy of the report in soft form must be submitted to the supervisor, along with other details, if any. Minimum 03 presentations should be delivered by the students.

First year M. Tech. Civil Structural Engineering SEM – II

CES2051: SEMINAR

Teaching Scheme				Evaluation Scheme				
					Theory Marks		Practical Marks	
L	T	P	Credits	Scheme	Max	Min for Passing	Max	Min for Passing
--	--	2	1	ISE	--	---	100	50%

Course Outcome:

After successful completion of this course student will be able to,

1. Identify research problem
2. Prepare and present statement of purpose,
3. Perform analysis work
4. Communicate with outside agencies
5. Write report and present

Laboratory work:

Seminar- I shall be delivered on one of the advanced topics chosen in consultation with the supervisor after compiling the information from the latest literature. The concepts must be clearly understood and presented by the student. All modern methods of presentation should be used by the student. Minimum 02 presentations are to be delivered by each student. A hard draft copy of the report (25 to 30 pages A4 size, 12 fonts, Times New Roman, single spacing one side printed, as per format) should be submitted to the Department Post Graduate Committee (DPGC) before delivering the final seminar. The final copy of the report in hard and soft form by incorporating corrections from DPGC , must be submitted to the Supervisor along with other details.

First year M. Tech. Structural Engineering SEM -II

CES2061: Research Methodology

Teaching Scheme				Evaluation Scheme				
					Theory Marks		Practical Marks	
L	T	P	Credits	Scheme	Max	Min % for Passing	Max	Min for Passing
1	--	2	2	ISE	--	--	50	50
				ESE			50	

Course outcomes:

At the end of this course, student should able to

1. To prepare Literature Review for developing research problem and design
2. Use of software for data analysis
3. Design and analyze experiment
4. Write a research proposal

Unit 1: Research Methodology and research process: (03)

Definition of research and characteristics of research; Types of research;

Research process: Formulating the Research Problem, Literature Review, Developing the objectives, preparing the Research Design including Sample Design, Collecting the Data, Analysis of Data, Generalization and Interpretation, Preparation of the Report or Presentation of Results

Unit 2: Literature survey: (03)

Importance of literature review, types of literature review, selection of the review topic, searching for the literature, analyzing and synthesizing the literature, writing the review report.

Unit 3: Statistical tools for analysis: (03)

Analysis of variance, regression analysis, Response surface methods for process optimization

Unit 4: Design and analysis of experiments: (03)

Strategy of experimentation, Statistical design of experiments, replication, randomization and blocking. Guidelines for designing experiments, Factorial designs. The two factor factorial design, Statistical analysis of factorial design, Taguchi design

Writing a research proposal: Title, Abstract, Introduction, Rationale, Objectives, Methodology, Time frame and work plan, Budget and Justification, References

Laboratory Work:

1. Two hour per week practical is to be utilized for the students that, they have properly learnt the topics covered in the lectures.
2. One assignment on each unit.

List of case studies:

1. Literature Review: Writing a review based on research papers

2. Questionnaire design for data collection
3. Use of software for data analysis-I
4. Design and Analysis of Experiments-I
5. Design and Analysis of Experiments-II
6. Writing a research proposal

References:

1. Kothari C.K. (2004) 2/e, Research Methodoloy – Methods and Techniques (New Age International, New Delhi)
2. Krishnswamy, K.N., Shivkumar, Appa Iyer and Mathiranjan M. (2006) Management Research Methodology; Integration of Principles, Methods and Techniques (Pearson Education, New Delhi)
3. Gupta, Santosh (2005) Research Methodology and Statistical Techniques, Deep and Deep Publications.
4. Douglas C. Montgomery, Design and analysis of experiments, John Willey and Sons, New York.
5. Tapan Bagchi, Taguchi Methods Explained: Practical steps to robust design, Prentice Hall
6. Phillip J. Ross, Taguchi Techniques for quality engineering, TATA McGraw Hill

First year M. Tech. Civil Structural Engineering SEM – II
*Program Elective III/IV

CES2071: ANALYSIS AND DESIGN OF TALL BUILDINGS

Teaching Scheme				Evaluation Scheme				
					Theory (Marks %)		Practical (Marks %)	
L	T	P	Credits	Scheme	Max	Min for Passing	Max	Min for Passing
3	-	--	3	ISE	20	40	--	--
				UT 1	15		--	--
				UT 2	15			
				ESE	50	40	--	--

Course Outcomes:
After successful completion of this course student will be able:

1. Demonstrate behaviour of various structural systems.
2. Calculate various types of loads for a tall building.
3. Analyse and design various frame elements of tall buildings.
4. Perform stability analysis of tall structures.

SYLLABUS CONTENT

Unit I – Introduction **6 Hrs**

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

Unit II – Loads and Materials **6 Hrs**

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

Unit III – Structural Systems **6 Hrs**

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

Unit IV- Analysis and Design **6 Hrs**

Analysis and Design principles of various horizontal load transfer systems - approximate methods - Modelling for accurate analysis - 3D analysis - Member forces - displacements. Analysis for various secondary effects - Creep, shrinkage and temperature. Stability Analysis - Overall buckling analysis of frames, wall frames, approximate methods, second order effects of gravity loading, P - effect and various methods of analysis - influence of foundation instability, out of plumb effects - Elastic

Deformations. Dynamic Analysis - Principles of design of tall braced frames for earthquake and blast resistant design.

Unit V – Stability Analysis **6 Hrs**

Overall buckling analysis of frames, wall – frames, Approximate methods, Second order effect of gravity loading, P – Delta Effects, Simultaneous first order and P-Delta analysis, Translational instability, Torsional Instability, Out of plumb effects, Effect of stiffness of members and foundation rotation in stability of structures.

Unit VI – Systems and economics **6 Hrs**

Structural systems for future generation buildings - Expert systems for consultations - Economics - Research needs in tall building materials, systems and designs.

REFERENCES

1. Bryan Stafford Smith and Alex Coull, 'Tall Building Structures', Analysis and Design, John Wiley and Sons, Inc., 1991.

2. Taranath B.S, 'Structural Analysis and Design of Tall Buildings', McGraw-Hill, 2011

3. COULL, A. and SMITH, STAFFORD, B. 'Tall Buildings', Pergamon Press, London, 1997.

4. LinT.Y. and Burry D.Stotes, 'Structural Concepts and Systems for Architects and Engineers', John Wiley, 1994.

5. Lynn S.Beedle, 'Advances in Tall Buildings', CBS Publishers and Distributors, Delhi, 1996.

First year M. Tech. Civil Structural Engineering SEM – II
*Program Elective III/IV

CES2081: PRE STRESSED CONCRETE STRUCTURES

Teaching Scheme				Evaluation Scheme				
					Theory (Marks %)		Practical (Marks %)	
L	T	P	Credits	Scheme	Max	Min for Passing	Max	Min for Passing
3	-	--	3	ISE	20	40	--	--
				UT 1	15		--	--
				UT 2	15			
				ESE	50	40	--	--

Course Outcomes

On successful completion of the course, the student shall be able:

1. To understand the concept of pre-stressing, behavior of the pre-stressed structures vis-à-vis that of the RCC structure.
2. To take the decision with respect to the choice of pre-stressed section over RCC.
3. To understand the application of these techniques in civil engineering construction.
4. To analyze the various pre-stressed components of the structures and design the same.

Course Content

Unit 1.
Mechanics of Pre-stressed concrete, stress concept, strength concept and load balancing concept, high strength material, systems of prestressing.

Unit 2.
Llosses of prestress, immediate losses, time dependent losses

Unit 3.
Design of prestress concrete beams, box, T and I Sections, shear, deflection, design of end block by IS code method.

Unit 4.
Analysis and Design of continuous beams, linear transformation and concordancy of cable profiles

Unit 5.
Analysis and design of cylindrical structures in prestressed concrete- pipes and tanks.

Unit 6.
Composite construction, behavior, flexural stresses, longitudinal shear transfer, transverse shear, creep and shrinkage effects in composite construction.

REFERENCES:

1. Prestressed Concrete- Krishna Raju (2000): *Tata McGraw Hill Publishing Co.*

2. Fundamentals of Prestressed Concrete- Sinha.N.C. and.Roy.S.K. (1998):', *S.Chand and Co.*

3. Prestressed Concrete- S. Ramamrutham (2013): *Dhanpat Rai Publishing Company*

5. Prestressed Concrete- N. Rajaopalan (2012): Narosa Publishing House

5. Design of Prestressed Concrete Structures- Lin, T.Y. and Burns, N.H. (2004):', *3rdEdition, John Wiley and Sons.*

6. IS: 1343 – 1980, "Code of Practice of Prestressed Concrete", Bureau of Indian Standards

First year M. Tech. Civil Structural Engineering SEM – II
*Program Elective III/IV

CES2091: COMPUTER AIDED ANALYSIS AND DESIGN

Teaching Scheme				Evaluation Scheme				
					Theory (Marks %)		Practical (Marks %)	
L	T	P	Credits	Scheme	Max	Min for Passing	Max	Min for Passing
3	-	--	3	ISE	20	40	--	--
				UT 1	15		--	--
				UT 2	15			
				ESE	50	40	--	--

Course Description:
Computer Aided Analysis and Design is offered as elective course for semester two, this course focuses on recent computer aided methods of drafting, analysis and design of structural element and whole structure. Also, it covers some of techniques of optimization and artificial intelligence which will helps students in their dissertation work.

Pre-requisite:
Basics computer programming, Auto CAD, other structural design and analysis softwares.

Course Outcomes:
After successful completion of this course student will be able:

1. To learn the principles of computer graphics.
2. To analyse structure and structural element using software package
3. To design steel and RCC structure using various software and also provide detailing.
4. To understand techniques of optimization and artificial intelligence.

SYLLABUS CONTENT

Unit I – Computer Graphics **6 Hrs**
Graphic primitives- Transformations, Basics of 2-D drafting, Modeling of curves and surfaces, Solid modeling, Graphic standards, Drafting software packages and usages.

Unit II – Structural Analysis **6 Hrs**
Compute Methods of Structural Analysis - Analysis through application packages.

Unit III – Structural Design **6 Hrs**
Computer Aided Design of steel and RC Structural elements - Detailed drawing Bill of materials.

Unit IV- Finite Element Analysis **6 Hrs**
Fundamentals of finite element analysis – Discretization -Types of elements – shape function –plane stress and plane strain problems Analysis packages and applications.

Unit V – Optimization **6 Hrs**

Linear Programming - Simplex algorithm - post-optimality analysis - Project scheduling CPM and PERT application genetic algorithm and applications.

Unit VI – Artificial Intelligence **6 Hrs**

Introduction - Heuristic search - knowledge based expert systems - Architecture and application of KBES - Expert system shells - Principles of neural network.

REFERENCES

1. Krishnamoorthy C. S. and Rajeev S., *"Computer Aided Design"*, Narosa Publishing House, New Delhi, 1991.

2. Groover M. P.and Zimmers E.W. Jr.," *CAD/CAM, Computer Aided Design and Manufacturing",* Prentice Hall of India Ltd, New Delhi, 1993.

3. Harrison H. B., *"Structural Analysis and Design Vol.I and II"*, Pergamon Press, 1991

4. Hinton E. and Owen D. R. J., *"Finite Element Programming"*, Academic Press 1977.

5. Rao. S. S., *"Optimisation Theory and Applications",* Wiley Eastern Limited, New Delhi, 1977.

6. Richard Forsyth (Ed.), 7.V.L. Shah *"Computer Aided Design in Reinforced Concrete"* Structural Publishers

First year M. Tech. Civil Structural Engineering SEM – II
***Program Elective III/IV**

CES2101: WIND AND CYCLONE EFFECT ON STRUCTURE

Teaching Scheme				Evaluation Scheme				
					Theory (Marks %)		Practical (Marks %)	
L	T	P	Credits	Scheme	Max	Min for Passing	Max	Min for Passing
3	-	--	3	ISE	20	40	--	--
				UT 1	15		--	--
				UT 2	15			
				ESE	50	40	--	--

Course Outcomes:
After successful completion of this course student will be able:

1. demonstrate the fundamentals of wind effect
2. understand wind tunnel studies
3. design structures for wind and cyclone effects

SYLLABUS CONTENT

Unit I – Introduction **8 Hrs**

Introduction, Spectral studies, Gust factor, Wind velocity, Methods of measurements, variation of speed with height, shape factor, aspect ratio, drag effects. Provisions in IS:875 Part-3.

Unit II – Wind Tunnel Studies **7 Hrs**

Wind Tunnel Studies, Types of tunnels, Modeling requirements, Interpretation of results, Aero-elastic models.

Unit III – Wind Effect **7 Hrs**

Wind on structures, Rigid structures, Flexible structures, Static and Dynamic effects, Tall buildings, chimneys.

Unit IV- Design Principles **7 Hrs**

Application to design, IS 875 code method, Buildings, Chimneys, Roofs, Shelters

Unit V – Cyclone And Design **7 Hrs**

Cyclone effect on structures, cladding design, window glass design.

References:

1. Cook.N.J., 'The Designer's Guide to Wind Loading of Building Structures', Butterworths, 1989.

2. Kolousek., et.al., 'Wind Effects on Civil Engineering Structures', Elsevier Publications, 1984.

3. Peter Sachs, 'Wind Forces in Engineering', Pergamon Press, New York, 1972.

4. Lawson T.V., 'Wind Effects on Building' Vol. I and II, Applied Science Publishers, London, 1980.

First year M. Tech. Civil Structural Engineering SEM – II
*Program Elective III/IV

CES2111: DESIGN OF STEEL CONCRETE COMPOSITE STRUCTURES

Teaching Scheme				Evaluation Scheme				
					Theory (Marks %)		Practical (Marks %)	
L	T	P	Credits	Scheme	Max	Min for Passing	Max	Min for Passing
3	-	--	3	ISE	20	40	--	--
				UT 1	15		--	--
				UT 2	15			
				ESE	50	40	--	--

Course Outcome:

1. Explain types and degrees of shear connection.
2. Analyse and design composite beam, column and floor systems.
3. Explain effect of temperature on composite section

Unit 1: **6Hrs**

Introduction – limit states of composite sections -shear connectors – types of shear connectors –degree of shear connection –

Unit 2: **6Hrs**

Partial and complete shear connections –strength of shear connectors – Analysis and design of composite beams without profile sheet.

Unit 3: **6Hrs**

Design of composite beam – propped condition –un-propped condition –deflection of composite beams–beam with profile sheeted deck slab – design of partial shear connection.

Unit 4: **6Hrs**

Introduction –Composite slabs –profiled sheeting –sheeting parallel to span–sheeting perpendicular to span –analysis and design of composite floor system.

Unit 5: **6Hrs**

Types of Composite columns –design of encased columns – design of in-filled columns–axial, uni-axial and bi-axially loaded columns.

Unit 6: **6Hrs**

Temperature–shrinkage and creep vibration of composite beams –Cyclic behavior of composite section case studies

REFERENCES

1.Johnson R.P., —Composite S tructures of Steel and Concrete‖ Volume-I, Black Well Scientific Publication, U.K., 1994

2.Teaching Resources for —Structural Steel Desginǁ. Vol.2 of 3, Institute of Steel Development and Growth (INSDAG), 2000

3.Narayanan R., —Composite Steel Structures –Advances, Design and construction, Elsevier, Applied Science, U.K., 1987

4.Owens, G.W & Knowels, P., Steel Designers Manual,ǁ (fifth edition), Steel Concrete Institute (U.K), Oxford Blackwell Scientific Publication, 1992.

5.IS 11384 –1985 Indian Standard Code ofPractice for Composite Construction in Structural Steel and Concrete, Bureau of Indian Standards, New Delhi.

First year M. Tech. Civil Structural Engineering SEM – II
*Program Elective III/IV

CES2121: EARTHQUAKE RESISTANT DESIGN OF STRUCTURE

Teaching Scheme				Evaluation Scheme				
					Theory (Marks %)		Practical (Marks %)	
L	T	P	Credits	Scheme	Max	Min for Passing	Max	Min for Passing
3	-	--	3	ISE	20	40	--	--
				UT 1	15		--	--
				UT 2	15			
				ESE	50	40	--	--

Course Outcomes:
After successful completion of this course the student will be able to:

1. Predict the sources of earthquakes understanding seismology and conceptually design the buildings.
2. Apply the Response Spectrum Analysis Method and static equivalent method for the determination of lateral loads on the buildings.
3. Apply ductility requirements for the design of structural components.
4. Assess seismic performance of non-structural components and structural components and identify effective measures to mitigate potential damage.
5. Apply clauses given in IS codes to increase resistance of structure to earthquake force.

SYLLABUS CONTENT

Unit I – Engineering seismology: **06**
Earthquake phenomenon cause of earthquakes-Faults- plate seismic tectonics- waves- Terms associated with earthquakes-Magnitude/Intensity of an earthquake-scales- Energy released-Earthquake measuring instruments-seismograph accelerograph, Characteristics of strong ground motions - Seismic zones of India, Earthquake prediction.

Unit II – Conceptual design **06**
Introduction-Functional planning-continuous load path-overall form-simplicity and symmetry-elongated shapes-stiffness and strength-Horizontal and Vertical members-Twisting of buildings-Ductility-definition-ductility relationships, flexible buildings-framing systems-choice of construction materials-unconfined concrete-confined concrete, masonry-reinforcing steel. Introduction to earthquake resistant design: seismic design requirements-regular and irregular configurations - basic assumptions - design earthquake loads - basic load combinations-permissible stresses-seismic methods of analysis-factors in seismic analysis-equivalent lateral force method – response spectrum method -Time history method.

Unit III – Masonry Buildings **06**
Introduction-Elastic properties of masonry assemblage- Categories of masonry buildings-Behaviour of unreinforced and reinforced masonry walls- Behaviour of walls- Box action and bands- Behaviour of infill walls- Improving seismic behaviour of masonry buildings- Load combinations and permissible stresses- seismic design requirements- Lateral load analysis of masonry buildings. **Structural Walls and Non-structural Elements:** strategies in the location of structural walls- sectional shape+ variations in elevation- cantilever walls without openings-

Failure mechanism of non-structures- Effects of non-structural elements on structural system- Analysis of non- structural elements- prevention of non-structural damage.

Unit IV- Ductility considerations in Earthquake Resistant Design of RC Buildings 06
Introduction- Impact of Ductility' Requirements for Ductility- Assessment of ductility- Factors-affecting Ductility- Ductile detailing considerations as per IS 13920. Behaviour of beam, columns and joints in RC buildings during earthquakes-Vulnerability of open ground storey and short columns during earthquakes. Capacity Based Design: Introduction to capacity Design, Capacity Design for Beams and columns- Case studies.

Unit V – - New Techniques in Seismic Design **06**
Cyclic loading behavior of RC steel and pre-stressed concrete elements modern concepts – base isolation – Adoptive systems – case studies, Field visit.

Unit VI – Water Tank **06**
Seismic design of Elevated RC Circular Water Tanks. Ductility requirements, types of ductility, factors affecting ductility. IS code provisions.

REFERENCES

1. Structural Dynamics : Vibrations and Systems, Madhujit Mukophadhyay, Publisher: ANE Books ISBN: 9788180520907, 8180520900 Edition: 01, 2008.
2. Structural Dynamics: Theory and Computation, 2nd Edition, Mario Paz, CBS Publisher ISBN: 9788123909783, 8123909780
3. Dynamics of Structures, R,W.clough and J.Penzien, McGraw – Hill Education, 2nd revised Edition, 1993, ISBN -10: 0071132414, ISBN -13: 978-0071132411.
4. Theory of Vibration with applications, Willaim Thomson, CRC Press; 4th edition, 1996, ISBN -10: 0748743804, ISBN -13: 978-0748743803.

F.Y. M.Tech. (Civil-Structural Engineering), SEM-II

*Program Elective III/IV

CES2131: FRACTURE MECHANICS

Teaching Scheme				Evaluation Scheme				
					Theory (Marks %)		Practical (Marks %)	
L	T	P	Credits	Scheme	Max	Min for Passing	Max	Min for Passing
3	-	--	3	ISE	20	40	--	--
				UT 1	15		--	--
				UT 2	15			
				ESE	50	40	--	--

Course Outcomes:

After successful completion of this course, the student should able to;

1. Develop systematic knowledge of stress strain concept
2. Familiarize with the fundamentals of stationary crack under static loading.
3. Develop the knowledge about energy balance and crack growth.
4. Know about the applications of fracture mechanics.

Unit Wise Syllabus

Unit 1: Elements of Solid Mechanics **07**

The geometry of stress and strain, elastic deformation, plastic and elasto – plastic deformation – limit analysis – Airy's function – field equation for stress intensity factor.

Unit 2: Stationary Balance and Crack Growth **08**

Two dimensional elastic fields – Analytical solutions yielding near a crack front – Irwin's approximation – plastic zone size – Dugdaale model – determination of J integral and its relation to crack opening displacement.

Unit 3: Energy Balance and Crack Growth **07**

Griffith analysis – stable and unstable crack growth – Dynamic energy balance- crack arrest mechanism – K1c test methods –R curves – determination of collapse load.

Unit 4: Fatigue Crack Growth Curve **07**

Empirical relation describing crack growth law – life calculation for a given load amplitude – effects of changing the load spectrum – rain flow methods – external factors affecting the K1c values- leak before break analysis.

Unit 5: Application of Fracture Mechanics **07**

Crack initiation under large scale yielding – thickness as a design parameter – mixed mode fractures – crack instability in thermal and residual stress fields – numerical methods.

References

1. David Broek, "Elemetary Engineering fracture Mechanics", Fifthoff and Norerdhoff International publisher, 1978.

2.Kare Hellan, "Introduction of Fracture Mechanics", McGraw-Hill Book Company, 1985.

3.Preshant Kumar, "Elements of Fracture Mechanics", Wheeler Publishing, 1999.

4.John Barson .M, and Stanly Rolfe. T, "Fatigue and fracture control in structures" Prentice hall Inc. Englewood cliffs 1977.

First year M. Tech. Civil Structure SEM - II

***Programme Elective III/IV**

CES2141: Industrial Safety and Risk Assessment

Teaching Scheme				Evaluation Scheme			
L	T	P	Credits	Scheme	Theory Marks Max %	Min for Passing %	
3	-	-	3	ISE	20	40%	40%
				UT 1	15		
				UT2	15		
				ESE	50	40%	

Course Description

As part of managing the health and safety of your business you must control the risks in your workplace. To do this you need to think about what might cause harm to people and decide whether you are taking reasonable steps to prevent that harm. This is known as risk assessment and it is something you are required by law to carry out. If you have fewer than five employees you don't have to write anything down. A risk assessment is not about creating huge amounts of paper work, but rather about identifying sensible measures to control the risks in your workplace. You are probably already taking steps to protect your employees, but your risk assessment will help you decide whether you have covered all you need to.

Course Outcomes:

After successful completion of this course student will be able to:

1. Analyze the root causes and effects of accidents in engineering industries.
2. Explain various methods of analyzing the risks involved in engineering industries
3. Assess the effects of industrial hygiene and occupational health
4. Predict the risks involved in engineering industries by applying various mathematical tools such as fuzzy logic and ANN
5. Design Safety management system for engineering industries
6. Create awareness about legal aspects of safety in engineering industries by implementing safety management plan.

Unit Wise Syllabus Structure:

Unit 1: Safety in Engineering Industries 06

Hazards in Industries, hazardous materials, hazard analysis, Fire hazards, hazards and risks, hazard assessment, methods of hazard analysis

Unit 2: Accidents in Engineering Industries 06

Sources and types of accidents, Root causes and effects of accidents, Technical analysis of accidents, guidelines for good safety practices, accident preventive techniques.

Unit 3: Risk assessment 06

Scope of risk assessment, probabilistic risk analysis (PRA), risk perception and acceptability, risk matrix, methods of risk assessment- Fault tree Analysis, event tree analysis etc, Diograph and other approaches.

Unit 4: Occupational Health and Industrial Hygiene 06

Objectives, Chronic and Acute Effects, Various Limits of Exposure- Lethal Dose 50, Lethal concentration 50,Threshold Limit Value etc. Effects of Various Physical, Chemical and Biological Hazards Present in Industries on Human Health.

Unit 5 : Application of mathematical tools for Risk assessment 06

Introduction to Artificial Neural network (ANN) and its application for risk assessment. Remote sensing and its application for risk assessment.

Unit 6 : Legal aspects of Safety in Engineering industries 06

Industrial safety acts, Major accident hazard control rules, On site and Off site Emergency Management Plan, Design of Safety Management system.

References:

1. David L. Goetsch, "Occupational Safety and health|| Prentice Hall, 2002 –184
2. EDEL Engineering consultancy Pvt. Ltd. Safety manual
3. Lee Harrison, Environmental Health and Safety Auditing Handbook , McGraw-Hill, 1999.
4. K Park Banarsidas, —Textbook of Preventive and Social medicine|| Bhanot Publishers
5. Dr A H Hommadi, —Industrial and Occupation safety||
6. K T Kulkarni, —Introduction to industrial safety||
7. Timothy Ross, —Neural network and fuzzy logic in engineering||
8. George J Klir, —Fussy sets and systems||

F.Y. M.Tech. (Civil-Structural Engineering), SEM-II

*Program Elective III/IV

CES2151: STRUCTURES IN DISASTER PRONE AREA

Teaching Scheme				Evaluation Scheme				
					Theory (Marks %)		Practical (Marks %)	
L	T	P	Credits	Scheme	Max	Min for Passing	Max	Min for Passing
3	-	--	3	ISE	20	40	--	--
				UT 1	15		--	--
				UT 2	15			
				ESE	50	40	--	--

Course Outcomes:

After successful completion of this course, the student should able to;

1. Understand by laws of urban and semi urban areas traditional and modern structures
2. Explain Methods of strengthening for different disasters
3. Analyse, design and use construction techniques for performance
4. Explain damage surveys

SYLLABUS CONTENT

Unit 1 Philosophy for design to resist Earthquake, Cyclone and flood –By laws of urban and Semi Urban areas Traditional and modern structures **6hrs**

Unit 2 Response of dams, bridges, buildings-Strengthening Testing and evaluation Classification of structures for safety point of view **6hrs**

Unit 3 Methods of strengthening for different disasters, Qualification test. **6hrs**

Unit 4 Use of modern materials their impact on disaster reduction -Use of modern analysis **6hrs**

Unit 5 Design and construction techniques optimization for performance. **6hrs**

Unit 6 Damage surveys Maintenance and modifications to improve hazard resistance - Different types of foundation and its impact on safety Ground improvement techniques.**6hrs**

REFERENCES

1. Allen, R. T. and Edwards, S.C., Repair of Concrete Structures, Blakie and Sons, 1980.

2.Moskvin V, Concrete and Reinforced Structures – Deterioration and Protection, Mir Publishers, Moscow, 1980

First year M. Tech. Civil Structural Engineering SEM – II
***Program Elective III/IV**

CES2161: GROUND IMPROVEMENT TECHNIQUES

Teaching Scheme				Evaluation Scheme				
L	T	P	Credits	Scheme	Theory (Marks %)		Practical (Marks %)	
					Max	Min for Passing	Max	Min for Passing
3	-	--	3	ISE	20	40	--	--
				UT 1	15		--	--
				UT 2	15			
				ESE	50	40	--	--

SYLLABUS CONTENT

Unit I – Dewatering **6 Hrs**

Introduction-scope and necessity of ground improvement in geotechnical engineering, basic concepts and philosophy-Drainage - Ground Water lowering by well points, deep wells, vacuum and electro-osmotic methods, Stabilisation by thermal and freezing techniques.

Unit II – Compaction and Sand Drains **6 Hrs**

In-situ compaction of granular and cohesive soils, surface compaction, deep compaction and compaction sand piles - concept, design, factors influencing compaction. Consolidation - preloading with sand drains, fabric drains etc. theories of sand drains - design and relative merits.

Unit III – Stone Column, Lime Piles and Soil Nailing **6 Hrs**

Stone column, lime piles - functions - methods of installation - design, estimation of load carrying capacity and settlement, Root piles, soil nailing - Applications.

Unit IV- Earth Reinforcement **6 Hrs**

Earth reinforcement - Principles and basic mechanism of reinforces earth, simple design, Geotextiles and their applications, filtration, drainage, separation, erosion control - case studies.

Unit V – Grouting **6 Hrs**

Grouting - types of grout - suspension and solution grouts - basic requirements of grout - grouting equipment - injection methods - gout monitoring. Electro - chemical stabilization - stabilization with cement and lime etc. stabilization of expansive clays.

Unit VI – Geo-Synthetics **6 Hrs**

Geo-Synthetics - Geo-synthetic clay liner – Construction details – Geo Synthetic Materials – Functions – Property characterization – Testing Methods for Geo-Synthetics – Recent research and Developments. Control of Improvement – Field Instrumentation – design and analysis for bearing capacity and settlement of improved deposits.

References:

1. Moseley .M. D, "Ground Treatment", Black willie Academic and professional, 1998.

2. Davies .M.C, and Schlosser. F, "Ground Improvement Geo Systems", American Society of Civil Engineers, 1997.

3. Jewell .R.A, "Soil Reinforcement with Geotextiles", CIRIA, London, 1996.

4. Das .B.M, "Principles of Foundation Engineering", Cengage Learning, 2010.(seventh Edition).

5. Jones .J.E.P, "Earth Reinforcement and Soil structure", Butterworths, 1985.

6. Balasubramaniam, A.S, "Symposium on Recent Developments in Ground improvement Techniques", Balkema Publishers, 1985.

7. Koerner, R.M. and Welsh, J.P, "Contruction and Geotechnical Engineering Using Synthetic Fabrics". John Wiley, 1990.

8. Balasubramaniam .A.S, Bergado. D.T, Yodbhir, Seah. T. S, Nutalaya. P, and Phienwej .N, "Prediction versus performance in Geotechnical Engineering", Bangkok, Balkema. A.A,1992.

9. Hehn .R.V, "Practical Guide to Grouting of Underground structures", ASCE 1996.

10.Shroff .A. V, "Grouting Technology in Tunneling and Dam", Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi, 1999.

SEMESTER III

K. E. Society's
Rajarambapu Institute of Technology, Rajaramnagar

CBCS Curriculum

Teaching Scheme and Structure

First Year M. Tech. Civil- Structural Engineering

Semester III

Course Code	Course		Evaluation Scheme				
			Contact Hours	Scheme	Credits	Practical (Marks)	
						Max	Min % for Passing
CES3011	**Industry Training (15 days)**		2	ISE	2	100	50
CES3021	**Self-Learning:** Course Related to Project Work (Certification Course/ Online Course)		2	ISE	2	50	50
CES3031	**Dissertation Phase-I**	**Industry Sponsored Project**	4	ISE	4	100	50
		Research Project Research Work in National Level Research Institutes					
		In house Project					
CES3041	**Dissertation Phase-II**	**Industry Sponsored Project**	10	ISE	4	100	50
CES3051		**Research Project** Research Work in National Level Research Institutes		ESE	6	100	50
		In house Project					

Total Credits: 18, **Total Contact Hours/Week: 18.**

First year M. Tech. Civil Structure SEM - III

CES3011: INDUSTRIAL TRAINING

Teaching Scheme				Evaluation Scheme				
L	T	P	Credits	Scheme	Theory (Marks %)			Practical (Marks %)
					Max	Min for Passing		Max	Min for Passing
--	--	--	2	ISE	--	--	--	100	50

Course Outcome:

After successful completion of this course student will be able to,

1. Identify training area
2. Prepare on site work report of training
3. Perform analysis work
4. Communicate with agencies
5. Generate report and Present the work carried out

Field Work:

In the field training work, the student is expected to get training in the industry, related to structural engineering for duration of 15 days (minimum) for at least 6 hrs per day. Student should work as an employer of the organization. He should learn work culture and latest development in structural engineering. Student should write a report on the field training and submit to department for ISE evaluation at the beginning of third semester. Student should include the certificate from company regarding satisfactory completion of the field training.

First year M. Tech. Civil Structure SEM - III

CES3021: ONLINE CERTIFICATION COURSE (Self Learning)

Teaching Scheme				Evaluation Scheme				
L	T	P	Credits	Scheme	Theory (Marks %)			Practical (Marks %)
					Max	Min for Passing		Max	Min for Passing
SL	--	--	2	ISE	--	--	--	100	50

Course Outcomes:
After successful completion of this course student will be able to,

1. Develop technical competence in skills of structural engineering field.
2. Apply the techniques for structural engineering practice.
3. Develop oral and written presentation skills for structural engineering projects.
4. Design and interpret data for structural engineering projects.

Online Certification Course:

1. Student should select any one course floated by NPTEL related to their dissertation topic in consultation with supervisor.
2. Student should report and maintain file of weekly submission as per assignments given by NPTEL.
3. Student should attach weekly grade sheet in the hard copy form to weekly submission file.
4. Final written exam is compulsory to all and it will be scheduled by NPTEL.
5. Submit the final grade sheet with course completion certificate.
6. The final grades will be given based on grades offered by NPTEL and file submission.

First year M. Tech. Civil Structure SEM - III

CES3031: DISSERTATION PHASE-I

Teaching Scheme				Evaluation Scheme				
L	T	P	Credits	Scheme	Theory (Marks %)			Practical (Marks %)
					Max	Min for Passing		Max	Min for Passing
--	--	4	4	ISE	--	--	--	100	50

Dissertation phase I and synopsis approval presentation:

Under the guidance of faculty called as 'Supervisor', PG student from second year is required to do innovative and research oriented work related to various theory and laboratory courses he/she studied during previous semesters. Dissertation work should not be limited to analytical formulation, experimentation or software based project. Student can undertake an interdisciplinary type project with the prior permission of DPGC from both departments.

Synopsis:

Student need to carry out exhaustive literature survey with consultation of his/her supervisor for not less than 25 reputed national international journal and conference papers. Student should make the Synopsis Submission Presentation (SSP) with literature survey report to DPGC and justify about the innovativeness, applicability, relevance and significance of the work. At the time of presentation, student shall also prepare Synopsis of the work and submit to department for approval. Student shall submit synopsis of dissertation as per the prescribed format in 02 copies to department.

Course Outcomes:

After successful completion of this course student will be able to,

1. Identify research problem from literature survey
2. Prepare research design for identified problem
3. Prepare synopsis report
4. Present the work plan to be carried out.

First year M. Tech. Civil Structure SEM - III

CES3041: DISSERTATION PHASE-II

Teaching Scheme				Evaluation Scheme					
L	T	P	Credits	Scheme	Theory (Marks %)			Practical (Marks %)	
					Max	Min for Passing		Max	Min for Passing
--	--	10	4	ISE	--	--	--	100	50
			6	ESE	--	--	--	100	50

III Dissertation phase II:

Phase II evaluation is based on End semester Examination (ESE) which is based on the work during the semester. It is expected that student shall present preliminary results from his/her work during the semester with report as per prescribed format. DPGC including external examiner as expert will approve the report and progress of student.

ISE will be evaluated DPGC and ESE will be evaluated by DPGC and one external expert. Student will submit a report (soft bound before 1 week of date of presentation) as per prescribed format and present to DPGC for ISE and ESE. If student is not showing satisfactory performance in, then he/she will be given grace period of two weeks. After two weeks student will again evaluated as per guidelines given in rules and regulations.

Course Outcomes:

After successful completion of this course student will be able to,

1. Prepare the set up for experimentation/ develop/ learn software.
2. Perform experimental/software analysis for validation of research work.
3. Generate report of work carried out.
4. Present the work carried out.

SEMESTER IV

K. E. Society's

Rajarambapu Institute of Technology, Rajaramnagar

CBCS Curriculum

Teaching Scheme and Structure

First Year M. Tech. Civil- Structural Engineering

Semester IV

Course Code	Course	Evaluation Scheme				
		Contact Hours	Credits	Scheme	Practical (Marks)	
					Max	Min % for Passing
CES4011	Dissertation Phase-III	08	08	ISE	100	50
CES4021	Dissertation Phase-IV	10	10	ISE	100	50
CES4031				ESE	100	50

Total Credits: 18, Total Contact Hours/Week: 18.

Grand Total of hours and credits - 04 semesters course

Sr	Batch	Hours	Credits
1	F. Y. M. Tech, SEM-I	29	25
2	F. Y. M. Tech, SEM-II	27	23
Total		**56**	**48**
3	S. Y. M. Tech, SEM-III	18	18
4	S. Y. M. Tech, SEM-IV	18	18
Total		**36**	**36**
Grand Total of SEM -I to SEM -IV		**92**	**82**

First year M. Tech. Civil Structure SEM - IV

CES4011: DISSERTATION PHASE-III

Teaching Scheme				Evaluation Scheme					
L	T	P	Credits	Scheme	Theory (Marks %)			Practical (Marks %)	
					Max	Min for Passing		Max	Min for Passing
--	--	8	8	ISE	--	--	--	100	50

Dissertation Phase III:

Student is required to give a presentation on the progress of his/her dissertation work in front of supervisor and DPGC. It is expected that up to this stage almost 90% of dissertation work is almost completed. Student will make the presentation and seek the suggestions from the supervisor and DPGC. Supervisor and DPGC will ensure that work carried out by the student till this stage is satisfactory and in compliance with synopsis of the dissertation submitted by student. This is In Semester Evaluation (ISE).

Course Outcomes:

After successful completion of this course student will be able to,

1. Perform experimental/software analysis for developing research work
3. Generate report work carried out.
4. Present the work carried out.

First year M. Tech. Civil Structure SEM - IV

CES4021: DISSERTATION PHASE-IV

Teaching Scheme				Evaluation Scheme					
L	T	P	Credits	Scheme	Theory (Marks %)			Practical (Marks	
					Max	Min for Passing		Max	Min for Pa
--	--	10	10	ISE	--	--	--	100	50
				ESE	--	--	--	100	50

Dissertation Phase IV:

This is final presentation, i.e., viva voce of the dissertation. Student will be allowed to ma this presentation only if he has submitted duly completed and certified dissertation repor Students will make the presentation in front of supervisor, DPGC and external supervis Examiners will check whether the dissertation work is in full compliance with synopsis dissertation or not. Dissertation will assess on the basis of quality of dissertation work, effo taken by the student, quality of paper(s) published on the dissertation work, etc. Stude should publish work carried by him along with supervisor in reputed journals as per institu rules and regulations.

Course Outcomes:

After successful completion of this course student will be able to,

1. Perform experimental/software analysis for developing research work.
2. Generate report work carried out.
3. Publish a research paper in journals/conference.
4. Prepare report using total work done as dissertation report
5. Present the work carried out.