G H RAISONI COLLEGE OF ENGINEERING

(An Autonomous Institute affiliated to RashtrasantTukadojiMaharaj Nagpur University, Nagpur)

Accredited by NAAC with 'A+' Grade

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M.TECH STRUCTURAL ENGINEERING

VISION & MISSION OF INSTITUTE

VISION

To achieve excellent standards of quality education by keeping pace with rapidly changing technologies and to create technical manpower of global standards with capabilities of accepting new challenges

MISSION

Our efforts are dedicated to impart quality and value based education to raise satisfaction level of all stake-holders. Our strength is directed to create competent professionals. Our endeavour is to provide all possible support to promote research and development activities

Programme: PG in Structural Engineering

VISION & MISSION OF CIVIL ENGINEERING PROGRAM

VISION

To achieve excellent standards of quality education in Civil Engineering by keeping pace with rapidly changing technologies & to create technical manpower of Global Standards in Civil Engineering with capabilities of accepting new challenges.

MISSION

1. To impart quality and value based education to raise satisfaction of all stake holders.
2. To serve society and nation for providing professional leadership in Civil Engineering for solving the problems consistent with rapidly changing technologies.
3. To create competent Civil Engineering professionals who are trained in the design and implementation of Civil Engineering systems.
4. To promote Research & Development Activities in the field of Civil Engineering and allied areas.

Programme Educational Objectives (PEOs)

Student shall be able to

1. Apply fundamental technical knowledge and practice structural engineering proficiently for the benefits of industry and society.
2. Analyze and design complex and real world engineering problem and implementation of sustainable technology for the benefits of industry and society.
3. Actively participate in research and development & to engage themselves in continue lifelong learning

Programme Outcomes (POs)

The programme is aimed to developing competencies, skills, Handiness and abilities amongst students. They shall be able to:

PO1: Independently carry out research / investigation and development work to solve practical problems.

PO 2: Write and present a substantial technical report/ document.

PO 3: Demonstrate a degree of mastery over the area as per the specialization of the programme. The mastery should be at a level higher than the requirements in the appropriate bachelor programme

PO 4: Function as a member of multidisciplinary environment to understand engineering management and finance principles to achieve economical and financial factors.

PO 5: Provide technical solutions to society with integrity, ethical behavior and commitment to code of conduct of professional practices and standards.

PROGRAM SPECIFIC OUTCOMES (PSO's)

A graduate of the Civil Engineering Program will demonstrate:

PSO1: An ability to recognize the importance of Civil Engineering professional development by pursuing postgraduate studies

PSO2: An ability to apply design, develop and execution of projects in the construction of various Civil Engineering disciplines

PSO3: An ability to face competitive examinations that offer challenging and rewarding careers and demonstrating leadership to emerged as potential entrepreneur.

M.TECH STRUCTURAL ENGINEERING SCHEME
(CIVIL ENGINEERING)

SUBJECT CODE	NAME OF THE COURSE	TEACHING SCHEME				CREDITS	EVALUATION SCHEME						ESE DURATION (HRS)	MODE OF EXAM (ONLINE / OFF LINE)
							THEORY			PRACTICAL				
		TH.	TU.	PR.	TOTAL HOURS		TAE	CAE	ESE	INT.	EXT.	TOTAL		
SEM-I														
STRL408	COMPUTATIONAL TECHNIQUES	3	-	0	3	3	20	30	50	-	-	100	3	OFF LINE
STRL409	STRUCTURAL DYNAMICS	3	-	0	3	3	20	30	50	-	-	100	3	OFF LINE
STRP409	STRUCTURAL DYNAMICS	-	-	2	2	1	-	-	-	25	25	50	-	OFF LINE
STRLXXX	ELECTIVE – I	3	-	0	3	3	20	30	50	-	-	100	3	OFF LINE
STRPXXX	ELECTIVE – I	-	-	2	2	1	-	-	-	25	-	25	-	OFF LINE
STRLXXX	ELECTIVE – II	3	-	0	3	3	20	30	50	-	-	100	3	OFF LINE
STRLXXX	ELECTIVE – III	3	-	0	3	3	20	30	50	-	-	100	3	OFF LINE
MBA602	ADVANCED COMMUNICATION SKILLS	-	-	2	2	1	-	-	-	25	-	25	-	OFF LINE
	TOTAL	15	00	06	21	18	100	150	250	75	25	600	-	

LIST OF ELECTIVE I				
1.	STRL523	MECHANICS OF COMPOSITE STRUCTURES	STRP523	MECHANICS OF COMPOSITE STRUCTURES
2.	STRL524	DESIGN OF ENVIRONMENTAL STRUCTURES	STRP524	DESIGN OF ENVIRONMENTAL STRUCTURES
3.	STRL525	MATRIX ANALYSIS OF STRUCTURES	STRP525	MATRIX ANALYSIS OF STRUCTURES
LIST OF ELECTIVE II				
1.	STRL526	DESIGN OF STEEL STRUCTURES		
2.	STRL527	STRUCTURAL STABILITY		
3.	STRL528	NEW ENGINEERING MATERIALS AND TECHNIQUES		
LIST OF ELECTIVE – III				
1.	STRL529	THEORY OF ELASTICITY AND ELASTIC STABILITY		
2.	STRL530	DISASTER MANAGEMENT		
3.	STRL531	DESIGN OF BRIDGES & RETAINING WALLS		
4.	STRL532	WIND EFFECTS ON STRUCTURES		

M.TECH STRUCTURAL ENGINEERING SCHEME
(CIVIL ENGINEERING)

SUBJECT CODE	NAME OF THE COURSE	TEACHING SCHEME				CREDITS	EVALUATION SCHEME						ESE DURATION (HRS)	MODE OF EXAM (ONLINE / OFF LINE)
							THEORY			PRACTICAL				
		TH.	TU.	PR.	TOTAL HOURS		TAE	CAE	ESE	INT.	EXT.	TOTAL		
SEM-II														
STRL 410	THEORY OF PLATES AND SHELLS	3	-	-	3	3	20	30	50	-	-	100	3	OFF LINE
STRL 411	FINITE ELEMENT METHOD	3	-	-	3	3	20	30	50	-	-	100	3	OFF LINE
STRP 411	FINITE ELEMENT METHOD	-	-	2	2	1	-	-	-	25	25	50	-	OFF LINE
STRL XXX	ELECTIVE – IV	3	-	-	3	3	20	30	50	-	-	100	3	OFF LINE
STRPXXX	ELECTIVE – IV	-	-	2	2	1	-	-	-	25	-	25	-	OFF LINE
STRL XXX	ELECTIVE – V	3	-	-	3	3	20	30	50	-	-	100	3	OFF LINE
STRL XXX	ELECTIVE – VI	3	-	-	3	3	20	30	50	-	-	100	3	OFF LINE
IDA403	RESEARCH METHODOLOGY	-	-	2	2	1	-	-	-	25	-	25	-	OFF LINE
	TOTAL	15	00	06	21	18	100	150	250	75	25	600	-	

	LIST OF ELECTIVE – IV			
1.	STRL 533	DESIGN OF SUBSTRUCTURE	STRP 533	DESIGN OF SUBSTRUCTURE
2.	STRL 534	PRESTRESSED CONCRETE STRUCTURES	STRP 534	PRESTRESSED CONCRETE STRUCTURES
3.	STRL 535	ADVANCED DESIGN OF STEEL STRUCTURES	STRP 535	ADVANCED DESIGN OF STEEL STRUCTURES
	LIST OF ELECTIVE – V			
1.	STRL 536	SOIL-STRUCTURE INTERACTION		
2.	STRL 537	EARTHQUAKE RESISTANT DESIGN OF RC STRUCTURE		
3.	STRL 538	GEOGRAPHIC INFORMATION SYSTEM AND APPLICATIONS		
	LIST OF ELECTIVE – VI			
1.	STRL 539	ANALYSIS AND DESIGN OF INDUSTRIAL STRUCTURES		
2.	STRL 540	FORENSIC ENGINEERING AND REHABILITATION OF STRUCTURES		
3.	STRL 541	ADVANCED STRUCTURAL DYNAMICS		
4.	STRL 542	ADVANCE DESIGN OF RCC STRUCTURES		

M.TECH STRUCTURAL ENGINEERING SCHEME
(CIVIL ENGINEERING)

SUBJECT CODE	NAME OF THE COURSE	TEACHING SCHEME				CREDITS	EVALUATION SCHEME						ESE DURATION (HRS)	MODE OF EXAM (ONLINE / OFF LINE)
							THEORY			PRACTICAL				
		TH.	TU.	PR.	TOTAL HOURS		TAE	CAE	ESE	INT.	EXT.	TOTAL		
SEM-III														
STRP 543	INDUSTRY PROJECT/ RESEARCH PROJECT (PHASE –I)	-	-	09	09	09	-	-	-	150	-	150	-	OFF LINE
	TOTAL	-	-	09	09	09	-	-	-	150	-	150	-	

M.TECH STRUCTURAL ENGINEERING SCHEME
(CIVIL ENGINEERING)

SUBJECT CODE	NAME OF THE COURSE	TEACHING SCHEME				CREDITS	EVALUATION SCHEME						ESE DURATION (HRS)	MODE OF EXAM (ONLINE / OFF LINE)
							THEORY			PRACTICAL				
		TH.	TU.	PR.	TOTAL HOURS		TAE	CAE	ESE	INT.	EXT.	TOTAL		
SEM-IV														
STRP 544	INDUSTRY PROJECT/ RESEARCH PROJECT (PHASE –II)	-	-	15	15	15	-	-	-	150	150	300	-	OFF LINE
	TOTAL	-	-	15	15	15	-	-	-	150	150	300	-	

SEMESTER-I

STRL408 COMPUTATIONAL TECHNIQUES (Offline)

Teaching Scheme				Credits	Evaluation Scheme				
					Theory			Practical	Total Marks
Th	Tu	Pr	Total Hours		TAE	CAE	ESE	Cont. Evaluation	
3	0	-	3	3	20	30	50	--	100

Course-Prerequisite	Applied Mathematics -III

Course Objective:

1. To understand basics of probability and statistics related to structural engineering
2. To learn linear programming and numerical methods.
3. Develop numerical solution by using algebraic and Transcendental Equations.

Modes of Delivery of Courses:

1	Conventional Teaching (Chalk Board)	**5**	Activity based learning (Paper Review, Poster, etc.)
2	Assignments	**6**	Special guest lectures /Industry Visit
3	Seminars	**7**	NPTEL Lecture
4	Audio visual aids		

Course Outcome:

Upon successful completion of the course, students shall be able to –

1. Use the concepts of probability in structural engineering problem.
2. To apply the knowledge of statistics in structural engineering problem.
3. Know the standard ways in which the linear programming problems can be approached.
4. Able to apply the concepts of structural problem & numerical method for various problem.
5. To solve algebraic & transcendental equations using Numerical method.
6. Use the concepts of Numerical method to solve differential equations.

Details of Course:

1. Probability: Random Variables-discrete and continuous, cumulative distribution function and probability density function, concept of most probable member, elementary ideas of joint probability distributions, mathematical expectations, moment, Moment generating function. **9**
2. Statistics: Fitting of curve and correlation, Sampling, Linear and Multiple regressions, hypotheses, t-test, F-test and Chi-square test for hypothesis testing. **8**
3. Linear Programming: Formation and model, Graphical method, Simplex method,Dual Simplex method. **9**
4. Structural Problem: Computer Implementation of Matrices, Guidelines for development of a large sized problem. NUMERICAL METHODS-Solution of Linear Simultaneous equations – Method of Gauss Elimination, Cholesky''s, , Solution based on Band width and its Variants **7**
5. Numerical Solution of algebraic and Trnscendental Equations: Error Analysis, Solution of system of linear algebraic equations by Gauss-seidel method &Crout's method. **7**
6. Numerical Solution of linear differential Equations:Solution of linear differential equation by Taylor's series method, Euler modified method and R-K method of 4th order and Milne's Predictor-Corrector method **7**

Suggested Books

1. Numerical Mathematical AnalysisScarborough J. B.Oxford and IBH publishers1996-
2. Applied Numerical Analysis
3. Gerald C. F.Addison – Wesley Publishing Company 1970 -
4. Numerical Methods for Scientific and Engineering ComputationsJain M. K., Iyengar S. R. K. and Jain R. KNew Age International Limited1993-
5. Numerical Methods Balgurusamy E Mc-Graw Hill Book Co. 2001-

STRL409 STRUCTURAL DYNAMICS (Offline)

Teaching Scheme				Credits	Evaluation Scheme					
					Theory			Practical		Total Marks
Th	Tu	Pr	Total Hours		TAE	CAE	ESE	Int.	Ext.	
3	0	2	5	4	20	30	50	25	25	100/50

Semester: 1st Subject Area: Structural Engineering

Course Objective:

1. To understand the concepts of free and forced vibration.
2. To interpret the response of structure considering lumped mass and continuous mass system.
3. To study the different codal provision for dynamic analysis of the structure.

Modes of Delivery of Courses:

1	Conventional Teaching(Chalk Board)	5	Activity based learning (Paper Review, Poster, etc.)
2	Assignments	6	Special guest lectures /Industry Visit
3	Seminars	7	NPTEL Lecture
4	Audio visual aids		

Course Outcome:

Upon successful completion of the course, students shall be able to –

1. Calculate the response for free and forced vibrations of SDOF systems
2. Evaluate response of SDOF systems under different types of loading

3. Apply the various numerical schemes and methods to find the mode shapes of MDOF structures
4. Evaluate response of MDOF systems under the dynamic loading
5. Analyze beams and plates having different boundary conditions using various approach
6. Understand the various clauses given in IS codes for the Seismic Analysis.

Details of Course:

1. Single degree freedom system, free vibrations, damped free vibrations, critical damping, and response, periodic loading expressed in harmonics, dynamic load factor **7**
2. Single degree freedom system, response to impulsive loading, rectangular, triangular pulses, Duhamel Integral, Response to general dynamic loading, Numerical schemes such as Wilson-Theta, Newmark-Beta, constant linear acceleration, time domain and frequency domain analysis **7**
3. Multi-degree freedom system, stiffness and flexibility approaches, Lumped-mass matrix, free vibrations fundamental Frequencies and mode shapes, orthogonality of modes, numerical schemes to find mode shapes and frequencies. **7**
4. Multi degree freedom systems, response to dynamic loading, Formulations of equations of motion, normal coordinates mode superposition method, modal matrix, numerical scheme of Wilson and Newmark **7**
5. Distributed systems, free vibrations of uniform beams, differential equation and Solution, boundary conditions, finite difference solution, finite element, Ritz approach, and free vibrations of simply supported plate. (Transverse vibrations) **6**
6. Study of IS 1893-1984 and 2000 applicable to buildings and water tanks, Response spectra, Introduction to vibrations due to earthquake **6**

STRP409 Structural Dynamics

Teaching Scheme: 02 P Total 02Credit: 01
Evaluation Scheme: 25 Internal + 25 External
Total Marks: 50

Minimum Eight experiments based on above syllabus
Suggested Books:

1. Dynamics of Structures R.W. Clough and J. PenzianTata McGrow Hill Publishing Company Limited, New Delhi 19932nd edition
2. Introduction to Structural Dynamics J. M. Biggs Tata McGrow Hill Publishing Company Limited, New Delhi 1964 -
3. Vibration Problems in Engineering W. Weaver, Jr., S. P. Timoshenko and D. H. Young. Chichester John Wiley & Sons Limited 1990 5th edition
4. Elements of Vibration AnalysisJames M. Gere and William Weaver Jr.McGraw Hill International Edition, Singapore19862nd Edition

(Elective I) STRL523 MECHANICS OF COMPOSITESTRUCTURES (Offline)

Teaching Scheme		Evaluation Scheme		
		Theory	Practical	

Course-Prerequisite				Credits					Total Marks
Th	Tu	Pr	Total Hours		TAE	CAE	ESE	Cont. Evaluation	Total Marks
3	0	-	3	3	20	30	50	--	100

Semester: 1st
Subject Area: Structural Engineering

Course Objective:

1. To study the basic concepts of composite structure
2. To identify the various analytical methods for analyzing the composite structures.
3. To identify the various loads acting on composite sections.

Modes of Delivery of Courses:

1	Conventional Teaching(Chalk Board)	5	Activity based learning (Paper Review, Poster, etc.)
2	Assignments	6	Special guest lectures /Industry Visit
3	Seminars	7	NPTEL Lecture
4	Audio visual aids		

Course Outcome:
Upon successful completion of the course, students shall be able to -

1. Understand the basic concepts, types of composite construction
2. Describe various types of composite materials and their advantages in engineering design
3. Demonstrate an understanding of the fundamental building components for composite systems
4. Use various micro-mechanics models to calculate macroscopic properties including stiffness and strength.
5. Develop an understanding of the linear elastic analysis of composite materials
6. Design the steel concrete composite columns subjected to different loadings

Details of Course:

1. Introduction to composite construction, basic concepts, types of composite constructions **7**
2. Steel concrete composite, Analysis and of composite beams **7**
3. Composite floors, shear connectors: functions & types **7**
4. Steel concrete composite columns, columns subjected to axial loads and moments **7**
5. Encased composite construction of beams and columns, concepts and design **6**
6. Study of IS: 11384, IRC-22 and their applications **6**

Suggested Books

1. Engineering Mechanics of Composite Materials M. Daniel & O. Ishai Oxford University Press 1999
2. Introduction to Composite Materials S. W. Tsai & H. T. Hahn Technomic Publishing Co.INC, USA 2002
3. Mechanics of Composite Structures László P. Kollár, George S. Springer, Cambridge University Press 2000
   A short term course on Composite Materials and Structures P. K. Sinha 1996

(Elective I) STRP523 MECHANICS OF COMPOSITESTRUCTURES

Teaching Scheme: 02 P Total 02 Credit: 01
Evaluation Scheme: 25 Internal
Total Marks: 25

Minimum Eight experiments based on above syllabus

(Elective I)STRL524 Design of Environmental Structures (Offline)

Teaching Scheme				Credits	Evaluation Scheme					
					Theory			Practical		Total Marks
Th	Tu	Pr	Total Hours		TAE	CAE	ESE	Int.	Ext.	
3	0	2	5	4	20	30	50	25		100

Semester: 1st
Subject Area : Structural Engineering

Course Objective:
1. To understand different boundary conditions of reservoirs.
2. To investigate the behavior of seismic effect on water tank
3. To consider various parameters for analyzing environmental structures.

Modes of Delivery of Courses:

1	Conventional Teaching(Chalk Board)	5	Activity based learning (Paper Review, Poster, etc.)
2	Assignments	6	Special guest lectures /Industry Visit
3	Seminars	7	NPTEL Lecture
4	Audio visual aids		

Course Outcome:
Upon successful completion of the course, students shall be able to -
1. Analyze and design circular & rectangular water tanks with different boundary conditions.
2. Conduct Earthquake analysis and design of water tanks.
3. Analyze and design different water treatment plant units.
4. Student shall conduct Analysis and design of jack well, WTP units and GSR.
5. Student shall be able to Analysis and design of ESR
6. To introduce to codal provisions of IS: 13920.

Details of Course:
1. Analysis of circular water tanks with various boundary conditions at base slab, variation of hoop tension, moment and deflection of wall with various H/RT ratios, deep and shallow tanks. **8**
2. Analysis of rectangular water tanks with various boundary conditions at base slab, variation of moments with respect to height/span ratio, Design (un-cracked and cracked design) of water tank sections subjected to moment, Moment and compression, moment and tension. **8**
3. Earthquake Analysis of water tanks on ground and overhead tanks, SDOF and MDOF model **8**
4. Analysis and design of jack well, WTP units and GSR etc. **8**
5. Analysis and design of ESR (container and staging) **8**

STRP524 Design of Environmental Structures

Teaching Scheme : 02 P Total 02 Credit : 01

Evaluation Scheme : 25 Internal Total Marks :25 External

Minimum Eight practical based on above syllabus

Suggested Books

1. Design of Reinforced Concrete Structures RamamruthamSDhanpatRai& Sons publications 199512TH
2. Reinforced Concrete limit state designJainA.KNem Chand & Bros. Roorkee19934TH
3. Circular Storage Tanks and SilosGhali, AE & F N Spon, London,1979
4. Guidelines for seismic design of liquid storage tanksJain, S.K. &Jaiswal, O.RNICEE, IITK 2004

(Elective – I) STRL525 MATRIX ANALYSIS OF STRUCTURES (Offline)

Teaching Scheme				Credits	Evaluation Scheme				
					Theory			Practical	Total Marks
Th	Tu	Pr	Total Hours		TAE	CAE	ESE	Cont. Evaluation	
3	0	2	5	4	20	30	50	--	100

Course Objective:
1. To understand local and global coordinates of structures.
2. To analyze the different structural members using flexibility and stiffness method.
3. To introduce software's for analyzing the different structures program for the analysis.

Modes of Delivery of Courses:

1	Conventional Teaching(Chalk Board)	5	Activity based learning (Paper Review, Poster, etc.)
2	Assignments	6	Special guest lectures /Industry Visit
3	Seminars	7	NPTEL Lecture
4	Audio visual aids		

Course Outcome:

Upon successful completion of the course, students shall be able to –

1. Understand the fundamental concepts and modern methods of Structural analysis.
2. Understand the importance of Transformation matrices, Global stiffness matrix and load vectors
3. Apply matrix methods to pin jointed trusses, continuous beams, grids and frames.
4. Apply flexibility methods (Structure approach) to pin jointed trusses, continuous beams and frames.
5. Analyze the structures for lack of fit and temperature variations.
6. Understand and use the concept used in band minimization and storage techniques.

Details of Course:

1. Introduction to stiffness and flexibility approach, Stiffness matrix for spring, Bar, torsion, Beam (including 3D),Frame and Grid elements, Displacement vectors, Local and Global co-ordinate system, Transformation matrices, Global stiffness matrix and load vectors **8**
2. Flexibility method (Structure approach): Flexibility coefficients, physical Meaning, basic determinate or released structure, choice of redundant, Geometrical compatibility conditions. Matrix formulations, Hand Solution of simple problems on truss, Beams, frames with loads **8**
3. Stiffness methods (structure & member approach): Stiffness co-efficient, restrained structure, Unknown displacements, Joint equilibrium conditions Hand solution of simple problems on beam, frames, grids **8**
4. Analysis for member loading (self, temperature & Imposed), inclined supports, lack of fit, initial joint displacements **8**
5. Solution technique with banded & skyline technique, band minimization, frontal techniques, finite size joint correction **8**

(Elective I) STRP525 MATRIX ANALYSIS OF STRUCTURES

Teaching Scheme: 02 P Total 02 Credit: 01
Evaluation Scheme: 25 Internal Total Marks: 25
Minimum Eight practical based on above syllabus

Suggested Books

1. Matrix Methods of Structural AnalysisDr A.S. Meghre and S. K. DeshmukhCharotar Publishing House, Anand, India2003
2. Structural Analysis, A Matrix ApproachG. S. Pandit and S. P. GuptaTataMcGrow Hill Publishing Company Limited, New Delhi1986
3. Introduction to Matrix Method of Structural Analysis B Martin, H.C McGraw Hill Book Co1996
4. Analysis of framed structures James M. Gere and William Weaver Jr. D Van Nostran Company Inc., Affiliated East West Press Pvt. Ltd1965

(Elective II) STRL526
DESIGN OF STEEL STRUCTURES (Offline)

Teaching Scheme				Credits	Evaluation Scheme				
					Theory			Practical	Total Marks
Th	Tu	Pr	Total Hours		TAE	CAE	ESE	Cont. Evaluation	
3	0	-	3	3	20	30	50	--	100

Semester: 1st
Subject Area: Structural Engineering

Course-Prerequisite	---

Course Objective:

1. To identify the loading effects on different types of connections.
2. To understand the different parameters in the design of tubular structures, steel chimneys and storage vessels.
3. To know the basic concepts of industrial sheds, highway and railway bridges.

Modes of Delivery of Courses:

1	Conventional Teaching(Chalk Board)	5	Activity based learning (Paper Review, Poster, etc.)
2	Assignments	6	Special guest lectures /Industry Visit
3	Seminars	7	NPTEL Lecture
4	Audio visual aids		

Course Outcome:

Upon successful completion of the course, students shall be able to -

1. Design different types of connections
2. Recognize the design philosophy of steel structures and have concept on limit state design
3. Apply the principles, procedures and current code requirements to the analysis and design of steel tension members, beams, columns, beam-columns and connections
4. Understand the behavior of steel structures, in particular the various forms of failure for members and connections under tension, compression, bending and combined actions
5. Design tubular structures, steel chimneys and storage vessels
6. Design industrial sheds, highway and railway bridges.

Details of Course:

1. Design of connections **10**
2. Design of round tubular structures, Design of steel chimneys, Design of storage vessels **10**
3. Design of industrial sheds bridges of crane / gantry Girders **10**

4. Design of bridges – highway and railways, Foot Bridge **10**

Suggested Books

1. Design of steel StructuresN. Subramanian,Oxford University Press, New Delhi 20081ST
2. Design of Steel StructuresS.K. DuggalTata McGraw Hill PublishingCompany Limited, New Delhi2008 3RD
3. Design of steel StructuresA S Arya and J L AjmaniNem Chand & Brothers,Roorkee2007
4. Designs of Steel Structures Raghupati, Tata McGraw Hill Publishing Company Ltd, New Delhi20071ST

(Elective II) STRL527STRUCTURAL STABILITY (Offline)

Teaching Scheme				Credits	Evaluation Scheme				
					Theory			Practical	Total Marks
Th	Tu	Pr	Total Hours		TAE	CAE	ESE	Cont. Evaluation	
3	0	-	3	3	20	30	50	--	100

Semester: 1st Subject Area: Structural Engineering

Course-Prerequisite	---

Course Objective:

1. To Study the various effects on thin and open sections due to torsional loading.
2. To analyze the behavior of beams due to buckling using various methods.
3. To study the effect on compression member under different loading.

Modes of Delivery of Courses:

1	Conventional Teaching(Chalk Board)	5	Activity based learning (Paper Review, Poster, etc.)
2	Assignments	6	Special guest lectures /Industry Visit
3	Seminars	7	NPTEL Lecture
4	Audio visual aids		

Course Outcome:

Upon successful completion of the course, students shall be able to -

1. Understand the behavior of structural components and systems that suffer from failure
2. Understand the fundamental basis of design rules concerned with structural instability
3. Analyze geometrically perfect and imperfect systems for structural stability
4. Understand the General Principles and Methods of Analysis in Stability.
5. Understand the concept of Effects of shearing force on the critical load.
6. Understand the concept of Buckling of thin rectangular plates in compression, shear and bending.

Details of Course:

1. Torsion of thin walled open sections, warping displacements under pure torsion,-Warping constants for rolled steel section, Strain energy in bending and torsion of members of thin walled open section including the effects of warping, Torsional buckling including the effects of Wagner's effect, flexural torsional buckling (with centroid and shear centers coincident) **10**
2. Lateral buckling of beams under pure bending central point load through center of gravity of the section, Cantilever beams with point load at the free end, Application of Rayleigh-Ritz method; Beam-columns on rigid supports-concentrated and continuous lateral loads with simply supported and built in-ends **10**
3. Continuous beam with as axial loads, Application of trigonometric series, In plane buckling of bars ; Approximate calculation of critical loads for bar structures by energy method- a bar on elastic foundation, a bar with intermediate compressive forces, bar under distributed axial loads, a bar with changes in cross section **10**
4. Effects of shearing force on the critical load, Buckling of built-up columns, In-elastic in-plane buckling of columns, Tangent and reduced modulus concept, Shanley's contribution, elastic critical loads for rigid frames and triangulated structures, stability functions, Bending of thin plate, Buckling of thin rectangular plates in compression, shear and bending **10**

Suggested Books

1. Theory of Elastic StabilityS.P. Timoshenko and J. M. GereMCGraw Hill1967 -
2. Stability of StructuresA. KumarAllied Publishers Ltd., New Delhi1998
3. The stability of frames M. R. Horns and W. MerchangPorgamon press1965
4. Elastic Instability, M. Gregoryspon's Civil Engineering series1967

(Elective II) STRL528 NEW ENGINEERING MATERIALS & TECHNIQUES (Offline)

Teaching Scheme				Credits		Evaluation Scheme				
					Theory			Practical		Total Marks
Th	Tu	Pr	Total Hours		TAE	CAE	ESE	Int.	Ext.	
3	0	2	5	4	20	30	50	25		100

Semester: 1st
SubjectArea: Structural Engineering

Course-Prerequisite	---

Course Objective:

1. To introduce various types of tests on concrete ingredients.

2. To understand concept of mix design & access techniques of quality check.
3. Conduct various tests on fibers.

Modes of Delivery of Courses:

1	Conventional Teaching(Chalk Board)	5	Activity based learning (Paper Review, Poster, etc.)
2	Assignments	6	Guest lectures /Industry Visit
3	Seminars	7	NPTEL Lecture
4	Audio visual aids		

Course Outcome: - At the end of course work, Student shall be able to

1. Understand concrete mix design and validation as per project needs.
2. Have exposure to instrumentation tools for structural testing.
3. Summaries the fibers reinforced concrete and their applications.
4. understand the importance of Light weight concrete, foam concrete on modifying fresh, hardened and durability properties of concrete
5. understand the importance of construction chemicals(admixtures) on properties of concrete
6. Have the capability to use Modern trends in concrete manufacturing and Industrial waste materials in concrete, their influence durability of concrete.

Details of Course:

1. Study of Indian standards and there specification for concrete ingredients, Principles of concrete mix design, methods of concrete mix design, design of high strength, high performance concrete, trimix concrete. **7**
2. Stress-strain measurement, strain gauges static and dynamics strain measurement, Calculation of stresses from measurement of strain, deflections etc. **7**
3. Steel fibers reinforced concrete, Properties, Aspect ratio, strength, Durability of fiber reinforced plastics, other types of fibers and their applications. **6**
4. Light weight concrete, foam concrete, workability, durability, and composition, application, Fly ash blended concrete, replacement procedures, effect of admixtures, adhesives, bond strength, durability, applications. **6**
5. Concrete admixtures, accelerators, retreads, non-destructive testing and quality control of materials **7**
6. Modern trends in concrete manufacturing, placement techniques, methods of transportation, placing of concrete, Industrial waste materials in concrete, their influence on physical mechanical properties of concrete and durability of concrete.

Suggested Books

1. Concrete Technology Neville, A.M. and Brookes, J.J Pearson Publishers, New Delhi 1994 -
2. Properties of Concrete Neville, A.M. and Brookes, J. JPearson Publishers, New Delhi 2004 -
3. Instrumentation in Industry Soissons, H. E John Willey & Sons, NY 1975
4. Experimental Stress Analysis Singh, Sadhu Khanna Publishers 1998 -

(Elective –III) STRL529 THEORY OF ELASTICITY AND ELASTIC STABILITY (Offline)

Teaching Scheme				Credits	Evaluation Scheme				
					Theory			Practical	Total Marks
Th	Tu	Pr	Total Hours		TAE	CAE	ESE	Cont. Evaluation	
3	0	-	3	3	20	30	50	--	100

Semester: 1st Subject Area: Structural Engineering

Course-Prerequisite	---

Course Objective:

1. To introduce the errands of theory of elasticity and methods of solving the structural problems.
2. To introduce the basic concepts and the state of the art of static and dynamic stability of structures

Modes of Delivery of Courses:

1	Conventional Teaching(Chalk Board)	5	Activity based learning (Paper Review, Poster, etc.)
2	Assignments	6	Special guest lectures /Industry Visit
3	Seminars	7	NPTEL Lecture
4	Audio visual aids		

Course Outcome:

Students shall be able to

1. Analyze 2D Stress and strain problems
2. Analyze 3D Stress- Strain problems with different boundary condition.
3. Solve the torsional problems on different elements.
4. Analyze differential equations for beam- column.
5. Analyze the approximate methods like virtual energy for different elements.
6. Solve various forces on built-up beams.

Details of Course:

1. Analysis of stress and strain in 2 dimensions: Introduction, Types of forces, Components of stresses and strains, Stress-strain relation, Plane stress and plane strain, Strain at a point, Differential equation of equilibrium, Boundary conditions and compatibility equations(rectangular coordinates), Airy's stress function **7**
2. Analysis of stress and strain in 3 dimensions: Components of stress, Principal stresses, Stress invariants, Maximum shearing stress, Differential equation of equilibrium, Boundary conditions and compatibility equations **7**
3. Bending of cantilever of narrow rectangular section loaded at end, bending of simply Supported beam with uniform load, torsion of non-circular sections, Elliptical cross section **6**
4. Differential equation for beams columns with concentrated loads, continuous lateral loads and couples for simply supported ends, Application of

trigonometric series, Lateral buckling of beams. **6**

5. Energy method for elastic bucking of columns, approximate method, buckling of columns on elastic foundation, Columns with intermediate compressive forces and distributed axial load, Columns with changes in cross section **7**
6. Effect of shearing force on critical load, buckling of built up columns, buckling of simply supported rectangular plates uniformly compressed in middle plane. **7**

Suggested Books

1. Theory of Elastic Stability Timoshenko, S.P Tata Mc-Graw Hill Publsihing Co. New Delhi,19612ND Edition
2. Flexural Torsional Buckling of Structures Trahair, N.SE & FM SPON, London1969 -
3. Theory of Beam-Columns-Space Behaviour and Design Chen, W.F Tata McGraw Hill International 19962ND Edition
4. Principles of Structural Stability Theory Alexander Chajes Prentice Hall College Division 19747TH Edition

(Elective III) STRL530 DISASTER MANAGEMENT

Teaching Scheme				Credits	Evaluation Scheme				
					Theory			Practical	Total Marks
Th	Tu	Pr	Total Hours		TAE	CAE	ESE	Cont. Evaluation	
3	0	-	3	3	20	30	50	--	100

Course Objective:

1. Understand various types of disaster situation to mitigate related work
2. To know basics of rescue and relief during pre/post disaster periods.
3. To identify the various processes of risk management

Modes of Delivery of Courses:

1	Conventional Teaching(Chalk Board)	5	Activity based learning (Paper Review, Poster, etc.)
2	Assignments	6	Special guest lectures /Industry Visit
3	Seminars	7	NPTEL Lecture
4	Audio visual aids		

Course Outcome:

Upon successful completion of the course, students shall be able to -

1. Affirm the usefulness of integrating management principles in disaster mitigation work.
2. Analyze the statistical approach for disaster preparedness.
3. Distinguish between the different approaches needed to manage pre- during and post- disaster periods.
4. Analyze different methods to prevent land sliding.
5. Explain the process of risk management.
6. Use modern tools usage to solve the global construction methods with sustainable technology.

Details of Course:

1. Concept of disaster management, types of disasters, disaster mitigating agencies and their organizational structure at different levels. Overview of disaster situations in India: vulnerability profile of India and vulnerability mapping including disaster – prone areas, communities, places. **7**
2. Disaster preparedness – ways and means, skills and strategies, rescue, relief, reconstruction and rehabilitation. Case studies: Lessons and experiences from various important disasters in India. Seismic vulnerability of urban areas **7**
3. Seismic response of R.C. frames buildings with soft first storey. Preparedness for natural disasters in urban areas. Sulbh technology for sanitation improvement in urban habitat. Landslide hazards zonation mapping and geo-environmental problems associated with the occurrence of landslides. **6**
4. A statistical approach to study landslides, Landslide casual factors in urban areas. Roads and landslide hazards in Himalaya. The use of electrical resistivity method in the study of landslide. Studies in Rock-mass classification and landslide management in a part of Garhwal-Himalaya, India. **7**
5. Urban earthquake disaster risk management. Using risks-time charts to plan for the future. Lateral strength of masonry walls. A numerical model for post-earthquake fire response of structures. Cyclone resistant house for coastal areas. **7**
6. Disaster resistant construction role of insurance sector. Response of buried steel pipelines carrying water subjected to earthquake ground motion. Preparedness and planning for an urban earthquake disaster. Urban settlements and natural hazards. Role of knowledge based expert systems in hazard scenario. **6**

Suggested Books

1. Natural Hazards in the Urban Habitat Iyengar, C.B.R.I Tata McGraw Hill
2. Natural Disaster management Jon Ingleton (Ed), Tulor Rose Tulor Rose 1999
3. Disaster Management R.B. Singh (Ed), Rawat Publications 2000
4. Anthropology of Disaster management Sachindra Narayan Gyan Publishing House 2000

(Elective III) STRL531DESIGN OF BRIDGES & RETAINING WALLS

Teaching Scheme				Credits	Evaluation Scheme				
					Theory			Practical	Total Marks
Th	Tu	Pr	Total Hours		TAE	CAE	ESE	Cont. Evaluation	

3	0	-	3	3	20	30	50	--	100

Course Objective:

1. To classify various IRC loadings and codal provisions for bridges and retaining walls.
2. To identify the various components of bridge viz. substructure and superstructure.
3. To understand the methods to calculate dynamic response of bridge structure.

Modes of Delivery of Courses:

1	Conventional Teaching(Chalk Board)	5	Activity based learning (Paper Review, Poster, etc.)
2	Assignments	6	Special guest lectures /Industry Visit
3	Seminars	7	NPTEL Lecture
4	Audio visual aids		

Course Outcome:

Upon successful completion of the course, students shall be able to –

1. Summarize the principles and criteria of bridge design and bridge evaluation.
2. Describe the responsibilities and work products of bridge engineers.
3. Perform conventional analysis and design of Prestressd RCC Box girder, prestressd Cantilever Bridge as per IRC Bridge Design Specifications.
4. Possess fundamental knowledge in a wide range of state – of – the-art practices, including code specifications, in bridge engineering.
5. Learn the analysis and design of bridge superstructures, foundations, bearings and deck joints.
6. To choose the appropriate bridge type for a given project, and to analyses and design the main components of the chosen bridge.

Details of Course:

1. IRC / IRS loading standards of balanced cantilever bridge, design of prestressed concrete girder and box girder bridges considering only primary torsion, design of end block. **7**
2. Bridge Bearing: Types of bearings, Elastomeric bearing **7**
3. Piers, Abutments, Wing walls factors effecting and stability, Well foundations. Design of well, Construction, Open sinking of walls, Plugging, Sand filling and casting of well cap. **7**
4. Types of bridge superstructure and introduction to their design, sub-structure, bearings, IRC / IRS Bridge loadings and other codal recommendations, Performance of Bridges in past earthquakes **6**
5. Seismic design philosophy for Bridges, State of art modeling of bridges, Seismic Design of Substructures, Capacitydesign of substructures and ductile detailing, Seismic design of well and pile foundations, Modeling soil flexibility. **6**
6. Earthquake behavior and Design of retaining wall and Abutments, IS code recommendations. Design of Bearings (Free, Guided and Restrained). **7**

Suggested Books

1. Bridge Engineering Handbook Chen, W.F. and Duan, L MCGraw Hill 1999
2. Fintel, M Handbook of Concrete Engineering CBS Publishers Delhi 1986 2nd Edition
3. Design of Steel Structures Gaylord, E.H. & Gaylord, C.N McGraw Hill Pulb 1998
4. Composite Structures of Steel and Concrete, Vol-I Johnson, R.P. Granado Publishing Ltd., London 1994

(Elective III) STRL532WIND EFFECTS ON STRUCTURES

Teaching Scheme				Credits	Evaluation Scheme				
					Theory			Practical	Total Marks
Th	Tu	Pr	Total Hours		TAE	CAE	ESE	Cont. Evaluation	
3	0	-	3	3	20	30	50	--	100

Course Objective:

1. To understand basic wind characteristics and codal provisions.
2. To identify various analytical methods for the calculation of wind forces.
3. To study various wind tunnel testing methods for various models.

Modes of Delivery of Courses:

1	Conventional Teaching(Chalk Board)	5	Activity based learning (Paper Review, Poster, etc.)
2	Assignments	6	Special guest lectures /Industry Visit
3	Seminars	7	NPTEL Lecture
4	Audio visual aids		

Course Outcome:

Upon successful completion of the course, students shall be able to -

1. Understand the characteristics of wind loads
2. Study the dynamic effect of wind in all directions on the buildings
3. Perform wind tunnel tests on rigid and aero elastic models
4. In depth knowledge of IS 875(Part 3), Indian Standard Code for wind load on structures
5. Knowledge about wind tunnels and various aspects of wind flow
6. Ability to do static and dynamic analysis for wind loading

Details of Course:

1. Wind Characteristics: Variation of wind velocity, atmospheric circulations – pressure gradient force, coriolisforce, frictionless wind balance, geostrophic flow, boundary layer. Extra ordinary winds – Foehn, Bora, Cyclones,Tornadoes etc. **7**
2. Static wind effects and building codes with particular reference to IS 875 (Part-III), wind speed map of India, introduction to the proposed revisions of IS 875 (Part III). **7**
3. Dynamic wind effects: Wind induced vibrations, flow around bluff bodies, along wind and across wind response, flutter, galloping, vortex shedding, locking, ovalling; analysis of dynamic wind loads, codal provisions – gust factor, dynamic response factor; vibration control and structural monitoring; exposure to perturbation method, averaging techniques **7**
4. Wind tunnel testing: Open circuit and closed circuit wind tunnels, rigid and aero elastic models, wind tunnel measurements and instruments along with site visit.
   Case studies: low rise buildings, parking sheds, workshop building, multistory building, water tanks, towers, chimneys, bridges. **7**

Suggested Books

1. An Introduction to Wind Effects on Structures C. ScrutonOxford University Press, Oxford, UK 1981
2. Wind Forces in Engineering Peter Sachs Pergamon Press. Oxford UK 1972.
3. Wind Effects on Buildings Lawson T. VApplied Science Publishers, London, UK 1980.
4. Wind Effects on Structures: fundamentals and applications to design Simiu, E., Scanlan, R. H., John Wiley & Sons, New York 1996 3rd Edition

MBA 602 ADVANCED COMMUNICATION SKILLS (Online/Offline)

Teaching Scheme				Credits	Evaluation Scheme					
					Theory			Practical		Total Marks
Th	Tu	Pr	Total Hours		TAE	CAE	ESE	Int.	Ext.	
0	0	2	2	1	0	0	0	25		25

Semester: 1st
Subject Area: Structural Engineering

Course Objective:
1. To enhance the quality of the undergraduates by introducing to them effective and advanced techniques of public speaking, one to one interaction and social ethics.

Modes of Delivery of Courses:

1	Conventional Teaching(Chalk Board)	5	Activity based learning (Paper Review)
2	Assignments	6	Special guest lectures /Industry Visit
3	Seminars		
4	Audio visual aids		

Course Outcome:
Upon successful completion of the course, students shall be able to -
1. Deliver the thoughts in an effective way
2. How to communicate uncertainty
3. Analyze and utilize body language to their advantage
4. Enhance their professionalism at work
5. Have the confidence to make more of an impact on their audience.
6. Understand the social ethics and implement them to become a more acceptable professional by the industry, institute and society in general.

SEMESTER-II

STRL410 THEORY OF PLATES AND SHELLS (Offline)

Teaching Scheme				Credits	Evaluation Scheme				
					Theory			Practical	Total Marks
Th	Tu	Pr	Total Hours		TAE	CAE	ESE	Cont. Evaluation	
3	0	-	3	3	20	30	50	--	100

Semester: 2nd **Subject Area: Structural Engineering**

Course-Prerequisite	

Course Objective:
1. To understand the different boundary conditions for plate & shell elements.
2. To study the various methods for analyzing the plate and shell element.
3. To apply the concept of pure bending.

Modes of Delivery of Courses:

1	Conventional Teaching (Chalk Board)	5	Activity based learning (Paper Review, Poster, etc.)
2	Assignments	6	Special guest lectures /Industry Visit
3	Seminars	7	NPTEL Lecture
Course-Prerequisite	---		
4	Audio visual aids		

Course Outcome:
Upon successful completion of the course, students shall be able to –
1. Understanding various properties of uniformly loaded circular plate and its behavior
2. Understanding laterally loaded rectangular plate and their boundary conditions
3. Apply the basic differential equation to bent surface of anisotropic plates
4. Understand the general shell geometry and membrane theory of cylindrical shell

5. Apply concepts of bending theory of cylindrical shell.
6. Grasp the approximate analysis of cylindrical shell.

Details of Course:

1. Introduction, Moment curvature relation in pure bending, Symmetrical bending of laterally loaded circular plates, Uniformly loaded circular plates with clamped and Governing differential equations of thin rectangular plates with various boundary conditions & loading **7**
2. Laterally loaded rectangular plates, Differential equation of the deflection surface (Lagrange's equation), Boundary conditions, simply supported plates under sinusoidal loading, Navier's solution **6**
3. Finite difference method, Differential equation to bent surface of anisotropic plate, Application to grid **7**
4. General shell geometry, classifications, Membrane theory of cylindrical shells, equation of equilibrium, stress resultants under dead load and snow load for circular, cycloidal, catenary, and parabolic cylindrical shells **7**
5. Bending theory of cylindrical shells, Finsterwalder theory, Schorer's theory **6**
6. Approximate analysis of cylindrical shells by beam arch method **7**

Suggested Books:

1. Theory of Plates and Shells S. P. Timoshenko and W. Kriger TMH 1987 2nd edition
2. Elementary Theory of PlatesL. G. Jaeger Macmillan 1964
3. Analysis of PlatesSzilard RudolpPHI1974 -
4. Design and Construction of Concrete Shell RoofsG. S. Ramaswamy CBS1986

STRL411FINITE ELEMENT METHOD
(Offline)

Teaching Scheme				Credits	Evaluation Scheme					
					Theory			Practical		Total Marks
Th	Tu	Pr	Total Hours		TAE	CAE	ESE	Int.	Ext.	
3	0	2	5	4	20	30	50	25	25	100/50

Semester: 2nd
Subject Area: Structural Engineering

Course-Prerequisite	---

Course Objective:

1. To understand the discretization technique of different elements.
2. To know the basic concepts of shape function, natural coordinate and isoperimetric function.
3. To develop analytical programmes by using FEM.

Modes of Delivery of Courses:

1	Conventional Teaching(Chalk Board)	5	Activity based learning (Paper Review, Poster, etc.)
2	Assignments	6	Special guest lectures /Industry Visit
3	Seminars	7	NPTEL Lecture
4	Audio visual aids		

Course Outcome:
Upon successful completion of the course, students shall be able to -

1. Identify mathematical model for solution of common engineering problems.
2. Develop comprehensive knowledge in the fundamental mathematical and physical basis of FEM.
3. Understand the Applications, Principles and discretization techniques used in Finite Element Analysis
4. Understand the concept of Shape function, convergence for rectangular, triangular and bar elements
5. Identify the application and characteristics of FEA elements such as bars, beams, planar elements, and common 3-D elements.
6. Appreciate the importance of professional responsibility and ethical issues pertaining to the effective utilization of FEA for analysis, design and research.

Details of Course:

1. Introduction to Finite element method, History, Applications, Principles and discretization, Elements stiffens/ mass formulation based on direct, variational and weighted residual techniques **7**
2. Shape function, convergence, displacement formulation for rectangular, triangular elements in Cartesian coordinates, Application to 2D stress analysis **7**
3. Natural coordinates, Isoperimetric elements, Numerical integration, Convergence of Isoperimetric elements, application to 1D problems **6**
4. Isoperimetric elements for two-dimensional and axisymmetric stress analysis for plane stress/ strain problems **6**
5. Isoperimetric formulation for thin and thick plates and shells **7**
6. Modeling techniques, application of FEM packages to general engineering structures **7**

STRP411 Finite Element Method

Teaching Scheme: 02 P Total 02 Credit: 01
Evaluation Scheme: 25 Internal + 25 External
Total Marks: 50

Minimum Eight experiments based on above syllabus
Suggested Books:

1. Finite Element Method Zienkiewicz, O. C. & Taylor, R. L Elsevier, 2000 Vol-I, II & III
2. Finite Element Method Hughes, T .R. J Dover Publication 2000 -
3. Finite Element Procedures Bathe, K.J Springer 2002 2nd Edition

4. Finite Element Method Reddy, J. N., John Willey & Sons 1982 -

(Elective IV) STRL533 DESIGN OF SUBSTRUCTURES (Offline)

Teaching Scheme				Credits	Evaluation Scheme					
					Theory			Practical		Total Marks
Th	Tu	Pr	Total Hours		TAE	CAE	ESE	Int.	Ext.	
3	0	2	5	4	20	30	50	25		100

Semester: 2nd
Subject Area: Structural Engineering

Course-Prerequisite	---

Course Objective:
1. To understand basic design parameters of substructures
2. To understand design philosophy of earth retaining structures
3. To interpret the different failure profiles of substructures.

Modes of Delivery of Courses:

1	Conventional Teaching(Chalk Board)	5	Activity based learning (Paper Review, Poster, etc.)
2	Assignments	6	Industry Visit
3	Seminars	7	NPTEL Lecture
4	Audio visual aids		

Course Outcome:
Upon successful completion of the course, students shall be able to –
1. Understand design of composite foundation systems for shallow/deep foundations.
2. Analysis and design of earth retaining structures.
3. Analyze and understand various foundation failures.
4. Student will be able to analyzed transfer and development length of concrete reinforcement
5. Student will be able to analyzed and design problems on major civil engineering structures.
6. To introduce to codal provisions of IS: 13920.

Details of Course:
1. Design of different isolated and combined footings including eccentric loading **7**
2. Design of raft foundation **7**
3. Design of deep foundation such as pile and well foundation **6**
4. Introduction to analysis and design of simple machine foundation **6**
5. Theory of sub grade reaction, beam on elastic foundation. **7**
6. Analysis and design of Abutments, Pier and retaining walls **7**

(Elective IV) STRP533 Design of Substructures
Teaching Scheme: 02 P Total 02 Credit: 01
Evaluation Scheme: 25 Internal
Total Marks: 25

Minimum Eight practical based on above syllabus
Suggested Books

1. Analysis and Design of Substructures Limit State Design Swami Saran Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi 2007 -
2. Design of Foundation Systems- Principles and Practices Kurian N.PNarosa Publishing House, New Delhi 2006
3. Reinforced Concrete DesignVergheseP.CPrentice hall of India, New Delhi2001
   Modern Foundations**,** Introduction to Advanced Techniques Kurian N.PTata McGraw-Hill, New Delhi1982

(Elective –IV) STRL534
PRESTRESSED CONCRETESTRUCTURES
(Offline)

Teaching Scheme				Credits	Evaluation Scheme					
					Theory			Practical		Total Marks
Th	Tu	Pr	Total Hours		TAE	CAE	ESE	Int.	Ext.	
3	0	2	5	4	20	30	50	25	25	100/50

Semester: 2nd
Subject Area: Structural Engineering

Course-Prerequisite	---

Course Objective:
1. To identify the various causes of failure in pre-stress concrete structures.
2. To understand the concept of deflection and shear resistance in pre-stressing.
3. To identify various analytical methods and dynamic behavior of pre-stressed concrete

Modes of Delivery of Courses:

1	Conventional Teaching(Chalk Board)	5	Activity based learning (Paper Review, Poster, etc.)
2	Assignments	6	Special guest lectures /Industry Visit
3	Seminars	7	NPTEL Lecture
4	Audio visual aids		

Course Outcome:
Upon successful completion of the course, students shall be able to -

1. Understand the general mechanical behavior of pre-stressed concrete.
2. Understand the behavior and design of pre-stressed concrete members.
3. Analyze the stresses in anchorage zones and design end anchorages for pre-stressed concrete beams and slabs
4. Understand the short-term and long-term losses in prestressing and design prestressed structures considering these losses
5. Analyze and design prestressed concrete flexural members.
6. Analyze and design for vertical and horizontal shear in prestressed concrete.

Details of Course:

1. Design of high strength concrete mixes, Loss of prestress in single span and continuous beams, Use of IS 1343- 1980, Analysis Limit State Design of beams for Tension Type II and III problems, Cracking moment, untensioned reinforcement, Partial prestressing, Stress Corrosion **7**
2. Transfer of prestress by bond, Transverse tensile stresses, End zone reinforcement, Behaviour of Bonded and unbounded prestress concrete beams **7**
3. Deflection of Prestressed concrete members, short and long term, control of deflections, Crack width considerations, Flexural strength of prestressed concrete sections: Types of flexural failures, Limit state concept **6**
4. Shear resistance of prestressed concrete members: Principal stresses and ultimate shear Resistance, Design of shear reinforcement, prestressed concrete, members in Torsion, Design of reinforcement in torsion shear and bending **6**
5. Stress distribution in end block, Analysis and Anchorage Zone reinforcement. Composite Construction of prestressed precast and cast in situ concrete, Statically Indeterminate structures: Continuous beams, primary and secondary moments, Continuity, concordant cable profile, Analysis and Design of continuous beams **7**
6. Prestressed concrete pipes and poles, Design of Prestressed concrete tanks, Prestressing of dams and bridges: Method of construction, Stage prestressing, Dynamic and Fatigue behaviour of prestressed concrete **7**

STRP534 Prestressed Concrete Structures
Teaching Scheme: 02 P Total 02 Credit: 01
Evaluation Scheme: 25 Internal
Total Marks: 25
Minimum Eight experiments based on above syllabus

Suggested Books:

1. Prestressed Concrete Bridge, Design and constructionNigel R Hewon Thomas Telford London 2003
2. Plan Cast Precast and Prestressed concrete (A Design Guide) Devid A. Sheppard & William R. Phillps Mcgraw Hill Publication Co 1989
3. Prestressed Concrete N. Krishnaraju Tata McGraw Hill1981 3rd Edition
4. Design of Prestressed Concrete Structures Lin T.Y, Burns N.H, John Wiley & sons Oxford & IBH 1996 5th edition

(Elective IV) STRL535 ADVANCED DESIGN OF STEEL STRUCTURES (Offline)

Teaching Scheme				Credits	Evaluation Scheme					
					Theory			Practical		Total Marks
Th	Tu	Pr	Total Hours		TAE	CAE	ESE	Int.	Ext.	
3	0	2	5	4	20	30	50	25	25	100/50

Semester: 2nd
Subject Area : Structural Engineering

Course-Prerequisite	---

Course Objective:

1. To understand different codal provisions use in steel structures.
2. To understand the different parameters in the design of tubular structures, steel chimneys and storage vessels.
3. To know the basic concepts of bearings and web sections

Modes of Delivery of Courses:

1	Conventional Teaching(Chalk Board)	5	Activity based learning (Paper Review, Poster, etc.)
2	Assignments	6	Special guest lectures /Industry Visit
3	Seminars	7	NPTEL Lecture
4	Audio visual aids		

Course Outcome:
Upon successful completion of the course, students shall be able to -

1. Understand the design philosophy and IS codes ,IRC recommendations
2. Understand the design beams subjected to biaxial bending and beam columns as per current code
3. Have an experience in the complete design of an Industrial building
4. Utilized the concept of design of transmission towers
5. Design round tubular structures, steel chimneys and storage vessels
6. Design the different types of bearings and web sections

Details of Course:

1. Design philosophy & IS codes IRC recommendations. Design of connections. **10**
2. Design of round tubular structures, Design of steel chimneys, Design of storage vessels. **10**
3. Types of Bearing, Design of Bearing. **10**
4. Design of bridges – highway and railways, Foot Bridge. Design of Web Sections. **10**

STRP535ADVANCED DESIGN OF STEEL STRUCTURES

Teaching Scheme: 02 P Total 02 Credit: 01
Evaluation Scheme: 25 Internal
Total Marks: 25

Minimum Eight experiments based on above syllabus

Suggested Books:

1. Steel Designers ManualOwens, G.W. & Knowles, P.R.Blackwell1994 -
2. Design of Steel StructuresGaylord,E.H. & Gaylord, C.N.McGraw Hill Pulb1998 -
3. Composite Structures of Steel and Concrete, Vol-I Johnson, R.P.Granado Publishing Ltd., London 1994
4. SteelStructures-Design and BehaviorSalmon and JohnsonHarper and Collins Publishers.

(Elective V) STRL536SOIL-STRUCTURE INTERACTION(Offline)

Teaching Scheme				Credits	Evaluation Scheme				
					Theory			Practical	Total Marks
Th	Tu	Pr	Total Hours		TAE	CAE	ESE	Cont. Evaluation	
3	0	-	3	3	20	30	50	--	100

Semester: 2nd Subject Area: Structural Engineering

Course-Prerequisite	Geotechnical Engineering I&II

Course Objective:

1. To understand the behavior of various soil under different conditions.
2. To know the software's used to model different soil systems.

Modes of Delivery of Courses:

1	Conventional Teaching (Chalk Board)	5	Activity based learning (Paper Review, Poster, etc.)
2	Assignments	6	Special guest lectures /Industry Visit
3	Seminars	7	NPTEL Lecture
4	Audio visual aids		

Course Outcome:

Upon successful completion of the course, students shall be able to-

1. Prepare realistic material models for structural materials, soils and interfaces/joints.
2. Understand modeling of engineering systems and Soil-Structure Interaction (SSI) using computer methods
3. The present methods of static and dynamic wind analysis of multistoried buildings
4. To identify preliminary sizing for mathematical modeling of RC/steel structures
5. Indian codes/Standards for RCC and PSC structures
6. Various shear wall analysis

Details of Course:

1. Introduction to soil foundation interaction problems, soil behavior, foundation behavior, interface behavior, scope of soil foundation interaction analysis, soil response models, Winkler, Elastic continuum, two parameter elastic model, Elastic Plastic behavior, Time dependent behavior. **8**
2. Beam on Elastic foundation-soil models: Infinite beam, two parameters, Isotropic elastic half space, analysis of beams of finite length, classification of finite beams in relation to their stiffness **8**
3. Plate on Elastic medium: Infinite plate, Winkler, two parameters, isotropic elastic medium, thin and thick plates, analysis of finite plates: rectangular and circular plates, Numerical analysis of finite plates, simple solutions **8**
4. Elastic analysis of piles: Elastic analysis of single pile, theoretical solutions for settlement and load distributions, analysis of pile group, interaction analysis, load distribution in groups with rigid cap **8**
5. Laterally loaded pile: Load deflection prediction for laterally loaded piles, sub-grade reaction and elastic analysis, interaction analysis, pile raft system, solution through influence charts. **8**

Suggested Books

1. Elastic analysis of soil foundation interactionA.P.S. Selvadurai, Elsevier Science 1979First
2. Pile Foundation Analysis and Design
3. Poulos, H.G. & Davis E.HWiley Series1980 First
4. Foundation AnalysisScott, R.FPrentice Hall; First EditionMarch 1981 First
5. Structure Soil Interaction- State of Art Report, Institutionof Structural Engineers, 1978 GeotechnicalEarthquakeEngineeringKramer, S.L
6. Design of Foundation Sytems : Principles & Practices N.P. KurienNarosa, New Delhi 1992 2001Second
7. Design Analysis of Beams, Circular Plates and Cylindrical Tanks on Elastic Foundation,E.S. MelerskiTaylor and Francis, 2006.

(Elective V)STRL537EARTHQUAKE RESISTANT DESIGN OF RC STRUCTURES (Offline)

Teaching Scheme				Credits	Evaluation Scheme				
					Theory			Practical	Total Marks
Th	Tu	Pr	Total Hours		TAE	CAE	ESE	Cont. Evaluation	
3	0	-	3	3	20	30	50	--	100

Semester: 2nd
Subject Area: Structural Engineering

Course-Prerequisite	

Course Objective:

1. To study geological strata of earth and movement of plate tectonics

2. To develop the response spectra for a different regions.
3. To understand various codal provision for seismic design.

Modes of Delivery of Courses:

1	Conventional Teaching(Chalk Board)	5	Activity based learning (Paper Review, Poster, etc.)
2	Assignments	6	Special guest lectures /Industry Visit
3	Seminars	7	NPTEL Lecture
4	Audio visual aids		

Course Outcome:

Upon successful completion of the course, students shall be able to -

1. Understand earth geology, movements of the plates, earthquakes
2. Understand the causes and damages of earthquake
3. Apply the guidelines for achieving efficient seismic resistant design
4. Apply the ductile detailing guidelines to strengthen the energy absorption capacity of beams and columns
5. Understand the impact of architectural aspects on performance of multi-storey building
6. Understand the various clauses given in IS codes for the Seismic Analysis.

Details of Course:

1. Engineering geology of earthquakes, faults, Propagation of earthquake waves, quantification of earthquake, magnitude, energy, intensity of earthquake, accelerograph, accelogram, recording and analysis of earthquake records, seismocity of the world, Analysis and interpretation of earthquake data, determination of magnitude, epicenter, epicenter distances, focal depth, focal mechanism, seismic zoning **6**
2. Causes or sources of earthquake damage, damage due to ground failure, History of past earthquakes, generation of response spectrum from available earthquake records, Evolution of seismic risk, Concept of response spectra, generation of site-specific spectrum, characteristics of earthquake ground motion **6**
3. Guideline for achieving efficient seismic resistant design, geotechnical design consideration, determination of average shear wave velocity, average SPT etc **6**
4. Strength, ductility and energy absorption, ductility of reinforced members subjected to flexure, axial loads & shear. Detailing of RCC members, beam column, Beam-column joints for ductile behaviors, IS code provisions **6**
5. Special aspects in Multi-storey buildings, Effect of torsion, flexible first story, P-delta effect, soil-structure, interaction on building response, drift limitation **6**
6. Study of IS: 1893, IS: 13920 for analysis and ductile design of RCC structures and other related codes **6**

Suggested Books

1. Earthquake resistant Design of Structures Pankaj Agrawal and Manish ShrikhandePrentice Hall of India Pvt, Ltd. Publications, 2006First
2. Earthquake Resistant Design of StructuresS. K. Duggal,Oxford University PressPublications2007First
3. IS 1893:2002, Criteria for Earthquake Resistant Design of Structures Bureauof Indian StandardsBureauof Indian Standards2002First
4. IS 13920: 1993, Ductile Detailing of Reinforced Concrete Structures subjected toSeismic forces - Code of practice,Bureauof Indian StandardsBureauof Indian Standards1993First
5. Earthquake Spectra & Design , Earthquake Design Criteria"Newmark,N.M. & Hall, W.J.Earthquake EngineeringResearchInstitute,Oakland, California, USA, 1982First

(Elective V) STRL538 GEOGRAPHIC INFORMATION SYSTEM AND (Offline)

Teaching Scheme				Credits	Evaluation Scheme				
					Theory			Practical	Total Marks
Th	Tu	Pr	Total Hours		TAE	CAE	ESE	Cont. Evaluation	
3	0	-	3	3	20	30	50	--	100

Semester: 2nd

Subject Area : Structural Engineering

Course Objective:

1. To study the GIS tools for the analysis of geographical data.
2. To understand the real world situation using GIS modern tools.

Modes of Delivery of Courses:

1	Conventional Teaching(Chalk Board)	5	Activity based learning (Paper Review, Poster, etc.)
2	Assignments	6	Special guest lectures /Industry Visit
3	Seminars	7	NPTEL Lecture
4	Audio visual aids		

Course Outcome:

Upon successful completion of the course, students shall be able to -

1. Use GIS tools to access, display, manipulate, edit, and analyze geographic data
2. Experience with real-world activity-based scenarios covering such operations as data acquisition and preparation, raster calculations, surface analysis, statistical analysis, and interpolation
3. Design a small research project, outlining the problem, hypothesis, objectives, and methods

(based primarily on the use of remote sensing data sets).

4. Search order/retrieve and, import remote sensing data relevant to their project.
5. Analyze and interpret the spectral signatures in the remote sensing images.
6. Apply the acquired theoretical and practical knowledge in remote sensing to complete an independent term project on a topic of their choice.

Details of Course:

1. GIS Definition–Map and map analysis– Automated cartography – History and development of GIS – Hardware requirement – Type of data – Spatial and non- spatial data – Data structure – Vector and raster – Files and data formats – Data compression. **10**
2. Spatial analysis – Data retrieval – Query – Overlay – Vector data analysis – Raster dataanalysis – Modelling in GIS – Digital Elevation Model – DTM – Types of output data –Output devices – Sources of errors – Types of errors – Elimination – Accuracies – **10**
3. The Global Positioning system and its applications. Data Acquisition and interpretation - Visual Image Interpretation – Visual Image Interpretation Equipment - Digital Image Processing – **10**
4. Classification.Applications in Survey, mapping and monitoring of land use/land cover – Transportation planning - Infrastructure development - Natural resources management - Urban Planning,Environment - Coastal Zone Management – Air Quality - Development of Resources Information Systems **10**

Suggested Books

1. Principles of Geographical Information Systems. Burrough P.A. and Rachel A. McDonell Oxford Publication 2004 First
2. Concepts and Techniques of Geographical Information Systems, C.P. Lo and Albert K. W. YeungPrentice-Hall India,. 2006 First
3. Remote Sensing and Image Interpretation . Thomas. M. Lillesand and Ralph. W. Kiefer, John Wiley andSons,. 2003 First

(Elective VI)STRL539 ANALYSIS AND DESIGN OF INDUSTRIAL STRUCTURES(Offline)

Teaching Scheme				Credits	Evaluation Scheme				
					Theory			Practical	Total Marks
Th	Tu	Pr	Total Hours		TAE	CAE	ESE	Cont. Evaluation	
3	0	-	3	3	20	30	50	--	100

Semester: 2nd
Subject Area: Structural Engineering

Course-Prerequisite	---

Course Objective:

1. To study different parameters of planning used in industrial structures.
2. To identify the real world problem for pressure vessels and cooling towers.
3. To understand the behavior of machine foundation.

Modes of Delivery of Courses:

1	Conventional Teaching(Chalk Board)	5	Activity based learning (Paper Review, Poster, etc.)
2	Assignments	6	Special guest lectures /Industry Visit
3	Seminars	7	NPTEL Lecture
4	Audio visual aids		

Course Outcome:
Upon successful completion of the course, students shall be able to -

1. Plan the industrial structures by using different parameters.
2. Design the pressure vessels and cooling towers on real world situations.
3. Design the machine foundation and suspended roof structures.
4. Develop mathematical models for various special structures
5. Apply various analysis techniques for special structures
6. Apply the principles and provisions for seismic design and detailing for special structures

Details of Course:

1. Planning of industrial structures. Design of single and multibay industrial structures in steel and concrete **10**
2. Bunkers and silos. Pressure vessels and chimneys. **10**
3. The Global Positioning system and its applications. Data Acquisition and interpretation - Visual Image Interpretation – Visual Image Interpretation Equipment - Digital Image Processing – **10**
4. Cooling towers. Large span roof structures. **10**

Suggested Books

1. Steel Designers ManualOwens, G.W. & Knowles, P.R.Blackwell1994 First
2. Design of Steel structuresGaylord,E.H. & Gaylord, C.NMcGraw Hill Pulb1998.First
3. Steel Design ManualELBS and Granada Publishers, London. ELBSand Granada Publishers, London.
4. CompositeStructuresof Steel and ConcreteJohnson, R.PGranado Publishing Ltd, London, 1975First
5. Steel Structures-Design and Behaviour Salmon and Johnson Harper and Collins Publishers

(Elective VI)STRL540FORENSIC ENGINEERING AND REHABILITATION OF STRUCTURES(Offline)

Teaching Scheme				Credits	Evaluation Scheme				
					Theory			Practical	Total Marks
Th	Tu	Pr	Total		TA	CA	ES	Cont. Evalu	

			Hours		E	E	E	ation	
3	0	-	3	3	20	30	50	--	100

Semester: 2nd Subject Area : Structural Engineering

Course Objective:

1. To determine causes of distress in structural member.
2. To investigate using various methods of deterioration of RC Concrete structures
3. To understand various alternative repair strategies.

Modes of Delivery of Courses:

1	Conventional Teaching(Chalk Board)	5	Activity based learning (Paper Review, Poster, etc.)
2	Assignments	6	Special guest lectures /Industry Visit
3	Seminars	7	NPTEL Lecture
4	Audio visual aids		

Course Outcome:

Upon successful completion of the course, students shall be able to -

1. Describe and evaluate the use of structural forensics in creating and maintaining urban civil infrastructure.
2. Identify common failure modes of structures and classify them according to criticality/risk.
3. Classify an observed structural failure as a technical or procedural failure or a combination.
4. Implemental structural design/construction/procurement process with an understanding of key weak elements and methods of addressing the weaknesses.
5. Investigate failures of structures, lessons learnt and produce technical notes – simulating a mechanism of reporting of structural.
6. Know the strategies of maintenance and repair.

Details of Course:

1. Failure of Structures: Review of the construction theory – performance problems –responsibility and accountability – case studies – learning from failures – causes of distress in structural members – design and material deficiencies – over loading **10**
2. Diagnosis and Assessment of Distress: Visual inspection – nondestructive tests –ultrasonic pulse velocity method – rebound hammer technique – ASTM classifications –pullout tests – Bremor test – Windsor probe test – crack detection techniques – case studies – single and multistory buildings – Fiber optic method for prediction of structural weakness. **10**
3. Environmental Problems and Natural Hazards: Effect of corrosive, chemical and marine environment – pollution and carbonation problems – durability of RCC structures – damage due to earthquakes and strengthening of buildings – provisions of BIS 1893 and 4326. **10**
4. Modern Techniques of Retrofitting: Structural first aid after a disaster – guniting, jacketing – use of chemicals in repair – application of polymers – Ferro cement and fiber concretes as rehabilitation materials – strengthening by pre-stressing – case studies –bridges – water tanks – cooling towers – heritage buildings – high rise buildings. **10**

Course-Prerequisite	---

Suggested Books

1. Designand Construction Failures DovkaminetzkyGalgotia Publication, NewDelhi, 2001First
2. Structural Failures, Jacob Feld and Kenneth L Carper Wiley Europe

(Elective VI)STRL541 ADVANCED STRUCTURAL DYNAMICS (Offline)

Teaching Scheme				Credits	Evaluation Scheme				
					Theory			Practical	Total Marks
Th	Tu	Pr	Total Hours		TAE	CAE	ESE	Cont. Evaluation	
3	0	-	3	3	20	30	50	--	100

Semester: 2nd

Subject Area: Structural Engineering

Course Objective:

1. To understand the concepts of free and forced vibration.
2. To interpret the response of structure considering lumped mass and continuous mass system.
3. To study the different codal provision for dynamic analysis of the structure.

Modes of Delivery of Courses:

1	Conventional Teaching(Chalk Board)	5	Activity based learning (Paper Review, Poster, etc.)
2	Assignments	6	Special guest lectures /Industry Visit
3	Seminars	7	NPTEL Lecture
4	Audio visual aids		

Course Outcome:

Upon successful completion of the course, students shall be able to -

1. Calculate the response for harmonic loading with concept of transmissibility.
2. Apply the codal provisions for MDOF analysis of lumped mass.
3. To study the distribution properties of dynamic analysis.
4. Capable to correlate information from various engineering and scientific discipline to understand complex behavior of RC structure subjected to seismic forces

5. Apply capacity design principle Capable to design RC structures in accordance with the provisions of Indian and International Building Codes considering seismic forces
6. Capable to use performance based design framework and nonlinear analysis techniques

Details of Course:

1. Fundamentals of rigid / deformable body dynamics, Analysis of undammed and viscously damped, single degree freedom systems. 6
2. Response of single degree freedom systems to harmonic loading, support motion and transmissibility, Duhamel's integral 6
3. Study of IS 1893-1984 and 2000 applicable to buildings and water tanks 6
4. Free vibrations of lumped mass multi degree freedom systems, shear buildings, orthogonality criteria, Rayleigh's method 6
5. Dynamic analysis of systems with distributed properties, approximate design method,
6. transformation factors 6
7. Response spectra, introduction to vibrations due to earthquake 6

Suggested Books

1. Dynamics of StructuresR.W. Clough and J.Penzian McGraw-Hill Inc,1993Second
2. Introduction to Structural DynamicsJ.M. Biggs McGraw-Hill Book Co.1964First
3. Vibration Problems in EngineeringW. Weaver, Jr., S. P. Timoshenko and D. H. Young. ChichesterJohnWiley & Sons Limited1990Fifth
4. Elements of Vibration AnalysisMeirovitch, LMcGraw Hill International Edition, Singapore1986Second
5. Introduction of Structural DynamicsBiggs, J.M.,McGraw Hill, NY1964First

(Elective VI) STRL542 ADVANCED DESIGN OF RCC STRUCTURES (Offline)

Teaching Scheme				Credits	Evaluation Scheme				
					Theory			Practical	Total Marks
Th	Tu	Pr	Total Hours		TAE	CAE	ESE	Cont. Evaluation	
3	0	-	3	3	20	30	50	--	100

Semester: 2nd Subject Area: Structural Engineering

Course-Prerequisite	---

Course Objective:

1. To understand clauses of IS codes and IRC recommendations.
2. To carry out load calculation, analysis, design and detailing of flat slabs, grid floor, water tanks, bunker and silos, folded plate and domes as per relevant IS code of practice
3. To Analysis and design of raft foundation, strip footing and pile caps
4. To introduce methodologies for service reservoirs as per codal provisions.
5. To analyze and design special structures with different methods, codes of practice.
6. To ensure serviceability criteria for reinforced concrete structural elements.

Modes of Delivery of Courses:

1	Conventional Teaching(Chalk Board)	5	Activity based learning (Paper Review, Poster, etc.)
2	Assignments	6	Special guest lectures /Industry Visit
3	Seminars	7	NPTEL Lecture
4	Audio visual aids		

Course Outcome:

Upon successful completion of the course, students shall be able to -

1. Understand the IS codes of practices & IRC recommendations in loading and design of reinforced concrete structures.
2. Analyze and design Elevated Service Reservoir for wind and earthquake loading.
3. Analyze and design the special structures like pipes, silos, Bunkers, chimneys.

Details of Course:

1. Analysis and Design of Slab type & T -Beam bridges, IRC Recommendations **10**
2. Analysis and Design of Elevated service Reservoirs, IS Recommendations for wind & earthquake, Ductile detailing. **10**
3. Analysis and design of Multistoried buildings, calculation of loads, Approximate analysis, Preliminary sizing, IS: 875, IS: 1893 recommendations, Ductile detailing. **10**
4. Analysis and design of special structures i.e. pipes (underground, on ground, Elevated), silos, Bunkers, chimneys, IS recommendations **10**

Suggested Books:

1. Plain & reinforced concrete Structures Jain &JaikrishnaNem Chand & brother VolumeI
2. Handbook on seismic analysis and design of structures Farzadneaim
3. Seismic design of R C & masonry Buildings paulay&Prestiley
4. Earthquake resistant Design for engineers & Architects Dowrick D

THIRD SEMESTER

STRL543 - Industry project/ Research Project (Phase-I)

Teaching Scheme				Credits	Evaluation Scheme					
					Theory			Practical		Total Ma
T	T	Pr	Tot		T	C	E	I	E	

h	u		al Hours		AE	AE	SE	NT	XT	rks
		09	09	09				150		150

Course Objectives :

1. To develop the ability to analyze and use scientific approach in solving complex engineering problems.
2. To develop an attitude of continuous and lifelong learning
3. To develop oral and written communication and presentation skills, critical review of the existing literature.
4. To develop design skills and the ability to conduct planned experimentation.

Course Outcomes:

1. Upon successful completion of phase –I of dissertation, students shall be able to:
2. Analyze complex engineering problems, develop action plan and apply appropriate research methodologies to find workable solution.
3. Develop oral and written communication and presentation skills, critical review of the existing literature, experimental and design skills
4. Develop an attitude of continuous and lifelong learning

Course Outcomes:

Upon successful completion of the dissertation, students will be able to:

1. Analyze and solve a complex engineering problem posed for investigative study, independently or as a team member, using modern tools and computational techniques.
2. Develop oral and written communication and presentation skills, critical review of the existing literature, experimental and design skills and showcase research findings through publications.
3. Develop an attitude of continuous and lifelong learning.

FOURTH SEMESTER

STRP544
Industry project/ Research Project (Phase-II)

Teaching Scheme				Credits	Evaluation Scheme					
					Theory			Practical		Total Marks
Th	Tu	Pr	Total Hours		TAE	CAE	ESE	INT	EXT	
		15	15	15				150	150	300

Course Objectives :

1. To develop the ability and skill sets to analyze and solve complex engineering problems, independently or as a team member, using modern tools and computational techniques.
2. To develop oral and written communication and presentation skills, critical review of the existing literature, experimental and design skills
3. To develop an attitude of continuous and lifelong learning