Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)

(Accredited 'A++' Grade by NAAC with a score of 3.6)

Hingna Road, Wanadongri, Nagpur - 441 110

Master of Technology

SoE & Syllabus 20**25**

(Department of Civil Engineering)

M.Tech in Structural Engineering

Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)

SoE No. 25STR-101

M.TECH. SCHEME OF EXAMINATION 2025

(Revised Scheme of Examination w.e.f. 2025-26 onward)

M.Tech. in Structural Engineering

SN	Sem	Sub. Code	Subject	T/P	Contact Hours				Credits	%Weightage		ESE Duration Hours
					L	T	P	Hrs		TA**	ESE	
I SEMESTER												
1	1	25STR101	Theory of Elasticity & Elastic Stability	T	3	0	0	3	3	20	80	3
2	1	25STR102	Structural Dynamics	T	3	0	0	3	3	20	80	3
3	1	25STR103	**Lab. :** Structural Dynamics	P	0	0	2	2	1	60	40	-
4	1	25STR104	Matrix Analysis of Structures	T	3	0	0	3	3	20	80	3
5	1	25STR105	**Lab. :** Matrix Analysis of Structures	P	0	0	2	2	1	60	40	-
6	1	25STR106	Design of Substructures & Foundations	T	3	0	0	3	3	20	80	3
7	1	25STR107	Earthquake & Wind Effects on Structures	T	3	0	0	3	3	20	80	3
8	1	25STR108	Advanced Concrete Structures	T	3	0	0	3	3	20	80	3
9	1	25STR109	**Lab. :** RCC Design Studio	P	0	0	2	2	1	60	40	-
				Total	**18**	**0**	**6**	**24**	**21**			
II SEMESTER												
1	2	25STR201	Finite Element Method	T	3	0	0	3	3	20	80	3
2	2	25STR202	Prestressed Concrete	T	3	0	0	3	3	20	80	3
3	2	25STR203	Advanced Steel Structures	T	3	0	0	3	3	20	80	3
4	2	25STR204	**Lab. :** Steel Design Studio	**P**	0	0	2	2	1	60	40	-
5	2		**Professional Elective-I**	T	3	0	0	3	3	20	80	3
6	2		**Professional Elective-II**	T	3	0	0	3	3	20	80	3
7	2		**Professional Elective-III**	T	3	0	0	3	3	20	80	3
				Total	**18**	**0**	**2**	**20**	**19**			

Professional Elective - I

1	2	25STR211	**PE-I :** New Engineering Materials
2	2	25STR212	**PE-I :** Theory of Plates & Shells
3	2	25STR213	**PE-I :** Smart Structures & Applications

Professional Elective - II

1	2	25STR231	**PE-II :** RC Tall Buildings
2	2	25STR232	**PE-II :** Composite Strucutres
3	2	25STR233	**PE-II :** RC Bridge Design

Professional Elective - III

1	2	25STR241	**PE-III :** Plastic Analysis & Design of Steel Structures
2	2	25STR242	**PE-III :** Seismic Analysis & Design of Structures
3	2	25STR243	**PE-III :** Design of Industrial Structures

III SEMESTER												
1	3	25STR301	Project Phase-I	**P**	0	0	20	20	10	100	-	-
				Total	**0**	**0**	**20**	**20**	**10**			
IV SEMESTER												
1	4	25STR401	Project Phase-II	**P**	0	0	36	36	18	60	40	-
				Total	**0**	**0**	**36**	**36**	**18**			
				GRAND TOTAL	**36**	**0**	**64**	**100**	**68**			

		June, 2025	1.00
Chairperson	Dean (Acad. Matters)	Date of Release	Version

Applicable for AY 2025-26 Onwards

I Semester
25STR101– Theory of Elasticity & Elastic Stability

Course Outcomes :
Upon successful completion of the course the students will be able to 1. Demonstrate the knowledge of fundamental methods of elasticity for 2-D and 3D stress analysis 2. Analyze bending and torsional problems and apprise various theories to solve 2-D problems 3. Apply the basic knowledge of elastic stability to various structural elements 4. Explain and solve the problems of beam-column, column and built up column using the concept of elastic stability.

Unit:1	**Two Dimensional Stress Analysis**	**7 Hours**
Introduction to Two Dimensional Stress Analysis, 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.		
Unit:2	**Three Dimensional Stress Analysis**	**6 Hours**
Introduction to Three Dimensional Stress Analysis, Components of stress, Principal stresses, Stress invariants, Maximum shearing stress, Differential equation of equilibrium, Boundary conditions and compatibility equations.		
Unit:3	**Bending of cantilever**	**6 Hours**
Bending of cantilever of narrow rectangular section loaded at end, bending of simply supported beam with uniform load, torsion of non-circular and elliptical cross section.		
Unit:4	**Beams columns**	**7 Hours**
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.		
Unit :5	**Elastic bucking of columns**	**7 Hours**
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 varying cross section.		
Unit :6	**Buckling of built up columns**	**6 Hours**
Effect of shearing force on critical load, Buckling of built up columns, Buckling of simply supported rectangular plates uniformly compressed in middle plane.		
	Total Lecture	**39 Hours**

Text Books	
1.	Timoshenko, S.P. and Goodier, J.N., Theory of Elasticity, 3rd Edition, Mc-Graw Hill Book Company, New Delhi, 1963
2.	Timoshenko, S.P. and Gere J. M., Theory of Elastic Stability , 2nd Edition, Mc-Graw Hill Book Company, New Delhi,1963
3.	Asadour H. Hadjian, Basic Elements of Earthquake Engineering, 2015, Wiley

Reference Books	
1	Srinath, L.S., Advanced Mechanics of Solids India, 2nd Edition, Tata Mc-Graw Hill Book Company, 2003.
2	Ameen, M., Computational Elasticity—Theory of Elasticity, Finite and Boundary Element Methods, 1st Edition, Narosa publication, 2007
	Mikhait Filonenkoborodich, Theory of Elasticity, 1st Edition, University press of pacific, 2003

YCCE e - library book links [ACCESSIBLE FROM COLLEGE CAMPUS]	
1	http://103.152.199.179/YCCE/Suported%20file/Supprted%20file/e-copies%20of%20books/Civil%20Engineering/

MOOCs Links and additional reading, learning, video material	
1.	https://archive.nptel.ac.in/courses/105/105/105105177/

I Semester
25STR102– Structural Dynamics

Course Outcomes
Upon successful completion of the course the students will be able to 1. Relate the importance of vibratory structure with respect to safety and reliability of engineering systems. 2. Analyze problems having undamped and damped vibrations. 3. Analyze problems having forced vibrations. 4. Implement codal provisions related to earthquake loading.

Unit:1	**Elements of Vibration.**	**7 Hours**
Basic Concepts of vibrations, Dynamic loading. Causes of Dynamic effect. Fundamentals of Rigid / Deformable body dynamics, Natural frequency and time period, Formation of Equation of Motion, Types of Vibration, Equivalent stiffness of spring combination.		
Unit:2	**Damped and Undamped free vibration of SDOF system**	**7 Hours**
Equation of motion, Analysis of undamped single degree freedom systems. Types of Damping, Measurement of Damping, Analysis of damped single degree freedom systems.		
Unit:3	**Forced vibration of SDOF system**	**6 Hours**
Response of single degree freedom systems to harmonic loading, support motion and transmissibility, Response of single degree freedom systems to periodic loading. Fourier series and Analysis. Duhamels Integral(Impulsive loading)		
Unit:4	**Vibration of multiple-degree of freedom system**	**7Hours**
Multiple degree of Freedom system: Vibration of undamped 2 DOF systems; Response of 2 DOF to harmonic excitation, mode superposition, vibration absorber, Free vibration of MDOF (up to 3 DOF) systems, Dynamic response of MDOF (2 DOF) systems-modal superposition method. Energy Principle, Rayleigh's method (2 DOF)		
Unit:5	**Longitudnal, Transverse and Torsional Vibration.**	**7 Hours**
Dynamic analysis of systems with distributed properties, Approximate design method, Transformation factors. Vibration of Continuous Systems: Free vibrations of Continuous systems-axial and transverse vibration of bars / beams. Response of continuous systems to dynamic load.		
Unit :6	**Elements of Seismology**	**7 Hours**
Introduction to vibrations due to earthquake, Codal Provision for Seismic analysis as per IS 1893 applicable to Buildings and Water Tanks**.(Contemporary issues related to topic)**		
	Total Lecture	**39 Hours**

Text Books	
1	Mario Paz, Structural Dynamics Theory & Application, CBS Publ.; N-Delhi, 1995.
2	Chopra A. K., Dynamics of Structures, Theory & Application to Earthquake Engineering, 2nd Edition., Pearson Education (Singapore) Pvt. Ltd, New Delhi, 1995

Reference Books	
1	Clough / Penzien, "Dynamics of Structures", McGraw Hill, 1993
2	Humar, J. L., "Dynamics of Structures", Prentice Hall, 1993
3	Timoshenko, S., "Advanced Dynamics", McGraw Hill Book Co; NY, 1948
4	Damodarasamy and Kavitha," Basics of structural Dyanamics and Aseismic design, Phi Publisher, New Delhi.

YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]	
1	http://103.152.199.179/YCCE/Suported%20file/Supprted%20file/e-copies%20of%20books/Civil%20Engineering/
2	https://onlinelibrary.wiley.com/doi/book/10.1002/9780470168042

MOOCs Links and additional reading, learning, video material	
1	https://nptel.ac.in/courses/105106151

I Semester
25STR103– Lab. : Structural Dynamics

Course Outcomes
Upon successful completion of the course the students will be able to 1. Explain the fundamentals of dynamic behavior in structures. 2. Conduct dynamic testing on structural components. 3. Employ software tools for structural dynamics. 4. Evaluate the effects of dynamic loads on structures

S.N.	Experiments based on
1	Study of the Instruments used in Structural Dynamics
2	To determine damping ratio & damped frequency
3	To study the response of single degree of freedom system and to find out the natural frequency.
4	To study the Soil liquefaction
5	Earthquake induced waves in rectangular water tanks
6	Evaluation of damping at Resonance.
7	Determining natural frequency and drawing mode shapes of a three degree freedom shear building model.
8	To calculate the lateral force in water tank due to earthquake when water tank is empty and water tank is full by 1893:2002
9	To calculate the horizontal seismic forces at all levels of the building using IS 1893:2002 (part-I)
10	Dynamics of a vibration absorber
11	Dynamics of one-span and two-span beams

I Semester
25STR104 – Matrix Analysis of Structures

Course Outcomes :
Upon successful completion of the course the students will be able to 1. Explain different types of structures 2. Apply the matrix stiffness method to model the behavior of planar trusses, beams, and frames; 3. Analyze any multistoried building using Matrix Stiffness methods of structural analysis. 4. Recognize special effects on behavior of structures. 5. Implement the method developing their own computer program to analyze structures.

Unit:1	**Basics of Stiffness Method**	**7 Hours**
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, Assembly of structure stiffness matrix with structural load vector, application to spring and bar problems. **(Contemporary Issues related to Topic)**		
Unit:2	**Analysis of Trusses**	**6 Hours**
Analysis of Plane Truss, Space Truss by Stiffness Method **(Contemporary Issues related to Topic)**		
Unit:3	**Analysis of Beams and Frames**	**6 Hours**
Analysis of Beam, Plane Frame, Space Frame by Stiffness Method**(Contemporary Issues related to Topic)**		
Unit:4	**Analysis of Building Systems with Horizontal Loads**	**6 Hours**
Analysis of building systems for horizontal loads, Buildings with and without rigid diaphragm, various mathematical models, and introduction to Solution techniques.**(Contemporary Issues related to Topic)**		
Unit:5	**Analysis of Grid:**	**7 Hours**
Analysis of Plane Grid by Stiffness Method.**(Contemporary Issues related to Topic)**		
Unit :6	**Analysis using special effects on structure**	**7 Hours**
Analysis for member loading (self, Temperature & Imposed) Inclined supports, Lack of Fit, Initial joint displacements. Effect of shear deformation, internal member end releases **(Contemporary Issues related to Topic)**		
	Total Lecture	**39 Hours**

Text Books	
1	Matrix Method of Structural Analysis, Gere, W. and Weaver; J. M., 3rd Edition, Van Nostrand Reinhold; New York; 1990
2	Matrix Method of Structural Analysis, Meghre A.S.& Deshmukh S.K. ; 1st edition, Charotar publishing house, Anand, 2003
3	Matrix Method of Structural Analysis, Kanchi, M. B., 2nd Edition; John Willey & Sons, 1999
4	Matrix Methods of Structural Analysis, Godbole P., Sonparote R., Dhote S., PHI Learning Pvt. Ltd. 2014

Reference Books	
1	Matrix Analysis of Structural Dynamics, Cheng, F.Y., M. Dekke; NY 2000
2	Finite Element Procedures, Bathe, K.J., 2nd Edition Springer,; 2002
3	Concepts and Applications of Finite Element Analysis, Cook, R.D. et. al, John Willey &Sons; NY 1995
4	Introduction to Matrix Method of Structural Analysis, Martin; H.C., McGraw Hill Book Co. 1966
5	Introduction to Finite Elements in Engineering, Chandrapatla T.R., Belegundu A., D. Prentice Hall India, 1991
6	Matrix Analysis of Structures SI Version, Kassimali A., Cengage Learning, 2011
7	Matrix Methods of Structural Analysis: Livesley R. K. Pergamon International Library of Science, Technology, Engineering and Social Studies, Elsevier, 2013
8	Matrix Structure Analysis. McGuire W. Gallaghar R. H. & Zimian R. D., John Willey Publication
9	Theory of Matrix Structural Analysis, Przemieniecki J. S., Dover Publication Inc. New York

YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]	
1	http://103.152.199.179/YCCE/Suported%20file/Supprted%20file/e-copies%20of%20books/Civil%20Engineering/20.%20Matrix%20methods%20of%20structural%20analysis%20(%20PDFDrive%20)-ebook.pdf

MOOCs Links and additional reading, learning, video material	
1	https://onlinecourses.nptel.ac.in/noc22_ce71/preview

I Semester
25STR105 – Lab : Matrix Analysis of Structures

Course Outcomes :
Upon successful completion of the course the students will be able to
1. Apply the stiffness method for structural analysis.
2. Analyze continuous beams, plane truss, space truss, plane frame neglecting axial deformation, plane frame considering axial deformation, plane grids.
3. Recognize special effects on behavior structures.

S.N.	Experiments based on
1	Analyze a continuous beam with maximum three degree of Kinematic Indeterminacy using software package. Compare the software result of analysis with manual analysis result. For manual analysis use stiffness matrix method.
2	Analyze a continuous beam with sinking of support with maximum three degree of Kinematic Indeterminacy using software package. Compare the software result of analysis with manual analysis result. For manual analysis use stiffness matrix method.
3	Analyze a plane truss with maximum three degree of Kinematic Indeterminacy using software package. Compare the software result of analysis with manual analysis result. For manual analysis use stiffness matrix method. Conclude it from both the result.
4	Analyze a plane truss subjected to inclined roller support with maximum three degree of Kinematic Indeterminacy using software package. Compare the software result of analysis with manual analysis result. For manual analysis use stiffness matrix method.
5	Analyze a plane truss subjected to temperature effect and lack of fit with maximum three degree of Kinematic Indeterminacy using software package. Compare the software result of analysis with manual analysis result. For manual analysis use stiffness matrix method.
6	Analyze a space truss with maximum three degree of Kinematic Indeterminacy using software package. Compare the software result of analysis with manual analysis result. For manual analysis use stiffness matrix method.
7	Analyze a plane frame with maximum three degree of Kinematic Indeterminacy, using software package. Compare the software result of analysis with manual analysis result. For manual analysis use stiffness matrix method.
8	Analyze a plane grid using software package. Compare the software result of analysis with manual analysis result. For manual analysis use stiffness matrix method.
9	Analyze a multi storied frame structure subjected to horizontal forces using software package.

I Semester
25STR106 – Design of Substructures & Foundations

Course Outcomes :
Upon successful completion of the course the students will be able to 1. Identify the suitable foundations system for various site conditions. 2. Apply the codal provisions for designing different types of foundation structures. 3. Explain the various methods of ground improvement techniques. 4. Analyze and design the different types of foundation structures.

Unit:1	**Soil Structure interaction**	**7 Hours**
Introduction to soil structure interaction, Bearing Capacity of Foundations, Theories, In-situ tests; Settlement Analysis, factors affecting settlement, control of excessive settlements; Soil classification, Geotechnical design parameters. Design of different isolated footings including eccentrically loaded footings. **(Contemporary Issues related to Topic)**		
Unit:2	**Combined and Raft foundation**	**6 Hours**
Design of combined footing and design of raft foundation. **(Contemporary Issues related to Topic)**		
Unit:3	**Pile Foundation**	**7 Hours**
Analysis and design of pile foundation, Function and Classification of piles, Static point and skin resistance capacity of a Pile, pile load tests, Pile settlements, design of RCC piles, Various pile group patterns, Efficiency of Pile in group, Negative skin friction, Pile Cap design, Under reamed pile foundation, Introduction to design of well foundation. IS 2911 Part I to Part V **(Contemporary Issues related to Topic)**		
Unit:4	**Machine foundations**	**6 Hours**
Introduction to machine foundations and its practical considerations for construction IS code of practice, introduction to analysis and design of simple machine foundation. Theory of sub grade reaction, beam on elastic foundation. **(Contemporary Issues related to Topic)**		
Unit:5	**Ground improvements**	**6 Hours**
Ground improvements: Various methods, sand drains, stone columns, stabilization, grouting, reinforced earth, geotextiles, diaphragm walls, Reinforced earth retaining walls, skin walls. **(Contemporary Issues related to Topic)**		
Unit :6	**Retaining wall and abutments**	**7 Hours**
Analysis and design of Cantilever, counter fort and basement retaining walls and abutments. **(Contemporary Issues related to Topic)**		
	Total Lecture	**39 Hours**

Text Books	
1	Sawmi Saran, Analysis and Design of Substructures, Oxford & IBH Publishing Co Pvt.Ltd; 2nd edition 2018
2	Kurain N. P, Design of foundation systems- Principles and Practice, Alpha Science International Ltd, 3rd edition, 2005
3	Karuna Moy Ghosh, Foundation Design in practice, PHI Learning Pvt. Ltd, New Delhi 2012
4	P. C. Varghese, Design of Reinforced Concrete Foundations, PHI Learning Pvt. Ltd., New Delhi, 2009.

Reference Books	
1	Kurain N.P, Modern Foundations: Introduction to Advance Techniques, Tata McGraw Hill, 1982
2	Winterkorn, H.F and Fang, Y.F., Foundation Engineering Handbook, Van Nostrand Reinhold, 1994.
3	Sreenivasalu & Varadarajan, Handbook of Machine Foundations, Tata McGraw Hill
4	Swami Saran, Soil Dynamics and machine Foundations, Galgotia Publications Pvt. Ltd., Third Edition, 2016

YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]	
1	http://link.springer.com/openurl?genre=book&isbn=978-3-540-32894-0

MOOCs Links and additional reading, learning, video material	
1	https://archive.nptel.ac.in/courses/105/105/105105207/
2	https://archive.nptel.ac.in/courses/105/105/105105176/

I SEMESTER
25STR107 Earthquake & Wind Effects on Structures

Course Outcomes :

Upon successful completion of the course the students will be able to

1. Analyze geological feature, and plate tectonics in occurrence of earthquake.
2. Evaluate causes and sources of earthquake damages and possible response of structure
3. Interpret characteristics of wind and its static effects on structures
4. Explain relevant I.S. codes in design of earthquake & Wind resistant structure

Unit:1	**Introduction to Earthquake**	**6 Hours**

Engineering geology of earthquakes, faults, Propagation of earthquake waves, quantification of earthquake (magnitude, & intensity of earthquake), Measurement of earthquake (accelerograph, accelogram recording and analysis of earthquake records), determination of magnitude, epicenter distances, Seismicity of the world.

Unit:2	**Sources of Earthquake**	**7 Hours**

Basic Geography and Tectonic Features, Origin of earthquake, Prominent Past Earthquakes in India, Seismic Zones of India, Inertia Forces in Structures, Effect of Deformations in Structures, Horizontal and Vertical Shaking, Flow of Inertia Forces to Foundations, Importance of Architectural Features, Horizontal Layout of Buildings, Vertical Layout of Buildings, Adjacency of Buildings, Building Design and Codes.

Unit:3	**Design philosophy and study of IS code**	**7 Hours**

Building Twists, The Earthquake Problem, Damage in Buildings – Unavoidable, Earthquake-Resistant Buildings, Earthquake Design Philosophy, Concepts of Earthquake Resistance Design, Acceptable Damage: Ductility, Introduction to Capacity Design Concept, Irregularities in Structures, Construction Materials, Introduction to Earthquake Load Analysis, Seismic Coefficient Method (Linear Static Method) as per IS 1893-2016, Basic Example Calculations.

Unit:4	**Introduction to Earthquake-Resistant Design of Masonry Buildings**	**6 Hours**

Oscillations of Flexible Buildings, Importance of Flexibility, Behaviour of Brick Masonry Walls, Choice and Quality of Building Materials, Box Action in Masonry Buildings, Role of Horizontal Bands, Earthquake-Resistant Features, Response of Masonry Walls & Behaviour during Past India Earthquakes.

Unit:5	**Wind Characteristics**	**6 Hours**

Nature of Wind, Wind Flow in the Atmospheric Boundary Layer, Types of Winds, Variation of Wind Speed with Height, Gust Factor and Turbulence, Directionality of Wind, Wind Pressure on Structures, Basic Wind Speed as per IS 875 (Part 3), Factors Affecting Wind Characteristics, Extreme Wind Events.

Unit :6	**Static Wind Effect and Study of IS – 875 (Part III)**	**7 Hours**

Introduction to Static Wind Effects, Wind Load on Structures, Design Wind Speed (Vz) and influencing factors, Design Wind Pressure (Pz), Pressure Coefficients for various building shapes, Load Combinations as per IS 875 (Part III), Topographic Effects, Procedure for Wind Load Calculation, Worked Examples. **Contemporary Issues related to Topic**

Total Lecture	**39 Hours**

Text Books	
1.	Arya A. S., "Introduction to earthquake engineering structures".
2.	C. Scruton, "An Introduction to Wind Effects on Structures", Oxford University Press, Oxford, UK., 1981
3.	Agrawal &Shrikhande, Design of Earthquake Resistant Structures, 3 rd 2006, Prentice – Hall of India Pvt. Ltd
	Paulay, T. & Prestiley M.J.N., Seismic design of R C & Masonry Buildings, 2nd 1999, John Willey & Sons
Reference Books	
1	Murthy, C.V.R, "Earthquake tips", IIT Kanpur documents.
2	Chopra A. K., Dynamics of Structures, Theory & Application to Earthquake Engineering, 2nd Edition., Pearson Education (Singapore) Pvt. Ltd, New Delhi, 1995
3	Dowrick, D.J, "Earthquake Resistant Design for Engineers and Architects", 2nd Edition; 1987
4	Peter Sachs, "Wind Forces in Engineering", Pergamon Press. Oxford UK, 1972
5	Lawson T. V., "Wind Effects on Buildings", Applied Science Publishers, London, UK, 1980
6	Emil Simiu and R. H. Scanlan, "Wind Effects on Structures – An Introduction to Wind Engineering", John Wiley and Sons, New York., 1986
YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]	
1	http://link.springer.com/openurl?genre=book&isbn=978-3-319-01025-0
2	http://link.springer.com/openurl?genre=book&isbn=978-94-007-6572-6
MOOCs Links and additional reading, learning, video material	
1	http://link.springer.com/openurl?genre=book&isbn=978-94-007-6572-6
2	https://nptel.ac.in/courses/105102016
3	https://nptel.ac.in/courses/105108074

I Semester
25STR108 – Advanced Concrete Structures

Course Outcomes :
Upon successful completion of the course the students will be able to 1. Apply the provisions of Indian Standards to analyze and design various concrete structural members. 2. Understand the impact of natural forces such as wind and earthquakes on structural systems and their influence on design and analysis in structural engineering. 3. Analyze and design essential structures such as multistoried building frames, water tanks, Bunker and Silos 4. Interpret and apply standard specifications and codes (such as IS and IRC) for the design of bridge deck slab and culverts

Unit:1	**Multistoried buildings**	**7 Hours**
Preliminary sizing, Calculation of loads, Approximate analysis, Analysis and design of Multistoried building frame structure.		
Unit:2	**Circular water tanks**	**6 Hours**
Introduction: Permissible stresses in concrete, permissible stresses in steel, minimum reinforcement, minimum cover. **Analysis and Design of Dome:** Introduction, Meridional thrust, Hoop thrust. **Circular water tank:** Circular tank with a flexible joint between floor and wall, circular tank with a rigid joint between floor and wall, Design of circular tanks using approximate method and IS code method.		
Unit:3	**Elevated water tank**	**7 Hours**
Introduction, Analysis and Design of Elevated water tank including design of supporting system		
Unit:4	**Standard specification and code of practice for bridges**	**6 Hours**
Introduction of the Indian Roads Congress (IRC) bridge code, IRC sections, Evolution of Standard Loading for Design of Bridges. **IRC 6:** Introduction of IRC 6, classification of IRC loading, Loads forces and Stresses, Impact factor, Width of carriage way, minimum clearance, ground contact area of the wheels. **IRC 21:** Introduction of IRC 21, guidelines, materials, permissible stresses, effective width of slab, Dispersion of wheel Loads on slab.		
Unit:5	**Design of deck slab**	**7 Hours**
Analysis, Design of bridge deck slab and Culverts.		
Unit :6	**Silos, and Bunkers**	**6 Hours**
Introduction, Rankine's Theory, Janssen's Theory, Airys Theory, analysis and design of silos and bunkers		
	Total Lecture	**39 Hours**

Text Books	
1.	Bhavikatti S. S., "Advanced R. C. C. Design", Volume-II, New age international publisher, New Delhi.
2.	Krishna Raju N, "Advanced R. C. C. Design", CSB Publisher and Distributor, New Delhi.
3.	Ramaswamy, G.S, "Design of Concrete Shells", Krieger Publisher and Co.

Reference Books:	
1.	Johnson and Victor, "Essentials of Bridge Engineering", Oxford and IBH publisher.
2.	Jain O.P. and Jai Krishna, "Plain and Reinforced concrete structures", Volume II, Nemchand and brothers, 1987
3.	Chattergee, B K, "Theory and design of Concrete Shells", Oxford and IBH publisher.
4.	Chen, W.F. and Duan, L. "Bridge engineering Handbook".
5.	IS 456 : 2000, "Plain and Reinforced Concrete - Code of Practice", Bureau of Indian Standards (BIS), New Delhi, India.
6.	IS 3370 : 2009, "Concrete Structures for Storage of Liquids - Code of Practice", Bureau of Indian Standards (BIS), New Delhi, India.
7.	SP 16 (1980), "Design Aids for Reinforced Concrete to IS 456", Bureau of Indian Standards (BIS), New Delhi, India.
8.	SP 34 (1987), "Handbook on - Concrete Reinforcement and. Detailing", Bureau of Indian Standards (BIS), New Delhi, India.
9.	IRC 6, "Standard specification, and code of practice - for bridges", Section-II, Loads and Stresses, Indian Road Congress, New Delhi, India.
10.	IRC 21, "Standard specification, and code of practice for bridges", Section-III, Cement Concrete (Plain and Reinforced), Indian Road Congress, New Delhi, India.

YCCE e- library book links [Accessible from college campus]	
1	http://link.springer.com/openurl?genre=book&isbn=978-3-211-82919-6
2	http://103.152.199.179/YCCE/Suported%20file/Supprted%20file/e-copies%20of%20books/Civil%20Engineering/12.%20REINFORCED%20CONCRETE%20DESIGN%20-%20N.KRISHNA%20RAJU.pdf
3	http://103.152.199.179/YCCE/Suported%20file/Supprted%20file/e-copies%20of%20books/Civil%20Engineering/11.%20Design%20of%20Concrete%20Structures,%2013th%20Edition%20-%20(Malestrom).pdf

MOOCs Links and additional reading, learning, video material	
1.	https://nptel.ac.in/courses/105105105

I Semester
25STR109 – Lab. : RCC Design Studio

Course Outcomes :
Upon successful completion of the course the students will be able to 1. Apply the provisions of Indian Standards to analyze and design various concrete structural members. 2. Develop structural systems by defining loads, assigning member properties, and applying boundary conditions using structural analysis software. 3. Analyze and design essential structures such as continuous beams, isolated footing, multistoried building frames, water tanks. 4. Evaluate and compare results obtained from manual calculations with those generated by structural analysis software.

SN	Assignment based on
1.	Review of IS 456 and IS 3370
2.	Review of SP16, SP34
3.	Review of IRC 6 and IRC 21
Minimum FOUR Practical's to be performed from the list as below	
4.	Using a software application, **analyse and design a continuous beam**. Compare the design outputs of software applications with those of manual calculations.
5.	Using a software application, **analyse and design of frame (Two bay and three floor).** Compare the design outputs of software applications with those of manual calculations.
6.	Using a software application, **design the Isolated footing of the frame (Two bay and three floor).** Compare the design outputs of software applications with those of manual calculations.
7.	Using a software application, **analyse and design of multistorey frame (Maximum upto Three bay and four floor)** subjected to dead load, live load and wind load.
8.	Using a software application, **analyse and design of elevated RCC rectangular water tank.**
9.	Design of deck slab using hand calculations
10	Silos, and Bunkers using hand calculations

Reference Books:	
1.	IS 456: 2000, "Plain and Reinforced Concrete - Code of Practice", Bureau of Indian Standards (BIS), New Delhi, India.
2.	IS 3370: 2009, "Concrete Structures for Storage of Liquids - Code of Practice", Bureau of Indian Standards (BIS), New Delhi, India.
3.	SP 16 (1980), "Design Aids for Reinforced Concrete to IS 456", Bureau of Indian Standards (BIS), New Delhi, India.
4.	SP 34 (1987), "Handbook on Concrete Reinforcement and. Detailing", Bureau of Indian Standards (BIS), New Delhi, India.
5.	SP 43 (1987), "Handbook on Structures with reinforced concrete portal frames (without cranes)", Bureau of Indian Standards (BIS), New Delhi, India.
6.	SP 64, "Explanatory Handbook on Indian Standard code of practice for design loads (other than earthquake) for Buildings and Structures", Part-III, Wind Loads, Bureau of Indian Standards (BIS), New Delhi, India.

II Semester
25STR201– Finite Element Method

Course Outcomes:
Upon successful completion of the course the students will be able to
1. Explain the basic concepts of finite element method.
2. Apply concepts of FEM for derivation of element equations.
3. Analyze civil engineering problems by finite element method.
4. Develop mathematical modeling and solution techniques in FEM

Unit:1	**Introduction**	**7 Hours**
Principles and discretization, Elements stiffness formulation based on variational techniques, Rayleigh Ritz Method for Bar and Beam analysis. Convergence criteria		
Unit:2	**Application of FEM to 1D Problems**	**6 Hours**
Shape functions, Formulation of stiffness matrices and load vectors, Assembling, Application of FEM to bar and beam Problems.		
Unit:3	**Application of FEM to 2D problems**	**7 Hours**
Application of FEM to 2D problems: Triangular and Rectangular element formulation using Cartesian Coordinates, Application to two-dimensional stress analysis.		
Unit:4	**Isoparametric elements**	**6 Hours**
Isoparametric elements, Natural coordinates, Application to 1D and 2D Problems.		
Unit:5	**Application of FEM to 3D problems**	**7 Hours**
Shape Functions for Three Dimensional Stress analysis, Axi-symmetric Stress Analysis.		
Unit :6	**Modelling techniques**	**6 Hours**
Numerical integration, Modelling and storage techniques, Introduction to standard FEM software. **Contemporary Issues related to Topic**		
	Total Lecture	**39 Hours**

Text Books	
1	Chandrapatla T.R., Belegundu A. D., *Introduction to Finite Elements in Engineering,* Prentice Hall India,1991
2	Godbole P. N., Introduction to Finite Element Method, I. K. International Publishing House Pvt. Ltd., New Delhi, 2013

Reference Books	
1	Desai Y. M., Eldho T. I., Shah A. H., Finite Element Method with Application in Engineering, Dorling Kindersley (India) Pvt. Ltd, New Delhi , 2011
2	Cook R. D., Concepts and Applications of Finite Element Analysis, 3rd Edition, Wiley India Text books, Wiley India Pvt Limited, New Delhi , 1989
3	Rajasekaran S., *Finite Element Analysis in Engineering Design,* S. Chand & Co. Ltd. New Delhi, 1999.
4	A.S. Meghre, Ms. K.M. Kadam, Finite Element Method in Structural Analysis, Khanna Publishers, New Delhi , 2014

YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]	
1	http://link.springer.com/openurl?genre=book&isbn=978-3-540-76342-0
2	http://link.springer.com/openurl?genre=book&isbn=978-3-211-81202-0

MOOCs Links and additional reading, learning, video material	
1	https://nptel.ac.in/courses/105105041
2	https://nptel.ac.in/courses/105107209

II Semester
25STR202– Prestressed Concrete

Course Outcomes :
Upon successful completion of the course the students will be able to 1. Explain the basic concepts of Prestressed concrete. 2. Apply the various codal provisions related to Prestressed concrete. 3. Analyze the Prestressed concrete structural members. 4. Design the Prestressed concrete structural members.

Unit:1	**Introduction to prestressed concrete**	**7 Hours**
Introduction to prestressed concrete, types of prestressing, systems and devices, materials, losses in prestress, IS1343-2012 codal provisions. Analysis of PSC flexural members, stresses at transfer and service loads. **(Contemporary Issues related to Topic)**		
Unit:2	**Analysis and design of PC Sections**	**6 Hours**
Limit state of collapse and serviceability for analysis and design of rectangular, I and box sections for flexure and shear, control of deflection. **(Contemporary Issues related to Topic)**		
Unit:3	**Transmission of Prestressed and Statically Indeterminate Structures**	**6 Hours**
Transmission of pre-stress in pre-tensioned members and post-tensioned members. Introduction to statically indeterminate structures, redundant reactions, linear transformation and concordancy. **(Contemporary Issues related to Topic)**		
Unit:4	**Continuous Beams**	**7 Hours**
Analysis and design of continuous beams, Choice of cable profile. **(Contemporary Issues related to Topic)**		
Unit:5	**Composite Construction**	**7 Hours**
Composite construction with precast PSC beams and cast in-situ RC slab - Analysis and design, creep and shrinkage, deflection effects. Partial prestressing - principles, analysis and design concepts, crack-width calculations **(Contemporary Issues related to Topic)**		
Unit :6	**Prestressed Concrete Slabs**	**6 Hours**
Analysis and design of prestressed concrete slabs – one way and two way Introduction to prestressed concrete pipes, tanks, flat slabs, grids, railway sleepers (No numerical problems). **(Contemporary Issues related to Topic)**		
	Total Lecture Hours	**39 Hours**

Text Books	
1	N. Krishana Raju, Prestressed Concrete, McGraw Hill Education, New Delhi.6th edition, 2018
2	Praveen Nagarajan, Prestressed Concrete Design, Pearson Education India, 1st edition, 2013
3	K.U. Muthu, Prestressed Concrete, PHI Learning, 2016
4	N. Rajagopalan, Prestressed Concrete, Alpha Science International Ltd, 2nd edition 2005

Reference Books	
1	P. Dayaratnam, Prestressed Concrete, Oxford & IBH Publishing Co Pvt.Ltd, 6th edition, 2018
2	Lin T.Y., Design of Prestressed Concrete structures, Wiley India Private Limited, 3rd edition, 2010
3	S.K. Mallick and A.P.Gupta, Prestressed concrete, Oxford and IBH Publishing Co., New Delhi
4	IS 1343: 2012 - Prestressed concrete-code of practice

YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]	
1	http://link.springer.com/openurl?genre=book&isbn=978-0-412-37760-0

MOOCs Links and additional reading, learning, video material	
1	https://nptel.ac.in/courses/105106117
2	https://archive.nptel.ac.in/courses/105/106/105106118/

II Semester
25STR203– Advanced Steel Structures

Course Outcomes :
Upon successful completion of the course the students will be able to 1. Apply the provisions of Indian Standards to analyze and design various steel structural members and connections. 2. Analyze and design steel structural components such as roof trusses, gantry girders, and plate girders used in industrial structures. 3. Analyze and design specialized steel structures including chimneys, elevated water tanks, and lattice towers by applying appropriate codes and structural principles. **4.** Evaluate and design steel truss bridges, assessing load distribution and member forces, and adhering to standard design practices.

Unit:1	**Roof Truss**	**7 Hours**
Analysis and design of roof truss of industrial structure.		
Unit:2	**Girder**	**6 Hours**
Analysis and design of gantry girder, plate girder of industrial Structure.		
Unit:3	**Chimney**	**7 Hours**
Analysis and design of Chimney.		
Unit:4	**Water Tank**	**6 Hours**
Analysis and design of elevated storage tank		
Unit:5	**Tower**	**7 Hours**
Analysis and Design of lattice towers		
Unit :6	**Truss Bridge**	**6 Hours**
Analysis and Design of Truss Bridges.		
	Total Lecture	**39 Hours**

Text Books	
1.	Duggal S.K., "Design of Steel Structures", Mc Graw Hill publication, 2007
2.	N. Krishna Raju, "Design of Bridges", Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi.
3.	Dayaratnam P., "Design of Steel Structures", Wheeler Publications, Allahabad, 1992

Reference Books:	
1.	Arya A.S and Ajmani J.L., "Design of Steel Structures", Nemchand & bross, Roorkee
2.	Ram Chandra, "Design of Steel structures", Volume I, Volume II, Standard book house, Rajsons Publication Pvt. Ltd., Delhi, 2006
3.	Gaylords, E.H. & Gaylords, C. N., "Design of Steel Structures", Blackwell.
4.	IS 800:2007, "Indian Standard, Code of Practice for General Construction in Steel", Bureau of Indian Standards, Bureau of Indian Standards (BIS), New Delhi, India.
5.	IS 875 (Part-I), "Indian Standard, Code of practice for design loads (other than earthquake) for buildings and structures", Part-I, Dead loads, Bureau of Indian Standards (BIS), New Delhi, India.
6.	IS 875 (Part-II), "Indian Standard, Code of practice for design loads (other than earthquake) for buildings and structures", Part-II, Imposed loads, Bureau of Indian Standards (BIS), New Delhi, India.
7.	IS 875 (Part-III), "Indian Standard, Code of practice for design loads (other than earthquake) for buildings and structures", Part-III, Wind load, Bureau of Indian Standards (BIS), New Delhi, India.
8.	IS 6533 (Part-I), "Indian Standard, Design, and construction of steel Chimney code of practice", Part-I Mechanical aspect, Bureau of Indian Standards (BIS), New Delhi, India.
9.	IS 6533 (Part-II), "Indian Standard, Design, and construction of steel Chimney code of practice", Part-II Structural aspect, Bureau of Indian Standards (BIS), New Delhi, India.
10.	SP 6 (I), "Handbook for Structural Engineers", Bureau of Indian Standards, New Delhi, India.
11.	SP 38, "Handbook of Typified Design for Structures with steel roof trusses (with and without cranes)", Bureau of Indian Standards (BIS), New Delhi, India.
12.	SP 40, "Handbook on Structures with Steel Portal Frames (without cranes)", Bureau of Indian Standards (BIS), New Delhi, India.
13.	SP 64, "Explanatory Handbook on Indian Standard Code of Practice for Design Loads (Other than Earthquake) for Buildings and Structures", Part-III Wind Loads, Bureau of Indian Standards (BIS), New Delhi, India.

YCCE e- library book links [Accessible from college campus]	
1.	http://link.springer.com/openurl?genre=book&isbn=978-1-4613-5864-0

MOOCs Links and additional reading, learning, video material	
1.	https://archive.nptel.ac.in/courses/105/105/105105162/
2.	https://youtu.be/Om6ICuhwBo0
3.	https://www.youtube.com/watch?v=Ch2vAzvXbKI

II Semester
25STR204– Lab. : Steel Design Studio

Course Outcomes:
Upon successful completion of the course the students will be able to 1. Apply the provisions of Indian Standards to analyze and design various steel structural members and connections. 2. Develop structural systems by defining loads, assigning member properties, and applying boundary conditions using structural analysis software. 3. Analyze and design steel structural elements using appropriate software tools in accordance with relevant Indian Standards (IS codes). 4. Evaluate and compare results obtained from manual calculations with those generated by structural analysis software.

SN	Assignment based on
1.	Review of IS 800:2007 for the following sections Section 5: Limit State Design, Section 6: Design of Tension Member and compression member, Section 7: Design of member subjected to bending, Section 9: Design of member subjected to combined forces, Section 10: Design of connection
2.	Review of IS 875 (Part I to V)
3.	Review of SP 38

Minimum THREE Practical's to be performed from the list as below	
4.	Using a software application, **analyse and design a beam subjected to TWO moving loads on it**. Compare the design outputs of software applications with those of manual calculations.
5.	Using a software application, **analyse and design a roof truss subjected to dead load, live load and Wind load on it**. Compare the design outputs of software applications with those of manual calculations.
6.	Using a software application, **analyse and design of elevated Steel rectangular water tank subjected to dead load, live load, hydrostatic load and wind load.** Compare the design outputs of software applications with those of manual calculations.
7.	Using a software application, **analyse and design of Foot truss bridge.** Compare the design outputs of software applications with those of manual calculations.
8.	Using a software application, **analyse and design of Tower.** Compare the design outputs of software applications with those of manual calculations.

Reference Books:	
1	IS 800:2007, "Indian Standard, Code of Practice for General Construction in Steel", Bureau of Indian Standards, Bureau of Indian Standards (BIS), New Delhi, India.
2	IS 875 (Part-I), "Indian Standard, Code of practice for design loads (other than earthquake) for buildings and structures", Part-I, Dead loads, Bureau of Indian Standards (BIS), New Delhi, India.
3	IS 875 (Part-II), "Indian Standard, Code of practice for design loads (other than earthquake) for buildings and structures", Part-II, Imposed loads, Bureau of Indian Standards (BIS), New Delhi, India.
4	IS 875 (Part-III), "Indian Standard, Code of practice for design loads (other than earthquake) for buildings and structures", Part-III, Wind load, Bureau of Indian Standards (BIS), New Delhi, India.
5	IS 6533 (Part-I), "Indian Standard, Design, and construction of steel Chimney code of practice", Part-I Mechanical aspect, Bureau of Indian Standards (BIS), New Delhi, India.
6	IS 6533 (Part-II), "Indian Standard, Design, and construction of steel Chimney code of practice", Part-II Structural aspect, Bureau of Indian Standards (BIS), New Delhi, India.
7	SP 6 (I), "Handbook for Structural Engineers", Bureau of Indian Standards, New Delhi, India.
8	SP 38, "Handbook of Typified Design for Structures with steel roof trusses (with and without cranes)", Bureau of Indian Standards (BIS), New Delhi, India.
9	SP 40, "Handbook on Structures with Steel Portal Frames (without cranes)", Bureau of Indian Standards (BIS), New Delhi, India.
10	SP 64, "Explanatory Handbook on Indian Standard Code of Practice for Design Loads (Other than Earthquake) for Buildings and Structures", Part-III Wind Loads, Bureau of Indian Standards (BIS), New Delhi, India.

II Semester
25STR211– PE I : New Engineering Materials

Course Outcomes :
Upon successful completion of the course the students will be able to 1. Classify and analyze new engineering materials based on their structure, properties, and behavior. 2. Differentiate between conventional and advanced concrete 3. Evaluate the applications of fiber-reinforced plastics, composite materials, and advanced steel sections 4. Design composite members using relevant IS codes.

Unit:1	**Fiber reinforced Concrete**	**7 Hours**
Steel fiber reinforced concrete, Properties, Aspect ratio, strength and durability.		
Unit:2	**Fiber reinforced Plastic**	**6 Hours**
Fiber reinforced plastics, other types of fibers and their applications.		
Unit:3	**Light weight concrete**	**6 Hours**
light weight concrete, foam concrete, fly ash concrete, workability, durability, and application		
Unit:4	**High grade Concrete**	**7 Hours**
High-grade concrete, high strength performance concrete, trimix concrete		
Unit:5	**Advance materials**	**7 Hours**
New engineering materials like light weight steel profile, aluminum profile, pressed steel sections		
Unit :6	**Steel Concrete**	**6 Hours**
Introduction to steel concrete composite including infill, encased section, properties of shear connectors, use of IS: 11384, IRC 22.**(Contemporary Issues related to Topic)**		
	Total Lecture	**39 Hours**

Text Books	
1	Neville A. M., Properties of Concrete, Pearson Education Limited.
2	Rafat Siddequi , Special Concretes, Galgotia Publications.
3	M Gambhir, Concrete Technology, Tata Mcgraw Hill Education Private Limited.

Reference Books	
1	Mehta P, Concrete Technology, Tata Mcgraw Hill Education Private Limited.
2	Shetty M. S, Concrete Technology, S. Chand Publisher.

YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]	
1	http://link.springer.com/openurl?genre=book&isbn=978-0-412-37760-0

MOOCs Links and additional reading, learning, video material	
1	https://nptel.ac.in/courses/105106053

II Semester
25STR212– PE-I : Theory of Plates & Shells

Course Outcomes :
Upon successful completion of the course the students will be able to 1. Demonstrate behavior of various plates 2. Analyze plates using different methods 3. Explain various theories of shells 4. Evaluate structural actions of shells using various theories

Unit:1	Governing differential equations for various plates	**7 Hours**
Development of governing differential equations by Kirchoff's theory with reference to thin rectangular plates with various boundary conditions. Symmetrical bending of laterally loaded circular plates with different boundary conditions .**(Contemporary Issues related to Topic)**		
Unit:2	. Navier's solution	**6 Hours**
Study of Simply supported plates under different loadings. Navier's solution. Introduction to Levis solution. **(Contemporary Issues related to Topic)**		
Unit:3	**Finite difference method**	**7 Hours**
Application of finite difference method to plate problem.**(Contemporary Issues related to Topic)**		
Unit:4	**Membrane theory of cylindrical shells**	**6 Hours**
Classification of Shells. Membrane theory of cylindrical shells with different directrix such as circular, cycloidal, catenary, and parabolic. **(Contemporary Issues related to Topic)**		
Unit:5	**Bending theory of cylindrical shells**	**7 Hours**
Bending theory of cylindrical shells, Finster walder, Schorer's, and D-K-J theory.**(Contemporary Issues related to Topic)**		
Unit :6	**Cylindrical shells by beam method**	**6 Hours**
Approximate analysis of cylindrical shells by beam method. One issue is the need to simulate damage and failure, with the final goal to estimate lifetime of a structure. **(Contemporary Issues related to Topic)**		
	Total Lecture	**39 Hours**

Text Books	
1	Timoshenko S.P and Krieger S.W, Theory of Plates and Shells, 2nd Edition, McGraw-Hill Book Company, New Delhi, 1970.
2	Chadrashekhara K, Theory of Plates, 1st Edition, Universities Press (India) Ltd, Hyderabad, 2001.
3.	Ramaswamy, G.S, Design of Concrete Shells, Krieger Publ. Co., 1984

Reference Books	
1	Ramachandran S., Thin Shells (Theory and Problems) 1st Edition, Universities Press (India) Ltd, Hyderabad
2	Szilard R., Theory and Analysis of Plates, Prentice Hall Publication, 1974.
3	Philipee G Ciarlet, Mathematical elasticity Vol.II: Theory of plates, 1st Edition, Elsevier Science B V, 1997

YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]	
1	http://link.springer.com/openurl?genre=book&isbn=978-3-540-76342-0
2	http://103.152.199.179/YCCE/Suported%20file/Supprted%20file/e-copies%20of%20books/Civil%20Engineering/

MOOCs Links and additional reading, learning, video material	
1	https://archive.nptel.ac.in/courses/105/103/105103209/

II Semester
25STR213– PE-I : Smart Structures & Applications

Course Outcomes :
Upon successful completion of the course the students will be able to 1. Explain the characteristics and behavior of smart materials. 2. Apply the knowledge of actuators and sensors in mitigation techniques. 3. Explain the overall structural health monitoring related to earthquake behavior 4. Demonstrate the various types of Vibration Control Techniques.

Unit:1	**Smart Materials**	**7 Hours**
Introduction to smart structures, application, smart systems –Components of smart systems, different types smart materials – characteristics and behavior of smart materials – modeling of smart materials. **(Contemporary Issues related to Topic)**		
Unit:2	**Actuators and Sensors**	**7 Hours**
Introduction of sensors and actuators., features and - characteristics of sensors-types of sensors and actuators- electronic, thermal and hydraulic type actuators, characteristics of sensors and actuators. **(Contemporary Issues related to Topic)**		
Unit:3	**Structural Health Monitoring.**	**6 Hours**
Overview of structural health monitoring, Types of structural health monitoring,smart SHM application to new and existing buildings,Advantages and limitations, **(Contemporary Issues related to Topic)**		
Unit:4	**Base Isolation**	**7Hours**
Theory of Base Isolation ,Principle of base isolation, Methods, Techniques **(Contemporary Issues related to Topic)**		
Unit:5	**Vibration Controlled Techniques.**	**7 Hours**
Energy dissipation devices; introduction, Methods, principals **(Contemporary Issues related to Topic)**		
Unit :6	**Energy Deissipation devices**	**7 Hours**
Dampers,purpose, Types of energy dissipation devices; Metallic yield dampers, friction dampers, viscoelastic dampers, tuned mass dampers. **(Contemporary Issues related to Topic)**		
	Total Lecture	**39 Hours**

Text Books	
1	Srinivasan, A.V. and Michael McFarland, D., Smart Structures: Analysis and Design, Cambridge University Press, 2000.
2.	Yoseph Bar Cohen, Smart Structures and Materials 2003, The International Society for Optical Engineering 2003.

Reference Books	
1	Brian Culshaw, Smart Structures and Materials , Artech House, Boston, 1996.
2	M.V. Gandhi and B.S. thompson, Smart Materials and Structures , Chapman and Hall 1992
3	Damodarasamy and Kavitha," Basics of structural Dyanamics and Aseismic design, Phi Publisher, New Delhi.

YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]	
1	http://link.springer.com/openurl?genre=book&isbn=978-1-4613-6193-0
2	https://onlinelibrary.wiley.com/doi/book/10.1002/9780470168042

MOOCs Links and additional reading, learning, video material	
1	https://nptel.ac.in/courses/112104173

II Semester
25STR231– PE-II : RC Tall Buildings

Course Outcomes :

Upon successful completion of the course the students will be able to

1. Apply the fundamental concept and analyse Earthquake and wind load as per Indian standards.
2. Analyze and design shear wall for earthquake forces as per Indian standards.
3. Apply technical design principles and techniques such as p-delta effect, soil- structure interaction, etc. for a design of high-rise building.
4. Implement various codal provisions for ductility design of RCC Structures

Unit:1	**Earthquake and Wind Load Analysis on Structures as per Indian Standards**	**7 Hours**
Structural Systems and concepts. Loading: Gravity, wind and earthquake loading. Earthquake load and wind load Analysis of multi -storied buildings as per Indian Standards. **(Contemporary Issues related to Topic)**		
Unit:2	**Analysis and Design of Shear wall**	**6 Hours**
Introduction to Frame – shear wall buildings, Mathematical modeling of buildings with different Structural systems. Analysis & Design of shear walled buildings with ductile detailing as per IS 13920-2016.**(Contemporary Issues related to Topic)**		
Unit:3	**Special aspects in multi-storey buildings**	**6 Hours**
Special aspects in multi-Story buildings like effect of torsion, flexible first storey, P- delta effect, Soil – Structure Interaction on building response, drift limitations. **(Contemporary Issues related to Topic)**		
Unit:4	**Ductility considerations in earthquake resistant design of RCC buildings**	**7 Hours**
Ductility of reinforced members subjected to flexure. Design of braced columns using Indian Standards. **(Contemporary Issues related to Topic)**		
Unit :5	**Analysis of multi-storeyed buildings with bracings & infills**	**7 Hours**
Analysis and Design of multi-storeyed buildings with bracings & masonry in fills, Design of Beam - Column joints for ductile behaviours as per IS code provisions. **(Contemporary Issues related to Topic)**		
Unit :6	**Seismic Design of Diaphragm.**	**6 Hours**
Seismic Design Philosophy, Introduction to Diaphragm. Seismic Design of Floor Diaphragm. **(Contemporary Issues related to Topic)**		
	Total Lecture	**39 Hours**

Text Books	
1.	Agrawal &Shrikhande, Design of Earthquake Resistant Structures, 3 rd 2006, Prentice – Hall of India Pvt. Ltd
2.	Paulay, T. & Prestiley M.J.N., Seismic design of R C & Masonry Buildings, 2nd 1999, John Willey & Sons
3.	Asadour H. Hadjian, Basic Elements of Earthquake Engineering, 2015, Wiley
4.	S.K.Duggal, "Earthquake Resistant Design of Structures." 2004

Reference Books	
1	C.V.R. Murty, Earthquake Tips, 2005, NICEE, IITK
2	Robin K. McGuire, Seismic Hazard and Risk Analysis, 2004, Earthquake Engineering Research Institute; First edition.
3	Roberto Villaverde, Fundamental Concepts of Earthquake Engineering, 2009, CRC Press
4.	FarzadNaeim, Handbook on Seismic Analysis and Design of Structures, Kluwer Academic Publisher, 2001
5.	Booth, E., Concrete Structures in Earthquake Regions, Longman Higher Education, 1994

YCCE e - library book links [ACCESSIBLE FROM COLLEGE CAMPUS]	
1	http://link.springer.com/openurl?genre=book&isbn=978-3-540-93817-0
2	https://drive.google.com/file/d/1WeI4wzsbzGqd-UGra1CWukcROIujg7jQ/view?usp=drive_web&authuser=2
3	https://drive.google.com/file/d/1sI5ppMZJX0OTN1cGHKjPBz8IANkzSAbR/view?usp=drive_web&authuser=2

MOOCs Links and additional reading, learning, video material	
1.	https://www.nicee.org/EQTips.php
2.	https://archive.nptel.ac.in/courses/105/104/105104200/
3.	https://archive.nptel.ac.in/courses/105/101/105101004/

II Semester
25STR232– PE-II : Composite Structures

Course Outcomes :
Upon successful completion of the course the students will be able to 1. Relate the basic concepts and characteristics of Composite materials. 2. Examine elastic behavior of lamina. 3. Interpret various failure theories. 4. Analyse laminated plates under bending and vibration

Unit:1	**Composite materials**	**7 Hours**
Introduction: definition, Classification and characteristics of Composite materials, advantages and limitations. Current Status and Future Prospects; Basic Concepts and characteristics: Homogeneity and Heterogeneity, Isotropy, Orthotropy and Anisotropy; **(Contemporary Issues related to Topic)**		
Unit:2	**Elastic Behaviour of Laminates.**	**6 Hours**
Characteristics and configurations of lamina, laminate, micromechanics and macro-mechanics. Constituent materials and properties; Elastic behavior of unidirectional lamina: Anisotropic, separately orthotropic and transversely isotropic materials, **(Contemporary Issues related to Topic)**		
Unit:3	**stress-strain behavior of laminates**	**6 Hours**
Stress-strain relations for thin lamina, transformation of stress and strain, transformation of elastic parameters, Strength of unidirectional lamina. **(Contemporary Issues related to Topic)**		
Unit:4	**Failure theories of laminates**	**7 Hours**
Macro-mechanical failure theories- Maximum stress theory, maximum strain theory, Deviatoric strain energy theory (Tsai-Hill), Interactive tensor polynomial theory (Tsai-Wu) **(Contemporary Issues related to Topic)**		
Unit :5	**Elastic Behavior of multidirectional laminates**	**7 Hours**
Elastic Behavior of multidirectional laminates: Basic assumptions, Stress-strain relations, load deformation relations, symmetric and balanced laminates, laminate engineering properties. **(Contemporary Issues related to Topic)**		
Unit :6	**Bending and vibration of laminated plates**	**6 Hours**
Bending and vibration of laminated plates: Governing equations, Deflection of simply supported rectangular symmetric angle-ply, especially orthotropic, anti-symmetric cross-ply laminates. Recent advances: Functionally graded materials, Smart materials **(Contemporary Issues related to Topic)**		
	Total Lecture	**39 Hours**

Text Books	
1.	R.M. Jones, Mechanics of Composite materials, Taylor and Francis, 1999.
2.	M. Daniel and O. Ishai, Engineering mechanics of Composite materials, Oxford university press, 1999

Reference Books	
1	P.K. Mallick, Fiber-reinforced Composites, Marcel Dekker Inc, 1988.
2	D. Hull and T.W. Clyne, An introduction to composite materials, Cambridge university press, Second Edition, 1996.
3	J.N. Reddy, Mechanics of laminated composite plates and shells-Theory and Analysis, CRC Press, BocaRaton, Second Edition, 2003.

YCCE e - library book links [ACCESSIBLE FROM COLLEGE CAMPUS]	
1	https://onlinelibrary.wiley.com/doi/book/10.1002/9780470168042

MOOCs Links and additional reading, learning, video material	
1.	https://nptel.ac.in/courses/101104010

II Semester
25STR233 – PE-II : RC Bridge Design

Course Outcomes :
Upon successful completion of the course the students will be able to
1. Explain different types of RC bridges and factors influencing their selection including hydraulic considerations.
2. Analyze and apply IRC design loads, impact factors, and other relevant loads in bridge design.
3. Design reinforced concrete slab bridges and analyze substructures such as abutments and piers.
4. Design appropriate types of bearings based on site conditions.

Unit:1	**Types of RC Bridges**	**7 Hours**
Types of RC bridge superstructure and introduction to their design, choice of type of bridges. Hydraulic Design: Importance of Hydraulic Factors in Bridge Design. **(Contemporary Issues related to Topic)**		
Unit:2	**Design Loads**	**6 Hours**
IRC Loads, Analysis of IRC Loads, Impact factors, Other loads to be considered in Bridge Design. **(Contemporary Issues related to Topic)**		
Unit:3	**Design of Slab bridge**	**7 Hours**
Reinforced concrete slab bridge, Effective width method, Dispersion length. Thrust Bed, Box Casting and Pushing techniques. **(Contemporary Issues related to Topic)**		
Unit:4	**Guidelines for Seismic Design of RC Bridges**	**6 Hours**
Seismic design philosophy for Bridges, Capacity design concept. Behavior Retaining wall. **(Contemporary Issues related to Topic)**		
Unit:5	**Analysis of Substructure**	**7 Hours**
Abutments, Stability Analysis of Abutments, Piers, Analysis of Piers. **(Contemporary Issues related to Topic)**		
Unit :6	**Bridge Bearings**	**6 Hours**
Bearings, Forces on Bearings, Types of Bearings, Basis for Selection of Bearings. **(Contemporary Issues related to Topic)**		
	Total Lecture	**39 Hours**

Text Books	
1	Jagdeesh R. and Jairam M., — Design of bridgesǁ, PHI Publication New Delhi, 2nd edition,
2	N. Krishna Raju, Design of bridges, Oxford & IBH publishing Co. Ltd., New Delhi.
3	D. Johnson Victor, Essentials of bridge engineering, Oxford & IBH publishing Co. Ltd., New Delhi.

Reference Books	
1	IRC: 5 -1970, Standard specifications and code of practice for road bridges, Sections I to V, Indian Roads Congress, New Delhi.
2	IRC 006, Standard Specifications and Code of Practice for Road Bridges, Section II – Loads and Stresses (Fourth Revision), 2014.
3	Chen, W.F. and Duan, L., Bridge Engineering Handbook, CRC Press, 1999
4	Hambly, E.C., Bridge deck behaviour, Chapman and Hall, London
5	O'Brien E.J. and Keogh D.L., Bridge deck analysis, E& FN Spon, New York
6	IRC: 5 -1970, Standard specifications and code of practice for road bridges, Sections I to V, Indian Roads Congress, New Delhi.

YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]	
1	http://103.152.199.179/YCCE/Suported%20file/Supprted%20file/e-copies%20of%20books/Civil%20Engineering/61.%20Bridge+Engineering+Handbook-+Seismic+Design,+Second+Edition-%20By%20EasyEngineering.net.pdf
2	https://onlinelibrary.wiley.com/doi/10.1002/9781118927595.ch2
3	https://link.springer.com/chapter/10.1007/3-540-32391-0_74
4	https://link.springer.com/chapter/10.1007/978-3-642-27963-8_21

MOOCs Links and additional reading, learning, video material	
1	https://nptel.ac.in/courses/105105165
2	https://archive.nptel.ac.in/courses/105/105/105105165/
3	https://nptel.ac.in/courses/105105216

II Semester
25STR241 – PE-III : Plastic Analysis & Design of Steel Structures

Course Outcomes:
Upon successful completion of the course the students will be able to
1. Explainthe behavior of steel structure elements and basic concepts of plastic analysis
2. Apply techniques for estimation of collapse loads on steel structures
3. Analyze the effects of axial and shear forces on plastic moment of resistance.
4. Implement philosophies of plastic design of steel structural elements

Unit:1	**Introduction to Plastic Analysis**	**7 Hours**
Plastic behavior, review curves of structural steel, plastic moments, shape factors, load factors, plastic hinge, types of collapse, collapse mechanism, collapse load factor, step by step method.		
Unit:2	**Basic Theorems and Collapse Load Factor**	**7 Hours**
Upper and lower bound, uniqueness theorem, principle of virtual work, statical method, minimum and maximum theorems, Determination of collapse load factor for beams and portal frames.		
Unit:3	**Methods of Plastic Design**	**6 Hours**
Methods of release of restrains, load interaction diagrams, method of inequalities.		
Unit:4	**Plastic Moment Distribution Method**	**6 Hours**
Plastic Moment distribution applied to continuous beams & portal frames (Max. two bays single story).		
Unit:5	**Effect of Shear Force**	**7 Hours**
Effect of Axial force & Shear force on Plastic moment of resistance, Design of simply supported and continuous beams.		
Unit :6	**Design of Portal Frame**	**6 Hours**
Design of portal frames up to single storey – two bays. Minimum weight design. **(Contemporary Issues related to Topic)**		
	Total Lecture	**39 Hours**

Text Books	
1	Steel Skeleton, J. F. Baker, Volume II, 1st edition Cambridge University Press 1956
2	B.G. Neal – Plastic Method of Structural Analysis,3rd edition, Chapman & Hall,1997

Reference Books	
1	"Limit state Design of Steel Structures", S K Duggal, 2nd edition McGraw Hill education, 2014
2	"Limit State Design of Steel Structures", Dr. M R Shiyekar, 2nd edition, PHI Publication,2013
3	A.S. Arya and J.L. Ajmani – Design of Steel Structures, Nem chand & Bros., Roorke,1996
4	Ramchandra – Design of Steel Structures Vol – II, Standard Book House, Delhi,2011
5	L.S. Beedle – Plastic Design of Steel Frames, John Willey & Sons.1958
6	Structural design in steel by Salwar Alam Raz New Age International Publishers,2003
7	Steel Designers Manual –, 6th edition, ELBS,2003

General Reading Suggested:

1	Codes: IS: 800 - 2007 Code of Practice for General Construction in Steel Hand books
2	SP: 6 (6) – 1972 Handbook for Structural Engineers: Application of plastic Theory in Design of Steel Structures
3	Handbook for Structural Engineers SP 6 (8) 1972 (Reaffirmed 1993) – Bureau of Indian Standards.
4	Teaching Resource for Structural Steel Design – INSDAG Kolkatta

YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]	
1	http://103.152.199.179/YCCE/Suported%20file/Supprted%20file/e-copies%20of%20books/Civil%20Engineering/

MOOCs Links and additional reading, learning, video material	
1	https://archive.nptel.ac.in/courses/114/105/114105031/

II Semester
25STR242 – PE-III : Seismic Analysis & Design of Structures

Course Outcomes :
Upon successful completion of the course the students will be able to 1. Apply basic concepts Earthquake resistant design in construction industry. 2. Illustrate the Damages caused to the structures due to past earthquake and remedial measures. 3. Analyze and design of building components for earthquake forces. 4. Implement codal provisions related to static as well as dynamic analysis of RC and Steel buildings.

Unit:1	**Earthquake Resistance Design Philosophy**	**7 Hours**
Basics of ERDS, Performance of RC buildings, behavior of RC buildings in past earthquakes, influence of unsymmetry, infill walls, foundations, soft story, confinement of concrete. **(Contemporary Issues related to Topic)**		
Unit:2	**Ductile Detailing of Beam-Column Joint**	**7 Hours**
Review of IS 1893:2016 Part I -Capacity Based Design concept - Design for Strong column & weak beam, Design of Beam-Column Joints. **(Contemporary Issues related to Topic)**		
Unit:3	**Ductile Detailing of RC-Beam**	**7 Hours**
Behavior and failures of RC beam and recommendation for it, Ductile Deatiling of RC Beam. **(Contemporary Issues related to Topic)**		
Unit:4	**Analysis & Design of shear wall**	**6 Hours**
Lateral load Resisting System, Types of Shear Wall, Analysis & Design of shear walled buildings with ductile detailing as per IS 13920-2016. **(Contemporary Issues related to Topic)**		
Unit:5	Basics of Steel Design.	**7 Hours**
Performance of steel structures in past earthquakes-Seismic behavior of steel structures - design philosophy for steel structures, Basics of Steel Design. **(Contemporary Issues related to Topic)**		
Unit:6	**ERDS of steel structures.**	**7 Hours**
Capacity design concept, Ductility of steel buildings- Stability considerations. **(Contemporary Issues related to Topic)**		
	Total Lecture	**39 Hours**

Text Books	
1	Agrawal P. & ,Shrikhande M., Earthquake Resistant Design of Structures, Prentice hall India, New Delhi, 4th Edition, 2007.
2	Mazzolani, F.M.; &Piluso Theory and Design of Seismic Resistant Steel Frames E&FN Spon

Reference Books	
1	Paulay, T. &Prestiley, M.J.N., Seismic design of R C & Masonry Buildings, John Willey & Sons; 2nd Edition, 1999
2	Farzad Naeim, Handbook on Seismic Analysis and Design of Structures, Kluwer Academic Publisher, 2001
3	Booth, E., Concrete Structures in Earthquake Regions, Longman Higher Education, 1994

YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]	
1	http://103.152.199.179/YCCE/Suported%20file/Supprted%20file/e-copies%20of%20books/Civil%20Engineering/20.%20Matrix%20methods%20of%20structural%20analysis%20(%20PDFDrive%20)-ebook.pdf

MOOCs Links and additional reading, learning, video material	
1	https://nptel.ac.in/courses/105107204

II Semester
25STR243 – PE-III : Design of Industrial Structures

Course Outcomes :
Upon successful completion of the course the students will be able to 1. Comprehend the industrial structure planning. 2. Analyze and design the large span of industrial structures. 3. Analyze and design bunkers, and silos 4. Analyze and design foundations for industrial structures

Unit I: Planning of industrial structures	**9 Hours**
Classification of industries and local regulations, Factors affecting planning, General Aspects, Civil Engineering Aspects, Light and Ventilation **(Contemporary Issues related to Topic)**	
Unit II: Large span structures in industries	**10 Hours**
Cable roofs, Types of cable roofs, Analysis of a cable subjected to concentrated loads and uniformly distributed load, Complexities in the analysis of a cable roof, Overview of deep beams, Virrendel Girder, Castellated Girders, **(Contemporary Issues related to Topic)**	
Unit III: Silos and Bunkers	**10 Hours**
Concept of Angle of Repose, Pressure distribution, Dynamic loads, Stability of bunkers, Foundations. **(Contemporary Issues related to Topic)**	
Unit IV: Foundations for Industrial Structures	**10 Hours**
Machine foundations, General requirements, Design criteria, General analysis, Design of a block foundation for vertical compressor, Vibration Isolation, Foundations for Chimney and Microwave Towers. **(Contemporary Issues related to Topic)**	
Total Lecture	**39 Hours**

Text Books	
1.	Srinivasula P., "Handbook of Machine Foundation", Tata Mc. Graw Hill Publications, New Delhi, India.
2.	Ramchandra, "Design of Steel Structures", Standard Book House, New Delhi, India.

Reference Books:	
1.	Raghupati M., "Design of Steel Structures", Tata Mc. Graw Hill Publication, Delhi, India.
2.	Dayaratnam P., "Design of Steel Structures", Wheelr's Publishers, Allahabad, India.
3.	Anand Arya & Ajmani J. L., "Design of Steel Structures", Nemchand & Bros., Roorkee, U.P., India, India.
4.	Lambert F.W., "The Theory & Practical Design of Bunkers", British Constructional Steelwork Association Ltd., London, UK.
5.	IS 800:2007, "Indian Standard, Code of Practice for General Construction in Steel", Bureau of Indian Standards, Bureau of Indian Standards (BIS), New Delhi, India.
6.	IS 875 (Part-I), "Indian Standard, Code of practice for design loads (other than earthquake) for buildings and structures", Part-I, Dead loads, Bureau of Indian Standards (BIS), New Delhi, India.
7.	IS 875 (Part-II), "Indian Standard, Code of practice for design loads (other than earthquake) for buildings and structures", Part-II, Imposed loads, Bureau of Indian Standards (BIS), New Delhi, India.
8.	IS 875 (Part-III), "Indian Standard, Code of practice for design loads (other than earthquake) for buildings and structures", Part-III, Wind load, Bureau of Indian Standards (BIS), New Delhi, India.
9.	IS 6533 (Part-I), "Indian Standard, Design, and construction of steel Chimney code of practice", Part-I Mechanical aspect, Bureau of Indian Standards (BIS), New Delhi, India.
10.	IS 6533 (Part-II), "Indian Standard, Design, and construction of steel Chimney code of practice", Part-II Structural aspect, Bureau of Indian Standards (BIS), New Delhi, India.
11.	SP 6 (I), "Handbook for Structural Engineers", Bureau of Indian Standards, New Delhi, India.
12.	SP 38, "Handbook of Typified Design for Structures with steel roof trusses (with and without cranes)", Bureau of Indian Standards (BIS), New Delhi, India.
13.	SP 40, "Handbook on Structures with Steel Portal Frames (without cranes)", Bureau of Indian Standards (BIS), New Delhi, India.
14.	SP 64, "Explanatory Handbook on Indian Standard Code of Practice for Design Loads (Other than Earthquake) for Buildings and Structures", Part-III Wind Loads, Bureau of Indian Standards (BIS), New Delhi, India.

YCCE e- library book links [Accessible from college campus]	
1.	http://link.springer.com/openurl?genre=book&isbn=978-1-4613-5864-0

MOOCs Links and additional reading, learning, video material	
1.	https://archive.nptel.ac.in/courses/105/105/105105162/
2.	https://youtu.be/Om6ICuhwBo0
3.	https://www.youtube.com/watch?v=Ch2vAzvXbKI

III Semester
25STR301 – Project Phase-I

Course Outcomes :
Upon successful completion of the course the students will be able to
1. Explain the advances in structural engineering
2. Apply the modern tools and techniques.
3. Act independently and in a team for effective communication.
4. Establish the importance of lifelong learning

S.N.	Contents
1	Literature review on current topic related to the structural engineering.
2	Preparation and presentation of progress seminars on topic selected for dissertation.
3	Submission of project report including introduction, literature review, objective and scope of investigation and pilot studies carried out during the semester.

IV Semester
25STR401 – Project Phase-II

Course Outcomes :
Upon successful completion of the course the students will be able to
1. Explain the advances in structural engineering.
2. Apply the modern tools and techniques.
3. Act independently and in a team for effective communication and life-long learning
4. Solve real world structural engineering problems

S.N.	Contents
1	The of detailed study of a work including collection and analysis of data, determining solution, design, scientific research on topic selected for dissertation.
2	Preparation and presentation of progress seminars on topic selected for dissertation.
3	Submission of project report on the entire studies carried out during the semester