WALCHAND INSTITUTE OF TECHNOLOGY, SOLAPUR
(AN AUTONOMOUS INSTITUTE)

Affiliated to
Punyashlok Ahilyadevi Holkar Solapur University, Solapur

CHOICE BASED CREDIT SYSTEM (CBCS)

Structure and Syllabus for
M.Tech. in Civil Structural Engineering

SCHEME-24

F. Y. M. Tech. Civil (Structural Engineering) W.E.F. 2024-25
S. Y. M. Tech. Civil (Structural Engineering) W.E.F. 2025-26

HEAD,
Department of Civil Engineering
Walchand Institute of Technology,
SOLAPUR-413006.

Dr. Mrs. M. A. Nirgude
Dean Academics

Walchand Institute of Technology, Solapur

Department of Civil Engineering

F.Y. M. Tech. Civil (Structural Engineering) (W.E.F. 2024-25)

Syllabus Structure-(Scheme-24)

Semester-I

Course Code	*Name ofthe Course*	*Engagement Hrs*			*Credits*	*SA*	*FA*		*Total*
		L	*T*	*P*		*ESE*	*ISE*	*ICA*	
SEP1CC1	Advanced Structural Analysis	3	-	-	3	60	40	-	100
SEP1CC2	Advanced Solid Mechanics	3	1	-	4	60	40	25	125
SEP1CC3	Structural Dynamics	3	-	-	3	60	40	-	100
SEP1CC4	Research Methodology and IPR	3	1	-	4	60	40	25	125
SEP1CE1N*	Core Elective- I	3	1	-	4	60	40	25	125
SEP1SM1	Seminar on Computer aided Structural Design	-	-	4	2	-	-	50	50
	Grand Total	**15**	**3**	**4**	**20**	**300**	**200**	**125**	**625**

N* indicates the serial number of electives offered in the respective category

Course Code	*Name of the Course*	*Engagement Hours*			*Credits*	*SA*	*FA*		*Total*
		L	T	*P*		*ESE*	*ISE*	*ICA*	
CMP1AC	Yoga for Stress Management	2	-	-	-	50	-	-	50

Core Elective-I

Course code	Course Title
SEP1CE11	Advanced Design of Concrete Structures
SEP1CE12	Design of Formwork
SEP1CE13	Advanced Design of Foundation
SEP1CE14	Structural Optimization

Walchand Institute of Technology, Solapur

Department of Civil Engineering

F.Y. M. Tech. Civil (Structural Engineering) (W.E.F. 2024-25)

Syllabus Structure-(Scheme-24)

Semester-II

Course Code	*Name of the Course*	*Engagement Hrs*			*Credits*	*FA*	*SA*		*Total*
		L	*T*	*P*		*ESE*	*ISE*	*ICA*	
SEP2CC5	Finite Element Method	3	-	-	3	60	40	-	100
SEP2CC6	Theory of Plates and Shells	3	1	-	4	60	40	25	125
SEP2CC7	Seismic Design of Multistoried Buildings	3	-	-	3	60	40	-	100
SEP2CE2N*	Core Elective – II	3	-	-	3	60	40	-	100
SEP2CE3N*	Core Elective – III	3	-	-	3	60	40	-	100
SEP2CC6	Advanced Concrete Technology Lab.	-	-	2	2	-	-	50	50
SEP2SMP2	Seminar on Mini Project work	-	-	2	2	-	-	50	50
	Grand Total	**15**	**1**	**4**	**20**	**300**	**200**	**125**	**625**

Note: -Students have to compulsorily undergo internship of one month after the Semester-II (in the summer vacation). The evaluation of the same will be carried out at the end of semester – III.

Core Elective-II

Course code	Course Title
SEP2CE21	Theory of Structural Stability
SEP2CE22	Design of RCC Bridges
SEP2CE23	Advanced Steel Design
SEP2CE24	Soil Structure Interaction

Core Elective-III

Course code	Course Title
SEP2CE31	Design of Prestressed Concrete Structures
SEP2CE32	Structural Audits
SEP2CE33	Concrete Composites
SEP2CE34	Design of Industrial Structures
SEP2CE35	Design of Tall buildings

Note: -For Open Elective course, students should enroll for one of the minimum 8 weeks duration courses offered by SWAYAM / NPTEL platform. They should complete its assignments and appear for certificate examination conducted by SWAYAM / NPTEL. Students should pass the examination till the end of Semester IV. Based on the marks obtained in the assignments and examination; credits will be transferred in Semester IV. The list of courses will be provided by the Board of Studies.

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S.Y. M. Tech. Civil (Structural Engineering) (W.E.F. 2025-26)

Syllabus Structure-(Scheme-24)

Semester-III

Course Code	*Name of the Course*	*Engagement Hrs*			*Credits*	*SA*	*FA*		*Total*
		L	*T*	*P*		*ESE*	*ISE*	*ICA*	
CMP3IK	Indian Science and Technology	2	-	-	2	-	50	-	50
SEP3IN	Intership	-	-	-	3	-	-	100	100
SEP3DS1	Dissertation Phase-I	-	-	30	15	-	200	150	350
	Total	**2**	**-**	**30**	**20**	**-**	**250**	**250**	**500**

Note: -Students mandatorily undergo internship of one month after the Semester-II (in the summer vacation). The evaluation of the same will be carried out at the end of semester – III.

Walchand Institute of Technology, Solapur

S.Y. M. Tech. Civil (Structural Engineering) (W.E.F. 2025-26)

Syllabus Structure-(Scheme-24)

Semester-IV

Course Code	*Name of the Course*	*Engagement Hrs*			*Credits*	*SA*	*FA*		*Total*
		L	*T*	*P*		*ESE*	*ISE*	*ICA*	
CMP4OE1N*	Open Elective (SWAYAM / NPTEL MOOC) #	-	-	-	4	-	-	-	-
SEP4DS2	Dissertation Phase-II	-	-	**32**	16	200	-	200	400
	Total	**-**	**-**	**32**	**20**	**200**	**-**	**200**	**400**

N* indicates course serial number of elective offered in the respective category

Note: -

For Open Elective course, students should enroll for one of the minimum 8 weeks duration course offered by SWAYAM / NPTEL platform. They should complete their assignments and appear for certificate examination conducted by SWAYAM / NPTEL. Students should pass the examination till the end of Semester IV. Based on the marks obtained in the assignments and examination; credits will be transferred in Semester IV. The list of courses will be provided by the Board of Studies.

As per the instruction provided in Semester II structure, the credits obtained by the students for the SWAYAM / NPTEL course will be transferred in this semester.

Walchand Institute of Technology, Solapur

F. Y. M. Tech Civil (Structural Engineering) – Semester-I

SEP1CC1 -ADVANCED STRUCTURAL ANALYSIS

Teaching Scheme:
Lectures: 3 hours per week, 3 Credits

Examination Scheme:
ESE: 60 marks

ISE: 40 marks

Course outcome: At the end of the course, students will be able to,

1. Draw ILD for indeterminate structures
2. Analyze the beams curved inplan
3. Analyze the structure resting on elastic foundation
4. Analyze the skeleton structures using stiffness method

SECTION-I

Unit 1 -Influence Line Diagrams for Indeterminate Structures **[8Hrs]**

Continuous beams, portal frames and two hinged arches. Muller- Breslau's Principle and Moment Distribution Method

Unit 2- Beams curved in plane **[5Hrs)**

Determinate and indeterminate beams curved in plan.

Unit 3- Beams on elastic foundations **[8Hrs]**

Analysis of infinite, Semi-infinite and finite beams

SECTION-II

Unit 4- Beam columns **[6Hrs]**

Concept of geometric and material non linearity, Governing differential equation, Analysis of beam- columns subjected to different loadings and support conditions, Stiffness and carry-over factors for beam-columns, fixed endactions due to various loads

Unit 5- Stiffness method of structural analysis [10Hrs]

Analysis of continuous beams, trusses and plane frames by structure oriented stiffness approach.

Unit 6- Member oriented stiffness Method [6Hrs]

Stiffness matrices of beam, truss, plane frame, grid, pin and rigid jointed space frame elements on member axes. Transformation of matrices on structure axes. Over-all joint stiffness matrix and nodal load vector, assembly rules, Calculation of member end forces, Bandwidth.

INTERNAL CONTINUOUS ASSESSMENT (ICA)

ICA shall be based upon Problems/ tutorials based on topics in the curriculum.

TEXT BOOKS:

1. Advanced Theory of Structures by Vazirani and Ratwani.
2. Analysis of structure by Vazirani and Ratwani, Vol.II
3. Mechanics of Structures Vol. I, II and III by Junnarkar and Shah.

REFERENCE BOOKS:

1. Structural Analysis by Negi and Jangid
2. Theory of Elastic Stability by Timoshenko and Gere.
3. Matrix Analysis of Framed structures by Gere and Weaver.
4. Structural Analysis–A Matrix approach by Pandit and Gupta.
5. Basic structural Analysis by C. S. Reddy.

Walchand Institute of Technology, Solapur

F. Y. M. Tech Civil (Structural Engineering) – Semester-I

SEP1CC2 -ADVANCED SOLID MECHANICS

Teaching Scheme:	**Examination Scheme:**
Lectures: 3 hours per week, 3 Credits	ESE: 60 marks
Tutorial: 1 hour per week, 1 Credit	ISE: 40 marks ICA: 25 marks

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

1. Identify and Solve problems of elasticity understanding the basic concepts
2. Apply numerical methods to solve continuum problems.
3. Identify and Solve problems of plasticity understanding the basic concepts.

SECTION- I

Unit 1- Introduction to Elasticity **[6Hrs]**

Displacement, Strain and Stress Fields, Constitutive Relations, Cartesian Tensors and Equations of Elasticity

Unit 2- Three-Dimensional Problems of Elasticity **[10Hrs]**

Elementary Concept of Strain, Stain at aPoint, Principal Strains and Principal Axes, Compatibility Conditions, Stress at a Point,Stress Components on an Arbitrary Plane, Differential Equations of Equilibrium, Hydrostatic and Deviatoric Components, Equations of Equilibrium, Stress- Strain relations, Strain Displacement and Compatibility Relations.

Unit 3- Two-Dimensional Problems of Elasticity **[6Hrs]**

Plane Stress and Plane Strain Problems, Airy's stress Function, Two-Dimensional Problems in Polar Coordinates.

SECTION- II

Unit 4- Torsion of Prismatic Bars **[8Hrs]**

Saint Venant's Method, Prandtl's Membrane Analogy, Torsion of Rectangular Bar, Torsion of Thin Tubes

Unit 5- Plastic Deformation **[7Hrs]**

Strain Hardening, Idealized Stress- Strain curve, Yield Criterion, Von Mises Yield Criterion

Unit 6- Plastic Deformation **[7Hrs]**

Tresca Yield Criterion, Plastic Stress-Strain Relations, Principle of Normality and Plastic Potential, Isotropic Hardening

INTERNAL CONTINUOUS ASSESSMENT (ICA)

ICA shall be based upon Problems/ tutorials based on topics in the curriculum.

TEXT BOOKS:

1. Theory of Plasticity by Chakraborty

REFERENCE BOOKS:

1. Theory of Elasticity: Timoshenko S. and Goodier J. N., McGraw Hill,1961.
2. Elasticity: Sadd M.H., Elsevier,2005.
3. Engineering Solid Mechanics: Ragab A.R., Bayoumi S.E., CRC Press,1999.
4. Computational Elasticity: Ameen M., Narosa,2005.
5. Solid Mechanics: Kazimi S. M. A., Tata McGraw Hill,1994.
6. Advanced Mechanics of Solids: Srinath L.S., Tata McGraw Hill,2000.
7. Introduction to Mechanics of Solids by Venkatraman &Patel

Walchand Institute of Technology, Solapur

F. Y. M. Tech Civil (Structural Engineering) – Semester-I

SEP1CC3 -STRUCTURAL DYNAMICS

Teaching Scheme	**Examination Scheme:**
Lectures: 3 hours per week, 3Credits	**ESE**:60 marks
	ISE: 40 marks

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

1. Analyze dynamic response of SDOF system using fundamental theory and equation of motion
2. Analyze dynamic response of MDOF system using fundamental theory and equation of motion
3. Analyze beams in flexure by applying the theory of free and forced vibration

SECTION-I

Unit 1- Single-Degree-of-Freedom System [9Hrs]

Single-Degree-of-Freedom System, Analysis models, Equations of motion, Free vibration, Damping, Types of Damping, Response to harmonic loading, Resonance, Support motion, Transmissibility, Vibration isolation

Unit 2- SDOF systems subjected to periodic and impulsive loading [7Hrs]

SDOF systems subjected to periodic and impulsive loading, and other different loading conditions, introduction to frequency-Domain Analysis.

Unit 3- SDOF system subjected to general dynamic loading [6Hrs]

SDOF system subjected to general dynamic loading, Numerical evaluation of SDOF – Duhamal's Integral, Application to simple loading cases

SECTION-II

Unit 4- MDOF System, Selection of DOFs **[8Hrs]**

MDOF System, Selection of DOFs, Formulation of Equation of motion, Structure matrices, Static condensation, Free vibrations, Frequencies and Mode Shapes, Determination of natural frequencies and mode shapes, Orthogonality conditions.

Unit 5- Discrete systems **[8Hrs]**

Discrete systems, Fundamental mode analysis, Rayleigh method, Dunkerly's Method, Response of MDOF systems to dynamic loading, Mode superposition Method.

Unit 6- Distributed Parameter Systems **[6Hrs]**

Distributed Parameter Systems, Partial differential equations of motion, free and forced vibrations, Application to beams in flexure.

INTERNAL CONTINUOUS ASSESSMENT (ICA)

ICA shall be based upon Problems/ tutorials based on topics in the curriculum.

TEXT BOOK:

1. Structural Dynamics–Mario Paz

REFERENCE BOOKS:

1. Dynamics of structures- R.W. Clough and J.Penxiene, McGraw-Hill Pub.
2. Structural Dynamics–Roy Craig, John-Wiley & Sons
3. Dynamics of Structures–Theory & Application to Earthquake Engineering- A.K. Chopra, Prentice Hall Publications
4. Dynamics of Structures–Mukhopadhyay
5. Elements of Earthquake Engineering by Jaikrishna, A.R. Chandrashekharan, Brijesh Chandra, Standard Publishers &Distributors.

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F. Y. M. Tech Civil (Structural Engineering) – Semester-I

SEP1CC4 - RESEARCH METHODOLOGY AND IPR

Teaching Scheme:	**Examination Assessment Scheme:**
Lectures: 3 hours per week, 3 Credits	ESE: 60 marks
Tutorial: 1 hour per week, 1 Credit	ISE: 40 marks ICA:25 marks

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

1. Propose and distinguish appropriate research designs and methodologies for specific research project.
2. Develop skills in literature review, qualitative and quantitative data analysis and presentation.
3. Describe the importance of Computers, Information Technology in research and also highlight the significance of ideas, concept, and creativity in research.
4. Illustrate the importance of Intellectual Property Rights in growth of individuals & nation.
5. Exhibit knowledge about IPR protection, providing an incentive to inventors for further research work leading to creation of new and better products.

SECTION-I

Unit 1- Introduction **[6Hrs]**

Defining Research, Scientific Enquiry, Hypothesis, Scientific Method, Types of Research, Research Process and steps in it. Research Proposals – Types, contents, sponsor agent's requirements, Ethical, Training, Cooperation and Legal aspects

Unit 2- Research Design **[6Hrs]**

Meaning, Need, Concepts related to it, categories; Literature Survey and Review, Dimensions and issues of Research Design, Research Design Process – Selection of type of research, Measurement and measurement techniques, Selection of Sample, Selection of Data Collection Procedures, Selection of Methods of Analysis, Errors in Research

Unit 3- Research Problem **[6Hrs]**

Problem Solving – Types, Process and Approaches – Logical, Soft System and Creative; Creative problem-solving process, Development of Creativity, Group Problem Solving Techniques for Idea Generation – Brain storming and Delphi Method.

SECTION-II

Unit 4- Nature of Intellectual Property **[8Hrs]**

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

Unit 5- Patent Rights **[5Hrs]**

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

Unit 6- New Developments in IPR **[5Hrs]**

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

REFERENCE BOOKS:

1. Krishnaswamy, K.N., Sivakumar, AppaIyer & Mathirajan M., (2006) - Management Research Methodology: Integration of Principles, Methods & Techniques (New Delhi, Pearson Education)
2. Montgomery, Douglas C. (2004) – Design & Analysis of Experiments, (New York, John Wiley &Sons)
3. Kothari, C.K. (2004) – Research Methodology, Methods & Techniques, (New Delhi, New Age International Ltd. Publishers).
4. Prabuddha Ganguli, IPR: Unleashing the Knowledge Economy, published by Tata McGraw Hill2001.
5. John W Cresswell, (2009)-Research Design: Qualitative, Quantitative and Mixed Methods

Approaches, (Sage Publications Pvt Ltd. 3rd Edition.)

6. Ranjit Kumar, 2nd Edition, “Research Methodology: A Step-by-Step Guide for beginners”
7. Halbert, “Resisting Intellectual Property”, Taylor & Francis Ltd,2007.
8. Robert P. Merges, Peter S. Menell, Mark A. Lemley, “Intellectual Property in New Technological Age”,2016.

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F. Y. M. Tech Civil (Structural Engineering) – Semester-I

SEP1CE11- CORE ELECTIVE- I

ADVANCED DESIGN OF CONCRETE STRUCTURES

Teaching Scheme:	**Examination Scheme:**
Lectures: 3 hours per week, 3 Credits	**ESE**: 60 marks
Tutorial: 1 hour per week, 1Credit	**ISE**: 40 marks
	ICA: 25marks

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

1. Analyze and design various special types of slabs
2. Analyze and Design Combined Footing and Raft foundation
3. Analyze and Design Overhead water tanks.
4. Design of Deep beam, Corbel, Chimneys, Silos and Bunkers

SECTION-I

Unit 1- Analysis and Design of Flat slab, Grid Slab and Circular slab **[8Hrs]**

Unit 2- Analysis and Design of Combined Footing and Raft foundation **[6Hrs]**

Unit 3- Design of miscellaneous structures **[8Hrs]**

Design of Deep Beam and Corbel, design of Shear Walls

SECTION-II

Unit 4- Analysis and Design of Overhead water tank **[8Hrs]**

Rectangular and Circular with flat bottom, Design of staging for wind and seismic loads

Unit 5- Design of RCC Chimneys **[6Hrs]**

Design factors, stresses due to self-weight and wind load, Temperature stresses

Unit 6- Design of silos and bunkers **[8Hrs]**

Classification, Square bunkers and circular bunkers, Silos- Lateral pressure, Airy's theory, Shallow Bins, Deep Bins

INTERNAL CONTINUOUS ASSESSMENT (ICA)

ICA shall be based upon Problems/ tutorials based on topics in the curriculum.

TEXT BOOK:

1. Reinforced Concrete StructuresVol.1 & Vol.2 by B. C. Punmia, A. K. Jain, Arun K. Jain.

REFERENCE BOOKS:

1. Reinforced concrete, Limit state Design by Ashok K. Jain, New Chandand Bros. Roorkee.
2. Advanced Reinforced Concrete Design by P. C. Varghese- Prentice Hall of India.
3. Advanced Reinforced Concrete Design by N. Krishnaraju -CBS Publishers & Distributors.
4. Reinforced Concrete StructuresVol.1&Vol.2 by Jain and Jaikrishna.
5. Advanced Reinforced Concrete Design by Bhavikatti S.S.

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F. Y. M. Tech Civil (Structural Engineering) – Semester-I

SEP1CE12- CORW ELECTIVE- I
DESIGN OF FORMWORK

Teaching Scheme:	**Examination Scheme:**
Lectures: 3 hours per week, 3Credits	**ESE**: 60 marks
Tutorial: 1 hour per week, 1Credit	**ISE**: 40 marks
	ICA: 25marks

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

1. Select proper formwork, accessories and material
2. Design the form work for Beams, Slabs, columns, Walls and Foundations.
3. Design the form work for Special Structures
4. Design the flying formwork

SECTION-I

Unit 1- Introduction to formwork **[6Hrs]**

Types of formworks, Requirement of formwork, Selection of formwork, Trenchless technology

Unit 2- Formwork materials **[8Hrs]**

Timber, Plywood, Steel, Aluminum, Plastic, and Accessories. Types of supports, Horizontal and Vertical Formwork Supports

Unit 3- Formwork Design **[8Hrs]**

Concepts, Formwork Systems and Design for Foundations, Walls, Columns Slab and Beams

SECTION-II

Unit 4- Formwork Design for Special Structures **[9Hrs]**

Shells, Domes, Folded Plates, Overhead Water Tanks, Tower, Bridges

Unit 5- Flying Formwork **[6Hrs]**

Table Form, Tunnel Form, Slip Form, Formwork for Precast Concrete, Formwork Management

Issues – Pre- and Post-Award

Unit 6- Causes and Case studies in Formwork Failure [9Hrs]

Causes and Case studies in Formwork Failure, Formwork Issues in Multi- Story Building Construction

INTERNAL CONTINUOUS ASSESSMENT (ICA)

ICA shall be based upon Problems/ tutorials based on topics in the curriculum.

TEXT BOOK:

1. Formwork for Concrete Structures, Peurify, McGraw Hill Publication India

REFERENCE BOOKS:

1. Formwork for Concrete Structures, Kumar Neeraj Jha, Tata McGraw Hill Education.
2. IS 14687: 1999, False work for Concrete Structures - Guidelines, BIS

Walchand Institute of Technology, Solapur

F. Y. M. Tech Civil (Structural Engineering) – Semester-I

SEP1CE13 – CORE ELECTIVE– I

ADVANCED DESIGN OF FOUNDATION

Teaching Scheme:	**Examination Scheme:**
Lectures: 3 hours per week,3 Credits	**ESE**: 60 marks
Tutorial: 1 hours per week, 1 Credit	**ISE**: 40 marks
	ICA: 25marks

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

1. Evaluate Bearing capacity of soil by various theories
2. Design wall footing, strap footing, combined footing
3. Design Pile foundation for the given loading and site conditions.
4. Design simple Machine foundation.

SECTION-I

Unit 1- Theories of failure of soil **[8Hrs]**

Theories of failure of soil, Determination of ultimate bearing capacity, Dynamic bearing capacity. Different methods of design of shallow foundations for axial and eccentric load

Unit 2- Design of wall footing **[8Hrs]**

Design of wall footing, strap footing, combined footing, (Rectangular & Trapezoidal)

Unit 3- Raft foundation **[5Hrs]**

Raft foundation, different types, Design considerations and various methods of analysis of raft.

SECTION-II

Unit 4- Determination of load carrying capacity **[8Hrs]**

Determination of load carrying capacity of single pile, rock socketing, Negative skin friction, Design of axially loaded piles, design of pile groups and pile cap, under-reamed piles

Unit 5- Analysis and design **[7Hrs]**

Analysis and design of drilled piers and well foundation.

Unit 6- Dynamic response of soil **[6Hrs]**

Dynamic response of soil, criteria for satisfactory machine foundation, framed and massive foundation, Analysis and design of simple machine foundations using I. S. Code. Vibration isolation.

INTERNAL CONTINUOUS ASSESSMENT (ICA)

ICA shall be based upon Problems/ tutorials based on topics in the curriculum.

TEXT BOOK:

1. "Soil Dynamics," Shamsher Prakash, McGraw Hill Book Co.

REFERENCE BOOKS: -

1. Winterkorn H.F. and Fang H.Y. "Foundation Engineering Hand Book"-Van Nostand ReinholdCompany,1975
2. Bowles J.E. "Foundation Analysis andDesign"-McGrawHillBookCompany,1968.
3. "Vibration Analysis and Design of Foundations for Machines and Turbines" – MajorA. ColletsHoldingLtd.,1962.
4. KanyM. "Design of Raft Foundations" ElithelmEarnestandSon.1974.
5. Goodman, L.J. and Karol, R.H. "Theory and Practice of Foundation Engineering", McMillion,1968.
6. D.D. Barkar, "Dynamics of Bases & Foundation."

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F. Y. M. Tech Civil (Structural Engineering) – Semester-I

SEP1CE14-ELECTIVE- I
STRUCTURAL OPTIMIZATION

Teaching Scheme:	**Examination Scheme:**
Lectures: 3 hours per week, 3 Credits	**ESE**: 60 marks
Tutorial: 1 hour per week,1 Credit	**ISE**: 40 marks **ICA**: 25 marks

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

1. Use variational principle for optimization
2. Apply optimization techniques to structural steel and concrete members
3. Apply Linear and nonlinear optimization technique.

SECTION-I

Unit 1- Objective optimization **[7Hrs]**

Objective optimization, problem formulation, problem types, constrained and unconstrained problems, implications of risk & uncertainly mathematical programming, general problems of linear and nonlinear programming.

Unit 2- Linear Programming **[7Hrs]**

Linear Programming-Standard linear programming form, definitions and theorem, simplex method-Algorithm canonical form, improving the basis, identifying an optimal solution, locating initial basic feasible solution, examples.

Unit 3- Application of Linear Programming **[7Hrs]**

Application of Linear Programming-Problems on structural design trusses, plastic analysis of frame, weight minimization, transportation problem, duality, decomposition, parametric linear programming, integer linear programming examples.

SECTION-II

Unit 4- Non-linear optimization **[7Hrs]**

Non-linear optimization-classical optimization techniques- differential calculus-Language multipliers, Newtons Raphson approximation, Kuhn Tucker conditions, examples.

Unit 5- Geometric programming **[7Hrs]**

Geometric programming- Calculus viewpoint, polynomials, orthogonality conditions, degree of difficulty, geometric inequality, primal-dual relations, inequality constraints, examples.

Unit 6- Search techniques **[7Hrs]**

Search techniques-altering, one dimensional or sectioning search, transforming nonlinear problem into linear cutting –plane method, logarithmic transformation, graphical optimization, examples. Examples on minimum route problem, minimum cost, minimum weight, optimum design of R.C.C. sections, Structural design-frame, trusses

INTERNAL CONTINUOUS ASSESSMENT (ICA)

ICA shall be based upon Problems/ tutorials based on topics in the curriculum.

TEXT BOOK:

1. Optimization in Structures by Hemp.

REFERENCE BOOKS:

1. Foundation of Optimization by Wilde & Beighter
2. Optimization Theory & Applications by S.S.Rao
3. Mechanical foundation for design by Stark and Nicholls, Mc Graw Hill

Walchand Institute of Technology, Solapur

F. Y. M. Tech Civil (Structural Engineering) – Semester-I

SEP1SM1- COMPUTER AIDED STRUCTURAL DESIGN LAB

Lab work: -
Practical: 4 hours per week, 2Credits

Examination Scheme:
ICA: -50 marks

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

1. Design and detail all the Structural Components of Frame Buildings.
2. Design and Detail Complete Multi-Storey Frame Buildings.

COURSE CONTENT

Design and detailed drawing of complete G+ 3 structures by individual student using latest relevant IS codes and relevant application software.

INTERNAL CONTINUOUS ASSESSMENT (ICA)

ICA shall be based upon the Term work consisting Analysis and Design calculations of the problem. The student shall give the presentation at the end of semester based on his / her term work. The supervisor shall assess the term work and presentation.

Walchand Institute of Technology, Solapur

F. Y. M. Tech Civil (Structural Engineering) – Semester-I

CMP1AC - STRESS MANAGEMENT USING YOGA

Teaching Scheme:

Lectures: 2 Hrs/week

Examination Scheme:

ESE- 50 marks

Course Objectives: -

1. To train the students in the fields of Yoga and Stress management
2. To promote awareness for positive health and personality development in the student through Yoga
3. To achieve overall Good Health of Body and Mind.
4. To increase the levels of happiness.

Course Outcomes: -

At the end of the course, students will be able to

1. Manage stress through breathing, awareness, meditation, and healthy movement.
2. Achieve overall health of body and mind by overcoming stress
3. Use their bodies in a healthy way and perform well in sports and academics.
4. Build concentration, confidence, and positive self-image.

Course Contents

Unit 1: Stress & Yoga Philosophy **(3)**

Unit 2: Managing Stress **(3)**

Unit 3: Worthy Tips for Gracious Living **(3)**

Unit 4: Panch Kosha, Trikaya & Abha (Five Sheaths, Three Bodies & Aura) **(3)**

Unit 5: Antahkarana Chatusthya Aur Nigrah (Four-Fold Mind & its Control) **(3)**

Unit 6: Introduction to Yoga **(3)**

Unit 7: Conditioning The Mind **(3)**

Unit 8: Pranayama (Breath Control) **(3)**

Unit 9: Dhaarna, Dhyana & Samadhi (Concentration, Meditation & Super-Consciousness) **(3)**

Text Book:

1) Acharya Yatendra, Yoga & Stress Management, Divya Yog Niketan Trust, Finger-Print! Life, An imprint of Prakash Books India Pvt. Ltd., New Delhi

Reference Books:

1) H R Nagendra and R Nagarathna. Yoga for Promotion of Positive Health. Swami Vivekananda Yoga Prakashan.
2) Contrada, R., & Baum, A. (Eds.). The handbook of stress science: Biology, psychology, and health. Springer Publishing Company.
3) Van den Bergh, O. Principles and Practice of Stress Management. Guilford Publications.
4) Swami Mukti Bodh Ananda, Hatha Yoga Pradipika, , Bihar School of Yoga
5) Swami Satyananda Saraswati, Four Chapters on Freedom, Bihar School of Yoga

Swami Tapasyananda, Srimad Bhagavat Gita, Sri Ramakrishna Math

Walchand Institute of Technology, Solapur

F. Y. M. Tech Civil (Structural Engineering) – Semester-II

SEP2CC5-FINITE ELEMENT METHOD

Teaching Scheme:
Lectures: 3 hours per Week, 3 Credits

Examination Scheme:
ESE: 60 marks
ISE: 40 marks

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

1) Analyse 1-D problems related to structural analysis like Bars, Trusses, Beams and Frames using finite element approach.
2) Find solution to problems using direct approach methods like Rayleigh – Ritz or Galerkin's Method.
3) Solve 2-D problems using knowledge of theory of elasticity.
4) Students will be able to implement the knowledge of numerical methods in FEM to find the solution to the various problems in statics and dynamics

SECTION-I

Unit 1- Introduction to Finite Element Method **[5Hrs]**

Principle of minimum potential energy, variation principle, Galerkin approach, Rayleigh – Ritz method, Point Collocation method, least square method, Finite element procedure

Unit 2- 1-D problems **[5Hrs]**

Discretization, nodes, element incidence, displacement model, shape function, selection of order of polynomials, application to bars with constant and variablecross section subjected to axial forces

Unit 3- 2-D problems **[5Hrs]**

Development of element stiffness matrix and nodal load vector for truss, beam and plane frame elements. Transformation of matrices, relevant structural engineering applications.2-D elements of triangular and quadrilateral shapes for plane stress and plane strain problems. Pascal's triangle, convergence requirements and compatibility conditions, shape functions, boundary conditions, element aspect ratio

Unit 4- 3-D problems **[5Hrs]**

Development of element stiffness matrix and nodal load vector for Tetrahedron, Hexahedral elements

SECTION-II

Unit 5- Isoparametric Elements **[8Hrs]**

Shape function, Natural Co- Ordinate systems, classification- Isoparametric, subparametric, superparametric elements 1-D, 2D & 3D Isoparametric elements, Gauss-quadrature integration

Unit 6- Axisymmetric Elements: **[4Hrs]**

Development of element stiffness matrix and nodal load vector.

Unit 7- Plate and Shell Elements **[6Hrs]**

Formation of stiffness matrix for plate bending elements of triangular and quadrilateral shapes, cylindrical thin shell elements.

Unit 8- Finite Element Applications to Structural Dynamics **[4Hrs]**

Formulation, Hamillon's principle, element mass matrices, evaluation of eigen values and eigen vectors.

TEXT BOOKS:

1. Introduction to Finite Element method by J.N. Reddy

REFERENCE BOOKS:

1. Concepts & Applications of Finite Element Analysis by R. D. Cook.
2. The finite Element Method (Fourth Edition) Vol I &II by O. C. Zienkiewicz& R.L. Taylor
3. Fundamentals of Finite Element Techniques by C.A. Brebbin & J.J. Common.
4. Introduction to Finite Element Method by C. S. Desai & J. F. Abel.
5. Programming in Finite Element Method by Dr. C. A. Krishnamoorthy (TMH Publication).
6. Introduction to Finite Element in Engineering by T.R. Chandrapatla and Belegundu

Walchand Institute of Technology, Solapur

F. Y. M. Tech Civil (Structural Engineering) – Semester-II

SEP2CC6 - THEORY OF PLATES AND SHELLS

Teaching Scheme:	**Examination Scheme:**
Lectures: 3 hours per Week, 3 Credits	**ESE:** 60 marks
Tutorial: 1 hour per Week, 1 Credit	**ISE:** 40 marks
	ICA: 25marks

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

1. Use analytical methods for the solution of thin plates.
2. Apply the numerical techniques and tools for the complex problems in thin plates.
3. Use analytical methods for the solution of shells.
4. Apply the numerical techniques and tools for the complex problems inshells.

SECTION-I

Unit 1 Introduction **[5Hrs]**

Space Curves, Surfaces, Shell Co-ordinates, Strain Displacement Relations, Assumptions in Shell Theory, Displacement Field Approximations, Stress Resultants, Equation of Equilibrium using principle of Virtual Work, Boundary Conditions.

Unit 2 Static Analysis of Plates **[10Hrs]**

Governing Equation for a Rectangular Plate, Navier Solution for Simply- Supported Rectangular Plate under various Loadings, Levy's solution for Rectangular Plate with other Boundary Conditions.

Unit 3 Circular Plates **[10Hrs]**

Analysis under Axi-symmetric Loading, Governing Differential Equation in Polar Co-ordinates. Approximate Methods of Analysis- Rayleigh-Ritz approach for Simple Cases in Rectangular Plates

SECTION-II

Unit 4 Static Analysis of Shells **[6Hrs]**

Membrane Theory of Shells - Cylindrical, Conical and Spherical Shells.

Unit 5 Shells of Revolution **[6Hrs]**

Shells of Revolution with Bending Resistance - Cylindrical and Conical Shells, Application to Pipes and Pressure Vessels

Unit 6 Thermal Stresses in Plate/ Shell **[5Hrs]**

Thermal Stresses in Plates/ Shell, causes and effects.

INTERNAL CONTINUOUS ASSESSMENT (ICA)

A set of tutorials/ problems based on above topics of syllabus.

TEXT BOOKS:

1. Design and Construction of Concrete Shells, Ramaswamy G.S.

REFERENCE BOOKS:

1. Theory of Plates and Shells, Timoshenko S. and Krieger W., McGrawHill.
2. Stresses in Plates and Shells, Ugural Ansel C., McGraw Hill.
3. Thin Elastic Shells, Kraus H., John Wiley andSons.
4. Theory of Plates, Chandrashekhara K., Universities Press.

Walchand Institute of Technology, Solapur

F. Y. M. Tech Civil (Structural Engineering) – Semester-II

SEP2CC7- SEISMIC DESIGN OF MULTISTORIED BUILDINGS

Teaching Scheme:
Lectures: 3 hours per Week, 3 Credits

Examination Scheme:
ESE: 60 marks
ISE: 40 marks

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

1. Evaluate the seismic response of the structures.
2. Design the reinforced concrete buildings for earthquake resistance.
3. Analyse, design and detail the multistoried buildings subjected to seismic loads.

SECTION-I

Unit 1 Characteristics of Earthquakes **[5Hrs]**

Characteristics of Earthquakes: Earthquake terminology, Indian Earthquakes, Measurement of Earthquakes, Magnitude, Intensity, Frequency-magnitude relationship, Liquefaction.

Unit 2 Earthquake response of systems **[8Hrs]**

Earthquake response of systems: Response spectrum theory, Strong ground motion, Concept of earthquake response spectrum Response Spectrum–elastic and inelastic response spectra, tripartite (D-V-A) response spectrum, use of response spectrum in earthquake resistant design.

Unit 3 Earthquake design philosophy **[10Hrs]**

Effect of irregularities and architectural planning, center of mass and center of rigidity, philosophy of earthquake resistant design, maximum considered earthquake, design-based earthquake, concept of stiffness, flexibility and ductility.

SECTION-II

Unit 4 Structural Concept **[7Hrs]**

Structural Concept, Configurations, various systems, Wind and Seismic loads, Dynamic approach, structural design considerations for multistoried buildings

Unit 5 Design of Reinforced concrete buildings for earthquake resistance **[10Hrs]**

Load combinations, Lateral load analysis, Provisions of IS-1893 for buildings, Base Shear, Application to Multistorey buildings. Ductility and energy absorption in buildings. Confinement of concrete for ductility, design of columns and beams for ductility, ductile detailing provisions of IS- 13920.

Unit 6 Seismic response control concepts **[5Hrs]**

Seismic response control concepts – Passive control, Base isolation, Tuned Mass Dampers, Vibration absorbers.

REFERENCE BOOKS:

1. Structural Design of Multi-storeyed Buildings, Varyani U. H., 2nd Ed., South Asian Publishers, New Delhi,2002.
2. Earthquake Design Practice for Buildings -- David Key, Thomas TelfordPub.
3. Dynamics of Structures: - Theory and Application to Earthquake Engineering byK. Chopra, Prentice- hall Publication.
4. Earthquake Resistant Design for Engineers and Architects – D. J. Dowrick, John Wiley and Sons.
5. Illustrated Design of Reinforced Concrete Buildings (GF+3storeyed), Shah V. L.&Karve, S. R. Structures Publications, Pune, 2013.
6. High Rise Building Structures, Wolfgang Schueller, Wiley1971.

Walchand Institute of Technology, Solapur

F. Y. M. Tech Civil (Structural Engineering) – Semester-II

SEP2CE21- CORE ELECTIVE- II
THEORY OF STRUCTURAL STABILITY

Teaching Scheme:
Lectures: 3 hours per Week, 3 Credits

Examination Scheme:
ESE: 60 marks
ISE: 40 marks

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

1. Determine stability of columns and frames
2. Determine stability of beams and plates
3. Use stability criteria and concepts for analyzing discrete and continuous systems

SECTION-I

Unit 1 Introduction **[6Hrs]**

Concept of stability, Static, dynamic and energy criterion of stability. Flexibility and stiffness criteria, Snap-through & post buckling behavior.

Unit 2 Stability of columns **[8Hrs]**

Critical load for standard boundary conditions, elastically restrained perfect Columns, effect of transverse shear in buckling, columns with geometric imperfections, eccentrically loaded columns. Orthogonality of buckling modes. Large deformation theory for columns

Unit 3 Stability of continuous Beams and Frames **[8Hrs]**

Moment distribution and stiffness methods for stability analysis of continuous beam & frames

SECTION-II

Unit 4 Lateral Buckling of Beam **[6Hrs]**

Differential equations for lateral bucking, lateral buckling of beams in pure bending, lateral buckling of beams subjected to concentrated and uniformly distributed forces

Unit 5 In-elastic stability of Columns **[8Hrs]**

In-elastic buckling, double modulus theory, tangent modulus theory, Shanleys theory of in-elastic buckling, eccentrically loaded in-elastic columns

Unit 6 Dynamic Stability of Structure **[8Hrs]**

Discrete systems, Lagrange-Hamilton formulation for continuous systems, Stability of continuous system, general method for conservative and non-conservative systems

REFERENCE BOOKS:

1. Concrete Technology & Design by R.N. Swamy, Surrey University Press.
2. Special Structural Concrete by Rafat Siddique, Galgotia pub Pvt. Ltd.
3. Fiber Reinforced Cement Composites by P.N. Balaguru, S.P. Shah, Mc-Graw hill
4. Fiber Cement and Fiber Concrete by John Wiley and sons.
5. Fracture Mechanics and Structural Concrete by Bhushan L. Karihal Longman Scientific and Technical John Wiley and sons.

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F. Y. M. Tech Civil (Structural Engineering) – Semester-II

SEP2CE22- CORE ELECTIVE- II
DESIGN OF R. C. C. BRIDGES

Teaching Scheme:
Lectures: 3 hours per Week, 3 Credits

Examination Scheme:
ESE: 60 marks
ISE: 40 marks

Course outcome: At the end of the course, students will be able to,

1. Select the suitable type of bridges according to the site condition.
2. Categorize IRC loads, distribution of these loads among longitudinal beams of abridge.
3. Design Solid deck slab and T beam bridge superstructure
4. Analyze and verify the adequacy of piers and abutments.
5. Identify and design the suitable type of bearing for the given condition

SECTION I

Unit 1 Introduction to Bridge Engineering **[5Hrs]**

General Basic bridge forms-beam, arch, suspension, various types of bridges, selection of type of bridge and economic span length, super structure philosophy, geometric alignment, drainage, road kerb, wall foundation, pile foundation, open well foundation

Unit 2 Loading on bridges **[5Hrs]**

Dead load, vertical live load, IRC loading, wind load, longitudinal forces, centrifugal forces, buoyancy, water current forces, thermal forces, deformation and horizontal forces.

Unit 3 Analysis and Design **[12Hrs]**

Analysis and Design of R. C. deck slab, beam and slab (For IRC class AA and IRC class A loading), T beam, Pigeaud's theory, Courbon's theory, Introduction to Hendry-Jaeger and Morice- Little Method, Analysis and Design of box culvert.

SECTION II

Unit 4 Design of sub structure **[8Hrs]**

Piers and Abutments- type, shape and their suitability, Design of sub-structure – abutments, piers, approach slab.

Unit 5 Bearings and Expansion Joint **[8Hrs]**

Bearing and expansion joints – forces on bearings – Types of bearing, design of reinforced elastomeric bearings, expansion joints.

Unit 6 Construction techniques **[5Hrs]**

Construction of sub structure- piles, caissons. Construction of reinforced earth retaining wall, super structure – erection methods.

INTERNAL CONTINUOUS ASSESSMENT (ICA)

Problems/ tutorials based on above topics.

REFERENCE BOOKS:

1. "Design of Bridges"- N Krishna Raju, Oxford & IBH Publishing Co New Delhi
2. "Principles and Practice of Bridge Engineering"- S P Bindra Dhanpat Rai& Sons New Delhi
3. IRC 6 – 1966 "Standard Specifications and Code of Practice for Road Bridges"- Section II Loads and Stresses, The Indian Road Congress New Delhi
4. IRC21–1966"StandardSpecifications and Code of Practice for Road Bridges"-Section III Cement Concrete (Plain and reinforced) The Indian Road Congress New Delhi
5. IS 456 – 2000 "Indian Standard Plain and Reinforced Concrete Code of Practice"- (Fourth Revision) BIS New Delhi
6. IS 1343 – "Indian Standard Prestressed Concrete Code of Practice"- BIS New Delhi
7. Raina V.K., "Concrete Bridge Practice"- Tata McGraw Hill
8. Bakht B & Jaeggar, "Bridge Analysis Simplified"- McGraw Hill
9. Ponnu swamy. S, "Bridge Engineering"- Tata McGraw Hill.
10. Derrick Beckett, "An Introduction to Structural Design of Concrete Bridges"- Surrey University Press

Walchand Institute of Technology, Solapur

F. Y. M. Tech Civil (Structural Engineering) – Semester-II

SEP2CE23- CORE ELECTIVE- II
ADVANCED STEEL DESIGN

Teaching Scheme:
Lectures: 3 hours per Week, 3 Credits

Examination Scheme:
ESE: 60 marks
ISE: 40 marks

Course outcome: At the end of the course, students will be able to,

1. Design steel structures/ components by different design processes.
2. Use the design provisions for hot-rolled and cold-formed steel structures.
3. Design Steel Beams with Web Openings.
4. Perform plastic analysis and design of portal frames and Beams.

SECTION-I

Unit 1 Laterally Unrestrained Beams **[8Hrs]**

Lateral Buckling of Beams, Factors affecting lateral stability, IS 800 code provisions, Design Approach. Lateral buckling strength of cantilever beams, continuous beams, beams with continuous and discrete lateral restraints, Mono- symmetric and non- uniform beams–Design Examples. Concepts of Shear Center, Warping, Uniform and Non-Uniform torsion

Unit 2 Tubular Structures **[6Hrs]**

Design of tubular Trusses and scaffoldings using circular hollow, rectangular hollow sections as per code, detailing of joints.

Unit 3 Cold–formed light gauges steel sections **[8Hrs]**

Special design considerations for compression elements, design of compression elements, stiffened compression elements, multi-stiffened elements, design of light gauge beams, behavior under repetitive loads and temperature effects. IS 801& 811 code provisions-numerical examples

SECTION-II

Unit 4 Plastic analysis **[8Hrs]**

Plastic bending of beams, plastic hinge, upper and lower bond theorems, Uniqueness theorem, Yield criteria, analysis and design of fixed and continuous beams. Plastic analysis and design of portal frames, collapse mechanisms, plastic moment distribution method, Introduction to Limits States in Steel Design

Unit 5 Steel Beams with Web Openings **[8Hrs]**

Shape of the web openings, practical guide lines, and Force distribution and failure patterns, Analysis of beams with perforated thin and thick webs, Design of laterally restrained castellated beams for given sectional properties, Vierendeel girders (design for given analysis results)

Unit 6 Concrete –Steel composite sections **[6Hrs]**

Elastic behavior of composite beams, shear connectors, Behavior at ultimate load. Design of composite beams. Design of encased steel columns

TEXT BOOKS:

1. Design of steel structures-Vol. II Ramchandra, Standard book, house, Delhi.

REFERENCE BOOKS:

1. Dynamics of Structures–Theory & Application to Earthquake Engineering, A.K. Chopra, Prentice Hall Publications
2. Design of steel structures, A.S. Arya, J.L. Ajamani, Nemchand and brothers.
3. Limit state design of steel structures, S K Duggal, Tata McGraw Hill Education
4. IS: 800 - 1984, Code of Practice for General Construction in Steel, BIS, NewDelhi.
5. IS: 801 - 1975, Code of Practice for use of cold formed light gauge steel structural members in general building construction, BIS, New Delhi.
6. IS: 802 (Part I and II)-1978, Code of practice for use of structural steel in overhead transmission line towers, BIS, New Delhi.
7. IS:806-1988, Code of practice for use of steel tubes in general building construction, BIS, New Delhi.

8. IS: 811-1987, Specification for cold formed light gauge structural steel sections, BIS, New Delhi.
9. IS: 875 (Part 1, 2 and 3) – 1987, Code of practice for design loads for buildings and structures, BIS, New Delhi.

Walchand Institute of Technology, Solapur

F. Y. M. Tech Civil (Structural Engineering) – Semester-II

SEP2CE24- CORE ELECTIVE- II
SOIL STRUCTURE INTERACTION

Teaching Scheme:
Lectures: 3 hours per Week, 3 Credits

Examination Scheme:
ESE: 60 marks
ISE: 40 marks

Course outcome: At the end of the course, students will be able to,

1. Evaluate soil structure interaction for different types of structure under various conditions of loading.
2. Prepare a comprehensive numerical tool for interaction problem based on theory of subgrade reaction such as beam, footing raft etc.
3. Analyze the soil-structure interaction of framed structures
4. Evaluate action of group of piles considering soil structure interaction

SECTION-I

Unit 1 Soil-Foundation Interaction **[7Hrs]**

Introduction to soil - Foundation interaction problems, Soil behaviour, Foundation behaviour, Interface, behaviour, Scope of soil-foundation interaction analysis, soil response models, Winkler, Elastic continuum, Two parameter elastic models, Elastic plastic behaviour, Time dependent behavior

Unit 2 Beam On Elastic Foundation - Soil Models **[7Hrs]**

Infinite beam, Two parameters, Isotropic elastic half space, Analysis of beams of finite length, Classification of finite beams in relation to their stiffness.

Unit 3 Soil-foundation-structure interaction models **[8Hrs]**

Idealization of soil by linear and non-linear modified Winkler model, Elastic continuum model (isotropic and anisotropic), Two parameter elastic models- Heteny model, Pasternak model, Reissner model.

SECTION-II

Unit 4 Soil Structure Interaction in Framed Structures [5Hrs]

Structures with isolated foundation, spring analog approach, determinations of spring parameters, structures with continuous beams and rafts as foundation, finite element modelling, sub-structure technique of analysis, concept of relative stiffness, Interactive behavior of some framed structure.

Unit 5 Soil pile interaction [10Hrs]

Laterally loaded single piles-Concept of coefficient of horizontal subgrade reaction, finite difference and finite element solution, soil-structure interaction of framed structures with pile foundation, Interaction of other structures with soil foundation system, Tanks with annular ring foundations, chimneys, silos, cooling towers, underground subways and tunnels.

Unit 6 Introduction to dynamic soil structure interaction as well as non- linear soil/concrete behavior. **[5Hrs]**

REFERENCE BOOKS:

1. John, P. Wolf, 'Dynamic Soil-Structure-Interaction'.
2. John, P. Wolf,' Soil-Structure-Interaction in Time Domain'.
3. Hemsley, J.A, Elastic Analysis of Raft Foundations, Thomas Telford,1998.
3. McCarthy, D.F. Essentials of Soil Mechanics and Foundations, basic geotechnics (6th Edition), Prentice Hall,2002.
4. Selvadurai, A.P.S., Elastic Analysis of Soil Foundation Interaction, Elsevier,1979.
5. Poulos, H.G., and Davis, E.H., Pile Foundation Analysis and Design, John Wiley,1980.
6. Scott, R.F. Foundation Analysis, Prentice Hall,1981.
7. Structure Soil Interaction - State of Art Report, Institution of structural Engineers, 1978.
   ACI 336, Suggested Analysis and Design Procedures for Combined Footings and Mats, American Concrete Institute, Dehit, 1988.

Walchand Institute of Technology, Solapur

F. Y. M. Tech Civil (Structural Engineering) – Semester-II

SEP2CE31- CORE ELECTIVE- III

DESIGN OF PRESTRESSED CONCRETE STRUCTURES

Teaching Scheme:
Lectures: 3 hours per Week, 3 Credits

Examination Scheme:
ESE: 60 marks
ISE: 40 marks

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

1. Describe different prestressing techniques.
2. Analyze and design statically determinate PSC beams.
3. Design the Anchor Blocks.
4. Design composite structural elements and prestressed concrete pipes.

SECTION-I

Unit 1 Introduction to prestressed concrete **(6)**

Types of prestressing, systems and devices, materials, losses in prestress. Analysis of PSC flexural members: basic concepts, stresses at transfer and service loads, ultimate strength in flexure, code provisions.

Unit 2 Statically determinate PSC beams **(9)**

Design for ultimate and serviceability limit states for flexure, analysis and design for shear and torsion, code provisions.

Unit 3 Design of Anchor Blocks **(5)**

Design of Anchor Blocks using Magnel's Method, Guyon's Method and IS Code Method

SECTION-II

Unit 4 Statically indeterminate structures **(9)**

Analysis and design - continuous beams and frames, choice of cable profile, linear transformation and concordancy.

Unit 5 Composite construction **(9)**

Precast PSC beams and cast in-situ RC slab - Analysis and design, creep and shrinkage effects. Partial prestressing - principles, analysis and design concepts, crack width calculations

Unit 6 Prestressed concrete pipes **(5)**

Analysis and design of prestressed concrete pipes.

TEXT BOOKS:

1. Design of Concrete Bridges, Jagadish & Jayaram, Tata McGrawHill.

REFERENCE BOOKS:

1. Design of Prestressed Concrete Structures, Lin T.Y., Asia Publishing House,1955.
2. Prestressed Concrete, Krishnaraju N., Tata McGraw Hill, New Delhi, 1981.
3. Concrete Bridge Practice: Analysis, Design and Economics, Dr. V. K. Raina, Shroff Publishers & Distributors Pvt. Ltd.
4. Reinforced Concrete Structures, Vol. II, Dr. B. C. Punmia, Ashok Kumar Jain, Arun Kumar Jain, Laxmi Publications.
5. IS: 1343- Code of Practice for Prestressed Concrete

Walchand Institute of Technology, Solapur

F. Y. M. Tech Civil (Structural Engineering) – Semester-II

SEP2CE32- CORE ELECTIVE- III
STRUCTURAL AUDITS

Teaching Scheme:
Lectures: 3 hours per Week, 3 Credits

Examination Scheme:
ESE: 60 marks
ISE: 40 marks

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

1. Strength evaluation of existing structures.
2. Evaluate the damaged structures and implement different retrofitting techniques.
3. Maintain the concrete structures in the working and safe condition.
4. Be able to take the decision of dismantling the structure, if it is deteriorated beyond the repairing.

SECTION-I

Unit 1 Introduction to Structural Audit **[3Hrs]**

Introduction to Structural Audit, Objectives, Bye-laws, Importance, Various Stages involved, Visual inspection: scope, coverage, limitations, Factors to be keenly observed.

Unit 2 Structural Health **[10Hrs]**

Structural Health, factors affecting health of structures, effect of leakage, age, creep, corrosion, fatigue on life of structure. Structural health monitoring. Various measures, regular maintenance, structural safety in alteration. Quality control & assurance of materials of structure, durability of concrete, Factors affecting durability of concrete, Corrosion in structures, Testing and prevention of corrosion.

Unit 3 Structural Audit **[10Hrs]**

Structural Audit, Assessment of health of structure, study of structural drawings, nature of distress, visual observations, Collapse and investigation, limitations on investigator, tools for investigation, Various NDT Methods for assessing strength of distressed materials, investigation management, review of assimilated information, interviews and statements, evaluation and reporting.

SECTION-II

Unit 4 Retrofitting of Structures **[10Hrs]**

Retrofitting of Structures, parameters for assessment for restoration strategies, selection of construction chemicals during restoration, Specification for important items of work in restoration, Structural detailing for restoration and various techniques of retrofitting.

Unit 5 Safety during construction **[15Hrs]**

Safety during construction, formwork and staging, Modular formwork, Structural aspects for formwork in buildings & bridges. Fire safety. Demolition of Structure, study of structural system and structural drawings, outline of various demolition methods and their evaluation, partial and controlled demolition, role of safety measures, temporary support structures in demolition. Recycling of demolished materials

REFERENCE BOOKS:

1. R N. Raikar: 'Durable Structures', R & D Centre, (SDCPL), Raikar Bhavan, Sector 17, Vashi, Navi Mumbai.
2. R.N. Raikar: 'Learning from Failures', R & D Centre, (SDCPL),Raikar Bhavan, Sector 17, Vashi, Navi Mumbai.
3. R.N. Raikar: 'Diagnosis and treatment of structures in Distress', R & D Centre, (SDCPL), Raikar Bhavan, Sector 17, Vashi, Navi Mumbai.
4. Jayakumar, J. Shah: 'A Book – A Handy Guide to Repairs, Rehabilitation and Waterproofing of RCC Building (Structures)', Third updated photo-copyset.
5. Austin. C. K : 'Formwork to Concrete', Chapman and Hall
6. Mr. Umesh Dhargalkar 'Structural Audit', Mumbai.
7. Jayakumar J. Shah: 'An Article – House Keeping of RCC Buildings', Published in April 2001 issue of the Housing Times, Vikas Premises, Fort Mumbai 400001.
8. Jayakumar J. Shah: 'An Article – Repairs & Rehabilitation of RCC Buildings (Structures) – Materials and Techniques', Published in March 2002 issue of New Building Materials and Construction World, New Delhi.
9. Jayakumar J. Shah: 'An Article – Repairs, Rehabilitation of Structurally Distressed RCC Members of Buildings', published in July 2000 issue of Construction World, ASAP Media, Mumbai.
10. J. J. Shah: 'Point of View – Repair, Rehabilitation and Waterproofing of structures-

Some View', Published in April 1998 issue of The Indian Concrete Journal, Mumbai.

11. Mani, K and Srinivasan, P.: 'An Article: Corrosion Damage and its Evaluation by Testing' in Advanced Testing and Evaluation of Structures and Components, Allied Publishers, Chennai, 2002 pp 14.01 –14.33.
12. Popovics, S and Popovics, J.S: 'An Article: A Critique of the Ultrasonic Pulse Velocity Method for Testing Concrete' in Non-destructive Testing of Concrete Elements and Structures', ASCE, New York, 1992, pp94-103.
13. Thandava Moorthy T.S. et al: 'Health Assessment of Concrete Structures by Ultrasonic pulse Velocity Technique an experimental Investigation in Building Materials', RRL Bhopal, February 26-27, 2004, pp.284-89.

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F. Y. M. Tech Civil (Structural Engineering) – Semester-II

SEP2CE33- CORE ELECTIVE- III

CONCRETE COMPOSITES

Teaching Scheme:
Lectures: 3 hours per Week, 3 Credits

Examination Scheme:
ESE: 60 marks
ISE: 40 marks

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

1. Produce and test Fabre reinforced concrete
2. Design and cast ferro-cement products
3. Produce Silica fume Concrete
4. Design and cast Polymer concrete

SECTION-I

Unit 1 Fiber Reinforced Concrete **[12Hrs]**

Introduction, properties of constituent materials, mix proportion, mixing, casting methods, properties of freshly mixed concrete (Fiber reinforced concrete), workability tests, mechanical properties, Behavior of Fiber reinforced concrete under Compression, tensile, flexure, research findings, application of Fiber Reinforced Concrete.

Unit 2 Ferro cement **[10Hrs]**

Introduction, materials used, mechanical properties, construction techniques, design in direct tension, applications, merits as structural materials.

SECTION-II

Unit 3 Silica Fume Concrete **[11Hrs]**

Introduction, physical and chemical properties of silica Fume, reaction mechanism of silica fume, properties of silica fume concrete in fresh state, mechanical properties and durability of silica fume concrete

Unit 4 Polymer concrete **[11Hrs]**

Introduction, classification, properties of constituent materials, polymer impregnated concrete, polymer concrete, application.

REFERENCE BOOKS:

1. Concrete Technology & Design by R. N. Swamy, Surrey University Press.
2. Special Structural Concrete by Rafat Siddique, Galgotia pub. pvt. Ltd.
3. Fiber Reinforced Cement Composites by P. N. Balaguru, S. P. Shah, Mc-GrawGill
4. Fiber Cement and Fiber Concrete by John Wiley and sons.
5. Fracture Mechanics and Structural Concrete by Bhushan L. Karihal Longman Scientific and Technical John Wiley and sons.

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F. Y. M. Tech Civil (Structural Engineering) – Semester-II

SEP2CE34- CORE ELECTIVE- III
DESIGN OF INDUSTRIAL STRUCTURES

Teaching Scheme:
Lectures: 3 hours per Week, 3 Credits

Examination Scheme:
ESE: 60 marks
ISE: 40 marks

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

1. Design Steel Gantry Girders.
2. Design Steel Portal, Gable Frames.
3. Design Steel Bunkers and Silos.
4. Design Chimneys and Water Tanks

SECTION-I

Unit 1 Steel Gantry Girders **[8Hrs]**

Introduction, loads acting on gantry girder, permissible stress, types of gantry girders and crane rails, crane data, maximum moments and shears, construction detail, design procedure

Unit 2 Portal Frames **[8Hrs]**

Design of portal frame with hinge base, design of portal frame with fixed base- Gable Structures – Lightweight Structures

Unit 3 Steel Bunkers and Silos **[8Hrs]**

Design of square bunker – Jansen's and Airy's theories – IS Code provisions – Design of side plates – Stiffeners – Hooper – Longitudinal beams Design of cylindrical silo – Side plates – Ring girder – stiffeners.

SECTION-II

Unit 4 Chimneys **[6Hrs]**

Introduction, dimensions of steel stacks, chimney lining, breech openings and access ladder, loading and load combinations, design considerations, stability consideration, design of base plate, design of foundation bolts, design of foundation

Unit 5 Water Tanks **[8Hrs]**

Design of rectangular riveted steel water tank – Tee covers – Plates – Stays –Longitudinal and transverse beams –Design of staging – Base plates – Foundation and anchor bolts

Unit 6 Design of pressed steel water tank **[6Hrs]**

Design of stays – Joints –Design of hemispherical bottom water tank – side plates – Bottom plates – joints – Ring girder – Design of staging and foundation

INTERNAL CONTINUOUS ASSESSMENT (ICA)

A set of tutorials/ problems based on above topics of syllabus.

REFERENCE BOOKS:

1. Design of Steel Structure, Punmia B. C., Jain Ashok Kr., Jain Arun Kr., 2nd Ed., Lakshmi Publishers,1998.
2. Design of Steel Structures, Ram Chandra, 12th Ed., Standard Publishers, 2009.
3. Design of Steel Structures, Subramaniyam.

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F. Y. M. Tech Civil (Structural Engineering) – Semester-II

SEP2CE35 - CORE ELECTIVE- III
DESIGN OF TALL BUILDINGS

Teaching Scheme:
Lectures: 3 hours per Week, 3 Credits

Examination Scheme:
ESE: 60 marks
ISE: 40 marks

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

1. Describe latest concepts, techniques and design of wind- and seismic-resistant buildings.
2 Explain the fundamental concepts relevant to different approach of high-rise building design method.
3 Identify the factors that causes the economy and optimization of the structural design and construction of Tall building.

SECTION-I

Unit 1 Structural Systems and concepts. Loading: Gravity, wind and seismic loading **[8 Hrs]**

Unit 2 Matrix and Approximate methods, Interaction of frames, shear-wall frames, Twist of frames **[8Hrs]**

Unit 3 Analysis of coupled shear walls. Tubular Buildings **[6Hrs]**

SECTION-II

Unit 4 Sequential loading, creep and shrinkage effects on tall buildings **[6Hrs]**

Unit 5 Overall buckling analysis of frames, wall-frames, second order effects of gravity loading, P-Delta analysis **[8Hrs]**

Unit 6 Analysis and Design: Modeling for approximate analysis, accurate **[6Hrs]**

analysis, subsystem interaction

REFERENCE BOOKS:

1. High Rise Building Structures by Schuellar, W
2. Structural Analysis & Design of tall Buildings B.S. Taranath
3. Handbook of Concrete Structures M. Fintal.
4. Tall Building Structures: Analysis & Design B. Stafford Smith & A. Coule
5. Advances in Tall Buildings, CBS Publishers and Distributors Delhi, 1986.

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F. Y. M. Tech Civil (Structural Engineering) – Semester-II

SEP2CC6-ADVANCED CONCRETE TECHNOLOGY LAB

Lab Scheme:	**Examination Scheme:**
Practical:2 hours per Week, 2 Credits	**ICA**: 50 marks

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

1. Design high grade concrete and study the parameters affecting its performance.
2. Conduct Non-Destructive Tests on existing concrete structures.
3. Apply engineering principles to understand behavior of structural elements

DETAILS OF LAB WORK

1. Study of parameters of high strength concrete, Correlation between cube strength, cylinder strength, split tensile strength and modulus of rupture.
2. Non-Destructive testing of existing concrete members. Behavior of Beams under flexure, Shear

REFERENCE BOOKS:

1. Properties of Concrete, Neville A. M., 5th Edition, Prentice Hall,2012.
2. Concrete Technology, Shetty M. S., S. Chand and Co.,2006.

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F. Y. M. Tech Civil (Structural Engineering) – Semester-II

SEP2SMP2- MINI PROJECT

Lab Scheme:	**Examination Assessment Scheme:**
Practical: 2 hours per week, 2Credits	**ICA**: 50 marks

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

1. Identify structural engineering problems reviewing available literature.
2. Study different techniques used to analyze complex structural systems.
3. Work on the solutions given and present solution by using his/her technique applying engineering principles.

Mini Project shall consist of detailed analysis, design along with working drawings of any one structure.

Mini Project will have mid semester presentation and end semester presentation. Mid semester presentation will include identification of the problem based on the literature review on the topic referring to latest literature available.

The student shall submit report on the subject chosen and make a presentation at the end of Semester-I. End semester presentation should be done along with the report on identification of topic for the work and the methodology adopted involving scientific research, collection and analysis of data, determining solutions highlighting individuals' contribution.

Continuous assessment of Mini Project at Mid Sem and End Sem will be monitored by the Advisor.

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S.Y. M. Tech. Civil (Structural Engineering) **Semester-III**

CMP3IK-INDIAN SCIENCE AND TECHNOLOGY

Teaching Scheme: **Examination Scheme**

Lectures- 2 Hours / week, 2Credits **ISE- 50 Marks**

Course Outcomes: -

At the end of this course, students will be able

1. Aware of the true history and rich culture of India
2. To explain the scientific value of the traditional knowledge of India
3. To appreciate the knowledge of Metallurgy, Textile Chemistry & Pyro Technology in IKS
4. To elaborate Indian knowledge of Water Management and transportation systems
5. To describe the contribution of IKS in Mathematics & Astronomy
6. To describe the concepts of IKS in Ecology and Environment

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Unit 1 Fundamentals **(4)**

An overview of Indian contributions to technology. Technological Innovations.

Unit 2 Metallurgy, Textile Chemistry & Pyro Technology **(5)**

Copper/Bronze/Zinc: Important Mines (Zawar, Khetri mines), Iron and Wootz Steel Technology, Textile and Dyeing- Indian Specialities (Kutchi Embroidery, Cotton Textile etc.), Ceramic Technology, Stone (Lapidary), Shell, Ivory, Faience & Glass Technology

Unit 3 Water Management & Transportation **(5)**

Harappan and Traditional Water Management System of Gujarat, Historical Sites- Sringeverpur, South Indian Water Management System, Western Ghats Cave- Kanheri, etc., Communities Involved in Water Management, Modes of Transportations and Reforms, Grand Trunk Road (Uttarapath & Dakshinapath), Development of Trading Techniques, Boat & Ship Building

Unit 4 Mathematics & Astronomy **(5)**

Mathematics contained in the Sulbasutra, Weaving Mathematics into Beautiful Poetry-Bhaskaracarya, The Evolution of Sine Function in India, The Discovery of Calculus by Kerala Astronomers, Vedanga Jyotish & Measuring Time & Calendar

Unit 5 Ecology and Environment **(5)**

Nakshatrara Gyaan and Agriculture, Vernacular Architecture, Forest Management and Urban Planning, Agroforestry, Tank, Lakes, and Stepwells

Unit 6 India's Contribution in Science and Technology to the World **(4)**

Text Book:

1. Introduction To Indian Knowledge System: Concepts and Applications Mahadevan, B. Bhat, Vinayak Rajat, Nagendra Pavana R.N. Apr 2022, Phi Learning Pvt. Ltd.

References books

1. R.M. Pujari, Pradeep Kolhe, N. R. Kumar, 'Pride of India: A Glimpse into India's Scientific Heritage', Samskrita Bharati Publication.
2. 'Indian Contribution to Science', compiled by Vijnana Bharati.
3. 'Knowledge traditions and practices of India', Kapil Kapoor, Michel Danino, CBSE, India.
4. Dr. Subhash Kak , Computation in Ancient India,Mount, Meru Publishing (2016)
5. Dharampal, *Indian Science and Technology in the Eighteenth Century,* Academy of Gandhian Studies, Hyderabad, 1971, republic. Other India Bookstore, Goa, 2000
6. Robert Kanigel, *The Man Who Knew Infinity: A Life of the Genius Ramanujan*, Abacus, London, 1999
7. Alok Kumar, *Sciences of the Ancient Hindus: Unlocking Nature in the Pursuit of Salvation*, CreateSpace Independent Publishing, 2014
8. B.V. Subbarayappa, *Science in India: A Historical Perspective,* Rupa, New Delhi, 2013
9. S. Balachandra Rao, *Indian Mathematics and Astronomy: Some Landmarks*, Jnana Deep Publications, Bangalore, 3rdedn, 2004
10. S. Balachandra Rao, *Vedic Mathematics and Science in Vedas,*Navakarnataka Publications, Bengaluru, 2019

11. Bibhuti bhushan Datta, *Ancient Hindu Geometry: The Science of the Śulba,* 1932, repr. Cosmo Publications, New Delhi, 1993
12. Bibhuti bhushan Datta & Avadhesh Narayan Singh, *History of Hindu Mathematics*, 1935, repr. Bharatiya Kala Prakashan, Delhi, 2004
13. George Gheverghese Joseph, *The Crest of the Peacock,* Penguin Books, London & New Delhi, 2000
14. J. McKim Malville&Lalit M. Gujral, *Ancient Cities, Sacred Skies: Cosmic Geometries andCity Planning in Ancient India*, IGNCA & Aryan Books International, New Delhi, 2000).
15. Clemency Montelle, *Chasing Shadows: Mathematics, Astronomy and the Early History ofEclipse Reckoning*, Johns Hopkins University Press, 2011
16. AnishaShekharMukherji, *Jantar Mantar: Maharaja Sawai Jai Singh's Observatory in Delhi,*
17. AMBI Knowledge Resources, New Delhi, 2010
18. Thanu Padmanabhan, (ed.), *Astronomy in India: A Historical Perspective,* Indian National Science Academy, New Delhi & Springer (India), 2010
19. AcharyaPrafulla Chandra Ray, *A History of Hindu Chemistry*, 1902, republ., Shaibya Prakashan Bibhag, centenary edition, Kolkata, 2002
20. R. Balasubramaniam, *Delhi Iron Pillar: New Insights*, Indian Institute of Advance Study, Shimla & Aryan Books International, New Delhi, 2002
21. R. Balasubramaniam, *Marvels of Indian Iron through the Ages*, Rupa& Infinity Foundation, New Delhi, 2008
22. Anil Agarwal & Sunita Narain, (eds), *Dying Wisdom: Rise, Fall and Potential of India'sTraditional Water-Harvesting Systems*, Centre for Science and Environment, New Delhi, 1997
23. Fredrick W. Bunce:*The Iconography of Water: Well and Tank Forms of the Indian Subcontinent,* DK Printworld, New Delhi, 2013

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S. Y. M. Tech. Civil (Structural Engineering) **Semester-III**

SEP3IN -INTERNSHIP

Examination Scheme

3 Credits, ICA- 100 Marks

The objective of internship is to give exposure to industry environment and practices. Students are expected to undergo rigorous training for a minimum period of one month during summer vacation (after semester-II) at leading Engineering organizations /Research laboratories /Design and Consultancy organizations.

Assessment

1. The assessment is based on ICA. The panel of minimum PG approved faculty members from the department shall assess the student for the internship.
2. The students are expected to present the work done in an internship tenure.
3. The students shall also submit a detailed report based on activities done in internship and learnings through the same.
4. The students shall also submit the duly signed internship certificate from the organization/s where internship was done, clearly indicating the period of internship in the certificate

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S. Y. M. Tech. Civil (Structural Engineering) **Semester-III**

SEP3DS1- Dissertation Phase-I

Teaching Scheme:	**Examination Scheme**
Practical – Total 30 Hours, 15 Credits	**ISE- 200 Marks**
	ICA- 150 Marks

Students shall fulfill –

1. substantial research work including exhaustive literature survey, research gaps finding and formulate the research problem to be addressed.
2. submit synopsis based on which his/her research problem.
3. Student shall submit synopsis of the dissertation work within first month of Semester-III. Synopsis submission seminar shall cover detailed synopsis of the proposed work.
4. Student shall deliver all seminars using modern presentation tools. A hard copy of the report shall be submitted to the department before delivering the seminar. A PDF copy of the report must be submitted to the advisor along with other details if any
5. carry out independent research work on the chosen topic.
6. Submit a comprehensive report based on practical work carried out, demonstration and findings. Present his/ her work in front of examiners panel. Progress seminar shall be delivered capturing details of the work done by student for dissertation.

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S. Y. M. Tech. Civil (Structural Engineering) **Semester-IV**

SEP4OE-Open Elective (SWAYAM/NPTEL MOOC)

Teaching Scheme:
4 Credits

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1. Students should enroll for one of the minimum 8 weeks duration courses offered by SWAYAM / NPTEL platform. They should complete their assignments and appear for certificate examination conducted by SWAYAM / NPTEL. Students should pass the examination till the end of Semester IV. Based on the marks obtained in the assignments and examination; credits will be transferred in Semester IV. The list of courses will be provided by the Board of Studies.

2. As per the instruction provided in Semester II structure, the credits obtained by the students for the SWAYAM / NPTEL course will be transferred this semester.

3. List of few 8-week NPTEL courses is attached. Students can take one of the courses mentioned in the list given below or any other 8-week NPTEL courses available at post-graduate (PG) level.

List of suggested open electives (an 8-week NPTEL courses)

Sr. No.	*Course ID*	*Discipline*	*Course Name*	*SME Name*	*Institute*	*Start date*	*End date*	*Exam date*
1	noc25-ge44	Any Engineering, Science and Management Disciplines	Artificial Intelligence in Industrial and Management Engineering	Prof. Deepu Philip, Prof. Prabal Pratap Singh	IIT Kanpur	August 18, 2025	October 10, 2025	November 2, 2025
2	noc25-cs101	Computer Science and Engineering	Data Science for Engineers	Prof. Ragunathan Rengasamy, Prof. Shankar Narasimhan	IIT Madras	July 21, 2025	September 12, 2025	September 21, 2025
3	noc25-hs142	Humanities and Social Sciences	Soft Skill Development	Prof. Priyadarshi Patnaik, Prof. V. N. Giri, Prof. D. Suar	IIT Kharagpur	July 21, 2025	September 12, 2025	September 20, 2025
4	noc25-hs204	Humanities and Social Sciences	Sustainable Happiness	Prof. Atasi Mohanty	IIT Kharagpur	July 21, 2025	September 12, 2025	September 21, 2025
5	noc25-hs213	Humanities and Social Sciences	Entrepreneurship and IP Strategy	Prof. Gouri Gargate	IIT Kharagpur	July 21, 2025	September 12, 2025	September 21, 2025
6	noc25-mg95	Management	Innovation, Business Models and Entrepreneurship	Prof. Rajat Agrawal Prof. Vinay Sharma	IIT Roorkee	August 18, 2025	October 10, 2025	October 25, 2025
7	noc25-mg141	Management	Ethics in Engineering Practice	Prof. Susmita Mukhopadhyay	IIT Kharagpur	August 18, 2025	October 10, 2025	November 2, 2025
8	noc25-me166	Mechanical Engineering	Robotics	Prof. D k Pratihar	IIT Kharagpur	July 21, 2025	September 12, 2025	September 21, 2025

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S.Y. M. Tech. Civil (Structural Engineering) **Semester-IV**

SEP4DS2- Dissertation Phase-II

Teaching Scheme: **Examination Scheme**

Practical – Total 32 Hours, 16 Credits **ICA- 200 Marks**

ESE- 200 Marks

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1. In this semester, students are expected to carry out substantial research work on a synopsis titled topic and obtain results based on the proposed study in the synopsis.
2. The dissertation work should be completed with all respect by this semester. The students are required to submit the dissertation work in the form of a dissertation report as per the Institute's guidelines.
3. The dissertation report shall be hard bound, including work done by the student, literature review, problem definition/theoretical/experimental formulation/, formulation, Analytical/experimental/software/interdisciplinary methodology, experimentation, analytical/experimental/ implementation results-investigation, discussion, conclusions, and its relevance to the further work.

The viva voce examination of the Dissertation-II shall consist of a presentation by the candidate and demonstration of the work carried out in front of the appointed External Examiner.