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Courses of Study and Scheme of Examination of M. Tech

SCHEME OF EXAMINATION AND SYLLABUS

M-Tech 2ND Semester (Civil) Specialization in Structural Engineering

S. No.	Board of Study	Subject Code	Subject	Periods per Week			Scheme of Examination Theory / Practical			Total Marks	Credit L+(T+P)/2
				L	T	P	ESE	CT	TA		
1	Civil Engg.	CE228201	Advance Design of Concrete Structure	3	1	-	100	20	20	140	4
2	Civil Engg.	CE228202	Earthquake Effect on Structures	3	1	-	100	20	20	140	4
3	Civil Engg.	CE228203	Finite Element Analysis of Structure	3	1	-	100	20	20	140	4
4	Civil Engg.	CE228204	Maintenance and Rehabilitation of structure	3	1	-	100	20	20	140	4
5	Refer Table –II		Elective- II	3	1	-	100	20	20	140	4
6	Civil Engg.	CE228291	Advance Design of Structure Lab	-	-	3	75		75	150	2
7	Civil Engg.	CE228292	Structural Experimentation Lab	-	-	3	75		75	150	2
Total				**15**	**5**	**6**	**650**	**100**	**250**	**1000**	**24**

L-Lecture **T-Tutorial**
P-Practical **ESE- End Semester Exam**
CT-Class Test **TA- Teacher's Assessment**

Table-II

ELECTIVE- II			
S.No.	**Board of Study**	**Subject Code**	**Subject**
1	Civil Engg.	CE228221	Wind Effect on Structure
2	Civil Engg.	CE228222	Design of Industrial Structure
3	Civil Engg.	CE228223	Fabrication and Erection of Structures
4	Civil Engg.	CE228224	Composite Construction using Structural Steel

Note(1)– 1/4th of total strength of students subject to minimum of twenty students is required to offer an elective in the college in a Particular academic session.

Note(2)– Choice of elective course once made for an examination cannot be changed in futureexaminations.

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Subject Code	Advance Design of Concrete Structure	L = 3	T = 1	P = 0	Credits = 4
CE228201	ESE	CT	TA	Total	ESE Duration
	100	20	20	140	3 Hours

Course Objective	Course Outcomes
The objective is to make the students understand and conceptualize the reinforced cement concrete and different method of design of reinforced concrete and concept of limit state method analysis and design of beams, flat slabs, slender columns, RC element and inelastic behavior.	On successful completion of the course, the student will be able to: **CO1:-**Learn to design of RCC beams, calculation of deflections and crack width and analysis modes of failure. **CO2:-**Learn to design of RCC columns, and design of moment for braced and unbraced columns, and design of slender columns. **CO3:-**Learn to design of concrete wall, grid floors, and analysis of force and approximate method. **CO4:-**design of flat slabs. **CO5:-**Learn to design of cast-insitu joint in frame and analysis of durability, fire resistance.

UNIT- IDESIGN OF BEAMS **CO1**

Behaviour of RCC beams under combined Shear, Torsion and Bending, Modes of Failures, Inter action effects, Analysis and design of beams circular in plan, Design calculation of deflections and crack width. **[8Hrs]**

UNIT – II DESIGN OF SLENDER COLUMNS **CO2**

Behaviour of slender RCC Columns, Failure modes and Interaction curves, Additional Moment method, Comparison of codal provisions, calculation of design moments for braced and unbraced columns, Principles of Moment magnification method, design of slender columns. **[8Hrs]**

UNIT – III DESIGN OF SPECIAL RC ELEMENTS **CO3**

Design and detailing of Concrete walls according to IS code, Classification of shear walls, design principles, design of rectangular shear walls, Analysis of forces, Approximate analysis and design of Grid floors. **[8Hrs]**

UNIT – IV DESIGN OF FLAT SLABS **CO4**

Design of Flat slabs according to IS method, Shear in Flat Slabs. [**8Hrs]**

UNIT – V INELASTIC BEHAVIOUR **CO5**

Inelastic Behaviour of concrete beams-moment-rotation curves, moment redistribution, Design of cast-insitu joints in frames. Detailing requirements for ductility, durability and fire resistance, **[8Hrs]**

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Subject Code	Advance Design of Concrete Structure	L = 3	T = 1	P = 0	Credits = 4
CE228201	ESE	CT	TA	Total	ESE Duration
	100	20	20	140	3 Hours

Text Books:

S. No.	Title	Authors	Edition	Publisher
1	Advanced Reinforced Concrete Design	Varghese, P.C.	4	Prentice Hall of India
2	Advanced Reinforced Concrete Design	Krishna Raju, N.	4	CBS Publishers and Distributers.

Reference Books:

S. No.	Title	Authors	Edition	Publisher
1	Reinforced Concrete Structure Structural Elements: Behaviour Analysis and Design,	Purushothaman P	3	Tata McGraw-Hill.
2	Design of Concrete Structures	. Arthur H. Nilson	5	Tata McGraw-Hill.

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Subject Code	Earthquake Effect on Structures	L = 3	T = 1	P = 0	Credits = 4
CE228202	ESE	CT	TA	Total	ESE Duration
	100	20	20	140	3 Hours

Course Objective	Course Outcomes
1. To provide a coherent development to the students for the courses in sector of earthquake engineering. 2. To present the foundations of many basic engineering concepts related earthquake Engineering. 3. To give an experience in the implementation of engineering concepts which are applied in field of earthquake engineering. 4. To involve the application of scientific and technological principles of planning, analysis, design of buildings according to earthquake design philosophy.	On successful completion of the course, the student will be able to: **CO1:-**To understand the basic concept of Earthquake Engineering. **CO2:-** To understand the behavior on structures in past earthquake. **CO3:-** To understand the concepts of seismic Design. **CO4:-** To understand the various codal provisions of seismic code. **CO5:-** To analyze the various problems related earthquake.

UNIT- I ENGINEERING SEISMOLOGY **CO1**

Elements of Engineering Seismology, Characterization of ground motion, Earthquake intensity and magnitude, Recording instruments and base line correction, Predominant period and amplification through soil, Earthquake spectra for elastic and inelastic systems, Response Spectrum, Indian Standard Codes on Earthquake Engineering, Seismic Zoning Map of India. **[8Hrs]**

UNIT – II CASE STUDIES **CO2**

Earthquake History, Behavior of Structures in the past Earthquakes, Case Studies and Remedial Measures, **[8Hrs]**

UNIT – III DESIGN CONCEPTS **CO3**

Seismic Design Concepts, Cyclic load behavior of structural elements, Design spectrum, Principles of capacity design. **[8Hrs]**

UNIT – IV CODAL PROVISIONS **CO4**

Idealization of structural systems for low, medium and high rise buildings, Provisions of Seismic Code (IS 1893), Building systems frames, shear walls, Braced Frames. Ductility requirements for framed structures, **[8Hrs]**

UNIT – V SPECIAL PROBLEMS **CO5**

Structural Configuration, Seismic performance, Irregular Buildings, Soil performance, Modern Concepts, Base Isolation, Adoptive system, **[8Hrs]**

SCHEME OF EXAMINATION AND SYLLABUS

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Subject Code	Earthquake Effect on Structures	L = 3	T = 1	P = 0	Credits = 4
CE228202	ESE	CT	TA	Total	ESE Duration
	100	20	20	140	3 Hours

Text Books:

S. No.	Title	Authors	Edition	Publisher
1	Earthquake Resistant Design of Structures	Agrawal P. and Srikhande M.	Fourth	Prentice hall of India Private Limited, New Delhi
2	Theory and applications to Earthquake Engineering	. Chopra A.K., Dynamics of Structures	Second	Prentice Hall Inc

Reference Books:

S. No.	Title	Authors	Edition	Publisher
1	Indian Standard Codes / Handbooks on Earthquake Engineering			
2	Proceedings of recent seminars / workshops / conferences, Papers from relevant National and International Journals and Material from NICEE, IIT Kanpur.			

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SCHEME OF EXAMINATION AND SYLLABUS

M-Tech 2ND Semester (Civil) Specialization in Structural Engineering

Subject Code	Finite Element Analysis of Structure	L = 3	T = 1	P = 0	Credits = 4
CE228203	ESE	CT	TA	Total	ESE Duration
	100	20	20	140	3 Hours

Course Objective	Course Outcomes
The objective is to give exposure various methods of solution and in particular the finite element method and its application to varieties of problems.	On successful completion of the course, the student will be able to: **CO1:** Apply finite element method to solve problems in solid mechanics. **CO2:** Formulate and solve problems of structures like beams. **CO3:**Formulate and solve problems of structures like frames CO4: Formulate and solve problems in structures like Trusses. **CO5:** -Formulate Finite Element characteristic equations for two dimensional elements and analyze plain stress, plain strain, axi-symmetric, plate bending problems and analysis of shells.

UNIT- I BASIC CONCEPTS **CO1**

Review of solid mechanics, Displacement model, shape functions, Lagrange and Serendipity elements. Element properties, isoperimetric elements, numerical integration technique assemblage of elements and solution technique for static analysis, **[8Hrs]**

UNIT – II ANALYSIS OF BEAMS **CO2**

Finite Element formulation and Analysis of beams by Finite Element method, **[8Hrs]**

UNIT – III ANALYSIS OF RIGID JOINTED PLANE FRAME **CO3**

Finite Element formulation and Analysis of rigid jointed plane frame by Finite Element method. **[8Hrs]**

UNIT – IV ANALYSIS OF PIN JOINTED PLANE FRAME **CO4**

Finite Element formulation and Analysis of pin jointed plane frame by Finite Element method. **[8Hrs]**

UNIT – V INTRODUCTION TO PLATE AND SHELL ELEMENTS **CO5**

Analysis of plane stress / strain and ax symmetric solids-triangular, quadrilateral and isoperametric elements, Analysis of plate bending, basic equations of thin plate theory, Reissinner-Mindlin theory, plate elements and applications. Analysis of shells, degenerated shell elements, **[8Hrs]**

SCHEME OF EXAMINATION AND SYLLABUS

M-Tech 2ND Semester (Civil) Specialization in Structural Engineering

Subject Code	Finite Element Analysis of Structure	L = 3	T = 1	P = 0	Credits = 4
CE228203	ESE	CT	TA	Total	ESE Duration
	100	20	20	140	3 Hours

Text Books:

S. No.	Title	Authors	Edition	Publisher
1	Introduction to Finite Elements in Engineering	Chandrupatla T.R., Belegundu A.D.	Fourth	Prentice Hall of India Private Limited
2	Introduction to the Finite Element Method	Desai C.S., Abel J.F.	First	CBS Publishers & Distributors

Reference Books:

S. No.	Title	Authors	Edition	Publisher
1	Finite Element Analysis – Theory and Programming	Krishanmurthy, C.S	Second	Tata McGraw HillPublishing Company Limited
2	Concepts and Applications of Finite Element Analysis	Cook R.D. et.al.	Fourth	John Wiley

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SCHEME OF EXAMINATION AND SYLLABUS

M-Tech 2ND Semester (Civil) Specialization in Structural Engineering

Subject Code	Maintenance and Rehabilitation of structure	L = 3	T = 1	P = 0	Credits = 4
CE228204	ESE	CT	TA	Total	ESE Duration
	100	20	20	140	3 Hours

Course Objective	Course Outcomes
The objective is to make the students To learn various distress and damages to concrete and masonry structures, understand the importance of maintenance of structures ,study the various types and properties of repair materials, assess the damage to structures using various tests, learn the importance and methods of substrate preparation ,learn various repair techniques of damaged structures, corroded structures	On successful completion of the course, the student will be able to: **CO1:** - Outline the different properties and quality assurance of concrete structures**.** **CO2:** -Outline the various distress and damages to concrete and masonry structures. **CO3:**-The importance of maintenance of structures, types and properties of repair materials etc. **CO4:** -Understand the different materials used in maintenance and repair work of structure. **CO5:** -Assessing damage to structures and various repair techniques.

UNIT- I QUALITY ASSURANCE **CO1**

Quality assurance for Concrete and Steel construction, Properties such as strength, permeability, thermal properties and cracking.Corrosion prevention, **[8Hrs]**

UNIT – II INFLUENCE ON SERVICEBILITY AND DURABILITY **CO2**

Effects due to climate, temperature, chemicals, wear and erosion, Design and construction errors, corrosion mechanism, Effects of cover thickness and cracking, methods of corrosion protection, corrosion inhibitors, corrosion resistant steels, coatings, cathodic protection. **[8Hrs]**

UNIT – III MAINTENANCE AND REPAIR STRATEGIES **CO3**

Definitions: Maintenance, repair and rehabilitation, Facets of Maintenance importance of Maintenance Preventive measures on various aspects Inspection, Assessment procedure for evaluating a damaged structure causes of deterioration - testing techniques. **[8Hrs]**

UNIT – IV MATERIALS FOR REPAIR **CO4**

Special concretes and mortar, concrete chemicals, special elements for accelerated strength gain, Expansive cement, polymer concrete, Sulphur infiltrated concrete, ferro cement, Fiber reinforced concrete. **[8Hrs]**

UNIT – V TECHNIQUES FOR REPAIR **CO5**

Rust eliminators and polymers coating for rebar's during repair foamed concrete, mortar and dry pack, vacuum concrete, Gunite and Shotcrete Epoxy injection, Mortar repair for cracks, shoring and underpinning. **[8Hrs]**

SCHEME OF EXAMINATION AND SYLLABUS

M-Tech 2ND Semester (Civil) Specialization in Structural Engineering

Subject Code	Maintenance and Rehabilitation of structure	L = 3	T = 1	P = 0	Credits = 4
CE228204	ESE	CT	TA	Total	ESE Duration
	100	20	20	140	3 Hours

Text Books:

S. No.	Title	Authors	Edition	Publisher
1	"Concrete Structures", Materials, Maintenance and Repair	Denison Campbell, Allen and Harold Roper	Second	Longman Scientific and Technical UK, 1991
2	Repair of Concrete Structures	R.T. Allen and S.C. Edwards	Second	Blakie and Sons, UK, 1987

Reference Books:

S. No.	Title	Authors	Edition	Publisher
1	Concrete Technology - Theory and Practice	M.S. Shetty	Second	S. Chand and Company, New Delhi, 1992
2	"Learning from failures - Deficiencies in Design	Raikar, R.N.	First	, Construction and Service - R & D Centre (SDCPL), Raikar Bhavan, Bombay, 1987.

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Subject Code	Wind Effect on Structure	L = 3	T = 1	P = 0	Credits = 4
CE228221	ESE	CT	TA	Total	ESE Duration
	100	20	20	140	3 Hours

Course Objective	Course Outcomes
The objective of this course is to introduce to the students about wind load and how the wind load effects on different structures and design criteria for different type of structures.	On successful completion of the course, the student will be able to: **CO1: -**To understand the wind characteristics and behavior. **CO2: -**To learn about the static wind effects. **CO3: -**To learn about the dynamic wind effects. **CO4: -**To understand the effect of wind on tunnels. **CO5: -**To learn about different case studies on different structures.

UNIT- I WIND CHARACTERISTICS **CO1**

Variation of wind velocity, atmospheric circulations – pressure gradient force, coriolis force, frictionless wind balance, geostrophic flow, boundary layer. Extra ordinary winds – Foehn, Bora, Cyclones, Tornadoes etc. **[8Hrs]**

UNIT – II STATIC WIND EFFECTS **CO2**

Static wind effects and building codes with particular reference to IS 875 (Part-III), wind speed map of India, introduction to the proposed revisions of IS 875 (Part III), **[8Hrs]**

UNIT – III DYNAMIC WIND EFFECTS **CO3**

Wind induced vibrations, flow around bluff bodies, along wind and across wind response, flutter, galloping, vortex shedding, locking, ovalling; analysis of dynamic wind loads, codal provisions – gust factor, dynamic response factor; vibration control and structural monitoring; exposure to perturbation method, averaging techniques. **[8Hrs]**

UNIT – IV WIND TUNNEL TESTING **CO4**

Open circuit and closed circuit wind tunnels, rigid and aero-elastic models, wind tunnel measurements and instruments along with site visit. **[8Hrs]**

UNIT – V CASE STUDIES **CO5**

low rise buildings, parking sheds, workshop building, multistory building, water tanks, towers, chimneys, bridges. **[8Hrs]**

SCHEME OF EXAMINATION AND SYLLABUS

M-Tech 2ND Semester (Civil) Specialization in Structural Engineering

Subject Code	Wind Effect on Structure	L = 3	T = 1	P = 0	Credits = 4
CE228221	ESE	CT	TA	Total	ESE Duration
	100	20	20	140	3 Hours

Text Books:

S. No.	Title	Authors	Edition	Publisher
1	Wind Effects on Structures – An Introduction to Wind Engineering	EmilSimiu and R. H. Scanlan	-	John Wiley and Sons, New York, 986
2	An Introduction to Wind Effects on Structures	C. Scruton	-	Oxford University Press, Oxford,UK, 1981
3	Wind Forces in Engineering	Peter Sachs	-	Pergamon Press. Oxford UK, 1972

Reference Books:

S. No.	Title	Authors	Edition	Publisher
1	Wind Effects on Buildings	Lawson T. V.	-	Applied Science Publishers, London, UK, 1980
2	Wind Effects on Structures: fundamentals and applications to design	Simiu, E., Scanlan, R. H	3rd edition	John Wiley & Sons, New York, 1996

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Subject Code	Design of Industrial Structure	L = 3	T = 1	P = 0	Credits = 4
CE228222	ESE	CT	TA	Total	ESE Duration
	100	20	20	140	3 Hours

Course Objective	Course Outcomes
The objective is to give exposure about different types of loads, detailed calculations and their effect on the industrial structures. Analysis and design of advanced structural elements as per national code of practices.	On successful completion of the course, the student will be able to: **CO1:** - Apply Guidelines from factory act for planning and designing of Industries. **CO2:** -Design Industrial Roofs, Trusses, Domes, gantry Girders and Machine Foundation. **CO3:** -Design Bunkers and Silos. **CO4:** -Design Chimneys, Cooling Towers, Boilers, Piping and Nuclear structures **CO5:** -Design Cables, Transmission towers, Substation, Foundation for towers.

UNIT- I PLANNING AND FUNCTIONAL REQIREMENTS **CO1**

Classification of Industries and Industrial structures - planning for Layout Requirements regarding Lighting, Ventilation and Fire Safety - Protection against noise and vibration - Guidelines from Factories Act. **[8Hrs]**

UNIT – II INDUSTRIAL BUILDINGS **CO2**

Roofs for Industrial Buildings, Trusses and domes, Gantry Girders, Machine Foundations, **[8Hrs]**

UNIT – III Bunkers and Silos **CO3**

Analysis and Design of Bunkers and Silos, **[8Hrs]**

UNIT – IV POWER PLANT STRUCTURES **CO4**

Chimneys and Cooling Towers, High Pressure boilers and piping design, Nuclear containment structures. **[8Hrs]**

UNIT – V POWER TRANSMISSION STRUCTURES **CO5**

Cables, Transmission Line Towers, Substation Structures, Tower Foundations, Testing Towers, **[8Hrs]**

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Subject Code	Design of Industrial Structure	L = 3	T = 1	P = 0	Credits = 4
CE228222	ESE	CT	TA	Total	ESE Duration
	100	20	20	140	3 Hours

Text Books:

S. No.	Title	Authors	Edition	Publisher
1	Indian Standard Codes and Handbooks on Industrial Structures			
2	Relevant Publications from Institute for Steel Development and Growth	-	-	Kolkata

Reference Books:

S. No.	Title	Authors	Edition	Publisher
1	Handbook of Machine Foundations	P. Srinivasulu and C.V. Vaidyanathan		Tata McGraw-Hill 1976
2	Design and Construction	S.N. Manohar		Tata McGraw-Hill, 1985
3	Transmission Line Structures	A.R. Santhakumar and S.S. Murthy		Tata McGraw-Hill1992
4	Storage Structures	Dr. K. Rajagopalan		Oxford IBH Publishing Company Ltd.

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Subject Code	Fabrication and Erection of Structures	L = 3	T = 1	P = 0	Credits = 4
CE228223	ESE	CT	TA	Total	ESE Duration
	100	20	20	140	3 Hours

Course Objective	Course Outcomes
1. To know various properties of different types of steel section hollow section and rectangular section. 2. To know about the fabrication drawing. 3. To know about the erection process. 4. To understand about the tools used for erection. 5. To know about the inspection, quality control and safety precaution.	On successful completion of the course, the student will be able to: **CO1:** - To develop ability of the properties of different types of steel section hollow section and rectangular section. **CO2:** -To understand about the fabrication drawing. **CO3:** - To develop ability of erection. **CO4:** - To develop process the tools used for erection. **CO5:** - To develop the ability of the inspection, quality control and safety precaution.

UNIT- I GENERAL **CO1**

Various slopes, size and properties of rolled steel sections, tubes and hollow rectangular sections: Chemical composition, physical properties and weldability of various types of structures steel, their suitability for various purposes.

Various operations like interpretation of drawings, shop-floor operations, fastenings, assembling, finishing and shipping, sub-assemblies and main assemblies, **[8Hrs]**

UNIT – II FABRICATION DRAWINGS **CO2**

Structural connections, their classification, symbols for their representation, layout of an industrial building, preparation of fabrication drawing and detailing for columns, trusses, beams and cladding, detailing of truss- joints, column bases, beam to beam and column to beam connection (Seated and framed). **[8Hrs]**

UNIT – III ERECTION PROCESS **CO3**

Principle of erection, Erection organisation, Preparation and reading of erection drawing, Assembly marks, common types of structures to be erected, erection of tackle and false work equipment's for lifting and rigging, Code provisions for erection.

Methods of erection, levelling and alignment, setting out and grouting, allowable tolerances for plumbing, levelling and alignment, **[8Hrs]**

UNIT – IV TOOLS FOR ERECTION **CO4**

Miscellaneous small tools for erection like drifts, shakles and grips, erection of shed type buildings, portal frames, multi-storeyed buildings, prefabricated tanks, towers and chimneys. **[8Hrs]**

Subject Code	Fabrication and Erection of Structures	L = 3	T = 1	P = 0	Credits = 4
CE228223	ESE	CT	TA	Total	ESE Duration
	100	20	20	140	3 Hours

UNIT – V INSPECTION, QUALITY CONTROL AND SAFETY **CO5**

Code provisions for tolerances and deviations, Inspection of welds, radiographic and ultrasonic techniques, various stages of inspection, Quality control departments, methods of rectification of defects.

Accidents and their causes, various unsafe acts and precautions for their prevention, Rules for safety for cranes, winches, etc.Safety during electrical operations and while using X-ray equipment's, Maintenance of erected structures, surface treatment against corrosion, etc. **[8Hrs]**

Text Books:

S. No.	Title	Authors	Edition	Publisher
1	Structural Steel Fabrication and Erection	S.K. Saxena and R.B. Asthane	-	Somaiya Publications, 172, Mumbai Marathi Granth, Sangrahalaya Marg, Dadar, Bombay-14
2	Guide Book for Fabrication and Erection of Steel Structures	-	-	Institute for Steel Development and Growth, Kolkata

Reference Books:

S. No.	Title	Authors	Edition	Publisher
1	Structural Steel Drafting and Detailing	Shivagunde R.B. and Asthana R.B.	-	Somaiya Publications, New Delhi.
2	Steel Designer's Manual	Graham W. Owens & Peter R. Knowles	5th Edition	Blackwell Scientific Publications, London

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Subject Code	Composite Construction using Structural Steel	L = 3	T = 1	P = 0	Credits = 4
CE228224	ESE	CT	TA	Total	ESE Duration
	100	20	20	140	3 Hours

Course Objective	Course Outcomes
1. To get introduced to composite construction and composite Behaviour of steel concrete composite structures. 2. To obtain the knowledge to conceptualize and design the composite beams, columns, floors, slabs and concrete 3. Filled steel tubes. To get introduced to various connections and connection design of composite structures 4. To have a knowledge in the Behaviour of composite box girder bridges 5. To possess practical knowledge on the skills of composite construction and seismic Behaviour of composite structures through case studies.	On successful completion of the course, the student will be able to: **CO1:** - Illustrate the behaviour of composite structures. **CO2:** - Design various composite structural elements such as beams, columns, floors, slabs and concrete filled steel tubes **CO3:** - Analyse the connection behaviour and design **CO4:** - Assess the behaviour of box girder bridges and design concepts of the same **CO5:** - Evaluate the concepts of various structural elements and design concepts through case studies

UNIT- I INTRODUCTION **CO1**

Introduction to steel - Concrete composite construction, Theory of composite structures, Seismic behaviour of composite structures, **[8Hrs]**

UNIT – II DESIGN OF COMPOSITE MEMBERS **CO2**

Behaviour of composite beams and Columns, Design of composite beams, Steel - Concrete composite columns, Design of composite trusses. **[8Hrs]**

UNIT – III DESIGN OF CONNECTIONS **CO3**

Types of connections, Design of connections in the composite structures, Shear connections, Design of connections in composite trusses. **[8Hrs]**

UNIT – IV COMPOSITE BRIDGERS **CO4**

Introduction, Behaviour of composite bridges, Design concepts, **[8Hrs]**

UNIT – V CASE STUDIES **CO5**

Case studies on steel - Concrete composite construction in buildings and bridges. **[8Hrs]**

SCHEME OF EXAMINATION AND SYLLABUS

M-Tech 2ND Semester (Civil) Specialization in Structural Engineering

Subject Code	Composite Construction using Structural Steel	L = 3	T = 1	P = 0	Credits = 4
CE228224	ESE	CT	TA	Total	ESE Duration
	100	20	20	140	3 Hours

Text Books:

S. No.	Title	Authors	Edition	Publisher
1	Composite structures of steel and concrete	Johnson R.P.	-	Blackwell Scientific Publications (Second Edition), UK, 1994.
2	Handbooks	Ross T. J	Third	Institute for Steel Development and Growth, Kolkata

Reference Books:

S. No.	Title	Authors	Edition	Publisher
1	Steel Designers manual	Owens, G.W. and Knowels. P.	5th Edition	Steel Concrete Institute (UK), Oxford Blackwell Scientific Publications, 1992
2	Proceedings of recent seminars / workshops / conferences and Papers from relevant National and International Journals			

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Subject Code	Advanced Design of Structures Lab	L = 0	T = 0	P = 3	Credits = 2
CE228291	ESE	CT	TA	Total	ESE Duration
	075	-	75	150	3 Hours

Experiments to be performed (Minimum 10 experiments to be performed)

1. Introduction to latest version of a Standard Structural Engineering Design Package such as STAAD Pro.
2. Modelling of RCC Frame on latest version of a Standard Structural Engineering Design Package such as STAAD Pro. (including Earthquake and Wind Loads)
3. Analysis and Interpretation of Results of Analysis on RCC Frame on latest version of a Standard Structural Engineering Design Package such as STAAD Pro.
4. Design and Interpretation of Results of Design of RCC Frame on latest version of a Standard Structural Engineering Design Package such as STAAD Pro.
5. Modelling, of Steel Frame on latest version of a Standard Structural Engineering Design Package such as STAAD Pro. (including Earthquake and Wind Loads)
6. Analysis and Interpretation of Results of Analysis on Steel Frame on latest version of a Standard Structural Engineering Design Package such as STAAD Pro.
7. Design and Interpretation of Results of Design of Steel Frame on latest version of a Standard Structural Engineering Design Package such as STAAD Pro.
8. Case Study of design of a RCC Multistory Building / Steel Industrial Building on latest version of a Standard Structural Engineering Design Package such as STAAD Pro.
9. Introduction to latest version of Finite Element Package such as ANSYS.
10. Modeling of an Steel Angle section on ANSYS and viewing the results.
11. Design of Multistory Building for Dead Loads and Live Loads.
12. Design of Multistory Building for Dead Loads, Live Loads and Wind Loads.
13. Design of Multistory Building for Dead Loads, Live Loads and Earthquake Loads.
14. Modeling of Steel Connections in Finite Element Package ANSYS.
15. Introduction to Non-Linear Finite Element analysis of structures on ANSYS

List of Equipments / Machine Required:

a) PIV Computers with 17" Colour Monitors & UPS
b) STAAD Pro Software
c) ANSYS Software

Recommended Books:

1. Users Manuals for STAAD Pro Software.
2. Users Manuals for ANSYS Software.

Shri Shankaracharya Technical Campus,

Shri Shankaracharya Group of Institutions

(An Autonomous Institute affiliated to Chhattisgarh Swami Vivekanand Technical University Bhilai)

Courses of Study and Scheme of Examination of M. Tech

SCHEME OF EXAMINATION AND SYLLABUS

M-Tech 2ND Semester (Civil) Specialization in Structural Engineering

Subject Code	Matrix Methods of Structural Analysis Lab	L = 0	T = 0	P = 3	Credits = 2
CE228292	ESE	CT	TA	Total	ESE Duration
	075	-	75	150	3 Hours

Experiments to be performed (Minimum 10 experiments to be performed)

1. Study of Strain gauges – Principles and applications, mechanical, optical and electrical strain gauges.
2. Study of Strain recording instruments.
3. Study the response of RCC Beams using dial gauges, load cells etc. on a loading Frame.
4. Study the response of structural members RCC Columns using dial gauges, load cells etc. on a loading Frame.
5. Study the response of Steel Beams using dial gauges, load cells etc. on a loading Frame.
6. Study the response of Steel Columns using dial gauges, load cells etc. on a loading Frame.
7. Study the response of Steel Trusses using dial gauges, load cells etc. on a loading Frame.
8. Testing and recording of stress strain curve of steel specimens on Universal Testing Machine.
9. Testing of steel connections to demonstrate single shear / Double shear failure of bolts on Universal Testing Machine.
10. Use of static and dynamic data recording and processing systems.
11. Comparison of behaviour of steel beam (laterally supported and laterally unsupported) on a loading frame.
12. Load carrying capacity of RCC Columns of various cross-sections such as plus shape, circular shape, etc.
13. Preparation of moment-rotation curves for framed steel connections.
14. Preparation of moment-rotation curves seated steel connections.
15. Preparation of moment-rotation curves for moment-resistant connections.

List of Equipments / Machine Required:

a) Loading frame (50T capacity)
b) Universal testing machine 100 T capacity
c) Strain gauges
d) Dial gauges
e) Load cells

Recommended Books:

1. Dally J.W. and Riley W.F., Experimental stress analysis, McGraw-Hill Inc., New York.
2. Rangan Csetal, Instrumentation-Devices & Systems, Tata McGraw Hill Publishing Co. Ltd., New Delhi.