



SATHYABAMA

INSTITUTE OF SCIENCE AND TECHNOLOGY

(DEEMED TO BE UNIVERSITY)

Accredited A++ Grade by NAAC | 12B Status by UGC | Approved by AICTE

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**School of Building and Environment
Department of Civil Engineering**

1.1.2 List of Courses Revised / Introduced in the Academic Year 2022 – 23

S. No.	Programme	Course Code	Course Name	Page No.
1	B.E. Civil Engg.	SCIA1703	Prestressed Concrete Structures	5
2	B.E. Civil Engg.	SCIA1506	Water Resources Engineering	6
3	B.E. Civil Engg.	SCIA2502	Environmental Engineering Lab	7
4	B.E. Civil Engg.	SCIA3022	Prefabricated Structures	8
5	B.E. Civil Engg.	SCIA3023	Experimental Stress Analysis	9
6	M.E. Structural Engg.	SCIA7003	Maintenance and Rehabilitation of Structures	10
6	M.E. Structural Engg.	SCIA1709	Structural Health Monitoring	11
7	B.E. Civil Engg.	SCIA2201	Building Planning and Drawing Lab	15
8	B.E. Civil Engg.	SCIA3005	Energy and Environmental Management	16
9	B.E. Civil Engg.	SCIA3009	Highway Pavement Design	17
10	B.E. Civil Engg.	SCIA2602	Highway Engineering Lab	18
12	B.E. Civil Engg.	SCIA3023	Green Buildings	19
13	M.E. Structural Engg.	SCIA5203	Advanced Design of Steel Structures	20



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School of Building and Environment Department of Civil Engineering

Board of Studies Meeting - Academic Year 2022-2023

The periodic Board of studies meeting, for the Department of Civil Engineering, School of Building and Environment will be held on 25.05.2022, 10.00 am at CADD lab, Civil Department.

Internal members

1. Dr.Devyani Gangopadhyay, Dean, School of Building and Environment
2. Dr.S.Packialakshmi, Associate Professor, Department of Civil Engineering
3. Dr.R.Padmapriya, Associate Professor, Department of Civil Engineering
4. Dr.V.Sampathkumar, Professor, Department of Civil Engineering
5. Dr.R.Nirmala, Associate Professor, Department of Civil Engineering

External members

1. Dr.R.Santhakumar, Professor, Department of Civil Engineering, NITTTR, Chennai
2. Dr.R.Saravanan, Associate Professor, CWR, Anna University, Chennai

Agenda:

1. Review of Curriculum for the upcoming semester courses
2. Revision of Syllabi for the Course Prestressed Concrete Structures, Water Resources Engineering and Environmental Engineering Lab for B.E. Civil Engineering and Maintenance and Rehabilitation of Structures for M.E. Structural Engineering
3. Implementation of Prefabricated Structures and Experimental Stress Analysis Elective Courses for B.E Civil Engineering students and Structural Health Monitoring as Elective course for M.E Structural Engineering students

HOD

HEAD OF THE DEPARTMENT
DEPARTMENT OF CIVIL ENGINEERING
SATHYABAMA
INSTITUTE OF SCIENCE AND TECHNOLOGY
(DEEMED TO BE UNIVERSITY)
Jeppiaar Nagar, Rajiv Gandhi Salai,
Chennai - 600 119.



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School of Building and Environment Department of Civil Engineering

Minutes of the BOS Meeting - Academic year 2022-2023

The Board of Studies Meeting for both UG and PG programme is held on 25.05.2022, 10.00 AM at CADD Lab, Civil Department.

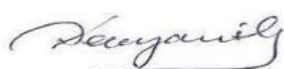
Members Present

- | | |
|---|---------------|
| 1. Dr.Devyani Gangopadhyay | |
| ConvenorDean, School of Building and Environment | |
| 2. Dr.R.Santhakumar | Expert Member |
| Professor, Department of Civil Engineering, NITTTR, Chennai | |
| 3. Dr.R..Saravanan | Expert Member |
| Associate Professor, CWR, Anna University, Chennai | |
| 4. Dr.R.Padmapriya | Member |
| Associate Professor, Department of Civil Engineering | |
| 5. Dr.S.Packialakshmi | Member |
| Associate Professor, Department of Civil Engineering | |
| 6. Dr.V.Sampathkumar | Member |
| Professor, Department of Civil Engineering | |
| 7. Dr.R. Nirmala | Member |
| Associate Professor, Department of Civil Engineering | |

The Dean, School of Building and Environment Dr. Devyani Gangopadhyay, initiated the periodic Board of Studies meeting by briefing the agenda to be discussed. After a detailed discussion among the board of studies members on the updating the syllabus of the courses mentioned below;

- Prof. Dr. Santhakumar, Department of Civil Engineering, NITTTR, Chennai suggested to incorporate the topic - Composite Construction – methods, design principles, IS specifications - Analysis of Stresses, Check for deflection, Flexural and Shear strength of Composite members in fifth Unit in the Course Prestressed Concrete.

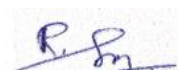
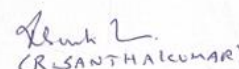
- Dr. R. Saravanan, Associate Professor, CWR, Anna University, Chennai, recommended to include the topic Intergrated Water Resources Management, Key issues in water management, Concepts and principles of Water Management, Benefits of Integrated Water Resources Management to various sectors such as Environment, Agriculture, Water supply and sanitation in Unit – I for the course Water Resources Engineering.
- Dr.S.Packialakshmi has given a suggestion on the inclusion of demonstration experiment on monitoring of air quality, an emerging scenario in the environment assessment and determination of odour and taste of a water sample for the students to learn in the laboratory course Environmental Engineering Lab.
- To meet out the sustainability requirements and effective recycling of waste materials in the course Maintenance and Rehabilitation of Structures, the topics Acoustical emission methods under Unit – II, Special types of Concrete made with Industrial wastes as an alternative materials under Unit -III, Strengthening of dams, canals – Strengthening of Heritage Buildings – Corrosion and erosion damaged structures and Demolition Techniques and Engineered Demolition Methods and its Case studies are added in Unit – IV Repair and strengthening of structures to understand the practical methodologies followed in the real-time applications.
- The syllabus for the Prefabricated Structures and Experimental Stress Analysis for UG Programme and Structural Health monitoring for PG Programme was framed by Dr.R. Padmapriya to develop the keen interest towards the applications of current trends in the structural engineering and to learn the assessment of Stress conditions for various experimental procedures, approved by Expert Committee members and implemented as Choice Based Credit Courses for the academic year 2022-2023
- The Curriculum for the courses (both Undergraduate and Post Graduate) in the upcoming semester is meeting out the requirements of skill development/ Employability/ Entrepreneurship liability for the students.



Convenor/Dean



HOD

Expert member

SCIA1703	PRESTRESSED CONCRETE STRUCTURES	L	T	P	Credits	Total Marks
		3	*	0	3	100

COURSE OBJECTIVE

- To impart the knowledge about design of pre stressed concrete members.

UNIT 1 INTRODUCTION – THEORY AND BEHAVIOUR

9 Hrs.

Basic Concepts – Advantages – Material Required – Systems and Methods of Prestressing – Analysis of Sections by Stress Concepts, Strength concept and Load Balancing Concept – Losses due to Prestressing.

UNIT 2 DESIGN FOR FLEXURE

9 Hrs.

Definition of Type I, II & III Structures – Basic assumptions – Permissible stresses in steel and concrete as per IS : 1343 – Design of Rectangular, I & T section – Ultimate strength based on IS : 1343 – 1980.

UNIT 3 DEFLECTION

9 Hrs.

Short term deflection of uncracked members – Long term deflection – Deflection due to creep – Code requirements of limit state deflection.

UNIT 4 TRANSFER OF PRESTRESS AND INDETERMINATE STRUCTURES

9 Hrs.

Anchorage Zone – Stresses in post tensioned members – Calculation of bearing stress and bursting tensile forces & reinforcement in anchorage zones based on IS : 1343 method. Methods of achieving continuity – Assumptions in Elastic analysis – Continuous beams – Linear transformation- Concordant cables.

UNIT 5 MISCELLANEOUS STRUCTURES

9 Hrs.

Design of tension and compression members – Tanks, pipes and poles – Partial prestressing – Definition, methods of achieving partial prestressing, merits and demerits of partial prestressing - Composite Construction – methods, design principles, IS specifications - Analysis of Stresses, Check for deflection, Flexural and Shear strength of Composite members

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, students will be able to

- CO1 - Analyse a composite section.
- CO2 - Evaluate the losses in different types of prestressed flexural beams.
- CO3 - Analyse and design of Tension and compression members.
- CO4 - Analysis of stresses in flexural member.
- CO5 - Design of prestressing concrete pipes.
- CO6 - Understand behaviour of flexural members subjected to external loads.

TEXT / REFERENCE BOOKS

1. Krishna Raju N., "Prestressed concrete", 6th Edition, Tata McGraw Hill Company, New Delhi, 2018
2. Pandit.G.S. and Gupta.S.P., "Prestressed Concrete", CBS Publishers and Distributors Pvt. Ltd, 2012.
3. Rajagopalan.N, "Prestressed Concrete", Narosa Publishing House, 2002.
4. Dayaratnam.P., "Prestressed Concrete Structures", Oxford and IBH, 2013.
5. Lin T.Y. and Ned.H.Burns, "Design of prestressed Concrete Structures", 3rd Edition, Wiley India Pvt. Ltd., New Delhi, 2013.
6. IS1343:2012, Code of Practice for Prestressed Concrete, Bureau of Indian Standards, New Delhi, 2012.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100

Exam Duration: 3 Hrs.

PART A: 10 Questions of 2 marks each - No choice

20 Marks

PART B: 2 Questions from each unit of internal choice; each carrying 16 marks

80 Marks

 Added Contents

 Deleted Contents

 New Course Introduced

SCIA1506	WATER RESOURCES ENGINEERING	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVES

- To introduce the theoretical concepts in hydrological components and understanding of water resources systems.
- To develop the skills in modeling of flood flows, flood routing, ground water flow, type of aquifer and yield from the well.
- To provide the knowledge of design of reservoir, operation and sedimentation.
- To study the effect, causes and remedial measures of watershed management

UNIT 1 INTRODUCTION

8 Hrs.

Introduction - Water resources projects - Introduction - Water resources of India - Range of water resources projects General planning philosophy - Water allocation priorities - Irrigation - Flood control - Hydropower. Data requirement and data collection for different projects - Water availability studies. Environmental checklist for Water Resources projects - **Intergrated Water Resources Management - Key issues in water management - Concepts and principles of Water Management - Benefits of IWRM to various sectors - Environment, Agriculture, Water supply and sanitation**

UNIT 2 BASIC CONCEPTS OF HYDROLOGY

10 Hrs.

Hydrologic cycle - rainfall and its measurement - computation of mean rainfall over a catchment area using arithmetic mean, Thiessen polygon and Isohyetal methods - Abstraction from rainfall - evaporation, factors affecting evaporation, measurement of evaporation - evapotranspiration - Infiltration, factors affecting infiltration, measurement of infiltration, infiltration indices. Runoff - components of runoff, factors affecting runoff, stream gauging, effective rainfall, separation of base flow.

UNIT 3 GROUND WATER HYDROLOGY

10 Hrs.

Soil water zones, Soil moisture relations Specific retention, Specific yield. Occurrence of ground water - Types of aquifers - unconfined aquifer, confined aquifer, aquitard - Storage coefficients - coefficient of permeability and transmissibility, Steady radial flow into a well under confined and unconfined condition, pumping and recuperation tests, Tube wells and Open wells - yield from an open well.

UNIT 4 RESERVOIR PLANNING

8 Hrs.

Reservoir planning: Investigation - selection of site - storage zones in a reservoir - mass inflow curve - demand curve - calculation of reservoir capacity and safe yield from mass inflow curve - reservoir sedimentation reservoir sediment control. Single and multipurpose reservoirs.

UNIT 5 WATERSHED MANAGEMENT

9 Hrs.

Flood and Drought: Design flood - assessment and mitigation measures - causes - methods of flood control, flood forecasting - Drought assessment and mitigation measures. Levees and flood walls, Channel improvement. Delineation of basin boundary - watershed management. Remote sensing application to water resource engineering - case study.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

- CO1 - Understand the importance of water resources and the system management and planning
- CO2 - Elaborate the system of hydrological cycle and their components with their implications
- CO3 - Estimate the hydrological components of precipitation, runoff, infiltration and evapo-transpiration characteristics
- CO4 - Understand the fundamentals of groundwater hydrology with geological considerations
- CO5 - Evaluate the important aquifer parameters for different types of aquifer storages
- CO6 - Build the planning and management of reservoirs and watershed as an flood and drought mitigation measures

TEXT / REFERENCE BOOKS

1. Linsley R.K. and Franzini J.B, "Water Resources Engineering", McGraw Hill Inc, 2009.
2. Garg S. K., "Irrigation Engineering and Hydraulic structures", Khanna Publishers, 23rd Revised Edition, New Delhi, 2009.
3. Punmia B.C. et al., Irrigation and water power Engineering, Laxmi Publications, 16th Edition, New Delhi, 2009
4. Ven Te Chow, "Applied Hydrology", McGraw Hill Inc., 1990.
5. Subramanya, K., Engineering Hydrology, Tata McGraw Hill Publishers, 2008.
6. Todd D.K., "Groundwater Hydrology", John Wiley & Sons, Inc., New York.
7. Sharma R.K. and T.K. Sharma, "Hydrology and Water Resources Engineering", Dhanpat Rai Publications, New Delhi.
8. Rushton K.R., "Groundwater hydrology conceptual and computational models", Wiley Publisher.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100

Exam Duration: 3 Hrs.

PART A: 10 Questions of 2 marks each - No choice

20 Marks

PART B: 2 Questions from each unit of internal choice; each carrying 16 marks

80 Marks

Added Contents

Deleted Contents

New Course Introduced

SCIA2502	ENVIRONMENTAL ENGINEERING LAB	L	T	P	Credits	Total Marks
		0	0	4	2	100

COURSE OBJECTIVES

- To analyze the physical, chemical and biological characteristics of water and wastewater.
- To quantify the dosage requirement for coagulation process.

SUGGESTED LIST OF EXPERIMENTS

1. Determination of pH
2. Determination of Conductivity
3. Determination of Alkalinity
4. Determination of Chlorides (Mohr's method)
5. Determination of Hardness (EDTA method)
6. Determination of Turbidity (NTU)
7. Determination of Total Solids
8. Determination of Total Dissolved Solids
9. Determination of Residual Chlorine
10. Determination of Optimum dosage of Coagulant (Jar Test)
11. Determination of Dissolved Oxygen (Winkler method)
12. Determination of Biochemical Oxygen Demand (BOD5)
13. Determination of Chemical Oxygen Demand (COD)
14. Determination of Total Organic Carbon (TOC)
15. Determination of colour and odour of water sample
16. Air quality monitoring (ambient, stack monitoring, indoor air pollution)

COURSE OUTCOMES

On completion of the course, student will be able to

- CO1 - Quantify the pollutant concentration in water and wastewater.
CO2 - Suggest the type of treatment required and amount of dosage required for the treatment.

 Added Contents

 Deleted Contents

 New Course Introduced

SCIA3022	PREFABRICATED STRUCTURES	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVES:

- To introduce the basic concepts of prefabrication
- To acquire the knowledge of prefabrication components and systems
- To understand the design principles in prefabrication
- To perceive the types of joints and connections in structural members
- To impart knowledge about the structural stability.

UNIT I INTRODUCTION

9 Hrs

Need for prefabrication -Advantages and limitations – Principles of prefabrication – Modular coordination – Standardization– Loads and load combinations– Materials – Production – Transportation – Erection.

UNIT II PREFABRICATED COMPONENTS AND SYSTEMS

9 Hrs

Behaviour and types of structural components– roof and floor slabs – Walls panels - Shear walls - Beams - Columns – skeletal system- portal frame system - Large panel systems- block system

UNIT III DESIGN PRINCIPLES

00 9 Hrs

Design philosophy- Design of cross section based on efficiency of material used – Problems in design because of joint flexibility – Allowance for joint deformation - Demountable precast concrete systems- Design for stripping, stacking, transportation and erection of elements

UNIT IV JOINTS AND CONNECTIONS IN STRUCTURAL MEMBERS

9 Hrs

Types of Joints – based on action of forces - compression joints - shear joints - tension joints - based on function - construction joints, contraction joints, expansion joints. Design of expansion joints - 108 Dimensions and detailing - Types of sealants - Types of structural connections - Beam to Column - Column to Column - Beam to Beam - Column to foundation.

UNIT V DESIGN FOR ABNORMAL LOADS

9 Hrs

Progressive collapse – Codal provisions – Equivalent design loads for considering abnormal effects such as earthquakes, cyclones, etc., - Importance of avoidance of progressive collapse -case study.

COURSE OUTCOMES:

On completion of the course, student will be able to

- CO1 - Understand concepts about principles of prefabrication, production, transportation, erection.
CO2 - Acquire knowledge about panel systems, slabs, beams, shear walls and columns used in precast construction.
CO3 - Acquire knowledge about design of cross section, joint flexibility.
CO4 - Acquire knowledge about joints and connection in precast construction.
CO5 - Acquire knowledge about abnormal loads
CO6 - Acquire knowledge about structural stability.

TEXT/REFERENCES BOOKS:

1. Bruggeling A.S. G and Huyghe G.F. "Prefabrication with Concrete", A.A. Balkema Publishers, USA,1991.
2. Lewitt,M. " Precast Concrete- Materials, Manufacture, Properties And Usage ,CRC Press, 2019
3. Alfred Steinle, Hubert Bachmann, Mathias Tillmann, Philip Thrift . "Precast Concrete Structures", Ernst & Sohn, Berlin, 2019.
4. Koncz T., "Manual of precast concrete construction", Vol. I, II and III, Bauverlag, GMBH, 1976.
5. "Handbook on Precast Concrete Buildings", Indian Concrete Institute, 2016.
6. " Precast concrete connection details", Structural Design manual, Society for the studies in the use of precast concrete, Netherland Betor Verlag, 2009.

Added Contents

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New Course Introduced

SCIA3023	EXPERIMENTAL STRESS ANALYSIS	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVE

- To learn the principles of measurements of static and dynamic response of structures and carryout the analysis of results.

UNIT 1 STRAIN MEASUREMENT

9 Hrs.

Methods of Measurement -Calibration-Load calibration of testing machines-I.S. Code provisions - Measurement system - Strain measurement - Strain gauges - Principle, Types, Performance, Uses - Strain Rosettes- Wheatstone Bridge- Photo elasticity- Principle, Application-Moire fringe- Electronic load cells-Proving rings.

UNIT 2 MEASUREMENT OF VIBRATION AND WIND FLOW

9 Hrs.

Measurement of Vibration- Vibration Galvanometers- Vibrometer-Characteristics of Structural vibration- Pressure gauges-Velocity transducers- Seismic transducers – Linear Variable Differential Transformer- Cathode ray oscilloscope – X Y Plotter- Wind Tunnels-Flow meters- Venturimeter- Digital Data Acquisition systems.

UNIT 3 DISTRESS MEASUREMENT AND CONTROL

9 Hrs.

Diagnosis of distress in structures-Cracks in structures-Formation of cracks- Types of cracks-Causes of cracks- Crack measurement- Monitoring and measurement of crack movement- Corrosion of reinforcement in RCC- Half cell-Construction and use-Damage assessment-Controlled blasting for demolition.

UNIT 4 N.D.T.METHODS

9 Hrs.

Load testing on structures-In situ load testing-Ultimate load testing-Rebound hammer-Principle and Applications-Limitations- Ultrasonic testing- Principles and Applications- Brittle coating- Principle and Applications- Stress coat- All Temp- Comparison of brittle coatings- Evaluation of the coating.

UNIT 5 MODEL ANALYSIS

9 Hrs.

Model laws- Laws of similitude-Model materials- Model testing- Necessity for Model analysis-Advantages- Applications- Types of similitude- Scale effect in Models- Indirect model study- Direct model study- Limitations of model investigations- Structural problems that may demand model studies- Usage of influence lines in model studies.

Max. 45 Hrs.

TEXT / REFERENCE BOOKS

1. Dally J.W. and Riley W.F., "Experimental stress Analysis", McGraw Hill, Inc. New York, 1991.
2. Srinath L.S. et al, "Experimental Stress Analysis", Tata McGraw Hill Publishing Co. Ltd., New Delhi, 1984.
3. Rangan C.S., "Instrumentation – Devices and Systems", Tata McGraw Hill Publishing Co. Ltd., New Delhi, 1983.
4. Sadhu Singh, "Experimental Stress Analysis", Khanna Publishers, New Delhi, 1996.
5. Sirohi R.S., Radhakrishna H.C., "Mechanical Measurements", New Age International Pvt. Ltd., 1997.
6. Bray D.E. and Stanley R.K., "Course Material on Non-destructive Evaluation", McGraw Hill Publishing Company, New York, 1989.
7. Ravisankar K. and Chellappan A., "Advanced course on Non-Destructive Testing and Evaluation of Concrete Structures", SERC, Chennai, 2007.
8. Ganesan T.P., "Model Analysis of Structures", University Press, India, 2000.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100

Exam Duration: 3 Hrs.

PART A: 10 Questions of 2 Marks each – No choice

20 Marks

PART B: 2 Questions from each unit of internal choice, each carrying 16 Marks

80 Marks

Added Contents

Deleted Contents

New Course Introduced

SCIA7003	MAINTENANCE AND REHABILITATION OF STRUCTURES	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVE

- To study the damages, repair and rehabilitation of structures.

UNIT 1 MAINTENANCE AND REPAIR STRATEGIES

9 Hrs.

Maintenance, repair and rehabilitation, facets of maintenance and importance of maintenance, various aspects of inspection, Assessment procedures for evaluating damaged structures, causes of deterioration – Testing techniques, NDT, Rebound Hammer, types of failures in foundation, floors, roofs, walls etc., Safety evaluation of existing buildings.

UNIT 2 SERVICEABILITY AND DURABILITY OF CONCRETE

9 Hrs.

Quality assurance for concrete construction, concrete properties strength, workability, permeability, thermal properties and cracking. Effects due to climate, temperature, chemicals, wear and erosion, design and construction errors, corrosion mechanism, effects of cover thickness and cracking of corrosion protection, corrosion inhibitors, corrosion resistant steels, coatings, cathodic protection - **Acoustical emission methods**

UNIT 3 MATERIALS AND TECHNIQUES FOR REPAIR

9 Hrs.

Special concrete and mortars, concrete chemicals, special elements for accelerated strength gain, expansive cement, polymer concrete, sulphur infiltrated concrete, Ferro-cement, fibre reinforced concrete, **Concrete made with industrial wastes** - water-proofing materials, Admixtures. Polymer coating for rebars, vacuum concrete, gunite, shotcrete, Epoxy injection, Mortar repairs of cracks, Shoring & Underpinning.

UNIT 4 REPAIR OF STRUCTURES

9 Hrs.

Repair of structures distressed due to Earthquake. Strengthening using FRP, Strengthening and Stabilization techniques for repair. Strengthening of bridge pier – **Strengthening of dams, canals – Strengthening of Heritage Buildings – Corrosion and erosion damaged structures** - **Demolition Techniques – Engineered Demolition Methods – Case Studies.**

UNIT 5 NDT OF STEEL

9 Hrs.

Correlating ASTM tensile test (or IS:1608) for rebar with chemical composition results with respect to IS:2062, use of digital thickness gauges and weld gauges, use of hardness testers – Correlation with fire damaged and virgin specimens simple surface NDT tests – Penetration tests, Magnetic particle tests, use of coating gauges for metallic and Non-Metallic coating and identification of details for corrosion (durability aspects) simple techniques in visual inspection of weldments.

Max. 45 Hrs.

TEXT / REFERENCE BOOKS

1. Denison Campbell, Allen and Harold Roper, "Concrete Structures: Materials, Maintenance and Repair", Longman Scientific and Technical UK, 1991.
2. R.T.Allen and S.C.Edwards, "Repair of Concrete Structures", Blakie and Sons, UK, 1987.
3. Shetty, M.S., "Concrete Technology – Theory and Practice", S. Chand and Company, New Delhi, sixth edition, 2008.
4. Santhakumar, A.R., "Training Courses notes and damage assessment and repair in low cost housing", "RHDC-NBO" Anna University, 1992.
5. Raikar, R.N. "Learning from Failures – Deficiencies in Design, Construction and Service (SDCPL)", Raikar Bhavan, Bombay, 1987.
6. B.Raj, T.Jayakumar and M.Thavasimuthu, "Practical Non-destructive testing", Wood Head Publishing Ltd., 2002.
7. IS:1608(1995) Mechanical Testing of metals.
8. IS: 2062(1999) Steel for general structural purposes.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100

Exam Duration: 3 Hrs.

PART A: 5 Questions of 6 Marks each – No choice

30 Marks

PART B: 2 Questions from each unit of internal choice, each carrying 14 Marks

70 Marks

 Added Contents

 Deleted Contents

 New Course Introduced

SCIA7019	STRUCTURAL HEALTH MONITORING	L	T	P	Credits	TotalMarks
		3	0	0	3	100

COURSE OBJECTIVES:

- To introduce various structural health monitoring tools and techniques.
- To introduce various sensors and its purposes
- To impart knowledge on static and dynamic measurement techniques

UNIT I INTRODUCTION TO STRUCTURAL HEALTH MONITORING

9 Hrs

Need for SHM, Structural Health Monitoring versus Non-Destructive Evaluation, Methods of SHM Local & Global Techniques for SHM, Short & Long-Term Monitoring, Active & Passive Monitoring, Remote Structural Health Monitoring- Advantages of SHM - Challenges in SHM

UNIT II SENSORS AND INSTRUMENTATION FOR SHM

9 Hrs

Sensors for measurements: Electrical Resistance Strain Gages, Vibrating Wire Strain Gauges, Fiber Optic Sensors, Temperature Sensors, Accelerometers, Displacement Transducers, Load Cells, Humidity Sensors, Crack Propagation Measuring Sensors, Corrosion Monitoring Sensors, Pressure Sensors, Data Acquisition – Data Transmission - Data Processing – Storage of processed data - Knowledgeable information processing

UNIT III STATIC AND DYNAMIC MEASUREMENT TECHNIQUES FOR SHM

9 Hrs

Static measurement - Load test, Concrete core trepanning, Flat jack techniques, Static response measurement, Dynamic measurement -Vibration based testing- Ambient Excitation methods, Measured forced Vibration-Impact excitation, step relaxation test, shaker excitation method.

UNIT IV DAMAGE DETECTION

9 Hrs

Damage Diagnostic methods based on vibrational response- Method based on modal frequency/shape/damping, Curvature and flexibility method, Modal strain energy method, Sensitivity method, Baseline-free method, Cross-correlation method, Damage Diagnostic methods based on wave propagation Methods-Bulk waves/Lamb waves, Reflection and transmission, Wave tuning/mode selectivity, Migration imaging, Phased array imaging, Focusing array/SAFT imaging

UNIT V DATA PROCESSING AND CASE STUDIES

9 Hrs

Advanced signal processing methods -Wavelet, Hilbert-Huang transform, Neural networks, Support Vector Machine Principal component analysis, Outlier analysis. Applications of SHM on bridges and buildings, case studies of SHM in Civil/ Structural engineering.

COURSE OUTCOMES:

On completion of this course, the student will be able to

- CO1 - Understand the need, advantages and challenges of SHM
- CO2 - Understand the different types of sensors and instrumentation techniques
- CO3 - Gain knowledge of the static and dynamic measurement techniques
- CO4 - Compare the various damage detection techniques
- CO5 - Know the various data processing methods through case studies
- CO6 – Apply the concept of Structural Health monitoring in Civil Engineering structures

TEXT/REFERENCES BOOKS:

1. Daniel Balageas, Peter Fritzen, Alfredo Guemes, Structural Health Monitoring, John Wiley & Sons, 2006.
2. Douglas E Adams, Health Monitoring of Structural Materials and Components Methods with Applications, Wiley Publishers, 2007
3. Hua-Peng Chen, Structural Health Monitoring of Large Civil Engineering Structures, Wiley Publishers, 2018
4. Ansari, F Karbhari, Structural health monitoring of civil infrastructure systems, V.M, Woodhead Publishing, 2009
5. J. P. Ou, H. Li and Z. D, "Duan Structural Health Monitoring and Intelligent Infrastructure", Vol1, Taylor and Francis Group, London, UK, 2006. 6. Victor Giurgutiu, "Structural Health Monitoring with Wafer Active Sensors", Academic Press Inc, 2007.



SATHYABAMA

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School of Building and Environment Department of Civil Engineering

Board of Studies Meeting - Academic Year 2022-2023

The periodic Board of studies meeting – Academic Year 2022-2023 for the Department of Civil Engineering, School of Building and Environment will be held on 18.11.2022 at 10.00 pm at CADD Lab, Department of Civil Engineering.

Internal members

1. Dr.Devyani Gangopadhyay, Dean, School of Building and Environment
2. Dr.S.Packialakshmi, Associate Professor, Department of Civil Engineering
3. Dr.R.Padmapriya, Associate Professor, Department of Civil Engineering
4. Dr.V.Sampathkumar, Professor, Department of Civil Engineering
5. Dr.R.Nirmala, Associate Professor, Department of Civil Engineering

External members

1. Dr.R.Santhakumar, Professor, Department of Civil Engineering, NITTTR, Chennai
2. Dr.R.Saravanan, Associate Professor, CWR, Anna University, Chennai

Agenda:

- Review of Curriculum for the upcoming semester courses for both B.E.-Civil Engineering and M.E. – Structural Engineering
- Review of contents of Courses Building, Planning and Drawing Lab, Highway Engineering Lab, Energy and Environmental Management, Highway Pavement Design in B.E. Civil Engineering Programme and Advanced Design of Steel Structures in M.E. Structural Engineering Programme.
- Implementation of Green Buildings as Elective for B.E Civil Engineering students

HOD



SATHYABAMA

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School of Building and Environment Department of Civil Engineering

Minutes of the BOS Meeting - Academic year 2022-2023

The periodic Board of Studies Meeting for both UG and PG programme is held on 18th November, 2022 at 10.00 PM at CADD Lab, Department of Civil Engineering

Members Present

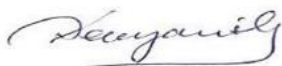
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|--|---------------|
| 1. Dr.Devyani Gangopadhyay,
Dean, School of Building and Environment | Convenor |
| 2. Dr.R.Santhakumar,
Professor, Department of Civil, NITTTR, Chennai | Expert Member |
| 3. Dr.R.Saravanan,
Associate Professor, CWR, Anna University, Chennai | Expert Member |
| 4. Dr.R.Padmapriya,
Associate Professor, Department of Civil Engineering | Member |
| 5. Dr.S.Packialakshmi,
Associate Professor, Department of Civil Engineering | Member |
| 6. Dr.V.Samathkumar,
Professor, Department of Civil Engineering | Member |
| 7. Dr.R.Nirmala,
Associate Professor, Department of Civil Engineering | Member |

The review of curriculum for the upcoming semester was discussed for both UG and PG programmes.

- The teaching pedagogy of the course Building, Planning and Drawing Lab was in manual drafting in A2 sheet and it was suggested by the board of studies members to partially incorporate the AutoCAD drafting for the elaborate plan and sectional drawing. Dr.Saravanan, Professor, NIT Trichy suggested to include the plan, elevation

and section of Semi-detached house and Cottage Building.

- In the course Energy and Environment Management, the concepts of Climate change - Photosynthetic mechanism and global climate change; various impacts of global warming; prediction of future climate changes; global climate models; The role of international bodies. Kyoto and Montreal protocols and Kigali agreement has been included to taken into consideration that it is a need of an hour.
- For the Practical Course Highway Engineering Lab, Dr.R. Nirmala highlighted the necessity of the practical applications-oriented laboratory tests and suggested to include the demonstration of Stripping value on Bitumen and determining Optimum Bitumen Content using cold solvent extraction method.
- Also, the Board of studies members has suggested Comparative evaluation of super pave and Marshall methods of design, AASHTO method of pavement design, Pavement Evaluation procedures and the importance of demonstrating the latest software in the Pavement Management System under the course Highway pavement Design.
- Dr. Santhakumar, Professor, NITTTR Chennai suggested to the internal board of studies members on the course Advanced Design of Steel Structures to include the latest software tool, Introduction on Tekla software in Unit – IV to get exposure about industry application software by the students.



Convenor/Dean



HOD



Dr. Santhakumar
(R.SANTHAKUMAR)

Expert member

SCIA2201	BUILDING PLANNING AND DRAWING LAB	L	T	P	Credits	Total Marks
		0	0	4	2	100

COURSE OBJECTIVE

To draft the plan, elevation and section of various buildings and its components using Manual Drafter and Computer Aided Drafting software.

SUGGESTED LIST OF EXPERIMENTS

A. MANUAL DRAFTING

1. Plan and Elevation section of various types of staircase
2. Plan, Elevation and Section of Primary Health Centre (Hospital).
3. Plan, Elevation and Section of School Building.
4. Elevation of Queen Post Truss
5. Approval Drawing of Two storeyed Residential Building.

B. COMPUTER AIDED DRAFTING

6. Elevation of Panelled Door
7. Elevation of King Post Truss
8. Elevation of Stepped Wall footing
9. Plan, Elevation and Section of Semidetached house
10. Plan, Elevation and Section of a cottage building

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Understands the concept of design of buildings as per National building code

CO2 - Explores basic knowledge about substructure and superstructure with specifications based on building bye laws

CO3 - Prepare building drawings for all types of buildings, trusses, doors and windows, staircase and footings.

CO4 - Prepare drawings for trusses, and doors

CO5 - Implement the regulations for layout planning

 Added Contents

 Deleted Contents

 New Course Introduced

SCIA2602	HIGHWAY ENGINEERING LAB	L	T	P	Credits	Total Marks
		0	0	4	2	100

COURSE OBJECTIVE

- To provide the students to hands on experience on the various testing procedures of pavement materials as per the IRC standards.

SUGGESTED LIST OF EXPERIMENTS

A) Test on Aggregate

1. Shape test
2. Los Angeles Abrasion test

B) Test on Bitumen

3. Penetration Test on Bitumen
4. Ductility test on bitumen
5. Softening point test on bitumen / tar
6. Flash and fire point test on bitumen - tar bitumen
7. Specific gravity test
8. Viscosity test on tar

C) Test on Mix Design

9. Marshall Stability Test for bitumen with design consideration
10. Stripping Value of Bituminous Mix – Demonstration
11. Optimum Bitumen Content in bituminous mix by cold solvent extraction method – Demonstration

D) Test on Subgrade Soil

12. California Bearing Ratio Test

E) Test on Pavement Evaluation

13. Benkelman Beam Method

COURSE OUTCOMES

On completion of the course, student will be able to

- CO1 - Assess the quality of aggregates used in the road construction
- CO2 - Interpret the test results with the recommended values for predicting the characteristics of bitumen
- CO3 - Understand the method adopted to determine the optimum bitumen content in Bituminous mix
- CO4 - Learn the procedure to test the bearing capacity of subgrade soil
- CO5 - Understand the structural evaluation technique used to envisage the deflection of existing pavement

 Added Contents

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 New Course Introduced

SCIA3005	ENERGY AND ENVIRONMENTAL MANAGEMENT	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVE

- To provide knowledge about the energy, policies, legislations and its management.

UNIT 1 ENERGY SCENARIO

9 Hrs.

Basic concepts of energy - Total energy systems - Energy resources - Non-renewable energy resources & Renewable energy resources - Energy and carbon emissions - Principles and imperatives of energy conservation Current energy scenario.

UNIT 2 ENERGY AUDIT

9 Hrs.

Energy audit concepts - Basic elements and measurements - Mass and energy balances - Scope of energy auditing industries - Methodology with respect to construction industry - Evaluation of energy conserving opportunities and environmental management.

UNIT 3 ENVIRONMENTAL MANAGEMENT AND CLIMATE CHANGE

9 Hrs.

Environmental Management Plan - Environmental sustainability - indicators and sustainability index Environmental Strategies for developing environmental awareness and protection - Global and National Environmental issues.

Climate change - Photosynthetic mechanism and global climate change; various impacts of global warming; prediction of future climate changes; global climate models; The role of international bodies. Kyoto and Montreal protocols and Kigali agreement.

UNIT 4 ENVIRONMENTAL POLICIES AND LEGISLATIONS

9 Hrs.

Introduction to environmental law and environmental protection act in India - Role of Judiciary in environmental conservation in India - Environmental policy - Environmental legislations and strategies to control pollution - Regulations for pollution controls of water, air and noise - industrial, automobile and hazardous waste.

UNIT 5 ENVIRONMENTAL IMPACT ASSESSMENT

9 Hrs.

Environmental components of EIA - Methods of environmental impact assessment - Environmental clearance procedures in India - impact, steps in EIA - Case studies of EIA of highways, thermal power plant, cement, dam.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, students will be able to

- CO1 - Principle and imperatives of energy conservation, carbon emissions, with current energy scenario
- CO2 - Energy audit concepts to evaluate energy conserving opportunities in the construction industry.
- CO3 - Global and national environmental issues for sustainability.
- CO4 - Environmental legislation and strategies to control pollutions.
- CO5 - Environmental impact assessment for highways, dam, thermal power plants and cement factories.

TEXT / REFERENCE BOOKS

1. Abbi Y.P. Shashank Jain , "Handbook on Energy Audit and Environment Management", TERI Publications, 2009.
2. Amlan Chakrabarti , "Energy Engineering and Management", PHI Publishers, 2018.
3. Dash M.C., "Concepts of Environmental Management for Sustainable Development", I.K. International Publishing House, 2013.
4. Kothari K.C., D.P.Ranjan, Rakesh Singal, "Renewable Energy Sources and Emerging Technologies", 2nd Revised Edition, Kindle Edition, PHI publishers, 2011.
5. Murali Krishna. I.V., Valli Manickam, "Environmental Management", 1st Edition, Science and Engineering for Industry, Butterworth-Heinemann, 2017.
6. Sharma K. V. , Venkateshaiah, "Energy Management and Conservation", I.K. International Publishing House, 2011.
7. Umesh Rathore, "Energy Management", Katson Book Publishers, 2013.
8. Trivedi R.R. and Jalka K.R, "Energy Management", Commonwealth Publication, 1997.
9. Boyle G, Everett B and Ramett J, "Energy Systems and Sustainability", Oxford University Press, 2010.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100

Exam Duration: 3 Hrs.

PART A: 10 Questions of 2 marks each - No choice

20 Marks

PART B: 2 Questions from each unit of internal choice; each carrying 16 marks

80 Marks

Added Contents

Deleted Contents

New Course Introduced

SCIA3009	HIGHWAY PAVEMENT DESIGN	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVES

- To gain knowledge on various IRC guidelines for designing rigid and flexible pavements
- To have the awareness in assessing quality and serviceability conditions of roads.

UNIT 1 PRINCIPLES OF PAVEMENT DESIGN

9 Hrs.

Components of a road - function - Factors affecting pavement stability - Equivalent single wheel load – load Calculation - vehicle and traffic vectors - moisture factors - climatic factors - soil stability - stress distribution in different condition - remedies.

UNIT 2 FLEXIBLE PAVEMENT DESIGN

11 Hrs.

Bitumen characteristics - Test in bitumen - Aggregate gradation - principles of bituminous mix design – IRC Asphalt Institute method - AASTHO - Burmister method - Super - pave mix design - Pavement design using IITPAVE software for granular base and granular sub base, cementitious base, cementitious sub base. - construction of Flexible pavement, defects and maintenance - Demonstration of Pavement Design Software – Comparative evaluation of Super pave and Marshall methods of design

UNIT 3 RIGID PAVEMENT DESIGN

9 Hrs.

Stress in Concrete Pavements - IRC Method - Design of Steel Reinforced - Design of Different Joints in Concrete Pavements and their Function – AASHTO method of pavement design - Construction of Concrete Pavements and their Maintenance.

UNIT 4 PAVEMENT EVALUATION AND STRENGTHENING

9 Hrs.

Structural Evaluation of Flexible & Rigid Pavement - Distresses in flexible & rigid pavements – Serviceability index - Evaluation by deflection measurements - Strengthening of pavements - Flexible overlays - Rigid overlays – Demonstration of pavement Evaluation Procedures

UNIT 5 HIGHWAY MAINTENANCE

7 Hrs.

Strengthening of Shoulders and Drainage System in flexible and rigid pavements - Maintenance of Bridges and Road Structures - Pavement Management System – Demonstration of Pavement Management Systems (PMS) software.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, students will be able to

- CO1 - Understand the principles of pavement design
- CO2 - Identify the pavement components and design bituminous mixes of Flexible pavement
- CO3 - Understand the design procedure and stress computation in Rigid Pavement
- CO4 - Evaluate the structural condition of Pavement
- CO5 - Learn the Systematic approach of maintenance of Pavements, Bridges or Road Structures

TEXT / REFERENCE BOOKS

- Kadiyali L.R "Principles and practices of Highway Engineering" 6th Edition, Khanna Publishers, 2015.
- Khanna S.K and Justo C.E.G., "Highway Engineering", 10th Edition, Nemchand brothers, Roorkee, 2015.
- IRC: 37 - 2001, "Guidelines for the Design of Flexible Pavements", 2nd edition, The Indian Roads Congress, New Delhi.
- IRC: 37 - 2012, "Guidelines for the Design of Flexible Pavements", 3rd Revision, The Indian Roads Congress, New Delhi.
- IRC: 58-1998, "Guideline for the Design of Rigid Pavements for Highways", The Indian Roads Congress, New Delhi.
- Yoder R.J and Witczak M.W., "Principles of Pavement Design", 2nd Edition, John Wiley Sons, 1975.
- Yoder R.J and Witczak M.W., "Principles of Pavement Design - eBook", Wiley, 2010.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100

Exam Duration: 3 Hrs.

PART A: 10 Questions of 2 marks each - No choice

20 Marks

PART B: 2 Questions from each unit of internal choice; each carrying 16 marks

80 Marks

Added Contents

Deleted Contents

New Course Introduced

SCIA3024	GREEN BUILDINGS	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To learn about Green building concept and techniques.
- To Apply cost effective techniques in construction
- To study the Concept of Green Building

UNIT 1 INTRODUCTION

9 Hrs.

Definition of green buildings and sustainable development, typical features of green buildings, benefits of green buildings towards sustainable development. Green building rating systems – GRIHA, IGBC and LEED, overview of the criteria as per these rating systems.

UNIT 2 SITE SELECTION AND PLANNING

9 Hrs.

Criteria for site selection, preservation of landscape, soil erosion control, minimizing urban heat island effect, maximize comfort by proper orientation of building facades, daylighting, ventilation, etc. Water conservation and efficiency: Rainwater harvesting methods for roof & non-roof, reducing landscape water demand by proper irrigation systems, water efficient plumbing systems, water metering, waste water treatment, recycle and reuse systems.

UNIT 3 ENERGY EFFICIENCY

9 Hrs.

Environmental impact of building constructions, Concepts of embodied energy, operational energy and life cycle energy. Methods to reduce operational energy: Energy efficient building envelopes, efficient lighting technologies, energy efficient appliances for heating and air-conditioning systems in buildings, zero ozone depleting potential (ODP) materials, wind and solar energy harvesting, energy metering and monitoring, concept of net zero buildings.

UNIT 4 BUILDING MATERIALS

9 Hrs.

Methods to reduce embodied energy in building materials: (a) Use of local building materials (b) Use of natural and renewable materials like bamboo, timber, rammed earth, stabilized mud blocks, (c) use of materials with recycled content such as blended cements, pozzolana cements, fly ash bricks, vitrified tiles, materials from agro and industrial waste. (d) reuse of waste and salvaged materials Waste Management: Handling of construction waste materials, separation of household waste, on-site and off-site organic waste management.

UNIT 5 INDOOR QUALITY

9 Hrs.

Indoor Environmental Quality for Occupant Comfort and Wellbeing: Daylighting, air ventilation, exhaust systems, low VOC paints, materials & adhesives, building acoustics. Codes related to green buildings: NBC, ECBC, ASHRAE, UPC etc.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

- CO1 - Understand the concept of Green Buildings
- CO2 - Classify the different site conditions and planning efficiently
- CO3 - Analyze the energy efficiency materials and applications
- CO4 - Analyze the Green materials and waste management
- CO5 - Plan the Indoor Quality and building Acoustics
- CO6 - Design the alternate source of energy and effective use water

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100

Exam Duration: 3 Hrs.

PART A: 10 Questions of 2 marks each - No choice

20 Marks

PART B: 2 Questions from each unit of internal choice; each carrying 16 marks

80 Marks

 Added Contents

 Deleted Contents

 New Course Introduced

SCIA5203	ADVANCED DESIGN OF STEEL STRUCTURES	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVES

- To study the behaviour of members and connections, analysis and design of Industrial buildings and roofs, chimneys.
- To Study the design of with cold formed steel and plastic analysis of structures.

UNIT 1 STRUCTURAL CONNECTIONS 9 Hrs.

Types of connections- Bolted and welded connections – Seated Connections – Unstiffened and Stiffened – Moment Resistant Connections – Clip angle Connections – Split beam Connections – Framed Connections.

UNIT 2 PRE ENGINEERED INDUSTRIAL BUILDING 9 Hrs.

Design of members subjected to lateral loads and axial loads, Analysis and design of Industrial Buildings and bents, Sway and non-sway frames, Design of Purlins, Louver rails, Gable column and Gable wind girder - Design of Moment Resisting Base Plates – Analysis of Gable Frames.

UNIT 3 PLASTIC ANALYSIS OF STRUCTURES 9 Hrs.

Introduction, Shape factor, Moment redistribution, Combined mechanisms, Analysis of portal frames, Effect of axial force - Effect of shear force on plastic moment, Connections - Requirement – Moment resisting connections. Design of Straight Corner Connections – Haunched Connections – Design of continuous beams.

UNIT 4 ANALYSIS AND DESIGN OF SPECIAL STRUCTURES 9 Hrs.

Design of self supporting chimney and guyed steel stacks- Stresses due to wind and earthquake forces – Design of foundation – Gust factor method. Towers- Basic structural configurations – free standing and guyed towers – loads on towers – wind loads – foundation design. – Introduction to Tekla Software – Basic 3D modelling, Structural profiles and materials, Creation of Drawings, Revision control and drawing management

UNIT 5 DESIGN OF COLD FORMED STEEL STRUCTURES 9 Hrs.

Behaviour of Compression Elements - Effective width for load and deflection determination – Behaviour of Unstiffened and Stiffened Elements – Design of webs of beams – Flexural members – Lateral buckling of beams – Shear Lag – Flange Curling – Design of Compression Members – Wall Studs.

Max. 45 Hrs.

TEXT / REFERENCE BOOKS

1. Owens G.W. and Cheal B.D., "Structural Steelwork Connections", Butterworths, London, 1989.
2. Dayaratnam P., "Design of Steel Structures", A.H. Wheeler & Co. Ltd., Allahabad, 1996.
3. Subramanian N., "Design of Steel Structures", Oxford University Press, 2008.
4. Murthy S.S. and Santhakumar A.R., "Transmission Line Structures", McGraw Hill Publishing Co. Ltd., 1990.
5. Wie Wen Yu, "Design of Cold Formed Steel Structures", McGraw Hill Book Company, New York, 1996.
6. Punmia B.C., Ashok Kumar Jain and Arun Kumar Jain, "Design of Steel Structures" Vol. I and II, Arihant Publications, Mumbai, 1998.
7. Duggal S.K., "Limit State design of steel structures", Tata McGraw Hill Publishing Company, New Delhi, 2010.
8. IS: 800-2007, Indian Standard for General Construction in Steel, Code of Practice.
9. IS:801-1975, : Code of practice for use of cold – formed light gauge steel structural members in general building construction.
10. SP 6(1) – 1964 Hand book for Structures Engineers.
11. IS 811 - 1987, "Specification for cold formed light gauge structural steel sections.
12. IS 875-1987 part 3 Code of practice for design loads.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100

Exam Duration: 3 Hrs.

PART A: 5 Questions of 6 Marks each – No choice

30 Marks

PART B: 2 Questions from each unit of internal choice, each carrying 14 Marks

70 Marks



Added Contents



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New Course Introduced