



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 newly introduced in the Academic Year

2022 – 23

S.no	Program	Course Code	Course Name
1	B.E. Civil Engg.	SCIA3022	Prefabricated Structures
2	B.E. Civil Engg.	SCIA3023	Experimental Stress Analysis
3	M.E. Structural Engg.	SCIA1709	Structural Health Monitoring
4	B.E. Civil Engg.	SCIA3023	Green Buildings

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 – Code 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.

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

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.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100

Exam Duration: 3 Hrs.

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

30 Marks

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

70 Marks

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: 6 Questions of 5 Marks each – No choice

30 Marks

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

70 Marks



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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

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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

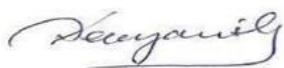
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|--|---------------|
| 1. Dr.Devyani Gangopadhyay
Dean, School of Building and Environment | Convenor |
| 2. Dr.R.Santhakumar
Professor, Department of Civil Engineering, NITTTR, Chennai | Expert Member |
| 3. Dr.R..Saravanan
Associate Professor, CWR, 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.Sampathkumar
Professor, Department of Civil Engineering | Member |
| 7. Dr.R. Nirmala
Associate Professor, Department of Civil Engineering | Member |

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



Shankar L.
(R.SANTHALCUMAR)

Expert member



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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

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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

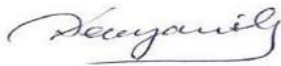
Members Present

- | | |
|--|---------------|
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Professor, Department of Civil, NITTTR, Chennai | Expert Member |
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| 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.Sampathkumar,
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.

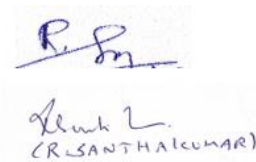
- In the course Energy and Environment Management, the concepts of Climate change - Photosynthetic mechanism and global climate change; various impacts of global warming; prediction of future climate changes; global climate models; The role of international bodies. Kyoto and Montreal protocols and Kigali 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



Expert member