



MOHAMED SATHAK A.J. COLLEGE OF ENGINEERING

(Approved by AICTE, New Delhi and Affiliated to Anna University, Chennai)
Recognized under UGC 12B & 2f Act

No:34, Rajiv Gandhi Road (OMR), IT Highway, Siruseri IT Park, Chennai - 603 103.



DEPARTMENT OF CIVIL ENGINEERING

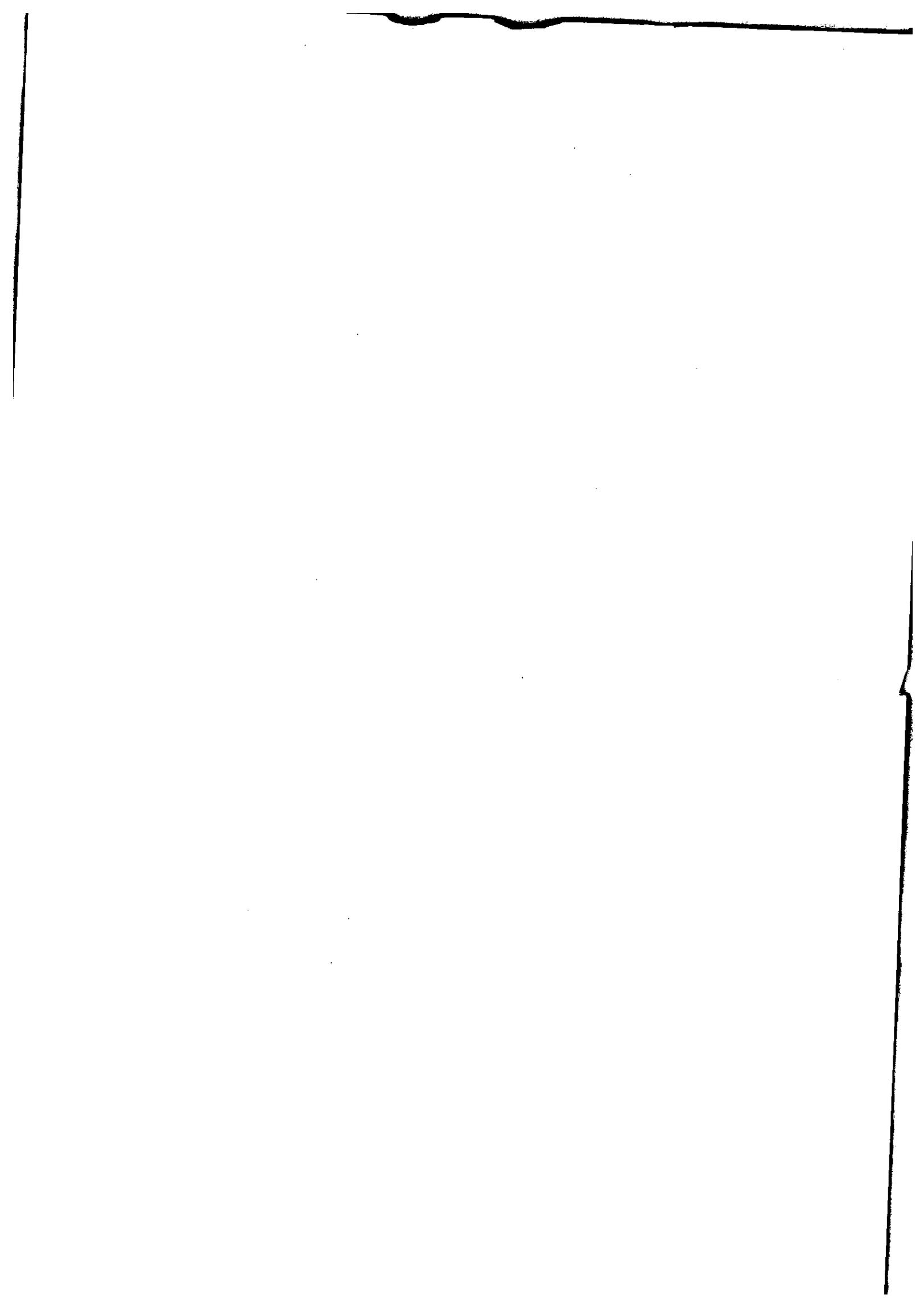
1.3.2 COURSES THAT INCLUDE EXPERIENTIAL LEARNING THROUGH PROJECT WORK/FIELD WORK/INTERNSHIP DURING 2022-23

S.No	Title of IV yr Project	Subject code & Subjects name related to the Projects
1	Synthetic Tannery wastewater parameter analysis-Before and after treatment by using activated carbon as adsorbent.	GE8291 - Environmental Science & Engineering EN8592 - Waste water Engineering
2	Incorporation of crimped discrete polyethelene teraphthalate plastic (PET) fiber in concrete payments recycled from waste bottles	GE8291 - Environmental Science & Engineering CE8301 - Strength of Materials I CE8391 - Construction Materials CE8402 - Strength of Materials II CE8404 - Concrete Technology CE8501 - Design of Reinforced Cement Concrete Elements
3	An experimental study of chopped basalt fibre in reinforced concrete	CE8301 - Strength of Materials I CE8402 - Strength of Materials II CE8404 - Concrete Technology CE8703 - Structural Design and Drawing

PRINCIPAL

Mohamed Sathak A.J. College of Engineering
No.34, Rajiv Gandhi Satai (OMR)
Sipcot - IT Highway Egattur,
Chennai - 603103.

HOD / CIVIL



**SYNTHETIC TANNERY WASTEWATER
PARAMETER ANALYSIS – BEFORE & AFTER
TREATMENT BY USING ACTIVATED CARBON AS
ADSORBENT**

Submitted by

RIYAS AHAMED.A

311819103005

MOHAMED KHAN.S

311819103301

MAHMOOD SHAFEEQ.A

311819103004

in partial fulfillment for the award of the degrees

of

BACHELOR OF ENGINEERING

in

CIVIL ENGINEERING



**MOHAMED SATHAK A.J. COLLEGE OF ENGINEERING
SIRUSERI, OMR, CHENNAI - 603103**

ANNA UNIVERSITY: CHENNAI 600 025

MAY 2023



PRINCIPAL

Mohamed Sathak A.J. College of Engineering
No.34, Rajiv Gandhi Salai (OMR)
Sipcot - IT Highway Egattur,
Chennai - 603103.

ANNA UNIVERSITY: CHENNAI 600 025

BONAFIDE CERTIFICATE

Certified that this project report **SYNTHETIC TANNERY WASTE WATER PARAMETER ANALYSIS - BEFORE & AFTER TREATMENT BY USING ACTIVATED CARBON AS ADSORBENT** is the bonfire work of **RIYAS AHAMED.A, MOHAMED KHAN.S, MAHMOOD SHAFEEQ.A**, who carried out the project work under my supervision.


12/05/23

SIGNATURE

Dr.R.SOMESWARAN. Ph.D.


12/05/2023

SIGNATURE

Dr.R.ELLISS YOGESH. Ph.D.

HEAD OF THE DEPARTMENT

Civil Engineering

Mohamed Sathak A J College

of Engineering

Siruseri, OMR, Chennai -

603103

SUPERVISOR

Civil Engineering

Mohamed Sathak A J College

of Engineering

Siruseri, OMR, Chennai -

603103

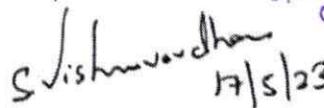


Project Viva-Voce held on

17/05/23


17/05/23

INTERNAL EXAMINER


17/5/23

EXTERNAL EXAMINER

PRINCIPAL

Mohamed Sathak A.J. College of Engineering
No.34, Rajiv Gandhi Salai (OMR)
Sipcot - IT Highway Egattur,
Chennai - 603103.

ABSTRACT

Fibres are used in concrete to improve its structural integrity. Nowadays, among all basalt fibres, an inert mineral fibre is gaining more importance due to its exceptional properties, which include resistance to corrosion and low thermal conductivity. It also improves tensile strength, flexural strength and toughness of concrete. It can be used to extend the life of important concrete structures such as nuclear power plants highways, bridges and runways. Basalt fibre in concrete is still an exploratory area due to limited studies. Therefore, a systematic study on basalt fibre-reinforced concrete was carried out with percentage volume fraction of fibre 0.50 (13.0 kg/m³), 0.75 (19.5 kg/m³) and 1.00 (26.0 kg/m³). The increase in compressive, splitting tensile and flexural strength is in the order of 26.79, 42.71 and 44.06%, respectively, for 0.50% dosage of basalt fibre as compared to control concrete.



PRINCIPAL

Mohamed Sathak A.J. College of Engineering
No.34, Rajiv Gandhi Salai (OMR)
Sipcot - IT Highway Egattur,
Chennai - 603103.

CONCLUSION

The properties of basalt fiber and BFRC were studied in which it was observed that basalt fibers are definitely a potential building material having higher thermal stability and higher mechanical properties. Basalt fiber was found to be amorphous in nature. TGA of basalt fibers showed that the mass loss was only 1.6% up to 1000 °C, indicating that the basalt fibers have high thermal stability. The average contact angle of basalt fiber for both polar (water) and non-polar (formamide) liquid was observed respectively, which reveals that basalt fiber is hydrophilic. The increase in compressive, splitting tensile, flexural strength and elastic modulus of concrete at 28 days having volume fraction of basalt fiber respectively, as compared to control concrete. The impact resistance of BFRC was found to be more than double as compared to control concrete.

DShu

OUTCOMES:

Students will be able to

- Analyze continuous beams, pin-jointed indeterminate plane frames and rigid plane frames by strain energy method
- Analyse the continuous beams and rigid frames by slope deflection method.
- Understand the concept of moment distribution and analysis of continuous beams and rigid frames with and without sway.
- Analyse the indeterminate pin jointed plane frames continuous beams and rigid frames using matrix flexibility method.
- Understand the concept of matrix stiffness method and analysis of continuous beams, pin jointed trusses and rigid plane frames.

TEXTBOOKS:

1. Bhavikatti, S.S, Structural Analysis, Vol.1, & 2, Vikas Publishing House Pvt.Ltd., New Delhi-4, 2014.
2. Bhavikatti, S.S, Matrix Method of Structural Analysis, I. K. International Publishing House Pvt.Ltd., New Delhi-4, 2014.
3. Vazrani.V.N And Ratwani, M.M, Analysis of Structures, Vol.II, Khanna Publishers, 2015.
4. Pandit G.S.and Gupta S.P., Structural Analysis—A Matrix Approach, Tata McGraw Hill Publishing Company Ltd., 2006

REFERENCES:

1. Punmia. B.C, Ashok Kumar Jain & Arun Kumar Jain, Theory of structures, Laxmi Publications, New Delhi, 2004.
2. William Weaver, Jrand James M.Gere, Matrix analysis of framed structures, CBS Publishers & Distributors, Delhi, 1995
3. Hibbeler, R.C., Structural Analysis, VII Edition, Prentice Hall, 2012.
4. Reddy.C.S, "Basic Structural Analysis", Tata McGraw Hill Publishing Company, 2005.
5. Rajasekaran. S, & G. Sankarasubramanian., "Computational Structural Mechanics", PHI Learning Pvt. Ltd, 2015
6. Negi L.S.and Jangid R.S., Structural Analysis, Tata McGraw Hill Publishing Co.Ltd.2004.



PRINCIPAL

Mohamed Sathak A.J. College of Engineering
No.34, Rajiv Gandhi Salai (OMR)
Sipcot - IT Highway Egattur,
Chennai - 603103.

EN8491

WATER SUPPLY ENGINEERING

**LTPC
3 0 0 3**

OBJECTIVE:

- To equip the students with the principles and design of water treatment units and distribution system.

UNIT I SOURCES OF WATER

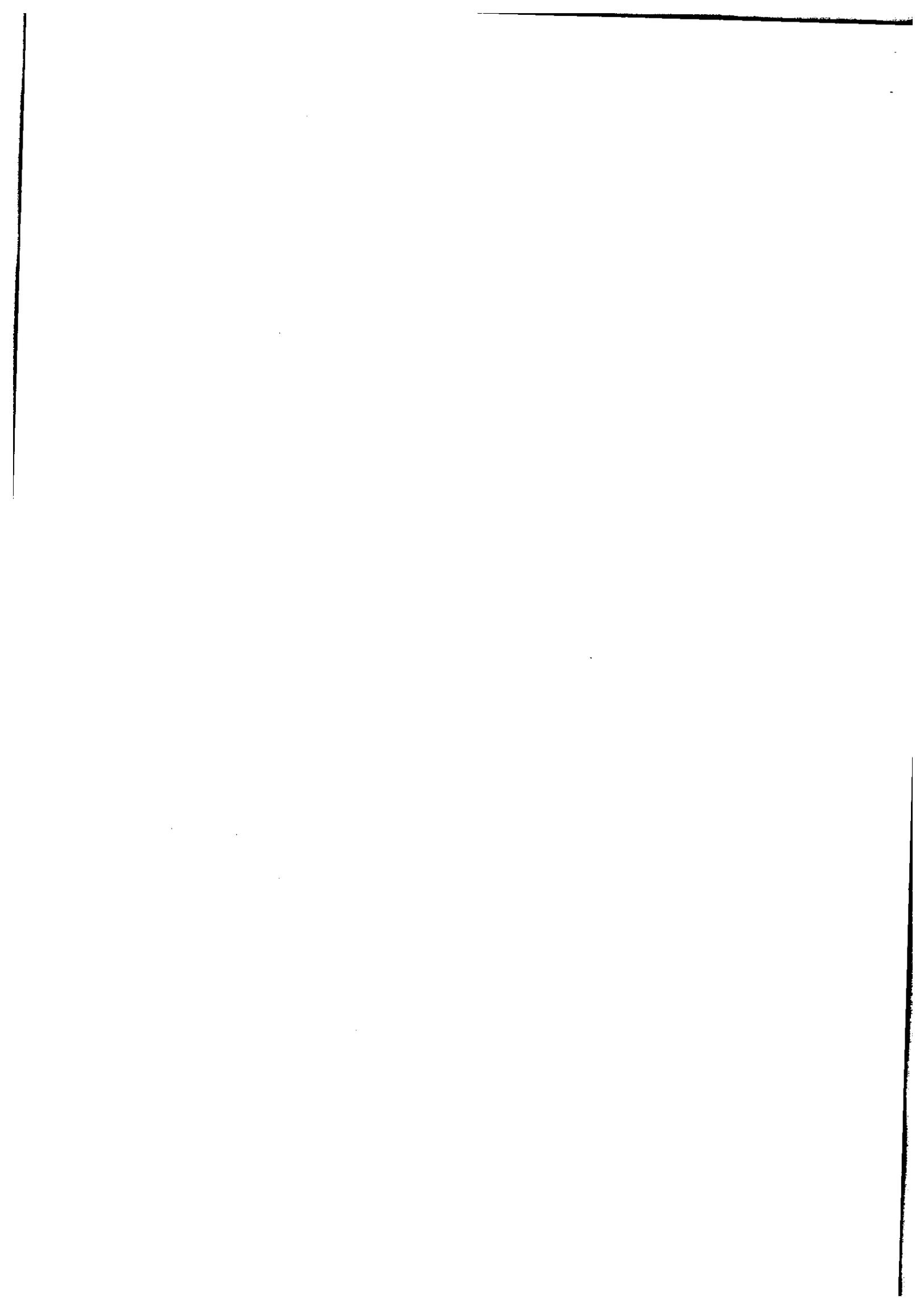
Public water supply system – Planning, Objectives, Design period, Population forecasting; Water demand – Sources of water and their characteristics, Surface and Groundwater – Impounding Reservoir – Development and selection of source – Source Water quality – Characterization – Significance – Drinking Water quality standards.

9

UNIT II CONVEYANCE FROM THE SOURCE

Water supply – intake structures – Functions; Pipes and conduits for water – Pipe materials – Hydraulics of flow in pipes – Transmission main design – Laying, jointing and testing of pipes – appurtenances – Types and capacity of pumps – Selection of pumps and pipe materials.

9



UNIT III WATER TREATMENT

Objectives – Unit operations and processes – Principles, functions, and design of water treatment plant units, aerators of flash mixers, Coagulation and flocculation – Clarifloccuator-Plate and tube settlers - Pulsator clarifier - sand filters - Disinfection - Residue Management – Construction, Operation and Maintenance aspects.

9

UNIT IV ADVANCED WATER TREATMENT

Water softening – Desalination- R.O. Plant – demineralization – Adsorption - Ion exchange– Membrane Systems – RO Reject Management - Iron and Manganese removal - Defluoridation - Construction and Operation & Maintenance aspects – Recent advances – MBR process

9

UNIT V WATER DISTRIBUTION AND SUPPLY

Requirements of water distribution – Components – Selection of pipe material – Service reservoirs – Functions – Network design – Economics – Analysis of distribution networks -Computer applications – Appurtenances – Leak detection. Principles of design of water supply in buildings – House service connection – Fixtures and fittings, systems of plumbing and types of plumbing.

9

TOTAL: 45 PERIODS

OUTCOMES:

The students completing the course will have

- an insight into the structure of drinking water supply systems, including water transport, treatment and distribution
- the knowledge in various unit operations and processes in water treatment
- an ability to design the various functional units in water treatment
- an understanding of water quality criteria and standards, and their relation to public health
- the ability to design and evaluate water supply project alternatives on basis of chosen criteria.

TEXTBOOKS:

1. Garg, S.K. Environmental Engineering, Vol.I Khanna Publishers, New Delhi, 2010.
2. Modi, P.N., Water Supply Engineering, Vol.I Standard Book House, New Delhi, 2010.
3. Punmia, B.C., Ashok Jain and Arun Jain, Water Supply Engineering, Laxmi Publications (P) Ltd., New Delhi, 2014.

REFERENCES:

1. Manual on Water Supply and Treatment, CPHEEO, Ministry of Urban Development, Government of India, New Delhi, 1999.
2. Syed R. Qasim and Edward M. Motley Guang Zhu, Water Works Engineering Planning, Design and Operation, Prentice Hall of India Learning Private Limited, New Delhi, 2009.

CE8591

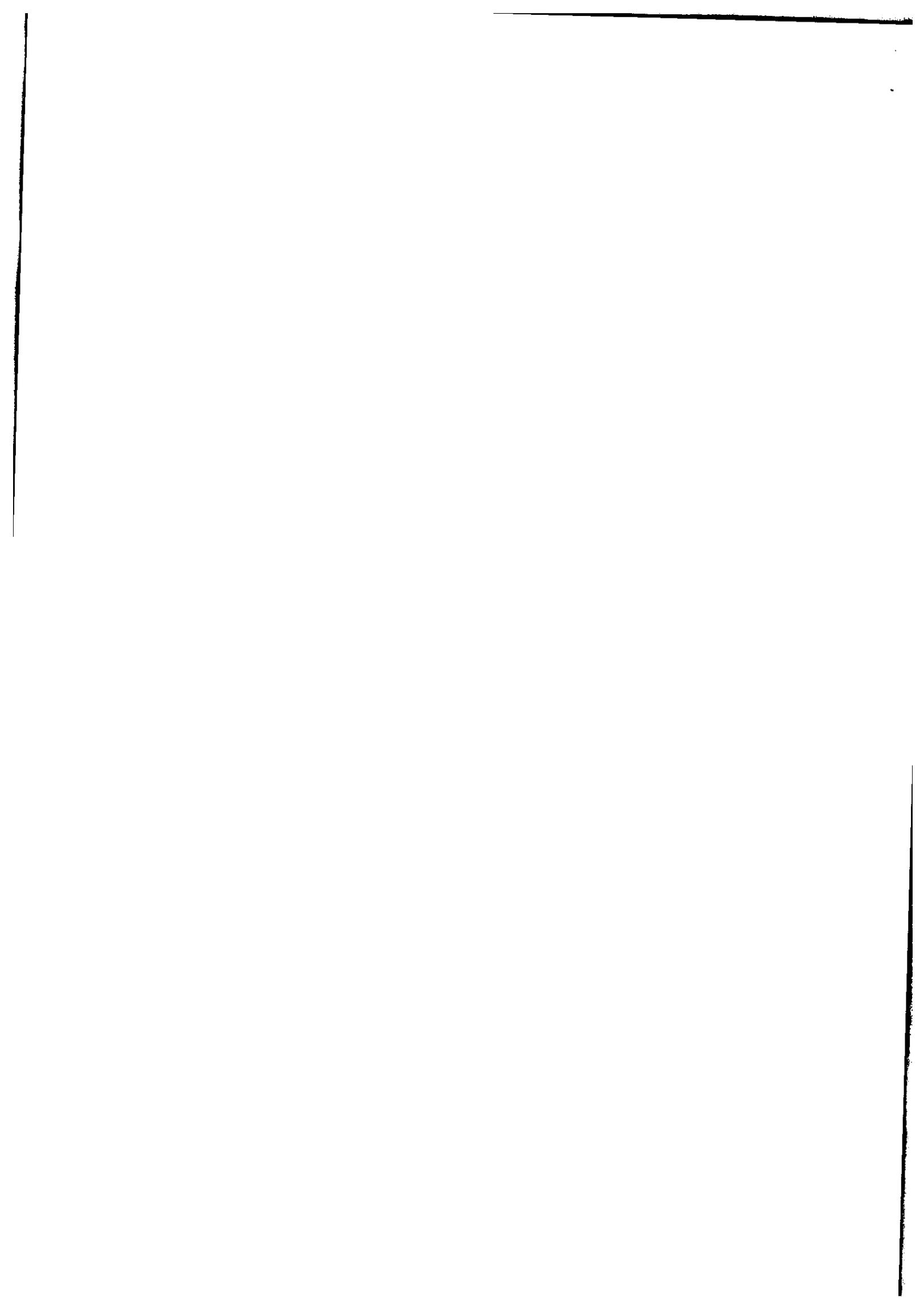
FOUNDATION ENGINEERING


PRINCIPAL
Mohamed Sathak A.J. College of Engineering,
No.34, Rajiv Gandhi Salai (OMR)
Sipcot - IT Highway Egattur,
Chennai - 603103.

LT PC
3 0 0 3

OBJECTIVE:

- To impart knowledge to plan and execute a detail site investigation programme, to select geotechnical design parameters and type of foundations. Also to familiarize the students for the geotechnical design of different type of foundations and retaining walls.



OBJECTIVE:

- The student is exposed to different phases in irrigation practices and Planning and management of irrigation. Further they will be imparted required knowledge on Irrigation storage and distribution canal system and Irrigation management.

UNIT I CROP WATER REQUIREMENT 9

Need and classification of irrigation- historical development and merits and demerits of irrigation- types of crops-crop season-duty, delta and base period- consumptive use of crops- estimation of Evapotranspiration using experimental and theoretical methods

UNIT II IRRIGATION METHODS 9

Tank irrigation – Well irrigation – Irrigation methods: Surface and Sub-Surface and Micro Irrigation – design of drip and sprinkler irrigation – ridge and furrow irrigation-Irrigation scheduling – Water distribution system- Irrigation efficiencies.

UNIT III DIVERSION AND IMPOUNDING STRUCTURES 9

Types of Impounding structures - Gravity dam – Forces on a dam -Design of Gravity dams; Earth dams, Arch dams- Diversion Head works - Weirs and Barrages-

UNIT IV CANAL IRRIGATION 9

Canal regulations – direct sluice - Canal drop – Cross drainage works-Canal outlets – Design of prismatic canal-canal alignments-Canal lining - Kennedy's and Lacey's Regime theory-Design of unlined canal

UNIT V WATER MANAGEMENT IN IRRIGATION 9

Modernization techniques- Rehabilitation – Optimization of water use-Minimizing water losses- On farm development works-Participatory irrigation management- Water resources associations- Changing paradigms in water management-Performance evaluation-Economic aspects of irrigation

TOTAL :45 PERIODS**OUTCOMES:**

Students will be able to

- Have knowledge and skills on crop water requirements.
- Understand the methods and management of irrigation.
- Gain knowledge on types of Impounding structures
- Understand methods of irrigation including canal irrigation.
- Get knowledge on water management on optimization of water use.


PRINCIPAL

Mohamed Sathak A.J. College of Engineering
No.34, Rajiv Gandhi Salai (OMR)
Sipsoor, Chennai Highway Bypass,
Chennai - 603103.

TEXTBOOKS:

- Dilip Kumar Majumdar, "Irrigation Water Management", Prentice-Hall of India, New Delhi, 2008.
- Punmia B.C., et. al; Irrigation and water power Engineering, Laxmi Publications, 16th Edition, New Delhi, 2009
- Garg S. K., "Irrigation Engineering and Hydraulic structures", Khanna Publishers, 23rd Revised Edition, New Delhi, 2009

REFERENCES:

- Duggal, K.N. and Soni, J.P., "Elements of Water Resources Engineering", New Age International Publishers, 2005
- Linsley R.K. and Franzini J.B, "Water Resources Engineering", McGraw-Hill Inc, 2000
- Chaturvedi M.C., "Water Resources Systems Planning and Management", Tata McGraw-Hill Inc., New Delhi, 1997.

TEXTBOOKS:

1. Khanna.S. K., Justo.C.E.G and Veeraragavan A. "Highway Engineering", Nemchand Publishers, 2014.
2. Subramanian K.P., "Highways, Railways, Airport and Harbour Engineering", Scitech Publications (India), Chennai, 2010
3. Kadiyali.L.R. "Principles and Practice of Highway Engineering", Khanna Technical Publications, 8th edition Delhi, 2013.

REFERENCES:

1. Indian Road Congress (IRC), Guidelines for the Design of Flexible Pavements, (Third Revision), IRC: 37-2012
2. Indian Road Congress (IRC), Guidelines for the Design of Plain Jointed Rigid Pavements for Highways, (Third Revision), IRC: 58-2012
3. Yang H. Huang, "Pavement Analysis and Design", Pearson Education Inc, Ninth Impression, South Asia, 2012
4. Ian D. Walsh, "ICE manual of highway design and management", ICE Publishers, 1st Edition, USA, 2011
5. Fred L. Mannering, Scott S. Washburn and Walter P.Kilareski, "Principles of Highway Engineering and Traffic Analysis", Wiley India Pvt. Ltd., New Delhi, 2011
6. Garber and Hoel, "Principles of Traffic and Highway Engineering", CENGAGE Learning, New Delhi, 2010
7. O'Flaherty,C.A "Highways, Butterworth – Heinemann, Oxford, 2006
8. IRC-37–2012,The Indian roads Congress, Guidelines for the Design of Flexible Pavements, New Delhi
9. IRC 58-2012. The Indian Road Congress, Guideline for the Design of Rigid Pavements for Highways, New Delhi

EN8592

WASTEWATER ENGINEERING

L T P C
3 0 0 3

PRINCIPAL

Munichand Sathak A.J. College of Engineering
No.34 Rajiv Gandhi Salai (O.M.B.)
Sector - II, Highway Egattur,
Chennai - 600105.

OBJECTIVE:

- The objectives of this course is to help students develop the ability to apply basic understanding of physical, chemical, and biological phenomena for successful design, operation and maintenance of sewage treatment plants.

UNIT I PLANNING AND DESIGN OF SEWERAGE SYSTEM 9

Characteristics and composition of sewage - population equivalent -Sanitary sewage flow estimation – Sewer materials – Hydraulics of flow in sanitary sewers – Sewer design – Storm drainage-Storm runoff estimation – sewer appurtenances – corrosion in sewers – prevention and control – sewage pumping-drainage in buildings-plumbing systems for drainage - Rain Water ting.

UNIT II PRIMARY TREATMENT OF SEWAGE 9

Objectives – Unit Operations and Processes – Selection of treatment processes – Onsite sanitation - Septic tank- Grey water harvesting – Primary treatment – Principles, functions and design of sewage treatment units - screens - grit chamber-primary sedimentation tanks – Construction, Operation and Maintenance aspects.

UNIT III SECONDARY TREATMENT OF SEWAGE

9

Objectives – Selection of Treatment Methods – Principles, Functions, - Activated Sludge Process and Extended aeration systems -Trickling filters– Sequencing Batch Reactor(SBR) – Membrane Bioreactor - UASB – Waste Stabilization Ponds – - Other treatment methods -Reclamation and Reuse of sewage - Recent Advances in Sewage Treatment – Construction, Operation and Maintenance aspects.

UNIT IV DISPOSAL OF SEWAGE

9

Standards for– Disposal - Methods – dilution – Mass balance principle - Self purification of river- Oxygen sag curve – deoxygenation and reaeration - Streeter–Phelps model - Land disposal – Sewage farming – sodium hazards - Soil dispersion system.

UNIT V SLUDGE TREATMENT AND DISPOSAL

9

Objectives - Sludge characterization – Thickening - Design of gravity thickener- Sludge digestion – Standard rate and High rate digester design- Biogas recovery – Sludge Conditioning and Dewatering – Sludge drying beds- ultimate residue disposal – recent advances.

TOTAL: 45 PERIODS

OUTCOMES:

The students completing the course will have

- An ability to estimate sewage generation and design sewer system including sewage pumping stations
- The required understanding on the characteristics and composition of sewage, self-purification of streams
- An ability to perform basic design of the unit operations and processes that are used in sewage treatment
- Understand the standard methods for disposal of sewage.
- Gain knowledge on sludge treatment and disposal.

TEXTBOOKS:

1. Garg, S.K., Environmental Engineering Vol. II, Khanna Publishers, New Delhi, 2015.
2. Duggal K.N., "Elements of Environmental Engineering" S.Chand and Co. Ltd., New Delhi, 2014.
3. Punmia, B.C., Jain, A.K., and Jain.A.K., Environmental Engineering, Vol.II, Laxmi Publications, 2010.

REFERENCES:

1. Manual on Sewerage and Sewage Treatment Systems Part A,B and C, CPHEEO, Ministry of Urban Development, Government of India; New Delhi, 2013.
2. Metcalf and Eddy- Wastewater Engineering–Treatment and Reuse, Tata Mc.Graw-Hill Company, New Delhi, 2010.
3. Syed R. Qasim "Wastewater Treatment Plants", CRC Press, Washington D.C.,2010
4. Gray N.F, "Water Technology", Elsevier India Pvt. Ltd., New Delhi, 2006.

CE8611

HIGHWAY ENGINEERING LABORATORY

L T P C

0 0 4 2

OBJECTIVE :

- To learn the principles and procedures of testing of highway materials

EXERCISES : *

I TEST ON AGGREGATES

- a) Specific Gravity
- b) Los Angeles Abrasion Test
- c) Water Absorption of Aggregates


PRINCIPAL
Mohamed Sathak A.J. College of Engineering
No. 34, Rajiv Gandhi Salai (OMR)
Sipcot - IT Highway Egattur,
Chennai - 603103.

**INCORPORATION OF CRIMPED DISCRETE
POLYETHELENE TEREPHTHALATE PLASTIC
(PET) FIBRE IN CONCRETE PAVEMENTS
RECYCLED FROM WASTE BOTTLES**

A PROJECT REPORT

Submitted by

ANANDU ACHARRY M.S - 311819103001

MOHAMED NATHEEM MANSOOR. N - 311819103302

S. SHAHITH ASLAM - 311819103006

In partial fulfilment of award of the degree

Of

BACHELOR OF ENGINEERING

IN

CIVIL ENGINEERING

MOHAMED SATHAK A.J COLLEGE OF ENGINEERING



PRINCIPAL

Mohamed Sathak A.J. College of Engineering
No.34, Rajiv Gandhi Salai (OMR)
Sipcot - IT Highway Egattur,
Chennai - 603103.



ANNA UNIVERSITY: CHENNAI 600 025

MAY 2023

ANNA UNIVERSITY: CHENNAI 600 025

BONAFIDE CERTIFICATE

Certified that this project report "INCORPORATION OF CRIMPED DISCRETE POLYETHELENE TEREPHTHALATE FIBRE IN CONCRETE PAVEMENTS RECYCLED FROM WASTE BOTTLES" is the bonafide work

ANANDU ACHARRY M.S

MOHAMED NATHEEM MANSOOR.N

S. SHAHITH ASLAM

Who carried out the project work under my supervision

R. Someswaran
12/05/23

SIGNATURE

Dr. R Someswaran MTech, Ph.D.

HEAD OF THE DEPARTMENT
MSAJCE

Civil Engineering

P. Kavithra
12/5/23

SIGNATURE

Mrs. P Kavithra M.E

SUPERVISOR
MSAJCE

Civil Engineering

M. Sathak A.J.

PRINCIPAL
Mohamed Sathak A.J. College of Engineering
No.34, Rajiv Gandhi Salai (OMR)
Sipcot - IT Highway Egattur,
Chennai - 603103.

PROJECT VIVA VOCE HELD ON: 17/05/2023

R. Someswaran
17/05/23

INTERNAL EXAMINER

S. Nishu
17/5/23

EXTERNAL EXAMINER

ABSTRACT

The integration of recycled materials in construction has been gaining attention in recent years due to the need for sustainable and resilient infrastructure development. This study investigates the feasibility of utilizing crimped discrete polyethylene terephthalate (PET) plastic fibres, sourced from waste plastic bottles, as a discrete fibre reinforcement material in concrete pavements. The primary objective is to analyze the mechanical properties of the PET fibre-reinforced concrete (PFRC) and compare it with conventional concrete, as well as investigate the homogeneity, quality, cracks, cavities and defects inside the concrete through non-destructive testing (NDT).

A comprehensive experimental program, including tests for plastic shrinkage, drying shrinkage, compressive strength, flexural strength, toughness, rebound hammer test, and ultrasonic pulse velocity test, was conducted on the concrete specimens. The results indicate that the inclusion of PET fibres significantly mitigates plastic and drying shrinkage, enhances the flexural and compressive strength, improves the toughness and durability of the pavement, and also improves the micro cracks and cavities inside the concrete.

This study contributes to the expanding body of knowledge on the use of recycled materials in the construction industry, particularly in the context of enhancing the performance of concrete pavements. The findings provide valuable insights into the potential application of crimped discrete PET fibres in PFRC and justifies that the use of such fibres can not only improve the mechanical properties but also improve the microstructure of the concrete. The results of this research have important implications for future research and practical applications in the construction industry, as they offer a valuable contribution to the field of sustainable and resilient infrastructure development.



PRINCIPAL

Mohamed Sathak A.J. College of Engineering
140 Rajiv Gandhi Salai (OMR)
Sipcot - IT Highway Egattur,
Chennai - 603103.

CHAPTER – 6

CONCLUSION

In conclusion, this project successfully achieved the hypothesis by demonstrating the effectiveness of crimped-shaped fibers in enhancing the bond between concrete. The incorporation of randomly oriented fibers acted as a stitching mechanism, effectively holding cracks together without causing spalling of the concrete. The experimental results showed a significant increase in the split tensile strength of the concrete, highlighting the positive impact of the fibers.

Furthermore, the study revealed that the use of crimped-shaped fibers also provided the concrete with good impact strength, further enhancing its overall durability. These findings highlight the potential of crimped-shaped fibers as a valuable reinforcement material for concrete structures. However, it is important to consider some drawbacks associated with the use of pet fibers, particularly in terms of workability. The addition of pet fibers can affect the workability of the concrete mixture, making it less fluid and potentially more challenging to handle. To overcome this issue, the use of superplasticizers is recommended, as they can help improve the workability without compromising the performance of the fibers.

Another factor to be mindful of is the volume of fibers added. While a high fiber volume can contribute to enhanced mechanical properties, there is a possibility of honeycombing if the concrete is not properly compacted. Therefore, it is crucial to ensure thorough compaction during the construction process to avoid any potential issues.

Furthermore, the ultrasonic test results yielded excellent outcomes due to the reduced presence of micro cracks in the concrete. This indicates that the inclusion of fibers positively influences the structural integrity of the concrete.


PRINCIPAL
Mohamed Sathak A.J. College of Engineering
No.34, Rajiv Gandhi Salai (OMR)
Sipcot - IT Highway Egattur,
Chennai - 603103.

OBJECTIVE:

- To introduce students to various materials commonly used in civil engineering construction and their properties.

UNIT I STONES – BRICKS – CONCRETE BLOCKS 9

Stone as building material – Criteria for selection – Tests on stones – Deterioration and Preservation of stone work – Bricks – Classification – Manufacturing of clay bricks – Tests on bricks – Compressive Strength – Water Absorption – Efflorescence – Bricks for special use – Refractory bricks – Concrete blocks – Lightweight concrete blocks.

UNIT II LIME – CEMENT – AGGREGATES – MORTAR 9

Lime – Preparation of lime mortar – Cement – Ingredients – Manufacturing process – Types and Grades – Properties of cement and Cement mortar – Hydration – Compressive strength – Tensile strength – Fineness – Soundness and consistency – Setting time – fine aggregates – river sand – crushed stone sand – properties – coarse Aggregates – Crushing strength – Impact strength – Flakiness Index – Elongation Index – Abrasion Resistance – Grading

UNIT III CONCRETE 9

Concrete – Ingredients – Manufacturing Process – Batching plants – mixing – transporting – placing – compaction of concrete – curing and finishing – Ready mix Concrete – Mix specification.

UNIT IV TIMBER AND OTHER MATERIALS 9

Timber – Market forms – Industrial timber – Plywood – Veneer – Thermocol – Panels of laminates – Steel – Aluminum and Other Metallic Materials – Composition – Aluminium composite panel – Market forms – Mechanical treatment – Paints – Varnishes – Distempers – Bitumens.

UNIT V MODERN MATERIALS 9

Glass – Ceramics – Sealants for joints – Fibre glass reinforced plastic – Clay products – Refractories – Composite materials – Types – Applications of laminar composites – Fibre textiles – Geomembranes and Geotextiles for earth reinforcement.

TOTAL: 45 PERIODS**OUTCOMES:**

On completion of this course the students will be able to

- Compare the properties of most common and advanced building materials.
- understand the typical and potential applications of lime, cement and aggregates
- know the production of concrete and also the method of placing and making of concrete elements.
- understand the applications of timbers and other materials
- Understand the importance of modern material for construction.

TEXT BOOKS:

- Varghese.P.C, "Building Materials", PHI Learning Pvt. Ltd, New Delhi, 2015.
- Rajput. R.K., "Engineering Materials", S. Chand and Company Ltd., 2008.
- Gambhir.M.L., "Concrete Technology", 3rd Edition, Tata McGraw Hill Education, 2004
- Duggal.S.K., "Building Materials", 4th Edition, New Age International, 2008

REFERENCES:

- Jagadish.K.S, "Alternative Building Materials Technology", New Age International, 2007.
- Gambhir. M.L., & Neha Jamwal., "Building Materials, products, properties and systems", Tata McGraw Hill Educations Pvt. Ltd, New Delhi, 2012.
- IS456 - 2000: Indian Standard specification for plain and reinforced concrete, 2011
- IS4926 - 2003: Indian Standard specification for ready-mixed concrete, 2012
- IS383 - 1970: Indian Standard specification for coarse and fine aggregate from natural Sources for concrete, 2011
- IS1542-1992: Indian standard specification for sand for plaster, 2009
- IS 10262-2009: Indian Standard Concrete Mix Proportioning –Guidelines, 2009

- Appreciate the numerical techniques of interpolation and error approximations in various intervals in real life situations.
- Apply the numerical techniques of differentiation and integration for engineering problems.
- Understand the knowledge of various techniques and methods for solving first and second order ordinary differential equations.
- Solve the partial and ordinary differential equations with initial and boundary conditions by using certain techniques with engineering applications.

TEXTBOOKS :

1. Burden, R.L and Faires, J.D, "Numerical Analysis", 9th Edition, Cengage Learning, 2016.
2. Grewal, B.S., and Grewal, J.S., "Numerical Methods in Engineering and Science", Khanna Publishers, 10th Edition, New Delhi, 2015.

REFERENCES :

1. Brian Bradie, "A Friendly Introduction to Numerical Analysis", Pearson Education, Asia, New Delhi, 2007.
2. Gerald. C. F. and Wheatley. P. O., "Applied Numerical Analysis", Pearson Education, Asia, 6th Edition, New Delhi, 2006.
3. Mathews, J.H. "Numerical Methods for Mathematics, Science and Engineering", 2nd Edition, Prentice Hall, 1992.
4. Sankara Rao. K., "Numerical Methods for Scientists and Engineers", Prentice Hall of India Pvt. Ltd, 3rd Edition, New Delhi, 2007.
5. Sastry, S.S, "Introductory Methods of Numerical Analysis", PHI Learning Pvt. Ltd, 5th Edition, 2015.

CE8401

CONSTRUCTION TECHNIQUES AND PRACTICES

**L T P C
3 0 0 3**

OBJECTIVE:

- The main objective of this course is to make the student aware of the various construction techniques, practices and the equipment needed for different types of construction activities. At the end of this course the student shall have a reasonable knowledge about the various construction procedures for sub to super structure and also the equipment needed for construction of various types of structures from foundation to super structure.

UNIT I CONSTRUCTION TECHNIQUES

9

Structural systems - Load Bearing Structure - Framed Structure - Load transfer mechanism - floor system - Development of construction techniques - High rise Building Technology - Seismic effect - Environmental impact of materials - responsible sourcing - Eco Building (Green Building) - Material used - Construction methods - Natural Buildings - Passive buildings - Intelligent(Smart) buildings - Meaning - Building automation - Energy efficient buildings for various zones - Case studies of residential, office buildings and other buildings in each zone.

(Handwritten signature)
 Ashamed Sathak A.J, College of Engineering
 No 34, Rajiv Gandhi Salai (OMR)
 Sipcot - IT Highway Egattur, 9
 Chennai - 603103

UNIT II CONSTRUCTION PRACTICES

Specifications, details and sequence of activities and construction co-ordination - Site Clearance - Marking - Earthwork - masonry - stone masonry - Bond in masonry - concrete hollow block masonry - flooring - damp proof courses - construction joints - movement and expansion joints - pre cast pavements - Building foundations - basements - temporary shed - centering and shuttering - slip forms - scaffoldings - de-shuttering forms - Fabrication and erection of steel trusses - frames - braced domes - laying brick - weather and water proof - roof finishes - acoustic and fire protection.

UNIT III SUB STRUCTURE CONSTRUCTION 9

Techniques of Box jacking – Pipe Jacking -under water construction of diaphragm walls and basement-Tunneling techniques – Piling techniques - well and caisson - sinking cofferdam - cable anchoring and grouting - driving diaphragm walls, sheet piles - shoring for deep cutting - well points -Dewatering and stand by Plant equipment for underground open excavation.

UNIT IV SUPER STRUCTURE CONSTRUCTION 9

Launching girders, bridge decks, off shore platforms – special forms for shells - techniques for heavy decks – in-situ pre-stressing in high rise structures, Material handling - erecting light weight components on tall structures - Support structure for heavy Equipment and conveyors - Erection of articulated structures, braced domes and space decks.

UNIT V CONSTRUCTION EQUIPMENT 9

Selection of equipment for earth work - earth moving operations - types of earthwork equipment - tractors, motor graders, scrapers, front end loaders, earth movers – Equipment for foundation and pile driving. Equipment for compaction, batching, mixing and concreting - Equipment for material handling and erection of structures – types of cranes - Equipment for dredging, trenching, tunneling,

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, students will be able to:

- know the different construction techniques and structural systems
- Understand various techniques and practices on masonry construction, flooring, and roofing.
- Plan the requirements for substructure construction.
- Know the methods and techniques involved in the construction of various types of super structures
- Select, maintain and operate hand and power tools and equipment used in the building construction sites.

TEXTBOOKS :

1. Peurifoy, R.L., Ledbetter, W.B. and Schexnayder, C., "Construction Planning, Equipment and Methods", 5th Edition, McGraw Hill, Singapore, 1995.
2. Arora S.P. and Bindra S.P., "Building Construction, Planning Techniques and Method of Construction", Dhanpat Rai and Sons, 1997.
3. Varghese, P.C. "Building construction", Prentice Hall of India Pvt. Ltd, New Delhi, 2007.

REFERENCES:

1. Jha J and Sinha S.K., "Construction and Foundation Engineering", Khanna Publishers, 1999.
2. Sharma S.C. "Construction Equipment and Management", Khanna Publishers New Delhi, 2002.
3. Deodhar, S.V. "Construction Equipment and Job Planning", Khanna Publishers, New Delhi, 2012.
4. Mahesh Varma, "Construction Equipment and its Planning and Application", Metropolitan Book Company, New Delhi, 1983.



PRINCIPAL
Mohamed Sathak A.J. College of Engineering
No.34, Rajiv Gandhi Salai (OMR)
Sipcot - IT Highway Egattur,
Chennai - 603103.

TEXTBOOKS:

1. Subramanya.K, "Flow in open channels", Tata McGraw Hill, New Delhi, 2000.
2. Modi P.N and Seth.S.M "Hydraulics and Fluid Mechanics including Hydraulic Machines", Standard Book House New Delhi, 2009.
3. Chandramouli P.N., "Applied Hydraulic Engineering", Yes Dee Publishing Pvt. Ltd., 2017.

REFERENCES: *

1. Ven Te Chow, "Open Channel Hydraulics", McGraw Hill, New York, 2009.
2. Hanif Chaudhry.M., "Open Channel Flow", Second Edition, Springer, 2007.
3. Rajesh Srivastava, "Flow through open channels", Oxford University Press, New Delhi, 2008.
4. Jain.A.K., " Fluid Mechanics" (Including Hydraulic Machines), Khanna Publishers, Twelfth Edition, 2016.
5. Subramanya.K., " Fluid Mechanics and Hydraulic Machines", Tata McGraw Hill Education Private Limited, New Delhi, 2010.

CE8404**CONCRETE TECHNOLOGY****L T P C
3 0 0 3****OBJECTIVE:**

- To impart knowledge to the students on the properties of materials for concrete by suitable tests, mix design for concrete and special concretes.

UNIT I	CONSTITUENT MATERIALS	9
Cement - Different types - Chemical composition and Properties – Hydration of cement - Tests on cement - IS Specifications - Aggregates – Classification - Mechanical properties and tests as per BIS - Grading requirements – Water - Quality of water for use in concrete.		
UNIT II	CHEMICAL AND MINERAL ADMIXTURES	9
Accelerators – Retarders - Plasticizers - Super plasticizers - Water proofers - Mineral Admixtures like Fly Ash, Silica Fume, Ground Granulated Blast Furnace Slag and Metakaoline - Effects on concrete properties.		
UNIT III	PROPORTIONING OF CONCRETE MIX	9
Principles of Mix Proportioning - Properties of concrete related to Mix Design - Physical properties of materials required for Mix Design - Design Mix and Nominal Mix - BIS Method of Mix Design - Mix Design Examples		
UNIT IV	FRESH AND HARDENED PROPERTIES OF CONCRETE	9
Workability - Tests for workability of concrete - Segregation and Bleeding - Determination of strength Properties of Hardened concrete - Compressive strength – split tensile strength - Flexural strength - Stress-strain curve for concrete - Modulus of elasticity – durability of concrete – water absorption – permeability – corrosion test – acid resistance.		
UNIT V	SPECIAL CONCRETES	9
Light weight concretes - foam concrete- self compacting concrete – vacuum concrete - High strength concrete - Fibre reinforced concrete – Ferrocement - Ready mix concrete – SIFCON - Shotcrete – Polymer concrete - High performance concrete - Geopolymer Concrete		

TOTAL: 45 PERIODS

PRINCIPAL

Mohamed Sathak A.J. College of Engineering
No.34, Rajiv Gandhi Salai (OMR)
Sipcot - IT Highway Egattur,
Chennai - 603103.

OUTCOMES:

Students will be able to understand

- The various requirements of cement, aggregates and water for making concrete
- The effect of admixtures on properties of concrete
- The concept and procedure of mix design as per IS method
- The properties of concrete at fresh and hardened state
- The importance and application of special concretes.

TEXTBOOKS:

1. Gupta.B.L., Amit Gupta, "Concrete Technology", Jain Book Agency, 2010.
2. Shetty,M.S, "Concrete Technology", S.Chand and Company Ltd, New Delhi, 2003
3. Bhavikatti.S.S, " Concrete Technology", I.K.International Publishing House Pvt. Ltd., New Delhi, 2015
4. Santhakumar. A.R., "Concrete Technology", Oxford University Press India, 2006.

REFERENCES:

1. Neville, A.M; "Properties of Concrete", Pitman Publishing Limited, London, 1995
2. Gambhir, M.L; "Concrete Technology", 3rd Edition, Tata McGraw Hill Publishing Co Ltd, New Delhi; 2007
3. IS10262-2009 Recommended Guidelines for Concrete Mix Design, Bureau of Indian Standards, New Delhi, 1998.
4. Job Thomas, "Concrete Technology", Cengage Learning India Pvt. Ltd., Delhi, 2015
5. Kumar P Mehta., Paulo J M Monterio., "Concrete - Microstructure, Properties and Materials", McGraw Hill Education (India) Private Limited, New Delhi, 2016

CE8491

SOIL MECHANICS

**L T P C
3 0 0 3**

OBJECTIVE:

- To impart knowledge to classify the soil based on index properties and to assess their engineering properties based on the classification. To familiarize the students about the fundamental concepts of compaction, flow through soil, stress transformation, stress distribution, consolidation and shear strength of soils. To impart knowledge of design of both finite and infinite slopes.

UNIT I SOIL CLASSIFICATION AND COMPACTION

9

History – formation and types of soil – composition - Index properties – clay mineralogy structural arrangement of grains – description – Classification – BIS – US – phase relationship – Compaction – theory – laboratory and field technology – field Compaction method – factors influencing compaction.

UNIT II EFFECTIVE STRESS AND PERMEABILITY

9

Soil - water – Static pressure in water - Effective stress concepts in soils – Capillary phenomena – Permeability – Darcy's law – Determination of Permeability – Laboratory Determination (Constant head and falling head methods) and field measurement pumping out in unconfined and confined aquifer – Factors influencing permeability of soils – Seepage - Two dimensional flow – Laplace's equation – Introduction to flow nets – Simple problems Sheet pile and wier.

UNIT III STRESS DISTRIBUTION AND SETTLEMENT

Stress distribution in homogeneous and isotropic medium – Boussinesq of theory – (Point load, Line load and udl) Use of Newmarks influence chart – Components of settlement – Immediate and consolidation settlement – Factors influencing settlement – Terzaghi's one dimensional consolidation theory – Computation of rate of settlement. – \sqrt{t} and $\log t$ methods. e-log p relationship consolidation settlement N-C clays – O.C clays – Computation.

*Mohamed Sathak A.J. College of Engineering
No.34, Rajiv Gandhi Salai (OMR)
Sipcot - IT Highway Egattur,
Chennai - 600119*

**AN EXPERIMENTAL STUDY OF CHOPPED BASALT FIBER
IN REINFORCED CONCRETE**

Submitted by

THASRUDEEN R

311819103303

VEERAKUMAR M

311819103304

MOHAMED NOOHU ADHIL P R

311819103305

in partial fulfillment for the award of the degrees

of

BACHELOR OF ENGINEERING

in

CIVIL ENGINEERING



MOHAMED SATHAK A.J. COLLEGE OF ENGINEERING

SIRUSERI, OMR, CHENNAI - 603103

ANNA UNIVERSITY: CHENNAI-600 025

MAY 2023



PRINCIPAL

**Mohamed Sathak A.J. College of Engineering
No.34, Rajiv Gandhi Salai (OMR)
Sipcot - IT Highway Egattur,
Chennai - 603103.**

BONAFIDE CERTIFICATE

Certified that this project report AN EXPERIMENTAL STUDY OF CHOPPED BASALT FIBER IN REINFORCED CONCRETE is the bonfide work of THASRUDEEN R,VEERAKUMAR M,MOHAMED NOOHU ADHIL P R,who carried out the project work under my supervision.



SIGNATURE OF H.O.D

Dr.R.SOMESWARAN.,Ph.D

HEAD OF THE DEPARTMENT

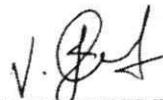
Civil Engineering

Mohamed Sathak A J College

of Engineering

Siruseri, OMR, CHENNAI -

603103



SIGNATURE OF GUIDE

Mrs.V.JANAKI.,M.E

ASSISTANT PROFESSOR

CivilEngineering

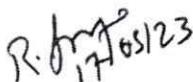
Mohamed Sathak A J College

of Engineering

Siruseri, OMR, CHENNAI -

603103

Project Viva-Voce held on 17.05.2023

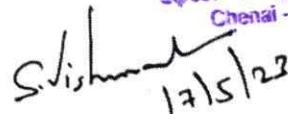


INTERNAL EXAMINER



PRINCIPAL

Mohamed Sathak A.J. College of Engineering
No. 14, Rajiv Gandhi Salai (OMR)
Sipcot - IT Highway Egattur,
Chennai - 603103.



EXTERNAL EXAMINER

ABSTRACT

Tanning industries are required very much for the large requirement of leather products such as shoes, belts, suitcase, wallets & jackets etc., industries are release massive amount of waste. Some small-scale industries and not legally registered industries are discharge the waste into the nearby running streams and open lands. The chromium content (Cr (VI) &Cr (III)) in the waste water largely affect the environment. In our research project, for maintaining the hydraulic loading rate, we use Peristaltic pump for continuous flow of waste water, which pumps 50ml/min for 15 rpm. Burned coconut shell used as an adsorbent to minimize the COD strength for prepared synthetic tannery waste water in our research work.

KEYWORDS:

Coconut Fiber - Burned charcoal - Manufactured sand - adsorbent - peristaltic pump - COD reduction - pH, DO, COD.



PRINCIPAL

Mehamed Sathak A.J. College of Engineering
No.34, Rajiv Gandhi Salai (OMR)
Sipcot - IT Highway Egattur,
Chennai - 603103.

CHAPTER-V

CONCLUSION

From the results it was identified that the treatment of synthetic tannery waste water using activated carbon and sand (adsorbent + absorbent) the TDS-40.2%; TSS reduction-6.3%; TS reduction-35.6% and the reduction of COD was 28.5% was obtained as per 10 days continuous characteristic study. In our study we conclude activated carbon mixed with sand bed filter is one of the best suitable filter media for strength and waste water filtration. If we need the quality as well as quantity of filter water in higher level the HLR and using of different adsorption and absorption materials also suitable for the reduction of strength of waste water.



PRINCIPAL
Mohamed Sathak A.J. College of Engineering
No.34, Rajiv Gandhi Salai (OMR)
Sipcot - IT Highway Egattur,
Chennai - 603103.

TEXTBOOKS:

1. Subramanian K.P., Highways, Railways, Airport and Harbour Engineering, V Scitech Publications (India), Chennai, 2010
2. Saxena Subhash, C.and Satyapal Arora, A Course in Railway Engineering, Dhanapat Rai and Sons, Delhi, 1998
3. Khanna.S.K. Arora.M.G and Jain.S.S, Airport Planning and Design, Nemachand and Bros, Roorkee, 1994

REFERENCES:

1. Venkatramaiah. C., Transportation Engineering-Vol.2 Railways, Airports, Docks and Harbours, Bridges and Tunnels.,Universities Press (India) Private Limited, Hyderabad, 2015.
2. Mundrey J S, Railway Track Engineering, McGraw Hill Education (India) Private Ltd, New Delhi, 2013

CE8703**STRUCTURAL DESIGN AND DRAWING****L T P C
3 0 2 4****OBJECTIVE:**

- This course aims at providing students with a solid background on the principles of structural engineering design. Students will be acquire the knowledge of liquid retaining structures, bridges components, retaining wall and industrial structures.

UNIT I RETAINING WALLS**9+6**

Reinforced concrete Cantilever and Counter fort Retaining Walls–Horizontal Backfill with Surcharge–Design of Shear Key–Design and Drawing.

UNIT II FLAT SLAB and BRIDGES**9+6**

Design of Flat Slabs with and without drops by Direct Design Method of IS code- Design and Drawing - IRC Specifications and Loading – RC Solid Slab Bridge – Steel Foot-over Bridge- Design and Drawing.

UNIT III LIQUID STORAGE STRUCTURES**9+6**

RCC Water Tanks - On ground, Elevated Circular, underground Rectangular Tanks– Hemispherical Bottomed Steel Water Tank –Design and Drawing

UNIT IV INDUSTRIAL STRUCTURES**9+6**

Structural steel Framing - Steel Roof Trusses – Roofing Elements – Beam columns – Codal provisions - Design and Drawing.

UNIT V GIRDERS AND CONNECTIONS**9+6**

Plate Girders – Behaviour of Components-Deign of Welded Plate Girder-Design of Industrial Gantry Girders – Design of Eccentric Shear and Moment Resisting connections.

TOTAL: 75 PERIODS**Design and Drawing Exercises for practical component****Part A - RCC Structures**

1. Rectangular Column and Footing
2. Combined footing with Two columns
3. RCC one way &Two way Slab and beam system


PRINCIPAL

Mohamed Sathak A.J. College of Engineering
No.34, Rajiv Gandhi Salai (OMR)
Sipcot - IT Highway Egattur,
Chennai - 603103.

4. Cantilever Retaining wall
5. RCC T beam bridge deck
6. Underground Rectangular Water Tank
7. Elevated circular water Tank

Part B- Steel Structures

1. Built up column, column base and Foundation
2. Simple Steel Roof Trusses
3. Industrial building Elements
4. Plate Girder (welded)
5. Framed Connections and Detailing
6. Gantry girder
7. Steel water Tank

STRUCTURAL DESIGN AND DRAWING	Theory Examination		Practicals	
	Question paper Pattern	Marks to awarded	Question paper Pattern	Marks to awarded
This paper is a theory cum practical course weightage for theory 80% and for practical 20%	Five Either/Or type questions 5 x20 = 100 marks : covering all the five units Total Duration of Examination will be 3 hours Each Question include Design - 12 Marks Free hand Drawing (Not to scale) - 8 marks	Theoretical component Marks will carry 80% weightage. End Semester Examination will be conducted by COE	2 Questions, one from Part A - RCC Structures & one from Part B- Steel Structures	Practical component Marks will carry 20% weightage. Practical Examination will be conducted by the respective institution as internal mode.

OUTCOMES:

At the end of the course the student will be able to

- Design and draw reinforced concrete Cantilever and Counterfort Retaining Walls
- Design and draw flat slab as per code provisions
- Design and draw reinforced concrete and steel bridges
- Design and draw reinforced concrete and steel water tanks
- Design and detail the various steel trusses and cantry girders

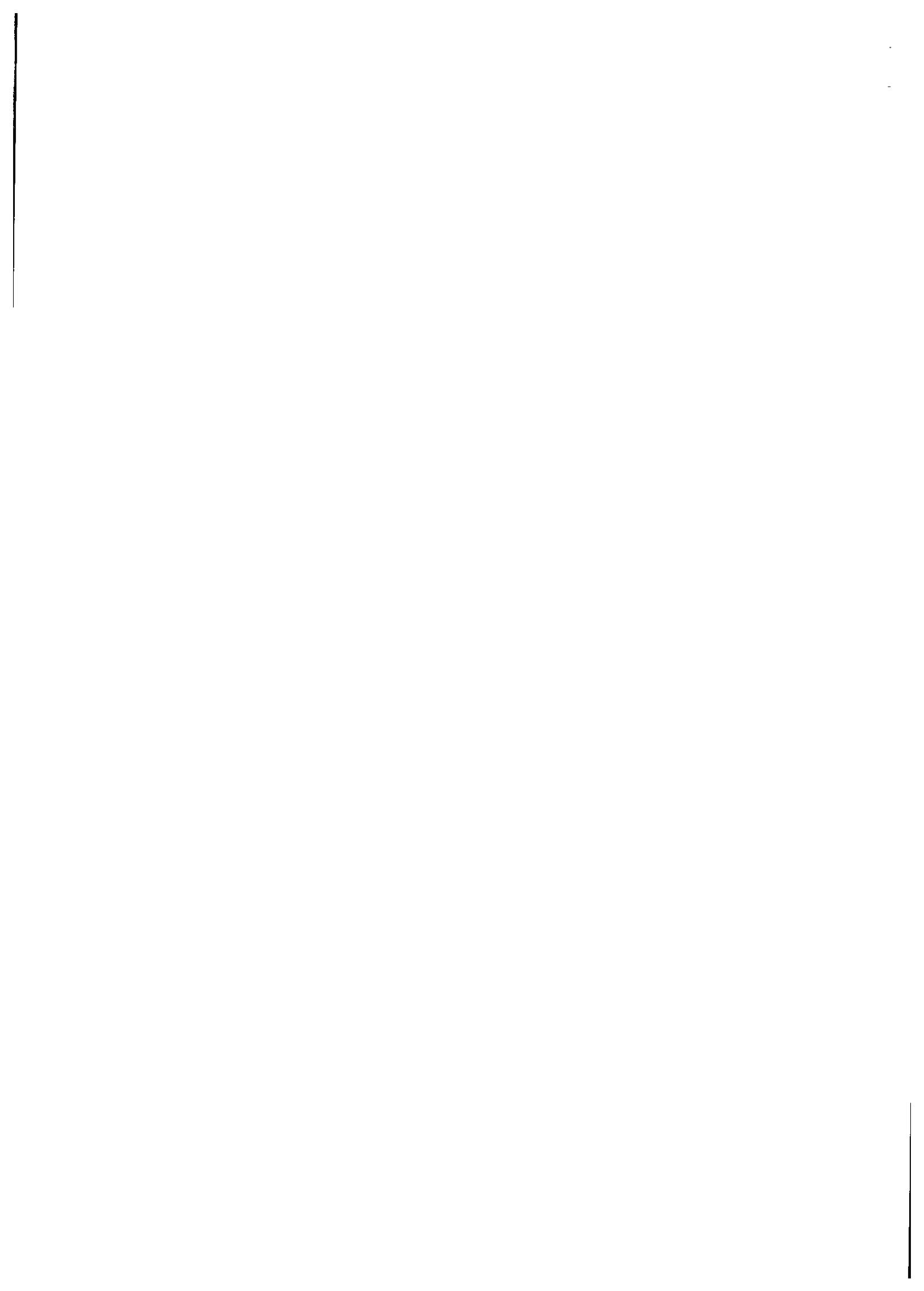
TEXTBOOKS:

1. Krishnaraju N, Structural Design and Drawing, Universities Press, 2009.
2. Punmia B.C, Ashok Kumar Jain and Arun Kumar Jain, Comprehensive Design of Steel Structures, Laxmi Publications Pvt. Ltd., 2003.

REFERENCES:

1. Krishnamurthy D, Structural Design and Drawing Voll, II and III, CBS Publishers, 2010.
2. Shah V L and Veena Gore, Limit State Design of Steel Structures
3. IS800-2007, Structures Publications, 2009.
4. IS 456(2000) Indian Standard Plain and Reinforced Concrete-Code of Practice, Bureau of Indian Standards, New Delhi.


PRINCIPAL
 Mohamed Sathak A.J. College of Engineering
 No.34, Rajiv Gandhi Salai (OMR)
 Sipcot - IT Highway Egattur,
 Chennai - 603103.



OUTCOMES:

- Environmental Pollution or problems cannot be solved by mere laws. Public participation is an important aspect which serves the environmental Protection. One will obtain knowledge on the following after completing the course.
- Public awareness of environmental is at infant stage.
- Ignorance and incomplete knowledge has lead to misconceptions
- Development and improvement in std. of living has lead to serious environmental disasters

TEXTBOOKS:

1. Benny Joseph, 'Environmental Science and Engineering', Tata McGraw-Hill, New Delhi, 2006.
2. Gilbert M.Masters, 'Introduction to Environmental Engineering and Science', 2nd edition, Pearson Education, 2004.

REFERENCES :

1. Dharmendra S. Sengar, 'Environmental law', Prentice hall of India Pvt Ltd, New Delhi, 2007.
2. Erach Bharucha, "Textbook of Environmental Studies", Universities Press(I) Pvt, Ltd, Hydrabad, 2015.
3. G. Tyler Miller and Scott E. Spoolman, "Environmental Science", Cengage Learning India PVT, LTD, Delhi, 2014.
4. Rajagopalan, R, 'Environmental Studies-From Crisis to Cure', Oxford University Press, 2005.

GE8292

ENGINEERING MECHANICS

 L T P C
3 2 0 4

OBJECTIVES:

- To develop capacity to predict the effect of force and motion in the course of carrying out the design functions of engineering.

UNIT I STATICS OF PARTICLES

Introduction – Units and Dimensions – Laws of Mechanics – Lami's theorem, Parallelogram and triangular Law of forces – Vectorial representation of forces – Vector operations of forces - additions, subtraction, dot product, cross product – Coplanar Forces – rectangular components – Equilibrium of a particle – Forces in space – Equilibrium of a particle in space – Equivalent systems of forces – Principle of transmissibility .

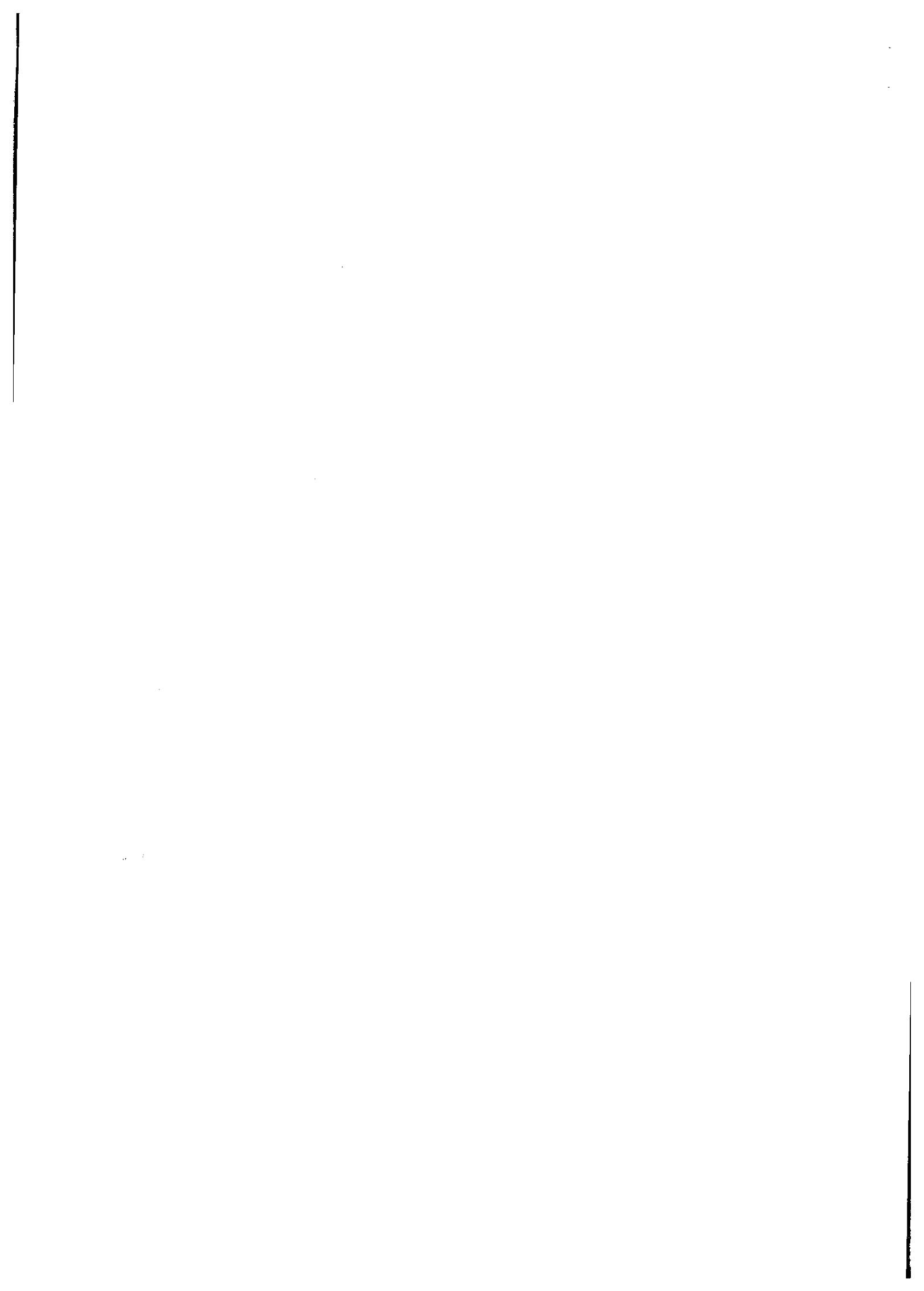
UNIT II EQUILIBRIUM OF RIGID BODIES

Free body diagram – Types of supports – Action and reaction forces – stable equilibrium – Moments and Couples – Moment of a force about a point and about an axis – Vectorial representation of moments and couples – Scalar components of a moment – Varignon's theorem – Single equivalent force -Equilibrium of Rigid bodies in two dimensions – Equilibrium of Rigid bodies in three dimensions

UNIT III PROPERTIES OF SURFACES AND SOLIDS

Centroids and centre of mass – Centroids of lines and areas - Rectangular, circular, triangular areas by integration – T section, I section, - Angle section, Hollow section by using standard formula –Theorems of Pappus - Area moments of inertia of plane areas – Rectangular, circular, triangular areas by integration – T section, I section, Angle section, Hollow section by using standard formula – Parallel axis theorem and perpendicular axis theorem – Principal moments of inertia of plane areas – Principal axes of inertia-Mass moment of inertia –mass moment of inertia for prismatic, cylindrical and spherical solids from first principle – Relation to area moments of inertia.

PRINCIPAL
Mohamed Sathak A.J. College of Engineering
No.34, Rajiv Gandhi Salai (OMR)
Sipcot - IT Highway Egattur, 9+6



UNIT IV DYNAMICS OF PARTICLES**9+6**

Displacements, Velocity and acceleration, their relationship – Relative motion – Curvilinear motion - Newton's laws of motion – Work Energy Equation– Impulse and Momentum – Impact of elastic bodies.

UNIT V FRICTION AND RIGID BODY DYNAMICS**9+6**

Friction force – Laws of sliding friction – equilibrium analysis of simple systems with sliding friction –wedge friction-. Rolling resistance -Translation and Rotation of Rigid Bodies – Velocity and acceleration – General Plane motion of simple rigid bodies such as cylinder, disc/wheel and sphere.

TOTAL : (45+30)=75 PERIODS**OUTCOMES:**

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

- illustrate the vectorial and scalar representation of forces and moments
- analyse the rigid body in equilibrium
- evaluate the properties of surfaces and solids
- calculate dynamic forces exerted in rigid body
- determine the friction and the effects by the laws of friction

TEXT BOOKS:

1. Beer, F.P and Johnston Jr. E.R., "Vector Mechanics for Engineers (In SI Units): Statics and Dynamics", 8th Edition, Tata McGraw-Hill Publishing company, New Delhi (2004).
2. Vela Murali, "Engineering Mechanics", Oxford University Press (2010)

REFERENCES:

1. Bhavikatti, S.S and Rajashekarappa, K.G., "Engineering Mechanics", New Age International (P) Limited Publishers, 1998.
2. Hibbeler, R.C and Ashok Gupta, "Engineering Mechanics: Statics and Dynamics", 11th Edition, Pearson Education 2010.
3. Irving H. Shames and Krishna Mohana Rao. G., "Engineering Mechanics – Statics and Dynamics", 4th Edition, Pearson Education 2006.
4. Meriam J.L. and Kraige L.G., " Engineering Mechanics- Statics - Volume 1, Dynamics-Volume 2", Third Edition, John Wiley & Sons,1993.
5. Rajasekaran S and Sankarasubramanian G., "Engineering Mechanics Statics and Dynamics", 3rd Edition, Vikas Publishing House Pvt. Ltd., 2005.

GE8261

ENGINEERING PRACTICES LABORATORY


PRINCIPAL

LTPC

Mohamed Sathak A.J. College of Engineering
 No.34, Rajiv Gandhi Salai (OMR)
 Sipcot - IT Highway Egattur,
 Chennai - 603103

OBJECTIVES:

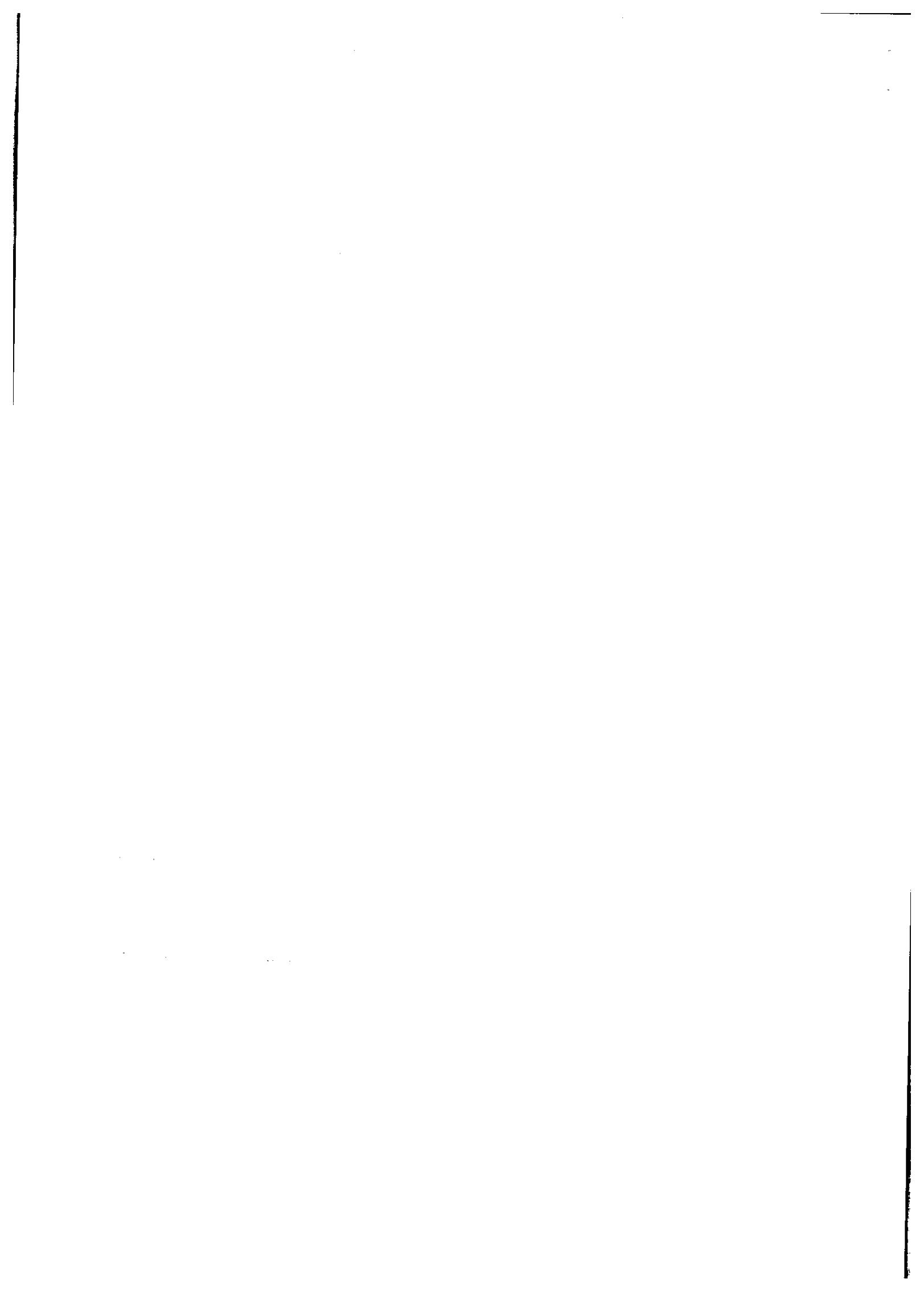
- To provide exposure to the students with hands on experience on various basic engineering practices in Civil, Mechanical, Electrical and Electronics Engineering.

GROUP A (CIVIL & MECHANICAL)**I CIVIL ENGINEERING PRACTICE****13****Buildings:**

- (a) Study of plumbing and carpentry components of residential and industrial buildings. Safety aspects.

Plumbing Works:

- (a) Study of pipeline joints, its location and functions: valves, taps, couplings, unions, reducers, elbows in household fittings.
- (b) Study of pipe connections requirements for pumps and turbines.



OBJECTIVES:

- To introduce the different types of philosophies related to design of basic structural elements such as slab, beam, column and footing which form part of any structural system with reference to Indian standard code of practice.

UNIT I INTRODUCTION

9+6

Objective of structural design-Steps in RCC Structural Design Process- Type of Loads on Structures and Load combinations- Code of practices and Specifications - Concept of Working Stress Method, Ultimate Load Design and Limit State Design Methods for RCC –Properties of Concrete and Reinforcing Steel - Analysis and Design of Singly reinforced Rectangular beams by working stress method - Limit State philosophy as detailed in IS code - Advantages of Limit State Method over other methods - Analysis and design of singly and doubly reinforced rectangular beams by Limit State Method.

UNIT II DESIGN OF BEAMS

9+6

Analysis and design of Flanged beams for – Use of design aids for Flexure - Behaviour of RC members in Shear, Bond and Anchorage - Design requirements as per current code - Behaviour of rectangular RC beams in shear and torsion - Design of RC members for combined Bending, Shear and Torsion.

UNIT III DESIGN OF SLABS AND STAIRCASE

9+6

Analysis and design of cantilever, one way simply supported and continuous slabs and supporting beams-Two way slab- Design of simply supported and continuous slabs using IS code coefficients- Types of Staircases – Design of dog-legged Staircase.

UNIT IV DESIGN OF COLUMNS

9+6

Types of columns –Axially Loaded columns – Design of short Rectangular Square and circular columns –Design of Slender columns- Design for Uniaxial and Biaxial bending using Column Curves

UNIT V DESIGN OF FOOTINGS

9+6

Concepts of Proportioning footings and foundations based on soil properties-Design of wall footing – Design of axially and eccentrically loaded Square, Rectangular pad and sloped footings – Design of Combined Rectangular footing for two columns only.

TOTAL: 75 PERIODS**OUTCOMES:**

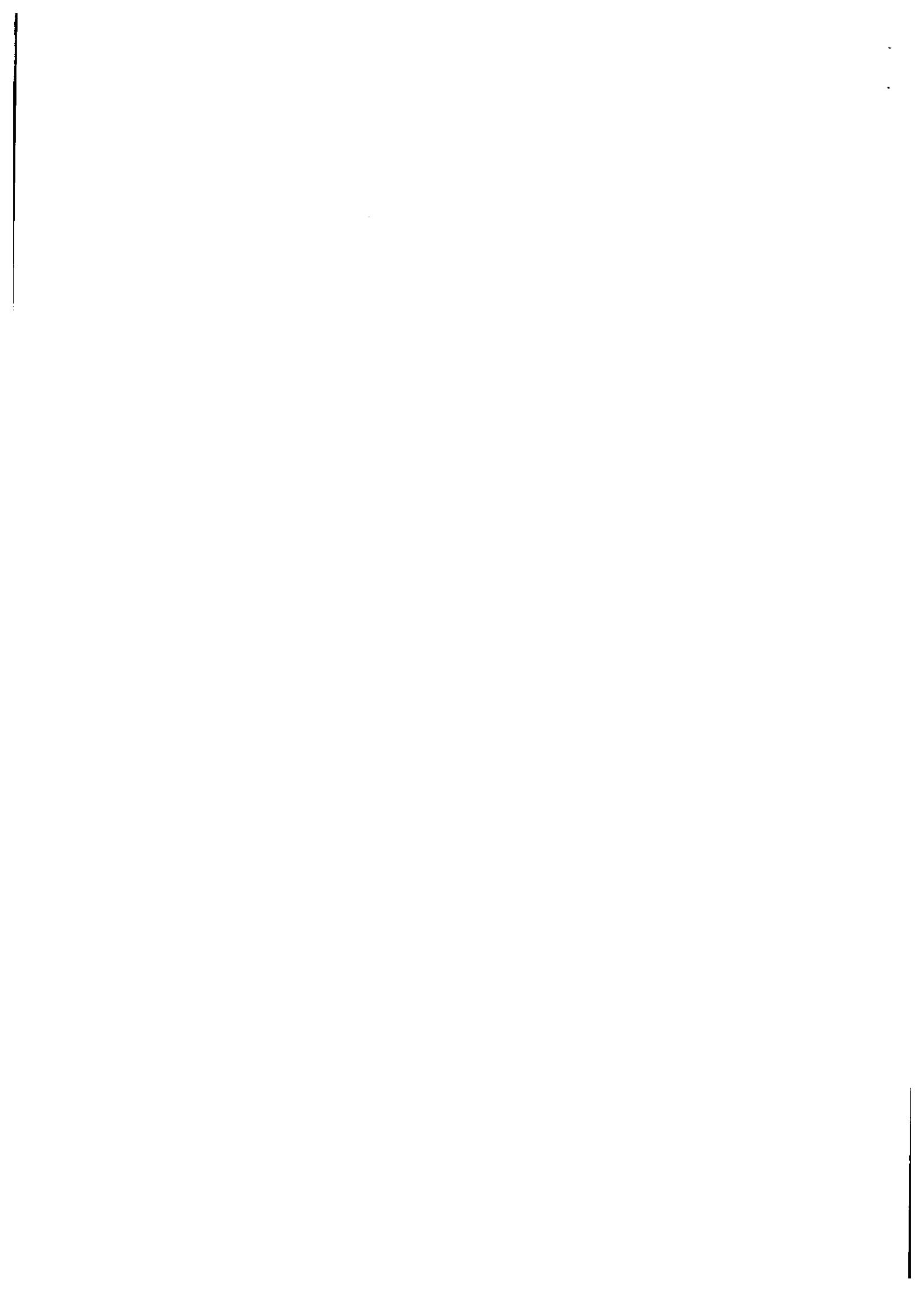
Students will be able to

- Understand the various design methodologies for the design of RC elements.
- Know the analysis and design of flanged beams by limit state method and sign of beams for shear, bond and torsion.
- design the various types of slabs and staircase by limit state method.
- Design columns for axial, uniaxial and biaxial eccentric loadings.
- Design of footing by limit state method.

TEXT BOOKS:

- Varghese, P.C., "Limit State Design of Reinforced Concrete", Prentice Hall of India, Pvt. Ltd., New Delhi, 2002.
- Gambhir. M.L., "Fundamentals of Reinforced Concrete Design", Prentice Hall of India Private Limited, New Delhi, 2006.
- Subramanian, N., "Design of Reinforced Concrete Structures", Oxford University Press, New Delhi, 2013.
- Krishnaraju. N " Design of Reinforced Concrete Structures ", CBS Publishers & Distributors Pvt. Ltd., New Delhi.
- Ramachandra, "Limit state Design of Concrete Structures" Standard Book House, New Delhi


PRINCIPAL
 Mohammed Sathya K. Chettiar, College of Engineering
 No.34, Rajiv Gandhi Salai (OMR)
 Singpet - IT Highway Egattur,
 Chennai - 600 033



OBJECTIVES:

- To know the method of finding slope and deflection of beams and trusses using energy theorems and to know the concept of analysing indeterminate beam
- To estimate the load carrying capacity of columns, stresses due to unsymmetrical bending and various theories for failure of material.

UNIT I ENERGY PRINCIPLES 9

Strain energy and strain energy density – strain energy due to axial load (gradual, sudden and impact loadings) , shear, flexure and torsion – Castigliano's theorems – Maxwell's reciprocal theorem - Principle of virtual work – unit load method - Application of energy theorems for computing deflections in determinate beams , plane frames and plane trusses – lack of fit and temperature effects - Williot Mohr's Diagram.

UNIT II INDETERMINATE BEAMS 9

Concept of Analysis - Propped cantilever and fixed beams - fixed end moments and reactions – sinking and rotation of supports - Theorem of three moments – analysis of continuous beams – shear force and bending moment diagrams.

UNIT III COLUMNS AND CYLINDERS 9

Euler's column theory – critical load for prismatic columns with different end conditions – Effective length – limitations - Rankine-Gordon formula - Eccentrically loaded columns – middle third rule - core of a section – Thin cylindrical and spherical shells – stresses and change in dimensions - Thick cylinders – Compound cylinders – shrinking on stresses.

UNIT IV STATE OF STRESS IN THREE DIMENSIONS 9

Stress tensor at a point – Stress invariants - Determination of principal stresses and principal planes - Volumetric strain. Theories of failure: Maximum Principal stress theory – Maximum Principal strain theory – Maximum shear stress theory – Total Strain energy theory – Maximum distortion energy theory – Application problems.

UNIT V ADVANCED TOPICS 9

Unsymmetrical bending of beams of symmetrical and unsymmetrical sections – Shear Centre - curved beams – Winkler Bach formula – stresses in hooks.

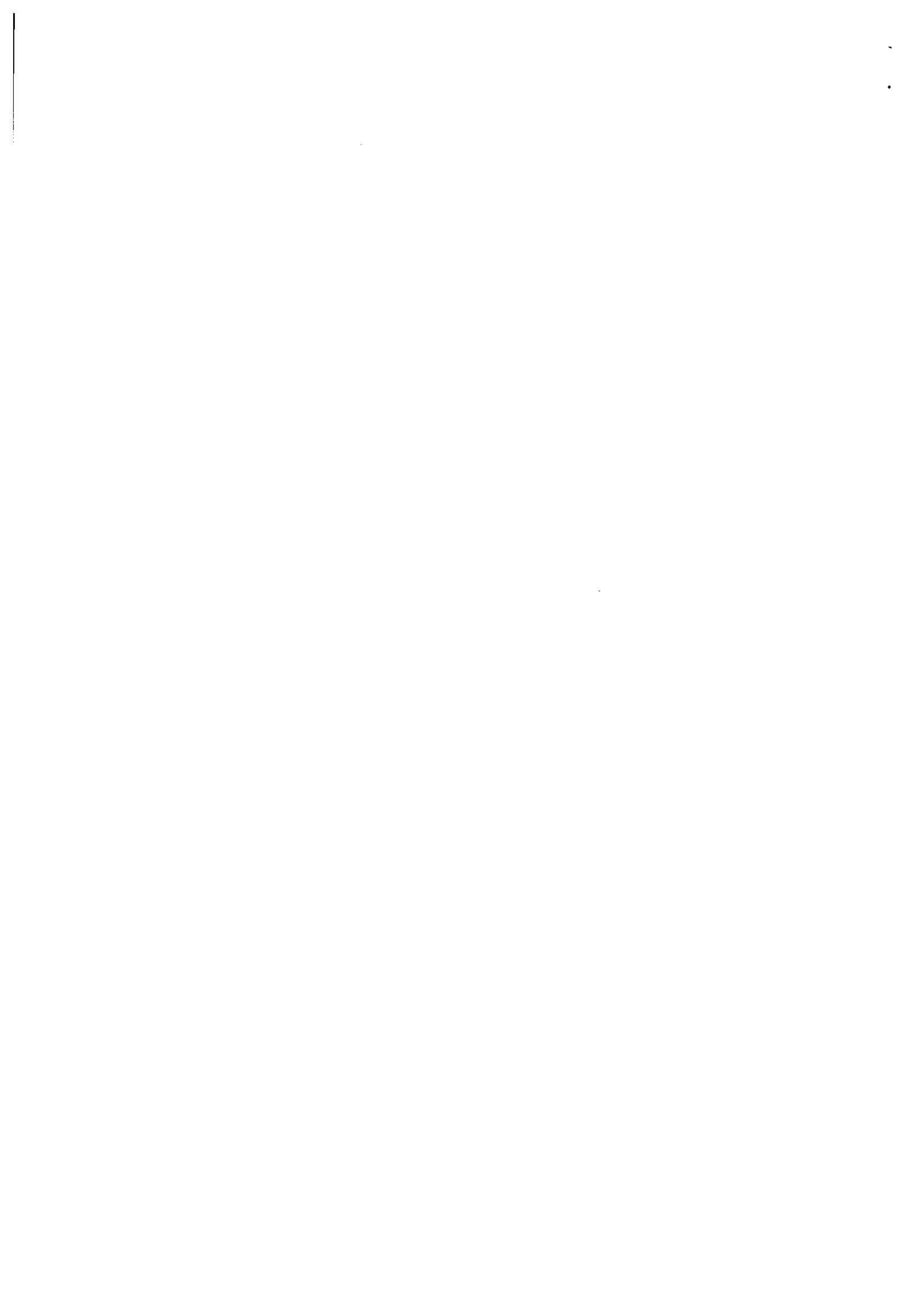
TOTAL: 45 PERIODS**OUTCOMES:**

Students will be able to

- Determine the strain energy and compute the deflection of determinate beams, frames and trusses using energy principles.
- Analyze propped cantilever, fixed beams and continuous beams using theorem of three moment equation for external loadings and support settlements.
- find the load carrying capacity of columns and stresses induced in columns and cylinders
- Determine principal stresses and planes for an element in three dimensional state of stress and study various theories of failure
- Determine the stresses due to Unsymmetrical bending of beams, locate the shear center, and find the stresses in curved beams.

TEXTBOOKS:

1. Rajput R.K. "Strength of Materials (Mechanics of Solids)", S.Chand & company Ltd., New Delhi, 2015.
2. Rattan.S.S., "Strength of Materials", Tata McGraw Hill Education Pvt. Ltd., New Delhi, 2011.



5. Ramana. B.V., "Higher Engineering Mathematics", McGraw Hill Education Pvt. Ltd, New Delhi, 2016.
6. Wylie, R.C. and Barrett, L.C., "Advanced Engineering Mathematics "Tata McGraw Hill Education Pvt. Ltd, 6th Edition, New Delhi, 2012.

CE8301

STRENGTH OF MATERIALS I

L T P C
3 0 0 3

OBJECTIVES:

- To learn the fundamental concepts of Stress, Strain and deformation of solids.
- To know the mechanism of load transfer in beams, the induced stress resultants and deformations.
- To understand the effect of torsion on shafts and springs.
- To analyze plane and space trusses

UNIT I STRESS, STRAIN AND DEFORMATION OF SOLIDS 9
Simple Stresses and strains – Elastic constants - Relationship between elastic constants – Stress Strain Diagram – Ultimate Stress – Yield Stress – Deformation of axially loaded member - Composite Bars - Thermal Stresses – State of Stress in two dimensions – Stresses on inclined planes – Principal Stresses and Principal Planes – Maximum shear stress - Mohr's circle method.

UNIT II TRANSFER OF LOADS AND STRESSES IN BEAMS 9
Types of loads, supports, beams – concept of shearing force and bending moment - Relationship between intensity of load, Shear Force and Bending moment - Shear Force and Bending Moment Diagrams for Cantilever, simply supported and overhanging beams with concentrated load, uniformly distributed load, uniformly varying load and concentrated moment. Theory of Simple Bending – Stress Distribution due to bending moment and shearing force - Flitched Beams - Leaf Springs.

UNIT III DEFLECTION OF BEAMS 9
Elastic curve – Governing differential equation - Double integration method - Macaulay's method - Area moment method - conjugate beam method for computation of slope and deflection of determinant beams.

UNIT IV TORSION 9
Theory of Torsion – Stresses and Deformations in Solid and Hollow Circular Shafts – combined bending moment and torsion of shafts - Power transmitted to shaft – Shaft in series and parallel – Closed and Open Coiled helical springs – springs in series and parallel – Design of buffer springs.

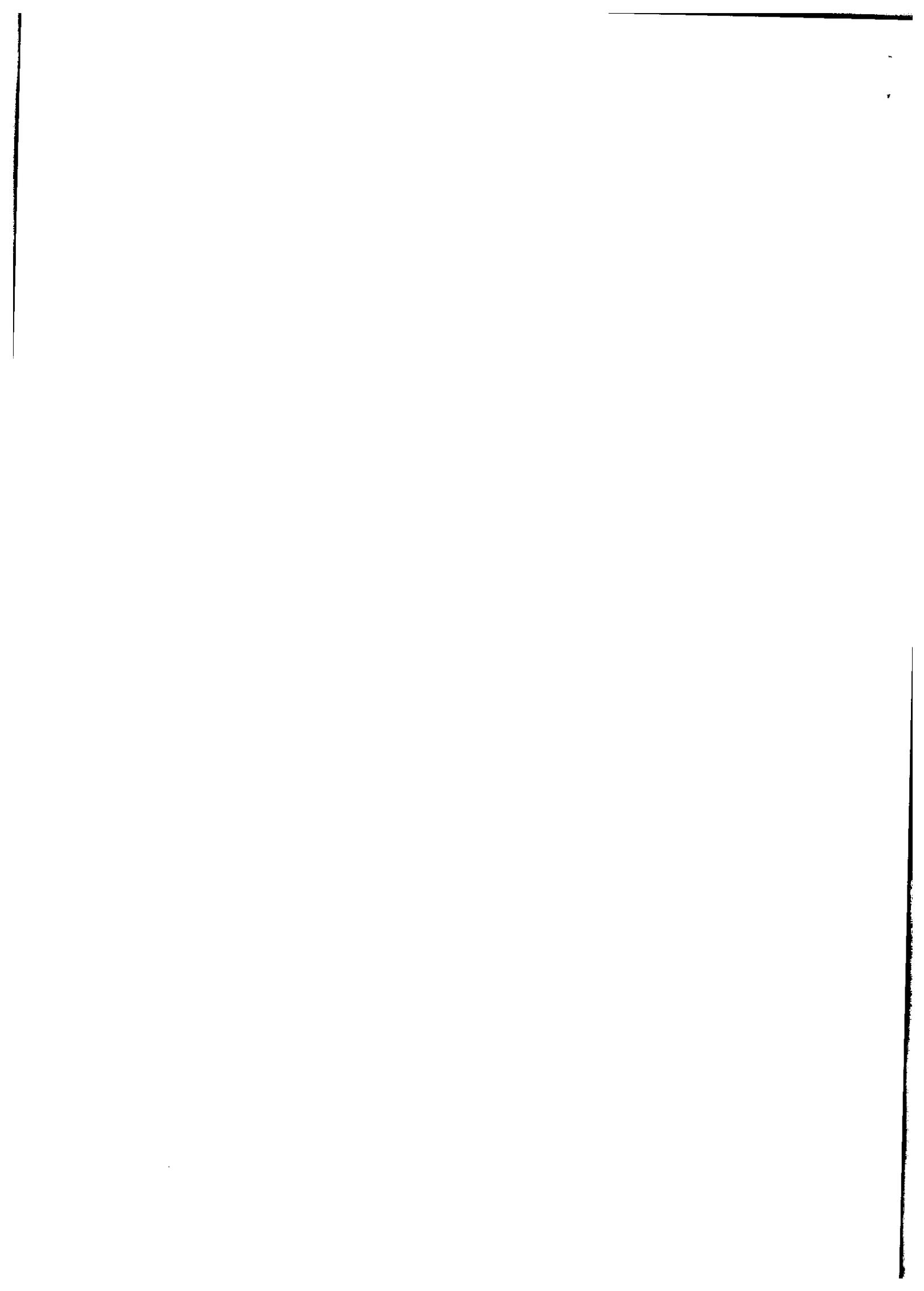
UNIT V ANALYSIS OF TRUSSES 9
Determinate and indeterminate trusses - Analysis of pin jointed plane determinate trusses by method of joints, method of sections and tension coefficient – Analysis of Space trusses by tension coefficient method.

TOTAL :45 PERIODS

OUTCOMES:

Students will be able to

- Understand the concepts of stress and strain, principal stresses and principal planes.
- Determine Shear force and bending moment in beams and understand concept of theory of simple bending.
- Calculate the deflection of beams by different methods and selection of method for determining slope or deflection.
- Apply basic equation of torsion in design of circular shafts and helical springs,
- Analyze the pin jointed plane and space trusses





MOHAMED SATHAK A.J. COLLEGE OF ENGINEERING

(Approved by AICTE, New Delhi and Affiliated to Anna University, Chennai)
Recognized under UGC 12B & 2f Act

No.34, Rajiv Gandhi Road (OMR), IT Highway, Siruseri IT Park, Chennai - 603 103.



COURSES THAT INCLUDE EXPERIENTIAL LEARNING THROUGH PROJECT WORK/FIELD WORK/INTERNSHIP DURING 2022-23

S.No	Reg.No	Name of the Students	Year of study	Company Name	Sub Code & Name related to the internship
1	311819103001	ANANDU ACHARRY M.S	2022-23	Digital EPCS Private Limited	1. CE8501 Design of Reinforced Cement Concrete Elements
2	311819103303	THASRUDEEN R	2022-23		2. CE8601 Design of Steel Structural Element 3. CE8703 Structural Design and Drawing
3	311819103302	MOHAMED NATHEEM MANSOOR N	2022-23	Haja Builders	1. CE8401 Construction Techniques and Practices 2. CE8404 Concrete Technology
4	311820103304	ISFAQ AHAMED B	2022-23	Builders World	1. CE8501 Design of Reinforced Cement Concrete Elements 2. CE8404 Concrete Technology
5	311821103003	K SANDESH KUMAR	2022-23	Verzeo	1. CE3302 Construction Materials and Technology 2. CE3403 Concrete Technology 3. CE3009 Construction Equipment and Machinery

PRINCIPAL

Mohamed Sathak A.J. College of Engineering
No.34, Rajiv Gandhi Salai (OMR)
Sipcot - IT Highway Egattur,
Chennai - 603103.



DIGITAL EPCS PRIVATE LIMITED

Offer Letter - Intern

20-JANUARY-2023

MAMBAKKAM

THASRUDEEN RAJA
S/O K. RAJA,
Plot no: 7, kalaivani nagar, keelkattalai,
Chennai-600117
Contact Number: 6380 642 048
E-Mail: thasrudeen2002@gmail.com

Dear Mr. THASRUDEEN,

We are pleased to offer you an internship at our company in the **Civil & Structural - TEKLA** department at our DIGITAL EPCS PRIVATE LIMITED. Your internship shall commence on [01-February-2023] and shall end on [30-April-2023] ("Term"). The terms and conditions of your internship with the Company are set forth below:

- Subject to your acceptance of the terms and conditions contained herein, your project and responsibilities during the Term will be determined by the team leader assigned to you for the duration of the internship.
- At the end of the internship, you will be required to submit a copy of your project report, the topic, and the timeline which will be shared by your supervisor on the day of your joining. On successful completion of the three months of the internship program and after submitting the project report, you will be awarded a completion certificate that can be used for your permanent position in DIGITAL EPCS. If the Project report is not satisfactory, the internship duration will be extended further for 6 months.
- You are eligible for a stipend of INR [2K] during the Term which shall be paid on completion of the tasks assigned to you during your internship to the satisfaction of the Company.
- Your timings will be from 8.30 am to 6.00 pm, Monday to Friday as per the current company policy. The company observes a 5-day work week and 1st & 3rd Saturday Working Days. Lunch Break 12.30 pm to 1.00 pm... Please be sure to bring [Required Document] documents with you on your first day to complete your profile.
 1. Aadhar Card – Xerox Copy and Scanned Copy send through the mail (hr@digitalepcs.com)
 2. Pan Card – Xerox Copy and Scanned Copy send through the mail (hr@digitalepcs.com)
 3. 10th and 12th Marksheet Original and Xerox Copy
 4. Passport size Photo – 2 Copy
 5. Course Completion Certificate – Original and Xerox Copy
 6. Degree Certificate – Original and Xerox Copy
- You will sign a confidentiality agreement with the company before you commence your internship.
- The internship cannot be construed as employment or an offer of employment with Digital EPCS.

PRINCIPAL

Mohamed Sami, College of Engineering
No.34, Rajiv Gandhi Salai (OMR)
Sipcot - IT Highway Egattur,
Chennai - 600119



DIGITAL EPCS PRIVATE LIMITED

Offer Letter - Intern

20-JANUARY-2023

MAMBAKKAM

ANANDU ACHARRY SANJEEV KUMAR MS
S/O MS. Sanjeev Kumar,
Moolackattu House, Nedumkunnam
P.O Kottayam, Kerala - 686542,
Kottayam, India
Contact Number: 9361774439
E-Mail: anandhuacharry7025@gmail.com

Dear Mr. ANANDU ACHARRY,

We are pleased to offer you an internship at our company in the **Civil & Structural - TEKLA** department at our DIGITAL EPCS PRIVATE LIMITED. Your internship shall commence on [01-February-2023] and shall end on [30-April-2023] ("Term"). The terms and conditions of your internship with the Company are set forth below:

- Subject to your acceptance of the terms and conditions contained herein, your project and responsibilities during the Term will be determined by the team leader assigned to you for the duration of the internship.
- At the end of the internship, you will be required to submit a copy of your project report, the topic, and the timeline which will be shared by your supervisor on the day of your joining. On successful completion of the three months of the internship program and after submitting the project report, you will be awarded a completion certificate that can be used for your permanent position in DIGITAL EPCS. If the Project report is not satisfactory, the internship duration will be extended further for 6 months.
- You are eligible for a stipend of INR [2K] during the Term which shall be paid on completion of the tasks assigned to you during your internship to the satisfaction of the Company.
- Your timings will be from 8.30 am to 6.00 pm, Monday to Friday as per the current company policy. The company observes a 5-day work week and 1st & 3rd Saturday Working Days. Lunch Break 12.30 pm to 1.00 pm... Please be sure to bring [Required Document] documents with you on your first day to complete your profile.

1. Aadhar Card – Xerox Copy and Scanned Copy send through the mail (hr@digitalepcs.com)
2. Pan Card – Xerox Copy and Scanned Copy send through the mail (hr@digitalepcs.com)
3. 10th and 12th Marksheet Original and Xerox Copy
4. Passport size Photo – 2 Copy
5. Course Completion Certificate – Original and Xerox Copy
6. Degree Certificate – Original and Xerox Copy

- You will sign a confidentiality agreement with the company before you commence your internship.


PRINCIPAL
Mohamed Sathak A.J. College of Engineering
No.34, Rajiv Gandhi Salai (OMR)
Sipcot - IT Highway Egattur,
Chennai - 602102

No.986, Angalamman Kovil 3rd Street, Kolathur Main Road, Mambakkam, Chennai-600127
Tel: +91-44-27479336, Mobile No: 7397405898, E-mail: admin@digitalepcs.com



BUILDERS WORLD

Er.A.Basheer
PLANNERS & DESIGNERS
Cell: 9842445168
8248436140
8838478940

Email: buildersworld1975@yahoo.com

Date: 16.08.2022

TO WHOM IT MAY CONCERN

This is to certify that Mr. B.ISFAQ AHAMED, student of B.E., Civil Engineering from Mohamed Sathak A.J. Engineering College, Chennai was successfully completed the Internship Training Programme in Builders World during the period 15th July 2022 to 15th August 2022 at our various site.

He has wide knowledge in field work and having a good knowledge in designing concept.

During his work period we found him a sincere, honest, hardworking & dedicated employee with a professional attitude and very good job knowledge.

We wish him all success in his future endeavor.

Thanking you.

Er. A. BASHEER AHAMED
Builders World, Licensed Surveyor,
Reg. No. : 098/LS/2019/00049
No. 44/2, Rizwan Tower,
Neela South Street,
NAGAPATTINAM 611001
Cell : 98424 45168

PRINCIPAL

Mohamed Sathak A.J. College of E
No.34, Rajiv Gandhi Sala (City)
Sipcot - IT Highway Egattur,
Chennai - 603103.



HAJA BUILDERS

No.1, Veerapathira Swami Kovil Street, NAGAPATTINAM - 611001.

Cell: 90036 42146 Email : riyazudeen0@gmail.com

Er. **RIYASUDEEN**, B.Tech.,
CIVIL ENGINEER

Date : ...08/10/22.....

TO WHOM IT MAY CONCERN

This is to certify that Mr. **MOHAMED NATHEEM MANSOOR**, student of B.Tech. Civil Engineering from **MOHAMED SATHAK AJ COLLEGE OF ENGINEERING**, Chennai was successfully completed the Internship Training Programme in Haja builders during the period 07th September 2022 to 08th October 2022 at our various site.

He has wide knowledge in field work and having a good knowledge in designing concept.

During his work period we found him a sincere, honest, hardworking & dedicated employee with a professional attitude and very good job knowledge.

We wish him all success in his future endeavor.

Thanking you.


PRINCIPAL

Mohamed Sathak A.J. College of Engineering
No.34, Rajiv Gandhi Salai (OMR)
Sipcot - IT Highway Egattur,
Chennai - 603103.


Er. **RIYASUDEEN**, B.Tech.,
CIVIL ENGINEER

VERZEO

Certificate of Internship

Sandesh Kumar K

has successfully completed an Internship Program Construction Planning
from 01-08-2022 to 30-09-2022.

During the internship, the student was found to be dedicated, hardworking and intelligent.

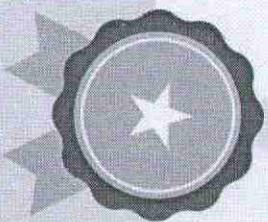
T. Nikhil

T. Nikhil
Academic head



Verified Certificate

Certificate ID: 1239623145
Date: 28-02-2023



Our internship completion certificates are verified and are recognized
by eminent industries and universities all over the world.

Mohamed Sathak A.J.

PRINCIPAL
Mohamed Sathak A.J. College of Engineering
No.34, Rajiv Gandhi Salai (OMR)
Sipcot - IT Highway Egattur,
Chennai - 603103.

Civil

OBJECTIVES:

- To introduce the different types of philosophies related to design of basic structural elements such as slab, beam, column and footing which form part of any structural system with reference to Indian standard code of practice.

UNIT I INTRODUCTION

9+6

Objective of structural design-Steps in RCC Structural Design Process- Type of Loads on Structures and Load combinations- Code of practices and Specifications - Concept of Working Stress Method, Ultimate Load Design and Limit State Design Methods for RCC –Properties of Concrete and Reinforcing Steel - Analysis and Design of Singly reinforced Rectangular beams by working stress method - Limit State philosophy as detailed in IS code - Advantages of Limit State Method over other methods - Analysis and design of singly and doubly reinforced rectangular beams by Limit State Method.

UNIT II DESIGN OF BEAMS

9+6

Analysis and design of Flanged beams for – Use of design aids for Flexure - Behaviour of RC members in Shear, Bond and Anchorage - Design requirements as per current code - Behaviour of rectangular RC beams in shear and torsion - Design of RC members for combined Bending, Shear and Torsion.

UNIT III DESIGN OF SLABS AND STAIRCASE

9+6

Analysis and design of cantilever, one way simply supported and continuous slabs and supporting beams-Two way slab- Design of simply supported and continuous slabs using IS code coefficients- Types of Staircases – Design of dog-legged Staircase.

UNIT IV DESIGN OF COLUMNS

9+6

Types of columns –Axially Loaded columns – Design of short Rectangula Square and circular columns –Design of Slender columns- Design for Uniaxial and Biaxial bending using Column Curves

UNIT V DESIGN OF FOOTINGS

9+6

Concepts of Proportioning footings and foundations based on soil properties-Design of wall footing – Design of axially and eccentrically loaded Square, Rectangular pad and sloped footings – Design of Combined Rectangular footing for two columns only.

TOTAL: 75 PERIODS**OUTCOMES:**

Students will be able to

- Understand the various design methodologies for the design of RC elements.
- Know the analysis and design of flanged beams by limit state method and sign of beams for shear, bond and torsion.
- design the various types of slabs and staircase by limit state method.
- Design columns for axial, uniaxial and biaxial eccentric loadings.
- Design of footing by limit state method.

TEXT BOOKS:

- Varghese, P.C., "Limit State Design of Reinforced Concrete", Prentice Hall of India, Pvt. Ltd., New Delhi, 2002.
- Gambhir. M.L., "Fundamentals of Reinforced Concrete Design", Prentice Hall of India Private Limited, New Delhi, 2006.
- Subramanian, N., "Design of Reinforced Concrete Structures", Oxford University Press, New Delhi, 2013.
- Krishnaraju.N " Design of Reinforced Concrete Structures ", CBS Publishers & Distributors Pvt. Ltd., New Delhi.
- Ramachandra, "Limit state Design of Concrete Structures" Standard Book House, New Delhi

Mohamed Sahak A.J. College of Engineering
No.34, Gandhi Salai (OMR)
Sipcot, IT Highway Egattur
Chennai - 603103.

OBJECTIVE:

- To introduce the students to limit state design of structural steel members subjected to compressive, tensile and bending loads, including connections. Design of structural systems such as roof trusses, gantry girders as per provisions of current code (IS 800 - 2007) of practice for working stress and Limit state Method.

UNIT I INTRODUCTION AND ALLOWABLE STRESS DESIGN**9+6**

Structural steel types – Mechanical Properties of structural steel- Indian structural steel products- Steps involved in the Design Process -Steel Structural systems and their Elements- -Type of Loads on Structures and Load combinations- Code of practices, Loading standards and Specifications - Concept of Allowable Stress Method, and Limit State Design Methods for Steel structures-Relative advantages and Limitations-Strengths and Serviceability Limit states.

Allowable stresses as per IS 800 section 11 -Concepts of Allowable stress design for bending and Shear –Check for Elastic deflection-Calculation of moment carrying capacity –Design of Laterally supported Solid Hot Rolled section beams-Allowable stress design of Angle Tension and Compression Members and estimation of axial load carrying capacity.

UNIT II CONNECTIONS IN STEEL STRUCTURES**9+6**

Type of Fasteners- Bolts Pins and welds- Types of simple bolted and welded connections Relative advantages and Limitations-Modes of failure-the concept of Shear lag-efficiency of joints- Axially loaded bolted connections for Plates and Angle Members using bearing type bolts –Prying forces and Hanger connection– Design of Slip critical connections with High strength Friction Grip bolts.- Design of joints for combined shear and Tension- Eccentrically Loaded Bolted Bracket Connections- Welds-symbols and specifications- Effective area of welds-Fillet and butt Welded connections-Axially Loaded connections for Plate and angle truss members and Eccentrically Loaded bracket connections.

UNIT III TENSION MEMBERS**9+6**

Tension Members - Types of Tension members and sections –Behaviour of Tension Members-modes of failure-Slenderness ratio- Net area – Net effective sections for Plates, Angles and Tee in tension –Concepts of Shear Lag- Design of plate and angle tension members-design of built up tension Members-Connections in tension members – Use of lug angles – Design of tension splice.

UNIT IV COMPRESSION MEMBERS**9+6**

Types of compression members and sections–Behaviour and types of failures-Short and slender columns- Current code provisions for compression members- Effective Length, Slenderness ratio –Column formula and column curves- Design of single section and compound Angles-Axially Loaded solid section Columns- Design of Built up Laced and Battened type columns – Design of column bases – Plate and Gusseted bases for Axially loaded columns- Splices for columns.

UNIT V DESIGN OF FLEXURAL MEMBERS**9+6**

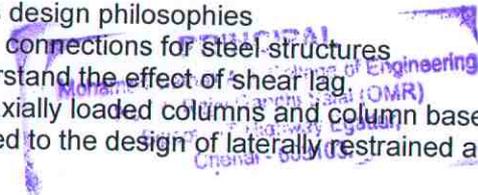
Types of steel Beam sections- Behaviour of Beams in flexure- Codal Provisions – Classification of cross sections- Flexural Strength and Lateral stability of Beams –Shear Strength-Web Buckling, Crippling and deflection of Beams- Design of laterally supported Beams- Design of solid rolled section Beams- Design of Plated beams with cover plates - Design Strength of Laterally unsupported Beams – Design of laterally unsupported rolled section Beams- Purlin in Roof Trusses-Design of Channel and I section Purlins.

OUTCOMES:

Students will be able to

- Understand the concepts of various design philosophies
- Design common bolted and welded connections for steel structures
- Design tension members and understand the effect of shear lag.
- Understand the design concept of axially loaded columns and column base connections.
- Understand specific problems related to the design of laterally restrained and unrestrained steel beams.

[Handwritten Signature] **TOTAL: 75 PERIODS**



CE8703

STRUCTURAL DESIGN AND DRAWING

LT P C
3 0 2 4

OBJECTIVE:

- This course aims at providing students with a solid background on the principles of structural engineering design. Students will be acquire the knowledge of liquid retaining structures, bridges components, retaining wall and industrial structures.

UNIT I RETAINING WALLS

Reinforced concrete Cantilever and Counter fort Retaining Walls–Horizontal Backfill with Surchage–Design of Shear Key–Design and Drawing. 9+6

UNIT II FLAT SLAB and BRIDGES

Design of Flat Slabs with and without drops by Direct Design Method of IS code- Design and Drawing - IRC Specifications and Loading – RC Solid Slab Bridge – Steel Foot-over Bridge- Design and Drawing. 9+6

UNIT III LIQUID STORAGE STRUCTURES

RCC Water Tanks - On ground, Elevated Circular, underground Rectangular Tanks– Hemispherical Bottomed Steel Water Tank —Design and Drawing 9+6

UNIT IV INDUSTRIAL STRUCTURES

Structural steel Framing - Steel Roof Trusses – Roofing Elements – Beam columns – Codal provisions - Design and Drawing. 9+6

UNIT V GIRDERS AND CONNECTIONS

Plate Girders – Behaviour of Components-Deign of Welded Plate Girder-Design of Industrial Gantry Girders – Design of Eccentric Shear and Moment Resisting connections. 9+6

Design and Drawing Exercises for practical component

TOTAL: 75 PERIODS

Part A - RCC Structures

1. Rectangular Column and Footing
2. Combined footing with Two columns
3. RCC one way & Two way Slab and beam system
4. Cantilever Retaining wall
5. RCC T beam bridge deck
6. Underground Rectangular Water Tank
7. Elevated circular water Tank

Part B- Steel Structures

1. Built up column, column base and Foundation
2. Simple Steel Roof Trusses
3. Industrial building Elements
4. Plate Girder (welded)
5. Framed Connections and Detailing
6. Gantry girder
7. Steel water Tank

PRINCIPAL

Mohamed Sathak A.J. College of Engineering
No.34, Rajiv Gandhi Salai (OMR)
Sipcot - IT Highway Egattur,
Chennai - 603103.

STRUCTURAL DESIGN AND DRAWING	Theory Examination		Practicals	
	Question paper Pattern	Marks to awarded	Question paper Pattern	Marks to awarded
This paper is a theory cum practical course weightage for theory 80% and for practical 20%	Five Either/Or type questions 5 x20 = 100 marks : covering all the five units Total Duration of Examination will be 3 hours Each Question include Design - 12 Marks Free hand Drawing (Not to scale) - 8 marks	Theoretical component Marks will carry 80% weightage. End Semester Examination will be conducted by COE	2 Questions, one from Part A - RCC Structures & one from Part B- Steel Structures	Practical component Marks will carry 20% weightage. Practical Examination will be conducted by the respective institution as internal mode.

OUTCOMES:

At the end of the course the student will be able to

- Design and draw reinforced concrete Cantilever and Counterfort Retaining Walls
- Design and draw flat slab as per code provisions
- Design and draw reinforced concrete and steel bridges
- Design and draw reinforced concrete and steel water tanks
- Design and detail the various steel trusses and cantry girders

TEXTBOOKS:

1. Krishnaraju N, Structural Design and Drawing, Universities Press, 2009.
2. Punmia B.C, Ashok Kumar Jain and Arun Kumar Jain, Comprehensive Design of Steel Structures, Laxmi Publications Pvt. Ltd., 2003.

REFERENCES:

1. Krishnamurthy D, Structural Design and Drawing Voll, II and III, CBS Publishers, 2010.
2. Shah V L and Veena Gore, Limit State Design of Steel Structures
3. IS800-2007, Structures Publications, 2009.
4. IS 456(2000) Indian Standard Plain and Reinforced Concrete-Code of Practice, Bureau of Indian Standards, New Delhi.



PRINCIPAL

Mohamed Sathak A.J. College of Engineering
No.34, Rajiv Gandhi Salai (OMR)
Sipcot - IT Highway Egattur,
Chennai - 603103.

CE3302

CONSTRUCTION MATERIALS AND TECHNOLOGY

L T P C
3 0 0 3

COURSE OBJECTIVES:

- To introduce students to various construction materials and the techniques that are commonly used in civil engineering construction.

UNIT I STONES - BRICKS - CONCRETE BLOCKS - LIME 9
Stone as building material – Criteria for selection – Tests on stones – Bricks – Classification – Manufacturing of clay bricks – Tests on bricks – Compressive strength – Water Absorption – Efflorescence – Lime – Preparation of lime mortar – Concrete hollow blocks – Lightweight concrete blocks.

UNIT II OTHER MATERIALS 9
Timber – Market forms – Plywood – Veneer – False ceiling materials – Steel – Mechanical treatment – Aluminum – Uses – Market forms – Glass – Ceramics – Refractories – Composite Materials – Types and applications – FRP – Fibre textiles – Geomembranes and Geotextiles for earth reinforcement.

UNIT III CONSTRUCTION PRACTICES & SERVICE REQUIREMENTS 9
Types of Foundations – Shallow and Deep Foundations – Stone Masonry – Brick Masonry – Plastering and Pointing – Cavity Walls – Diaphragm Walls – Formwork – Centering and Shuttering – Shoring – Scaffolding – Underpinning – Roofing – Flooring – Joints in concrete – Contraction/Construction/Expansion joints – Fire Protection – Thermal Insulation – Ventilation and Air conditioning – Acoustics and Sound Insulation – Damp Proofing.

UNIT IV CONSTRUCTION EQUIPMENTS 9
Selection of equipment for earthwork excavation, concreting, material handling and erection of structures – Dewatering and pumping equipment.

UNIT V CONSTRUCTION PLANNING 9
Introduction to construction planning – Scheduling for activities – Critical path method (CPM) and PERT network modelling and time analysis – Case illustrations.

COURSE OUTCOMES

TOTAL: 45 PERIODS

Students will be able to

- CO1** Identify the good quality brick, stone and blocks for construction.
- CO2** Recognize the market forms of timber, steel, aluminum and applications of various composite materials.
- CO3** Identify the best construction and service practices such as thermal insulations and air conditioning of the building
- CO4** Select various equipments for construction works conditioning of building
- CO5** Understand the construction planning and scheduling techniques

TEXTBOOKS

- Varghese.P.C, Building Materials, Second Edition PHI Learning Ltd., 2015.
- Arora S.P and Bindra S.P Building construction, Dhanpat Rai and sons, 2013.

REFERENCES:

- Varghese.P.C, Building Construction, Second Edition PHI Learning Ltd., 2016.
- Punmia ,B.C Building construction , Laxmi publication (p)ltd.,2008.
- Peurifoy R.L., Schexnayder,C.J., Shapira A., Schmitt.R., Construction Planning Equipment and Methods, Tata McGraw-hill, 2011.
- Srinath L.S.,PERT and CPM -Principles and applications, Affiliated East West Press 2001

PRINCIPAL

Mohamed Sathak A.J. College of Engineering
No.34, Rajiv Gandhi Salai (OMR)
Sipcot - IT Highway Egattur,
Chennai - 603103.

CE3403

CONCRETE TECHNOLOGY

L T P C
3 0 0 3

COURSE OBJECTIVES:

- To study the properties of concrete making materials.
- To have better knowledge about the chemical and mineral admixtures in concrete.
- To familiarize with the IS method of mix design as per the latest code .
- To understand the fresh and hardened properties of concrete. To know the importance and applications of special concretes

UNIT I **CONSTITUENT MATERIALS**

Cement-Different types-Chemical composition and Properties -Tests on cement-IS Specifications- Aggregates-Classification-Mechanical properties and tests as per BIS Grading requirements-Water- Quality of water for use in concrete. 9

UNIT II **CHEMICAL AND MINERAL ADMIXTURES**

Accelerators-Retarders- Plasticisers- Super plasticizers- Water proofers - Mineral Admixtures like Fly Ash, Silica Fume, Ground Granulated Blast Furnace Slag and Metakaoline -Their effects on concrete properties 9

UNIT III **PROPORTIONING OF CONCRETE MIX**

Principles of Mix Proportioning-Properties of concrete related to Mix Design-Physical properties of materials required for Mix Design - Design Mix and Nominal Mix-BIS Method of Mix Design - Mix Design Examples 9

UNIT IV **FRESH AND HARDENED PROPERTIES OF CONCRETE**

Workability-Tests for workability of concrete-Slump Test and Compacting factor Test-Segregation and Bleeding-Determination of Compressive and Flexural strength as per BIS - Properties of Hardened concrete- Stress-strain curve for concrete-Determination of Modulus of elasticity. 9

UNIT V **SPECIAL CONCRETES**

Light weight concretes - High strength concrete - Fibre reinforced concrete – Ferrocement - Ready mix concrete - SIFCON - Shotcrete – Polymer concrete - High performance concrete- self compacting concrete - Geopolymer Concrete. 9

COURSE OUTCOMES:

TOTAL : 45 PERIODS

At the end of the course the student will be able to

- C01 Understand the requirements of cement, aggregates and water for concrete
- C02 Select suitable admixtures for enhancing the properties of concrete
- C03 Design concrete mixes as per IS method of mix design
- C04 Determine the properties of concrete at fresh and hardened state.
- C05 Know the importance of special concretes for specific requirements.

TEXTBOOKS:

1. Gupta.B.L., Amit Gupta, "Concrete Technology", Jain Book Agency, 2010.
2. Shetty,M.S, "Concrete Technology", S.Chand and Company Ltd, New Delhi, 2003

REFERENCES:

1. Neville, A.M; "Properties of Concrete", Pitman Publishing Limited, London, 1995
2. Gambhir.M.L.Concrete Technology,Fifth Edition, McGraw Hill Education,2017.
3. Job Thomas., Concrete Technology, Cengage learning India Private Ltd, New Delhi, 2015.
4. IS10262-2019 Recommended Guidelines for Concrete Mix Design, Bureau of Indian Standards, New Delhi.

[Signature]
PRINCIPAL
Mohamed Sathak A.J. College of Engineering
No.34, Rajiv Gandhi Salai (OMR)
Sipcot - IT Highway Egattur,
Chennai - 603103.

COURSE OBJECTIVE

- To expose the students in the field of construction equipment and machineries so as to gain knowledge in carrying out engineering tasks.

UNIT I CONSTRUCTION EQUIPMENTS

9

Identification - Planning of equipment - Selection of equipment - Equipment management in projects - Maintenance management - Equipment cost - Operating cost - Cost control of equipment - Depreciation analysis - Replacement analysis - Safety management.

UNIT II EQUIPMENT FOR EARTHWORK

9

Fundamentals of earthwork operations - Earth moving operations - Types of earthwork equipment - Tractors, motor graders, scrapers, front end loaders - Dozer, excavators, rippers, loaders, trucks and hauling equipment, compacting equipment, finishing equipment - Case studies on earthwork equipment.

UNIT III OTHER CONSTRUCTION EQUIPMENT

9

Equipment for dredging, trenching, drag line and clamshells, tunneling - Jacking equipment - Equipment for drilling and blasting - Pile driving equipment - Erection equipment - Crane, mobile crane - Types of pumps used in construction - Equipment for dewatering, grouting and demolition.

UNIT IV ASPHALT AND CONCRETE PLANTS

9

Aggregate production - Different crushers - Feeders - Screening equipment - Handling equipment - Batching and mixing equipment - Ready mix concrete equipment, concrete pumping equipment - Asphalt plant - Asphalt pavers - Asphalt compacting equipment.

UNIT V MATERIALS HANDLING EQUIPMENT

9

Forklifts and related equipment - Portable material bins - Material handling conveyors - Material handling cranes - Industrial trucks - Aerial transporting equipment.

COURSE OUTCOMES:**TOTAL: 45 PERIODS**

On completion of this course, the student is expected to be able to:

- CO1 Develop knowledge on planning of equipment and selection of equipment
- CO2 Explain the knowledge on fundamentals of earth work operations, earth moving operations and types of earth work equipment
- CO3 Develop the knowledge on special construction equipment
- CO4 Apply the knowledge on asphalt and concrete plants
- CO5 Apply the knowledge and select the proper materials handling equipment

TEXTBOOKS:

- Peurifoy, R.L., Schexnayder, C., Schmitt, R.L. and Aviad Shapira., Construction Planning, Equipment and Methods, 9th Edn. McGraw Hill, Singapore, 2018.
- Granberg G., Popescu M Construction Equipment and Management for Engineers Estimators and Owners, Taylor and Francis Publishers, New York, 2006.

REFERENCES:

- Deodhar, S.V. Construction Equipment and Job Planning, 4th Edn. Khanna Publishers, New Delhi, 2020.
- Arora S.P. and Bindra S.P., Building Construction, Planning Techniques and Method of Construction, Dhanpat Rai and Sons, 2018.
- Sharma S.C. Construction Equipment and Management, Khanna Publishers, New Delhi, 2008.
- Dr. Mahesh Varma., Construction Equipment and its Planning and Application, Metro-politan Book Company, New Delhi., 2003.

[Signature]
PRINCIPAL
Sathak A. J. College of Engineering
No.34, Rajiv Gandhi Salai (GMR)
Sipcot - IT Highway Egattur,
Chennai, 2008.

OBJECTIVE:

- The main objective of this course is to make the student aware of the various construction techniques, practices and the equipment needed for different types of construction activities. At the end of this course the student shall have a reasonable knowledge about the various construction procedures for sub to super structure and also the equipment needed for construction of various types of structures from foundation to super structure.

UNIT I CONSTRUCTION TECHNIQUES

Structural systems - Load Bearing Structure - Framed Structure - Load transfer mechanism - floor system - Development of construction techniques - High rise Building Technology - Seismic effect - Environmental impact of materials - responsible sourcing - Eco Building (Green Building) - Material used - Construction methods - Natural Buildings - Passive buildings - Intelligent(Smart) buildings - Meaning - Building automation - Energy efficient buildings for various zones-Case studies of residential, office buildings and other buildings in each zones. 9

UNIT II CONSTRUCTION PRACTICES

Specifications, details and sequence of activities and construction co-ordination - Site Clearance - Marking - Earthwork - masonry - stone masonry - Bond in masonry - concrete hollow block masonry - flooring - damp proof courses - construction joints - movement and expansion joints - pre cast pavements - Building foundations - basements - temporary shed - centering and shuttering - slip forms - scaffoldings - de-shuttering forms - Fabrication and erection of steel trusses - frames - braced domes - laying brick - weather and water proof - roof finishes - acoustic and fire protection. 9

UNIT III SUB STRUCTURE CONSTRUCTION

Techniques of Box jacking - Pipe Jacking -under water construction of diaphragm walls and basement-Tunneling techniques - Piling techniques - well and caisson - sinking cofferdam - cable anchoring and grouting - driving diaphragm walls, sheet piles - shoring for deep cutting - well points -Dewatering and stand by Plant equipment for underground open excavation. 9

UNIT IV SUPER STRUCTURE CONSTRUCTION

Launching girders, bridge decks, off shore platforms - special forms for shells - techniques for heavy decks - in-situ pre-stressing in high rise structures, Material handling - erecting light weight components on tall structures - Support structure for heavy Equipment and conveyors - Erection of articulated structures, braced domes and space decks. 9

UNIT V CONSTRUCTION EQUIPMENT

Selection of equipment for earth work - earth moving operations - types of earthwork equipment - tractors, motor graders, scrapers, front end waders, earth movers - Equipment for foundation and pile driving. Equipment for compaction, batching, mixing and concreting - Equipment for material handling and erection of structures - types of cranes - Equipment for dredging, trenching, tunneling. 9

OUTCOMES:**TOTAL: 45 PERIODS**

On successful completion of this course, students will be able to:

- know the different construction techniques and structural systems
- Understand various techniques and practices on masonry construction, flooring, and roofing.
- Plan the requirements for substructure construction.
- Know the methods and techniques involved in the construction of various types of super structures
- Select, maintain and operate hand and power tools and equipment used in the building construction sites.

PRINCIPAL

Mohamed Sathish R.S. 
No.34, Rajiv Gandhi Salai (OMR)
Special Highway Egattur,
Chennai - 600100

TEXTBOOKS :

- Peurifoy, R.L., Ledbetter, W.B. and Schexnayder, C., "Construction Planning, Equipment and Methods", 5th Edition, McGraw Hill, Singapore, 1995.
- Arora S.P. and Bindra S.P., "Building Construction, Planning Techniques and Method of Construction", Dhanpat Rai and Sons, 1997.

OBJECTIVE:

- To impart knowledge to the students on the properties of materials for concrete by suitable tests, mix design for concrete and special concretes.

UNIT I CONSTITUENT MATERIALS

9

Cement - Different types - Chemical composition and Properties – Hydration of cement - Tests on cement - IS Specifications - Aggregates – Classification - Mechanical properties and tests as per BIS - Grading requirements – Water - Quality of water for use in concrete.

UNIT II CHEMICAL AND MINERAL ADMIXTURES

9

Accelerators – Retarders - Plasticizers - Super plasticizers - Water proofers - Mineral Admixtures like Fly Ash, Silica Fume, Ground Granulated Blast Furnace Slag and Metakaoline - Effects on concrete properties.

UNIT III PROPORTIONING OF CONCRETE MIX

9

Principles of Mix Proportioning - Properties of concrete related to Mix Design - Physical properties of materials required for Mix Design - Design Mix and Nominal Mix - BIS Method of Mix Design - Mix Design Examples

UNIT IV FRESH AND HARDENED PROPERTIES OF CONCRETE

9

Workability - Tests for workability of concrete - Segregation and Bleeding - Determination of strength Properties of Hardened concrete - Compressive strength – split tensile strength - Flexural strength - Stress-strain curve for concrete - Modulus of elasticity – durability of concrete – water absorption – permeability – corrosion test – acid resistance.

UNIT V SPECIAL CONCRETES

9

Light weight concretes - foam concrete- self compacting concrete – vacuum concrete - High strength concrete - Fibre reinforced concrete – Ferrocement - Ready mix concrete – SIFCON - Shotcrete – Polymer concrete - High performance concrete - Geopolymer Concrete

TOTAL: 45 PERIODS**OUTCOMES:**

Students will be able to understand

- The various requirements of cement, aggregates and water for making concrete
- The effect of admixtures on properties of concrete
- The concept and procedure of mix design as per IS method
- The properties of concrete at fresh and hardened state
- The importance and application of special concretes.

TEXTBOOKS:

- Gupta.B.L., Amit Gupta, "Concrete Technology", Jain Book Agency, 2010.
- Shetty,M.S, "Concrete Technology", S.Chand and Company Ltd, New Delhi, 2003
- Bhavikatti.S.S, " Concrete Technology", I.K.International Publishing House Pvt. Ltd., New Delhi, 2015
- Santhakumar. A.R., "Concrete Technology", Oxford University Press India, 2006.

PRINCIPAL

Mohamed Sathak A.J. College of Engineering
No. 46, Raily Gandhi Salai (OMR)
Sipcot - IT Highway Egattur,
Chennai - 603103.

REFERENCES:

- Neville, A.M; "Properties of Concrete", Pitman Publishing Limited, London, 1995
- Gambhir, M.L; "Concrete Technology", 3rd Edition, Tata McGraw Hill Publishing Co Ltd, New Delhi, 2007
- IS10262-2009 Recommended Guidelines for Concrete Mix Design, Bureau of Indian Standards, New Delhi, 1998.
- Job Thomas, "Concrete Technology", Cengage Learning India Pvt. Ltd., Delhi, 2015
- Kumar P Mehta., Paulo J M Monterio., "Concrete - Microstructure, Properties and Materials", McGraw Hill Education (India) Private Limited, New Delhi, 2016

OBJECTIVES:

- To introduce the different types of philosophies related to design of basic structural elements such as slab, beam, column and footing which form part of any structural system with reference to Indian standard code of practice.

UNIT I INTRODUCTION

9+6

Objective of structural design-Steps in RCC Structural Design Process- Type of Loads on Structures and Load combinations- Code of practices and Specifications - Concept of Working Stress Method, Ultimate Load Design and Limit State Design Methods for RCC –Properties of Concrete and Reinforcing Steel - Analysis and Design of Singly reinforced Rectangular beams by working stress method - Limit State philosophy as detailed in IS code - Advantages of Limit State Method over other methods - Analysis and design of singly and doubly reinforced rectangular beams by Limit State Method.

UNIT II DESIGN OF BEAMS

9+6

Analysis and design of Flanged beams for – Use of design aids for Flexure - Behaviour of RC members in Shear, Bond and Anchorage - Design requirements as per current code - Behaviour of rectangular RC beams in shear and torsion - Design of RC members for combined Bending, Shear and Torsion.

UNIT III DESIGN OF SLABS AND STAIRCASE

9+6

Analysis and design of cantilever, one way simply supported and continuous slabs and supporting beams-Two way slab- Design of simply supported and continuous slabs using IS code coefficients- Types of Staircases – Design of dog-legged Staircase.

UNIT IV DESIGN OF COLUMNS

9+6

Types of columns –Axially Loaded columns – Design of short Rectangula Square and circular columns –Design of Slender columns- Design for Uniaxial and Biaxial bending using Column Curves

UNIT V DESIGN OF FOOTINGS

9+6

Concepts of Proportioning footings and foundations based on soil properties-Design of wall footing – Design of axially and eccentrically loaded Square, Rectangular pad and sloped footings – Design of Combined Rectangular footing for two columns only.

TOTAL: 75 PERIODS**OUTCOMES:**

Students will be able to

- Understand the various design methodologies for the design of RC elements.
- Know the analysis and design of flanged beams by limit state method and sign of beams for shear, bond and torsion.
- design the various types of slabs and staircase by limit state method.
- Design columns for axial, uniaxial and biaxial eccentric loadings.
- Design of footing by limit state method.

TEXT BOOKS:

- Varghese, P.C., "Limit State Design of Reinforced Concrete", Prentice Hall of India, Pvt. Ltd., New Delhi, 2002.
- Gambhir. M.L., "Fundamentals of Reinforced Concrete Design", Prentice Hall of India Private Limited, New Delhi, 2006.
- Subramanian,N., "Design of Reinforced Concrete Structures", Oxford University Press, New Delhi, 2013.
- Krishnaraju.N " Design of Reinforced Concrete Structures ", CBS Publishers & Distributors Pvt. Ltd., New Delhi.
- Ramachandra, "Limit state Design of Concrete Structures" Standard Book House, New Delhi

Signature
 Principal
 Mohamed Sathak A.J. College of Engineering
 No. 34, Rajiv Gandhi Salai (OMR)
 Sipcot - IT Highway Egattur,
 Chennai - 603103.



DIGITAL EPCS PVT LTD

AN ISO CERTIFIED COMPANY 9001:2015



CERTIFICATE OF INTERNSHIP

This certificate awarded to

THASRUDEEN

**IN RECOGNITION OF HIS EFFORTS AND
ACHIEVEMENTS IN COMPLETED INTERNSHIP
PROGRAM CALLED "COZMIC" IN**

CIVIL-TEKLA

FEB-1-2023 TO APRIL-30-2023

Conducted from


PRINCIPAL
Mohamed Samir, College of Engineering
No. 14, Road, Giza, Egypt
Special Program, Education
Giza - 60113

ANANDAKUMAR RAMAKRISHNAN
Co-Founder & Managing Director

