

The following are the syllabus copy as per Anna University
curriculum and experiential learning document

1.3.2
COURSES THAT INCLUDE
EXPERIENTIAL LEARNING
THROUGH PROJECT
WORK/FIELD
WORK/INTERNSHIP DURING
2022-2023

**1.3.2 AVERAGE PERCENTAGE OF COURSES THAT INCLUDE EXPERIENTIAL
LEARNING THROUGH PROJECT WORK / FIELD WORK / INTERNSHIP
DURING
2022-2023**

S/N.	PROGRAME OFFERING	NAME OF THE COURSE	COURSE CODE	PROJECT WORK / FIELD WORK / INTERNSHIP	PAGE NO
1	B.E-Civil Engineering	Engineering Mechanics	ME3351	Internship	3
2	B.E-Civil Engineering	Fluid Mechanics	CE3301	Internship	6
3	B.E-Civil Engineering	Construction Materials And Technology	CE3302	Internship	9
4	B.E-Civil Engineering	Water Supply And Wastewater Engineering	CE3303	Internship	12
5	B.E-Civil Engineering	Strength Of Materials	CE3402	Internship	15
6	B.E-Civil Engineering	Concrete Technology	CE3403	Internship	18
7	B.E-Civil Engineering	Soil Mechanics	CE3404	Internship	21
8	B.E-Civil Engineering	Highway And Railway Engineering	CE3405	Internship	24
9	B.E-Civil Engineering	Design of Reinforced Cement Concrete Elements	CE8501	Internship	27
10	B.E-Civil Engineering	Structural Analysis I	CE8502	Project work	30
11	B.E-Civil Engineering	Water SupplyEngineering	EN8491	Internship	36
12	B.E-Civil Engineering	Foundation Engineering	CE8591	Project work	39
13	B.E-Civil Engineering	Survey Camp	CE8513	Internship	46
14	B.E-Civil Engineering	Design of Steel Structural Elements	CE8601	Internship	48
15	B.E-Civil Engineering	Structural Analysis II	CE8602	Project work	51
16	B.E-Civil Engineering	Irrigation Engineering	CE8603	Internship	57
17	B.E-Civil Engineering	Highway Engineering	CE8604	Internship	60
18	B.E-Civil Engineering	WastewaterEngineering	EN8592	Internship	63
19	B.E-Civil Engineering	Estimation, Costing and Valuation Engineering	CE8701	Internship	66
21	B.E-Civil Engineering	Railways, Airports,Docks and Harbour Engineering	CE8702	Internship	69
22	B.E-Civil Engineering	Structural Design and Drawing	CE8703	Project work	72
23	B.E-Civil Engineering	Project Work	CE8811	Project work	78

COURSE OBJECTIVES

- To Learn the use scalar and vector analytical techniques for analyzing forces in Statically determinate structures
- To introduce the equilibrium of rigid bodies
- To study and understand the distributed forces, surface, loading on beam and intensity.
- To learn the principles of friction, forces and to determine the apply the concepts of frictional forces at the contact surfaces of various engineering systems.
- To develop basic dynamics concepts – force, momentum, work and energy

UNIT I STATICS OF PARTICLES

9

Fundamental Concepts and Principles, Systems of Units, Method of Problem Solutions, Statics of Particles - Forces in a Plane, Resultant of Forces, Resolution of a Force into Components, Rectangular Components of a Force, Unit Vectors. Equilibrium of a Particle- Newton's First Law of Motion, Space and Free-Body Diagrams, Forces in Space, Equilibrium of a Particle in Space.

UNIT II EQUILIBRIUM OF RIGID BODIES

9

Principle of Transmissibility, Equivalent Forces, Vector Product of Two Vectors, Moment of a Force about a Point, Varignon's Theorem, Rectangular Components of the Moment of a Force, Scalar Product of Two Vectors, Mixed Triple Product of Three Vectors, Moment of a Force about an Axis, Couple - Moment of a Couple, Equivalent Couples, Addition of Couples, Resolution of a Given Force into a Force - Couple system, Further Reduction of a System of Forces, Equilibrium in Two and Three Dimensions - Reactions at Supports and Connections.

UNIT III DISTRIBUTED FORCES

9

Centroids of lines and areas – symmetrical and unsymmetrical shapes, Determination of Centroids by Integration, Theorems of Pappus-Guldinus, Distributed Loads on Beams, Centre of Gravity of a Three-Dimensional Body, Centroid of a Volume, Composite Bodies, Determination of Centroids of Volumes by Integration. Moments of Inertia of Areas and Mass - Determination of the Moment of Inertia of an Area by Integration, Polar Moment of Inertia, Radius of Gyration of an Area, Parallel Axis Theorem, Moments of Inertia of Composite Areas, Moments of Inertia of a Mass - Moments of Inertia of Thin Plates, Determination of the Moment of Inertia of a Three-Dimensional Body by Integration.

UNIT IV FRICTION

9

The Laws of Dry Friction, Coefficients of Friction, Angles of Friction, Wedge friction, Wheel Friction, Rolling Resistance, Ladder friction.

UNIT V DYNAMICS OF PARTICLES

9

Kinematics - Rectilinear Motion and Curvilinear Motion of Particles. Kinetics- Newton's Second Law of Motion - Equations of Motions, Dynamic Equilibrium, Energy and Momentum Methods - Work of a Force, Kinetic Energy of a Particle, Principle of Work and Energy, Principle of Impulse and Momentum, Impact of bodies.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course the students would be able to

CO1 Illustrate the vectorial and scalar representation of forces and moments

CO2 Analyse the rigid body in equilibrium

CO3 Evaluate the properties of distributed forces

CO4 Determine the friction and the effects by the laws of friction

CO5 Calculate dynamic forces exerted in rigid body

TEXTBOOKS:

1. Beer Ferdinand P, Russel Johnston Jr., David F Mazurek, Philip J Cornwell, Sanjeev Sanghi, Vector Mechanics for Engineers: Statics and Dynamics, McGraw Higher Education., 11th Edition, 2017.
2. Vela Murali, "Engineering Mechanics-Statics and Dynamics", Oxford University Press, 2018.

REFERENCES:

1. Borelli P and Schmidt J, Engineering Mechanics: Statics and Dynamics, 1/e, Cengage learning, 2008.
2. Hibbeler, R.C., Engineering Mechanics: Statics, and Engineering Mechanics: Dynamics, 13th edition, Prentice Hall, 2013.
3. Irving H. Shames, Krishna Mohana Rao G, Engineering Mechanics – Statics and Dynamics, 4th Edition, Pearson Education Asia Pvt. Ltd., 2005.
4. Meriam J L and Kraige L G, Engineering Mechanics: Statics and Engineering Mechanics: Dynamics, 7th edition, Wiley student edition, 2013.
5. Timoshenko S, Young D H, Rao J V and Sukumar Pati, Engineering Mechanics, 5th Edition, McGraw Hill Higher Education, 2013.



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TO WHOMSOEVER IT MAY CONCERN

This is to certify that Mr. M. Harish, II year, B.E., Civil Engineering, NPR College of Engineering & Technology, Natham has completed his training in site maintenance and site execution during the period 19/07/2022 to 30/07/2022.

Date: 30/07/2022



Dr. J. SUNIL K. ARARAJAN,

B.E., M.Tech., Ph.D.,

Principal

NPR College of Engineering & Technology
Natham, Dist. Dindigul - 626 401.

COURSE OBJECTIVES:

• To introduce the students about properties and behaviour of the fluids under static conditions and to impart basic knowledge of the dynamics of fluids through the control volume approach and to expose to the applications of the conservation laws to a) flow measurements b) flow through pipes (both laminar and turbulent) and c) forces on pipe bends with an exposure to the significance of boundary layer theory and its applications.

UNIT I FLUIDS PROPERTIES AND FLUID STATICS

10

Scope of fluid mechanics – Definitions of a fluid – Methods of analysis – Continuum hypothesis – System and Control volume approach – Reynold's transportation theorem – Fluid properties – Fluid statics – Manometry – Forces on plane and curved surfaces – Buoyancy and floatation – Stability of floating bodies.

UNIT II BASIC CONCEPTS OF FLUID FLOW

10

Kinematics: Classification of flows – Streamline, streak-line and path-lines – Stream function and velocity potentials – Flow nets; Dynamics : Application of control volume to continuity, energy and momentum – Euler's equation of motion along a stream line – Bernoulli's equation – Applications to velocity and discharge measurements – Linear momentum equation – Application to Pipe bends – Moment of momentum equation.

UNIT III DIMENSIONAL ANALYSIS AND MODEL STUDIES

7

Fundamental dimensions – Dimensional homogeneity – Rayleigh's method and Buckingham Pi theorem – Dimensionless parameters – Similitude and model studies – Distorted and undistorted models.

UNIT IV INCOMPRESSIBLE VISCOUS FLOW

10

Reynolds experiment – Laminar flow in pipes and between parallel plates – Development of laminar and turbulent flows in pipes – Darcy-Weisbach equation – Moody diagram – Major and minor losses of flow in pipes – Total energy line – Hydraulic grade line – Siphon – Pipes in series and parallel – Equivalent pipes

UNIT V BOUNDARY LAYERS

8

Definition of boundary layers – Laminar and turbulent boundary layers – Displacement, momentum and energy thickness – Momentum integral equation – Applications – Separation of boundary layer – Drag and Lift forces.

TOTAL: 45 PERIODS**COURSE OUTCOMES:**

• On completion of the course, the student is expected to

CO1 Demonstrate the difference between solid and fluid, its properties and behaviour in static conditions.

CO2 Apply the conservation laws applicable to fluids and its application through fluid kinematics and dynamics. **CO3** Formulate the relationship among the parameters involved in the given fluid phenomenon and to predict the performance of prototypes by model studies.

CO4 Estimate the losses in pipelines for both laminar and turbulent conditions and analysis of pipes connected in series and parallel.

CO5 Explain the concept of boundary layer and its application to find the drag force exerted by the fluid on the flat solid surface.



TEXTBOOKS:

1. Modi P.N and Seth Hydraulics and Fluid Mechanics including Hydraulic Machines Standard Book House New Delhi. 2015.

2. Streeter, V.L. Wylie, E. B. and Bedford K.W, Fluid Mechanics. (9 th Ed.) Tata McGraw Hill, New Delhi, 1998.

REFERENCES:

1. S K Som; Gautam Biswas and S Chakraborty, Introduction to Fluid Mechanics and Fluid Machines, Tata McGraw Hill Education Pvt. Ltd., 2012.

2. Pani B S, Fluid Mechanics: A Concise Introduction, Prentice Hall of India Private Ltd, 2016.

3. Jain A. K. Fluid Mechanics including Hydraulic Machines, Khanna Publishers, New Delhi, 2014.

4. Narayana Pillai N. Principles of Fluid Mechanics and Fluid Machines, (3 rd Ed.) University Press (India) Pvt. Ltd. 2009.



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This is to certify that **Mr. I.Vijaya Sri Hari**, II year, B.E., Civil Engineering, NPR College of Engineering & Technology, Natham has completed his training in site maintenance and site execution during the period 19/07/2022 to 30/07/2022.

Date:30/07/2022



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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.

TOTAL: 45 PERIODS**COURSE OUTCOMES**

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

1. Varghese.P.C, Building Materials, Second Edition PHI Learning Ltd., 2015.



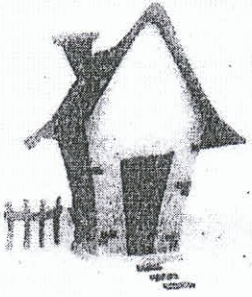
2. Arora S.P and Bindra S.P Building construction, Dhanpat Rai and sons, 2013.

REFERENCES:

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



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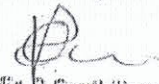
Er. P. Senthilkumar

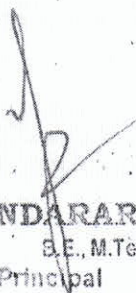
Date: 13.08.2022

TO WHOM IT MAY CONCERN

This is to certify that **Ms. C. Jeevitha (920819103002)**, B.E. Civil Engineering from NPR College of Engineering & Technology, Natham has successfully completed her internship during the period 13.07.2022 to 13.08.2022.

For Sona Builders Engineers & Contractors


Er. P. Senthilkumar
Proprietor


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COURSE OBJECTIVES:

- To introduce students to various components and design of water supply scheme, water treatment methods, water storage distribution system, sewage treatment and disposal and design of intake structures and sewerage system.

UNIT I WATER SUPPLY

12

Estimation of surface and subsurface water resources - Predicting demand for water- Impurities of water and their significance - Physical, chemical and bacteriological analysis - Waterborne diseases - Standards for potable water. Intake of water: Pumping and gravity schemes.

UNIT II WATER TREATMENT

12

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 - softening, removal of iron and manganese - Defluoridation - Softening - Desalination process - Residue Management - Construction, Operation and Maintenance aspects

UNIT III WATER STORAGE AND DISTRIBUTION

12

Storage and balancing reservoirs - types, location and capacity. Distribution system: layout, hydraulics of pipe lines, pipe fittings, valves including check and pressure reducing valves, meters, analysis of distribution systems, leak detection, maintenance of distribution systems, pumping stations and their operations - House service connections.

UNIT IV PLANNING AND DESIGN OF SEWERAGE SYSTEM

12

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

UNIT V SEWAGE TREATMENT AND DISPOSAL

12

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

TOTAL: 60 PERIODS

COURSE OUTCOMES:

On completion of the course, the student is expected to

CO1 Understand the various components of water supply scheme and design of intake structure and conveyance system for water transmission

CO2 Understand on the characteristics and composition of sewage, ability to estimate sewage generation and design sewer system including sewage pumping stations

CO3 Understand the process of conventional treatment and design of water and wastewater treatment system and gain knowledge of selection of treatment process and biological treatment process.

CO4 Ability to design and evaluate water distribution system and water supply in buildings and understand the self-purification of streams and sludge and septage disposal methods.

CO5 Able to understand and design the various advanced treatment system and knowledge about the recent advances in water and wastewater treatment process and reuse of sewage.

TEXTBOOKS:

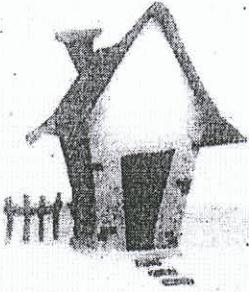
1. Garg, S.K. Environmental Engineering, Vol.I Khanna Publishers, New Delhi, 2010.
2. Modi, P.N., Water Supply Engineering, Vol.I Standard Book House, New Delhi, 2016.
3. Garg, S.K., Environmental Engineering Vol.II, Khanna Publishers, New Delhi, 2015.
4. Duggal K.N., "Elements of Environmental Engineering" S. Chand and Co. Ltd., New Delhi, 2014.
5. Punmia, B.C., Jain, A.K., and Jain.A.K., Environmental Engineering, Vol.II, Laxmi Publications, 2010.

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1. Punmia B.C, Ashok Jain and Arun Jain, Water Supply Engineering, Laxmi Publications (P) Ltd., New Delhi 2010.
2. Manual on Water Supply and Treatment, CPHEEO, Ministry of Urban Development, Government of India, New Delhi, 1999.
3. 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.
4. Of Urban Development, Government of India, New Delhi, 2013.
5. Metcalf and Eddy – Waste water Engineering – Treatment and Reuse, Tata Mc. Graw – Hill Company, New Delhi, 2010.
6. Syed R.Qasim "Waste water Treatment Plants", CRC Press, Washington D.C., 2010
7. Gray N.F, "Water Technology", Elsevier India Pvt.Ltd. New Delhi, 2006.



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Engineers & Contractors

Er. P. Senthilkumar


Date: 13.08.2022

TO WHOM IT MAY CONCERN

This is to certify that **Ms. S. Saranya Devi (920819103005)**,
B.E. Civil Engineering from NPR College of Engineering & Technology,
Natham has successfully completed her internship during the period
13.07.2022 to 13.08.2022.

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COURSE OBJECTIVES:

- To learn the fundamental concepts of Stress in simple and complex states and to know the mechanism of load transfer in beams and the induced stresses due to simple bending and unsymmetrical bending and to determine the deformation in determinate beams and to know the basic concepts of analysis of indeterminate beams.

UNIT I SIMPLE AND COMPOUND STRESSES

9

Stresses in simple and compound bars – Thermal stresses – Elastic constants - Thin cylindrical and spherical shells – Biaxial state of stress – **Principal stresses and principal planes** – Mohr's circle of stresses - Torsion on circular shafts.

UNIT II BENDING OF BEAMS

9

Types of beams and transverse loadings– **Shear force and bending moment for simply supported, cantilever and over-hanging beams** - Theory of simple bending – Bending stress distribution – Shear stress distribution.

UNIT III DEFLECTION OF BEAMS

9

Double Integration method – Macaulay's method – Area moment method – Conjugate beam method - Strain energy method for determinate beams.

UNIT IV INDETERMINATE BEAMS

9

Propped Cantilever and Fixed Beams – Fixed end moments reactions, **slope and deflection for standard cases of loading** – Continuous beams – support reactions and moments – Theorem of three moments – **Shear Force and Bending Moment Diagrams.**

UNIT V ADVANCED TOPICS

9

Unsymmetrical bending of beams - shear center applied - Thick cylinders - Theories of failure – **Principal stress, principal strain, shear stress, strain energy and distortion energy theories – application problems.**

TOTAL: 45 PERIODS**COURSE OUTCOMES:**

Students will be able to

CO1 Understand the concepts of stress and strain, principal stresses and principal planes.

CO2 Determine Shear force and bending moment in beams and understand concept of theory of simple bending.

CO3 Calculate the deflection of beams by different methods and selection of method for determining slope or deflection.

CO4 Analyze propped cantilever, fixed beams and continuous beams for external loadings and support settlements.

CO5 Determine the stresses due to Unsymmetrical bending of beams, locate the shear center, and study the various theories of failure



TEXTBOOKS

1. Rajput R.K. "Strength of Materials (Mechanics of Solids)", S.Chand & company Ltd., New Delhi, 2018.
2. Rattan.S.S., "Strength of Materials", Tata McGraw Hill Education Pvt. Ltd., New Delhi, 2017.
3. Punmia B.C., Ashok Kumar Jain and Arun Kumar Jain, "Theory of Structures" (SMTS) Vol -II, Laxmi Publishing Pvt Ltd, New Delhi 2017.
4. Basavarajiah and Mahadevapa, Strength of Materials, University press, Hyderabad, 2016
5. Vazirani.V.N, Ratwani.M.M, Duggal .S.K Analysis of Structures: Analysis, Design and Detailing of Structures-Vol.1, Khanna Publishers, New Delhi 2014.

REFERENCES:

1. Kazimi S.M.A, "Solid Mechanics", Tata McGraw-Hill Publishing Co., New Delhi, 2017
2. William A .Nash, "Theory and Problems of Strength of Materials", Schaum's Outline Series, Tata McGraw Hill Publishing company, 2017.
3. Singh. D.K., " Strength of Materials", Ane Books Pvt. Ltd., New Delhi, 2021
4. Egor P Popov, "Engineering Mechanics of Solids", 2nd edition, PHI Learning Pvt. Ltd., New Delhi, 2015
5. Irwing H.Shames, James M.Pitarresi, Introduction to Solid Mechanics, Prentice Hall of India, New Delhi, 2002
6. Beer. F.P. &Johnston.E.R."Mechanics of Materials", Tata McGraw Hill, Sixth Edition, New Delhi 2010.
7. James M.Gere., Mechanics of Materials, Thomas Canada Ltd., Canada, 2006.
8. Egor. P.Popov, Engineering Mechanics of Solids, Prentice Hall of India, Second Edition New Delhi 2015



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Date: 30/07/2022




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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

9

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.

UNIT II CHEMICAL AND MINERAL ADMIXTURES

9

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

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-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.

UNIT V SPECIAL CONCRETES

9

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.

TOTAL : 45 PERIODS**COURSE OUTCOMES:**

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

- CO1** Understand the requirements of cement, aggregates and water for concrete
- CO2** Select suitable admixtures for enhancing the properties of concrete
- CO3** Design concrete mixes as per IS method of mix design
- CO4** Determine the properties of concrete at fresh and hardened state.



CO5 Know the importance of special concretes for specific requirements.

TEXTBOOKS:

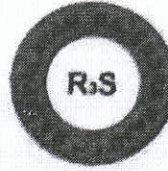
1. Gupta.B.L., Amit Gupta, "Concrete Technology", Jain Book Agency, 2010.
2. Shetty,M.S, "Concrete Technology", S.Chand and Company Ltd, New Delhi, 2003

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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 Delhii.



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**ENGINEERS &
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DATE:06.03.2023

TO WHOMSOEVER IT MAY CONCERN

This certify that Mr.K.PURUSOTHAMAN (REG:NO 920819103302)

Civil Engineering student of **NPR COLLEGE OF ENGINEERING &
TECHNOLOGY,DINDIGUL , TAMILNADU** has undergone the Internship in our
construction sites at Trichy and Perambalur for carrying out their final semester
project works from 06-02-2023 to 07-03-2023. During his training period, we find
his learning skills and interest are very good.

We wish him all success for his future endowers.

For R3S ENGINEERS AND CONTRACTORS


Er.R.SUDEESH.M.E.,

Civil Engineering Consultant

& concrete Technologist


Dr. J.SUNDARARAJAN,

B.E., M.Tech., Ph.D.,

Principal

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Woraiyur, Trichy-620 003.**

COURSE OBJECTIVES

- 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

Formation of soil - Soil description - Particle - Size shape and colour - Composition of gravel, sand, silt, clay particles - Particle behaviour - Soil structure - Phase relationship - Index properties - Significance - BIS classification system - Unified classification system - Compaction of soils - Theory, Laboratory and field tests - Field Compaction methods - Factors influencing compaction of soils.

UNIT II EFFECTIVE STRESS AND PERMEABILITY

9

Soil - water - Static pressure in water - Effective stress concepts in soils - Capillary phenomena - Permeability interaction - Hydraulic conductivity - Darcy's law - Determination of Hydraulic Conductivity - 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 weir).

UNIT III STRESS DISTRIBUTION AND SETTLEMENT

9

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

UNIT IV SHEAR STRENGTH

9

Shear strength of cohesive and cohesion less soils - Mohr-Coulomb failure theory - Measurement of shear strength - Direct shear, Triaxial compression, UCC and Vane shear tests - Pore pressure parameters - Cyclic mobility - Liquefaction.

UNIT V SLOPE STABILITY

9

Stability Analysis - Infinite slopes and finite slopes - Total stress analysis for saturated clay - Friction circle method - Use of stability number - Method of slices - Fellenious and Bishop's method - Slope protection measure

TOTAL: 45 PERIODS**COURSE OUTCOMES:**

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

CO1 Demonstrate an ability to identify various types of soils and its properties, formulate and solve engineering Problems

CO2 Show the basic understanding of flow through soil medium and its impact of engineering solution
CO3 Understand the basic concept of stress distribution in loaded soil medium and soil settlement due to consolidation



CO4 Show the understanding of shear strength of soils and its impact of engineering solutions to the loaded soil medium and also will be aware of contemporary issues on shear strength of soils.

CO5 Demonstrate an ability to design both finite and infinite slopes, component and process as per needs and specifications.

TEXTBOOKS:

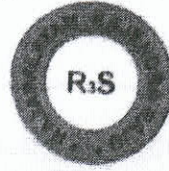
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2. Gopal Ranjan and Rao, A.S.R., "Basic and Applied Soil Mechanics", New Age Ltd. International Publisher New Delhi (India) 2006.

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1. McCarthy, D.F., "Essentials of Soil Mechanics and Foundations". Prentice-Hall, 2006.
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3. Das, B.M., "Principles of Geotechnical Engineering". Brooks / Coles / Thompson Learning Singapore, 8th Edition, 2013.
4. Punmia, B.C., "Soil Mechanics and Foundations", Laxmi Publications Pvt. Ltd. New Delhi, 2005.



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**ENGINEERS &
CONTRACTORS**

DATE:06.03.2023

TO WHOMSOEVER IT MAY CONCERN

This certify that **Mr.S.Naveenraj** (REG:NO 920819103003)

Civil Engineering student of **NPR COLLEGE OF ENGINEERING &
TECHNOLOGY,DINDIGUL , TAMILNADU** has undergone the Internship in our
construction sites at Trichy and Perambalur for carrying out their final semester
project works from 06-02-2023 to 07-03-2023. During his training period, we find
his learning skills and interest are very good.

We wish him all success for his future endowers.

For R3S ENGINEERS AND CONTRACTORS

Er.R.SUDEESH.M.E.,

Civil Engineering Consultant

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Woraiyur, Trichy-620 003.

COURSE OBJECTIVE:

- To give an overview about the highway and railway engineering with respect to, planning, design, construction and maintenance as per IRC standards, specifications and methods.

UNIT I HIGHWAY ENGINEERING

9

Classification of highways – Institutions for Highway planning, design and construction at different levels – factors influencing highway alignment – Typical cross sections of Urban and Rural roads – Engineering surveys for alignment- Conventional and Modern method

UNIT II DESIGN OF HIGHWAY ELEMENTS

9

Cross sectional elements – Horizontal curves, super elevation, transition curves, widening of curves – Sight distances – Vertical curves, gradients– pavement components and their role - Design practice for flexible and rigid pavements (IRC methods only).

UNIT III HIGHWAY CONSTRUCTION AND MAINTENANCE

9

Highway construction materials, properties, testing methods – Construction practice of flexible and concrete pavement- Highway drainage – Evaluation and Maintenance of pavements.

UNIT IV RAILWAY PLANNING AND CONSTRUCTION

9

Elements of permanent way – Rails, Sleepers, Ballast, rail fixtures and fastenings, Selection of gauges - Track Stress, coning of wheels, creep in rails, defects in rails – Route alignment surveys, conventional and modern methods-Geometric design of railway, gradient, super elevation, widening of gauge on curves (Problems)-Railway drainage- Level Crossings-Signalling.

UNIT V RAILWAY TRACK CONSTRUCTION MAINTENANCE AND OPERATION

9

Points and Crossings - Design of Turnouts, Working Principle-Track Circuiting - Construction & Maintenance – Conventional, Modern methods and Materials, Lay outs of Railway Stations and Yards, Rolling Stock, Tractive Power, Track Resistance - Role of Indian Railways in National Development – Railways for Urban Transportation – LRT & MRTS Feasibility study, Planning and construction.

TOTAL: 45 PERIODS**COURSE OUTCOMES**

On completion of the course, the student is expected to

CO1 Plan a highway according to the principles and standards adopted in various institutions in India.

CO2 Design the geometric features of road network and components of pavement. 78

CO3 Test the highway materials and construction practice methods and know its properties and able to perform pavement evaluation and management.

CO4 Understand the methods of route alignment and design elements in railway planning and constructions.

CO5 Understand the construction techniques and maintenance of track laying and railway stations.



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, 6th edition Delhi, 2015.
4. C. Venkatramaiah., Transportation Engineering-Vol.2 Railways, Airports, Docks and Harbours, Bridges and Tunnels., Universities Press (India) Private Limited, Hyderabad, 2015.

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, Ist Edition, USA,2011
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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
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**ENGINEERS &
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DATE:06.03.2023

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We wish him all success for his future endowers.

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CE8501 DESIGN OF REINFORCED CEMENT CONCRETE ELEMENTS

L T P C
3 2 0 4

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:

1. Varghese, P.C., "Limit State Design of Reinforced Concrete", Prentice Hall of India, Pvt.Ltd., New Delhi, 2002.
2. Gambhir. M.L., "Fundamentals of Reinforced Concrete Design", Prentice Hall of India Private Limited, New Delhi, 2006.
3. Subramanian,N., "Design of Reinforced Concrete Structures", Oxford University Press, New Delhi, 2013.
4. Krishnaraju.N " Design of Reinforced Concrete Structures ", CBS Publishers & Distributors Pvt. Ltd., New Delhi.
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1. Jain, A.K., "Limit State Design of RC Structures", Nemchand Publications, Roorkee, 1998
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3. Unnikrishna Pillai, S., Devdas Menon, "Reinforced Concrete Design", Tata McGraw Hill Publishing Company Ltd., 2009
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5. Bandyopadhyay. J.N., "Design of Concrete Structures", Prentice Hall of India Pvt. Ltd., New Delhi, 2008.
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8. Shah V L Karve S R., "Limit State Theory and Design of Reinforced Concrete", Structures Publications, Pune, 2013



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RP CONSTRUCTION

ISO 9001:2015

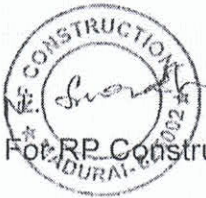
G16, Race Course Colony, New Natham Road, Madurai – 625 002.

Date: 30.07.2022

TO WHOMSOEVER IT MAY CONCERN

This is to certify that **Mr. R. Videshwaran**, Reg. No: 920820103315, II year, B.E., Civil Engineering, NPR College of Engineering & Technology, Natham, has completed his in-plant training in our construction from 16.07.2022 to 30.07.2022.

During the tenure of training his conduct was found good.



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OBJECTIVE:

- To introduce the students to basic theory and concepts of classical methods of structural analysis

UNIT I STRAIN ENERGY METHOD

9

Determination of Static and Kinematic Indeterminacies — Analysis of continuous beams, plane frames and indeterminate plane trusses by strain energy method (up to two degree of redundancy).

UNIT II SLOPE DEFLECTION METHOD

9

Slope deflection equations — Equilibrium conditions - Analysis of continuous beams and rigid frames — Rigid frames with inclined members - Support settlements - symmetric frames with symmetric and skew-symmetric loadings.

UNIT III MOMENT DISTRIBUTION METHOD

9

Stiffness and carry over factors — Distribution and carryover of moments - Analysis of continuous Beams- Plane rigid frames with and without sway — Support settlement - symmetric frames with symmetric and skew-symmetric loadings.

UNIT IV FLEXIBILITY METHOD

9

Primary structures - Compatibility conditions — Formation flexibility matrices - Analysis of indeterminate pin- jointed plane frames, continuous beams and rigid jointed plane frames by direct flexibility approach.

UNIT V STIFFNESS METHOD

9

Restrained structure — Formation of stiffness matrices - equilibrium condition - Analysis of Continuous Beams, Pin-jointed plane frames and rigid frames by direct stiffness method.

TOTAL: 45 PERIODS**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




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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

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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.




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**EXPERIMENTAL STUDY ON STABILIZED MUD BLOCK
USING E-WASTE AND GGBS**

A project report

Submitted by

R.VENKATESAN 920819103009

In partial fulfilment for the award of the degree

of

BACHELOR OF ENGINEERING

IN

CIVIL ENGINEERING



DEPARTMENT OF CIVIL ENGINEERING

NPR COLLEGE OF ENGINEERING & TECHNOLOGY

NATHAM-624 401

ANNA UNIVERSITY: CHENNAI 600 025

MAY 2023



ANNA UNIVERSITY: CHENNAI 600 025

BONAFIDE CERTIFICATE

Certificate that this project report "EXPERIMENTAL STUDY ON STABILIZED MUD BLOCK USING E-WASTE AND GGBS" is this bonafide work of R.VENKATESAN (920819103009) who carried out the project work under any supervision


SIGNATURE

Dr.A.HEMALATHA,M.Tech.,Ph.D

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Dr.A.HEMALATHA,M.TECH.,Ph.D

SUPERVISOR

Department of Civil Engineering
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Submitted for the viva-voice Examination of CE8811 project work held at NPR College of Engineering and Technology, Natham on 18.5.23




INTERNAL EXAMINER

 18/05/23
EXTERNAL EXAMINER


Dr. J.SUNDARARAJAN,
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ABSTRACT

E-waste that is increasing day by day turning into a major threat to public health and successively pollutes the setting. India ranks fifth in the world for E-waste generation about a pair of million a lot of E-waste is generated associate rally and an unrevealed quantity of E-waste is foreign from alternative countries around the world. The significance of this project is to use locally available waste material in to useful manner there by reducing the slight impact on environment.in this project. The mud blocks are made up of red soil, GGBS, e-waste and geo polymer solution as binder. Here the geo polymeric solution [sodium hydroxide NaOH and sodium silicate Na_2SiO_4] used as alkali activator. The molarity of NaOH solution is 8M and the proportioning of NaOH : Na_2SiO_4 was taken as 1:2.

The propotion of GGBS was maintained 15% for all mixes and the percentage of e-waste added was ranged from 5% to 11% at the rate of 2% increment. Mud blocks are casted using semi automatic mud block making machine names as HYDRAFORM. Totally 120 blocks were casted 150 and cured at 60°C at in hot air oven curing and teste were carried out on 1st, 3rd, 7th, 14th, and 21st day of oven curing. During this period of curing wet compression test, dry compression test, water absorption test, ultrasonic pulse velocity tests are conducted . from above all the mix propotion the mix D1, D2 shows the good result in strength and D3 show less water absorption , it is also that addition of e-waste had an influent effect on weight but when it exceeds more than 13% it affects the strength and durability of the block .

i



CHAPTER 5

CONCLUSIONS

CONCLUSION

From studies and tests conducted the strength of geo polymer mud blocks using E-waste and GGBS was determined for the various percentage of replacement. Totally 160 blocks were casted and tests were carried out.

Tests like dry compression test, wet compression test, water absorption test and Ultrasonic Pulse Velocity (UPV) test were conducted for mud blocks 3rd day, 7th day, 14th and 21st day.

As a conclusion of these tests the following results are given,

1. The maximum dry compression test absorbed as 10.36 MPa from mixed proportion of D1 and minimum dry compression test absorbed as 5.94 MPa.
2. The maximum wet compression test absorbed as 4.63 MPa from mixed proportion of D1 and minimum wet compression test absorbed as 2.05 MPa.
3. The best water absorption test obtained as 10.32 % from mixed proportion of D3.
- 6 From the above results we can conclude that 5% is found to be optimum mix.
- 7 The compression test was gradually decreasing with addition of E-waste with stabilizer more than 13%.



OBJECTIVE:

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

UNIT I SOURCES OF WATER

9

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.

UNIT II CONVEYANCE FROM THE SOURCE

9

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.

UNIT III WATER TREATMENT

9

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.

UNIT IV ADVANCED WATER TREATMENT

9

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

UNIT V WATER DISTRIBUTION AND SUPPLY

9

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

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 publichealth
- ☐ the ability to design and evaluate water supply project alternatives on basis of chosen



criteria.


TEXTBOOKS:

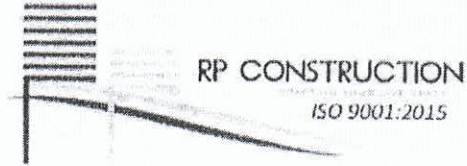
1. Garg, S.K. Environmental Engineering, Vol.I Khanna Publishers, New Delhi, 2010.
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1. Manual on Water Supply and Treatment, CPHEEO, Ministry of Urban Development, Government of India, New Delhi, 1999.
2. Syed R. Qasim and Edward M. Motley Guang Zhu, Water Works Engineering Planning, Design and Operation, Prentice Hall of India Learning Private Limited, New Delhi, 2009.




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Date: 30.07.2022

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During the tenure of training his conduct was found good.



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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.

UNIT I SITE INVESTIGATION AND SELECTION OF FOUNDATION

9

Scope and objectives – Methods of exploration – Auguring and boring – Wash boring and rotary drilling – Depth and spacing of bore holes – Soil samples – Representative and undisturbed – Sampling methods – Split spoon sampler, Thin wall sampler, Stationary piston sampler – Penetration tests (SPT and SCPT) – Data interpretation – Strength parameters – Bore log report and Selection of foundation.

UNIT II SHALLOW FOUNDATION

9

Location and depth of foundation – Codal provisions – Bearing capacity of shallow foundation on homogeneous deposits – Terzaghi's formula and BIS formula – Factors affecting bearing capacity

– Bearing capacity from in-situ tests (SPT, SCPT and plate load) – Allowable bearing pressure – Seismic considerations in bearing capacity evaluation. Determination of Settlement of foundations on granular and clay deposits – Total and differential settlement – Allowable settlements – Codal provision – Methods of minimizing total and differential settlements.

UNIT III FOOTINGS AND RAFTS

9

Types of Isolated footing, Combined footing, Mat foundation – Contact pressure and settlement distribution – Proportioning of foundations for conventional rigid behaviour – Minimum thickness for rigid behaviour – Applications – Compensated foundation – Codal provision

UNIT IV PILE FOUNDATION

9

Types of piles and their functions – Factors influencing the selection of pile – Carrying capacity of single pile in granular and cohesive soil – Static formula – Dynamic formulae (Engineering news and Hileys) – Capacity from in situ tests (SPT and SCPT) – Negative skin friction – Uplift capacity – Group capacity by different methods (Feld's rule, Converse – Labarra formula and block failure criterion) – Settlement of pile groups – Interpretation of pile load test (routine test only), Underreamed piles – Capacity under compression and uplift – Cohesive – expansive – non expansive – Cohesionless soils – Codal provisions.

UNIT V RETAINING WALLS

9

Plastic equilibrium in soils – Active and passive states – Rankine's theory – Cohesionless and cohesive soil – Coulomb's wedge theory – Condition for critical failure plane – Earth pressure on retaining walls of simple configurations – Culmann's Graphical method – Pressure on the wall due to line load – Stability analysis of



retaining walls – Codal provisions.

TOTAL: 45 PERIODS

OUTCOMES:

Students will be able to

- Understand the site investigation, methods and sampling.
- Get knowledge on bearing capacity and testing methods.
- Design shallow footings.
- Determine the load carrying capacity, settlement of pile foundation.
- Determine the earth pressure on retaining walls and analysis for stability.

TEXTBOOKS:

1. Murthy, V.N.S., "Text book of Soil Mechanics and Foundation Engineering", CBS Publishers Distribution Ltd., New Delhi. 2014.
2. Arora, K.R., "Soil Mechanics and Foundation Engineering", Standard Publishers and Distributors, New Delhi, 7th Edition, 2017 (Reprint).
3. Punmia, B.C., "Soil Mechanics and Foundations", Laxmi Publications Pvt. Ltd. New Delhi, 16th Edition 2017.

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2. Kaniraj, S.R. "Design aids in Soil Mechanics and Foundation Engineering", Tata McGraw Hill publishing company Ltd., New Delhi, 2014.
3. Joseph E bowles, "Foundation Analysis and design", McGraw Hill Education, 5th Edition, 28th August 2015.
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9. IS Code 2911 (Part 3) : 1979 (Reaffirmed 1997) "Under Reamed Piles", Bureau of Indian Standards, New Delhi.
10. IS Code 2911 (Part 4) : 1979 (Reaffirmed 1997) "Load Test on Piles", Bureau of Indian Standards, New Delhi.
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13. IS Code 2132: 1986 (Reaffirmed 1997) "Code of Practice for thin – walled tube sampling for soils", Bureau of Indian Standards, New Delhi.



14. IS Code 1892 (1979): Code of Practice for subsurface Investigation for Foundations. Bureau of Indian Standards, New Delhi.
15. IS Code 14458 (Part 1) : 1998 "Retaining Wall for Hill Area – Guidelines, Selection of Type of Wall", Bureau of Indian Standards, New Delhi.
16. IS Code 14458 (Part 2) : 1998 "Retaining Wall for Hill Area – Guidelines, Design of Retaining/Breast Walls", Bureau of Indian Standards, New Delhi.
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COMPARATIVE STUDY ON SILICON CARBIDE BRICK WITH FLY ASH AND BURNT CLAY BRICK

A PROJECT REPORT

Submitted by

**N.ARUN KUMAR
S.SUBASH
K.PURUSOTHAMAN**

**920819103001
920819103007
920819103302**

in partially fulfilment for the award of the degree

Of

BACHELOR OF ENGINEERING

IN

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ANNA UNIVERSITY: CHENNAI 600 025

MAY 2023



ANNA UNIVERSITY: CHENNAI 600 025

BONAFIDE CERTIFICATE

Certified that this project report "COMPARISION STUDY ON SILICON CARBIDE BRICK WITH FLYASH AND BURNT CLAY BRICK" is the bonafide work of "N.ARUN KUMAR (920819103001) , S.SUBASH (920819103007) & K.PURUSOTHAMAN (920819103302) " who carried out the project work under my supervision.


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ABSTRACT

This main objective of this project details about the introduction of CO₂ with silica sand or sodium silicate sand and by adding either epoxy or urethane or silicate gel as binder, with varying proportions or percentage to the weight of sand, which in terns hardens the matrix as can be used as bricks.

This project also discuss about the comparison of silicon carbide bricks with fly ash& burnt clay bricks and their advantages and dis-advantages, also comparing their strength and other parameters (as per code provisions) to make or create walls that require little or no added steel reinforcement.



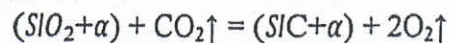
CHAPTER 9

SCOPE CONCLUSIONS & FUTURE

9.1 Conclusions

From the previous chapters we can conclude that,

The fascinating & interesting point about SIC Bricks are it insanely converts the CO_2 to O_2



1. The compressive strength of the SIC Bricks are higher than that of Fly ash & Burnt Clay Bricks.
2. SIC Bricks doesn't absorb water or any type of liquid which make it waterproof due to the epoxy resin coating. Whereas, Fly-ash bricks and burnt clay bricks absorb water of 15% to 20% which might cause ill effects and damage of masonry structure in long run during flood season.
3. Due to cohesion and adhesion property of SIC Brick they contribute good bonding and due to its dimensional stability it saves plaster up to 15%.
4. Silica sand can be reclaimed just by crushing and washing with detergent. Efficient scrap value.
5. SIC bricks can be casted with in less than 5 minutes & it gains its full strength with in 24 hours which saves more time when compared with Fly-Ash and Burnt Clay bricks.



The objective of the survey camp is to enable the students to get practical training in the field work. Groups of not more than six members in a group will carry out each exercise in survey camp. The camp must involve work on a large area of not less than 40 acres outside the campus (Survey camp should not be conducted inside the campus). At the end of the camp, each student shall have mapped and contoured the area. The camp record shall include all original field observations, calculations and plots.

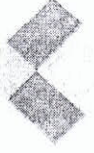
Two weeks Survey Camp will be conducted during summer vacation in the following activities:

1. Traverse - using Total station
2. Contouring
 - (i). Radial tachometric contouring - Radial Line at Every 45 Degree and Length not less than 60 Meter on each Radial Line
 - (ii). Block Level/ By squares of size at least 100 Meter x 100 Meter atleast 20 Meter interval
 - (iii). L.S & C.S - Road and canal alignment for a Length of not less than 1 Kilo Meter atleast L.S at Every 30M and C.S at every 90 M
3. Offset of Buildings and Plotting the Location
4. Sun observation to determine azimuth (guidelines to be given to the students)
5. Use of GPS to determine latitude and longitude and locate the survey camp location
6. Traversing using GPS
7. Curve setting by deflection angle

Apart from above students may be given survey exercises in other area also based on site condition to give good exposure on survey.



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This is to certify that Mr. S.P. Kishore, III year, B.E., Civil Engineering, NPR College of Engineering & Technology, Natham, has completed his internship in site maintenance and site execution during the period 12/07/2022 to 12/08/2022.

Date: 12/08/2022




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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 but 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 RoofTrusses-Design of Channel and I section Purlins.

TOTAL: 75 PERIODS

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.

TEXTBOOKS:

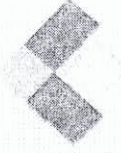
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2. Gambhir. M.L., "Fundamentals of Structural Steel Design", McGraw Hill Education India Pvt. Ltd., 2013
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1. Narayanan.R.et.al. "Teaching Resource on Structural Steel Design", INSDAG, Ministry of Steel Publications, 2002
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6. IS800 :2007, General Construction in Steel - Code of Practice, (Third Revision), Bureau of Indian Standards, New Delhi, 2007
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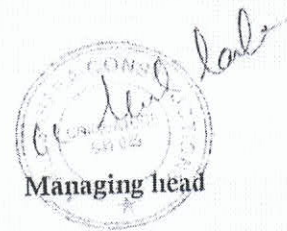
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OBJECTIVES :

- To learn the method of drawing influence lines and its uses in various applications like beams and plane trusses.
- To analyse the arches, suspension bridges and space trusses.
- Also to learn Plastic analysis of beams and rigid frames.

UNIT I INFLUENCE LINES FOR DETERMINATE BEAMS

9

Influence lines for reactions in statically determinate beams – Influence lines for shear force and bending moment – Calculation of critical stress resultants due to concentrated and distributed moving loads – absolute maximum bending moment – influence lines for member forces in pin jointed plane frames.

UNIT II INFLUENCE LINES FOR INDETERMINATE BEAMS

9

Muller Breslau's principle– Influence line for Shearing force, Bending Moment and support reaction components of propped cantilever, continuous beams (Redundancy restricted to one), and fixed beams.

UNIT III ARCHES

9

Arches - Types of arches – Analysis of three hinged, two hinged and fixed arches - Parabolic and circular arches – Settlement and temperature effects.

UNIT IV CABLES AND SUSPENSION BRIDGES

9

Equilibrium of cable – length of cable - anchorage of suspension cables – stiffening girders - cables with three hinged stiffening girders – Influence lines for three hinged stiffening girders.

UNIT V PLASTIC ANALYSIS

9

Plastic theory - Statically indeterminate structures – Plastic moment of resistance – Plastic modulus – Shape factor – Load factor – Plastic hinge and mechanism – collapse load - Static and kinematic methods – Upper and lower bound theorems - Plastic analysis of indeterminate beams and frames.

TOTAL:45 PERIODS**OUTCOMES:**

Students will be able to

- Draw influence lines for statically determinate structures and calculate critical stress resultants.
- Understand Muller Breslau principle and draw the influence lines for statically indeterminate beams.
- Analyse of three hinged, two hinged and fixed arches.
- Analyse the suspension bridges with stiffening girders
- Understand the concept of Plastic analysis and the method of analyzing beams and rigid frames.

TEXTBOOKS:

1. Bhavikatti, S.S, Structural Analysis, Vol.1 & 2, Vikas Publishing House Pvt.Ltd.,




New Delhi-4, 2014.

2. Punmia.B.C, Ashok Kumar Jain and Arun Kumar Jain, Theory of structures, Laxmi, Publications, 2004.
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1. Negi.L.S and Jangid R.S., Structural Analysis, Tata McGraw-Hill Publishers, 2004.
2. Reddy C.S., Basic Structural Analysis, Tata McGraw Hill Publishing Co.Ltd.2002.
3. Gambhir.M.L., Fundamentals of Structural Mechanics and Analysis, PHI Learning Pvt.Ltd., 2011.
4. Prakash Rao D.S., Structural Analysis, Universities Press, 1996.




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**EXPERIMENTAL ANALYSIS IN PARTIAL
REPLACEMENT OF CEMENT WITH
GLASS POWDER IN CONCRETE**

A PROJECT REPORT

Submitted by

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SACHIN R 920819103303

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of

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IN

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BONAFIDE CERTIFICATE

Certified that this project report "EXPERIMENTAL ANALYSIS IN PARTIAL REPLACEMENT OF CEMENT WITH GLASS POWDER IN CONCRETE" is the bonafide work of S.NAVEEN RAJ (920819103003), S.P. KISHORE (920819103304) and R.SACHIN (920819103303) who carried out the project work under my supervision.


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Submitted for the viva-voice Examination of CE8811 project work held at NPR College of Engineering and Technology, Natham on ..15.05.2022




INTERNAL EXAMINER


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ABSTRACT

Cement manufacturing industry is one of the carbon-dioxide emitting sources beside deformation and burning of fossil fuel. The global warming caused by emission of green house gases, such as emitted CO_2 to the atmosphere. The global cement industry is contributed about 7% of green house green gases emission to earth atmosphere. The work examines the possibility of using glass powder as partial replacement as 0% , 5%, 10%, 15% and for its compressive strength up to 7, 14 & 28 days of age and was compared with those of conventional concrete.

Leaving the waste material has been emphasized waste can be used more efficiently and the environmental problem. Hence the reuse of waste material has been emphasized waste can be used to produce new products or can be used admixture so that natural resources are used more efficiently and the environment is protected from waste deposits. Glass powder material is very fine powder material obtained as glass during sawing and shaping, and not recycling it causes environmental problem in the world. The possibility of using it glass ash powder separately as partial replacement of cement on concrete were studied and evaluated based upon % replacement of cement on concrete were studied and evaluated based upon % of the partial cement replacement with both glass powder.



CHAPTER 8

CONCLUSION

From our investigation for m20 grade concrete by replacing 40% also it attain 20km/m³. So we can make it as a practice by replacing 40% in all conventional buildings. It also make it as a economical and ecofriendly building.

The above mentioned work of various researchers and our present experimental work, it is clear that glass powder can be used as a partial replacement of cement in concrete because of its increased workability, strength parameters like compressive strength and split tensile strength. A disposal, utilization of waste glass powder in concrete will not only provide economic, it will also help in reducing disposal problems



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 – Waterdistribution system- Irrigation efficiencies.

UNIT III DIVERSION AND IMPOUNDING STRUCTURES 9

Types of Impounding structures - Gravity dam – Forces on a dam -Design of Gravity dams; Earthdams, 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 ofprismatic 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 form 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.

TEXTBOOKS:

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


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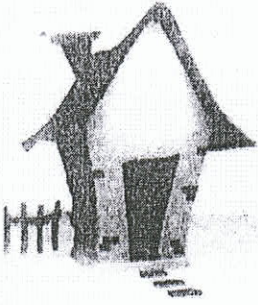
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- International Publishers, 2005
2. Linsley R.K. and Franzini J.B, "Water Resources Engineering", McGraw-Hill Inc, 2000
 3. Chaturvedi M.C., "Water Resources Systems Planning and Management", Tata McGraw-Hill Inc., New Delhi, 1997.




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Er. P. Senthilkumar


Date: 30.07.2022

TO WHOM IT MAY CONCERN

This is to certify that **Ms. S. Yazhini (920820103014)**, B.E. Civil Engineering from NPR College of Engineering & Technology, Natham has successfully completed her in-plant training during the period 18.07.2022 to 30.07.2022.

For Sona Builders Engineers & Contractors


Er. P. Senthilkumar
Proprietor


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OBJECTIVE:

- ☐ To give an overview about the highway engineering with respect to, planning, design, construction and maintenance of highways as per IRC standards, specifications and methods.

UNIT I HIGHWAY PLANNING AND ALIGNMENT 9

Significance of highway planning — Modal limitations towards sustainability - History of road development in India — factors influencing highway alignment — Soil suitability analysis - Road ecology - Engineering surveys for alignment, objectives, conventional and modern methods - Classification of highways — Locations and functions — Typical cross sections of Urban and Rural roads

UNIT II GEOMETRIC DESIGN OF HIGHWAYS 9

Cross sectional elements - Sight distances — Horizontal curves, Super elevation, transition curves, widening at curves — Vertical curves - Gradients, Special consideration for hill roads - Hairpin bends — Lateral and vertical clearance at underpasses.

UNIT III DESIGN OF FLEXIBLE AND RIGID PAVEMENTS 9

Pavement components and their role - Design principles - Design practice for flexible and rigid Pavements (IRC methods only) — Embankments- Problems in Flexible pavement design.

UNIT IV HIGHWAY CONSTRUCTION MATERIALS AND PRACTICE 9

Highway construction materials, properties, testing methods — CBR Test for subgrade - tests on aggregate & bitumen — Test on Bituminous mixes-Construction practice including modern materials and methods, Bituminous and Concrete road construction, Polymer modified bitumen, Recycling, Different materials — Glass, Fiber, Plastic, Geo-Textiles, Geo-Membrane (problem not included) — Quality control measures - Highway drainage — Construction machineries.

UNIT V EVALUATION AND MAINTENANCE OF PAVEMENTS 9

Pavement distress in flexible and rigid pavements — Types of maintenance — Pavement Management Systems - Pavement evaluation, roughness, present serviceability index, skid resistance, structural evaluation, evaluation by deflection measurements — Strengthening of pavements — Highway Project formulation.

TOTAL: 45 PERIODS**OUTCOMES:**

Students will be able to

- Get knowledge on planning and aligning of highway.
- Geometric design of highways
- Design flexible and rigid pavements.
- Gain knowledge on Highway construction materials, properties, testing methods
- Understand the concept of pavement management system, evaluation of distress and maintenance of pavements.



TEXTBOOKS:

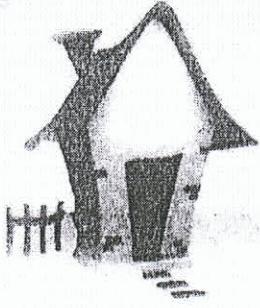
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5. Fred L. Mannering, Scott S. Washburn and Walter P.Kilareski, "Principles of HighwayEngineering and Traffic Analysis", Wiley India Pvt. Ltd., New Delhi, 2011
6. Garber and Hoel, "Principles of Traffic and Highway Engineering", CENGAGE Learning,New Delhi, 2010
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8. IRC-37–2012,The Indian roads Congress, Guidelines for the Design of Flexible Pavements, New Delhi
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Er. P. Senthilkumar

Date: 30.07.2022

TO WHOM IT MAY CONCERN

This is to certify that **Ms. S. Srilakshmi (920820103312)**, B.E. Civil Engineering from NPR College of Engineering & Technology, Natham has successfully completed her in-plant training during the period 18.07.2022 to 30.07.2022.

For Sona Builders Engineers & Contractors


Er. P. Senthilkumar
Proprietor


Dr. J. SUNDARARAJAN,

B.E., M.Tech., Ph.D.,

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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.




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Date: 13.08.2022

TO WHOMSOEVER IT MAY CONCERN

This is to certify that **Mr. T. Prithviraj, Reg. No: 920820103310**, II year, B.E., Civil Engineering, NPR College of Engineering & Technology, Natham, has completed his internship in our construction from 16.07.2022 to 13.08.2022.

During the tenure of training his conduct was found good.



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OBJECTIVE:

- The students will acquire knowledge in estimation, tender practices, contract procedures, and valuation and will be able to prepare estimates, call for tenders and execute works.

UNIT I QUANTITY ESTIMATION

9

Philosophy – Purpose – Methods of estimation – Types of estimates – Approximate estimates – Detailed estimate – Estimation of quantities for buildings, bituminous and cement concrete roads, septic tank, soak pit, retaining walls – culverts (additional practice in class room using computer softwares)

UNIT II RATE ANALYSIS AND COSTING

9

Standard Data – Observed Data – Schedule of rates – Market rates – Standard Data for Man Hours and Machineries for common civil works – Rate Analysis for all Building works, canals, and Roads– Cost Estimates (additional practice in class room using Computer softwares) - (Analysis of rates for the item of work asked, the data regarding labour, rates of material and rates of labour to be given in the Examination Question Paper)

UNIT III SPECIFICATIONS, REPORTS AND TENDERS

9

Specifications – Detailed and general specifications – Constructions – Sources – Types of specifications – Principles for report preparation – report on estimate of residential building – Culvert – Roads – TTT Act 2000 – Tender notices – types – tender procedures – Drafting model tenders , E-tendering-Digital signature certificates- Encrypting -Decrypting – Reverse auctions.

UNIT IV CONTRACTS

9

Contract – Types of contracts – Formation of contract – Contract conditions – Contract for labour, material, design, construction – Drafting of contract documents based on IBRD / MORTH Standard bidding documents – Construction contracts – Contract problems – Arbitration and legal requirements.

UNIT V VALUATION

9

Definitions – Various types of valuations – Valuation methods - Necessity – Capitalised value – Depreciation – Escalation – Valuation of land – Buildings – Calculation of Standard rent – Mortgage – Lease

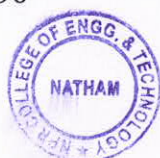
TOTAL: 45 PERIODS**OUTCOMES:**

The student will be able to

- Estimate the quantities for buildings,
- Rate Analysis for all Building works, canals, and Roads and Cost Estimate.
- Understand types of specifications, principles for report preparation, tender notices types.
- Gain knowledge on types of contracts
- Evaluate valuation for building and land.

TEXTBOOKS:

1. B.N Dutta 'Estimating and Costing in Civil Engineering', UBS Publishers & Distributors (P) Ltd, 2010.
2. B.S.Patil, 'Civil Engineering Contracts and Estimates', University Press, 2006
3. D.N. Banerjee, 'Principles and Practices of Valuation', V Edition, Eastern Law House, 1998

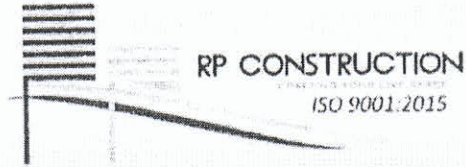


REFERENCES:

1. Hand Book of Consolidated Data – 8/2000, Vol.1, TNPWD
2. Tamil Nadu Transparencies in Tenders Act, 1998
3. Arbitration and Conciliation Act, 1996
4. Standard Bid Evaluation Form, Procurement of Good or Works, The World Bank, April 1996
5. Standard Data Book for Analysis and Rates, IRC, New Delhi, 2003




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Date: 13.08.2022

TO WHOMSOEVER IT MAY CONCERN

This is to certify that **Mr. M. Alexpandi, Reg. No: 920820103301**, II year, B.E., Civil Engineering, NPR College of Engineering & Technology, Natham, has completed his internship in our construction from 16.07.2022 to 13.08.2022.

During the tenure of training his conduct was found good.




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OBJECTIVE:

- To introduce the students about Railways planning, design, construction and maintenance and planning design principles of airport and harbour

UNIT I RAILWAY PLANNING AND CONSTRUCTION 10
Elements of permanent way — Rails, Sleepers, Ballast, rail fixtures and fastenings, Selection of gauges - Track Stress, coning of wheels, creep in rails, defects in rails — Route alignment surveys, conventional and modern methods--Geometric design of railway, gradient, super elevation, widening of gauge on curves- Level Crossings. .

UNIT II RAILWAY CONSTRUCTION AND MAINTENANCE 8
Earthwork — Stabilization of track on poor soil - Track drainage — Calculation of Materials required for track laying - Construction and maintenance of tracks — Railway Station and yards and passenger amenities-Signalling

UNIT III AIRPORT PLANNING 7
Air transport characteristics - airport classification — ICAO - airport planning: Site selection typical Airport Layouts, Case Studies, parking and Circulation Area

UNIT IV AIRPORT DESIGN 10
Runway Design: Orientation, Wind Rose Diagram, Problems on basic and Actual Length, Geometric Design — Elements of Taxiway Design — Airport Zones — Passenger Facilities and Services — Runway and Taxiway Markings.

UNIT V HARBOUR ENGINEERING 10
Definition of Basic Terms: Harbour, Port, Satellite Port, Docks, Waves and Tides — Planning and Design of Harbours: Harbour Layout and Terminal Facilities — Coastal Structures: Piers, Break waters, Wharves, Jetties, Quays, Spring Fenders, Dolphins and Floating Landing Stage — Inland Water Transport — Wave action on Coastal Structures and Coastal Protection Works — Coastal Regulation Zone, 2011

TOTAL: 45 PERIODS

OUTCOMES:

Students who successfully complete this course will be able to:

- Understand the methods of route alignment and design elements in Railway Planning and Constructions.
- Understand the Construction techniques and Maintenance of Track laying and Railway stations.
- Gain an insight on the planning and site selection of Airport Planning and design.
- Analyze and design the elements for orientation of runways and passenger facility systems.
- Understand the various features in Harbours and Ports, their construction, coastal protection works and coastal Regulations to be adopted.




TEXTBOOKS:

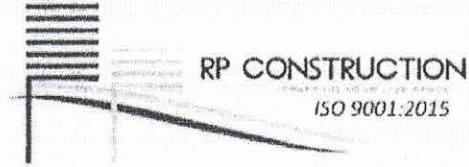
1. Subramanian K.P., Highways, Railways, Airport and Harbour Engineering, V Scitech Publications (India), Chennai, 2010
2. Saxena Subhash, C. and Satyapal Arora, A Course in Railway Engineering, Dhanapat Rai and Sons, Delhi, 1998
3. Khanna.S.K. Arora.M.G and Jain.S.S, Airport Planning and Design, Nemachand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

REFERENCES:

1. Venkatramiah. 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




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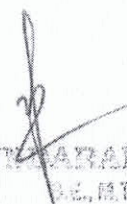
Date: 13.08.2022

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This is to certify that **Mr. P. Anandhan Alaguvel, Reg. No: 920820103002**, II year, B.E., Civil Engineering, NPR College of Engineering & Technology, Natham, has completed his internship in our construction from 16.07.2022 to 13.08.2022.

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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
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.



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ANALYSIS AND DESIGN OF SOLAR POWERED DUPLEX RESIDENTIAL BUILDING

A DESIGN PROJECT REPORT

Submitted by

K.PURUSOTHAMAN 920819103302

K.SUDHARSAN 920819103008

In partial fulfillment for the award of the degree

of

BACHELOR OF ENGINEERING

IN

CIVIL ENGINEERING

NPR COLLEGE OF ENGINEERING & TECHNOLOGY

NATHAM-624401



ANNA UNIVERSITY: CHENNAI 600 025

NOVEMBER 2022



ANNA UNIVERSITY: CHENNAI 600 025

BONAFIDE CERTIFICATE

Certified that this project report "ANALYSIS AND DESIGN OF SOLAR POWERED DUPLEX RESIDENTIAL BUILDING" is the bonafide work of K.PURUSOTHAMAN (920819103302) and K.SUDHARSAN (920815103008) who carried out the project work under my supervision.


SIGNATURE

Dr.A.HEMALATHA, M.Tech, Ph.D.

HEAD OF THE DEPARTMENT

Civil Engineering Department NPR
college of Engineering &
Technology Natham 624 401


SIGNATURE

Mr.K.SHANTHA KUMAR, M.E

SUPERVISOR ASSISTANT

PROFESSOR

Civil Engineering Department
NPR college of Engineering &
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Natham 624 401

Submitted for the viva-voce Examination held at NPR College of Engineering and Technology, Natham on 21/1/23


INTERNAL EXAMINER


EXTERNAL EXAMINER

Dr. J.SUNDARARAJAN,
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ABSTRACT

It is concerned about the Plan, Analysis and Design of Solar Powered Duplex Residential Building (G+1). This design is taken up with the objective of understanding the behavior of structure and gain confidence in designing structure by making use of the codal provisions. The Plan of this Solar Powered Duplex Residential Building (G+1) is drafted by using AutoCAD Software. The Analysis of the Structure is done with the help of STAAD Pro. The slab, beam, column, staircase, footing is designed by limit state method satisfying all codal provisions of IS 456:2000. The grade of concrete used are M30 and Fe550 bars. Economical Design is achieved by satisfying the "Collapse and Serviceability" Limit State conditions.



CHAPTER 7

CONCLUSION

- In this design project the basic requirements of the Solar Powered Duplex Residential Building are satisfied.
- The structural elements like slab, beams, columns, footing, staircases have been designed and analyzed successfully.
- The Satisfactory results were obtained by doing analysis with the STAAD.PRO.
- Adequacy of materials is ensured by doing shear and effective depth checks.
- Codal provisions of Indian Standard and NBC are strictly followed.
- Economical design of sections is done as per limit state philosophy by Involvement of collapse and serviceability conditions.
- The planning of the project was done only after having case studies and reviews of different such projects, references and discussion along with well experienced Civil Engineering professors.
- Through this design project, were able to peep in and deal with modern phases concerning Civil Engineering such as planning, analysis and design of the structures in various modern software's.
- Hence best outcomes have been produced.



OBJECTIVE:

- To develop the ability to solve a specific problem right from its identification and literature review till the successful solution of the same. To train the students in preparing project reports and to face reviews and viva voce examination.

STRATEGY:

The student works on a topic approved by the head of the department under the guidance of a faculty member and prepares a comprehensive project report after completing the work to the satisfaction. The student will be evaluated based on the report and the viva voce examination by a team of examiners including one external examiner.

TOTAL: 300 PERIODS**OUTCOME:**

- On Completion of the project work students will be in a position to take up any challenging practical problems and find solution by formulating proper methodology.




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EXPERIMENTAL INVESTIGATION ON HIGH STRENGTH CONCRETE USING PERLITE AS A AGGREGATE

A PROJECT REPORT

Submitted by

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SUDHARSAN K	920819103008
NITHEESH KUMAR A R	920819103301

In partial fulfilment for the award of the degree

of

**BACHELOR OF ENGINEERING
IN
CIVIL ENGINEERING**



**DEPARTMENT OF CIVIL ENGINEERING
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NATHAM - 624 401**

ANNA UNIVERSITY: CHENNAI 600 025

MAY 2023



ANNA UNIVERSITY: CHENNAI 600 025

BONAFIDE CERTIFICATE

Certified that this project report "EXPERIMENTAL INVESTIGATION ON HIGH STRENGTH CONCRETE USING PERLITE AS A AGGREGATE" is the bonafide work of SANJAY K (920819103004), SUDHARSAN K (920819103008), NITHEESH KUMAR A R (920819103301) who carried out the project work under my supervision.


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Head of the department

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Mr. P. MANIKANDAN M.E.,

Assistant Professor

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Submitted for the viva-voice Examination of CE8811 project work held at NPR College of Engineering and Technology, Natham on 18.12.2023


INTERNAL EXAMINER


EXTERNAL EXAMINER




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Principal

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ABSTRACT

The aim of this study is to determine the feasibility of utilizing perlite as the partial replacement for the fine aggregate. In this study, the natural perlite was replaced for fine aggregate in the levels of 20%, 40%, 60% and 80% . The performance of high strength concrete is compared with the conventional concrete specimen. The cast samples were used to study the reduction in density without compromising the mechanical properties (i.e., compression strength and tensile strength) of the developed concrete at 7 days , 14 days and 28 days. This concrete has been an interest due to its advantages compared to normal concrete. High strength concrete can be produced by the use of perlite as aggregates. As the results, expandable perlite obviously has the effect in reducing the concrete density.

KEYWORDS: High strength, perlite



CHAPTER 8

CONCLUSION

8.1 GENERAL

- The addition of perlite, dolomite powder and fly ash which shows increase in compressive strength of vermiculite concrete by achieving the maximum strength is 10% greater than conventional concrete as the 28 days results.
- Perlite addition results in significant increase in split tensile strength achieving the maximum strength 5.4% than conventional concrete.
- The implication of vermiculite shows greater significance in compressive strength but lesser in split tensile strength of vermiculite concrete.
- From the results above, it is clearly understandable that perlite addition beyond 40% leads to gradual decrease of all strength properties due to the low self-weight of the specimen that results in reduction of strength.

8.2 SCOPE OF THE FUTURE WORK

This investigation can be further extended by casting reinforced beams to determine flexural strength and deflection that play major role in large structures. Also, it is planned to cast brick with perlite and other non-structural elements due to the conclusion and the specimen is subjected for fire resistance test in order to find out the fire resistance capacity of perlite.

