1.3.2

COURSES THAT INCLUDE EXPERIENTIAL LEARNING THROUGH PROJECT WORK / INTERNSHIP DURING 2020-2021

1.3.2 AVERAGEPERCENTAGE OFCOURSESTHAT INCLUDE EXPERIENTIAL LEARNINGTHROUGHPROJECT WORK/FIELD WORK/INTERNSHIPDURING 2020-2021

S.No	Programme offering	Name of the course	Course code	Project/ fieldwork / internship	Page No
1	B.E-Civil Engineering	Strength of Materials -I	CE8301	Project	4
2	B.E-Civil Engineering	Surveying	CE8351	Internship	11
3	B.E-Civil Engineering	Construction Techniques and Practices	CE8401	Internship	14
4	B.E-Civil Engineering	Strength of Materials-II	CE8402	Project	17
5	B.E-Civil Engineering	Concrete Technology	CE8404	Project	23
6	B.E-Civil Engineering	Soil Mechanics	CE8491	Project	29
7	B.E-Civil Engineering	Water Supply Engineering	EN8491	Project	36
8	B.E-Civil Engineering	Design of Reinforced Cement Concrete Elements	CE8501	Internship	42
9	B.E-Civil Engineering	Structural Analysis - I	CE8502	Internship	48
10	B.E-Civil Engineering	Foundation Engineering	CE8591	Internship	51
11	B.E-Civil Engineering	Survey Camp (2 weeks –During IV Semester)	CE8513	Internship	54
12	B.E-Civil Engineering	Design of Steel Structural Elements	CE8601	Project	56
13	B.E-Civil Engineering	Structural Analysis - II	CE8602	Internship	63
14	B.E-Civil Engineering	Irrigation Engineering	CE8603	Project	66
15	B.E-Civil Engineering	Highway Engineering	CE8604	Project	72
16	B.E-Civil Engineering	Project work	CE8811	Project	77

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CE8301 **STRENGTH OF MATERIALS I** **L T P C**
3 0 0 3

OBJECTIVES:

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

UNIT I STRESS, STRAIN AND DEFORMATION OF SOLIDS 9

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

UNIT II TRANSFER OF LOADS AND STRESSES IN BEAMS 9

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

UNIT III DEFLECTION OF BEAMS 9

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

UNIT IV TORSION 9

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

UNIT V ANALYSIS OF TRUSSES 9

Determinate and indeterminate trusses - Analysis of pin jointed plane determinate trusses by method of joints, method of sections and tension coefficient – Analysis of Space trusses by tension coefficient method.

TOTAL :45 PERIODS

OUTCOMES:

Students will be able to

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

TEXTBOOKS:

1. Rajput.R.K. “Strength of Materials”, S.Chand and Co, New Delhi, 2015.
2. Punmia.B.C., Ashok Kumar Jain and Arun Kumar Jain, SMTS –I Strength of materials, Laxmi publications. New Delhi, 2015
3. Rattan . S. S, “Strength of Materials”, Tata McGraw Hill Education Private Limited, NewDelhi, 2012
4. Bansal. R.K. “Strength of Materials”, Laxmi Publications Pvt. Ltd., New Delhi, 2010

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1. Timoshenko.S.B. and Gere.J.M, “Mechanics of Materials”, Van Nos Reinbhold, New Delhi1999.
2. Vazirani.V.N and Ratwani.M.M, “Analysis of Structures”, Vol I Khanna Publishers, NewDelhi,1995.
3. Junnarkar.S.B. and Shah.H.J, “Mechanics of Structures”, Vol I, Charotar Publishing House, New Delhi 2016.
4. Singh. D.K., “ Strength of Materials”, Ane Books Pvt. Ltd., New Delhi, 2016
5. Basavarajaiah, B.S. and Mahadevappa, P., Strength of Materials, Universities Press, Hyderabad, 2010.
6. Gambhir. M.L., "Fundamentals of Solid Mechanics", PHI Learning Private Limited., NewDelhi, 2009.

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EXPERIMENTAL STUDIES ON HYBRID FIBER REINFORCED SELF COMPACTING CONCRETE

PROJECT REPORT

Submitted by

N.ARUNPANDIAN (920817103010)
P.BALAKRISHNAN (920817103011)
S.GUHAN (920817103019)
R.MUTHU KUMAR (920817103030)

In partial fulfillment for the award of the degree

Of

BACHELOR OF ENGINEERING

In

CIVIL ENGINEERING

NPR COLLEGE OF ENGINEERING AND TECHNOLOGY

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NOVEMBER 2021

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BONAFIDE CERTIFICATE

Certificate that this project report **"EXPERIMENTAL STUDIES ON HYBRID FIBER REINFORCED SELF COMPACTING CONCRETE"** is the bonafide work **of " N.ARUNPANDIAN (920817103010), P.BALAKRISHNAN (920817103011), S.GUHAN (920817103019), R.MUTHU KUMAR (920817103030) "** who carried out the project work under my supervision

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Submitted for the viva voice examination held at NPR College of Engineering and Technology, Natham on 4/8/2022.

INTERNAL EXAMINER

EXTERNAL EXAMINER

ABSTRACT

Self-compacting concrete (SCC) offers several economic and technical benefits; the use of steel fibers extends its possibilities. Steel fibers acts as a bridge to retard their cracks propagation, and improve several characteristics and properties of the concrete. Fibers are known to significantly affect the workability of concrete. Therefore, an investigation was performed to compare the properties of Conventional Self Compacting Concrete (CSCC) and SCC with steel fiber and sisal fiber. The content of the cementitious materials was maintained constant (584kg/m^3), while the water/cementitious material ratio is kept constant 0.33.

The self-compacting mixtures had a cement replacement of 30% by weight of Class F fly ash and 10% metakaolin. From previous studies the optimum content of steel fiber is found as 1.5%. The aspect ratio of steel fibers with hook ends was kept as 50, and steel fibers were added at different volume fractions (0, 1.25, 1.5 and 1.750) is used. Sisal fiber of 1 cm length with volume fractions of 0.1% , 0.2% , 0.3% and 0.4% by weight of cementitious material is estimated. Slump flow time and diameter, J-Ring, V-funnel, and L-Box were performed to assess the fresh properties of the concrete. Compressive strength, splitting tensile strength and flexural strength of the concrete by means of BEAM-COLUMN joint were determined for the hardened properties.

The test results of concrete cubes and cylinders were obtained by replacing the various percentage fraction of steel fiber and sisal fiber. All specimens were cured for 28 days before compression, split tensile and flexural strength tests.

CHAPTER 7

CONCLUSION

The following points are concluded from the experimental work

- The workability tests of SCC for filling ability, passing ability, segregation resistance were found out and the obtained results are with in the acceptable limits given by the EFNARC guidelines.
- Replacement of Fly ash up to 30% and metakaolin up to 10% does not affect the fresh properties of SCC.
- When the volume fraction of steel fiber exceeds 1% by weight of cement it produces uneven flow , it is overcoming by adding Viscosity Modifying Admixture up to 0.3% in Hybrid Fiber Reinforced SCC.
- This study results shows that the dosage of steel fiber 1.75 % and sisal fiber 0.3% has higher compressive strength when compared to all other hybrid mixes and control mixes. That is HFM (3/3) shows 17.23 % increment in strength at 28 days when compared to CM 01.
- The test results shows that the dosage of steel fiber 1.5 % and sisal fiber 0.3% mix that is HFM (2/3) has higher split tensile strength when compared to all other hybrid mixes and control mixes. The HFM (2/3) shows 53.89 % increment in strength at 28 days when compared to the conventional self compacting mix that is CM 01.

CE8351 **SURVEYING** **L T P C**

3 0 0 3

OBJECTIVES :

- To introduce the rudiments of plane surveying and geodetic principles to Civil Engineers.
- To learn the various methods of plane and geodetic surveying to solve the real world Civil Engineering problems.
- To introduce the concepts of Control Surveying
- To introduce the basics of Astronomical Surveying

UNIT I FUNDAMENTALS OF CONVENTIONAL SURVEYING AND LEVELLING 9

Classifications and basic principles of surveying - Equipment and accessories for ranging and chaining - Methods of ranging - Compass - Types of Compass - Basic Principles- Bearing – Types - True Bearing - Magnetic Bearing - Levelling- Principles and theory of Levelling – Datum- - Bench Marks – Temporary and Permanent Adjustments- Methods of Levelling- Booking – Reduction - Sources of errors in Levelling - Curvature and refraction.

UNIT II THEODOLITE AND TACHEOMETRIC SURVEYING 9

Horizontal and vertical angle measurements - Temporary and permanent adjustments - Heights and distances - Tacheometer - Stadia Constants - Analytic Lens -Tangential and Stadia Tacheometry surveying - Contour – Contouring – Characteristics of contours – Methods of contouring – Tacheometric contouring - Contour gradient – Uses of contour plan and map

UNIT III CONTROL SURVEYING AND ADJUSTMENT 9

Horizontal and vertical control – Methods – specifications – triangulation- baseline – satellite stations – reduction to centre- trigonometrical levelling – single and reciprocal observations – traversing – Gale's table. - Errors Sources- precautions and corrections – classification of errors – true and most probable values - weighed observations – method of equal shifts – principle of least squares - normal equation – correlates- level nets- adjustment of simple triangulation networks.

UNIT IV ADVANCED TOPICS IN SURVEYING 9

Hydrographic Surveying – Tides – MSL – Sounding methods – Three point problem – Strength of fix – astronomical Surveying – Field observations and determination of Azimuth by altitude and hour angle methods –.Astronomical terms and definitions - Motion of sun and stars - Celestial coordinate systems - different time systems - Nautical Almanac - Apparent altitude and corrections - Field observations and determination of time, longitude, latitude and azimuth by altitude and hour angle method

UNIT V MODERN SURVEYING 9

Total Station : Advantages - Fundamental quantities measured - Parts and accessories - working principle - On board calculations - Field procedure - Errors and Good practices in using Total Station GPS Surveying : Different segments - space, control and user segments - satellite configuration - signal structure - Orbit determination and representation - Anti Spoofing and Selective Availability - Task of control segment - Hand Held and Geodetic receivers - data processing - Traversing and triangulation.

TOTAL : 45 PERIODS

OUTCOMES :

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

- The use of various surveying instruments and mapping
- Measuring Horizontal angle and vertical angle using different instruments
- Methods of Leveling and setting Levels with different instruments
- Concepts of astronomical surveying and methods to determine time, longitude, latitude andazimuth
- Concept and principle of modern surveying.

TEXTBOOKS :

1. Kanetkar.T.P and Kulkarni.S.V, Surveying and Levelling, Parts 1 & 2, Pune Vidyarthi GrihaPrakashan, Pune, 2008
2. Punmia.B.C., Ashok K.Jain and Arun K Jain , Surveying Vol. I & II, Lakshmi PublicationsPvt Ltd, New Delhi, 2005
3. James M. Anderson and Edward M. Mikhail, "Surveying, Theory and Practice", 7th Edition,McGraw Hill, 2001.
4. Bannister and S. Raymond, "Surveying", 7th Edition, Longman 2004.
5. Laurila, S.H. "Electronic Surveying in Practice", John Wiley and Sons Inc, 1993
6. Venkatramaiah, Text book of Surveying, University press, New Delhi, 2014

REFERENCES :

1. Alfred Leick, “GPS satellite surveying”, John Wiley & Sons Inc., 3rd Edition, 2004.
2. Guocheng Xu, “GPS Theory , Algorithms and Applications”, Springer – Berlin, 2003.
3. SatheeshGopi, rasathishkumar, N. madhu, “Advanced Surveying, Total Station GPS and Remote Sensing” Pearson education, 2007
4. Roy S.K., "Fundamentals of Surveying", 2nd Edition, Prentice Hall of India, 2004.
5. Arora K.R.,"Surveying Vol I & II", Standard Book house, 10th Edition 2008

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WALLS INFRA Constructions
42B, Renga Residency, 1st Street,
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Mail: vimal@wallsinfra.com
Mobile: +91-9585712310

Date: 26/08/2020

To

The Principal
NPR College of Engineering & Technology
Natham,
Dindigul-624 401.

Sir,

Sub: Internship – reg.

With reference to your request letter regarding Internship training for **Mr.R.Muthukumar of Final year, Civil Engineering** is confirmed. Internship will begin for them from 31/08/2020. The students have to follow the rules and safety practices of our concern during the period of internship.

Bring the Bonafide certificate at the time of joining.

Thank you

WALLS INFRA CONSTRUCTIONS COIMBATORE

Managing Head

NPR COLLEGE OF ENGG. & TECHNOLOGY NATHAM

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CE8401 CONSTRUCTION TECHNIQUES AND PRACTICES L T P C
3 0 0 3

OBJECTIVE:

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

UNIT I CONSTRUCTION TECHNIQUES 9

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

UNIT II CONSTRUCTION PRACTICES 9

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

UNIT III SUB STRUCTURE CONSTRUCTION 9

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

UNIT IV SUPER STRUCTURE CONSTRUCTION 9

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

UNIT V CONSTRUCTION EQUIPMENT 9

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

TOTAL: 45 PERIODS

OUTCOMES:

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

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

TEXTBOOKS :

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

REFERENCES:

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

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PUBLIC WORKS DEPARTMENT

Buildings (Construction & Maintenance) Division, Madurai

TO WHOMSOEVER IT MAY CONCERN

This is to Certify that Selvi.R.AJITHA (Reg.No.920817103008) Civil Engineering Student of NPR COLLEGE OF ENGINEERING & TECHNOLOGY, DINDIGUL has undergone the In-plant Training in the Construction Sites for the works undergone in this Division from 05.10.2020 to 19.10.2020 (07.10.2020–Absent).

22/10/20

Executive Engineer, PWD,
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NPR COLLEGE OF ENGG. & TECHNOLOGY * NATHAM

22/10/2020

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CE8402 **STRENGTH OF MATERIALS II** **L T P C**
3 0 0 3

OBJECTIVES:

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

UNIT I ENERGY PRINCIPLES **9**

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

UNIT II INDETERMINATE BEAMS **9**

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

UNIT III COLUMNS AND CYLINDERS **9**

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

UNIT IV STATE OF STRESS IN THREE DIMENSIONS **9**

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

UNIT V ADVANCED TOPICS **9**

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

TOTAL: 45 PERIODS

OUTCOMES:

Students will be able to

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

TEXTBOOKS:

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

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

REFERENCES:

1. Kazimi S.M.A, "Solid Mechanics", Tata McGraw-Hill Publishing Co., New Delhi, 2003
2. William A .Nash, "Theory and Problems of Strength of Materials", Schaum's Outline Series,Tata McGraw Hill Publishing company, 2007.
3. Singh. D.K., " Strength of Materials", Ane Books Pvt. Ltd., New Delhi, 2016
4. Egor P Popov, "Engineering Mechanics of Solids", 2nd edition, PHI Learning Pvt. Ltd., NewDelhi, 2012

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EXPERIMENTAL INVESTIGATION ON COMPRESSIVE STRENGTH ON CONCRETE

A PROJECT REPORT

Submitted by

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MOUNEESH B	920817103301
SIVARAM R	920817103502

In partial fulfillment for the award of the degree

Of

BACHELOR OF ENGINEERING

IN

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BONAFIDE CERTIFICATE

This is to Certified that this project report " **EXPERIMENTAL INVESTIGATION ON COMPRESSIVE STRENGTH ON CONCRETE"** is the bonafide work of **"KAVIMALAN R(920817103024), MOUNEESH B (920817103301),SIVARAM R (920817103502) "** who carried out the project work under my supervision.

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INTERNAL EXAMINER **EXTERNAL EXAMINER**

NPR COLLEGE OF ENGG. & TECHNOLOGY NATHAM

ABSTRACT

The grading of aggregates is an important factor in the preparation of concrete and its compression strength. This experimental investigation was conducted to find the impact of different aggregate sizes on the compressive strength of the concrete. The aggregates used in this experiment was 8 mm and 11.2 mm size. The concrete of M 25 grade and the water-cement ratio of 0.4 was used for this experiment. Tests were done on the concrete making materials, on the fresh concrete and hardened concrete. The fresh batches of concrete prepared from each of the coarse aggregate sizes were collected, and the slump test for the collected batches was conducted to determine the workability. In total, 24 concrete cubes of size 150 mm × 150 mm were cast and cured for 28 days. The cubes, after 28 days of curing, were tested in compression testing machine to determine the compression strength of the concrete. The results showed that the workability of the concrete was directly proportional to the aggregate size. And also, the compressive strength increased with an increase in aggregate sizes.

CHAPTER 13

CONCLUSION

Based on the tests results and further analysis, the following conclusions were drawn:

- The compressive strength of the geopolymer concrete paver block is 38.5 MPa , which is 14.4% less than the control concrete paver block of grade M35.
- The strength property of geopolymer concrete is improved by adequate modification in mixing and curing methods by appropriate proportion.

CE8404 **CONCRETE TECHNOLOGY** **L T P C**

3 0 0 3

OBJECTIVE:

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

UNIT I CONSTITUENT MATERIALS **9**

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

UNIT II CHEMICAL AND MINERAL ADMIXTURES **9**

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

UNIT III PROPORTIONING OF CONCRETE MIX **9**

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

UNIT IV FRESH AND HARDENED PROPERTIES OF CONCRETE **9**

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

UNIT V SPECIAL CONCRETES **9**

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

TOTAL: 45 PERIODS

OUTCOMES:

Students will be able to understand

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

TEXTBOOKS:

1. Gupta.B.L., Amit Gupta, "Concrete Technology", Jain Book Agency, 2010.
2. Shetty,M.S, "Concrete Technology", S.Chand and Company Ltd, New Delhi, 2003
3. Bhavikatti.S.S, " Concrete Technology", I.K.International Publishing House Pvt. Ltd., NewDelhi, 2015
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NPR COLLEGE OF ENGG. & TECHNOLOGY
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EXPERIMENTAL STUDY ON PARTIAL REPLACEMENT OF PROSOPIS JULIFLORA IN COARSE AGGREGATE AND ADDITION OF EGGSHELL POWDER BY CEMENT

A PROJECT REPORT

Submitted by

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NAVEENCHANDRU V	**920817103032**
SURYA R	**920817103050**

In partial fulfilment for the award of the degree

of

BACHELOR OF ENGINEERING

IN

CIVIL ENGINEERING

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INTERNAL EXAMINER

EXTERNAL EXAMINER

NPR COLLEGE OF ENGG. & TECHNOLOGY ★ NATHAM

ABSTRACT

The concrete project is heavily used as construction materials in modern society. With the growth in urbanization and industrialization and its demand is in increased day by days. In order to minimize the negative impact of concrete,the use of waste materials. Our project deals with the partial replacement Prosopis juliflora in coarseaggregate, added cement by eggshell powder.The substituent to coarseaggregate by Prosopisjuliflora level of 10%optimally used .The added cement by Eggshell powder at level of 2.5%,5%,7.5% is to be studied for masteries and strength of properties 100% cement concrete mix is of M20 and watercement ratio is 0.55.The strength will be tested during the periodof 7day 28days respective.We will compare the replaceconcrete with the conventional concrete about the strength of the concrete.

CHAPTER - 9

CONCLUSION

The main aim of the study is to be obtain the suitability material as replacement of coarse aggregate. From the research on concrete made of prosopis juliflora and eggshell powder the following conclusion are made:

- In this project we tried to replace the cement and coarse aggregate partially by prosopis juliflora and eggshell powder (2.5%, 5%, & 7.5%) respectively to increase the strength of concrete.
- The strength is same with the conventional concrete only at 10% optimum replacement of aggregate by prosopis juliflora .The strength sSo we conclude that the cement and coarse aggregate replaced with prosopis juliflora ash and eggshell powder at 7.5% in concrete is suitable for construction.
- More over it reduces the construction cost by reducing the cost of cement and coarse aggregate and it also reduces the environmental pollution due to prosopis juliflora and eggshell powder.
- The eggshell powder surrounding the surface of the mix,may increase the carbonation process and may reduce the permeability in the long run. Hence a detailed study of carbonation process in the mix is needed.

CE8491 **SOIL MECHANICS** **L T P C**

3 0 0 3

OBJECTIVE:

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

UNIT I SOIL CLASSIFICATION AND COMPACTION 9

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

UNIT II EFFECTIVE STRESS AND PERMEABILITY 9

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

UNIT III STRESS DISTRIBUTION AND SETTLEMENT 9

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

UNIT IV SHEAR STRENGTH 9

Shear strength of cohesive and cohesion less soils – Mohr-Coulomb failure theory – shearstrength - Direct shear, Triaxial compression, UCC and Vane shear tests – Pore pressure parameters – Factors influences shear strength of soil.

UNIT V SLOPE STABILITY 9

Infinite slopes and finite slopes — Friction circle method – Use of stability number –Guidelines for location of critical slope surface in cohesive and c - φ soil – Slope protection measures.

TOTAL: 45 PERIODS

OUTCOMES:

Students will be able to

- classify the soil and assess the engineering properties, based on index properties.
- Understand the stress concepts in soils
- Understand and identify the settlement in soils.
- Determine the shear strength of soil
- Analyze both finite and infinite slopes.

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. Gopal Ranjan, A S R Rao, "Basic and Applied Soil Mechanics" New Age InternationalPublication, 3rd Edition, 2016.
4. Punmia, B.C., "Soil Mechanics and Foundations", Laxmi Publications Pvt. Ltd. New Delhi,16th Edition, 2017.

REFERENCES:

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2. Coduto, D.P., "Geotechnical Engineering – Principles and Practices", Prentice Hall of IndiaPvt. Ltd. New Delhi, 2010.
3. Braja M Das, "Principles of Geotechnical Engineering", Cengage Learning India Private Limited, 8th Edition, 2014.
4. Palanikumar.M., "Soil Mechanics", Prentice Hall of India Pvt. Ltd, Learning Private LimitedDelhi, 2013.
5. Craig.R.F., "Soil Mechanics", E & FN Spon, London and New York, 2012.
6. Purushothama Raj. P., "Soil Mechanics and Foundations Engineering",2nd Edition, Pearson Education, 2013.
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ANALYSIS OF SOIL PROFILE USING QGIS

A PROJECT REPORT

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INTERNAL EXAMINER

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NPR COLLEGE OF ENGINEERING & TECHNOLOGY ★ NATHAM

ABSTRACT

Soil survey constitutes a valuable resource inventory linked with the survival of life on the earth. The technological advancements in the field of remote sensing and Geographical Information System have been a boon for such surveys. This project describes the role of remote sensing and Geographical Information System (GIS) technologies for mapping and characterizing soils at various scales. The spectral behaviour of soil and its components, which is fundamental to deriving information from remote sensing data, is also discussed with illustrations. Furthermore, the scope of present day remote sensing data for varying levels information generation is also reviewed. Modeling and mapping of soil properties has been identified as key for effective land degradation management and mitigation. The ability to model and map soil properties at sufficient accuracy for a large agriculture area is demonstrated using GIS and Remote sensing. QGIS is a popular open-source GIS with advanced capabilities. Here is a series of tutorials and tips that show you how to use it to tackle common GIS problems..We are going to use the QGIS software for the above process and we are going to create a terrain and analyze it by the QGIS Software.

professional looking maps. It requires specialized expertise for integration with various external packages, especially when it is implemented on proprietary operating systems. Also it needs numerous auxiliary applications to be installed process that can create confusion.

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EN8491 **WATER SUPPLY ENGINEERING** **L T P C**
3 0 0 3

OBJECTIVE:

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

UNIT I SOURCES OF WATER **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 -Computer applications – Appurtenances – Leak detection.

Principles of design of water supply in buildings – House service connection – Fixtures and fittings, systems of plumbing and types of plumbing.

TOTAL: 45 PERIODS

OUTCOMES:

The students completing the course will have

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

TEXTBOOKS:

1. Garg, S.K. Environmental Engineering, Vol.IKhanna Publishers, New Delhi, 2010.
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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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DAIRY INDUSTRIES WASTE WATER TREATMENT USING NATURAL COAGULANTS

A PROJECT REPORT

Submitted by

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INTERNAL EXAMINER **EXTERNAL EXAMINER**

NPR COLLEGE OF ENGINEERING & TECHNOLOGY ★ NATHAM

ABSTRACT

Dairy industry is one of the large scaled industries which produce lot of organic and inorganic wastes. Dairy effluent contains hazardous element which can affect human immunity when it is directly discharge in water bodies. The collected Dairy industry waste water was tested for basic parameters such as pH, Turbidity etc., Coagulation process is done using natural coagulant such as orange peels and banana peels.

The waste water cannot be disposed directly into river or pond or lake, etc., because when it is mixed with water it is unfit for the aquatic animals and it may cause water pollution, make the drinking water unfit for all purposes. It may cause soil pollution and when it is discharged untreated. So it is essential to treat the water before it is discharged so that it doesn't have any harmful effects.

In this project we are treating the dairy industry waste water using various natural coagulants such as orange peels and banana peels and test results are compared with the original sample without any treatment using natural coagulants.

CHAPTER-8
CONCLUSION

In the developing countries treatment plant are expensive, the ability to pay service is minimal and skills as well as technology are scarce. In order to alleviate the prevailing difficulties, approaches should focus on sustainable water treatment system that are low cost, robust and require minimal maintenance and operator sills. Therefore, locally available materials can be exploited towards achieving sustainable safe water supply. The study was conducted to obtain banana peel and orange peel, as new source of bioremediation for the treatment of dairy cutting industries. The effects of seeds on pH, Turbidity are to be compared accordingly. The chemical coagulant Alum was used for comparing the values with natural coagulants. The result obtained from this research revealed that banana peel is effective in removal of turbidity of dairy industry effluent. While observing dairy factory effluent it was found that banana, shows higher percentage variation in physical parameters such as pH 96%. Turbidity was 93.3% respectively. The change in pH of the effluent and it reduced to accepted level. It was found that removal efficiency of suspended solids was grater in natural coagulants.

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- Desingn of simply supported and continuous slabs using IS code coefficients- Types of Staircases – Design of dog-legged Staircase.

UNIT IV DESIGN OF COLUMNS **9+6**

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

UNIT V DESIGN OF FOOTINGS **9+6**

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

TOTAL: 75 PERIODS

OUTCOMES:

Students will be able to

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

TEXT BOOKS:

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 IndiaPrivate Limited, New Delhi, 2006.
3. Subramanian,N.,”Design of Reinforced Concrete Structures”,Oxford University Press, New Delhi, 2013.

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REFERENCES:

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EXPERIMENTAL INVESTIGATION ON PAVER BLOCK USING SILICA FUME AND POLYPROPYLENE FIBRE

A PROJECT REPORT

Submitted by

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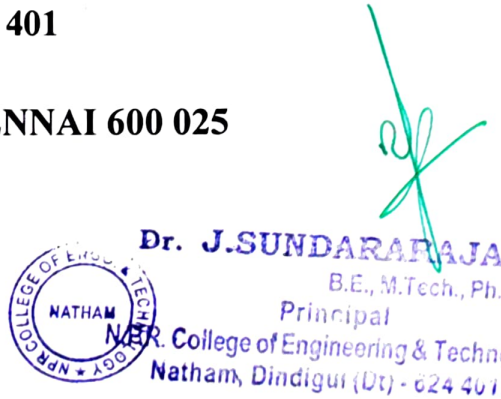

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INTERNALEXAMINER **EXTERNAL EXAMINER**

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ABSTRACT

Interlocking concrete pavement block is an solid unreinforced precast member laid over a bedding material. It is a load carrying component of the pavement. However the conventional pavement block become brittle due to many operational and environmental constraints. The main objective of this project is to produce high strength interlocking pavement block by using silica fume and polypropylene fibre. The main reason for the use of silica fume is to produce high strength and improved durability. polypropylenefibre are used inorder to arrest cracks. In this project work M50 grade is used and the test are conductedforvariousproportionofsilicafumewithcement10%,20%,30%,40% and 2% polypropylene fibre were added. The pavement blocks were casted and testedasperthestandardsgivenintheIndianStandardforprecastconcreteblocks (IS 15658:2006).The test results are then compared with the conventional pavement block.

CHAPTER 13

CONCLUSION

- Based on experimental observations, the following conclusions aredrawn
- Highercompressivestrengthwasachievedwhen30%cementwasreplaced by equal proportion of silica fume and 2% polypropylenefiber.
- The abrasion resistance seems to besatisfactory.
- Water absorption is well below the permissiblelimit.
- All the samples satisfy the requirement given in IS 15658: 2006 for concrete paving blocks to be used in heavy trafficareas.
- There is a saving in cost of cement if cement is replaced by silicafume.
- Thepercentageofsavingishighlybeneficialformassproductionofpaving blocks.
- It is concluded that the use of silica fume and polypropylene fiber in concrete paving blocks as partial cement replacement ispossible.

CE8502 **STRUCTURAL ANALYSIS I** **L T P C**
3 0 0 3

OBJECTIVE:

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

UNITI 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).

UNITII 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.

UNITIII 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.

UNITIV FLEXIBLITY 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.

UNITV 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 defection 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.,NewDelhi-4,2014.
2. Bhavikatti, S.S, Matrix Method of Structural Analysis, I. K. International Publishing HousePvt.Ltd.,New Delhi-4, 2014.
3. Vazrani.V.N And Ratwani, M.M, Analysis of Structures, Vol.II, Khanna Publishers, 2015.
4. Pandit G.S.andGupta S.P.,Structural Analysis–AMatrix Approach, Tata McGraw Hill Publishing Company Ltd.,2006

REFERENCES:

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

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NATHAM

PUBLIC WORKS DEPARTMENT

Buildings (Construction & Maintenance) Division, Madurai

TO WHOMSOEVER IT MAY CONCERN

This is to Certify that Selvan.R.SURYA (Reg.No.920817103050) Civil Engineering Student of NPR COLLEGE OF ENGINEERING & TECHNOLOGY, DINDIGUL has undergone the In-plant Training in the Construction Sites for the works undergone in this Division from 05.10.2020 to 19.10.2020(07.10.2020–Absent).

25/10/20

Executive Engineer, PWD,
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Division, Madurai-2

22/10/2020

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CE8591 **FOUNDATION ENGINEERING** **L T P C**
3 0 0 3

OBJECTIVE:

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

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 thicknessfor 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 insitu 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), Under reamed 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.

REFERENCES:

1. Braja M Das, "Principles of Foundation Engineering" (Eigth edition), Cengage Learning2014.
2. Kaniraj, S.R. "Design aids in Soil Mechanics and Foundation Engineering", Tata McGrawHill publishing company Ltd., New Delhi, 2014.
3. Joseph E bowles, "Foundation Analysis and design", McGraw Hill Education, 5th Edition,28th August 2015.
4. IS Code 6403 : 1981 (Reaffirmed 1997) "Bearing capacity of shallow foundation", Bureauof Indian Standards, New Delhi.
5. IS Code 8009 (Part 1):1976 (Reaffirmed 1998) "Shallow foundations subjected to symmetrical static vertical loads", Bureau of Indian Standards, New Delhi.
6. IS Code 8009 (Part 2):1980 (Reaffirmed 1995) "Deep foundations subjected to symmetrical static vertical loading", Bureau of Indian Standards, New Delhi.
7. IS Code 2911 (Part 1): 1979 (Reaffirmed 1997) "Concrete Piles" Bureau of Indian Standards, New Delhi.
8. IS Code 2911 (Part 2): 1979 (Reaffirmed 1997) "Timber Piles", Bureau of Indian Standards, New Delhi.
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.
11. IS Code 1904: 1986 (Reaffirmed 1995) "Design and Construction of Foundations in Soils", Bureau of Indian Standards, New Delhi.
12. IS Code 2131: 1981 (Reaffirmed 1997) "Method for Standard Penetration test for Soils", Bureau of Indian Standards, New Delhi.
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 Typeof Wall" , Bureau of Indian Standards, New Delhi.
16. IS Code 14458 (Part 2) : 1998 "Retaining Wall for Hill Area – Guidelines, Design ofRetaining/Breast Walls" , Bureau of Indian Standards, New Delhi.
17. IS Code 14458 (Part 3) : 1998 "Retaining Wall for Hill Area – Guidelines, Construction OfDry Stone Walls" , Bureau of Indian Standards, New Delhi.

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Sona Builders
Engineers & Contractors

Er. P. Senthilkumar

Date: 02.11.2020

TO WHOM IT MAY CONCERN

This is to certify that **Ms. M. Rubinipriya (920817103041),** B.E. Civil Engineering from NPR College of Engineering & Technology, Natham has successfully completed her internship during the period 02.10.2020 to 02.11.2020.

For Sona Builders Engineers & Contractors

Er. P. Senthilkumar
Proprietor

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CE8513	SURVEY CAMP	L T P C
	(During IV semester Summer Vacation 2 weeks)	- - - 2

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
   - (i). Block Level/ By squares of size at least 100 Meter x 100 Meter atleat 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.

caaliber
CONSTRUCTION
Degree of Excellence

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Mobile: +91-98439 73537

Date: 02.11.2020

TO WHOMSOEVER IT MAY CONCERN

This to certify that **Ms. N. S. Abinaya** student from Final year B.E., Civil Engineering, NPR College of Engineering & Technology has successfully completed her Internship in Madurai site. During the period of training from 02.10.2020 to 02.11.2020, her conduct was good.

Er. S. SENTHILKUMAR, DCE., B.E(Civil)
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CE8601 **DESIGN OF STEEL STRUCTURAL ELEMENTS** **L T P C**
3 2 0 4

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 Deign 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 deign 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 colums- Splices for colums.

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 defection of Beams- Design of laterally supported Beams- Design of solid rolled section Beams- Design of Plated beams with cover plates - Design Strength of Laterally unsupported Beams – Design of laterally unsupported rolled section Beams- Purlin in Roof Trusses-Design of Channel and I section Purlins.

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 unrestrainedsteel beams.

TEXTBOOKS:

1. Subramanian.N, "Design of Steel Structures", Oxford University Press, New Delhi, 2013.
2. Gambhir. M.L., "Fundamentals of Structural Steel Design", McGraw Hill Education IndiaPvt. Ltd., 2013
3. Duggal. S.K, "Limit State Design of Steel Structures", Tata McGraw Hill Publishing Company, 2005

REFERENCES:

1. Narayanan.R.et.al. "Teaching Resource on Structural Steel Design", INSDAG, Ministry of Steel Publications, 2002
2. Sai Ram. K.S. "Design of Steel Structures " Dorling Kindersley (India) Pvt. Ltd., New Delhi,2nd Edition, 2015, www.pearsoned.co.in/kssairam
3. Shiyekar. M.R., "Limit State Design in Structural Steel", Prentice Hall of India Pvt. Ltd,Learning Pvt. Ltd., 2nd Edition, 2013
4. Bhavikatti.S.S, "Design of Steel Structures" By Limit State Method as per IS:800– 2007, IKInternational Publishing House Pvt. Ltd., 2009
5. Shah.V.L. and Veena Gore, "Limit State Design of Steel Structures", IS 800–2007, Structures Publications, 2009.
6. IS800 :2007, General Construction in Steel - Code of Practice, (Third Revision), Bureau of Indian Standards, New Delhi, 2007
7. SP 6(1) Hand book on structural Steel Sections

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EXPERIMENTAL INVESTIGATION ON MODIFIED BITUMINOUS MIXES USING WASTE MATERIALS

A PROJECT REPORT

Submitted by

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NIRANJAN.R	**920817103033**
POTHIYALAGAN.C	**920817103034**
YOGESH SURYA.K	**920817103055**

In partial fulfilment for the award of the degree of

BACHELOR OF ENGINEERING

IN

CIVIL ENGINEERING

ANNA UNIVERSITY: CHENNAI 600 025

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BONAFIDE CERTIFICATE

Certified that this project report **"EXPERIMENTAL INVESTIGATION ON MODIFIED BITUMINOUS MIXES USING WASTE MATERIALS"** is the Bonafide work of **Mohan Raj.G (920817103029), Niranjan.R (920817103033), Pothiyalagan.C (920817103034) and Yogesh Surya.K (920817103055)** who carried out the project work under my supervision

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INTERNAL EXAMINER

EXTERNAL EXAMINER

ABSTRACT

Increase in road traffic in combination with insufficient maintenance due to shortage in funds causes rapid deterioration of the roads. To alleviate this process, several measures may be effective, such as, use of better quality materials, use of cost-effective construction methods, dedicated funds for maintenance, improved and innovative roadway design. The main purpose of this research is to examine the possibility of incorporating waste materials into a bitumen as a modifier. With this perspective, this project aimed at exploring the potential prospects of crumb rubber and sugarcane waste to enhance bituminous mix properties.

Experimental phase of this research starts with the unmodified bitumen tests with bitumen content of 5%, 6% and 7%. The modified bitumen test is carried out with varying percentage of sugarcane waste (4%, 5%, 6%) and crumb rubber (5%, 6%, 7%). With varying bitumen content (5%, 6%, 7%), the bitumen samples are prepared with varying percentage of crumb rubber (5%, 6%, 7%) and sugarcane waste (4%, 5%, 6%) and marshall stability test is carried out to determine the optimum content.

CHAPTER-6

CONCLUSION

From the Marshall test results, it is concluded that the marshall stability value increases with an increase in bitumen content from 5% to 6% then it decreases. The optimum binder content was found to be 6 %. Also higher value of Marshall stability was found for a modified mix as compared to an unmodified one. While adding optimum content of crumb rubber to the bituminous mixes results in reducing the flow value of bitumen. Addition of sugarcane waste to modified bitumen which in turn leads to the reduction of air voids content in bituminous mixes. The results of the study indicated that the modified mixture have a higher stability and VMA percentage compared to the non-modified mixtures. This would positively influence the rutting resistance of these mixtures.

Optimum value:

Binder Content (%)	**Type of bituminous mix**
6%	Normal bitumen + 4% of sugarcane waste + 6% of crumb rubber

Table-7.1

CE8602 **STRUCTURAL ANALYSIS II** **L T P C**
3 0 0 3

OBJECTIVES :

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

UNITI 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.

UNITII 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.

UNITV 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 staticallyindeterminate 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 rigidframes.

TEXTBOOKS:

1. Bhavikatti,S.S, Structural Analysis,Vol.1 & 2, Vikas Publishing House Pvt.Ltd., NewDelhi-4,2014.
2. Punmia.B.C, Ashok Kumar Jain and Arun Kumar Jain, Theory of structures, Laxmi, Publications,2004.

3. Vazrani.V.N And Ratwani,M.M, Analysis of Structures, Vol.II, Khanna Publishers,2015.

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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, PHIL earning Pvt. Ltd.,2011.
4. Prakash Rao D.S., Structural Analysis, Universities Press,1996.

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CE8603 **IRRIGATION ENGINEERING** **L T P C**
3 0 0 3

OBJECTIVE:

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

UNIT I CROP WATER REQUIREMENT **9**

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

UNIT II IRRIGATION METHODS **9**

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

UNIT III DIVERSION AND IMPOUNDING STRUCTURES **9**

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

UNIT IV CANAL IRRIGATION **9**

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

UNIT V WATER MANAGEMENT IN IRRIGATION **9**

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

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, 23rdRevised Edition, New Delhi, 2009

REFERENCES:

1. Duggal, K.N. and Soni, J.P., "Elements of Water Resources Engineering", New Age 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.

4. Sharma R.K.. "Irrigation Engineering", S.Chand & Co. 2007.
5. Michael A.M., Irrigation Theory and Practice, 2nd Edition, Vikas Publishing House Pvt. Ltd.,Noida, Up, 2008
6. Asawa, G.L., “Irrigation Engineering”, NewAge International Publishers, New Delhi, 2000.
7. Basak, N.N, "Irrigation Engineering", Tata McGraw Hill Publishing Co. New Delhi,1999

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EXPERIMENTAL ANALYSIS OF LEACHATE TREATMENT USING LOW COST ADSORBENTS

A PROJECT REPORT

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BONAFIDE CERTIFICATE

Certified that this project report "**EXPERIMENTAL ANALYSIS OF LEACHATE TREATMENT USING LOW COST ADSORBENTS**" is the bonafide work of,**ABITHA.D(920817103005),RAMANA SWETHA.U.B (920817103038)**who carried out the project work under my supervision.

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Submitted for the viva-voce Examination held at NPR College of Engineering and Technology, Natham on 04/8/2021

INTERNAL EXAMINER

EXTERNAL EXAMINER

NPR COLLEGE OF ENGG. & TECHNOLOGY NATHAM

ABSTRACT

The aim of the project work is to treat the landfill leachate before disposal. If leachate is directly disposed into environment it creates serious problems on the surrounding soil, ground water aquifers and nearby surface water. Therefore great attention has been directed towards new techniques based on physico-chemical process, and heavy metals removal using low cost materials as filter media with down flow reactor.

Leachate generation is a major problem for municipal solid waste (MSW) landfills and causes significant threat to surface water and groundwater. Leachate can be defined as a liquid that passes through alandfill and has extracted dissolved and suspended matter from it. Leachate results from precipitation entering the landfill from moisture that exists in the waste when it is composed. This paper presents the results of the analyses of leachate treatment from the solid waste landfill.

CHAPTER 8

CONCLUSION

The reactor R1 which is filled with laterite as filter media is more efficient than compare to other reactors in removal of both heavy metals and physico-chemical parameters. Sugar cane bagasse and brick bats filter medias which contains high amount of dissolved organic matter which increases the dissolved solid content and Electrical conductivity. The removal of heavy metals is observed in both laterite and other filter media.The percentage of toxic content removed by laterite soil was 82%when compared to other filter medias.sugarcane bagasse can reduce the toxic content upto 60% which is higher when compared to brick bats44%.Thus,sugarcane bagasse,laterite soil are the best one to reduce toxic content in leachate.

Leachate control is a very important step to receive the long-term functionality of the drainage system, to reduce treatment costs and to render possible high-tech treatment systems. Nowadays more than 100 leachete treatment plants are under operation in Germany, so there are many experiences concerning the technology, costs, the effluent quality and associated problems. In some cases the treatment of leachate resulted in increasing operation problems in opposite to the treatment of other wastewaters. The selection of the adaequate treatment process should not only include the compliance with the effluent limit values and maintenance but also the production of residuals which have to be further treated or disposed.

CE8604 **HIGHWAY ENGINEERING** **L T P C**
3 0 0 3

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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3. Kadiyali.L.R. "Principles and Practice of Highway Engineering", Khanna Technical Publications, 8th edition Delhi, 2013.

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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, Nineth Impression, South Asia, 2012
4. Ian D. Walsh, "ICE manual of highway design and management", ICE Publishers, Ist Edition, USA, 2011
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
7. O'Flaherty.C.A "Highways, Butterworth – Heinemann, Oxford, 2006
8. IRC-37–2012,The Indian roads Congress, Guidelines for the Design of FlexiblePavements, New Delhi
9. IRC 58-2012. The Indian Road Congress, Guideline for the Design of Rigid Pavements for Highways, New Delhi

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NPR COLLEGE OF ENGG. & TECHNOLOGY * NATHAM

EXPERIMENTAL INVESTIGATION ON PAVER BLOCK USING SILICA FUME AND POLYPROPYLENE FIBRE

A PROJECT REPORT

Submitted by

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T. LOGESH	**920817103026**
K.PREMKUMAR	**920817103036**

In partial fulfillment for the award of the degree

Of

BACHELOR OF ENGINEERING

IN

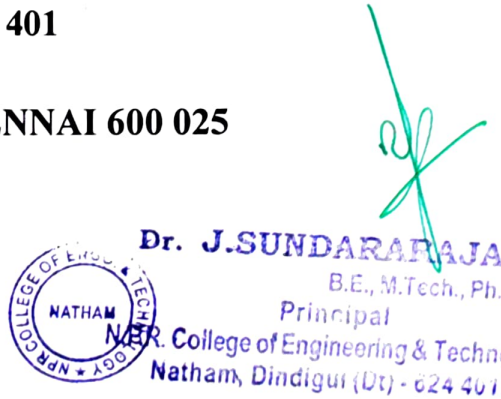
CIVIL ENGINEERING

NPR COLLEGE OF ENGINEERING AND TECHNOLOGY

NATHAM-624 401

ANNA UNIVERSITY: CHENNAI 600 025

APRIL 2021



ANNA UNIVERSITY: CHENNAI 600 025

BONAFIDE CERTIFICATE

This is to Certified that this project report **"EXPERIMENTAL INVESTIGATION ON PAVER BLOCK USING SILICA FUME AND POLYPROPYLENE FIBRE"** is the bonafide work of **"S.HARIHARAN (920817103021),T. LOGESH (920817103026) and K.PREMKUMAR (920817103036)"**who carried out the project work under my supervision.

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INTERNALEXAMINER **EXTERNAL EXAMINER**

NPR COLLEGE OF ENGG & TECHNOLOGY NATHAM

ABSTRACT

Interlocking concrete pavement block is an solid unreinforced precast member laid over a bedding material. It is a load carrying component of the pavement. However the conventional pavement block become brittle due to many operational and environmental constraints. The main objective of this project is to produce high strength interlocking pavement block by using silica fume and polypropylene fibre. The main reason for the use of silica fume is to produce high strength and improved durability. polypropylenefibre are used inorder to arrest cracks. In this project work M50 grade is used and the test are conductedforvariousproportionofsilicafumewithcement10%,20%,30%,40% and 2% polypropylene fibre were added. The pavement blocks were casted and testedasperthestandardsgivenintheIndianStandardforprecastconcreteblocks (IS 15658:2006).The test results are then compared with the conventional pavement block.

CHAPTER 13

CONCLUSION

- Based on experimental observations, the following conclusions aredrawn
- Highercompressivestrengthwasachievedwhen30%cementwasreplaced by equal proportion of silica fume and 2% polypropylenefiber.
- The abrasion resistance seems to besatisfactory.
- Water absorption is well below the permissiblelimit.
- All the samples satisfy the requirement given in IS 15658: 2006 for concrete paving blocks to be used in heavy trafficareas.
- There is a saving in cost of cement if cement is replaced by silicafume.
- Thepercentageofsavingishighlybeneficialformassproductionofpaving blocks.
- It is concluded that the use of silica fume and polypropylene fiber in concrete paving blocks as partial cement replacement ispossible.

CE6811	PROJECT WORK	L T P C 0 0 12 6

OBJECTIVES:

- 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.

The students in a group of 3 to 4 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 of the supervisor. The progress of the project is evaluated based on a minimum of three reviews. The review committee may be constituted by the Head of the Department. A project report is required at the end of the semester. The project work is evaluated based on oral presentation and the project report jointly by external and internal examiners constituted by the Head of the Department.

TOTAL: 180 PERIODS

OUTCOMES:

- 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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NATHAM

EXPERIMENTAL STUDY AND COMPARTIVE ANALYSIS OF PARTIAL REPLACEMENT OF BLACK COTTON SOIL WITH NORMAL BRICK

A PROJECT REPORT

Submitted by

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BONAFIDE CERTIFICATE

Certified that this project report **"EXPERIMENTAL STUDY AND COMPARTIVE ANALYSIS OF PARTIAL REPLACEMENT OF BLACK COTTON SOIL WITH NORMAL BRICK"** is the bonafide work of "GOKUL.S (920817103017), MANIKANDAN.K (920817103027), SARATH.M (920817103043), and SURIYA NARAYANAN.V.M (920817103048)" who carried out project under my supervision.

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INTERNAL EXAMINER

EXTERNAL EXAMINER

NPR COLLEGE OF ENGG. & TECHNOLOGY NATHAM

ABSTRACT

Over a past few decades, there have been a wide ranges of alternatives available in the field of construction, especially with reference to manufacture of bricks. Further, there are some inventions like fly ash brick, concrete blocks etc. There are also researches using black cotton soil as a raw material in the manufacturing of bricks along with few admixtures to alter the properties of the black cotton soil. This project study describes the feasibility of using black cotton soil as a raw material with additional stabilizer in the brick production as partial replacement of clay in context. This project has revealed that the bricks manufactured using this method have good quality with acceptable strength and further, they can be manufactured in a cost effective manner.

10.2 CONCLUSION

1. The Physical& Geotechnical properties of Black Cotton Soil, Red Soil & water are within the permissible limits as per relevant IS codes.
2. The Physical Properties of manufactured bricks is better and are suitable for construction of common buildings.
3. All three proportions arrived during manufacturing of bricks are found effective by means of physical properties (as all proportions strength is >35Kg/cm^2 and other properties are satisfactory) and cost analysis.
4. As per the cost analysis, Black cotton- Red soil bricks are found to be cheaper than Normal Red soil Bricks for manufacturer and leads him towards profit (on bulksell).