

Mohamed Sathak A J College of Engineering, Chennai-603103

Department of Civil Engineering

1.3.2. Average percentage of courses that include experiential learning through project work / field work / internship during AY2023-24

S.No	Title of IV yr Project	Subject code & Subjects name related to the Projects
1	Carwash Wastewater treatment using Azola- A Case study.	EN8592 Waste water Engineering CE8512 Water and waste water analysis lab
2	Enhancing the soil strength by adding micro fine ground granulated blast furnace slag, rice husk ash & sodium lignosulfonate	CE8491 Soil Mechanics CE8591 Foundation Engineering CE8511 Soil mechanics lab
3	Sanitary napkin sustainable disposal- A case study	GE8291 Environmental Science and Engineering
4	An experimental study on Eco-friendly fiber reinforced concrete by using seashell ash and coconut palm leaf ash	CE8391 Construction materials CE8404 Concrete Technology

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HoD

**CARWASH WASTEWATER TREATMENT
USING AZOLLA - A CASE STUDY**

A PROJECT REPORT

Submitted by

HABEEB MUSTHAF A M N	311820103001
MOHAMED FAHIM S	311820103002
MOHAMED JASSIM M	311820103307
MOHAMED YUSUF ARSHATH A	311820103308

in partial fulfillment for the award of the degree

of

BACHELOR OF ENGINEERING

IN

CIVIL ENGINEERING

**MOHAMED SATHAK A.J COLLEGE OF ENGINEERING
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MAY 2024



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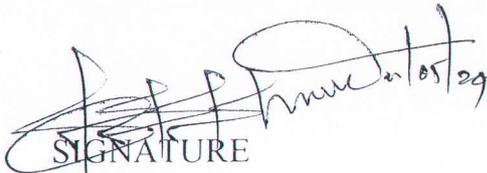
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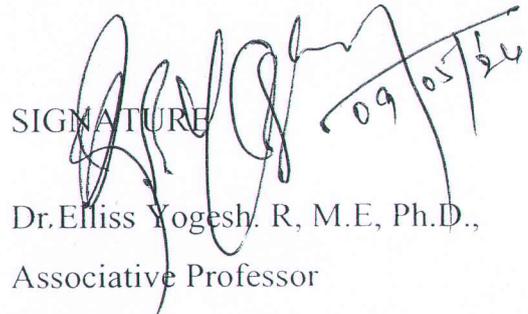
Certified that this project report "CARWASH WASTE WATER TREATMENT USING AZOLLA- A CASE STUDY" is the Bonafide work of

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ABSTRACT

Car wash facilities generate significant volumes of wastewater containing pollutants such as oil, grease, detergents and heavy metals, posing environmental challenges. Traditional treatment methods are often costly and energy-intensive. This case study explores an innovative approach using azolla a fast growing aquatic fern for effective and sustainable wastewater treatment. Azolla is a floating fern with high growth rates and exceptional nutrient uptake capabilities it has been widely studied for potential in wastewater treatment due to its ability to absorb pollutants water quality. It has take time to purify the water with increase in pH, alkality and etc.,. Professional carwash reclaiming systems use water treated in one or more of these manners although technology may differ from installation to installation. It is important to note that choosing the wrong combination of cleaning solutions or treatment processes can create more problems than it solves. It is imperative for the professional carwash operator to understand each element of the reclaim system and its intended use.

Key words: car wash, azolla.



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CONCLUSION

The literature reviewed highlights the potential of Azolla as a sustainable and cost-effective solution for wastewater treatment in car wash facilities. While challenges exist, continued research and innovation offer opportunities to harness Azolla's full potential and contribute to advancing sustainable water management practices.

This literature review provides a foundation for further exploration and implementation of Azolla-based wastewater treatment systems, offering insights into their efficacy, mechanisms, challenges, and future prospects in the context of car wash facility operations.

The literature reviewed underscores the significant potential of Azolla as a sustainable and cost-effective solution for wastewater treatment. While challenges exist, continued research and innovation offer opportunities to harness the unique properties of Azolla and address pressing environmental and public health concerns associated with wastewater pollution. By advancing our understanding of Azolla-mediated treatment processes and exploring novel applications, we can pave the way for a more sustainable and resilient water management future.



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**ENHANCING THE SOIL STRENGTH BY
ADDING MICRO FINE GROUND
GRANULATED BLAST FURNACE SLAG
(MFGGBS), RICE HUSK ASH (RHA) AND
SODIUM LIGNOSULFONATE**

A PROJECT REPORT

Submitted by

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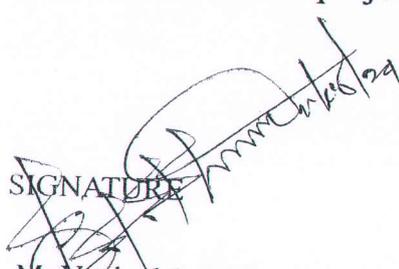
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Certified that this project report “Enhancing the Soil Strength by adding Micro Fine Ground Granulated Blast Furnace Slag (Mfggbs), Rice Husk Ash (Rha) and Sodium Lignosulfonate” is the Bonafide work of

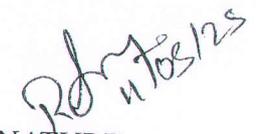
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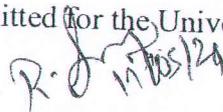
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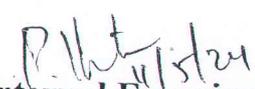

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ABSTRACT

Much of the country is covered in expansive soils. To improve the properties of soil, it is necessary to use locally available and potentially cost-effective waste material as a stabilizer. The purpose of this study is to determine whether utilizing SODIUM LIGNOSULFONATE (0.5%, 1%, and 1.5%), RICE, is feasible. MFGGBS (2%, 4%, and 6%) and RICE HUSK ASH (2%, 4%, and 6%) to enhance the soil's geotechnical qualities. Geotechnical, index, and environmental properties are the testing parameters. Compaction, consolidation, Atterberg's limits, and unconfined compressive strengths are examples of geotechnical qualities that have been used to investigate the effects of strength and swelling properties. The results show that unconfined compressive strengths rise as chemical percentage increases and that swelling percentage decreases as SODIUM LIGNOSULFONATE and RICE admixtures rise.

Keywords: Soil properties, admixtures, MFGGBS, Rice husk ash and soil experiments



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CHAPTER – 6

CONCLUSION:

The objective of the present study is to investigate the compaction characteristics and strength characteristics of clayey soil treated with) MFGGBS, Rice Husk Ash (2%, 4% & 6%) and Sodium Lignosulfonate (0.5%, 1% & 1.5%). This has been done to make the soil suitable for construction of structure on it or acting as suitable subgrade for construction of roads. Firstly, a series of Standard Proctor Tests has been done to determine the optimum moisture content and maximum dry density of untreated clayey soil and the clayey soil treated with MFGGBS, Rice Husk Ash (2%, 4% & 6%) and Sodium Lignosulfonate (0.5%, 1% & 1.5%). Then, a series of California Bearing Ratio tests has been conducted to determine the Direct Shear Test value of untreated clayey soil and the clayey soil treated with MFGGBS, Rice Husk Ash (2%, 4% & 6%) and Sodium Lignosulfonate (0.5%, 1% & 1.5%). The results of these tests have been analysis under the following headings.



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**SANITARY NAPKIN SUSTAINABLE DISPOSAL – A
CASE STUDY**

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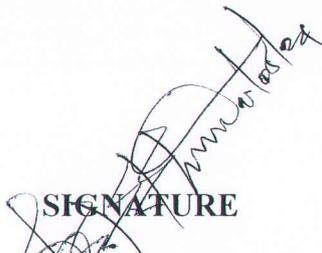


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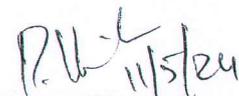

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ABSTRACT

The disposal of sanitary napkins poses significant environmental and health challenges. Traditional methods of disposal, such as landfilling or flushing, have proven to be ineffective and environmentally unsustainable. This project proposes the development and use of a specialized incinerator for sanitary napkins that is safe, eco-friendly, and efficient. The incinerator design features an electrically heated chamber that ensures complete combustion of napkins, reducing them to a small amount of ash. The system includes several safety features, such as automatic shut-off mechanisms and insulation to prevent burns, making it safe for public and home use. By providing a practical solution for the disposal of sanitary napkins, this project aims to reduce landfill waste and mitigate the environmental impact of menstrual product waste. In our study we conclude that nitrogen, potassium and phosphorus enrich after adding of sanitary napkins ash.



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5.3 CONCLUSION:

- In conclusion, the research and procedures conducted in this project highlight the critical importance of addressing the environmental impact of sanitary napkin disposal while simultaneously promoting sustainable recycling practices.
- Through the lens of "**Bridging Environmental Responsibility to Soil Health Revitalization,**" it is evident that innovative solutions are essential for mitigating the adverse effects on both the environment and human health.
- By advocating for the adoption of eco-friendly disposal methods and implementing recycling initiatives, we can significantly **reduce the burden on landfills and prevent harmful pollutants from leaching into the soil and water systems.** through this bioconversion processes, we can **enrich soil health and promote agricultural sustainability.**
- The journey towards bridging environmental responsibility to soil health revitalization is an ongoing process that demands dedication, perseverance, and collective action. Through our combined efforts, we can **build a healthier planet for current and future generations to thrive.**



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AN EXPERIMENTAL STUDY ON ECO-FRIENDLY FIBER REINFORCED CONCRETE BY USING SEASHELL ASH AND COCONUT PALM LEAF ASH



A PROJECT REPORT

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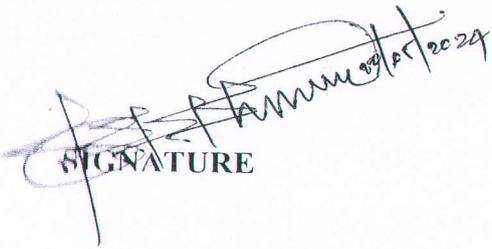
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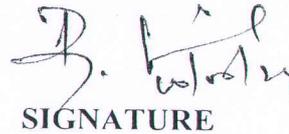
BONAFIDE CERTIFICATE

Certified that this project report "AN EXPERIMENTAL STUDY ON ECO-FRIENDLY FIBER REINFORCED CONCRETE BY USING SEASHELL ASH AND COCONUT PALM ASH" is the Bonafide work of JAYASEELAN J. (311820103305), LOGESHWARAN P. (311820103306), PRADEEP KUMAR K. (311820103310), PRIYATARSAN K. (311820103311) who carried out the project work under my supervision.



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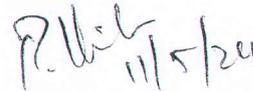
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INTERNAL EXAMINER



EXTERNAL EXAMINER



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ABSTRACT

This study investigates the potential of seashell powder and coconut palm leaf ash as partial replacement for cement in concrete production, aiming to enhance the sustainability of construction materials while assessing the impact on mechanical properties and durability. The utilization of these waste materials not only contributes to reducing the environmental footprint associated with cement production but also addresses waste management challenges. Seashell powder, derived from ground seashells, and coconut leaf ash, obtained from the incineration of coconut leaves, are explored as supplementary cementitious materials (SCMs) due to their pozzolanic properties. An experimental approach was adopted, where concrete mixes were prepared with varying replacement levels of cement by weight 5%, 10%, 15%, and 20% with either seashell powder, coconut leaf ash, or a combination of both. The mechanical properties, including compressive strength, tensile strength, and flexural strength, were evaluated at different curing periods (7, 28, and 56 days). The results indicated that concrete mixes containing up to 10% seashell powder or coconut leaf ash exhibited comparable or slightly enhanced mechanical properties relative to the control mix. However, higher replacement levels led to a reduction in strength, suggesting a threshold for the beneficial use of these materials. Their main role is to overcome plastic shrinkage and limit the formation of cracks in the concrete. As a result, they increase the durability and prolong the life of the element. Micro PPF can be an alternative to crack control meshes. They can be classified as a monofilament or fibrillated.



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CONCLUSION

- The M40 grade of concrete design mix has been achieved
- . Workability of concrete made using foundry sand observed to be increased slightly with replacement level.
- * The compressive strength M40 of concrete cube on replacing **SEASHELL ASH AND COCONUT PALM LEAF ASH 50%** was tested. And is 15% achieved. *
- Split tensile strength M40 of concrete cube on replacing **SEASHELL ASH AND COCONUT PALM LEAF ASH 50%** and was tested. And is 15% achieved. *
- The compressive strength M40 of mortar cube on replacing **SEASHELL ASH AND COCONUT PALM LEAF ASH 30%** and 50% was tested. And is 15% achieved. *
- Calcium, silica and hydrate (C-S-H) are bind together and give strength to the concrete. There is some non-activated calcium and hydrate (C-H) are present in this mix while adding **SEASHELL ASH AND COCONUT PALM LEAF ASH** the remaining non-activated content is activated and gives strength also increase
- Disposal problem of waste and environmental effect can be reduced through this.



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TEXTBOOKS:

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

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

EN8592**WASTEWATER ENGINEERING****L T P C
3 0 0 3****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.

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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.

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

CE8611

HIGHWAY ENGINEERING LABORATORY

OBJECTIVE :

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

EXCERCISES :

I TEST ON AGGREGATES

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



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COURSE OBJECTIVES:

- To analyse the physical, chemical and biological characteristics of water and wastewater
- To quantify the dosage requirement for coagulation process
- To study the growth of micro-organism and its quantification
- To quantify the sludge

Course Content:

1. Physical, Chemical and biological characteristics of water and wastewater
2. Jar test
3. Chlorine demand and residual test
4. Growth of micro-organism

COURSE OUTCOME:

On the completion of the course, the students will be able to:

- Quantify the pollutant concentration in water and wastewater
- Suggest the type of treatment required and amount of dosage required for the treatment
- Examine the conditions for the growth of micro-organisms

TOTAL: 60 PERIODS**List of Experiments:**

1. Determination of pH, Turbidity and conductivity
2. Determination of Hardness
3. Determination of Alkalinity and Acidity
4. Determination of Chlorides
5. Determination of Phosphates and Sulphates
6. Determination of iron and fluoride
7. Determination of Optimum Coagulant dosage
8. Determination of residual chlorine and available chlorine in bleaching powder
9. Determination of Oil, and Grease
10. Determination of suspended, settleable, volatile and fixed solids
11. Determination Dissolved Oxygen and BOD for the given sample
12. Determination of COD for given sample
13. Determination of SVI of Biological sludge and microscopic examination
14. Determination of MPN index of given water sample

(During IV semester Summer Vacation 2 weeks)

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

OUTCOMES:

Students will be able to understand

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

TEXTBOOKS:

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

REFERENCES:

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

CE8491

SOIL MECHANICS

LTPC
3003

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. – \sqrt{t} and $\log t$ methods. e-log p relationship consolidation settlement N-C clays – O.C clays – Computation.



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UNIT IV SHEAR STRENGTH**9**

Shear strength of cohesive and cohesion less soils – Mohr-Coulomb failure theory – shear strength - 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 $c - \phi$ 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 International Publication, 3rd Edition, 2016.
4. Punmia, B.C., "Soil Mechanics and Foundations", Laxmi Publications Pvt. Ltd. New Delhi, 16th Edition, 2017.

REFERENCES:

1. McCarthy, D.F., "Essentials of Soil Mechanics and Foundations: Basic Geotechnics". Prentice-Hall, 2006.
2. Coduto, D.P., "Geotechnical Engineering – Principles and Practices", Prentice Hall of India Pvt. 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 Limited Delhi, 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.
7. Venkatramiah.C., "Geotechnical Engineering", New Age International Pvt. Ltd., New Delhi, 2017

CE8481

STRENGTH OF MATERIALS LABORATORY

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0042

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OBJECTIVE:

- To expose the students to the testing of different materials under the action of various forces and determination of their characteristics experimentally.

LIST OF EXPERIMENTS

1. Tension test on steel rod
2. Compression test on wood
3. Double shear test on metal
4. Torsion test on mild steel rod

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

REFERENCES:

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

CE8591

FOUNDATION ENGINEERING



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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 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.



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REFERENCES:

1. Braja M Das, "Principles of Foundation Engineering" (Eighth edition), Cengage Learning 2014.
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.
4. IS Code 6403 : 1981 (Reaffirmed 1997) "Bearing capacity of shallow foundation", Bureau of 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 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.
17. IS Code 14458 (Part 3) : 1998 "Retaining Wall for Hill Area – Guidelines, Construction Of Dry Stone Walls" , Bureau of Indian Standards, New Delhi.

CE8511

SOIL MECHANICS LABORATORY

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OBJECTIVE:

- To develop skills to test the soils for their index and engineering properties and to characterise the soil based on their properties.

EXERCISES:

1. DETERMINATION OF INDEX PROPERTIES

- a. Specific gravity of soil solids
- b. Grain size distribution – Sieve analysis
- c. Grain size distribution - Hydrometer analysis
- d. Liquid limit and Plastic limit tests
- e. Shrinkage limit and Differential free swell tests

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COURSES THAT INCLUDE EXPERIMENTL LEARNING THROUGH PROJECT WORK/ FIELD WORK / INTERNSHIP DURING 2023-2024

S.No	Reg.No	Name of the Students	Year of study	Company name	Sub code & Name related to Internship
1	311820103307	Mr.M . Mohamed Jasim	2023-24	Star Builder & Associates	CE8701-Estimation Costing & Valuation Engineering OME754-Industrial safety

PRINCIPAL
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34, Rajiv Gandhi Road (OMR), Siruseri, IT Park
Chennai-603 103.



MOHAMED SATHAK A.J. COLLEGE OF ENGINEERING

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

No:34, Rajiv Gandhi Road (OMR), IT Highway, Siruseri IT Park, Chennai - 603 103.
044-2747 0024 99400 04500 principal@msajce-edu.in www.msajce-edu.in



BONAFIDE CERTIFICATE

Ref. No.: MSAJCE / BC / 63 / 2023-24

Date: 02.09.2023

This is to certify that Mr.M.Mohamed Jassim (Reg No.-311820103307), S/o. Mr. Mohamed Salih is a bonafide student of this college studying in IV year, B.E –Civil Engineering course for the academic year 2023 – 2024.

This certificate is issued to enable him to apply for Internship.

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1.3.2 (Internship)
3.5.1

Er.M.Kadar Ibrahim.,BE.STAAD PRO.,

Mob: +91 9080 94 9887

Star Builders & Associates

3/843-1, Behind SBI, Bharathi Nagar, Paramakudi - 623 707.

E-mail: kadarbe@yahoo.com

Date: 24.10.2023

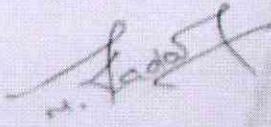
INTERNSHIP TRAINING CERTIFICATE

This is certify that **Mr.M.Mohamed Jassim** (Reg. no: 311820103307) 4th year student of Civil Engineering Department in Mohammed Sathak AJ College of Engineering had a training of 50 days (05.09.2023 - 24.10.2023) in our Villa Projects at Paramakudi Region, Ramnad Dist.

He completed this training on Civil Construction i.e. Site supervising, Labour Monitoring and Assisting to Office works. During this Period his Performance and Attendance was Good.

We wish him all Success and well Place in Life.

For Star Builders & Associates



Er. M. Kadar Ibrahim, B.E., STAAD PRO.,
Licensed Building Surveyor,
L.No. 631/2013/P1
STAR BUILDERS & ASSOCIATES
3217, Hospital Road, Paramakudi-623 707.



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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

OUTCOMES:**TOTAL: 45 PERIODS**

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:

- B.N Dutta 'Estimating and Costing in Civil Engineering', UBS Publishers & Distributors (P) Ltd, 2010.
- B.S.Patil, 'Civil Engineering Contracts and Estimates', University Press, 2006
- D.N. Banerjee, 'Principles and Practices of Valuation', V Edition, Eastern Law House, SIPCOT - IT Highway Egattur, Chennai - 603103.


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REFERENCES:

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

OBJECTIVE :

- To impart knowledge on safety engineering fundamentals and safety management practices.

UNIT I	INTRODUCTION	9
Evolution of modern safety concepts – Fire prevention – Mechanical hazards – Boilers, Pressure vessels, Electrical Exposure.		
UNIT II	CHEMICAL HAZARDS	9
Chemical exposure – Toxic materials – Ionizing Radiation and Non-ionizing Radiation - Industrial Hygiene – Industrial Toxicology.		
UNIT III	ENVIRONMENTAL CONTROL	9
Industrial Health Hazards – Environmental Control – Industrial Noise - Noise measuring instruments, Control of Noise, Vibration, - Personal Protection.		
UNIT IV	HAZARD ANALYSIS	9
System Safety Analysis –Techniques – Fault Tree Analysis (FTA), Failure Modes and Effects Analysis (FMEA), HAZOP analysis and Risk Assessment		
UNIT V	SAFETY REGULATIONS	9
Explosions – Disaster management – catastrophe control, hazard control, Safety education and training - Factories Act, Safety regulations Product safety – case studies.		

TOTAL : 45 PERIODS**OUTCOMES:**

- Students must be able to identify and prevent chemical, environmental mechanical, fire hazard through analysis and apply proper safety techniques on safety engineering and management.

TEXT BOOK:

- John V.Grimaldi, “Safety Management”, AITB S Publishers, 2003.

REFERENCES:

- Safety Manual, “EDEL Engineering Consultancy”, 2000.
- David L.Goetsch, “Occupational Safety and Health for Technologists”, 5th Edition, Engineers and Managers, Pearson Education Ltd., 2005.


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