



MOHAMED SATHAK A J COLLEGE OF ENGINEERING

Sponsored by Mohamed Sathak Trust

(Approved by AICTE, New Delhi and Affiliated to Anna University, Chennai)

Siruseri IT Park, Egattur, Chennai 603 103

BE - CIVIL ENGINEERING

S.No	Name of the course that include experiential learning through Project work/ Internship (2018 - 2019)
1	CE6401 - Construction Materials
2	CE6002 - Concrete Technology
3	CE6006 - Traffic Engineering and Management
4	CE6503 - Environmental Engineering I
5	CE6405 - Soil Mechanics
6	CE6505 - Design of Reinforced Concrete Elements
7	CE6402 - Strength of Materials
8	EN6501 - Municipal Solid Waste Management
9	CE6506 - Construction Techniques, Equipment and Practice
10	CE6504 - Highway Engineering
11	GE6351 - Environmental Science and Engineering

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

OBJECTIVES:

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

UNIT I STONES – BRICKS – CONCRETE BLOCKS 9

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

UNIT II LIME – CEMENT – AGGREGATES – MORTAR 9

Lime – Preparation of lime mortar – Cement – Ingredients – Manufacturing process – Types and Grades – Properties of cement and Cement mortar – Hydration – Compressive strength – Tensile strength – Fineness– Soundness and consistency – Setting time – Industrial byproducts – Fly ash – Aggregates – Natural stone aggregates – Crushing strength – Impact strength – Flakiness Index – Elongation Index – Abrasion Resistance – Grading – Sand Bulking.

UNIT III CONCRETE 9

Concrete – Ingredients – Manufacturing Process – Batching plants – RMC – Properties of fresh concrete – Slump – Flow and compaction Factor – Properties of hardened concrete – Compressive, Tensile and shear strength – Modulus of rupture – Tests – Mix specification – Mix proportioning – BIS method – High Strength Concrete and HPC – Self compacting Concrete – Other types of Concrete – Durability of Concrete.

UNIT IV TIMBER AND OTHER MATERIALS 9

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

UNIT V MODERN MATERIALS 9

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

TOTAL: 45 PERIODS**OUTCOMES:**

On completion of this course the students will be able to

- compare the properties of most common and advanced building materials.
- understand the typical and potential applications of these materials
- understand the relationship between material properties and structural form
- understand the importance of experimental verification of material properties.

TEXT BOOKS:

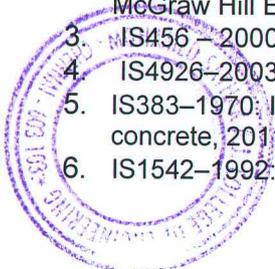
- Varghese.P.C, "Building Materials", PHI Learning Pvt. Ltd, New Delhi, 2012.
- Rajput. R.K., "Engineering Materials", S. Chand and Company Ltd., 2008.
- Shetty.M.S., "Concrete Technology (Theory and Practice)", S. Chand and Company Ltd.,2008.
- Gambhir.M.L., "Concrete Technology", 3rd Edition, Tata McGraw-Hill Education, 2004
- Duggal.S.K., "Building Materials", 4th Edition, New Age International ,2008.

REFERENCES:

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

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OBJECTIVES:

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

UNIT I CONSTITUENT MATERIALS 9

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

UNIT II CHEMICAL AND MINERAL ADMIXTURES 9

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

UNIT III PROPORTIONING OF CONCRETE MIX 9

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

UNIT IV FRESH AND HARDENED PROPERTIES OF CONCRETE 9

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

UNIT V SPECIAL CONCRETES 9

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

TOTAL : 45 PERIODS

OUTCOMES:

- The student will possess the knowledge on properties of materials required for concrete tests on those materials and design procedures for making conventional and special concretes.

TEXTBOOKS:

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

REFERENCES:

- Santhakumar,A.R; "Concrete Technology", Oxford University Press, New Delhi, 2007
- Neville, A.M; "Properties of Concrete", Pitman Publishing Limited, London,1995
- Gambir, M.L; "Concrete Technology", 3rd Edition, Tata McGraw Hill Publishing Co Ltd, New Delhi, 2007
- IS10262-1982 Recommended Guidelines for Concrete Mix Design, Bureau of Indian Standards, New Delhi, 1998



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OBJECTIVES:

- To give an overview of Traffic engineering, traffic regulation, management and traffic safety with integrated approach in traffic planning as well.

UNIT I TRAFFIC PLANNING AND CHARACTERISTICS 9

Road Characteristics – Road user characteristics – PIEV theory – Vehicle – Performance characteristics – Fundamentals of Traffic Flow – Urban Traffic problems in India – Integrated planning of town ,country ,regional and all urban infrastructure – Towards Sustainable approach.– land use & transport and modal integration.

UNIT II TRAFFIC SURVEYS 10

Traffic Surveys – Speed, journey time and delay surveys – Vehicles Volume Survey including nonmotorized transports – Methods and interpretation – Origin Destination Survey – Methods and presentation – Parking Survey – Accident analyses -Methods, interpretation and presentation – Statistical applications in traffic studies and traffic forecasting – Level of service – Concept, applications and significance.

UNIT III TRAFFIC DESIGN AND VISUAL AIDS 10

Intersection Design - channelization, Rotary intersection design – Signal design – Coordination of signals — Grade separation - Traffic signs including VMS and road markings – Significant roles of traffic control personnel - Networking pedestrian facilities & cycle tracks.

UNIT IV TRAFFIC SAFETY AND ENVIRONMENT 8

Road accidents – Causes, effect, prevention, and cost – Street lighting – Traffic and environment hazards – Air and Noise Pollution, causes, abatement measures – Promotion and integration of public transportation – Promotion of non-motorized transport.

UNIT V TRAFFIC MANAGEMENT 8

Area Traffic Management System - Traffic System Management (TSM) with IRC standards – - Traffic Regulatory Measures-Travel Demand Management (TDM) – Direct and indirect methods – Congestion and parking pricing – All segregation methods- Coordination among different agencies – Intelligent Transport System for traffic management, enforcement and education.

TOTAL: 45 PERIODS**OUTCOMES:**

On completing this course, the Students will be able to

- Analyse traffic problems and plan for traffic systems various uses
- Design Channels, Intersections, signals and parking arrangements
- Develop Traffic management Systems

TEXTBOOKS:

- Kadiyali.L.R. "TrafficEngineering andTransportPlanning", KhannaPublishers, Delhi, 2013
- Indian Roads Congress (IRC) Specifications: Guidelines and Special Publications on Traffic Planning and Management.
- Salter. R.I and Hounsell N.B, "Highway Traffic Analysis and design", Macmillan Press Ltd.1996.



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 MGHANED BATHAK A.J. COLLEGE OF ENGINEERING
 34, Rajiv Gandhi Road (OMR), Siroseri, IT Park
 Chennai-603 103.

REFERENCES:

1. Fred L. Mannering, Scott S. Washburn and Walter P. Kilaeski, Principles of Highway Engineering and Traffic Analysis, Wiley India Pvt. Ltd., New Delhi, 2011
2. Garber and Hoel, "Principles of Traffic and Highway Engineering", CENGAGE Learning, New Delhi, 2010
3. SP:43-1994, IRC Specification, "Guidelines on Low-cost Traffic Management Techniques" for Urban Areas, 1994
4. John E Tyworth, "Traffic Management Planning, Operations and control", Addison Wesley Publishing Company, 1996
5. Hobbs.F.D. "Traffic Planning and Engineering", University of Brimingham, Peragamon Press Ltd, 2005
6. Taylor MAP and Young W, "Traffic Analysis – New Technology and New Solutions", Hargreen Publishing Company, 1998.



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



OBJECTIVES:

To study the nature and facts about environment.

- To finding and implementing scientific, technological, economic and political solutions to environmental problems.
- To study the interrelationship between living organism and environment.
- To appreciate the importance of environment by assessing its impact on the human world; envision the surrounding environment, its functions and its value.
- To study the dynamic processes and understand the features of the earth's interior and surface.
- To study the integrated themes and biodiversity, natural resources, pollution control and waste management.

UNIT I ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY**12**

Definition, scope and importance of Risk and hazards; Chemical hazards, Physical hazards, Biological hazards in the environment – concept of an ecosystem – structure and function of an ecosystem – producers, consumers and decomposers- Oxygen cycle and Nitrogen cycle – energy flow in the ecosystem – ecological succession processes – Introduction, types, characteristic features, structure and function of the (a) forest ecosystem (b) grassland ecosystem (c) desert ecosystem (d) aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) – Introduction to biodiversity definition: genetic, species and ecosystem diversity – biogeographical

classification of India – value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values – Biodiversity at global, national and local levels – India as a mega-diversity nation – hot-spots of biodiversity – threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – endangered and endemic species of India – conservation of biodiversity: In-situ and ex-situ conservation of biodiversity.

Field study of common plants, insects, birds

Field study of simple ecosystems – pond, river, hill slopes, etc.

UNIT II ENVIRONMENTAL POLLUTION**10**

Definition – causes, effects and control measures of: (a) Air pollution (Atmospheric chemistry- Chemical composition of the atmosphere; Chemical and photochemical reactions in the atmosphere - formation of smog, PAN, acid rain, oxygen and ozone chemistry - Mitigation procedures- Control of particulate and gaseous emission, Control of SO₂, NO_x, CO and HC) (b) Water pollution : Physical and chemical properties of terrestrial and marine water and their environmental significance; Water quality parameters – physical, chemical and biological; absorption of heavy metals - Water treatment processes. (c) Soil pollution - soil waste management: causes, effects and control measures of municipal solid wastes – (d) Marine pollution (e) Noise pollution (f) Thermal pollution (g) Nuclear hazards–role of an individual in prevention of pollution – pollution case studies –

Field study of local polluted site – Urban / Rural / Industrial / Agricultural.

UNIT III NATURAL RESOURCES**10**

Forest resources: Use and over-exploitation, deforestation, case studies- timber extraction, mining, dams and their effects on forests and tribal people – Water resources: Use and overutilization of surface and ground water, dams-benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies – Energy resources: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources, Energy Conversion processes – Biogas – production and uses, anaerobic digestion; case studies – Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification – role of an individual in conservation of natural resources – Equitable use of resources for sustainable lifestyles. Introduction to Environmental Biochemistry: Proteins –

Biochemical degradation of pollutants, Bioconversion of pollutants.

Field study of local area to document environmental assets – river / forest / grassland / hill / mountain.

UNIT IV SOCIAL ISSUES AND THE ENVIRONMENT

7

From unsustainable to sustainable development – urban problems related to energy – water conservation, rain water harvesting, watershed management – resettlement and rehabilitation of people; its problems and concerns, case studies – role of non-governmental organization- environmental ethics: Issues and possible solutions – 12 Principles of green chemistry- nuclear accidents and holocaust, case studies. – wasteland reclamation – consumerism and waste products – environment production act – Air act – Water act – Wildlife protection act – Forest conservation act –The Biomedical Waste (Management and Handling) Rules; 1998 and amendments- scheme of labeling of environmentally friendly products (Ecomark). enforcement machinery involved in environmental legislation- central and state pollution control boards- disaster management: floods, earthquake, cyclone and landslides.
Public awareness.

UNIT V HUMAN POPULATION AND THE ENVIRONMENT

6

Population growth, variation among nations – population explosion – family welfare programme – environment and human health – human rights – value education – HIV / AIDS – women and child welfare –Environmental impact analysis (EIA)- -GIS-remote sensing-role of information technology in environment and human health – Case studies.

TOTAL : 45 PERIODS

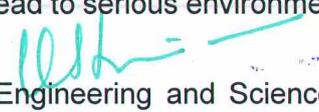
OUTCOMES:

Environmental Pollution or problems cannot be solved by mere laws. Public participation is an important aspect which serves the environmental Protection. One will obtain knowledge on the following after completing the course.

- Public awareness of environmental is at infant stage.
- Ignorance and incomplete knowledge has lead to misconceptions
- Development and improvement in std. of living has lead to serious environmental disasters

TEXTBOOKS :

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


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REFERENCES :

1. Trivedi R.K. 'Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards', Vol. I and II, Enviro Media.
2. Cunningham W.P.Cooper., T.H. Gorhani, 'Environmental Encyclopedia', Jaico Publishing House, Mumbai, 2001.
3. Dharmendra S. Sengar, 'Environmental law', Prentice hall of India PVT LTD, New Delhi, 2007.
4. Rajagopalan R, 'Environmental Studies - From Crisis to Cure', Oxford University Press, 2005



OBJECTIVES:

- 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 CONCRETE TECHNOLOGY 9

Cements – Grade of cements - concrete chemicals and Applications – Grade of concrete - manufacturing of concrete – Batching – mixing – transporting – placing – compaction of concrete – curing and finishing - Testing of fresh and hardened concrete – quality of concrete – Extreme Weather Concreting - Ready Mix Concrete -, Non-destructive testing.

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 loaders, earth movers – Equipment for foundation and pile driving. Equipment for compaction, batching and mixing and concreting - Equipment for material handling and erection of structures - Equipment for dredging, trenching, tunneling,

TOTAL: 45 PERIODS**OUTCOMES:**

- Students completing the course will have understanding of different construction techniques, practices and equipments. They will be able to plan the requirements for substructure and superstructure a construction.

TEXTBOOKS :

- Peurifoy, R.L., Ledbetter, W.B. and Schexnayder, C., "Construction Planning, Equipment and Methods", 5th Edition, McGraw Hill, Singapore, 1995.
- Arora S.P. and Bindra S.P., "Building Construction, Planning Techniques and Method of Construction", Dhanpat Rai and Sons, 1997.
- Varghese, P.C. "Building construction", Prentice Hall of India Pvt. Ltd, New Delhi, 2007.
- Shetty, M.S, "Concrete Technology, Theory and Practice", S. Chand and Company Ltd, New Delhi, 2008.

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. Dr. Mahesh Varma, "Construction Equipment and its Planning and Application", Metropolitan Book Company, New Delhi, 1983.
5. Gambhir, M.L, "Concrete Technology", Tata McGraw Hill Publishing Company Ltd, New Delhi, 2004



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OBJECTIVES:

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

UNIT I ENERGY PRINCIPLES

9

Strain energy and strain energy density – strain energy due to axial load, shear, flexure and torsion – Castigliano's theorems – Maxwell's reciprocal theorems - Principle of virtual work – application of energy theorems for computing deflections in beams and trusses - Williot Mohr's Diagram.

UNIT II INDETERMINATE BEAMS

9

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

UNIT III COLUMNS AND CYLINDER

9

Euler's theory of long columns – critical loads for prismatic columns with different end conditions; Rankine-Gordon formula for eccentrically loaded columns – Eccentrically loaded short columns – middle third rule – core section – Thick cylinders – Compound cylinders.

UNIT IV STATE OF STRESS IN THREE DIMENSIONS

9

Determination of principal stresses and principal planes – Volumetric strain – Theories of failure – Principal stress - Principal strain – shear stress – Strain energy and distortion energy theories – application in analysis of stress, load carrying capacity.

UNIT V ADVANCED TOPICS IN BENDING OF BEAMS

9

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

TOTAL (L:45+T:15): 60
PERIODS

OUTCOMES:

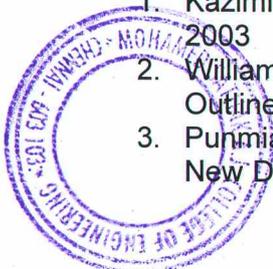
- students will have thorough knowledge in analysis of indeterminate beams and use of energy method for estimating the slope and deflections of beams and trusses.
- they will be in a position to assess the behaviour of columns, beams and failure of materials.

TEXT BOOKS:

1. Rajput R.K. "Strength of Materials (Mechanics of Solids)", S.Chand & company Ltd., New Delhi, 2010.
2. Egor P Popov, "Engineering Mechanics of Solids", 2nd edition, PHI Learning Pvt. Ltd., New Delhi, 2012

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. Punmia B.C."Theory of Structures" (SMTS) Vol 1&II, Laxmi Publishing Pvt Ltd, New Delhi 2004.



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 METHODS OF DESIGN OF CONCRETE STRUCTURES 9

Concept of Elastic method, ultimate load method and limit state method – Advantages of Limit State Method over other methods – Design codes and specification – Limit State philosophy as detailed in IS code – Design of beams and slabs by working stress method.

UNIT II LIMIT STATE DESIGN FOR FLEXURE 9

Analysis and design of singly and doubly reinforced rectangular and flanged beams - Analysis and design of one way, two way and continuous slabs subjected to uniformly distributed load for various boundary conditions.

UNIT III LIMIT STATE DESIGN FOR BOND, ANCHORAGE SHEAR & TORSION 9

Behaviour of RC members in bond and Anchorage - Design requirements as per current code - Behaviour of RC beams in shear and torsion - Design of RC members for combined bending shear and torsion.

UNIT IV LIMIT STATE DESIGN OF COLUMNS 9

Types of columns – Braced and unbraced columns – Design of short Rectangular and circular columns for axial, uniaxial and biaxial bending.

UNIT V LIMIT STATE DESIGN OF FOOTING 9

Design of wall footing – Design of axially and eccentrically loaded rectangular pad and sloped footings – Design of combined rectangular footing for two columns only.

TOTAL: 45 PERIODS**OUTCOMES:**

- The student shall be in a position to design the basic elements of reinforced concrete structures.

TEXTBOOKS:

- Varghese, P.C., "Limit State Design of Reinforced Concrete", Prentice Hall of India, Pvt. Ltd., New Delhi, 2002.
- Gambhir.M.L., "Fundamentals of Reinforced Concrete Design", Prentice Hall of India Private Limited, New Delhi, 2006.
- Subramanian,N., "Design of Reinforced Concrete Structures", Oxford University Press, New Delhi, 2013.

REFERENCES:

- Jain, A.K., "Limit State Design of RC Structures", Nemchand Publications, Roorkee, 1998
- Sinha, S.N., "Reinforced Concrete Design", Tata McGraw Hill Publishing Company Ltd., New Delhi, 2002
- Unnikrishna Pillai, S., Devdas Menon, "Reinforced Concrete Design", Tata McGraw Hill Publishing Company Ltd., 2009
- Punmia.B.C., Ashok Kumar Jain, Arun Kumar Jain, "Limit State Design of Reinforced Concrete", Laxmi Publication Pvt. Ltd., New Delhi, 2007.
- Bandyopadhyay. J.N., "Design of Concrete Structures", Prentice Hall of India Pvt. Ltd., New Delhi, 2008.
- IS456:2000, Code of practice for Plain and Reinforced Concrete, Bureau of Indian Standards, New Delhi, 2000
- SP16, IS456:1978 "Design Aids for Reinforced Concrete to Bureau of Indian Standards, New Delhi, 1999



OBJECTIVES:

- 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

Significance of highway planning – Modal limitations towards sustainability - History of road development in India – Classification of highways – Locations and functions – Factors influencing highway alignment – Soil suitability analysis - Road ecology - Engineering surveys for alignment, objectives, conventional and modern methods.

UNIT II GEOMETRIC DESIGN OF HIGHWAYS

Typical cross sections of Urban and Rural roads — 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

Design principles – pavement components and their role - Design practice for flexible and rigid Pavements (IRC methods only) - Embankments .

UNIT IV HIGHWAY CONSTRUCTION MATERIALS AND PRACTICE

Highway construction materials, properties, testing methods – CBR Test for subgrade - tests on aggregate & bitumen – 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

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

TOTAL: 45 PERIODS

OUTCOMES:

- The students completing this course would have acquired knowledge on planning, design, construction and maintenance of highways as per IRC standards and other methods.

TEXTBOOKS:

- Khanna.S. K., Justo.C.E.G and Veeraragavan A. "Highway Engineering", NemchandPublishers, 2014.
- Subramanian K.P., "Highways, Railways, Airport and Harbour Engineering", ScitechPublications (India), Chennai, 2010
- Indian Road Congress (IRC), Guidelines and Special Publications of Planning andDesign.

REFERENCES:

- Kadiyali.L.R. "Principles and Practice of Highway Engineering", Khanna TechnicalPublications, 8th edition Delhi, 2013.
- Yang H. Huang, "Pavement Analysis and Design", Pearson Education Inc, NinthImpression, South Asia, 2012



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 MOHAMMED SAIFULLAH KHAN COLLEGE OF ENGINEERING
 34, Rajahmundry Road (OMR), Sholing,
 Chennai-603 103.

OBJECTIVES:

- To make the students conversant with principles of water supply, treatment and distribution

UNIT I PLANNING FOR WATER SUPPLY SYSTEM

8

Public water supply system -Planning - Objectives -Design period - Population forecasting -Water demand -Sources of water and their characteristics -Surface and Groundwater- Impounding Reservoir Well hydraulics -Development and selection of source - Water quality - Characterization and standards- Impact of climate change.

UNIT II CONVEYANCE SYSTEM

7

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

UNIT III WATER TREATMENT

12

Objectives - Unit operations and processes - Principles, functions design and drawing of Chemical feeding, Flash mixers, flocculators, sedimentation tanks and sand filters - Disinfection- Residue Management - Construction and Operation & Maintenance aspects of Water Treatment Plants.

UNIT IV ADVANCED WATER TREATMENT

9

Principles and functions of Aeration - Iron and manganese removal, Defluoridation and demineralization -Water softening - Desalination - Membrane Systems - Recent advances.

UNIT V WATER DISTRIBUTION AND SUPPLY TO BUILDINGS

9

Requirements of water distribution -Components -Service reservoirs -Functions and drawings - Network design -Economics -Computer applications -Analysis of distribution networks - Appurtenances -operation and maintenance -Leak detection, Methods. Principles of design of water supply in buildings -House service connection -Fixtures and fittings -Systems of plumbing and drawings of 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
- 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 selection criteria

TEXTBOOKS:

- Garg, S.K., "Environmental Engineering", Vol.1 Khanna Publishers, New Delhi, 2005.
- Modi, P.N. "Water Supply Engineering", Vol. I Standard Book House, New Delhi, 2005.
- Punmia, B.C., Ashok K Jain and Arun K Jain, "Water Supply Engineering", Laxmi Publications Pvt. Ltd., New Delhi, 2005

REFERENCES:

- Government of India, "Manual on Water Supply and Treatment", CPHEEO, Ministry of Urban Development, New Delhi, 2003
- Syed R. Qasim and Edward M. Motley Guang Zhu, "Water Works Engineering Planning", Design and Operation, Prentice Hall of India Private Limited, New Delhi, 2006.

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MOTILAL SATHYAN

OMRI, Siruseri, Haryana

150012



OBJECTIVES:

- To make the students conversant with different aspects of the types, sources, generation, storage, collection, transport, processing and disposal of municipal solid waste.

UNIT I SOURCES AND TYPES 8

Sources and types of municipal solid wastes-waste generation rates-factors affecting generation, characteristics-methods of sampling and characterization; Effects of improper disposal of solid wastes-Public health and environmental effects. Elements of solid waste management –Social and Financial aspects – Municipal solid waste (M&H) rules – integrated management-Public awareness; Role of NGO's.

UNIT II ON-SITE STORAGE AND PROCESSING 8

On-site storage methods – Effect of storage, materials used for containers – segregation of solid wastes – Public health and economic aspects of open storage – waste segregation and storage – case studies under Indian conditions – source reduction of waste – Reduction, Reuse and Recycling.

UNIT III COLLECTION AND TRANSFER 8

Methods of Residential and commercial waste collection – Collection vehicles – Manpower- Collection routes – Analysis of collection systems; Transfer stations – Selection of location, operation & maintenance; options under Indian conditions – Field problems- solving.

UNIT IV OFF-SITE PROCESSING 12

Objectives of waste processing – Physical Processing techniques and Equipments; Resource recovery from solid waste composting and biomethanation; Thermal processing options – case studies under Indian conditions.

UNIT V DISPOSAL 9

Land disposal of solid waste; Sanitary landfills – site selection, design and operation of sanitary landfills – Landfill liners – Management of leachate and landfill gas- Landfill bioreactor- Dumpsite Rehabilitation

TOTAL: 45 PERIODS**OUTCOMES:**

The students completing the course will have

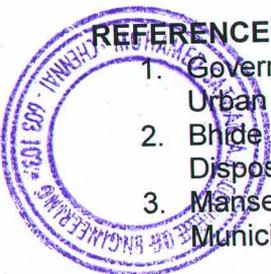
- an understanding of the nature and characteristics of municipal solid wastes and the regulatory requirements regarding municipal solid waste management
- ability to plan waste minimisation and design storage, collection, transport, processing and disposal of municipal solid waste

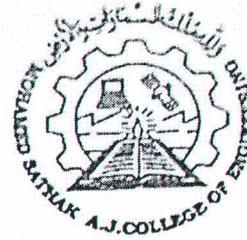
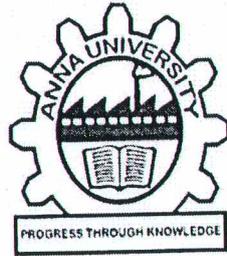
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**REDUCTION OF WATER PERMEABILITY
USING CRYSTALLISATION TECHNOLOGY**

Submitted by

P. ASWIN BALAN	311815103011
F. FAWAZ AHAMED	311815103016
A.MARY CHRISTINA SUMITHA RAJ	311815103029
H. MD ZUBAIRULLAH	311815103030

in partial fulfillment for the award of the degree

of

BACHELOR OF ENGINEERING

IN

CIVIL ENGINEERING

MOHAMED SATHAK A.J. COLLEGE OF ENGINEERING

PRINCIPAL
MOHAMED SATHAK A.J. COLLEGE OF ENGINEERING
34, P. Raju Street, (Opp. IIT), Siruseri, IT Park
Chennai-603 103.

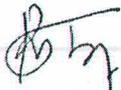
ANNA UNIVERSITY, CHENNAI – 600 025

APRIL-2019



BONAFIDE CERTIFICATE

Certified that this project report, "REDUCTION OF WATER PERMEABILITY IN CONCRETE USING CRYSTALLISATION TECHNOLOGY" is the bonafide work of "P.ASWIN BALAN (311815103011), F. FAWAZ AHAMED (311815103016), A. MARY CHRISTINA SUMITHA RAJ (311815103029), H.MD ZUBAIRULLAH (311815103030)," who carried out the project work under my supervision.



HEAD OF THE DEPARTMENT
Mr. P. DHARMARAJ, M.E.,
ASSISTANT PROFESSOR,
Department of Civil Engineering,
Mohammed Sathak A. J College of
Engineering, Egattur,
Chennai - 603103



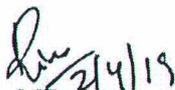
SUPERVISOR,
Mr. B. RIZHA UR RAHMAN, M.E.,
ASSISTANT PROFESSOR,
Department of Civil Engineering,
Mohammed Sathak A. J College of
Engineering, Egattur,
Chennai - 603103



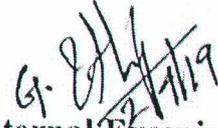
PRINCIPAL
MOHAMED SATHAK A.J.COLLEGE OF ENGINEERING
34, Rajiv Gandhi Road (GMR), Siruseri, IT Park
Chennai-603 103.

Submitted for the project viva voce examination held on

2/4/2019



Internal Examiner



External Examiner

ABSTRACT

A new water based crystallisation technology to minimize the water-related problems of concrete is presented in this study. This technology is dependent on the formation of sodium acetate and ammonium sulphate crystals inside the pores of the concrete. Results have indicated a significant reduction in water permeability, as a result of concrete treatment with this solution after full curing. Results have also indicated that an optimum addition of these salts provides best minimization of water penetration into concrete without altering the physical and performance properties of the concrete.



PRINCIPAL
MOHAMED BATHAK A.J. COLLEGE OF ENGINEERING
34, Rajiv Gandhi Road (OMR), Siruseri, IT Park
Chennai-603 103.



CONCLUSION

This study presents new technology for minimizing water related problems. This technology is based on Crystallization where crystal salts are dissolved and added in concrete. It is believed that the crystals of these salts grow relatively fast and therefore minimizing pore volumes inside concrete.

An optimum concentration of Sodium Acetate added to 20%wt of water content provides best minimization of water penetration into concrete without altering the physical properties and performance of concrete.

An optimum concentration of Ammonium Sulphate added to concrete provides greater compressive strength in concrete cubes without altering the physical properties and performance of concrete.

The technology is also believed to be cost effective when compared with short service life barrier systems. It also becomes an integral part of concrete substrate preventing water penetration from all phases of concrete surfaces. This technology is expected to increase service life of concrete.



PRINCIPAL
MOHAMED BATHAK A.J. COLLEGE OF ENGINEERING
34, Rajiv Gandhi Road (OMR), Sinsert, IT Park
Chennai-600 103.



AN EXPERIMENTAL STUDY ON THE PARTIAL
REPLACEMENT OF COARSE AGGREGATE
WITH E-WASTE & CERAMIC TILE WASTE

A PROJECT REPORT

Submitted by

P. CHANDRASEKAR

311815103012

A. FATIMA SHEHNAAZ

311815103015

H. MOHAMED ASFAR SALIH

311815103034

A. AMEEN UL ALTHAF

311815103301

in partial fulfillment for the award of the degree

of

BACHELOR OF ENGINEERING

IN

CIVIL ENGINEERING

MOHAMED SATHAK A.J. COLLEGE OF ENGINEERING
PRINCIPAL
54, Rajiv Gandhi Road (OER), Siruseri, IT Park
Chennai-603 103.

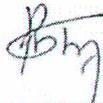
ANNA UNIVERSITY: CHENNAI – 600 025

APRIL-2019



BONAFIDE CERTIFICATE

Certified that this project report, "AN EXPERIMENTAL STUDY ON PARTIAL REPLACEMENT OF COARSE AGGREGATE WITH E-WASTE & CERAMIC TILE WASTE" is the bonafide work of "P. CHANDRASEKAR (311815103012), A. FATIMA SHEHNAAZ(311815103015), H.MOHAMED ASFAR SALIH (311815103034) A. AMEEN UL ALTHAF (311815103301)" who carried out the project work under my supervision.



HEAD OF THE DEPARTMENT
Mr. P. DHARMARAJ, M.E.,
ASSISTANT PROFESSOR,
Department of Civil Engineering,
Mohammed Sathak A. J College of
Engineering, Egattur,
Chennai - 603103 .



SUPERVISOR,
Mr. B. RIZHA UR RAHMAN, M.E.,
ASSISTANT PROFESSOR,
Department of Civil Engineering,
Mohammed Sathak A. J College of
Engineering, Egattur,
Chennai - 603103.

Submitted for the project viva voce examination held on

2/4/19



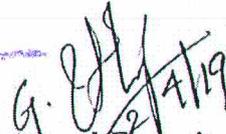
2/4/19

Internal Examiner



PRINCIPAL

MOHAMED SATHAK A.J.COLLEGE OF ENGINEERING
34, Rajiv Gandhi Road (DMR), Siruseri, IT Park
Chennai-603 103.



2/4/19

External Examiner



ABSTRACT

Concrete is one of the important construction material used in the world of all the engineering works including the infrastructure development proved that, it is a material and its constituents are widely available in nature. Due to wide spread usage and fast infrastructure development in all over the world, there is shortage of natural aggregates, such as fine aggregate and coarse aggregate. These materials are available with high cost to reduce the use of coarse aggregate can be replaced with waste materials.

In this project work, coarse aggregates are replaced by 15% of E-waste and Ceramic crushed tile in the range of 10%, 15%, 20% and 25% respectively by weight of M20 grade concrete. Sieve analysis is done for ceramic crushed tile, E-waste, fine aggregate and coarse aggregate. Concrete mixtures were prepared, tested and compared in terms of compression and split tensile strength of the conventional concrete. The tests were carried out to evaluate the strength properties for 7 and 28 days.

KEYWORDS : Compressive Strength, Split Tensile Strength, Ceramic Crushed Tile and E-waste.



A handwritten signature in blue ink, appearing to be "MSA".

PRINCIPAL
MOHAMED SATHAK A.J. COLLEGE OF ENGINEERING
34, Rajiv Gandhi Road (OMR), Siruseri, IT Park
Chennai-603 103.

CHAPTER 7

CONCLUSION

Based on the results, it can be concluded as follows:

- The M20 grade of concrete design mix has been achieved.
- The compressive strength of M₄ concrete cube on replacing ceramic crushed tile 20% and E-waste 15% is 20% higher than the conventional concrete M₁.
- The split tensile strength of M₄ concrete on replacing ceramic crushed tile 20% and E-waste 15% is 12.5% higher than the conventional concrete.
- The partially replaced concrete M₄ which contains ceramic crushed tile and E-waste in 20% and 15% respectively attains higher compressive and split tensile strength than the conventional concrete M₁.
- The M₄ concrete mix is best for using in the construction which requires high compressive and split tensile strength and also are economical.
- The use of ceramic and E-waste in concrete is possible to improve its mechanical properties and can be one of the economical ways for their disposal in environment friendly manner.
- E-waste and ceramic tile waste replaced concrete is eco-friendly and has the potential to replace coarse aggregate. It can thus be concluded that concrete possesses excellent mechanical property and durability for aggressive environment.



A handwritten signature in blue ink, appearing to be 'Mohamed Sathak A.J.'.

PRINCIPAL
MOHAMED SATHAK A.J. COLLEGE OF ENGINEERING
34, Rajiv Gandhi Road (OMR), Siruseri, IT Park
Chennai-603 103.



**EXPERIMENTAL ANALYSIS ON PAVER BLOCKS
WITH PARTIAL REPLACEMENT OF COCONUT
SHELLS AND EGG SHELLS AS AGGREGATES**

A PROJECT REPORT

Submitted by

MOHAMMED UWAIS A

311815103051

MUSHTHAQ N

311815103055

In partial fulfillment for the award of the degree

of

BACHELOR OF ENGINEERING

IN

CIVIL ENGINEERING

MOHAMED SATHAK A.J COLLEGE OF ENGINEERING

ANNA UNIVERSITY : CHENNAI 600 025

APRIL 2019



PRINCIPAL
MOHAMED SATHAK A.J. COLLEGE OF ENGINEERING
34, Rajiv Gandhi Road (OMR), Siruseri, IT Park
Chennai-603 103.

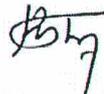
ANNA UNIVERSITY : CHENNAI 600 025

BONAFIDE CERTIFICATE

Certified that this project report **“EXPERIMENTAL ANALYSIS ON PAVER BLOCKS WITH PARTIAL REPLACEMENT OF COCONUT SHELLS AND EGG SHELLS AS AGGREGATES”** is the bonafide work of **“MOHAMMED UWAIS A (311815103051)”** and **“MUSHTHAQ N (311815103055)”** who carried out the project work under my supervision.

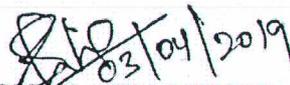

(SIGNATURE)

Ms. S. PATHMAVATHI M.E
Supervisor
Assistant Professor
Department of Civil Engineering
Mohamed Sathak A.J College Of
Engineering
Egattur, Chennai –603103.


(SIGNATURE)

Mr. P. DHARMARAJ M.E
Head Of Department
Department of Civil Engineering
Mohamed Sathak A.J College Of
Engineering
Egattur, Chennai –603103.

Submitted for the University Examination held on 03/04/2019


INTERNAL EXAMINER


EXTERNAL EXAMINER



PRINCIPAL
MOHAMED SATHAK A.J. COLLEGE OF ENGINEERING
34, Rajiv Gandhi Road (OMR), Siruseri, IT Park
Chennai-603 103.

ABSTRACT

In the construction, the cost of building materials are rising day by day, use of alternative materials to partial replacing the coarse aggregates will help in solving the need for natural aggregates. There are many waste materials used such as coconut shells, eggshells powder and various other materials. So here in our project we used coconut shells waste as replacement of coarse aggregate and eggshells powder as replacement of fine aggregates by different percentage for making concrete of grade like M-20 with a ratio of proportion (1: 1.32: 3.19). Concrete made from coconut shells waste as coarse aggregate and eggshells powder as fine aggregates will be studied for compressive strength, the percentage replacement will be 5%, 10%, and 15% with natural coarse aggregate. The main ingredient in eggshells is calcium carbonate (the same brittle white stuff that chalk, limestone, cave stalactites, sea shells, coral, and pearls are made of). The shell itself is about 95% CaCO_3 (which is also the main ingredient in sea shells). The remaining 5% includes Magnesium, Aluminium, Phosphorous, Sodium, Potassium, Zinc, Iron, Copper, Ironic acid and Silica acid. Then the cuboids are prepared and tested experimentally by the following tests like slump test, vee bee test and compression strength test to obtain the results. The use of eggshells powder and coconut shells in concrete reduces the cost of raw materials with high strength durability and light weight of concrete. A large number of trial mixes are required to select desired optimum replacement of aggregates by coconut shells and eggshells powder waste material. So our concept of the project is replacing the coconut shells and eggshells powder on concrete to achieve the required strength of concrete.



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MOHAMED SATHAK A.J. COLLEGE OF ENGINEERING
34, Rajiv Gandhi Road (OMR), Siruseri, IT Park
Chennai-603 103.

CHAPTER 7

CONCLUSION

1. Coconut shells exhibits more resistance against crushing, impact and abrasion.
2. By using coconut shells the aggregates provided volume at low cost comprising 66% to 78% of concrete.
3. By increasing percentage of coconut shells reduces compressive strength of concrete.
4. Using coconut shells on concrete is also termed as structural light weight concrete.
5. The specific gravity of coconut shells is low as compared to coarse aggregates and water absorption is higher for coarse aggregates.
6. The eggshells powder of 2.2 grams of calcium in the form of calcium carbonate and 95% dry eggshells is calcium carbonate of 5.5 grams.
7. The specific gravity of the eggshells powder is 0.85 and the moisture content is 1.18 and surface area is 21.2 sq.m per gram.
8. The workability of concrete has decreased when compared with ordinary concrete.
9. The compressive strength of concrete is increased for 10% replacement whereas the compressive strength of partially replaced concrete is increased at 3 and 7 and gradually decreased from 14 and 28 days.



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MOHAMED SATHAK A.J. COLLEGE OF ENGINEERING
34, Rajiv Gandhi Road (OMR), Siruseri, IT Park
Chennai-603 103.



PARTIAL REPLACEMENT OF FINE AGGREGATE BY DRY COCONUT SHELLS

A PROJECT REPORT

Submitted By

A.S.ABDUL JABBAR	311815103002
ADIL AHMAD MAGRAY	311815103003
P.M.JAYAPRAKASH	311815103018
M.MOHAMED THASIM	311815103044

In partial fulfillment for the award of the degree

of

BACHELOR OF ENGINEERING

IN

CIVIL ENGINEERING

MOHAMED SATHAK A.J. COLLEGE OF ENGINEERING

ANNA UNIVERSITY, CHENNAI – 600 025

APRIL 2019

PRINCIPAL

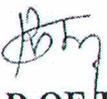
MOHAMED SATHAK A.J.COLLEGE OF ENGINEERING
34, Rajiv Gandhi Road (OMR), Siruseri, IT Park
Chennai-603 103.



ANNA UNIVERSITY : CHENNAI 600 025

BONAFIDE CERTIFICATE

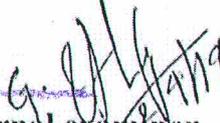
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HEAD OF THE DEPARTMENT
Mr. P. DHARMARAJ M.E.,
ASSISTANT PROFESSOR
Department of Civil Engineering,
Mohamed Sathak A. J. College of
Engineering, Egattur,
Chennai-603103


PROJECT GUIDE
MR.R.ARVIND SARAVAN M.tech,
ASSISTANT PROFESSOR
SUPERVISOR
Department of Civil Engineering,
Mohamed Sathak A. J. College of
Engineering, Egattur,
Chennai-603103

Submitted for the project viva voice examination held at **MOHAMED SATHAK A.J. COLLEGE OF ENGINEERING** ON 02/04/2019.


Internal examiner



External examiner

PRINCIPAL
MOHAMED SATHAK A.J.COLLEGE OF ENGINEERING
34, Rajiv Gandhi Road (OMR), Siruseri, IT Park
Chennai-603 103.



ABSTRACT

PARTIAL REPLACEMENT OF FINE AGGREGATE BY DRY COCONUT SHELLS

The high cost of conventional construction material affects economy of structure. Use of the waste materials not only helps in getting them utilized in cement, concrete and other construction materials, but also has numerous indirect benefits such as reduction in land fill cost, saving in energy, and protecting environment from possible pollution effect. It also helps in reducing the cost of concrete manufacturing. In the present work, dry coconut shell as partial replacement for fine aggregate in concrete is studied. The main purpose of this project is to compare and study the compressive strength of normal concrete and the partially replaced concrete. M25 grade of concrete will be adopted. The concrete is prepared with different combinations of dry coconut shell content in the proportion of 0%, 10%, 20%, 30% will be replaced. 3 Sample specimens will be prepared for each concrete mixes. The parameters will be tested for compressive strength behavior of cube for 7,14 and 28 days. The strength obtained from the dry coconut shell concrete is compared with the conventional concrete. The rural areas will be developed as there is a vast production of dry coconut shell. The objective is to encourage the use of these seemingly waste product as conventional materials in low cost building. It is also expected to serve the purpose of encouraging housing developer's in investing these materials in house construction.



PRINCIPAL
MOHAMED BATHAK A.J. COLLEGE OF ENGINEERING
34, Rajiv Gandhi Road (OMR), Siruseri, IT Park
Chennai-603 103.

CHAPTER 9

CONCLUSION

The aim of this project work was the recycling and the use of dry coconut shells as fine aggregates in the concrete. In this project we tried to replace the fine aggregate partially by dry coconut shell (10%, 20%, 30%) respectively to find out the strength of concrete and compare it to the normal concrete. It is found that the compressive strength is achieved when the replacement is till 20%. For 30% of replacement the compressive strength decreases to a higher value. This is due to the decrease in density of the concrete. The density of the concrete decreases as the percentage of replacement increases. Moreover in turn it is found out that the fine aggregate can be replaced by certain amount of dry coconut shells. Use of the waste material not only helps in getting them utilized in cement, concrete and other construction materials, but also has numerous indirect benefits such as reduction in land fill cost, saving in energy, and protecting environment from possible pollution effect. It also helps in reducing the cost of concrete manufacturing.



PRINCIPAL
MOHAMED SATHAK A.J. COLLEGE OF ENGINEERING
34, Rajiv Gandhi Road (OMR), Siruseri, IT Park
Chennai-603 103.



**EXPERIMENTAL INVESTIGATION OF PARTIAL
REPLACEMENT OF FINE AGGREGATES WITH
CARBON POWDER IN CONCRETE**

A PROJECT REPORT

Submitted by

V.JOHN EBENEZER

311815103021

P.MANOJ KUMAR

311815103028

S.MOHAMED ISMAIL

311815103037

K.SIVARAMAKRISHNAN

311815103071

In partial fulfilment for the award of the degree

of

BACHELOR OF ENGINEERING

IN

CIVIL ENGINEERING

MOHAMED SATHAK A.J.COLLEGE OF ENGINEERING

**34, Rajiv Gandhi Road (OMK), Siruseri, IT Park
Chennai-693 103.**

ANNA UNIVERSITY, CHENNAI – 600 025

APRIL 2019



BONAFIDE CERTIFICATE

Certified that this project report “**EXPERIMENTAL INVESTIGATION OF PARTIAL REPLACEMENT OF FINE AGGREGATES WITH CARBON POWDER IN CONCRETE**” is the bonafide work of “**V.JOHN EBENEZER(311815103021), P.MANOJ KUMAR (311815103028), S.MOHAMED ISMAIL(311815103037), K.SIVARAMAKRISHNAN (311815103071)**” who carried out the project work under my supervision.



SIGNATURE

HEAD OF THE DEPARTMENT

Mr.P.DHARMARAJ, M.E

Assistant Professor

Civil Department

Mohamed Sathak A.J.
College of Engineering



SIGNATURE

SUPERVISOR

Ms.S.MAHESWARI, M.E

Assistant Professor

Civil Department

Mohamed Sathak A.J.
College of Engineering

Submitted for the viva voice examination held at MOHAMED SATHAK A.J.
COLLEGE OF ENGINEERING ON ...02.04.2019.....



INTERNAL EXAMINER



PRINCIPAL EXTERNAL EXAMINER

MOHAMED SATHAK A.J.COLLEGE OF ENGINEERING
34, Rajiv Gandhi Road (OMR), Siruseri, IT Park
Chennai-603 103.



ABSTRACT

Concrete has been an essential building material in the construction industry. This concrete contains pores and micro-cracks which lead to less resistance of atmospheric attacks and acid intrusions. This can be resolved by making concrete denser by adding filler which will decrease permeability and increase durability and strength of concrete. So, an experimental attempt is made to fill these pores in concrete by adding carbon black powder, which acts as filler in concrete. This paper presents a review of all such authors who had used to suggest the optimum percentage of carbon black to be added in concretes with carbon black of different percentage were cast. A comparison of strength is made between conventional and non-conventional concrete blocks. It is observed that the strength gets dramatically increased with the addition of filler in the concrete and hence shows good performance in durability with addition of carbon black in the concrete.

Keywords: Carbon black as a filler, Compressive Strength, Concrete, Corrosion



PRINCIPAL
MOHAMMED SATHAK A.J. COLLEGE OF ENGINEERING
34, Rajiv Gandhi Road (OMR), Siruseri, IT Park
Chennai-603 103.



CHAPTER 6

CONCLUSIONS AND RECOMMENDATIONS

6.1 GENERAL

As a conclusion, all the objectives of this project are achieved concrete with using carbon black powder and crushed carbon particles has a **very high workability from control sample.**

6.2 CONCLUSIONS AND RECOMMENDATIONS

Following are the conclusions are drawn from the present study.

- The optimum replacement of carbon black as fine aggregate was found in 8%.
- When compared to 0%, 4%, and 10% the compressive strength and tensile strength was found to be more in 8% of replacement of carbon black.
- In 28 days curing time the compressive strength and tensile strength of the specimen for 8% of carbon black was found to be 30.8 N/mm^2 and 2.50 N/mm^2 respectively.
- 2.88 kg of carbon black is added for the replacement of fine aggregate in 8 % optimum percentage.



PRINCIPAL
MOHAMED BATHAK A.J. COLLEGE OF ENGINEERING
34, Rajiv Gandhi Road (OMR), Siruseri, IT Park
Chennai-603 103.





INTELLIGENT TRANSPORTATION SYSTEM

A PROJECT REPORT

Submitted by

ARUL VINAYAGAM.S	(311815103009)
MOHAMED ALHAMDHLM	(311815103032)
MOHAMED JASIM.H	(311815103039)
MOHAMED NAVEETH.B	(311815103041)

In partial fulfillment for the award of the degree

of

BACHELOR OF ENGINEERING

IN

CIVIL ENGINEERING

MOHAMED SATHAK A.J. COLLEGE OF ENGINEERING

ANNA UNIVERSITY; CHENNAI 600 025

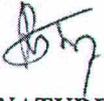
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PRINCIPAL
MOHAMED SATHAK A.J. COLLEGE OF ENGINEERING
34, Rajiv Gandhi Road (OMR), Siruseri, IT Park
Chennai-603 103.



BONAFIDE CERTIFICATE

Certified that this project report, "INTELLIGENT TRANSPORTATION SYSTEM" is the Bonafide work of "ARUL VINAYAGAM. S (311815103009), MOHAMED ALHAMDHI.M (311815103032), MOHAMED JASIM.H (311815103039), MOHAMED NAVEETH.B (311815103041)" who carried out the project work under my supervision.



SIGNATURE

Mr. P. DHARMARAJ, M.E.,
HEAD OF DEPARTMENT

Department of Civil Engineering,
Mohamed Sathak A. J. College of
Engineering, Egattur,
Chennai-603103.

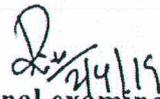


SIGNATURE

Mrs. S. SHARMILA PONNAMAL, M.E.,
SUPERVISOR

Department of Civil Engineering,
Mohamed Sathak A. J. College of
Engineering, Egattur,
Chennai-603103.

Submitted for the project viva voce examination held on 02/04/2019.....



Internal examiner



External examiner



PRINCIPAL
MOHAMED SATHAK A.J. COLLEGE OF ENGINEERING
34, Rajiv Gandhi Road (OMR), Siruseri, IT Park
Chennai-603 103.

ABSTRACT

An important metric for economic growth of any country is its burgeoning vehicle ownership. know ever, the indirect effect of vehicle ownership is acute traffic congestion. India has, in the past decade, seen an astronomical increase in vehicle ownership and associated road blocks and traffic snarls in its metropolitan cities. The variety of vehicles in India two, three and four wheelers, in addition to Large pedestrian population, complicates the situation. The principal reason for traffic congestion in India is that the road space and infrastructure have not improved on par with the traffic. The direct solution for this problem by improvements in infrastructure is constrained by space availability and other Logistic problems. There is, therefore, on urgent need to explore and develop better traffic management options to ease traffic congestion. An intelligent transportation system (ITS) is an advanced application which, without embodying intelligence as such, aims to provide innovative services relating to different modes of transport and traffic management and enable users to be better informed and make safer, more coordinated, and 'smarter' use of transport networks. ITS as systems in which information and communication technologies are applied in the field of road transport, including infrastructure, vehicles and users, and in traffic management and mobility management, as well as for interfaces with other modes of transport. ITS may improve the efficiency of transport in a number of situations, i.e. road transport, traffic management, mobility, etc. ITS activities in at the development of sustainable, multi-modal surface transportation system that will establish connected transportation environment among vehicles, the infrastructure, and portable devices. Various countries develop strategies and techniques, based on their geographic, cultural, socio-economic and environmental background, to integrate the various components into an inter-related system.



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PRINCIPAL

MOHAMED SATHAK A.J. COLLEGE OF ENGINEERING
34, Rajiv Gandhi Road (OMR), Siruseri, IT Park
Chennai-603 103.



CHAPTER 5 CONCLUSION

Explosive growth in traffic density and population has raised various issues such as air pollution, congestion and accidents that have become the area of report. Hence Intelligent Transport System (ITS) is used to solve these transport related issues. ITS combines various technologies such as data collection, communication, machine learning and data mining to provide transport related services. These services include Traffic control, navigation systems, driver assistance systems and Fault detection systems. In addition to this ITS also solves transport related issues such as disaster management, congestion control and air pollution. Further enhancement in ITS include addition of new techniques such as internet of vehicles, vehicular cloud computing, Agent based computing which includes the introduction of Artificial Transport System. By combining these techniques the ITS can be made more efficient in solving transport related problems.



PRINCIPAL
MOHAMED SATHAK A.J.COLLEGE OF ENGINEERING
34, Rajiv Gandhi Road (OMR), Siruseri, IT Park
Chennai-603 103.



URBAN TRANSPORTATION PLANNING

FINAL YEAR PROJECT REPORT

Submitted by

K.AJITH KUMAR (311815103004)

J.AKIN SHIBU (311815103005)

A.CRISPIN ANCY ROSE (311815103013)

S.GOWTHAM (311815103017)

In partial fulfillment for the award of the degree

Of

BACHELOR OF ENGINEERING

IN

CIVIL ENGINEERING

MOHAMED SATHAK A.J.COLEEGE OF ENGINEERING,

CHENNAI-603103



PRINCIPAL

MOHAMED SATHAK A.J. COLLEGE OF ENGINEERING

**100th Gandhi Road, Kamaraj Salusery, IT Park
Chennai-600 025**

ANNA UNIVERSITY: CHENNAI 600025



APRIL 2019

ANNA UNIVERSITY: CHENNAI 600025

BONAFIDE CERTIFICATE

This it to certified that this project report "URBAN TRANSPORTATION PLANNING" is the bonafide work of K.Ajith kumar, J.Akin shibu, S.Gowtham, A.Crispin aney rose, who carried out the project work under my supervision.



SIGNATURE

P. DHARMARAJAN, M.E

HEAD OF THE DEPARTMENT

Department of civil

Engineering

MSAJCE, Chennai



SIGNATURE

Mrs.S.SHARMILA PONNAMMAL,M.E

ASSISTANT PROFESSOR

Department of civil

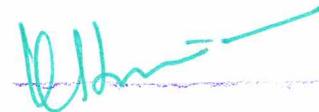
Engineering

MSAJCE, Chennai

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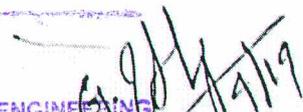


INTERNAL EXAMINER



PRINCIPAL

MOHAMED SATHAK A.J.COLLEGE OF ENGINEERING
34, Rajiv Gandhi Road (OMR), Sion East,
Chennai-603 103.



EXTERNAL EXAMINER

CHAPTER 5 CONCLUSION

It has been argued that cities are the engines of economic growth in most developing countries, and that urban transport is the oil that prevents the engine from seizing up. Unfortunately, deteriorating transport conditions are already damaging the economy of many large cities, particularly the megacities, worldwide. Because demand for transport is essentially a derived demand, urban transport must be viewed strategically as an integral component of the city economy and hence of its development strategy.

The economic performance of the sector can be improved by more careful attention to the requirements of freight transport and logistics, as well as by improvements to infrastructure, including privately financed infrastructure, where appropriate. While expanding cities require adequate infrastructure, it is physically and economically impossible to escape from congestion by building roads in the densest cities. Broader structural approaches are also required. De concentration of activities can be encouraged, but is difficult to achieve. Planning and management of land-use structure is essential, but has practical limitations. Liberalization of land market can help, but the direct impact is weakened by the inability to internalize the external costs of development. Integration and coordination of sector policies are also central to the more integrated development approach.

By using STELLA software we can predict the future demand and effect. The program allows users to run models created as graphical representations of a system using four fundamental building blocks.



PRINCIPAL
MOHAMED SATHAK A.J. COLLEGE OF ENGINEERING
34, Rajiv Gandhi Road (OMR), Siruseri, IT Park
Chennai-603 103.

