

ABHILASHI UNIVERSITY

School of Engineering and Technology

Doctor of Philosophy in Civil Engineering Ph.D. Course Work Scheme

S.No.	Course Code	Course Title	Credit	Examination		
				Internal Assessment	External Assessment	Total
1.	AUPH DRM-101	Research Methodology	4	40	60	100
2.	AURPE-04	Research & Publication Ethics	4	40	60	100
3.	AUPHDCE-103*	Elective- 1	4	40	60	100
4.	AUPHDCE-104*	Elective-11	4	40	60	100

*** Elective: 1**

S.No.	Course Code	Course Title
1.	AUPHDCE-103(A)	Advance Concrete Technology
2.	AUPHDCE-103(B)	Repair & Rehabilitation of Structure

*** Elective: 2**

S.No.	Course Code	Course Title
1.	AUPHDCE-104(A)	Composite Material
2.	AUPHDCE-104(B)	Structural Engineering

PHD CIVIL ENGINEERING COURSE WORK

AUPH DRM-101

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Research Methodology

Objective: The method is supported by powerful optimization and numerical techniques, which allow us to work with bodies of complex initial design and with very fine finite-element meshes, giving thus quite accurate solutions even in "difficult" parts and for complex geometries.

Overview of Research

10 Hrs

Research and its type, identifying and defining research problems, introduction to different types of research designs. Essential constituents of literature review. Basic principles of experimental design, completely randomized, randomized block, Latin square, factorial

Methods of Data Collection

04 Hrs

Primary and secondary data, methods of primary data collection, classification of secondary data

Sampling Methods

10 Hrs

Probability sampling: simple random sample, systematic sampling, stratified sampling, cluster sampling and multistage sampling; Non-probability sampling: convenience sampling, judgement sampling, quota sampling; sampling distribution

Processing and Data Analysis

15 Hrs

Statistical measures and their significance: central tendencies, measures of variability, skewness, kurtosis, correlation and regression; hypothesis testing: parametric test (z, t, F), Chi square, ANOVA and non-parametric test

Reliability and Validity

03 Hrs

Test- retest reliability, alternative form reliability, internal-comparison reliability, and scorer reliability; content validity, criterion- related validity and construct validity

Essentials of Report Writing

05 Hrs

Recommended Books

1. Geoffrey R. Norman, David L. Streiner, Biostatistics: The Bare Essentials, PMPH USA
2. Beth Dawson, Robert G. Trapp, Basic & Clinical Biostatistics, McGraw-Hill
3. Marcello Pagano, Kimberlee Gauvreau, Principles of Biostatistics, CRC Press
4. Antonella Bacchieri, Giovanni Della Cioppa, Fundamentals of Clinical Research, Springer

PHD CIVIL ENGINEERING COURSE WORK**Advance Concrete Technology**

AUPHDCE-103(A)

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Unit-1

Aggregates: Review of types; sampling and testing; effects on properties of concrete, production of artificial aggregates.

Cements: Review of types of cements, chemical composition; properties and tests, chemical and physical process of hydration,. Blended cements

Unit-2

Properties of fresh concrete - basics regarding fresh concrete – mixing, workability, placement, consolidation, and curing, segregation and bleeding Chemical Admixtures: types and classification; actions and interactions; usage; effects on properties of concrete. Mineral Admixtures: Flyash, ground granulated blast furnace slag, metakaolin, rice-husk ash and silica fume; chemical composition; physical characteristics; effects on properties of concrete; advantages and disadvantages.

Proportioning of concrete mixtures: Factors considered in the design of mix. BIS Method, ACI method. Properties of hardened concrete: Strength- compressive tensile and flexure - Elastic properties - Modulus of elasticity – Creep, factors affecting creep, effect of creep - shrinkage- factors affecting shrinkage, plastic shrinkage, drying shrinkage, autogenous shrinkage, carbonation shrinkage

Unit-3

Durability of Concrete: Durability concept; factors affecting, reinforcement corrosion; fire resistance; frost damage; sulfate attack; alkali silica reaction; concrete in sea water, statistical quality control, acceptance criteria as per BIS code. Non-destructive testing of concrete: Surface Hardness, Ultrasonic, Penetration resistance, Pull-out test, chemical testing for chloride and carbonation- core cutting - measuring reinforcement cover.

Unit-4

Special Concretes - Lightweight concrete- description of various types -High strength concrete - Self compacting concrete -Roller compacted concrete – Ready mixed concrete – Fibre reinforced concrete - polymer concrete Special processes and technology for particular types of structure - Sprayed concrete; underwater concrete, mass concrete; slip form construction, Prefabrication technology

Books Recommended:

1. Concrete, its Properties and Microstructure by P.K. Mehta, and P.J.M.
2. Ferro cement by B.K. Paul, and R.P. Pama
3. Fibre Reinforced Concrete by Bentur and Mindess
4. Flyash in Concrete by Malhotra and Ramezaniapur

PHD CIVIL ENGINEERING COURSE WORK

Composite Materials

AUPHDCE-104(A)

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Unit-1

Supplementary Cementing Materials:

Types of supplementary cementing materials such as fly ash, silica fume, rice husk ash, and metakaolin; their physical, chemical, mineralogical properties; Effects of these materials on the fresh properties; Strength properties; Durability properties.

Fibre Reinforced Concrete:

Definition; types of fibres; Properties of fibres; Factors affecting FRC. Mixing and casting procedure; Composite materials approach; Effect of fibres on the workability, strength and durability of concretes; Applications of different types of fibres.

Unit-2

High Volume Fly Ash Concrete:

Definition, Effect of types of fly ash in large quantities on the strength properties of concrete; Durability and abrasion resistance of HVFA; Applications of HVFA.

Self-Compacting Concrete (SCC):

Definition, Advantages and disadvantages of SCC; Various mix design procedures; Tests for SCC; Applications for SCC.

Unit-3

High Performance Concrete:

Definition of HPC; Material selection and its properties; Parameters for concrete being considered as HPC; Applications of HPC. Polymer Concrete Composites: Definition; Types of monomers and polymers; Types of polymer concretes and their applications.

Fibre Reinforced Plastics (FRP):

Types of FRP, their properties and effects on concrete elements under various loading conditions. Use of Waste Materials and By-products: Types of waste materials and by-products such as waste glass, scrap tires, waste foundry sand, clean coal ash, etc. Effect of these materials on the various properties of mortar and concrete; Introduction of leachates from waste materials and their analysis.

Unit-3

Behavior of Concrete at High Temperature:

Definition of high temperature; Mechanism of concrete failure at high temperature; Spalling characteristics; Difference in the behavior of normal concrete, High strength concrete and self-compacting concrete at high temperature.

Recommended Books

1. Nevelli, A. M., Properties of Concrete, Prentice Hall of India (1995).
2. Siddique, R., Special Structural Concretes, Galgotia Publications (2000).
3. Krishna Raju, N., Concrete Mix Design, CBS Publications (2002).
4. Gambhir, M. L., Concrete Technology, Tata-McGraw Hill, 3rd Edition (2008).
5. Siddique, R., Waste Materials and By-products in Concrete, Springer (2008)

PHD CIVIL ENGINEERING COURSE WORK

Repair and Rehabilitation of Structures

AUPHDCE-103(B)

L T/P

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Contents

Maintenance and repair strategies

Maintenance, Repair and Rehabilitation, Facets of Maintenance, importance of Maintenance, Various aspects of Inspection, Assessment procedure for evaluating a damaged structure, causes of deterioration.

Strength and durability of concrete

Quality assurance for concrete – Strength, Durability and Thermal properties, of concrete - Cracks, different types, causes – effects due to climate, temperature, sustained elevated temperature, corrosion - effects of cover thickness.

Special concretes

Polymer concrete, Sulphur infiltrated concrete, Fibre reinforced concrete, High strength concrete, High performance concrete, Vacuum concrete, Self compacting concrete, Geopolymer concrete, Reactive powder concrete, Concrete made with industrial wastes.

Techniques for repair and protection methods

Non-destructive Testing Techniques, Epoxy injection, Shoring, Underpinning, Corrosion protection techniques – Corrosion inhibitors, Corrosion resistant steels, Coatings to reinforcement, cathodic protection.

Repair, rehabilitation and retrofitting of structures

Strengthening of Structural elements, Repair of structures distressed due to corrosion, fire, Leakage, earthquake – demolition techniques - Engineered demolition methods - Case studies

Books Recommended:.

1. Neville A.M.,“Properties of Concrete”, Trans-Atlantic Publications, Inc.; 5e, 2012
2. Job Thomas., “ Concrete Technology”, Cenage learning,
3. R. Santhakumar ,, Concrete Technology”, Oxford Universities Press, 2006
4. Shetty M. S., Concrete Technology”, S. Chand & Co., 2006

PHD CIVIL ENGINEERING COURSE WORK

Structural Engineering

AUPHDCE-104(B)

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Contents:

Unit-1

Engineering Mechanics: System of forces, free-body diagrams, equilibrium equations; Internal forces in structures; Friction and its applications; Kinematics of point mass and rigid body; Centre of mass; Euler’s equations of motion; Impulse-momentum; Energy methods; Principles of virtual work.

Solid Mechanics: Bending moment and shear force in statically determinate beams; Simple stress and strain relationships; Theories of failures; Simple bending theory, flexural and shear stresses, shear Centre; Uniform torsion, buckling of column, combined and direct bending stresses.

Unit-2

Structural Analysis: Statically determinate and indeterminate structures by force/ energy methods; Method of superposition; Analysis of trusses, arches, beams, cables and frames;

Displacement methods: Slope deflection and moment distribution methods; Influence lines; Stiffness and flexibility methods of structural analysis.

Unit-3

Construction Materials and Management: Construction Materials: Structural steel - composition, material properties and behavior; Concrete - constituents, mix design, short-term and long-term properties; Bricks and mortar; Timber; Bitumen.

Construction Management: Types of construction projects; Tendering and construction contracts; Rate analysis and standard specifications; Cost estimation; Project planning and network analysis - PERT and CPM.

Unit-4

Concrete Structures: Working stress, Limit state and Ultimate load design concepts; Design of beams, slabs, columns; Bond and development length; Prestressed concrete; Analysis of beam sections at transfer and service loads.

Steel Structures: Working stress and Limit state design concepts; Design of tension and compression members, beams and beam- columns, column bases; Connections - simple and eccentric, beam-column connections, plate girders and trusses; Plastic analysis of beams and frames.

Recommended Books:

1. Gere, G. M. and Weaver, Jr. W., Matrix Analysis of Framed Structures, CBS Publishers (1987).
2. McCormac, J. C. & Nelson, J. K., Structural Analysis: A Classical and Matrix Approach, Iyengar, N.G.R., Elastic Stability of Structural Elements, Macmillan India Ltd (1980).
3. Pandit & Gupta, Matrix Analysis of Structures, Tata McGraw Hill Publications (2003)
4. Moshe, F., Rubenstein, Matrix Computer Analysis of Structures, Prentice Hall, Ne