

List of Postgraduate Courses

CE6011 Boundary Element Method
CE6101 Theory of Elasticity
CE6103 Theory of Plates
CE6105 Plastic Design of Structures
CE6106 Elastic Stability of Structures
CE6108 Analysis and Design of Shells
CE6109 Finite Element Methods
CE6110 Computer Methods In Civil Engineering
CE6111 Advanced Design of Concrete Structures
CE6114 Analysis and Design of Tall Buildings
CE6115 Bridge Engineering
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CE6117 Structural Dynamics and Seismic Design of Structures
CE6118 Structural Brick Work
CE6119 Advanced Theory and Design of Steel Structures
CE6201 Advanced Concrete Technology
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CE6301 Theory of Water Treatment
CE6304 Theory of Sewage Treatment
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CE6315 Water Supply Engineering and Design
CE6316 Sewerage and Drainage Engineering Design
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CE6323 Surface water Quality Modeling
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CE6327 Aquatic Chemistry for Environmental Engineers
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CE6403 Foundation Analysis Methods
CE6404 Earth Pressure and Retaining Structures
CE6405 Earth Dams and Stability of Slopes
CE6406 Rock Mechanics
CE6407 Soil Dynamics
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CE6409 Reinforced Earth
CE6410 Constitutive Modeling in Soil Mechanics
CE6411 Earthquake Engineering
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CE6502 Geometric Design of Highways
CE6503 Highway Materials
CE6504 Advanced Surveying
CE6505 Structural Design of Pavements
CE6507 Traffic Engineering
CE6508 Railway Engineering
CE6509 Waterways
CE6510 Planning and Design of Airports
CE6511 Transportation Planning
CE6512 Transportation Engineering Economics
CE6513 Traffic Simulation
CE6514 GIS and Remote Sensing in Transportation
CE6515 Transportation Modeling
CE6516 Road Traffic Accident

CE 6011 Boundary Element Method

3 Credits

Introduction; One-dimensional problems: potential flow, beam bending; Two-dimensional problems of potential flow; Two-dimensional problems of elastostatics; Axisymmetric analysis; Three-dimensional formulations; Parametric representations of functions and geometry; Time-dependent analysis: elastodynamics, transient groundwater flow; Non-linear analysis: problems of elastoplasticity; Combination of Boundary Element Method with other numerical methods.

CE 6101 Theory of Elasticity

3 Credits

Stress-strain relationship; Plane-stress and plane-strain; Stress functions; Two dimensional problems in rectangular and polar coordinates; Torsion; Energy principles; Stress and strain in three dimensions; General theorems; Three dimensional problems; Theories of failure; Computer solutions of elasticity problem.

CE 6103 Theory of Plates

3 Credits

Rectangular plates with various edge conditions; Circular plates; Energy methods; Approximate methods; Orthotropic plates; Numerical methods in the solution of plate problems Non-linear analyses of plates.

CE 6105 Plastic Design of Structures

3 Credits

Review of fundamental concepts. Plastic hinges, collapse of beams and frames; Effects of axial load and shear forces; investigation of plastic collapse mechanisms and calculation of collapse loads; Upper and lower bounds; Plastic analyses and design of beams, frames and grillages; Plastic collapse of reinforced concrete and masonry structures; Elastic-plastic analysis; Repeated loading; Shakedown theorems; Minimum weight design; numerical analysis; Design of multistory frames.

CE 6106 Elastic Stability of Structures

3 Credits

Stability of struts and beam-columns; Initial imperfections; Inelastic buckling; Stability functions; Stiffness matrix; Fixed end moments; Energy method; Elastic instability of plane frames; Critical load; Buckling modes; Failure load analysis. Torsional buckling under various conditions of end loads; Buckling by combined torsion and flexure. Lateral buckling of beams; Local buckling phenomenon; Buckling of thin plates and membrane shells; Buckling of built-up sections.

CE 6108 Analysis and Design of Shells

3 Credits

Review of membrane theory of shells; Bending theory of cylindrical shells and shells of revolution; Synclastic and anticlastic shells; Design of shell roof of various shapes. Finite difference and finite element methods; Model analysis.

CE 6109 Finite Element Methods

3 Credits

Introduction to finite element concepts, basic techniques, shape functions. Finite element formulation of various elastic problems-plane stress, plane strain, axisymmetric and three dimensional cases. Isoparametric elements, the elastic membrane, thick shell and plate elements, body of revolution with pressure and sinusoidal loading. Local loads from shape function routines. Bending of plates axisymmetric shells, shells-the semiloof beam and shell. Developing

and implementing elements. Convergence the patch test. Solution techniques. front and band solutions, element assembly and equation solving, roundoff errors. Variational principles in finite element analysis.

CE 6110 Computer Methods in Civil Engineering

3 Credits

Advanced programming techniques related to civil engineering problems; Program optimization; Computational pitfalls; Management of files and data bases; File structures; Direct access backing storage; Computational aspects of matrix algebra relaxation methods, various reduction and elimination schemes; Eigenvalue problems, storage of and computation with large and sparse matrices; Numerical differentiation and integration; Interpolation and curve fitting; Linear and non-linear programming algorithms; Software packages; Computer graphics; Interactive analysis and design; Programming for civil engineering problems on microcomputers.

CE 6111 Advanced Design of Concrete Structures

3 Credits

Review of principles; beams, slabs and columns, Design of columns; long columns, two way slab systems, grids, waffle slabs, ribbed slab, deep beams, curved beams shear walls, building frames, Design for torsion. Bulk storage structures, creep and temperature effects. Details of reinforced concrete members, Advanced problems in foundations of structures, Codes and specifications and their influence in design. An individual or group project to design a complete structural system. Prestressed concrete structures.

CE 6114 Analysis and Design of Tall Building

3 Credits

Structural forms of tall buildings-floor system, vertical load resisting systems, lateral load resisting systems. Choice of systems optimum design. Coupled shear walls-continuous medium, wide-column analogy, and finite element solutions. Interaction of walls and frames-approximate methods, analysis. Tubular structures-approximate methods, computer analysis. Masonry high-rise buildings. The future of high-rise building.

CE 6115 Bridge Engineering

3 Credits

Planning concepts, various types of bridges and their suitability for different span ranges. Bridge loadings, Orthotropic plate decks, Grillage, space frame, finite element and finite strip methods of bridge deck analysis. Long span bridges cable stayed bridge, suspension bridge. Substructures; Design and construction.

CE 6116 Finite Element Methods II

3 Credits

General sources of nonlinearity in structures. Solution of nonlinear equations, incremental, Iterative. Newton-Raphson and Modified Newton Raphson solution procedures. Geometric Nonlinearity- Large displacement and structural instability, Lagrangian approach-both total and updated, Eulerian approach, Material Nonlinearity- Material modelling. Yield criteria, plasticity, creep, elasto-plasticity, viscoplasticity, elastio viscoplasticity, modelling of reinforced concrete. Combined geometric and material nonlinearity. Modelling of dynamic problems and solution procedure. Finite element analysis of non-structural problems fluid flow, heat conduction, electro-magnetic field analysis etc.

CE 6117 Structural Dynamics and Seismic Design of Structures

3 Credits

Fundamentals of structural dynamics. SDOF, Free vibration response, response to harmonic, periodic, impulsive and general dynamic loading. MDOF, undamped free vibrations. Analysis of dynamic response. Beam: vibrations, random vibrations. Probability theory. Deterministic and nondeterministic analysis of earthquake response. Earthquake resistant design of buildings, bridges and dams.

CE 6118 Structural Brickwork

3 Credits

Properties of bricks and mortar: Strength compression element; Analysis and brickwork; Strength of brick masonry compression element; Analysis and design of unreinforced brickwork structures; Reinforced and prestressed brickwork structures; Composite action of brick masonry walls.

CE 6119 Advanced Theory and Design of Steel Structure

3 Credits

Tension members - Design criteria; Compression members - Buckling of Column; Residual Stress; Column Strength curves; AISC design formulas for working stress design; Buckling of plates; Design of column as affected by local buckling. Design of laterally supported beam; Shear on beams; Biaxial bending; Stresses due to torsions; Analogy between torsion and plane bending; Design for combined procedures for laterally unsupported beams. Beam column; AISC working stress design criteria for combined bending and axial load; Connections.

CE 6201 Advanced Concrete Technology

3 Credits

Properties of plain concrete, physico-chemical aspects of behaviour; Constituent materials; Cements, aggregates and admixtures; Influence of material properties on stress distribution in structural members. Durability, permeability and porosity; physical and chemical deterioration. Mixdesign, manufacture, transportation and placing. Form works. Field control and acceptance. Testing destructive and nondestructive. Concrete for special purposes.

CE 6203 Theory and Design of Structural Concrete

3 Credits

Introduction to the limit state design concept. Ultimate limit state design of sections in bending, shear, torsion and combination of axial load and bending. Comparison of design recommendations of different codes (viz. American, British, Canadian etc). Evaluation of the impact of traditional concepts describing structural concrete behaviour on its analysis and design. Introduction to compressive field theory, strut-and - tie model and compressive-force path concept. Design in compliance with these concepts. Prospects and problems of applying finite element method in the analysis and design of structural concrete.

CE 6301 Theory of Water Treatment

3 Credits

Water and its impurities. Criteria of water quality; Physical, chemical and biological treatment processes. Desalinization and demineralization processes. Controls of aquatic growth. Control of taste and odour.

CE 6304 Theory of Sewage Treatment

3 Credits

Composition, properties and analysis of sewage. Biology and bio-chemistry of sewage treatment. Principles of physical, chemical and biological treatment processes. Tertiary treatment of effluents. Sludge digestion. Sludge dewatering and disposal.

CE 6305 Biology of Sewage and Polluted Waters

3 Credits

Important microorganisms related to water and waste water engineering; Cell physiology; Introductory Biochemistry; Bacterial growth and disinfection kinetics; Enumeration of bacterial population; Indicator organisms and water borne pathogens: Sampling and bacteriological examination of water and waste water.

CE 6309 Environmental Sanitation

3 Credits

Application of engineering principles to the control of communicable diseases; Vector control; Insecticides and bacteriocides; Collection and disposal of municipal refuse; Housing; Milk and food sanitation; Industrial and personal hygienes; Air pollution; Plumbing; Ventilation, air-conditioning; Hospital sanitation; Camp sanitation.

CE 6310 Industrial Water and Waste Treatment

3 Credits

Requirements of water and various industries; Quality and treatment of industrial water; Characteristics and volume of industrial waste; Problems associated with industrial wastes; Physical, chemical and biological methods of treatment; Industrial waste problems of major industries and their methods of treatment and disposal.

CE 6311 Municipal and Rural Sanitation

3 Credits

Transmission and control of communicable diseases; Importance of safe water supply and safe disposal of waste on sanitation; Principles of excreta disposal with and without water carriage; Individual water supply facilities and their sanitary protection; Solid waste management; Municipal and rural sanitation facilities in Bangladesh; Public health organizations.

6312 Water Pollution and its Control

3 Credits

Sources of pollution; Effects on water; Basic theory of control devices; Pollution surveys and control programs; Water pollution problems in Bangladesh.

CE 6315 Water Supply Engineering and Design

3 Credits

development of design criteria for municipal and rural water sources; Intakes, pipe lines, distribution systems, storage facilities and water treatment systems; Ground water resources and well design.

CE 6316 Sewerage and Drainage Engineering Design

3 Credits

Design of collection system, pump house; Functional hydraulic and structural design and complete sewage treatment plant and drainage systems.

CE 6319 Environmental Management

3 Credits

Environment and sustainable development; Global and regional approach to environmental management; Environmental implications of sectoral development: Infrastructure, water resources, industry, agriculture, transport and communication, energy, health and population, mineral resources, tourism, land use and urbanization; Environmental management at project level; Environmental resource management and conservation strategies; Environmental policy and legislation; Environmental Quality Standards (EQS); Economics of Environmental Management.

CE 6321 Environmental Impact Assessment (EIA)

3 Credits

Historical development; Definition, aims and objectives of Environmental Impact Assessment (EIA); Environmental issues related to development projects; Project screening, Initial Environmental Examination (IEE); Impact identification, prediction analysis and evaluation; EIA methodologies: Adhoc, Checklists, Matrices, Network, Simulation Modelling Workshops (SMW), Environmental Evaluation System (EES), Overlays, Geographical Information System Guidelines; Environmental Impact Statement (EIS); Impact mitigation plan; Environmental

monitoring and post-development audits; Organization of EIA: Scope, Work plan, resource requirements and costs of EIA, TOR for EIA; EIA in developing countries; Case studies.

CE 6323 Surface Water Quality Modeling

3 Credits

Principal components of dissolved oxygen (DO) analysis, sources and sinks of DO kinetics, DO analysis for waterbodies, engineering control of DO; Basic mechanisms of eutrophication, significance of N/P ratio, sources and sinks of N and P, phytoplankton and nutrient interactions, phytoplankton-DO relationships, simplified river-stream eutrophication analysis for phytoplankton and rooted aquatic plants; Objectives of modeling, applications; Mass loading rate estimations: point source, tributary and intermittent sources; Low flow estimates, travel time and velocity estimates; Steady state stream equations; Estuarine hydrology; Distribution of water quality in rivers and estuaries, dispersion coefficients, hydraulic transport processes, mathematical formulations, water quality parameters, solution techniques, multi-dimensional models; Physical and hydrologic characteristics of lakes, lakeside response to inputs, finite segment steady state lake models, model calibration and verification, sensitivity analysis parameter estimation; Case studies.

CE 6325 Environmental Fluid Dynamics

3 Credits

Governing laws of motion for a viscous fluid: Review of laminar and turbulent flows; Fickian diffusion; Turbulent diffusion, Mass transport equation; Shear flow dispersion; Mixing in rivers and estuaries; Jets and buoyant jets; Reservoir dynamics; Pollutant movement in porous media; Computation of environmental flows.

CE 6327 Aquatic Chemistry for Environmental Engineers

3 Credits

Review of some fundamentals of Chemistry; Approaches to equilibrium problem solving: numerical solution, graphical solution, the 'tableau method'; Natural weak acids and bases, alkalinity and pH in natural waters, buffer capacity; Dissolved carbonate equilibria (closed system), dissolution of CO₂ (open system); Solubility of solids, coexistence of phases in equilibrium; Metal ions and ligands in natural waters, aqueous complexes, ion association among major aquatic constituents, inorganic and organic complexation of trace elements; Redox equilibria and electron activity, pe-pH diagrams, redox conditions in natural waters; Aquatic particles and coordinative properties of surfaces, adsorption of metals and ligands on aquatic particles, surface complexation models; Fate of organic compounds in natural environment: volatilization, sorption/partitioning, transformation reactions, structure-activity and property-activity relationships.

CE 6401 Soil Mechanics I

3 Credits

(2 hours per week theory and 3 hours per week practical).

Identifying characteristics of soils, clay minerals, clay-water relation, fabric, Compression. One and three dimensional consolidation, swelling, collapse and rheological properties. Soil shear strength, concept of cohesion and internal friction. Failure theories Bearing capacity equations and factors. Subsoil exploration programme, interpretation of topographic, geological and agricultural soil maps. Laboratory testing of soils and their interpretation for engineering purposes.

CE 6402 Soil Mechanics II

3 Credits

Soil porosity and moisture effects relative to effective stress principles, capillarity, permeability and frost action. Hydraulic fracturing. Principles governing flow of water through soils. Soil seepage analysis for isotropic and anisotropic conditions. Numerical techniques for vertical and radial drainage. Description, design procedure and usage of current site improvement techniques, preloading, earth reinforcement, dynamic consolidation, vibrocompaction, blasting densification, lime treatment, drains and geotechnical fabrics.

CE 6403 Foundation Analysis Methods

3 Credits

Elastic foundations, loads on infinite slabs, subgrade coefficient, settlement on non-homogeneous half space, linearly-elastic pile and soil, laterally loaded pile, soil foundation interaction for footing and mat designs. Analysis of simple pile and pile group foundations. Exact and numerical solutions to above problems.

CE 6404 Earth pressure and Retaining Structures

3 Credits

Fundamentals of lateral earth pressure and classical methods of analysis. Analysis of braced excavations, retaining walls and design of sheet piling system. Principles of cofferdam design. Bearing capacity theories related to shallow and deep foundations.

CE 6405 Earth dams and Stability of Slopes

3 Credits

Seepage in composite sections. Methods of stability analysis, stability of slopes. Compaction, Measurement of performance, construction and control of embankment.

CE 6406 Rock Mechanics

3 Credits

Classification and engineering properties of intact rocks, brittle fracture theory. Characterization and properties of rock discontinuities criteria of rock failure. Engineering problems associated with construction in rocks; Stabilization, anchoring and rock bolting; Rock slope stability and reinforcement; Design of underground opening and structures; Geotechnical aspects of open pit and underground mining; soft and hard rock; Material handling, waste disposal.

CE 6407 Soil Dynamics

3 Credits

Sources and types of dynamic loading. Vibration of elementary systems, Wave propagation in soils. Dynamic solid properties and methods of their determination, liquefaction, shear modulus and damping effects. Vibrations of foundations on elastic media, machine foundations, earthquake response, blast effects including nuclear weapon effects.

CE 6408 Advanced Engineering Geology

3 Credits

Advanced physical geology concerning transported and residual soils. Erosion and deposition. Geomorphology. Study of the formation of delta. Engineering geology of soft clays. Engineering properties of rocks. Geologic structures. Historical geology. Geology of Bengal Basin. Earthquake zones of Bangladesh. Geological considerations for engineering designs.

CE 6409 Reinforced Earth

3 Credits

Materials used in reinforced earth; constitutive laws; Design parameters and testing techniques; Conceptual performance of reinforced soil; Analysis, design and construction of reinforced earth retaining structures; Reinforced sloped; Design and construction of reinforced paved and unpaved road; Analysis, design and construction of granular insitu stabilized columns; Soil nailing, root or micropiles. Random (non-oriented) fibre reinforced soil.

CE 6410 Constitutive Modeling in Soil Mechanics

3 Credits

Elasto-plastic modeling of soils; Model development process; Models for different types of soils; Monotonic, cyclic and repetitive loading models; Modern approach of constitutive modeling in

soil mechanics; Thermodynamic approach of modeling; Application of soil models with small and large strain theories; Application of soil models in Finite Element Method, Distinct Element Method and Finite Difference Method.

CE 6411 Earthquake Engineering

3 Credits

Historical background; Plate tectonics; Various types of earthquakes and faulting; Wave types and their characteristics; Characteristics of seismometers and microtremor instruments; Characteristics of magnitude and intensity scales; Earthquake time histories; Fourier and response spectra; Historical seismicity and earthquake catalogues: data acquisition, sources, magnitude rescaling, application to hazard analysis; Site characterization: amplification and responses; Experimental simulation and shaking tables; Introduction to lifeline engineering: electricity, water, natural gas, telecommunication and transportation systems; Post earthquake damage survey; Mitigation strategies; Case studies of major earthquakes.

CE 6501 Transportation Engineering

3 Credits

Historical development, systems of transportation, technical and operation characteristics of highways, railways, waterways, airways and pipelines; transportation planning and development.

CE 6502 Geometric Design of Highways

3 Credits

Highway classification; Design controls and criteria; Traffic, vehicle characteristics, speed capacity; Elements of design; Sight distance, horizontal and vertical alignment; Cross-section elements; Road intersections, grade separation and interchanges; Highway drainage.

CE 6503 Highway Materials

3 Credits

Origin, production, specifications properties and uses of bituminous materials; binder mixtures; design and analysis of bituminous paving mixes; field operations, surface treatments, stabilization methods; aggregates, base, subbase and subgrade; cement concrete in pavement constructions.

CE 6504 Advanced Surveying

3 Credits

Triangulation; Classification and schemes, instruments, linear and angular measurements, field works errors and corrections, computations; Geometric levelling; Field astronomy; Motions of earth, and other stars, time, coordinate systems, errors and corrections; Hydrographic surveying; determination of depth under water, measurement of discharge and stream current; Terrestrial and aerial photogrammetry; Instruments, field works, plotting of maps, analysis and interpretation of photographs, stereophotogrammetry, remote sensing and its application in civil engineering.

CE 6505 Structural Design of Pavements

3 Credits

Pavement types, wheel loads, stresses in flexible pavements, stresses in rigid pavements, pavement performance, evaluation of subgrade and base support, design theories and practices, construction methods and maintenance, pavement rehabilitation.

CE 6507 Traffic Engineering

3 Credits

Characteristics of vehicles and driver, traffic stream characteristics, traffic control and operation, traffic surveys, accidents and road safety, parking, roadway lighting, traffic management and administration.

CE 6508 Railway Engineering

3 Credits

General requirements, permanent way, alignments, gradient and curves, points and crossings, signalling and interlocking, tunnelling, construction and maintenance.

CE 6509 Waterways

3 Credits

Historical development of navigation, navigational channels, survey of waterways, classification of waterways, traffic, vessels, ports and harbours, navigational aids, maintenance of waterways.

CE 6510 Planning and Design of Airports

3 Credits

Growth and demand of air transport, airport site selection and configuration, geometric design of runways and taxiways, terminal areas, capacity analysis, lighting and marking, air traffic control systems, structural design, construction and maintenance of airport pavements, airport drainage.

CE 6511 Transportation Planning

3 Credits

Techniques and processes used in solving transportation problems, relationship between trip generation and land use, collection and characteristics of base year data, formulation of mathematical models to simulate existing travel patterns, forecasting procedures and evaluation of transportation systems.

CE 6512 Transportation Engineering Economics

3 Credits

Introduction to basic economic theories; principles and methodologies appropriate to transportation engineering; identification and measurement of transportation costs and benefits; Road user charges and principles of road pricing; Evaluation of transportation proposals in terms of their economic, social and environmental consequences; Techniques of cost benefit analysis; Selected case studies - application of economic principles to one or more current issues in transportation policy and planning.

CE 6513 Traffic Simulation

3 Credits

Introduction to simulation techniques; Review of Monte Carlo simulation, macroscopic and microscopic simulation, deterministic and stochastic simulation; Simulation in traffic engineering, review of traffic simulation models, lane-based and non-lane-based mixed traffic simulation; Simulation system components, introduction to statistical distributions, sampling from distributions, random number generation techniques, vehicle representation and processing techniques, simulation warm up and update procedures; Development of traffic simulation model, logical aspects of modeling traffic flow components, elements of systems analysis and synthesis; Model verification, refinements and parameter estimation, calibration and validation; Application of simulation models.

CE 6514 GIS and Remote Sensing in Transportation

3 Credits

Concepts of Geographic Information Systems (GIS): definition, data structure, data processing and management, spatial analysis; GIS software; Basic principles of remote sensing (RS) and global positioning systems (GPS): definition, data acquisition, spectral characteristics of land cover, multi-spectral analysis, image interpretation, geometric corrections, classification techniques; Integration of RS and GPS with GIS; GIS applications in the field of transportation planning and traffic engineering: digitized mapping of land use and transport network, transport infrastructure development and management, analysis and prediction of impacts, strategy planning, monitoring and evaluation of transport systems and environment, route selection,

traffic management and accident analysis, public transport information systems; Integration of GIS packages with transport modeling software.