الجامعـــة الإسلاميـــة للتكنولوجيا

ISLAMIC UNIVERSITY OF TECHNOLOGY (IUT)

ORGANISATION OF ISLAMIC COOPERATION (OIC)

COURSE STRUCTURE
AND
COURSE CONTENTS

ACADEMIC CALENDAR 2011-2012

DEPARTMENT OF CIVIL AND ENVIRONMENTAL ENGINEERING (CEE)

2011

Contents

GENERAL INFORMATION

Civil Engineering is a professional engineering discipline that deals with the design, construction, and maintenance of the physically and naturally built environment, including works such as bridges, roads, canals, dams and buildings. Civil Engineering is the oldest engineering discipline. The earliest practices of Civil Engineering may have commenced between 4000 and 2000 BC in Ancient Egypt and Mesopotamia (Ancient Iraq) when humans started to abandon a nomadic existence, thus causing a need for the construction of shelter. In fact, it is traditionally broken into several sub-disciplines: environmental engineering, geotechnical engineering, structural engineering, transportation engineering, municipal or urban engineering, earthquake engineering, water resources engineering, materials engineering, coastal engineering, surveying and construction engineering.

The Department of Civil and Environmental Engineering started at IUT from academic session 2008-2009 with an enrolment of 41 students. At present, there are 8 well-qualified full-time teachers along with 6 part-time teachers. The mission of the department is to:

Educate students in fundamental concepts and principles, develop critical thinking, technical skills, as applied to engineering analysis and sustainable design and through appropriate curriculum and courses,

Provide continuing educational opportunities, technical assistance, and intellectual resources to the local, national, and international arena,

Serve the engineering profession and society through innovative research and

To strengthen educational cooperation and expertise within the OIC member states in the field of Civil and Environmental Engineering.

Programme offered by CEE Department:

- Bachelor of Science in Civil Engineering

The 4-year B.Sc. Engg. (CE) Programme consists of a number of courses which are distributed in 8 semesters. Total number of credit hours is 181.5. There is also an Industrial Training of 4 week duration offered to students to familiarise with construction and design works.

The department is well equipped with laboratories in the areas of concrete and structures, geo-technics, hydraulics and environmental engineering. The laboratory facilities are constantly developed and augmented to cater for increased teaching and research needs. The laboratories are well supported and managed by laboratory technicians and auxiliary staffs.

FACULTY

Head of the Department

Prof. Dr. A.K.M. Sadrul Islam
Ph.D. (London), M.Sc. (BUET), B.Sc. Engg. (BUET)

Assistant Professors

Dr. Shahriar Shams
Ph.D. (Manchester), M.Sc. (KTH), M.Sc. (UKM),
B.Sc. Engg. (RUET)

Dr. Shakil Mohammad Rifaat
Ph.D. (Calgary), M.Sc. (NUS), B.Sc. Engg. (BUET)

Mohammad Shafiqual Alam
M.Sc. (UPV & UJF), B.Sc. Engg. (BUET)

Lecturers

Md. Al-Amin, B.Sc. Engg. (BUET)
Nazmus Sakib, B.Sc. Engg. (BUET)
Md. Tahmidur Rahman, B.Sc. Engg. (BUET)

Part Time Teachers

Prof. Dr. Abul Fazal M. Saleh
IWFM, BUET

Prof. Dr. Md. Monimul Huque
Chemistry Department, BUET

Prof. Dr. Md. Abdul Maleque
Mathematics Department, BUET

Prof. Dr. Md. Forhad Mina
Physics Department, BUET

Engr. Mirza Abu Taher
B.Sc. Engg. (BUET), FIEB

COURSE STRUCTURE for B.Sc. in Civil Engineering Programme:

L = Lecture, P = Practical

First Semester

Course Number	Course Title	Contact Hours L-P	Credit Hours
Math 4103	Mathematics I	3-0	3.00
Phy 4103	Physics I	3-0	3.00
Chem 4103	Chemistry	3-0	3.00
MCE 4191	Computer Programming and Applications	2-0	2.00
CEE 4101	Surveying	4-0	4.00
TVE 0107	Islamiat	2-0	2.00
TVE 0102	Spoken Arabic I	0-2	1.00
	Or		
TVE 0104	Spoken English I		
	Or		
TVE 0106	Spoken French I		
Phy 4104	Physics I Lab	0-1.5	0.75
Chem 4104	Chemistry Lab	0-1.5	0.75
CEE 4108	Civil Engineering Drawing	0-3	1.50
MCE 4192	Computer Programming and Applications lab	0-3	1.50
	Total L-P	17-11	
	Total Hours	28	22.5

Second Semester

Course Number	Course Title	Contact Hours L-P	Credit Hours
Math 4203	Mathematics II	3-0	3.00
Phy 4203	Physics II	3-0	3.00
Chem 4203	Chemistry of Engineering Materials	3-0	3.00
MCE 4203	Engineering Mechanics I	3-0	3.00
TVE 0207	Islamic History & Culture	3-0	3.00
TVE 4249	Technology, Environment and Society	3-0	3.00
Phy 4204	Physics II Lab	0-1.5	0.75
Chem 4204	Chemistry of Engineering Materials Lab	0-1.5	0.75
TVE 0202	Spoken Arabic II	0-2	1.00
	or		
TVE 0204	Spoken English II		
	or		
TVE 0206	Spoken French		
CEE 4210	Workshop Practice	0-3	1.50
CEE 4202	Practical Surveying*		1.50
	Total L-P	18-8	
	Total Hours	26	23.5

* 2 weeks of field works

Third Semester

Course Number	Course Title	Contact Hours L-P	Credit Hours
Math 4303	Mathematics III	4-0	4
CEE 4303	Engineering Geology & Geomorphology	3-0	3
CEE 4311	Mechanics of Solids	4-0	4
CEE 4321	Fluid Mechanics	3-0	3
EEE 4325	Electrical & Electronic Tech	3-0	3
CEE 4331	Ecology and Environment	2-0	2
CEE 4302	Materials & Mechanics of Solids Lab	0-3	1.5
CEE 4312	Quantity Surveying	0-3	1.5
CEE 4322	Fluid Mechanics Lab	0-3	1.5
EEE 4326	Electrical & Electronic Tech Lab	0-1.5	0.75
	Total L-P	19-10.5	
	Total Hours	29.5	24.25

Fourth Semester

Course Number	Course Title	Contact Hours L-P	Credit Hours
Math 4403	Mathematics IV	3-0	3.00
CEE 4411	Structural Analysis & Design I	4-0	4.00
CEE 4401	Construction Materials.	3-0	3.00
CEE 4423	Hydrology	3-0	3.00
CEE 4431	Water Supply Engineering	3-0	3.00
CEE 4441	Soil Mechanics & Geotechnical Engineering	3-0	3.00
CEE 4412	Structural Analysis & Design Sessional I	0-3	1.50
CEE 4400	Details of Construction	0-3	1.50
Math 4404	Mathematics Practice IV	0-1.5	0.75
CEE 4442	Geotechnical Engineering Lab	0-3	1.50
TVE 4472	Technical Report Presentation	0-2	1.00
	Total L-P	19-12.5	
	Total Hours	31.5	25.25

Fifth Semester

Course Number	Course Title	Contact Hours	Credit Hours
		L-P	
CEE 4511	Design of Concrete Structures	4-0	4.00
CEE 4521	Open Channel Flow	3-0	3.00
CEE 4531	Environmental Sanitation	3-0	3.00
CEE 4523	Irrigation and Drainage Engineering	3-0	3.00
CEE 45xx	Elective/Specialization Subject	3-0	3.00
CEE 45xx	Elective/Specialization Subject	3-0	3.00
CEE 4522	Open Channel Flow Lab	0-3	1.50
CEE 4532	Environmental Engineering Lab	0-3	1.50
	Total L-P	19-6	
	Total Hours	25	22

Sixth Semester

Course Number	Course Title	Contact Hours L-P	Credit Hours
CEE 4611	Design of Pre-stressed Concrete Structures	3-0	3.00
CEE 4631	Environmental Pollution and Its Control	3-0	3.00
CEE 4651	Introduction to Transportation Engineering and Traffic Design	3-0	3.00
TVE 4649	Social Studies and Accountancy	3-0	3.00
CEE 46xx	Elective/Specialization Subject	3-0	3.00
CEE 46xx	Elective/Specialization Subject	3-0	3.00
CEE 4622	Design of Concrete Structures Sessional	0-3	1.5
CEE 4652	Transportation Engineering Sessional I	0-3	1.5
	Total L-P	18-6	
	Total Hours	24	21

Seventh Semester

Course Number	Course Title	Contact Hours L-P	Credit Hours
CEE 4700	Project and Thesis I	0-6	3.00
CEE 4701	Professional Practices and Communication	3-0	3.00
CEE 4703	Socioeconomic Aspects of Development Projects	3-0	3.00
CEE 4741	Foundation Engineering	3-0	3.00
MCE 4717	Engineering Economy	2-0	2.00
TVE 4749	Science, Technology & Islam	2-0	2.00
CEE 47xx	Elective Subject	3-0	3.00
CEE 4732	Advanced Environmental Sessional	0-3	1.50
CEE 4790	Industrial Training		1.00
	Total L-P	16-9	
	Total Hours	25	21.5

Eighth Semester

Course Number	Course Title	Contact Hours L-P	Credit Hours
CEE 4800	Project & Thesis II	0-6	3
CEE 4811	Structural Analysis & Design II	3-0	3
CEE 4821	Integrated Water Resources Management	3-0	3
CEE 4831	Environmental Impact Assessment	2-0	2
CEE 4851	Highway design and Railways	3-0	3
CEE 4801	Project Planning & Management	3-0	3
CEE 48xx	Elective Subject	3-0	3
CEE 4852	Transportation Engineering Sessional II	0-3	1.5
	Total L-P	20-6	
	Total Hours	26	21.5

COURSE CONTENTS
For Undergraduate Programmes

CEE 4101 Surveying **4-0** **Credit 4.00**

Reconnaissance survey; linear measurements; traverse survey; levelling and contouring; calculation of areas and volumes; problems on heights and distances; curves and curve ranging, transition curve, vertical curves. Tacheometry: introduction, principles and problems on tacheometry. Astronomical surveying: definition, instruments, astronomical corrections, systems of time. Photogrametry: introduction of terrestrial photography, aerial photography, reading of photo mossaic, scale; project surveying; errors in surveying; remote sensing; introduction to global positioning system (GPS).

CEE 4108 Civil Engineering Drawing **0-3** **Credit 1.50**

Introduction - lettering, numbering and heading; plane geometry-pentagon, hexagon, octagon, ellipse, parabola, hyperbola. Projection (Solid Geometry) - cube, triangular prism, square prism, pentagonal prism, hexagonal prism, cone, cylinder. Development - cube, pyramid, cone, prism; section and true shape - cube, pyramid, cone, prism. Isometric Drawing - cube, pyramid, cone. Oblique Drawing - cube, pyramid, cone, Interpretation of Solids. Plan, elevation and section of one storied buildings. Plan, elevation and sections of multi-storied buildings, Plan and section of septic tank; Building services drawings; introduction to computer aided drafting.

CEE 4202 Practical Surveying **Credit 1.50**

Two weeks of field work based on CEE 4201

CEE 4210 Workshop Practice **0-3** **Credit 1.50**

Carpentry shop, Machine shop and Welding shop sessional

Carpentry shop (3/2 hrs/week)

Wood working tools; Wood working machine: Band saw, scroll saw, circular saw, jointer, thickness planer, disc sander, wood lathe; Types of sawing; Common cuts in wood works; Types of joint; Defects of timber: Natural defects and artificial defects; Seasoning; Preservation; Substitute of timber; Commercial forms of timber. Characteristics of good timber; Use of fastening; Shop practice: Practical job, planning and estimating of a given job.

Machine shop (3/4 hrs/week)

Kinds of tools; Common bench and hand tools; Marking and layout tools, measuring tools, cutting tools, machine tools, bench work with job. Drilling, Shapar, Lathe and Milling Machines: Introduction, type, size and capacity, uses and applications.

Welding shop (3/4 hrs/week)

Methods of metal joints: Riveting, grooving soldering, welding; Types of welding joints and welding practice; Position of arc welding and polarty: Flat, vertical, horizontal, overhead; Electric Arc welding and its machineries; Welding of different types of materials: Low carbon steel, cast iron, brass, copper, stainless steel, aluminium; Types of electrode, fluxes and their composition; Arc welding defects; Test of Arc welding: Visual, destructive and non-destructive tests. Types of gas welding system and gas welding equipment; Gases and types of flame; welding of different types of materials; Gas welding defects; test of gas welding.

Math 4303 Mathematics III 4-0 Credit 4.00

Vector Calculus: Formal definition of differentiation and integration and their elementary application to geometry and mechanics. Scaler point function and vector point function. Definition and physical interpretation of gradient of scalar function, divergence and curl of a vector function. Vector formula. Theorems of Gauss, Green and stokes.

Partial differential equations: Introduction, Equation of the linear and non-linear first order. Standard forms. Linear equations of higher order. Equations of the second order with variable coefficients.

Numerical Analysis: Concept of Simple difference and divided difference and their relation. Newtons forward and backward interpolation formula. General interpolation formula of Newton and Langrange. Langrange's inverse interpolation formula. Inverse interpolation by successive approximation. Numerical differentiation. Numerical integration. General quadrature formula for equidistant ordinates. Simpson's rule, Weddles rule, Trapezoidal rule and their comparative study. Gauss quadrature formula. Study of least square principle and its application in curve fitting. Solution of algebraic and transcendental equation by graphical method and Newton-Raphson method. Newton-Raphson method for the solution of simultaneous

equations. Numerical solution of simple first order differential equation by Euler's method, Picards method and Runge-kutta method.

CEE 4302 Quantity Surveying 0-3 Credit 1.50

Analysis of rates; detailed estimate of all items of work of a building, bridge, truss, highway. Specifications of materials for the above constructions.

CEE 4303 Engineering Geology & Geomorphology 3-0 Credit 3.00

Minerals; identification of minerals, common rock forming minerals; physical properties of minerals; mineraloids rocks; types of rocks, cycle of rock change; earthquake and seismic map of Bangladesh.

Structural geology; faults; types of faults; fold and fold type; domes; basins; erosional process; quantitative analysis of erosional land forms. Channel development; channel widening; valley shape; stream terraces; alluvial flood plains; deltas and alluvial fans; channel morphology; channel patterns and the river basin; geology and geomorphology of Bangladesh;

CEE 4311 Mechanics of Solids 4-0 Credit 4.00

Fundamental concepts of stress and strain; mechanical properties of materials; strain energy; stresses and strains in members subjected to tension, compression, shear and temperature changes; bending moment and shear force diagrams of beams and frames; flexural and shearing stresses in beams; shear centre; thin walled pressure containers; rivetted and welded joints; torsional stresses in shafts and tubes; compound stresses; helical springs; transformation of stresses; deflection of beams by direct integration, moment area, elastic load and conjugate beam methods; buckling of columns; cables and cable supported structures.

CEE 4312 Materials & Mechanics of Solids Lab 0-3 Credit 1.50

Test for specific gravity. Unit weight, voids and bulking of aggregates; moisture content and absorption of coarse and fine aggregates; normal consistency and initial setting time of cement; direct tensile and compressive strengths of cement mortar; gradation of coarse and fine aggregates; design and testing of a concrete mix.

Tension, direct shear and impact tests of mild steel specimen, compression test of timber specimen, slender column test; static bending test; hardness test of metals; helical spring tests; determination of shear centre; load-deflection behavior of simple beam.

CEE 4321 Fluid Mechanics **3-0** **Credit 3.00**

Development and scope of fluid mechanics; fluid properties; fluid statics; kinematics of fluid flow; fluid flow concepts and basic equations- continuity equation, Bernoulli's equation, energy equation, momentum equation and forces in fluid flow. Similitude and dimensional analysis. Steady incompressible flow in pressure conduits; laminar and turbulent flow; general equation for fluid friction. Empirical equations for pipe flow. Minor losses in pipe flow. Fluid measurement: pitot tube, orifice, mouthpiece, nozzle, venturimeter, weir. Pipe flow problems- pipes in series and parallel, branching pipes, pipe networks.

CEE 4322 Fluid Mechanics Lab **0-3** **Credit 1.50**

Center of pressure; proof of Bernoulli's theorem; flow through venturimeter; flow through orifice; coefficient of velocity by co-ordinate method; flow through mouthpiece; flow over V- notch; flow over sharp crested weir; fluid friction in pipe.

CEE 4331 Ecology and Environment **2-0** **Credit 2.00**

Ecology: Concept, definition, and components of ecology. Ecosystem: Concept, principles, structure and functioning of ecosystem; Types of ecosystem; Energy and Materials flow in ecosystem; Food chain, biodiversity and stability in ecosystems. Biochemical cycles: Carbon cycle, nitrogen cycle, sulfur cycle and phosphorous cycle, cycle of trace elements. Population dynamics and carrying capacity.

Environment: Introduction to environment; components of the environment; environmental resources; environment-human interaction and environmental degradation; Environmental pollution; Environmental conservation. Global environmental concerns: Climate change, ozone layer depletion, global warming and green house effects, sea level rise, El nino, La nino.

CEE 4400 Details of Constructions 0-3 Credit 1.50

Foundations; different types of foundations; brick masonry; framed structures and bearing walls; arches and lintels; details of floors and roofs; pointing; plastering and interior finishing; scaffolding, staging; shoring and underpinning; thermal insulation and acoustics; House plumbing.

CEE 4401 Construction Materials 3-0 Credit 3.00

Properties and uses of bricks, efflorescence, cement, cement chemistry, aggregates, cement and lime mortars, concrete, standard tests of bricks, cement and concrete, salinity problem in concrete, corrosion and its prevention, paints, varnishes, metallic coating.

Design of concrete mixes, atomic structure and bonding, crystal structures, mechanical properties, yielding/ fracture, elasticity, plasticity. Properties and uses of rubber, timber and plastics. Concrete for special purposes. Ferrocement.

Math 4404 Mathematics Practice IV 0-1.5 Credit 0.75

Sessional in the Computer Centre based on Math 4303

CEE 4411 Structural Analysis and Design I 4-0 Credit 4.00

Stability and determinacy of structures: analysis of statically determinate trusses and arches; influence lines; moving loads on beams and trusses; analysis of suspension bridge.

Wind and earthquake loads; approximate analysis of statically indeterminate structures, e.g. braced trusses and multi storied building frames (portal and cantilever menthod for lateral load analysis and approximate method for vertical load analysis); deflection of beams, trusses and frames by virtual work method.

CEE 4412 Structural Analysis and Design Sessional I 0-3 Credit 1.50

Analysis and design problems; design of members and connection of steel structures; e.g. trusses and plate girders; use of software in analysis and design problems.

CEE 4423 Hydrology **3-0** **Credit 3.00**

Hydrologic cycle; weather and hydrology; precipitation, evaporation and transpiration; infiltration; stream flow; rainfall-runoff relations; hydrographs, unit hydrographs; hydrologic routing; application of telemetry and remote sensing in hydrologic data acquisition; statistical methods in hydrology.

CEE 4431 Water Supply Engineering **3-0** **Credit 3.00**

Water Supply Engineering: introduction; water demands; water sources; ground water exploration: aquifer properties and ground, water flow, well hydraulics, water well design, drilling, construction and maintenance; water demand for rural communities; shallow hand tube wells and deep set Tara pumps for problem areas. Rainwater harvesting. Surface water collection and transportation. Pumps and pumping machinery.

Water quality: Impurities in water; important water quality parameters; Guidelines and Standards for drinking water. Water treatment: plain sedimentation, flocculation and settlement, filtration, disinfecting; miscellaneous treatment methods; low cost treatment methods for rural communities. Water distribution system: analysis and design of distribution network; Fire hydrants; Water meters; Leak detection, unaccounted-for water. Water Safety Plan.

CEE 4441 Soil Mechanics & Geotechnical Engineering **3-0** **Credit 3.00**

Introduction to geotechnical engineering; formation, type and identification of soils; soil composition; soil structure and fabric; index properties of soils; engineering classification of soils; soil compaction; principles of total and effective stresses; permeability and seepage; stress-strain-strength characteristics of soils; compressibility and settlement behaviour of soils; lateral earth pressure; stress distribution.

CEE 4442 Geotechnical Engineering Lab **0-3** **Credit 1.50**

Field identification tests; grain size analysis by sieve and hydrometer; specific gravity test; Atterberg limits test; permeability tests; unconfined compression test; compaction test; relative density test; direct shear tests; consolidation tests.

CEE 4511 Design of Concrete Structures 4-0 Credit 4.00

Fundamental behavior of reinforced concrete; introduction to WSD and USD methods; analysis and /design of singly reinforced, doubly reinforced and T-beams according to strength design method; shear, diagonal tension and tension and torsion of beams; bond and anchorage; design of one way slabs; design of two way edge supported slabs using strip and alternate methods; reinforced concrete floor and roof systems; review of codes; yield line method; design of column supported slabs; design of column under uniaxial and biaxial bending; design of footings and retaining walls; seismic detailing.

CEE 4521 Open Channel Flow 3-0 Credit 3.00

Open channel flow and its classification. Velocity and pressure distributions. Energy equation, specific energy and transition problems. Critical flow and control. Principles of flow measurement and devices. Concept of uniform flow, Chezy and Manning equations, estimation of resistance coefficients and computation of uniform flow. Momentum equation and specific momentum. Hydraulic jump. Theory and analysis of gradually varied flow. Computation of flow profiles. Design of channels.

CEE 4522 Open Channel Flow Lab 0-3 Credit 1.50

Broad-crested weir. Sluice gate. Venturi flume. Parshall flume. Cut-throat flume. Hydraulic jump. Velocity distribution profile. Manning's roughness coefficient. Specific force and specific energy.

CEE 4531 Environmental Sanitation 3-0 Credit 3.00

Sewage Sanitation: Estimation of sewage; Collection and transportation of sewage; Characteristics of sewage; Preparatory, primary and secondary treatment of sewage; Sewage disposal; Treatment of industrial wastewater, treatment and disposal of sludge.

Sanitation of low-income communities: on-site sanitation systems; septic tank and soakwell/subsurface drainage systems, small-bore sewer system.

Refuse (Solid Wastes) sanitation; sources, type and characteristics of refuse; generation of wastes; collection and transportation; resource recovery and recycling; incineration; composting; disposal in landfills.

Air pollution and control, indoor sanitation, food sanitation and sanitation of public places.

CEE 4532 Environmental Engineering Lab 0-3 Credit 1.50

Physical, chemical and bacteriological analysis of water and wastewaters.

CEE 4523 Irrigation and Drainage Engineering 3-0 Credit 3.00

Importance of irrigation; sources and quality of irrigation water; soil-water relationship; consumptive use and estimation of water requirements; methods of irrigation; design of irrigation canal systems; irrigation structures; irrigation pumps; problems of irrigated land; irrigation water management; importance of land drainage; drainage systems and design.

CEE 4611 Design of Pre-stressed Concrete Structures 3-0 Credit 3.00

Prestressed concretes: materials; prestressing systems; loss of prestress; analysis of sections for flexure, shear, bond and bearing; beam deflections and cable layout; partial prestress. Design of prestressed sections for flexure, shear, bond and bearing.

CEE 4622 Design of Concrete Structures Sessional 0-3 Credit 1.50

Use of structural analysis and design software; analysis and design problems based on CEE 4511 and CEE 4611; design of a slab bridge, simple girder bridge and a low-rise building.

CEE 4651 Introduction to Transportation Engineering & Traffic Design 3-0 Credit 3.00

Introduction to transportation engineering; development of transportation systems; elements of transportation system; transportation in Bangladesh; modal share; transportation planning concepts: collection, study and analysis of basic data; highway location and surveys; geometric design of highways: elements of design, cross-section elements, curves and sight distances; road intersections; traffic engineering: the road/traffic system, vehicle and

traffic characteristics, traffic control devices, traffic studies, parking and roadway lighting; waterways and terminals.

CEE 4652 Transportation Engineering Sessional I **0-3** **Credit 1.50**

Tests bn bituminous materials, tests on sub grade, sub base and base materials; mix design; roadway capacity studies.

CEE 4700 Project and Thesis I **0-6** **Credit 3.00**

Experimental and theoretical investigation of various topics in structural engineering, concrete technology, environmental engineering, transportation engineering and geotechnical engineering. Individual or group study of one or more topics from any of the above fields. The students will be required to submit thesis/project report at the end of the work.

CEE 4701 Professional Practices and Communication **3-0** **Credit 3.00**

The project cycle; project proposal; contractual provisions; techniques of specification writing; evaluation of bids; project evaluation.

Interpretation of literature, documents etc.; communicating; preparation of report; industrial and labour relations; professional ethics in Civil Engineering.

CEE 4703 Socioeconomic Aspects of Development Projects **3-0** **Credit 3.00**

Economic and social structure; development and economic growth; socio-economic indicators; population, prosperity and poverty; employment of workforce; population displacement; rehabilitation strategy; productivity, landloss, landuse and land ownership patterns; fisheries and aquaculture; deforestation and afforestation; communication, commerce, industries and other economic benefits; water supply, sanitation, health and nutrition; inequalities in distribution of benefits and losses; socio-economic survey; case studies.

CEE 4712 Structural Analysis & Design Sessional II **3-0** **Credit 1.50**

Use of structural analysis and design software; design of various reinforced concrete structures, e.g. buildings, water towers, folded plate roof.

CEE 4741 Foundation Engineering **3-0** **Credit 3.00**

Soil investigation techniques; settlement computation; types of foundations; bearing capacity of shallow and deep foundations; settlement and distortion of foundations; design and construction of footings, rafts and piles; slope stability analyses.

CEE 4722 Design of Hydraulic Structures **0-3** **Credit 1.50**

Types of hydraulic structures; principles of design; design of different types of hydraulic structures: regulators; dams; barrages; cross-drainage works; pump house, etc.

CEE 4790 Industrial Training **1-0** **Credit 1.00**

CEE 4800 Project and Thesis II **0-6** **Credit 3.00**

Continuation of the Project

CEE 4801 Project Planning and Management **3-0** **Credit 3.00**

Principles of management; principles of construction management; construction contracts and specifications; inspection and quality control; construction safety; construction planning and scheduling: PERT, CPM, case studies, resource scheduling; PERT: a cost accounting system, linear programming. Psychology in administration; materials management; demand forecasting; inventory control; stores management; procurement. Project planning and evaluation; feasibility reports, cash flow, pay back period, internal rate of return. Benefit-cost ratio, construction equipments and plants. Replacement studies.

CEE 4811 Structural Analysis and Design II 3-0 Credit 3.00

Analysis of statically indeterminate beams and frames by moment distribution, consistent deformation/flexibility and stiffness methods; Algorithms for implementing direct stiffness method in a computer; influence lines of statically inderminate beams and frames.

CEE 4821 Integrated Water Resources Management 3-0 Credit 3.00

Basic concepts in integrated water resources management; Formulation and evaluation of alternatives; economic, environmental and institutional aspects, Project Appraisal; Participation of beneficiaries, formation of users' group. Operation and maintenance of water resources systems.

SPECIALIZATION/ELECTIVE COURSES 5th & 6th Semester

CEE 4513 Construction Technology 3-0 Credit 3.00

Construction contracts; value engineering in construction; project network analysis (CPM); selection of construction equipment; fundamentals of earth moving; soil stabilization and compaction; tractor and related equipment; scrapers; excavating equipment; trucks and wagons; operation analyses; belt-conveyor systems; compressed air; drilling rock and earth; blasting rocks; tunneling; foundation grouting; pile and pile driving equipment; pumping equipment; production of crushed-stone aggregates; concrete technology; scaffolding and form works.

CEE 4525 Groundwater Engineering 3-0 Credit 3.00

Groundwater in hydrologic cycle and its occurrence; Physical properties and principles of groundwater movement; groundwater and well hydraulics; hand, shallow, deep set shallow and deep tube wells; their design, drilling, construction and maintenance; groundwater resource evaluation; groundwater levels and environmental influences; water mining and land subsidence; groundwater pollution and contaminant transport; recharge of groundwater; saline water intrusion in aquifers; groundwater management; groundwater exploration.

CEE 4533 Solid and Hazardous Waste Management **3-0 Credit 3.00**

Solid wastes: Sources and types of solid wastes: Physical and chemical properties of solid wastes; Solid wastes generation: Collection of solid wastes; Community participation in solid waste collection; Transfer and transport; On-site handling and shorting; Volume reduction and recycling; Recovery of resources, conversion products and energy; Final disposal of solid wastes and residual products.

Hazardous wastes: Identification and classification of hazardous wastes; Generation, on-site storage, collection and transport of hazardous wastes; Physical, chemical and biological processes of treatment; Disposal of hazardous wastes. Generation, storage, collection, treatment and disposal of hospital wastes.

CEE 4541 Soil Investigation for Construction 3-0 Credit 3.00

Soil investigation techniques: Pit sampling; Wash boring; Borehole stability; borehole logging; sample quality, preservation, transportation, preparation for testing; stress release effects; Standard Penetration tests; Cone penetration tests; Pressure meter tests; Vane shear tests; Plate load tests; field permeability tests; installation of settlement plates, slope indicators etc. Subsoil exploration program; interpretation of topographic, geological and agricultural soil maps; Soil Investigation report writing.

CEE 4613 Steel structures **3-0 Credit 3.00**

Behaviour of structural steel members and steel frames; code requirements; design of tension and compression members by WSD and LFD methods; design of beam, beam-columns; Joint design.

CEE 4623 Hydraulic Machinery **3-0 Credit 3.00**

Review of impulse-momentum principle; forces in fluid flow; principles of hydraulic machines; reciprocating pumps; similarity laws for turbo machines; centrifugal pumps; water turbines; testing of hydraulic machines; irrigation pumps used in Bangladesh.

CEE 4631 Environmental Pollution & Its Control **3-0 Credit 3.00**

Water pollution: Sources and types of pollutants; Dissolved oxygen models and waste assimilation capacity of water bodies/streams; Industrial pollution; Groundwater pollution; Marine pollution; Pollution control measures; Water quality monitoring and management. Air pollution: Sources and types of pollutants; Effects on health, properties and plants; Air pollution monitoring and control measures. Sources, effects and control of noise pollution; Sources, effects, control of thermal pollution; Soil pollution, control and remediation.

CEE 4633 Environmental Management **3-0 Credit 3.00**

Definition; Anthropogenic and natural causes of environmental degradation; International initiatives; Glpbal, regional and local approaches to environmental management; Environmental implications of sectoral development. Environmental resource management and conservation strategies; Environmental management tools: Environmental Impact Assessment (EIA), environmental education and awareness; Environmental guidelines, policies, environmental legislation and Environmental Quality Standards (EQS). Environment and sustainable development; Environmental management at project level; Economics of environmental management.

CEE 4643 Construction of Dams and Embankments **3-0 Credit 3.00**

Field and laboratory compaction; compaction equipment and methods; methods of stability analysis; stability analysis for static and dynamic forces; seepage in composite sections; piping; pinhole test; core design; measurement of performance; construction control of embankments; ground improvement methods; field instrumentations: installation of piezometers, settlement plates, inclinometers; maintenance of dams and embankments.

SPECIALIZATION/ELECTIVE COURSES 7th & 8th Semester

CEE 4713 Introduction to Finite Element Method **3-0 Credit 3.00**

Introduction to finite element method as applied to Civil Engineering problems. One dimensional stress deformation and time dependent flow problem. Two dimensional plane stress and plane strain analysis of stress deformation problems.

CEE 4723 River Engineering and Flood Mitigation **3-0 Credit 3.00**

Behavior of alluvial rivers; river pattern and morphological processes; river training and bank protection works; navigation and dredging; sediment movement in river channels, bed forms and flow regimes; flood and its causes; methods of flood management; structural and non structural measures such as reservoirs, levees and flood walls, channel improvement, interior drainage, flood ways, land management, flood proofmg, flood zoning, flood hazard mapping, flood forecasting and warning; flood damage in urban and rural areas.

CEE 4731 Industrial Wastewater Engineering 3-0 Credit 3.00

Characteristics and volume of industrial wastewater; Estimation of pollution load; Environmental chemistry and microbiology; Physical, chemical and biological treatment of industrial wastewater; Problems associated with treatment of wastewaters from different industries; toxidity and biodegradability; Treatment and disposal of sludges; Advanced treatment process: Electrochemical processes, membrane bio-reactors, sequential batch reactor etc.; Tertiary treatment; Resources recovery, reuse and recycling of industrial wastewater; Zero-discharge technologies.

CEE 4733 Energy and Environment **3-0 Credit 3.00**

Introduction: Definition, classification and sources of energy, importance and use of energy, renewable and non-renewable energy, transformation of energy; Fossil fuel: Sources, exploration, abstraction and related environmental problems, burning of fossil fuel and emission of pollutants, acid rain and transboundary effects; Nuclear energy- environmental problems and safety associated with

nuclear power plants; Environmental issues related to Solar and geothermal energy, hydro, tidal and wind power energy; Energy consumption, emission of green-house gases, climate change and international initiatives to combat climate change; Energy policies.

CEE 4741 Earth Retaining Structures **3-0 Credit 3.00**

Fundamentals of earth pressure and classical methods of analysis; Braced excavations; retaining walls; design of sheet piling systems; cofferdam design; reinforced earth walls; bearing capacity theories and their implication in design.

CEE 4753 Highway Drainage and Airports **3-0 Credit 3.00**

Highways drainage and drainage structures. Evaluation and strengthening of pavements; importance, advantages and trends in air transportation; planning and design of airports; aircraft characteristics related to airport design; types and elements of airport planning studies; airport configuration; geometric design of the landing area; Terminal area; heliports; design of airport pavements; lighting, marking and signing; Airport drainage.

CEE 4813 Dynamics of Structures **3-0 Credit 3.00**

Formulation of equation of motion; free vibration response; SDOF and MDOF systems; response to harmonic and impulse loading and vibration analysis by Rayleigh's method.

CEE 4823 Coastal Engineering and Management **3-0 Credit 3.00**

Coast and coastal features; tides and currents; tidal flow measurement; waves and storm surges; docks and harbours; forces of waves and tides in the design of coastal and harbour structures; coastal sedimentation processes; deltas and estuaries; shore protection works; dredging and dredgers.

CEE 4831 Environmental Impact Assessment 3-0 Credit 3.00

Definition, aims and objectives of Environmental Impact Assessment (EIA); Environmental issues in development projects; EIA in the project cycle; Project screening; Initial Environmental Examination (IEE); EIA Methodologies; Impact identification, prediction, analysis and evaluation; Scooping and people's participation in EIA;

Environmental Impact Statement (EIS); Environmental Management Plan(EMP); Environmental monitoring and post development audit; EIA Guidelines of developing countries and donor agencies; Organization of EIA. Case studies.

CEE 4833 Environmental Economics 3-0 Credit 3.00

Concept and systems of environmental economics; Environment, economic growth and sustainability; The economy and environment: Natural resources economics, the fundamental balance, environment as an economic and social asset; Analytical tools: Benefits and costs, supply and demand, economic efficiency and markets; Economics of environmental quality: pollution control- a general model, environmental damages, efficient level of emission, abatement cost, enforcement cost; Environmental analysis: Impact analysis, cost-effectiveness analysis, benefit-cost analysis, risk analysis; Economics of enforcement: Environmental taxes, Incentive-based strategies, emission and effluent charges, abatement subsidies; Institutional strengthening and capacity building.

CEE 4835 Environmental Modeling 3-0 Credit 3.00

Introduction, objectives and applications of environmental models; Physical, mathematical and conceptual models; Modeling parameters, model formulation, solution, calibration, verification and sensitivity analysis; Modeling of surface and ground water quality: sources and sinks of contaminants, dispersion and hydraulic transport processes, mathematical formulation, and solution techniques. Biochemical system, nutrient cycle, .and ecosystem models; Air pollution models; Software based studies of environmental problems; Case studies.

CEE 4837 Environment and Geographical Information System 3-0 Credit 3.00

Definition of GIS, data, database and information; Techniques of data input and digitizing geographical features; Database management in GIS environment; Data manipulation techniques, sub-model formation, weighting and multi-criteria evaluation for selecting sites for establishment safeguarding environment. Mapping concepts:

Definition of map and map features, characteristics of map, concept of layers, topographical maps, thematic maps, attribute information and display information. Image enhancement and image classification; Application of GIS for resources identification and environmental planning and management.

CEE 4843 Slope Stability 3-0 Credit 3.00

Methods of stability analysis: Taylor's method, Felleneous method, Bishop's methods, Morgenstern and Price's method; Stability for dynamic forces; Seepage in composite sections; Measurement of performance; construction control of embankments; field instrumentations.

CEE 4851 Highway Design & Railways 3-0 Credit 3.00

Highway materials; subgrade, subbase and base courses; soil stabilization and soil aggregates in road constructions; low-cost roads; production, properties and uses of bituminous materials and mix design methods; design, construction and maintenance of flexible and rigid road pavements; equipments; railways: general requirements, alignment, permanent way, station and yards, signalling, points and crossings, maintenance.

CEE 4852 Transportation Engineering Sessional II 0-3 Credit 1.50

Design of rigid and flexible highway and air field pavements; geometric design: Roadway intersections, capacity calculations; traffic studies and design.

CEE 4853 Transport Projects and Operation 3-0 Credit 3.00

Highway needs study; highway planning, economics and financing; evaluation and analysis of transportation projects, management, monitoring; organization and implementation of transportation projects; selected case studies; traffic engineering administration and legislation; urban public transportation and freight movement.