**Detail Syllabus of Undergraduate Programme of Civil and Water Resources Engineering Department**

**Courses offered by the Department of Civil and Water Resources Engineering**

**Basic Engineering Courses:**

**Course Title: Engineering Drawing-I**

Course No: CWRE 100

Credit: 1.5

Contact Hour: 3 Hrs per week

Schedule: Level-1, Term-1

Syllabus:

Introduction: Handling instruments and their uses, Lettering and numbering and heading.

Plane Geometry: Pentagon, Hexagon, Octagon, Ellipse, Parabola, and Hyperbola.

Projection (Solid geometry): Cube, Triangle, Prism, Pentagonal prism, Hexagonal prism, Cone, Cylinder.

Development of different types of section: Cube, Triangle, Prism, Pentagonal prism, Hexagonal prism, Cone, Cylinder.

Isometric Drawing: Cube, Triangle, Prism, Pentagonal prism, Hexagonal prism, Cone, Cylinder, Interpretation of Solids.

Architectural approaches of drawings; B.N.B.C. requirements (Part-3, Chap-1).

Preliminary planning of one-unit housing, Plans, Elevations and Sections of multistoried buildings, Drawing of different types of stairs, Plan and Section of septic tanks.

Plan, elevation and section of simple hydraulic structures.

**Course Title: Analytical Mechanics**

Course No: CWRE 101

Credit: 4.0

Contact Hour: 4 Hrs per week

Schedule: Level-1, Term-1

Syllabus:

**Introduction to Mechanics:** What is mechanics? Fundamental concepts and principles. System of units. Methods of problem solution. Basic concepts of forces: The concepts of a rigid body.

Resultants and Components of forces; coplanar concurrent forces; moments and parallel coplanar forces; non- concurrent non- parallel coplanar forces; friction; non-coplanar forces. Centroids; moments of inertia of areas; moments of inertia of masses; plane motion; force systems that produce rectilinear motion; kinetic energy, power; impulse and momentum.

**Course Title: Engineering Drawing-II**

Course No: CWRE 102

Credit: 1.5

Contact Hour: 3 Hrs per week

Schedule: Level-1, Term-2

Syllabus:

Plan, elevation and sections of regulator, bridges, siphon, aqueduct and other hydraulic structures with reinforcement details; Layout and x-section of irrigation canals and embankments; plan, elevation and sections of buildings; reinforcement details of beams, columns, slabs, stairs etc using AutoCAD.

**Course Title: Surveying**

Course No: CWRE 103

Credit: 3.0

Contact Hour: 3 Hrs per week

Schedule: Level-1, Term-2

Syllabus:

Calculation of areas and volumes; types of surveying: chain surveying; traverse surveying; plane table survey, leveling and contouring; problems of heights and distances; curves and curve ranging; super-elevation its type and design, horizontal curve and its elements and their application, vertical curve and its types and their application; uses of modern surveying equipments.

Hydrographic surveying: elements of hydrograph; acoustic measurements and investigations; hydrographic operations.

**Course Title: Practical Surveying**

Course No: CWRE 104

Credit: 1.5

Contact Hour: 3 Hrs per week

Schedule: Level-1, Term-2

Syllabus:

Introduction to Survey, Chain Survey, Traverse Survey, Plane Table Survey, Leveling & Contouring, Earthwork Calculation, Problems on Height and Distance, hydrographic survey

**Course Title: Engineering Geology and Geomorphology**

Course No: CWRE 105

Credit: 3.0

Contact Hour: 3 Hrs per week

Schedule: Level-1, Term-2

Syllabus:

**Rocks and Minerals**: identification of rocks and minerals; common rocks forming minerals; physical properties of minerals; mineraloids rocks; types of rocks, cycle of rock change.

**Structural geology**: faults; types of faults; fold and fold type; domes; basin, erosional process; quantitative analysis of erosional land forms; earthquake and seismic map of Bangladesh; geology of Bangladesh.

**Fluvial processes in Geomorphology**: channel development; channel widening; valley shape; stream terraces; alluvial flood plains; deltas and alluvial fans; fluvial deposits; coastal deposits; glacial deposits; lacustrine deposits and Aeolian deposit, river basin; geomorphologic characteristics of rivers of Bangladesh.

**Course Title: Details of Construction Sessional**

Course No: CWRE 200

Credit: 1.5

Contact Hour: 3 Hrs per week

Schedule: Level-2, Term-1

Syllabus:

Types of building, components of a building, design loads, framed structure and load bearing wall structure; foundations: shallow foundation and deep foundation, site exploration, bearing capacity of soil, standard penetration test; brick masonry: types of brick, bonds in brickwork , supervision of brickwork, load bearing and non load bearing walls, cavity walls, partition walls; lintels and arches: different types of lintels and arches, loading on lintels, construction of arches; stair: different type of stairs; floors: ground floors and upper floors; roof and roof coverings; shoring; underpinning; scaffolding and framework; plastering, painting, distempering and white washing; cement concrete construction; sound insulation: acoustics; thermal insulation; house plumbing: water supply and waste water drainage.

**Course Title: Fluid Mechanics**

Course No: CWRE 201

Credit: 4.0

Contact Hour: 4 Hrs per week

Schedule: Level-2, Term-1

Syllabus:

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.

**Course Title: Fluid Mechanics Sessional**

Course No: CWRE 202

Credit: 1.5

Contact Hour: 3 Hrs per week

Schedule: Level-2, Term-2

Syllabus:

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

**Course Title: Estimating and Cost Analysis**

Course No: CWRE 204

Credit: 1.5

Contact Hour: 3 Hrs per week

Schedule: Level-2, Term-2

Syllabus:

Analysis of rates; detailed estimate of all items of work of a building including sub-structure regulator, bridge, truss, culvert, embankment, lined canals;

Specifications of materials for the above constructions.

**Course Title: Computer Programming and Numerical Methods**

Course No: CWRE 205

Credit: 3.0

Contact Hour: 3 Hrs per week

Schedule: Level-2, Term-2

Syllabus:

Basic components of computer systems, Operating systems for micro- computers, Flow network C/C++ language, Development of C/C ++ programs and solution of problems using a computer, Application to Civil Engineering Problems.

Numerical solution of algebraic and transcendental equations; Bisection method, Regular false method, Newtown Raphson method, alteration method (Rate of Convergence, Order of errors). Solution of systems of linear equations; Matrices, Gaussian elimination method, Gauss-Seidel iteration method. Interpolation: Simple differences, difference tables, difference of a polynomial, Newton's formulae for interpolation, Central difference interpolation formulae, Divided difference. Tables of divided differences, Newton's general interpolation formula, Lagrange's interpolation formula, Curve fitting by least squares. Numerical interaction and differentiation (ordinary & partial). Numerical solution of differential equation. Picard's method, Eller's method and Runge-Kutta method.

**Course Title: Computer Programming Sessional**

Course No: CWRE 206

Credit: 1.5

Contact Hour: 3 Hrs per week

Schedule: Level-2, Term-2

Syllabus:

Programming concepts and algorithm, Number systems, internal representation of data; Elements of structured programming language: data types, operators, expressions, control structures, functions, pointers and arrays, input and output. Concept of Object Oriented Programming (OOP): encapsulation, inheritance, polymorphism and abstraction. Template functions and classes. Development of programs related to Water Resources Engineering.

**Compulsory Courses**

**Course Title: Hydrology**

Course No: CWRE 203

Credit: 3.0

Contact Hour: 3 Hrs per week

Schedule: Level-2, Term-2

Syllabus:

Hydrologic cycle, Weather and Hydrology, Precipitation, Evaporation and transpiration,

Infiltration, Stream flow, Application of telemetry and remote sensing in hydrologic data

Acquisition, Rainfall-runoff relations, Hydrographs, unit hydrographs. Hydrologic routing,

Statistical methods in hydrology; Hypothesis Testing, Trend Analysis, Linear regression, Uncertainty, Data Analysis, Correlation, Probability, Frequency Analysis.

**Course Title: Open Channel Hydraulics**

Course No: CWRE 301

Credit: 4.0

Contact Hour: 4 Hrs per week

Schedule: Level-3, Term-1

Syllabus:

Open channel flow and its classification, Velocity and pressure distributions, Energy equation, specific energy and transition problems; Critical flow and control; Principle 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 channel regime; Hydraulics of bridges and culverts.

**Course Title: Open Channel Hydraulics Sessional**

Course No: CWRE 302

Credit: 1.5

Contact Hour: 3 Hrs per week

Schedule: Level-3, Term-1

Syllabus:

Use of Broad-crested weir, Sluice gate, Venturi flume, Parshall flume, Cut-throat flume in laboratory flow measurement, Hydraulic jump, Velocity distribution profile, Manning’s roughness coefficient, Specific force and specific energy.

**Course Title: GIS and RS in Water Resources Engineering**

Course No: CWRE 303

Credit: 2.0

Contact Hour: 2 Hrs per week

Schedule: Level-3, Term-2

Syllabus:

Basic principles of remote sensing; sensors, gamma radiation; aerial photography; multi spectral scanners; thermal sensors; microwave sensors; lasers; platforms and satellite systems; data reception; data processing; storage and dissemination; interpretation and analysis; flood monitoring; flood mapping; water quality evaluation and management; future developments; elements of GIS; data structures: vector and raster data; data acquisition and data management; mapping and analysis; application of GIS in water resources engineering.

**Course Title: GIS and RS in Water Resources Engineering Sessional**

Course No: CWRE 304

Credit: 1.5

Contact Hour: 3 Hrs per week

Schedule: Level-3, Term-2

Syllabus:

Application of GPS data to Engineering Projects; Creating and editing spatial data: digitizing, new view, map projection, classification of features; creating and editing attributes: tables, relationship between tables; spatial analysis: spatial relationship, spatial analysis operation, buffers, geo-processing; charts, layouts; introduction to surface data: TIN, DEM; application of GIS in water resources.

**Course Title: Project/Thesis**

Course No: CWRE 400

Credit: 4.5

Schedule: Level-4, Term-1 & Level-4, Term-2

Syllabus:

Experimental and theoretical investigation of various topics in Water Resources Engineering. Individual or group study of one or more topics. The students will be required to submit a thesis/project report at the end of the work.

**Course Title: River Engineering and Flood Mitigation**

Course No: CWRE 401

Credit: 3.0

Contact Hour: 3 Hrs per week

Schedule: Level-4, Term-1

Syllabus:

Behavior of alluvial rivers, River channel 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 proofing, flood zoning, flood hazard mapping, flood forecasting and warning; flood damage in urban and rural areas.

**Course Title: Computer Applications in Water Resources Engineering**

Course No: CWRE 402

Credit: 1.5

Contact Hour: 3 Hrs per week

Schedule: Level-4, Term-1

Syllabus:

Introduction to hydrodynamic modeling; model calibration; statistical analysis in hydrology; computation of flow profiles; water requirement in irrigation scheduling; recharge computation.

**Course Title: Ground Water Engineering**

Course No: CWRE 405

Credit: 2.0

Contact Hour: 2 Hrs per weeks

Schedule: Level-4, Term-2

Syllabus:

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.

**Course Title: Hydraulic Structures**

Course No: CWRE 407

Credit: 3.0

Contact Hour: 3 Hrs per weeks

Schedule: Level-4, Term-2

Syllabus:

Hydraulic structures: Classification and Characteristics, Principle of design of hydraulic structures. Design of barrages, weirs, silt control devices, reservoir, dam, spillways, energy dissipaters, regulator, transition, Irrigation structures. Cross drainage works: Siphon, aqueduct, bridge, culvert, surface fall.

**Course Title: Design of Hydraulic Structure Sessional**

Course No: CWRE 408

Credit: 1.5

Contact Hour: 3 Hrs per weeks

Schedule: Level-4, Term-2

Syllabus:

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

**Course Title: Irrigation and Drainage Engineering**

Course No: CWRE 411

Credit: 3.0

Contact Hour: 3 Hrs per weeks

Schedule: Level-4, Term-2

Syllabus:

Importance of irrigation; Sources and quality of irrigation water; Soil water relationship. Consumptive use and estimation of irrigation water requirements. Irrigation efficiencies; Design of irrigation canal system; Problems of irrigated land; irrigation water management; irrigation scheduling; Concept and practices of participatory design, Participatory management of irrigation projects, irrigation water market in developing countries; importance of land drainage; drainage system and its design, EIA of Water Resources Projects.

**Course Title: Irrigation and Drainage Engineering Sessional**

Course No: CWRE 412

Credit: 1.5

Contact Hour: 3 Hrs per weeks

Schedule: Level-4, Term-2

Syllabus:

Soil- water characteristics; infiltration; losses in irrigation canal; abstraction from a well in an unconfined aquifer; hydrograph analysis; pumps in series and parallel; pump characteristics; design of sub surface drainage system; design of irrigation and drainage network; flow through canal regulating structures.

**Course Title: Coastal Engineering**

Course No: CWRE 413

Credit: 3.0

Contact Hour: 3Hrs per weeks

Schedule: Level-4, Term-2

Syllabus:

Coast and coastal features; tides and currents; tidal flow measurement; waves and its characteristics; forces of waves and tides in the design of coastal and harbour structures; coastal water level fluctuation-storm surge, tsunami and basin oscillation; coastal zone processes; deltas and its characteristics; estuary and estuary control; docks and harbours, design of shore protection works.

**Optional Courses**

**Course Title: Hydraulic Machinery**

Course No: CWRE 421

Credit: 2.0

Contact Hour: 2 Hrs per weeks

Schedule: Level-4, Term-2

Syllabus:

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.

**Course Title: Port and Harbor Engineering**

Course No: CWRE 423

Credit: 2.0

Contact Hour: 2 Hrs per weeks

Schedule: Level-4, Term-2

Syllabus:

Planning and harbor layout; channel basin and berths; wharves jetties, dolphins and moorings; dry docks and shipway; cargo handling equipment; supporting facilities and ancillaries; navigation aids; port structures; construction materials and methods.

**Course Title: Integrated Water Resource Management (IWRM)**

Course No: CWRE 425

Credit: 2.0

Contact Hour: 2 Hrs per weeks

Schedule: Level-4, Term-2

Syllabus:

Introduction and Concepts: Definition of IWRM, IWRM and other terminology; Past/present water development and management practices; IWRM principles; Sustainable development; Socio-economic and environmental considerations; Stakeholders’ participation.

Management of the Water Resources: Water supply vs. demand management; Water conservation; Water pricing and cost recovery, Water allocation and management;Uncertainty and risks in IWRM, Multi-criteria analysis.

Water Law, Policy and Legislation in Bangladesh: The Law on Water Resources; Water policy; Water related legislations; Water rights system and water allocation.

**Course Title: Climatology**

Course No: CWRE 427

Credit: 2**.0**

Contact Hour: 2 Hrs per weeks

Schedule: Level-4, Term-2

Syllabus:

The global climate system: global heat and water balance; atmospheric and ocean circulation, interaction of ocean and atmospheric processes-annual cycle; monsoon circulation, tropical cyclones; ENSO ( El Nino-Southern Oscillation) cycle; instrumentation and measurement of climate data; sources of climate data and information; climate models; climate variability and climate change; anthropogenic effects on climate- greenhouse warming and sea level changes.

**Course Title: Waterways Engineering**

Course No: CWRE 429

Credit: 2.0

Contact Hour: 2 Hrs per weeks

Schedule: Level-4, Term-2

Syllabus:

Introduction to waterways system; route classification; river types; causes of deterioration of waterways measures of improving waterways; navigational aids; purpose, buoys, channel markers, light houses, radar reflectors etc.; river ports; facilities , developments and problems; inland vessels; waterways of Bangladesh

**Engineering Practice**

**Course Title: Institutional/Industrial Training**

Course No: CWRE 450

Credit: Non-Credit course

Contact Hour: 2 weeks

Schedule: Level-4, Term-1

Syllabus:

Hands on training/internship on water resources engineering problems at related organizations.

**Course Title:** **Water Resources Planning and Construction Management**

Course No: CWRE 451

Credit: 3.0

Contact Hour: 3 Hrs per weeks

Schedule: Level-4, Term-1

Syllabus:

Principles and practices of WR planning and Management, concept and practice of water governance, concept of hydrological modeling for WR planning and management; Concepts in integrated water resources planning and management; process of water resources planning; project formulation and appraisal; comprehensive and integrated planning, master plan;

Principles of construction management; specification and contract documents; inspection and quality control, construction safety; construction planning and scheduling; PERT, CPM, materials management and inventory control; project planning and evaluation, feasibility reports, cash flow, payback period, internal rate of return, Benefit-cost ratio, Economic Life, Life Cycle Costs;construction equipment and plant; human factors in construction management; equity and social justice of WRM in Bangladesh with case studies; Psychology in water resources planning and construction management, optimization and simulation.

**Course Title: Professional Practices and Communication**

Course No: CWRE 453

Credit: 3.0

Contact Hour: 3 Hrs per weeks

Schedule: Level-4, Term-1

Syllabus:

Introduction; Code of practices: BNBC, ECR, NWP;WSP; *Nirman Bidimala*; Procurement regulations and law: PPA 2008, PPR 2010;

Types of Contract; Selection of Contract Types; Procurement Process; Various procurement methods; Selection of consultants and contractors; Tender document and specification; Evaluation of bids; Conflict resolution and arbitration;

Professional ethics; Professional practice management plan.

Techniques of effective communication in professional environment; Writing techniques of research paper, memos and technical reports; oral presentation of reports; writing proposals; preparing effective speaking and successful inter personal communications; job application process: interviews and follow-ups.

**Course Title: Socioeconomic Aspects of Development Projects**

Credit: 3.0

Contact Hour: 3 Hrs per weeks

Schedule: Level-4, Term-1

Syllabus:

Economics and social structure; development and economic growth; socio-economic indicators; concept of human development, human development index; gender related human development index; poverty reduction strategies in Bangladesh; concepts of sustainable development; MDGs and SDGs

Characteristics of development projects; human interest related aspects; population displacement; resettlement and rehabilitation strategy.

Productivity; land loss, land use and land ownership patterns; deforestation and afforestation; commerce, industries and other economic benefits;

Socio-economic impact assessment approach; socio-economic survey; case studies.

**Courses offered by the Department of Civil Engineering**

**Course Title: Engineering Materials**

Course No: CE 281

Credit: 4.0

Contact Hour: 4 Hrs per weeks

Schedule: Level-2, Term-1

Syllabus:

Engineering material and their properties; Manufacturing process of bricks, pavers block, tiles and cement. Properties and uses of bricks, tiles, cement, aggregates, cement and lime mortars, standard tests of bricks, cement and aggregates; Timber, uses of rubber and plastics; corrosion and its prevention; paints, varnishes, metallic coatings.

**Concrete**: composition, Properties of fresh concrete-mixing, workability, Transportation, Compaction, curing, segregation and bleeding, admixture, design of concrete mix using different codes of practices (ACI, BS), Ready-mix concrete, properties of hardened concrete, mechanical properties, shrinkage, elasticity, plasticity, special concrete, Durability of concrete: factors affecting durability, chemical attack on concrete, chloride and sulphate attack; concrete in sea environment, corrosion of reinforcement in concrete, remedial measures; Ferro-cement.

**Course Title: Engineering Materials Sessional**

Course No: CE 282

Credit: 1.5

Contact Hour: 3 Hrs per weeks

Schedule: Level-2, Term-1

Syllabus:

General discussion on preparation and properties of concrete. Tests for specific gravity, unit weight, moisture content, and absorption of coarse and fine aggregates; Fineness, normal consistency and initial and final setting time of cement. Fineness modulus of coarse and fine aggregates, Different tests on brick, mortar and cement. Direct tensile and compressive strength of cement mortar, General discussions on preparation and properties of concrete; design and testing of a concrete mix (using ACI & BS Code).

**Course Title: Mechanics of Solids-I**

Course No: CE 283

Credit: 3.0

Contact Hour: 3 Hrs per weeks

Schedule: Level-2, Term-1

Syllabus:

Fundamental concepts of stress and strain, Mechanical properties of materials; Strain energy; stresses and strains in member subjected to tension, compression, shear and temperature changes. Torsional stress in shafts and tubes with different cross section. Helical springs, stresses in thin walled pressure vessels. Bending moment and shear force diagrams of beams and frames, Flexural and shear stress in beam (Straight & Curve), Inelastic Bending of Beams.

**Course Title: Mechanics of Solids Sessional**

Course No: CE 284

Credit: 1.5

Contact Hour: 3 Hrs per weeks

Schedule: Level-2, Term-1

Syllabus:

Problems on stress, strain and mechanical properties of materials: Tension, direct shear and impact tests of mild steel specimens. Compressions test of timber and concrete specimens. Shear force and bending moment diagrams for practical structural components (e.g. stair-case, sunshade, bus stand shed etc.) Slender column test; static bending test; hardness test of metals; torsional test of different types of materials by Torque Machine; Helical spring test, Determination of shear center, Load deflection behavior of simple beams.

**Course Title: Mechanics of Solids-II**

Course No: CE 285

Credit: 3.0

Contact Hour: 3 Hrs per weeks

Schedule: Level-2, Term-2

Syllabus:

Riveted and welded joints shear center, Compound stresses; Transformation of stresses; deflection of statically determinate beam by various methods: moment area method, direct integration method, Conjugate beam method, Elastic load method. Buckling of Columns, Flexural and shear stress in beams due to unsymmetrical bending.

**Course Title: Principles of Soil Mechanics**

Course No: CE 335

Credit: 4.0

Contact Hour: 4 Hrs per weeks

Schedule: Level-3, Term-1

Syllabus:

Introduction to geotechnical engineering, Basic properties and characteristics of soil, soil grain and aggregate, clay mineralogy, Weight, volume and moisture-density relationship, soil structure and fabric, Index properties of soil, Identification and classification of soil, principles of total and effective stress, soil-water, Permeability, Seepage and flow nets, fundamental of soil liquefaction. Stress distribution, Soil compaction, One-dimensional consolidation, Stress-strain-strength characteristics of soil.

**Course Title: Geotechnical Engineering Sessional**

Course No: CE 336

Credit: 1.5

Contact Hour: 3 Hrs per weeks

Schedule: Level-3, Term-1

Syllabus:

Field identification tests: Specific gravity test, Atterberg limits test, Grain size analysis by sieve and hydrometer, Relative density test, Field density test, Permeability test, Compaction test, Unconfined compression test, Direct shear test, Consolidation tests.

**Course Title: Foundation Engineering**

Course No: CE 337

Credit: 3.0

Contact Hour: 3 Hrs per weeks

Schedule: Level-3, Term-2

Syllabus:

Soil investigation techniques; various types of foundation & factors affecting their selection. Bearing capacity of shallow & deep foundation, settlement & distortion foundations. Design and construction of footings, rafts & piles, slope stability analysis.

**Course Title: Water Supply, Water quality &Treatment and Wastewater Engineering**

Course No: CE 353

Credit: 3.0

Contact Hour: 3 Hrs per weeks

Schedule: Level-3, Term-1

Syllabus:

**Water Supply Engineering**: introduction; water demands; water supply sources; Surface water collection and transportation; head works; pumps and pumping machineries; water distribution systems; analysis & design of distribution network; leak detection; Plumbing system for water supply; unaccounted for water.

**Water quality and treatment**: water quality parameters and standards; water treatment- plain sedimentation, coagulation, flocculation, filtration, disinfection; miscellaneous treatment methods; Membrane Technology for water treatment.

**Wastewater Engineering**: Introduction; estimation of wastewater; wastewater collection systems; hydraulics of sewer; design, construction and maintenance of sanitary sewer and storm drainage system: sewer appurtenances.

Microbiology of wastewater; wastewater characteristics; wastewater treatment and disposal; treatment and disposal of industrial effluents; Advanced treatment of wastewater; Membrane Technology; septic tank system: design and construction; Introduction to Best Management Practices (BMPs) in water and wastewater engineering.

**Course Title: Environmental Engineering Sessional**

Course No: CE 354

Credit: 1.5

Contact Hour: 3 Hrs per weeks

Schedule: Level-3, Term-1

Syllabus:

Water and wastewater sampling techniques, sample preservation; Physical, chemical and bacteriological tests of water and wastewater; Design of water supply system.

**Course Title: Environmental Pollution and Solid Waste Management**

Course No: CE 355

Credit: 3.0

Contact Hour: 3 Hrs per weeks

Schedule: Level-3, Term-2

Syllabus:

**Environment pollution and its control:**

**Water pollution:** sources and types of pollutants; waste assimilation capacity of streams; dissolved oxygen modeling; ecological balance of streams; industrial pollution; heavy metal contamination; detergent pollution and eutrophication; marine pollution; pollution control measures: water quality monitoring and management.

**Air pollution**: sources and types of pollutants; effects of various pollutants on human health, materials and plants, air pollution meteorology; global warming and greenhouse effects; air pollution monitoring and control measures; Introduction to air quality models.

**Solid Waste Management**: sources and types of solid wastes; physical and chemical properties of solid wasters; solid wastes generation; on-site handling storage and processing; collection of solid wastes; transfer stations and transport; ultimate disposal methods; resources and energy recovery; Industrial solid waste collection and disposal; hazardous waste management.

**Course Title: Structural Analysis and Design-I**

Course No: CE 381

Credit: 3.0

Contact Hour: 3 Hrs per weeks

Schedule: Level-3, Term-1

Syllabus:

Stability and determinacy of structures, Analysis of statically determinate beams, girders, frames, trusses, space trusses, flexible chord, cables and cables supported structures. Influence lines, Moving loads on beams, frames & trusses.

**Course Title: Structural Analysis and Design Sessional**

Course No: CE 382

Credit: 1.5

Contact Hour: 3 Hrs per weeks

Schedule: Level-3, Term-1

Syllabus:

Analysis and design problems: Design of members and connections of steel structures (e.g. trusses, steel plate girder and gable frames).

**Course Title: Structural Analysis and Design-II**

Course No: CE 383

Credit: 3.0

Contact Hour: 3 Hrs per weeks

Schedule: Level-3, Term-2

Syllabus:

Approximate analysis of statically indeterminate structures (e.g. braced trusses, portal frames, mill bent and multi-storied building frames), Portal frames and multistoried building frames under the action of vertical dead and live load and lateral loads, Wind and Earthquakes loads on structure, Long and Short period structures. Wind and earthquake forces as per BNBC-93 code, deflection of beams, frames and trusses by virtual work method, Analysis of statically indeterminate structure by consistent deformation method.

**Course Title: Design of Concrete Structure-I**

Course No: CE 385

Credit: 3.0

Contact Hour: 3 Hrs per weeks

Schedule: Level-3, Term-1

Syllabus:

Fundamental behavior of reinforced concrete; Loads, Introduction to Strength design and Service load design method; Analysis and design of singly reinforced beam, doubly reinforced beam and T-beam according to Strength design method; Diagonal tension, bond and anchorage according to Strength design method, Analysis and design of one-way and two-way slabs by Strip and Alternate methods; Stair case, Shear walls; Introduction to ferro-cement design as per BNBC.

**Course Title: Concrete Structure & Design Sessional-I**

Course No: CE 386

Credit: 1.5

Contact Hour: 3 Hrs per weeks

Schedule: Level-3, Term-2

Syllabus:

Analysis and design problems based on CE-385; design of a slab bridge, balanced cantilever bridge and a low-rise building**.**

**Course Title: Design of Concrete Structure-II**

Course No: CE 387

Credit: 4.0

Contact Hour: 4 Hrs per weeks

Schedule: Level-3, Term-2

Syllabus:

Review of codes (BNBC, ACI, BS, EURO, IS, etc.); Analysis and design of columns; Introduction to slender column; footings, retaining walls, piles and pile caps according to Strength design method; Analysis and design of members subjected to torsion; Deep beam; flat plate and flat slab design by Direct design method and Equivalent frame method; Limit state design and yield-line theory; Design of reinforcement at joints, brackets and corbels; Seismic detailing of slab, beam, column, footing; Structural forms; Introduction to prestressed concrete.

**Course Title: Transportation Engineering Sessional**

Course No.: CE 442

Credit: 1.5

Contact Hour: 3 Hrs per weeks

Schedule: Level-4, Term-1

Syllabus:

Test on bituminous materials, Tests on sub-grade, Sub-base, base and surface course materials.

**Course Title: Transportation Engineering**

Course No: CE 449

Credit: 4.0

Contact Hour: 4 Hrs per weeks

Schedule: Level-4, Term-1

Syllabus:

Introduction to transportation Engineering: elements of transportation system: transportation in Bangladesh; transportation planning concepts; study and analysis of basic data; highway location and surveys; geometric design of highways; elements of design, cross-section elements, road intersections; traffic engineering; the road/traffic system, vehicle and traffic characteristics and its classification, traffic control devices, traffic studies, parking and roadway lighting.

Various types of pavements used in Bangladesh and its various structural layers indicating their functions and material used. Production, properties and uses of bituminous materials.

Railways: general requirements, alignment, permanent way, station and yards, signaling, points and crossings, maintenance.

**Course Title: Structural Analysis and Design-III**

Course No: CE 481

Credit: 3.0

Contact Hour: 3 Hrs per weeks

Schedule: Level-4, Term-1

Syllabus:

Analysis of statically indeterminate structures by displacement method, slope deflection method, Moment distribution method, Stiffness matrix; Member stiffness; Stiffness transformations, Assembly of stiffness matrices & solution for beams, frames & plane trusses; Flexibility Matrix. Influence line for statically indeterminate beams, frames, Introduction to design of steel structure, Design of tension and compression members, Design of beam and beam-columns.

**Course Title: Concrete Structure & Design Sessional-II**

Course No: CE 482

Credit: 1.5

Contact Hour: 3 Hrs per weeks

Schedule: Level-4, Term-1

Syllabus:

Computer applications in the analysis of buildings and PC Girder Bridge; Design of a multistoried RCC frame residential building and a simple span PC girder bridge.

**Courses offered by the Department of Mathematics**

**Course Title: Differential and Integral Calculus**

Course No: Math-105

Credit: 3.0

Contact Hour: 3 Hrs per weeks

Schedule: Level-1, Term-1

Syllabus:

**Differential Calculus:** Limit, Continuity and Differentiability of functions, Derivatives of real functions. Higher order derivatives and Leibnitz’s theorem. Rolle’s theorem, Mean value theorem. Taylor’s theorem Maclaurine’s Series. Expansion of functions. Indeterminate forms. Tangent and Normal – Cartesian and Polar curves. Lengths of tangent, normal, sub-tangent and subnormal. Functions of several variables. Partial and total derivatives. Homogeneous functions, Euler’s theorem. Maxima and Minima of functions of more than one variables. Curvature, Radius of curvature, Centre of curvature, curve tracing.

**Integral Calculus:** Techniques of integration, Standard integrals, Integration of rational fractions, Reduction formulae. Definite integrals. Integral as the limit of sum, Improper integrals, Gamma and Beta functions. Lengths of curves, Areas of Cartesian and polar curves, Volumes and surfaces of solids of revolution and relative application.

**Course Title: Matrices and Solid Geometry**

Course No: Math-107

Credit: 3.0

Contact Hour: 3 Hrs per weeks

Schedule: Level-1, Term-2

Syllabus:

**Matrices:** Review of matrix. Rank, inverse of matrix and elementary transformations, solution of a system of linear equations by matrix method, quadratic forms, matrix polynomials. Determination of characteristic roots and vectors, Cayley Hamilton theorem. Matrix Application to solid mechanics and differential equation (Evaluating principal Stress, deflection of beam, and stability test of dynamic system).

**Solid Geometry:** System of co-ordinates, projection, direction cosines and direction ratios, Angle between two straight lines. Equation of planes, Angle between planes, distance from a point to a plane, Condition of perpendicularity and parallelism of planes, equation of straight lines. Shortest distance between given straight lines. Sphere, ellipsoid. Hyperboloid of one sheet and hyperboloid of two sheets.

**Course Title: Differential Equations**

Course No: Math-205

Credit: 3.0

Contact Hour: 3 Hrs per weeks

Schedule: Level-2, Term-1

Syllabus:

**Ordinary Differential Equation**: Definition and formation of differential equations. Solution of first order differential equations, solution of differential equations of first order and higher degrees, solution of general linear equations of second and higher orders with constant coefficient. Solutions of Euler’s homogeneous linear equations. Solution of differential equations in series by the method of Frobenius. Bessel’s functions, Legendre’s polynomials and their properties.

**Partial Differential Equation (PDE)**: Introduction, equations of the linear and non-linear first order PDE. Standard forms, Linear PDE of second and higher order with constant coefficient, Equations of the second order with variable coefficient.

**Laplace Transform:** Laplace transform, Inverse Laplace transform, Solution of differential equation applying Laplace transform technique.

**Course Title: Vector Calculus, Statistics and Harmonics**

Course No: Math-207

Credit: 3.0

Contact Hour: 3 Hrs per weeks

Schedule: Level-2, Term-2

Syllabus:

**Vector Calculus:** ScalarandVectorpoint function. Gradient, Divergence and Curl; Physical interpretation of Gradient, Divergence and Curl; Solenoidal and irrorational vector fields, Vector Integration (line, surface and volume integral), Green’s theorem in the plane, Gauss’s Divergence theorem, Stoke’s theorem and their applications.

**Statistics:** Elementary probability theory; Random variable, discrete probability distributions, e.g., Binomial, Poisson and negative Binomial distributions. Continuous probability distributions e.g., Normal and Exponential distributions, Elementary sampling theory, Estimation, Hypothesis testing and Regression analysis.

**Harmonic Analysis:** Introduction, Laplace equation in Cartesian, Cylindrical and sphericalco-ordinates, cylindrical harmonics, Spherical harmonics and their applications to Engineering problems.

**Courses offered by the Department of Chemistry**

**Course Title: Chemistry**

Course No: Chem-105

Credit: 3.0

Contact Hour: 3 Hrs per weeks

Schedule: Level-1, Term-1

Syllabus:

**Atomic Structure:** The structure of atom, nuclear charge and atomic number, Rutherford’s model of atom, Bohr’s model, wave nature of electron, quantum number, electronic configuration, radioactivity, types and properties of radiations, nuclear radiations, energy released in radiation, meson theory of nuclear forces, mass defect, nuclear binding energy, nuclear stability.

**Classification of Elements:** Periodic properties of elements, variation of properties of elements with their periods and groups, properties of s, p, d and f types elements. Structure and properties semiconductor elements like boron, silicon, germanium, arsenic and antimony, purification of silicon.

**Chemical Bonding:** Different types of chemical bonds; ionic bond, covalent bond, co-ordinate bond, metallic bond and hydrogen bond, dipole bond. Valence bond theory, hybridization, shapes of molecules, molecular orbital theory, linear combination of atomic orbital (LCAO).

**Solutions:** Types of solution, Henry's law, solubility, factor's affecting solubility, solubility curves, concentration of solutions, Nernst distribution law, solvent extraction, colligative properties of dilute solutions.

**Colloids:** Definition, classification, preparation, purification, properties, sols, gels, emulsions, coagulation, gold number, applications of colloids.

**Thermochemistry:** Definition, enthalpy of a reaction, exothermic and endothermic reactions, thermo chemical equations, heat of reactions, heat of combustion, heat of solution, heat of neutralization, Hess’s law and its application, bond energy, measurement of heat of reaction.

**Electrochemistry:** Different types of cells, EMF and free energy, relation between EMF measurement of cell, single electrode potential, standard electrode potentials and its application, EMF series and reactivity of metals, pH and its determination, factors influencing conductivity, mechanism of electrolytic conduction, measurement of conductivity, law of independent migration of ions and its application, abnormal conductance of proton and hydroxyl ions, ionic mobility and transport number.

**Course Title: Chemistry Sessional**

Course No: Chem-106

Credit: 1.5

Contact Hour: 3 Hrs per weeks

Schedule: Level-1, Term-1

Syllabus:

Oxidation-reduction based titrations, quantitative analysis of Fe, Cu and Ca volumetrically, brass analysis.

**Courses offered by the Department of Electrical and Electronic Engineering**

**Course Title: Basic Electrical Engineering**

Course No: EEE-153

Credit: 3.0

Contact Hour: 3 Hrs per weeks

Schedule: Level-1, Term-1

Syllabus:

Electrical circuit analysis-DC circuit, Electrical network theorems. Fundamentals of alternating quantities.,Phasor algebra, Electrical circuit analysis-AC circuits, balanced three phase circuits. Electrical wiring for residential and commercial loads.

Working principles, Constructional features. Types, Characteristics and Application of following Electrical Machines-DC generator and Motor, Single phase and three phase transformers, single phase and three phase induction motors.

Sources of electrical energy, power generation, Steam, Hydro, Fas and Nuclear; Power Generation Bangladesh context.

**Course Title: Basic Electrical Engineering Sessional**

Course No: EEE-154

Credit: 1.5

Contact Hour: 3 Hrs per weeks

Schedule: Level-1, Term-1

Syllabus:

Experiments based on EEE 153 theory course.

**Courses offered by the Department of Physics**

**Course Title: Physics**

Course No: Phy-105

Credit: 3.0

Contact Hour: 3 Hrs per weeks

Schedule: Level-1, Term-2

Syllabus:

**Physical Optics**: Interference of Light: Theory of interference, Young’s double slit experiment, Interference in thin films: Interference by multiple reflections: constant and varying thickness, Newton’s rings and its application.

Diffraction of Light: Fresnel and Fraunhofer diffraction, Fraunhofer diffraction by single slit and double slit, plane diffraction grating.

**Polarization**: Production and analysis of polarized light, Brewster’s law, Malus’ law, Polarization by double refraction, Nicol prism, Polaroid, Optical activity, Polari meters.

Properties of matter: Different states of matter, Review of Elastic properties of solids, bending of beam, Cantilever.

**Heat and thermodynamics:** Measurement of temperatures, resistance and thermocouple thermometers, Radiation pyrometers. Fourier Equation of heat flow, Steady state and periodic heat flow in one dimension, determination of thermal conductivity of good and bad conductors, heat flow through compound walls. Review of First Law of thermodynamics and its application, reversible and irreversible process, Second law thermodynamics, Carnot cycle, efficiency of heat engines, Carnots Theorem, Entropy and disorder, Third Law of thermodynamics.

**Waves and Oscillations**: Differential equation of a simple Harmonic ,motion, Total energy and average energy, Combination of simple Harmonic Oscillation, Lissajous figures, Spring mass system, Calculation of time period of torsional pendulum; Two-body oscillations. Reduced mass. Differential equation of a progressive wave, power and intensity of wave motion, Stationary wave, Group velocity and phase velocity, Architectural acoustics, Reverberation and Sabine’s formula.

**Course Title: Physics Sessional**

Course No: Phy-108

Credit: 1.5

Contact Hour: 3 Hrs per weeks

Schedule: Level-1, Term-2

Syllabus:

Determination of the radius of curvature of a lens by Newton’s rings experiment; Determination of the wave length of monochromatic light by a spectrometer using a plane diffraction grating; Determination of the specific rotation of sugar solution by means of Polarimeter; Determination of the Young’s modulus by the flexure of a beam (bending method); Determination of the Spring Constant and Effective Mass of a Given Spiral Spring and hence to calculate the Rigidity Modulus of the Material of the spring; Determination of the mechanical equivalent of heat ‘J’ by electrical method; Determination of the thermal conductivity of a bad conductor by Lees method; Determination of the frequency of a Tuning fork by Melde’s Experiment; Determination of the lien frequency by Lissajous figures using oscilloscope and function generator and verification of the TIME/DIV knob at particular position for different frequencies; Determination of surface tension of water by capillary tube method; Determination of the surface tension of mercury and the angle of contact by Quincke’s method; Determination of the co- efficient of viscosity of a liquid (glycerin) using Stoke’s law.

**Courses offered by the Department of Humanities**

**Course Title: English**

Course No: Hum-105

Credit: 3.0

Contact Hour: 3 Hrs per weeks

Schedule: Level-1, Term-1

Syllabus:

**Grammar**: Functions of word classes, Phrase structures and clause.

**Sentence making**: basic sentence patterns, analysis, transformation and synthesis. Punctuation; word formation processes and common mistakes in English

**Reading**: Various approaches to reading. Reading techniques and readability. Academic texts, types of texts, using reading lists, using library catalogues and using library websites to search electronic resources, reading abstracts, facts, opinion and critical thinking.

**Writing**: Descriptive, narrative, argumentative and persuasive writing, Principles of paragraph writing, paragraph structure, development of ideas, and linking paragraph together. Writing introduction and its structure, and opening sentences and conclusion. Technical report writing and its purposes and various forms, Method of note taking, notice writing, assignment and examination paper.

Structure and cohesion, argument and discussion, cause and effect, comparison and contrast, definitions, exemplification classification, generalizations, numbers, problems and solutions, and academic style.

**Speaking**: Speech delivery, announcement, dialogue, Group discussion and interview skills.

**Course Title: Engineering Economics**

Course No: Hum-107

Credit: 2.0

Contact Hour: 2 Hrs per weeks

Schedule: Level-1, Term-2

Syllabus:

Definition of Economics, concept of microeconomics. Demand and supply Analysis, Market Equilibrium, Elasticity of demand & supply. Theory of utility and preference, Consumer behavior-Indifference curve analysis, analysis of consumer surplus and producer surplus. Consumer equilibrium .Theory of production, Theory of cost, concept of market and market structure.

Concept of macroeconomics, National Income analysis: various concepts about GNP, NNP GDP and NDP, methods of calculation national Income, circular flow of income, Fundamentals of savings, Investment and consumption functions, Inflation, Unemployment; types of unemployment. Problems of unemployment, how to solve the unemployment problem. Fiscal policy and monetary policy; Characteristics of five-year plans and its implication in Bangladeshi Economy. Development vs. Growth, Development. The pure theory of International trade.

**Course Title: Principle of Accounting & Costing**

Course No: Hum-205

Credit: 2.0

Contact Hour: 2 Hrs per weeks

Schedule: Level-2, Term-1

Syllabus:

**Introduction** : Definitions of book keeping, Costing and accounting, objects and advantages of book keeping; Principles of double entry book keeping, Accounting concepts and convention, Transaction, Definition of business transaction, Nature of business transactions, Journal, Ledger, Trail balance & Financial statement, Analysis of financial statement.

**Depreciation**: Definition, objects and types of depreciation, Methods of providing depreciation, classifying revenue and capital expenditure.

**Cheque**: Classification of cheque, Crossing of cheque and endorsement of cheque.

**Cost Accounting**: Introduction, Definition, object and advantages of cost accounting, Elements of cost, Stores ledger, Overhead allocation.

**Marginal analysis**: Computation of Break Even point, Standard Costing, Cost Variance, Construction Costing, Budget and Budgetary Control.

**Course Title: Principles of Sociology**

Course No: Hum-207

Credit: 2.0

Contact Hour: 2 Hrs per weeks

Schedule: Level-2, Term-2

Syllabus:

Definition Nature and Scope of Sociology, Sociological Perspectives, Importance of Studying Sociology for Civil Engineering Students, Method of Sociology, Basic Concepts; Society, Community. Association and institution, Socialization, Nation and Nationality, Social Stratification, Group, Social Structure, marriage and family, Social change, Social control and Deviance, Culture and Civilization, Industrialization and Urbanization, Urban Ecology, Population and Environment; Population Growth, Environment as Sociological Issue, Sustainable Development, Environmental decision making, Social Impacts of Disaster. Social problems; Juvenile Delinquency, Crime, Unemployment, Corruption, Rights and Duties of Citizen in Society.

**Course Title: State and Government**

Course No: Hum-209

Credit: 2.0

Contact Hour: 2 Hrs per weeks

Schedule: Level-2, Term-2

Syllabus:

Nature of State, Origin and Development of the state. Basic Concepts: Pressure Group, Interest Group, Civil Society, Good Governance, Political Party, Socialism, Fascism, Marxism.

Nationalism& Internationalism: Nationality, Nation and State, Federation and Confederation.

Organization Theories: Classical Theories- F.W Taylor, Henry Fayol, Neo Classical Theories and Modern Theories. Process of Organization- Motivation, Leadership, Communication, decision making.

The United Nations, Bureaucracy: Bureaucracy and Max Weber, Bureaucracy in Bangladesh, its characteristics and functions, Forms of Government, Organs of Government, Local Government , Concepts of Public Administration, constitution.