Course Structure of the Four Year B.Sc. Engineering Program

Syllabus of Courses Offered in 1st Year
B.Sc. Engineering

ODD SEMESTER

SL No.	Course No.	Course Title	Contact Hour/ Week	Credit
1.	CE 1101	Surveying	4	4.00
2.	Chem 1101	Chemistry-I	3	3.00
3.	Phy 1101	Physics-I	3	3.00
4.	Math 1101	Mathematics-I	3	3.00
5.	Hum1101	English	2	2.00
6.	CE 1100	Civil Engineering Drawing-I	3	1.50
7.	MES 1132	Mechanical Engineering Shops	3	1.50
8.	Chem 1102	Chemistry Sessional -I	3/2	0.75
9.	Phy 1102	Physics Sessional-I	3/2	0.75
Total			**24**	**19.50**

No. of Theory Courses = 05   Total Contact Hour =24
No. of Sessional Courses = 04   Total Credit = 19.50

EVEN SEMESTER

SL No.	Course No.	Course Title	Contact Hour/ Week	Credit
1.	CE 1201	Engineering Mechanics	4	4.00
2.	EEE 1241	Basic Electrical Engineering	3	3.00
3.	Chem 1201	Chemistry-II	3	3.00
4.	Phy 1201	Physics-II	3	3.00
5.	Math 1201	Mathematics-II	3	3.00
6.	CE 1202	Practical Surveying	3	1.50
7.	CE 1200	Civil Engineering Drawing-II	3	1.50
8.	Chem 1202	Chemistry Sessional-II	3/2	0.75
9.	Phy 1202	Physics Sessional -II	3/2	0.75
Total			**25**	**20.50**

No. of Theory Courses = 05   Total Contact Hour =25
No. of Sessional Courses = 04   Total Credit = 20.50

ODD SEMESTER

CE 1101   Surveying
Lecture: 4 hrs/ week   **Credit: 4.00**

Introduction: linear measurements, chain survey, traverse survey and plane table survey. **Leveling and Contouring:** Calculation of areas and volumes, Problems on heights and distances, Curves and curve ranging. Tacheometry: introduction, principles and problems on tacheometry. **Astronomical surveying:** Definition, instruments, astronomical corrections and systems of time. Photogrametry: Introduction to terrestrial photography, aerial photography, reading of photo mosaic and scale. Project surveying: errors in surveying, remote sensing and introduction to global positioning system (GPS).

Chem 1101   Chemistry-I
Lecture: 3 hrs/ week   **Credit: 3.00**

Atomic structure, periodic table, chemical bonds. Chemistry of cement, silicates and limes. Physical and chemical properties of water. Different types of solutions, concentration units, chemical equilibrium. **Reactions kinetics:** rate of chemical reactions, order and molecularity of reactions, different types of rate expressions, methods of determining rate and order, effect of temperature on reaction rate and energy of activation. **Colloid and colloidal solution:** classification, preparation, purification, properties, protective action and application of colloids.

Chem 1102   Chemistry-I Sessional
Contact hours: 3/2 hrs/ week   **Credit: 0.75**

Volumetric analysis: acid-base titration, oxidation-reduction titration salts analysis (qualitative).

Phy 1101 Physics-I
Lecture: 3 hrs/ week   **Credit: 3.00**

Physical optics: Theories of light: Huygen's principle and construction. **Interference of light:** Young's double slit experiment, Fresnel bi-prism, Newton's rings, interferometers. **Diffraction of light:** Fresnel and Fraunhoffer diffraction, diffraction by single slit, diffraction by double slit, diffraction gratings. **Polarization of light:** production and analysis of polarized light, optical activity, optics of crystals.

Heat and Thermodynamics: temperature, zeroth law of thermodynamics. Thermometers, constant volume, platinum resistance and thermocouple. First law of thermodynamics and its application, molar specific heats of gases, isothermal and adiabatic relations, work done by a gas. Kinetic theory of gases: explanation of gas laws, kinetic interpretation of temperature, equipartition of energy and calculation of ratio of specific heats, mean free path, Vander Waals equation of state, second law of thermodynamics: reversible and irreversible processes, Carnot's cycle, efficiency, Carnot's theorem, entropy.

Waves and Oscillations: Oscillations: Simple harmonic motion, damped simple harmonic oscillations, forced harmonic oscillations, resonance, vibrations of membranes and columns. Combination and composition of simple harmonic motions, Lissajous' figures. Transverse and longitudinal nature of waves, travelling and standing waves, intensity of waves, energy calculation of progressive and stationary waves, phase velocity, group velocity. Sound waves: velocity of longitudinal wave in a gaseous medium and Doppler effect. Architectural acoustics: Sabine's formula, requirements of a good auditorium.

Phy 1102 Physics Sessional -I
Contact Hours: 3/2hrs/ week   **Credit: 0.75**

Determination of the specific heat of a liquid by the method of cooling. Determination of the thermal conductivity of a bad conductor by Lee's method. Determination of the pressure coefficient of air by constant volume air thermometer. Determination of the frequency of a tuning fork by Melde's apparatus. Determination of the mechanical equivalent of heat by electrical method. Determination of the focal length of concave lens by auxiliary lens method. Determination of the refractive index of the material of a prism using spectrometer. Determination of the spring constant and the effective mass of a loaded spring.

Math 1101   Mathematics-I
Lecture: 3 hrs/ week   **Credit: 3.00**

Differential Calculus: Limit continuity and differentiability, *n*-th derivatives of standard functions. Leibnit'z theorem, Rolle's theorem and Mean value theorem. Expansion in finite and infinite forms, indeterminate form and partial differentiation. Euler's theorem. tangent and normal. Subtangent and subnormal in partial and polar co-ordinates. Maxima and minima of functions of single variables. Curvature.

Integral Calculus: Integration by parts. Standard integral. Integration by the method of successive reduction. Definite integrals. Improper integrals. Beta function. Gama functions. Multiple integrals. Area, Volume of solids of revolution.

Hum 1101   English
 Lecture: 2 hrs/ week   **Credit:2.00**

English phonetics: the places and manners of articulation of the English sounds. Vocabulary. **English grammar:** Construction of sentences, some grammatical problems. Comprehension. Composition on current affairs. Amplification, precis writing, Phrases and idioms. Commercial correspondence and tenders. Technical report writing, Lessons in spoken English, Drafting notes. Short stories written by some well-known classic writers.

CE 1100 Civil Engineering Drawing-I
Sessional: 3 hrs/ week   **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 and cylinder. **Development:** cube, pyramid, cone and prism. **Section and true shape:** cube, pyramid, cone prism. **Isometric drawing:** cube, pyramid and cone. Oblique drawing: cube, pyramid and cone. Interpretation of solids: Plan, elevation and section of one-storied buildings.

MES 1132   Mechanical Engineering Shops
Sessional: 3 hrs/ week   **Credit: 1.50**

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, and bench work with job. Drilling, shaper, 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 polarity, flat, vertical, horizontal, overhead, Electric arc welding and its machinery, welding of different types of material, Low carbon steel, cast iron, brass, copper, stainless steel, aluminum, 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.

EVEN SEMESTER

CE 1202 Practical Surveying
Sessional: 3 Weeks in field   **Credit: 1.50**

Practice on handling of instruments, chain survey, plane table survey, Theodolite traversing, Leveling and contouring, route project, house setting, curve setting, stadia surveying, height and distance problem.

CE 1201 Engineering Mechanics
Lecture: 4 hrs/ week   **Credit: 4.00**

Introduction to SI Units, coplanar concurrent forces, moments and parallel coplanar forces, non-concurrent non-parallel coplanar forces, centroids, moment of inertia of areas, moment of inertia of masses, Friction, flexible cords, plane motion, force systems that produce rectilinear motion, work, kinetic energy, power, impulse and momentum.

CE 1200 Civil Engineering Drawing-II
Sessional: 3 hrs/ week   **Credit: 1.50**

Plan, elevation and sections of multi-storied buildings, reinforcement details of beams, slabs, stairs etc. Plan and section of septic tank, detailed drawing of roof truss, plan, elevation and sections of culverts, bridges and other hydraulic structures, building services drawings, introduction to computer aided drafting.

EEE 1241   Basic Electrical Engineering
Lecture: 3 hrs/ week   **Credit: 3.00**

Electrical units and standards. Electrical networks, series, parallel and series-parallel networks. Method of network analysis. Measurement of electrical quantities, resistance, current, voltage, power and energy measurements.

Alternating current: Instantaneous, rms and average values of current and voltage. Real and reactive power. Steady AC circuit analysis, single phase RLC circuit with sinusoidal excitation. Polyphase circuit, Balanced three phase circuit, Familiarization with different types of electrical machines, DC generators and motors, AC generators and motors and transformers.

Introduction to electronic principles and its simple applications. Introduction to electrical wiring.

Chem 1201   Chemistry-II
Lecture: 3 hrs/ week   **Credit: 3.0**

Chemical corrosion: Introduction to chemical corrosion, corrosion of metals and alloys in dry and wet environments, mechanism of corrosion, atmospheric and soil corrosion and their protective measures.

Chemistry of environmental pollution: Environment and its characteristics, chemistry of toxic metal and non-metal pollutants, analytical techniques used in the determination of pollutants, chemical concept of DO, BOD, COD and threshold odour number, chemistry involved in water treatment plants, quality of industrial waste water.

Polymers: Chemistry of polymerization, different types of polymers and their properties, polymer-degradation, elastomers and composite materials.
Paints and varnishes: introduction to paints and varnishes, pre-treatment of the surface, metallic, non-metallic and organic protective coating, types of paints and their uses.

Principle of spectophotometric analysis: Beer Lambert law and its applications.

Thermo chemistry: Laws of thermo chemistry and problems based on them, Kirchoff's equation, heat of solution and heat of neutralization.

Chem 1202   Chemistry Sessional-II
Lecture: 3/2 hrs/ week   **Credit: 0.75**

Gravimetric analysis: Determination of Fe, Cu, Ca, Cl, SO_4 Volumetrically spectophotometric estimation of As, Cr, Mn, Ca, Fe, Ni, Zn. Determination of pH of a solution.

Phy 1201 Physics-II
Lecture: 3 hrs/ week   **Credit: 3.00**

Structure Matter: States of matter: Solid, liquid and gas. Classification of solids: amorphous, crystalline, ceramics and polymers. Atomic arrangement in solids. Different types of bonds in solids: metallic. Vander Waals, covalent and ionic bond, packing in solids, interatomic distances and forces of equilibrium, X-ray diffraction, Bragg's law. Plasticity and elasticity. Distinction between metal, insulator and semi-conductor.

Electricity and Magnetism: Electric charge, Coulomb's law, the electric field electric flux and Gauss's law, some application of Gauss's law, electric potential V, relation between E and V, electrical potential energy. Capacitors, capacitance, dielectrics: an atomic view, dielectrics and Gauss' law.

Current and resistance: Current and current density, Ohm's law, Ampere's law, Faraday's law, Lenz's law, self-inductance and mutual inductance. Magnetic properties of matter: magnetomotive force, magnetic field intensity, permeability, susceptibility, classifications of magnetic materials, magnetization curves.

Modern Physics: Michelson Morley's experiment, Gallilean transformation, special theory of relativity, Lorentz-transformation, relative velocity, length contraction, time dilation, mass energy relation. Photoelectric effect, Compton effect, De-Broglie wave, Bohr's atom model. **Nuclear Physics:** Radioactive decay, half life, mean life, isotopes, nuclear binding energy, alpha, beta and gamma decay.

Phy 1202 Physics Sessional -II
Lecture: 3/2 hrs/ week   **Credit: 0.75**

Laboratory Experiment:

Determination of the radius of curvature of a plano-convex lens by Newton's ring method. Determination of threshold frequency for the photoelectric effect of a photocathode and the value of the Planck's constant. To plot thermoelectromotive force-temperature (calibration) curve for a given thermocouple. Determination of the melting point of a solid using the calibration curve. Determination of the specific rotation of sugar solution by a polarimeter. Determination of the temperature coefficient of the resistance of the material of a wire. Measurement of unknown resistance and verification of the laws of resistance by P.O. (post office) box. Comparison of the E.M.F's of two cells by potentiometer.

Math 1201   Mathematics-II
Lecture: 3 hrs/ week   **Credit: 3.00**

Matrices: Definition of matrix, Algebra of matrices. Multiplication of matrices. Transpose of a matrix and inverse of a matrix. Rank and elementary transformation of matrices. Solution of linear equations. Linear dependence and independence of vector. Quadratic forms. Matrix polynomials. Determination of characteristic roots and vectors. Null space and nullity of a matrix. Characteristic subspace of a matrix.

Two and three-dimensional Co-ordinate Geometry: A pair of straight lines and conic section in two dimensions. System of co-ordinate. Projection. Direction Cosines. Equations of planes and lines. Angle between lines and planes. Distance from a point to a plane. Co-planar lines. Shortest distance between two given straight lines. Standard equation of conicoids, sphere ellipsoid. Hyperboloid of one sheet, hyperboloid of two sheets. Tangent planes. Normal lines. Condition of tangency.

Syllabus of Courses Offered in 2nd Year B.Sc. Engineering

ODD SEMESTER

SL No.	Course No.	Course Title	Contact Hours/ Week	Credit
1.	CE 2103	Engineering Materials	4	4.00
2.	CE 2111	Mechanics of Materials-I	3	3.00
3.	CE 2121	Fluid Mechanics	4	4.00
4.	Math 2101	Mathematics -III	4	4.00
5.	Hum 2101	Sociology and Government	2	2.00
6.	CE 2104	Engineering Materials Sessional	3	1.50
7.	CE 2110	Details of Construction	3	1.50
8.	CE 2122	Fluid Mechanics Sessional	3	1.50
		Total	**26**	**21.50**

No. of Theory Courses = 05 Total Contact Hour =26
No. of Sessional Courses = 03 Total Credit =21.50

EVEN SEMESTER

SL No.	Course No.	Course Title	Contact Hours/ Week	Credit
1.	CE 2201	Numerical Methods & Computer Programming	4	4.00
2.	CE 2203	Geology and Geomorphology	2	2.00
3.	CE 2213	Mechanics of Materials-II	3	3.00
4.	Math 2201	Mathematics – IV	4	4.00
5.	Hum 2201	Accounting & Economics	3	3.00
6.	CE 2202	Numerical Methods & Computer Programming Sessional	3	1.50
7.	CE 2214	Mechanics of Materials Sessional-II	3	1.50
8.	CE 2220	Details of Estimating	3/2	0.75
		Total	**23.5**	**19.75**

No. of Theory Courses = 05 Total Contact Hour = 23.50
No. of Sessional Courses = 03 Total Credit =19.75

ODD SEMESTER

CE 2103 Engineering Materials
Lecture: 4 hrs/ week   **Credit: 4.00**

Atomic structures and bonding, yielding, fracture, elasticity, plasticity.

Brick: Constituents of brick clay, characteristics, specifications, classification and uses of bricks, efflorescence.

Aggregate: Classification and properties of aggregate, grading of aggregate, testing of aggregate, classification, properties, tests and function of sand.

Cement: Point of difference between cement and lime, composition of ordinary cement, functions of various ingredients of cement, physical properties of Portland cement, types and tests of cement.

Mortar and plaster: Types of mortar, functions of sand and surki in mortar, uses of mortar, preparation of cement mortar, precautions in using mortars, plastering, pointing, white and color washing and distempering.

Concrete: Function of aggregate and water in concrete, segregation, bleeding, properties of concrete, strength and workability of concrete, factors influence the properties of concrete, creep of concrete, chemical attack of concrete, design of concrete mixes.

Corrosion and its prevention, paints, varnishes, properties and uses of rubber, timber plastics and ferrocement.

CE 2111 Mechanics of Materials-I
Lecture: 3 hrs/ week   **Credit: 3.00**
Prereq. CE 1201

Fundamental concept 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 beam, shear flow and shear center. Thin walled pressure containers, riveted and welded Joints.

CE 2121 Fluid Mechanics
Lecture: 4 hrs/ week   **Credit: 4.00**

Development and scope of fluid mechanics fluid properties, Fluid static's Manometers and pressure gages, pressure head, center of pressure, application of hydrostatic forces. Buoyancy and Floatation: Principle of Archimedes's stability of floating body, Metacenter. Kinematics of fluid flow. Fluid flow concept and basic continuity equations, Bernoulli's equation, Energy equation, Momentum equation and forces in fluid flow. Similitude and dimensional analysis. Study in compressible flow in pressure conduits, laminar and turbulent flow. Pipe flow: general equation for pipe flow and minor losses in pipe flow. Pipe flow problems: pipe in series and parallels, branching of pipes and pipe networks. Fluid measurements: pitot tube, orifice, mouthpiece, nozzle, venturimeter and weir.

Math 2101 Mathematics-III
Lecture: 4 hrs/ week   **Credit: 4.00**

Differential equation: Definition, formation of differential equation and solution of first order ordinary differential equation by various methods. Solution of differential equation of first order and higher degrees. Solution of linear equations of second degree and higher orders with constant co-efficient. Solution of differential equations when the dependent and independent variables are absent. Solution of differential equation in series by the method of Fobenious: Bessel's function, Legendre's polynomials and their properties.

Fourier series and partial differential equation: Fourier series, Periodic functions, odd and even function, evaluation of Fourier co-efficient, Fourier integral, Fourier transforms and their uses to physical problem.
Partial differential equation: Solution of first order partial differential equation by Lagrange method and Charpit method. Definition of harmonics, Laplace equation in Cartesian, polar, cylindrical and spherical co-ordinates.

Hum 2101 Sociology & Government
Lecture: 2 hrs/ week   **Credit: 2.00**

Sociology: scope, some basic concepts. social evolution and techniques of production, culture and civilization. Social structure of Bangladesh. Population and world resources. Oriental and occidental societies, industrial revolution. Family urbanization and industrialization, urban ecology, co-operative and socialist movements. Rural sociology.

Government: Some basic concepts of government and politics. Functions, organs and forms of modern state government, socialism, Fascism, Marxism, U.N.O. Government and politics of Bangladesh. Some major administrative systems of developed countries. Local self-government.

CE 2104 Engineering Materials Sessional
Contact Hours: 3 hrs/ week   **Credit: 1.50**

Test of specific gravity, unit weight, moisture content and absorption of coarse and fine aggregate, normal consistency, setting time, direct tensile and compressive strength of cement mortar, gradation of coarse and fine aggregate, design and testing of concrete mix.

CE 2110   Details of Construction
Sessional: 3 hrs/ week   **Credit: 1.50**

Brick masonry, framed structures, arches and lintels, details of floors and roofs, pointing, plastering and interior finishing. Scaffolding and staging, shoring and underpinning, thermal insulation and acoustics, stairs: types and construction details, specifications of materials for the above constructions.

CE 2122   Fluid Mechanics Sessional
Contact Hours: 3 hrs/ week   **Credit: 1.50**

Center of pressure, proof of Bernoulli's theorem, flow through venturimeter, flow through orifice and mouthpiece, concept of velocity by co-ordinate method, flow though mouthpiece, flow over V-notch, fluid friction in pipes, flow over sharp-crested weir.

EVEN SEMESTER

CE 2201   Numerical Methods & Computer Programming
Lecture: 4 hrs/ week   **Credit: 4.00**

Basic components of computer system, FORTARN and C/C^{++} language, numerical solution of algebraic and transcendental equations, matrices, solution of systems of linear equations, curve-fitting by least squares, finite differences, divided differences, interpolation, computer applications to Civil Engineering problems, numerical differentiation and integration, numerical solution of differential equations.

CE 2203   Geology and Geomorphology
Lecture: 2 hrs/ week   **Credit: 2.00**

Mineralogy: Identification of minerals, common rock forming minerals, physical properties of minerals.

Mineraloids: Rocks: types of rock, cycle of rock change, sedimentation and metamorphism, earthquake and seismic map of Bangladesh.

Structural Geology: Faults, type of Faults, dome and basin, fold, fold types, Erosional process, quantitative analysis of erosional land forms, land subsidence, land slide.

Geomorphology: Channel development, channel widening, valley shape, stream terraces: channel pattern and river basins, channel morphology, drainage pattern, geology and geomorphology of Bangladesh.

CE 2213   Mechanics of Materials-II
Lecture: 3 hrs/ week   **Credit: 3.00**
Prereq. CE 2111

Torsional stresses in shafts and tubes, helical springs, combined stresses, transformation of stresses. Deflection of beam by direct integration, moment area and conjugate beam methods. Buckling of columns.

Math 2201   Mathematics-IV
Lecture: 4 hrs/ week   **Credit: 4.00**

Vector analysis: Fundamental of vector algebra, scalar and vector product of two vectors. Triple and multiple products, vector differentiation, gradient, divergence and curl. Vector integration, divergence, Gauss's, Green's and Stoke's theorem and their application.

Laplace transformation: Definition, Laplace transforms of some elementary function. Inverse Laplace transforms. Laplace transforms of derivatives. Solution of differential equation by Laplace transforms.

Statistics: Measures of central tendency, measures of dispersion, moments, skewness and kurtosis. Elementary probability theory and discontinuous probability distribution e.g. Binomial, Poisson and normal elementary sampling theory, estimation and confidence limit, hypothesis testing, correlation and regression analysis.

Hum 2201   Accounting & Economics
Lecture: 3 hrs/ week   **Credit: 3.00**

Principles of accounting: Accounts, transaction, the accounting procedure and financial statements. Cost in general: objectives and classifications. Overhead costing. Cost sheet under job costing operating costing and process costing. Marginal costing: tools and techniques, cost-volume-profit analysis. Relevant costing: analyzing the profitability within the firm, guidelines for decision making. Long-run planning and control: capital budgeting.

Definition of economics: Economics and Engineering. Principles of Economics.

Micro economics: The theory of demand and supply and their elasticity's. Price determination. Nature of an economic theory, applicability of economic theories to the problems of developing countries. Indifference curve technique. Marginal analysis. Optimization. Market. Production, Production function, types of productivity. Rational region of production of an engineering firm. The short run and the long run. Fixed cost and variable cost. Internal and external economics and diseconomies.

Macro-economics: savings, investment. National income analysis. Inflation. Monetary policy, fiscal policy and trade policy with reference to Bangladesh. Planning in Bangladesh.

CE 2202 Numerical Methods & Computer Programming Sessional
Contact Hours: 3 hrs/ week   **Credit: 1.50**

Operating system for microcomputers, development of FORTRAN programs and solution of problems using a computer, solution of Civil Engineering problems by microcomputers.

CE 2214 Mechanics of Materials Sessional -II
Contact Hours: 3 hrs/ week   **Credit: 1.50**

Tension test and impact test of mild steel specimen, hardness test of metals, compression test of timber specimen. Helical spring test, static bending test, direct shear test and slender column test.

CE 2220   Details of Estimating
Sessional: 1.5 hrs/ week   **Credit: 0.75**

Detailed estimate of all items of work of a building, detailed estimate of all items of work of a bridge, truss, culvert and a simple girder bridge.

Syllabus of Courses Offered in 3rd Year
B.Sc. Engineering

ODD SEMESTER

SL No.	Course No.	Course Title	Contact Hours/ Week	Credit
1	CE 3111 Prereq. CE 2111	Structural Analysis & Design-I	3	3.00
2.	CE 3115 Prereq. CE 2213	Reinforced Concrete-I	3	3.00
3.	CE 3121 Prereq. CE 2121	Engineering Hydraulics	4	4.00
4.	CE 3131	Geotechnical Engineering-I	3	3.00
5.	CE 3141	Environmental Engineering-I	3	3.00
6.	CE 3112	Structural Analysis & Design Sessional-I	3	1.50
7.	CE 3122	Engineering Hydraulics Sessional	3/2	0.75
8.	CE 3132	Geotechnical Engineering Sessional-I	3/2	0.75
9.	CE 3142	Environmental Engineering Sessional-I	3/2	0.75
		Total	**23.5**	**19.75**

Prereq. = Prerequisite

No. of Theory Courses   = 05   Total Contact Hour =23.5
No. of Sessional Courses = 04   Total Credit = 19.75

EVEN SEMESTER

SL No.	Course No.	Course Title	Contact Hours/ Week	Credit
1.	CE 3221	Hydrology	3	3.0
2.	CE 3213 Prereq. CE 3111	Structural Analysis & Design-II	3	3.0
3.	CE 3217 Prereq. CE 3115	Reinforced Concrete-II	3	3.0
4.	CE 3233 Prereq. CE 3131	Geotechnical Engineering-II	3	3.0
5.	CE 3205	Transportation Engineering-I	3	3.00
6.	CE 3218	Reinforced Concrete Sessional-II	3	1.50
7.	CE 3234	Geotechnical Engineering Sessional-II	3/2	0.75
8.	CE 3206	Transportation Engineering Sessional-I	3/2	0.75
		Total	**21**	**18.00**

Prereq. = Prerequisite

No. of Theory Courses   = 05   Total Contact Hour =21
No. of Sessional Courses = 03   Total Credit = 18.00

ODD SEMESTER

CE 3111   Structural Analysis and Design-I
Lecture: 3 hrs/ week   **Credit: 3.00**
Prereq. CE 2111

Stability and determinacy of structures, analysis of statically determinate arches. Influence lines for statically determinate structure: moving loads on beams, frames and trusses. Cable supported structures and space trusses.

CE 3112   Structural Analysis and Design Sessional-I
Contact Hour: 3 hrs/ week   **Credit: 1.50**

Introduction to steel structures. Design of a roof truss, a plate girder bridge and steel frame.

CE 3115   Reinforced Concrete-I
Lecture: 3 hrs/ week   **Credit: 3.00**

Fundamental behavior of reinforced concrete members, introduction to WSD and USD methods, analysis and design of singly and doubly reinforced beams. T-beams and one way slab according to WSD and USD methods, Diagonal tension, bond and anchorage according to WSD and USD methods, Lintels, and staircases.

CE 3121   Engineering Hydraulics
Lecture: 4 hrs/ week   **Credit: 4.00**
Prereq. CE 2121

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 Mannings equations, estimation of resistance coefficients and computation of uniform flow, momentum equation, hydraulic jump, stilling basin, dams and related structures. Theory and analysis of gradually varied flow, computation of flow profiles, design of channel. Impact of water jet, Principles of hydraulic machines: pumps.

CE 3122   Engineering Hydraulics Sessional
Contact Hours: 1.5 hrs/ week   **Credit: 0.75**

Experiments on sluice gate, venture flume, Parshall flume, cut-throat flume, hydraulic jump, velocity distribution profile, Manning's roughness coefficient. specific force and specific energy: pipe surge and water hammer, Preparation and analysis of hydrographs, aquifer characteristics and estimation of yield from wells.

CE 3131   Geotechnical Engineering-I
Lecture: 3 hrs/ week   **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, capillarity and flow net, shear-strength characteristics of soils, compressibility and settlement behavior of soils.

CE 3132   Geotechnical Engineering Sessional-I
Lecture: 3/2 hrs/ week   **Credit: 0.75**

Field identification of soil samples, specific gravity test, Atterberg limits test, grain size analysis by sieve and hydrometer, field density test, standard proctor compaction test, modified proctor compaction test, permeability (constant & variable head) test.

CE 3141   Environmental Engineering-I
Lecture: 3 hrs/ week   **Credit: 3.00**

Introduction to Environmental Engineering: Ecology and environment; climate change; biodiversity.

Introduction to water supply: Population forecasting and water requirement; water supply sources: groundwater and surface water; ground water exploration: aquifer properties and ground water flow, well hydraulics, water well design, drilling, construction and maintenance; water shallow hand tubewells, deep tubewells, deep set pumps and alternative water supplies (Shallow Shrouded Tube well, Very Shallow Shrouded Tube well, pond sand filter, rainwater harvesting) for problem areas.

Surface water collection and transportation: head works; pumps and pumping machineries; water distribution systems; analysis and design of distribution network; fire hydrants; water meters; leak detection; unaccounted for water.
Water quality and treatment: Water quality parameters and standards, Water treatment: plain sedimentation, coagulation, flocculation, filtration; disinfection; other treatment methods, low cost treatment methods for rural communities; water safety plans.

Socio-economic aspects: Community, local government structure, cultural issues, influence of socio-economic aspects on community water supply and sanitation, concept of community participation, community mobilization, sustainable development approach, gender aspects.

CE 3142 Environmental Engineering Sessional-I
Contact Hours: 3/2 hrs/ week   **Credit: 0.75**

Laboratory safety and introduction to laboratory equipments and accessories; Water and wastewater sampling techniques, sample preservation, physical and chemical tests of water and wastewater; breakpoint chlorination, alum coagulation.

EVEN SEMESTER

CE 3221 Hydrology
Lecture: 3 hrs/ week   **Credit: 3.00**

Introduction: Hydrologic cycle, meteorological aspects of Hydrology, precipitation, water losses, interception, evaporation, transpiration and infiltration. Run off: Factors affecting run off, estimation of run off, stream flow, stream flow hydrograph, overland flow, flood rating, statistical methods in hydrology.

Ground water: Introduction, aquifer properties and ground water flow, well hydraulics, quality of ground water, ground water recharge, design, drilling and construction of water wells.

CE 3213 Structural Analysis and Design-II
Lecture: 3 hrs/ week   **Credit: 3.00**
Prereq. CE 3111

Approximate analysis of statically indeterminate structures, deflection of beams, frames and trusses by virtual work method, Two hinged arches, Composite structure.

CE 3217 Reinforced Concrete-II
Lecture: 3 hrs/ week   **Credit: 3.00**
Prereq. CE 3115

Review of codes, Reinforced concrete floor and roof systems, Two way slabs, flat slabs and flat plates, columns, isolated and combined footings, retaining walls plastic hinge idea and collapse mechanism, yield line method. Deflection of Beam Introduction of pre-stressed concrete.

CE 3218 Reinforced Concrete Sessional-II
Contact Hours: 3 hrs/ week   **Credit: 1.50**

Introduction to bridge engineering, analysis and design of a slab bridge and a deck-girder bridge.

CE 3233 Geotechnical Engineering-II
Lecture: 3 hrs/ week   **Credit: 3.00**
Prereq. CE 3131

Soil investigation techniques, direct measurement of consistency and relative density, correlation of strength parameters with N-Values, lateral earth pressure, stress distribution, settlement computation, types of foundations, bearing capacity of shallow, slope stability analysis.

CE 3234   Geotechnical Engineering Sessional-II
Contact Hours: 1.5 hrs/ week   **Credit: 0.75**

Direct shear test, unconfined compression test, triaxial compression test, relative density test, consolidation test, Field test (SPT).

CE 3205   Transportation Engineering-I
Lecture: 3 hrs/ week   **Credit: 3.00**

Introduction to transportation engineering, development of transportation system, elements of transportation system, transportation in Bangladesh, Transportation system managemen, the land use and transportation interaction,. **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,

Highway materials: desirable properties of road aggregate; production, properties and uses of bituminous material

Road safety engineering: Accident data system, Road engineering, Traffic legislation, Traffic enforcement, Driver training & testing, Vehicle safety, Education & publicity, Medical services.

CE 3206   Transportation Engineering Sessional-I
Lecture: 3/2 hrs/ week   **Credit: 0.75**

Roadway capacity studies, Tests on road aggregate, Tests on bituminous material.

Syllabus of Courses Offered in 4th Year B.Sc. Engineering

ODD SEMESTER

SL No.	Course No.	Course Title	Contact hour/ Week	Credit
1.	CE 4111 Prereq. CE 3213	Structural Analysis & Design-III	4.0	4.00
2.	CE 4121 Prereq. CE 3121	Irrigation and Flood Engineering	3.0	3.00
3.	CE 4131 Prereq. CE 3233	Geotechnical Engineering-III	3.0	3.00
4.	CE 4141 Prereq. CE 3141	Environmental Engineering-II	3.0	3.0
5.	CE 4105 Prereq. CE 3205	Transportation Engineering-II	3.0	3.0
6.	CE 4112	Structural Analysis & Design Sessional-III	3.0	1.5
7.	CE 4142	Environmental Engineering Sessional-II	1.5	0.75
8.	CE 4106	Transportation Engineering Sessional-II	1.5	0.75
9.	*CE 4000	Project & Thesis	6.0	1.5
		Total	**28.0**	**20.50**

* This Credit will be assessed at the end of 8th semester.

No. of Theory Courses = 05   Total Contact Hour = 28.0
No. of Sessional Courses = 04   Total Credit = 20.50

EVEN SEMESTER

Option	Course No.	Course Title	Theory Contact Hours/ Week	Theory Credit
1	CE 4201	Project Planning & Construction Management	3.0	3.00
2	CE 4213	Pre-stressed Concrete	2.0	2.00
	CE 4215	Theory of Elasticity and Elastic Instability of Structures	2.0	2.00
	CE 4217	Finite Element Method	2.0	2.00
	CE 4219	Structural Dynamics	2.0	2.00
	CE 4211	Design of Steel Structures	2.0	2.00
	CE 4210	Structural Analysis and Design Sessional –IV	3.0	1.5
	CE 4214	Structural Analysis & Design Sessional-V	3.0	1.5
3	CE 4220	Water Resources Engineering Sessional-I	3.0	1.50
	CE 4221	Integrated Water Resources Planning and Management	2.0	2.00
	CE 4223	River Engineering	2.0	2.00
	CE 4225	Coastal Engineering	2.0	2.00
	CE 4227	Hydraulic Structures	2.0	2.00
	CE 4229	Ground Water Engineering	2.0	2.00
4	CE 4230	Geotechnical Engineering Sessional-III	3.0	1.5
	CE 4233	Geotechnical Engineering-IV	2.0	2.00
	CE 4235	Geotechnical Engineering-V	2.0	2.00
	CE 4237	Geotechnical Engineering-VI	2.0	2.00
5	CE 4240	Environmental Engineering Sessional-III	3.0	1.5
	CE 4243	Environmental Pollution Control	2.0	2.00
	CE 4245	Solid Waste Management	2.0	2.00
	CE 4247	Environmental Development Project	2.0	2.00
6	CE 4206	Transportation Engineering Sessional-III	3.0	1.5
	CE 4205	Transportation Engineering-III	2.0	2.00
	CE 4207	Transportation Engineering-IV	2.0	2.00
	CE 4209	Transportation Engineering-V	2.0	2.00
7	CE 4203	Professional Practices & Communication Skills	2.0	2.00

	CE 4249	Socio-Economic Aspects of Development Project	2.0	2.00
8	CE 4000	Project & Thesis	6.0	3.0

N.B. 1 & 8-Compulsory course, (2-7) - Optional course. Students shall take one optional thesis related theory course & the corresponding sessional course from any optional group of 2-6 and three more optional theory courses from other options of 2-7 but not more than one from each option & another corresponding sessional course.

No. of Theory Courses = 05   Total Contact Hour = 32
No. of Sessional Courses = 06   Total Credit = 21.5

ODD SEMESTER

CE 4111   Structural Analysis and Design-III
Lecture: 4 hrs/ week   **Credit: 4.00**
Prereq. CE 3213

Analysis of statically indeterminate structures by displacement method, slope deflection and moment distribution method. Analysis of composite structures. Influence lines for statically indeterminate beams, frames, arches and grids. Stiffness matrix, member stiffness, stiffness transformation, assembly of stiffness matrices & solution for beams, frames and plane trusses and flexibility matrix. Structural forms and their applications.

CE 4112   Structural Analysis and Design Sessional-III
Contact Hours: 3 hrs/ week   **Credit: 1.50**

Principles of different types of bridges over rivers and wide canals, detailed design of a balanced cantilever bridge.

CE 4121   Irrigation and Flood Engineering
Lecture: 3 hrs/ week   **Credit: 3.00**
Prereq. CE 3121
Irrigation:

Importance of irrigation: source and quality of irrigation water, soil-water relationship, consumptive use, estimation of irrigation water requirements and irrigation scheduling and methods of irrigation. Design of irrigation canal system, irrigation structures and irrigation devices. Water logging, salinity and reclamation. Problems of irrigated land, irrigation projects and institutional constraints.

Flood Engineering:
Flood and its causes, Methods of flood management, structural and non-structural measures, economic aspects of flood management, flood risk and vulnerability analysis, direct and indirect losses of flood. Flood damage assessment, flood damage in urban and rural areas.

CE 4131   Geotechnical Engineering-III
Lecture: 3 hrs/ week   **Credit: 3.00**
Prereq. CE 3233

Selection of type of foundation based on sub-soil exploration reports, introduction of soil improvement techniques, design and construction of mat and pile foundations. Sheet pilling wall, caissons and cofferdam, Design of machine foundation.

CE 4141   Environmental Engineering-II
Lecture: 3 hrs/ week   **Credit: 3.00**
Prereq. CE 3141
Environmental Sanitation: Introduction to environmental sanitation, environmental pollution, environmental protection and management, different sanitation options, various types of latrines, low cost sanitation technology, construction and maintenance of sanitation facilities, community latrine cum bio-gas plant, sustainability of sanitation services, building sanitation, code of practice.
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; plumbing system, design of septic tank and soak well, small bore sewerage system.
Wastewater quality and treatment: Microbiology of wastewater; wastewater characteristics; wastewater treatment (preparatory, primary and secondary treatment) and disposal; treatment and disposal of industrial effluents; sludge treatment and disposal; waste stabilization ponds.
Health and Hygiene: Disease description, transmission and control, integrated approach for water, sanitation and health education, environmental management and environmental impact assessment.

CE 4142   Environmental Engineering Sessional-II
Contact Hours: 1.5 hrs/ week   **Credit: 0.75**

Laboratory test: Biological tests of water and wastewater. Sampling and laboratory analysis of air, sampling and laboratory analysis of soil and solid waste.

Design of water supply system: estimation of industrial, domestic and fire demands, design of water distribution network, design of water treatment plant.

CE 4105   Transportation Engineering-II
Lecture: 3 hrs/ week   **Credit: 3.00**
Prereq. CE 3205

Sub-grade, sub-base and base courses, soil stabilization and soil aggregates in road constructions, low-cost roads, mix design methods, design, construction and maintenance of flexible and rigid road pavements, equipment, Present Serviceability Index.
Railways: general requirements, alignment, permanent way, station and yards. Signaling, points and crossings, maintenance.

Waterways: Introduction, harbors, ports, docks, coastal structure

CE 4106   Transportation Engineering Sessional-II
Contact Hours: 1.5 hrs/ week   **Credit: 0.75**

Tests on sub-grade, sub-base and base materials, Mix design Method for bituminous concrete
CE 4000   Project and Thesis
Hours/ week: 6   **Credit: 1.50**

Experimental and theoretical investigation of various topics in structural Engineering, concrete technology, Environmental Engineering, transportation Engineering, Geotechnical Engineering and water resources 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.

EVEN SEMESTER

CE 4201 Project Planning & Construction Management
Lecture: 3 hrs/ week   **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, decision making and simulation, psychology in administration, materials management, demand forecasting, inventory control, personnel management, stores management, procurement, project planning and evaluation, feasibility reports, cash flow, pay back period, internal rate of return, benefit-cost ratio, construction equipment and plants, replacement studies.

CE 4203 Professional Practices and Communication Skills
Lecture: 2 hrs/ week   **Credit: 2.00**

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 labor relations, professional ethics in Civil Engineering.

CE 4249 Socio-Economic Aspects of Development Projects
Lecture: 2 hrs/ week   **Credit: 2.00**

Economic and social structure, development and economic growth, socio-economic indicators, population, prosperity and poverty, employment of work force, population displacement, rehabilitation strategy, productivity, land loss, land use and land ownership patterns, fisheries and aqua culture, 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.

CE 4221 Integrated Water Resources Planning and Management
Lecture: 2 hrs/ week   **Credit: 2.00**

Basic concepts in integrated water resources management. Economic, environmental and industrial aspects. Participation of beneficiaries. Formation of users group. Fisheries management. Strategic planning. System analysis approach: Conceptual framework and models. Analytical techniques.

CE 4210 Structural Analysis and Design Sessional-IV
Lecture: 3 hrs/ week   **Credit: 1.50**

Introduction to design of tall building. Computer aided analysis and design of a multistoried building.

CE 4214 Structural Analysis and Design Sessional-V
Sessional: 3 hrs/ week   **Credit: 1.50**

Computer aided analysis & design of various reinforced concrete structures (Water tank, folded plate), Steel Structure.

CE 4213 Prestressed Concrete
Lecture: 2 hrs/ week   **Credit: 2.00**

Prestressed concrete: 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. Analysis and design of prestressed beam section.

CE 4215 Theory of Elasticity and Elastic Instability of Structures
Lecture: 2 hrs/ week   **Credit: 2.00**

Introduction to theory of elasticity, plane stress and plane strain condition, two dimensional problems in rectangular and polar coordinates, torsion of circular and non-circular shafts, instability of structures, stability functions.

CE 4217 Finite Element Method
Lecture: 2 hrs/ week   **Credit: 2.00**

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

CE 4219 Structural Dynamics
Lecture: 2 hrs/ week   **Credit: 2.00**

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.

CE 4220 Water Resources Engineering Sessional-I
Sessional: 3 hrs/ week   **Credit: 1.50**

Design of hydraulic structures, river training works. Groundwater resource assessment and water well design.

CE 4223   River Engineering
Lecture: 2 hrs/ week   **Credit: 2.00**

Behavior of alluvial rivers. River channel pattern and fluvial processes. Aggradation and degradation, local scours, river training and bank protection works. Navigation and dredging. Sediment movement in river channels, bed forms and flow regimes.

CE 4225   Coastal Engineering
Lecture: 2 hrs/ week   **Credit: 2.00**

Coast and coastal features. Tides and currents. Tidal flow measurement. Waves and storm surges. Docks and labor. Forces of waves and fides in the design of coastal and harbor structures.

Coastal sedimentation processes. Deltas and estuaries. Shore protection works. Dredging and dredgers.

CE 4227   Hydraulic Structures
Lecture: 2 hrs/ week   **Credit: 2.00**

Principles of design o hydraulic structures, types of hydraulic structures. Design of dams, barrages, weirs, spillways, energy dissipaters and spillway gates. Cross drainage works.

CE 4229   Ground Water Engineering
Lecture: 2 hrs/ week   **Credit: 2.00**

Groundwater in hydrologic cycle and its occurrence. Physical properties and principles of groundwater movement. Groundwater and well hydraulics. Groundwater resource evaluation. Groundwater levels and environmental influences. Water pollution and contaminant transport. Recharge of groundwater. Saline water intrusion in aquifer. Groundwater management.

CE 4230   Geotechnical Engineering Sessional-III
Sessional: 3 hrs/ week   **Credit: 1.50**
Interpretation of soil test results and design of foundation.

CE 4233   Geotechnical Engineering-IV
Lecture: 2 hrs/ week   **Credit: 2.00**
Prereq. CE 3233

Foundation for structures subjected to lateral loads, retaining walls and abutments, operation and methods of construction, de-watering and slurry-wall construction.

Flexible earth retaining structures, sheet piles, cofferdams, caissons, machine foundations, elementary vibrations, shear modulus and elastic constants, foundation design for vibration, fundamentals of soil liquefaction.

CE 4235   Geotechnical Engineering-V
Lecture: 2 hrs/ week   **Credit: 2.00**

Introduction to critical state soil mechanics, SHANSEP and stress path methods, stress deformation and failure of soil masses. One, two and three dimensional consolidation problem, pore pressure coefficients, soil structure-interaction, earthquake and liquefaction problems, soil improvement, numerical solution of Geotechnical Engineering problems.

CE 4237   Geotechnical Engineering-VI
Lecture: 2 hrs/ week   **Credit: 2.00**

Introduction to soil-water interaction problems. Permeability, capillarity and soil suction. Seepage analysis, stability of natural, man made slope, and excavation subjected to seepage, water current, wave action etc. Theories of filters and revetment design, hydraulic fills.

CE 4240   Environmental Engineering Sessional-III
Sessional: 3 hrs/ week   **Credit: 1.50**
Design of sewerage system: estimation of industrial, domestic and commercial wastewater generation, wastewater network design; household plumbing system design; and wastewater treatment plant design.

Field visits and reporting: existing waster supply and sanitation technologies, environmental conditions of water sources and hygiene practice.

CE 4243   Environmental Pollution Control
Lecture: 2 hrs/ week   **Credit: 2.00**

Environment Pollution and its control: Water pollution-source 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, ground water pollution, marine pollution control measures-water quality monitoring and management.

Air pollution: Sources and type of pollutants, effects of various pollutants on human health, material and plants, air pollution meteorology, global warming and greenhouse effects, air pollution monitoring and control measures, noise pollution and its effects, ozone layer depletion and acid rain.

CE 4245 Solid Waste Management
Lecture: 2 hrs/ week   **Credit: 2.00**

Solid Waste Management: sources and types of solid wastes; physical and chemical properties of solid wastes; solid waste generation; onsite handling, storage and processing; collection of solid wastes; transfer stations and transport; ultimate disposal methods; resources and energy recovery and recycling; soil pollution; industrial solid waste collection and disposal.

Hazardous Waste Management: identification, sources and characteristics of hazardous wastes; hospital waste management practices; legal aspects; auditing and prevention; methods of treatment and disposal – physical, chemical, biological and thermal treatment; stabilization and solidification, engineering storage, incineration, landfill and deep burial.

CE 4247 Environmental Development Project
Lecture: 2 hrs/ week   **Credit: 2.00**

Environment and sustainable development, environmental policies and legislation, environmental implication of sectoral development, environmental quality standards, environmental issues and priorities, environmental impact assessment of development schemes, baseline studies, assessment methodologies, economics of environmental management, special topics.

CE 4206 Transportation Engineering Sessional-III
Sessional: 3 hrs/ week   **Credit: 1.50**
Prereq. CE 4105

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

CE 4205 Transportation Engineering-III
Lecture: 2 hrs/ week   **Credit: 2.00**
Prereq. CE 3205

The transportation planning process, traffic management concepts, traffic accident investigations, city road and street networks, grade separation and interchanges, pedestrian and bicycle facilities. The urban bypass, environmental aspects of highway traffic and transportation projects, elements of traffic flow.

CE 4207 Transportation Engineering-IV
Lecture: 2 hrs/ week   **Credit: 2.00**

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.

CE 4209 Transportation Engineering-V
Lecture: 2 hrs/ week   **Credit: 2.00**

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.

CE 4211 Design of Steel Structures
Sessional: 2 hrs/ week   **Credit: 2.00**

Behavior of structural steel members and steel frames, code requirements, design of tension and compression members by WSD and USD methods, design of beam. Beam-columns, joint design.

Prerequisite Courses: The list of prerequisite courses are given below-

Course No.	Course Title	Prerequisite	
		Course No.	Course Title
CE 2111	Mechanics of Materials-I	CE 1201	Engineering Mechanics
CE 2213	Mechanics of Materials-II	CE 2111	Mechanics of Materials-I
CE 3111	Structural Analysis & Design-I	CE 2213	Mechanics of Materials-II
CE 3121	Engineering Hydraulics	CE 2121	Fluid Mechanics-I
CE 3213	Structural Analysis & Design-II	CE 3111	Structural Analysis & Design-I
CE 3217	Reinforced Concrete-II	CE 3115	Reinforced Concrete-I
CE 3233	Geotechnical Engineering-II	CE 3131	Geotechnical Engineering-I
CE 4111	Structural Analysis & Design-III	CE 3213	Structural Analysis & Design-II
CE 4121	Irrigation and Flood Engineering	CE 3121	Engineering Hydraulics
CE 4131	Geotechnical Engineering-III	CE 3233	Geotechnical Engineering-II
CE 4141	Environmental Engineering-II	CE 3141	Environmental Engineering-I
CE 4105	Transportation Engineering-II	CE 3205	Transportation Engineering-I