Fareast International University

Faculty of Engineering

Syllabus for
B.Sc. in Civil & Environmental Engineering

Faculty of Engineering
Department of Civil & Environmental Engineering

1. Introduction

Civil engineering influences our everyday lives - the entire infrastructure of our surroundings from all kinds of buildings to utilities, transport, environment and its related social and other issues. The Program offers courses which are grounded in a broad spectrum of disciplines including mathematics, basic science, humanities, public health and engineering (basic, civil, structural, environmental, geotechnical and water resources engineering). The scopes of civil engineering in Bangladesh and global contexts will be dealt with in various conditions, such as, rural, urban, disaster, climate change, and developing and developed country perspectives towards sustainable development. The Program will be launched from the above-mentioned Department. The goal and mission of the Department are; 'to create and enhance competent professionals, researchers, policy makers and beneficiaries who will contribute towards sustainable development of our rapidly changing world' and' to contribute to advancement of knowledge and betterment of humanity through excellence in education, research and public services' in civil engineering and science.

2. Program Objectives

The objective of the Program is to create foundations for careers and interests in civil engineering based on developed knowledge about conceptualizing, administering, assessing, modeling, managing, educating, communicating, monitoring and evaluating, advocating, policy making, research and/or consultancy service approaches for addressing the issues in Bangladesh and other countries.

3. Framework and Rules

3.1   Recruit, support, and retain competent faculty and staff; as well as provide facilities and equipment to create an atmosphere conducive to learning and discovery and application of knowledge.

3.2   Provide with guidance and support to students in proper planning and selection of courses.

3.3   Administer the latest educational methods and techniques; with particular focus on interactive -learning at class rooms, laboratories, group works seminars as well as field and group exercises.

3.4   Adopt course and/or modular systems.

3.5   Continuous evaluation of student's performance.

3.6   Opportunity for students to choose more courses than the minimum required course load depending on her/his interests and capabilities.

3.7   The Credits hours requirement for the B.Sc. degree would be at least 160 Credits hours over 4 years; unless otherwise stated. A major is a student's principal field of study.

3.8   For minor the undergraduate students will require 9 -15 Credits hours, in addition to the specified Credits hours in principle major.

3.9   Students of this Program can undertake second minor and/or minors from departments and programs other than their principal major of the School and the departments from other schools and students from other Schools/Departments/Programs/ other equivalent Universities; after approval from the respective departments.

3.10   Both full-time and part-time students will be accepted based on the UGC rules and regulations.

4. Course Outline

The courses are designed to provide with foundation in both civil engineering and other related science. The general/humanities education needed to enhance the related cultural, social, management and other capacities in the real world are included also: (i) core courses; which are compulsory courses and represent nucleus of the program, (ii) pre-requisite courses: which are required to be completed before some other course(s) can be taken, and (iii) optional courses;. The students will have some choice to choose the required number of courses from a specified group/ number of courses. Students majoring in a concentration group; such as Structural, Geotechnical, Environmental, Transportation or Water Resources Engineering, will require, at least, 5 additional Credits hours and thesis from the concerned concentration/optional group of interest.

5. Degree to be Awarded

Bachelor of Science in Civil Engineering with concentration/major in (1) Structural Engineering, (2) Environmental Engineering, (3) Geotechnical Engineering, (4) Transportation and (5) Water Resources Engineering.

6. Duration of the Program

The duration of the program will be four years divided into 12 semesters for full-time students with H.S.C or equivalent and requiring none special pre-requisites or waivers (please check admission requirements). The students with Diploma in Civil Engineering or equivalent qualification will be eligible for waiver in some courses depending on course content/ outline of the courses undertaken during the diploma study.

7. Number of Semesters in a Year and Course Distribution

 i) There will be three terms in an academic year. The duration of each semester will be 15 weeks which will be used as follows:
Spring   :   January to April
Summer :   May to August
Fall   :   September to December

ii) Courses over 9- 15 Credits hours will be offered per semester. The course timings and schedules may be arranged as day and/or evening classes throughout a week or on specified days of a week depending on the demand from majority students.

8. Admission

Every applicant, without any exception must fulfill the admission requirement as laid down by the UGC and the Fareast International University. Admission will be arranged 3 times in a year. Application forms for the admission will be available all the year round at the admission desk of the university but admission will be placed only three times before starting each individual semester. Students form science can apply for the admission.

9. Admission Requirements

i) Students obtaining minimum CGPA of 2.5 or second division in S.S.C and H.S.C can apply to the program. The O-level and A-level students must have an average grade of ' B'. Those having Diploma engineering are also eligible for application with waivers in some courses depending on their major and courses undertaken during the diploma. However, all diploma candidates have to take at least 3 years 120 Credits out of the required 160 courses (thesis/project is compulsory). UGC guideline/rules will be followed in all cases. Any further circulation from UGC will be updated into the system.

ii) Admission test will be required for undergraduate programs. The tests will be held in Dhaka as arranged by the University. The undergraduate program written admission tests will be held on the following three areas:

a. Language; English
b. Mathematics, and
c. Physics and Chemistry

A student having a minimum score of 1200 (with a minimum of 400 in verbal) in SAT may not sit to take at the Bachelor program admission test (written) administered by the University. But all the students must appear before a personal interview as part of the admission requirements. Candidates will be selected for interview on the basis of results in the admission test (written).

10. Provision for Foreign Students

For other foreign certificates, the University will determine equivalence. Applicants will be required to sit for an admission test designed to judge their abilities and aptitude for the program.

11. Class Attendance

Each student is required to attend all classes held during each semester. Only three absences in one semester in each course may be excused. More over attendance in the classes will contribute to increase the grading point in particular course or total program.

12. Grading System

A student may earn the following letter grades: A+, A, A-, B+, B, B-, C+, C, D, and F depending on his/her performance in the course. However, grade 'F' is the failing grade. The numerical equivalent of the grades along with meaning for each grade is given in the tabular form below:

Numerical Grade	Letter Grade	Grade Point
80% and above	A+	4.0
75% to less than 80%	A	3.75
70% to less than 75%	A-	3.5
65% to less than 70%	B+	3.25
60% to less than 65%	B	3.0
55% to less than 60%	B-	2.75
50% to less than 55%	C+	2.5
45% to less than 50%	C	2.25
40% to less than 45%	D	2.0
Less than 40%	F	0.0
	F* Failure I** Incomplete W*** Withdrawal R**** Repeat Y***** Audit	

F*   "F" means failure. Credits for courses with this grade do not apply towards graduation and needs to repeat for improvement.

I**   An "I" grade is given to students who have fulfilled the majority of the course requirements but have been unable to complete the rest. The student is not required to register for the course in the next semester.

***   "W" means withdrawal. A student may decide to withdraw from a course by the deadline with the consent of the instructor and the Academic Advisor.

****   "R" means repeat. If a student fails to earn minimum grade point of 2 in a course he or she has to retake the course(s) in the following 2 consecutive semesters. After repetition, improvement if any, will be calculated towards GP A or CGP A.

***** "Y" means audit. An existing student or ex-student may decide to audit a course of his her interest for improvement of his knowledge for the particular course. In this case, the student pays the full tuition fee for the course, attends the classes, but is not required to sit for the exams and no Credits is earned.

13. Academic Standing of a Student

Student to remain in good standing maintain a mm1mum Cumulative 'Grade Point Average (COPA) of 2.00 out of 4.00 on the basis of courses taken. Students obtaining "F" grade in a course in any semester must repeat that course within the next two consecutive semesters.

If a student earns grade "B-" or above (above or equal to 55% marks) for any course he/she would not be allowed to repeat the course. The students obtaining "C+" or "C" or "D" for any course can repeat the course for improvement within next two consecutive semesters if they wish.

Pre-requisite course_ should be repeated on priority basis. The improved grade will be calculated in the final transcript and previous grades (i.e. "C+" or "C" or "D" or "F") will be marked with R grade (Retake) which has no effect on GPA or COPA. If, after repeating · the courses, a student fails to raise his/her CGP A to 2.0 he/she will automatically be dismissed from the program.

14. Transfer of Credits Hours

Transfer of Credits from institutions having equivalent curriculum, comparable grading system, and grading standard to maximum of 50% of the total Credits required for graduation having minimum "C-" or above grade may be considered. Transfer of Credits will ·be considered only after a student enrolls in the program after fulfilling the admission requirements as laid down for regular students. The university on a case by case basis will review transfer of Credits. Necessary documents of support their application must also be provided.

15. Student Advisor

An assigned Student Advisor from the Department will discuss and guide for selection of nature or number of courses and other required help for courses to be registered during .s/her academic program.

16. Dean's List

As a recognition of excellent performance, the names of students obtaining an average GPA of 3.75 or above in two regular terms in each academic year may be published in the Dean's list in each faculty/School.

17. Course Designation and Numbering System

Each course is designated by a designation including the following code:
*   First two to three letters identifying the Program: CE= Civil Engineering
*   The first and second digit will correspond to the year and semester in which the course is normally taken by the student.
*   Last two digit will usually be odd for theoretical and even for laboratory or sessional courses.

18. Summary of Course Requirements for B. Sc. Civil Engg Degree

Courses	Requirements Credits hours	Courses offered (Credits hours)
Basic Science	24.0	27.0
Humanities and Related Science	12.0	12.0
Basic Engineering & Civil Engineering	49.0	49.0
Structural Engineering	19.0	31.0
Environmental Engineering	12.0	24.0
Geotechnical Engineering	7.5	19.5
Transportation Engineering	9.0	21.0
Water resources Engineering	13.5	25.5
Sub-total	146.0	
Project	5.0	
Major/Concentration	9.0	
Total	**160.0**	

19. List of courses to be offered per semester:

Sequence of Courses in Civil Engineering Undergraduate Program

1st Year: Semester I

Code	Course	Nature of Course	Credits
CE 1101	Engineering Mechanics	C	3.0
CE 1102	Engineering Drawing	C	1.5
MATH 1102	Analytical Geometry	C	3.0
ENG 1111	Fundamental of English	C	3.0
PHY 1111	Physics I	C	3.0

Total Credits: 13.5

1st Year: Semester II

Code	Course	Nature of Course	Credits
CE 1203	Surveying I	C	3.0
CSE 1211	Structural Programming	C	3.0
PHY 1215	Physics II	C	3.0
PHY 1116	Physics Laboratory I	C	1.5
MATH 1203	Calculus I	C	3.0

Total Credits: 13.5

1st Year: Semester III

Code	Course	Nature of Course	Credits
CE 1305	Surveying II	C	3.0
CE 1307	Civil Engineering Principles	C	3.0
CHEM 1111	Chemistry I	C	3.0
CHEM 1212	Chemistry Laboratory I	C	1.5
MATH 2503	Differential Equation I	C	3.0
CSE 1212	Structural Programming Lab	C	1.5

Total Credits: 15.0

2nd Year: Semester I

Code	Course	Nature of Course	Credits
CE 2101	Engineering Materials	C	3.0
CE 2102	Engineering Materials/ Concrete Laboratory	C	1.5
CE 2104	Practical Surveying	C	1.5
MATH 1305	Linear Algebra	C	3.0
HSS 101	Sociology	C	3.0
BUS 2112	Principles of Accounting	C	3.0

Total Credits: 15.0

C= Compulsory Course

2nd Year: Semester II

Code	Course	Nature of Course	Credits
CE 2202	Computer Aided Drafting	C	1.5
CE 2201	Engineering Geology and Geomorphology	C	2.0
CE 2203	Mechanics of Solids I	C	3.0
CE 2205	Numerical Analysis	C	3.0
CE 2207	Details of Construction	C	1.5
HSS 103	Economic Analysis	C	3.0

Total Credits: 14.0

2nd Year: Semester III

Code	Course	Nature of Course	Credits
CE 2301	Fluid Mechanics	C	3.0
CE 2302	Fluid Mechanics and Hydraulics Laboratory	C	1.5
CE 2303	Mechanics of Solids II	C	3.0
CE 2304	Quantity Surveying	C	1.5
EE 313	Building Services III: Planning Electrical Equipment	C	2.0
CE 2306	Workshop Laboratory	C	1.5
CE 2308	Mechanics of Solids Laboratory	C	1.5

Total Credits: 14.0

3rd Year: Semester I

Code	Course	Nature of Course	Credits
CE 3101	Structural Analysis and Design I	C	3.0
CE 3102	Structural Analysis and Design Sessional I	C	1.5
CE 3103	Design of Concrete Structure I	C	3.0
CE 3105	Geotechnical Engineering I	C	3.0
CE 3104	Geotechnical Engineering Laboratory	C	1.5
CE 3107	Hydraulics and Hydraulic Structures	C	3.0

Total Credits: 15.0

3rd Year: Semester II

Code	Course	Nature of Course	Credits
CE 3201	Environmental Engineering Principal	C	3.0
CE 3203	Transport Engineering I	C	3.0
CE 3207	Geotechnical Engineering II	C	3.0
CE 3202	Concrete Structure Design Sessional	C	1.5
CE 3204	Transportation Engineering Laboratory I	C	1.5

Total Credits: 12.0

C= Compulsory Course

3rd Year: Semester III

Code	Course	Nature of Course	Credits
CE 3301	Structure Analysis and Design II	C	3.0
CE 3302	Water Resources Engineering Sessional	C	1.5
CE 3303	Design of Concrete Structure II	C	3.0
CE 3305	Transportation Engineering II	C	3.0
CE 3307	Water Resources	C	3.0

Total Credits: 13.5

4th Year: Semester I

Code	Course	Nature of Course	Credits
CE 4000	Project	C	1.5
CE 4101	Water and Water Supply	C	3.0
CE 4102	Environmental Engineering Laboratory	C	1.5
CE 4103	Prestressed Concrete	C	2.0
CE 4104	Transportation Engineering Laboratory II	C	1.5
CE 4105	Irrigation and Drainage System	C	3.0

Total Credits: 12.5

4th Year: Semester II

Code	Course	Nature of Course	Credits
CE 4000	Project	C	2.0
CE 4202	Design of Water Supply, Sanitation & Sewage System Sessional	C	1.5
CE 4203	Hydrology	C	3.0
CE 4207 CE 4209	Environmental Pollution Control and Its Control Environmental Impact Assessment (EIA)	Major in Environmental Engineering	3.0+3.0=6.0
CE 4211 CE 4213	Introduction to Finite Element Method Theory of Elasticity	Major in Structural Engineering	3.0+3.0=6.0
CE 4215 CE 4217	Transportation Engineering III Traffic Planning and Management	Major in Transportation Engineering.	3.0+3.0=6.0
CE 4219 CE 4221	Geotechnical Engineering III Elementary Soil Dynamic	Major in Geotechnical Engineering.	3.0+3.0=6.0
CE 4223 CE 4225	River Engineering and Flood Mitigation Coastal Engineering	Major in Water Resources Engineering	3.0+3.0=6.0

Total Credits: 12.5

C= Compulsory Course

4th Year: Semester III

Code	Course	Nature of Course	Credits
CE 4000	Project	C	1.5
CE 4323	Solid Waste Management, Environmental Sanitation and Hygiene	C	3.0
CE 4325	Design of Steel Structure	C	2.0
CE 4301 CE 4303	Waste Water and Industrial Wastewater Energy and Environment	Select any One (Major in Environmental Engineering)	3.0
CE 4305 CE 4309	Dynamic Structure Construction Practices and Management	Select any One (Major in Structural Engineering)	3.0
CE 4311 CE 4313	Highway Drainage & Airport Port Engineering: Planning and Operations	Select any one (Major in Transportation Engineering)	3.0
CE 4315 CE 4317	Geotechnical Engineering IV Earth Dam and Stability of Slope	Select any one (Major in Geotechnical Engineering.)	3.0
CE 4319 CE 4321	Groundwater Engineering Open Channel Flow	Select any One (Major in Water Resources Engineering)	3.0

Total Credits: 9.5

C= Compulsory Course

COURSE DETAILS

BASIC SCIENCES

MATH 1101: Fundamental Mathematics
3.0 Credits

Number System: Real Numbers: Natural Numbers, Integers, Rational Numbers, Irrational Numbers. Prime Numbers, Composite Numbers, Fraction, Complex Numbers, Negative Numbers, Ratio, Cardinal Numbers. Set Theory: Algebra of Sets, Ordered Pair, Cartesian Product, De Morgan's Laws, Power Set, Compliment of Set, Related application and problems of a set.

Sequence and series: Arithmetic Mean, Geometric Mean, Harmonic Mean, Inequality, Cauchy's Inequality, Weierstrass Inequality, Summation of Finite Series, Logarithms and Partial fraction. Determinants up to nth order, Fundamental Theorem of Algebra, Remainder Theorem, Factor Theorem.

Indices and surds: Definition of indices, laws of indices, definition of surds, operation of surds.

Trigonometry: Fundamental notions and definitions, Logarithms, Polar and Cartesian form, Cauchy's Integral Formula, Cauchy's residue theorem with it's application, De-Moivre's theorem with it's application.

MATH 1102: Analytical Geometry
3.0 Credits

Two-dimensional geometry:
Change of axes, Transformation of coordinates, Pair of straight lines, Important properties and related topics on circle, parabola, ellipse and hyperbola. The general equation of second degree and reduction to standard forms.

Three-dimensional geometry:
Different system of co-ordinates, Direction cosines and direction ratios, Planes and straight lines, General equations, Important properties and related topics on sphere, cone, ellipsoid, hyperboloid, paraboloid, cylinder.

MATH 1203: Calculus I
3.0 Credits

Differential Calculus: Function, Limit, Continuity, Derivative, Euler's theorem, Different types of function, Domain and Range of a function, Variable, Constant, Mean Value theorem, Determination of maximum and minimum values of functions and Inflection Points, Concavity and Convexity, Extreme-Value Theorem, Rolle's Theorem, Mean-Value Theorem, Curvature, L'Hospital Rule.

Integral Calculus: Fundamental theorem of Integral Calculus, Indefinite integrals, Properties of indefinite integrals, Definite integrals, Properties of definite integrals, Mean-Value theorem for Integral, Area between two curves, Arc Length, Volumes, Improper Integrals and applications.

MATH 2503: Differential Equation I
3.0 Credits

Differential Equation: Introduction of differential equation, Classification and formation of ODEs, Separation of variables, Homogeneous equations, Exact equation, Integrating Factor, Linear equations of first order and first degree, Bernoulli's equation, Linear second and higher order differential equations with constant coefficients, Particular Integral, Homogeneous and non-homogeneous equations (variation of parameter, undetermined co-efficient, reduction of order).

Introduction of Partial Differential Equation, Classification-Linear, Nonlinear, Homogeneous and non-homogeneous PDE.

MATH 1305: Linear Algebra
3.0 Credits

1. **Linear Equations and Matrices:** Introduction to matrix, different types of matrices, equivalent matrices, determinants, properties of determinants, minors, cofactors, evaluation of determinants, adjoint matrix, inverse matrix, method for finding inverse matrix, elementary row operations and echelon form of matrix, system of linear equations (homogeneous and non-homogeneous equations) and their solutions.
2. **Diagonalization of Matrices**: Introduction, eigenvalues and eigenvectors, diagonalization, the minimum polynomial of a matrix and theCayley Hamilton theorem, the diagonalization of a symmetric matrix, Jordan Canonical form.
3. **Vector Spaces:** Vector, vector spaces and subspaces, linear independence and dependence, basis and dimension, change of bases, rank and nullity.
4. **Linear transformation**: The matrices of a linear transformation, the kernel and images of a linear transformation and their properties. Applications to Linear equations & rank of matrices.

CHEM 1111: Chemistry
3.0 Credits

Atomic Structure: Atomic Theory; Dalton's Atomic Theory; Cathode rays' Discovery of electrons; Radioactivity and Atomic Structure; Scattering of Alfa rays; Rutherford's Atom model, Neutron, Isotopes. Atomic Spectra and Electronic Structure, The Principal quantum number; The Subsidiary Quantum number; The magnetic Quantum number; The Spin Quantum number, Types of Electrons; Distribution of Electrons on the Atoms of Elements.

Periodic Table: Periodic law, The Modem Periodic Table: Electronic structure and the Periodic Law, Inert Gases, representative elements (sand p block elements), The Transition elements (d block elements), The Inner Transition elements (f-block elements), Variation of properties within periods and groups: Metallic character, Atomic size; Ionic Radii, Ionization potentials, Electron Affinities, Electro negativities, Oxidizing and Reducing powers.

Chemical Bonding: Concept of chemical Bond; The Electronic Concept, The Ionic Bond, General properties of the Ionic Bond the Covalent Bond: Lewis Theory, Multiple Bonds, Polar Covalent Bond, Exceptions to Octet rule, Formal Charge and Lewis formulas: bond length, bond order, bond energy, Coordination bond, Donor Acceptor atoms, Valence Bond Theory (VBT): Hybrid Bonds, sp Hybrid Bonds, sp2 Hybrid Bonds, sp3 Hybrid Bonds, Resonance, Sigma and pi Bonds, Some properties of Covalent Bond, distinction between ionic and Covalent bonds, Other types of chemical bonds: The Metallic Bond, The Hydrogen Bond.

Different types of solutions: Definitation and Calculation of different types of Concentration units, The strength of acids, pH concept, Thermodynamics.

CHEM 1112: Chemistry Laboratory
1.5 Credits

Chemistry Laboratory will be conducted according to the theory course CHEM 131.

PHY 1111: Physics I
3.0 Credits

Mechanics: Linear motion of a body as function of time, position and velocity, momentum (Linear and angular momentum), simple harmonic motion and its application, damped and forced Vibration and resonance.

Dynamics of rigid body: Conservation theorem of momentum and energy, collision and torque, center of mass of rigid body, rotational kinetic energy, fly wheel, axes theorems and their application, Determination of moment of inertia of a rigid body.

Gravity and Gravitation: Definitions, compound pendulum, gravitational potentials and fields, relation between, potential due to spherical shell, escape velocity and Kepler's law of planetary motion**.**

Elasticity: Hooke's law, relation between different elastic constants, bending of beams, cantilever, determination of Young's modulus and its engineering applications.

Surface tension and viscosity: molecular theory of surface tension, capillarity, angle of contact, expression for surface tension, stream line and turbulent motion, Bernauli's equation and its application, coefficient of viscosity, Stoke's law, Determination of coefficient of viscosity.

Waves: Waves in elastic media, standing waves and resonance, Sound waves, beats and Doppler's effect, Fourier theorem and its application.

Heat & Thermodynamics: Temperature, Zeroth law of thermodynamics, Thermometers: Constant volume, platinum resistance, thermocouple, Thermodynamic system, First law of thermodynamics and its application, Molar specific heat of gases, isothermal & adiabatic relation, kinetic theory of gas, Vander Waals equation of state, Second law of thermodynamics, Thermodynamic temperature scale, Carnot's heat engine, The efficiency of engine, combined first and second law, Entropy and refrigerator.

PHY 1116: Physics II
3.0 Credits

Charge and Matter: Electric charge, conductors and insulators, Coulomb's Jaw, electric field, electric field strength, Gauss's Jaw and its applications, electric potential and potential function, electric dipole, Dielectrics and Gauss's law, energy storage in an electric field**.**

Current and Resistance: Current and current density, Ohm's Jaw, Resistively, Electromotive force, potential difference. RC Circuits The Magnetic Field: The definition of B, the magnetic force on a current, magnetic force on current, Ampere's law, Biot– Savartlaw and their application, Lorentz force.

Electromagnetic induction: Faraday's law of induction, Lenz's law, self and mutual induction, energy density in the magnetic field, generation of alternating current and emf,

Physical Optics: Theories of light, Huygen's principle and construction, Interference of light: Young's double slit experiment, Fresnel bi-prism, Newton's ring, Diffraction of light: Fresnel and Fraunhoffer diffraction, diffraction gratings, Polarization and analysis of polarized light, Optical fobre.

Relativity and Light waves: Postulates of special relativity, time dilation and length contraction, mass - energy relation, Photo electric effect, X-ray and Bragg's law, Compton effect, De Broglie waves.

Modem Physics: Bhor's atom model, atomic spectra and Zeeman effect, atomic nucleus and binding energy, radioactive decays and half life.

PHY-1116 Physics Laboratory I
1.5 Credits

Physics Laboratory will be conducted according to the theory course PHY 1111.

HUMANITIES AND RELATED SCIENCE

ENG 1111: Fundamental of English
3.0 Credits

Sentence and its components, phrases and clauses, tense, parts of speech, paragraph writing, article and other grammatical features.

HSS 101: Sociology
3.0 Credits

Introduction to Sociology, Social evolution and techniques of production, application of scientific methods in the observation and analysis of social change, norms, groups, inter-group relations, social stratification, institutions, and basic socialization processes, Social structure of Bangladesh, Industrial revolution, Examine historical and modern consequences of engineering and technological development, and resource limitations on human populations in the context of various social theories, gender and development.

ECO 101: Principles of Economics
3.0 Credits

Introduction: Definition of economics, Scope and utility of studying economics.

Microeconomics: The theory of demand and supply and their elasticity, Price determination, Nature of an economic theory, applicability of economic theories to the problems of developing countries. Indifference curves technique, Marginal utility analysis, Production: Production function, types of productivity, the nature of Iso quants and Iso costs, Rational region of production of an engineering firm, Euler's theorem.

Market: Concepts of market and market structure. cost analysis and cost function. small-scale production and large-scale production, optimization, theory of distribution, macroeconomics: savings, investment, employment, national income analysis, inflation, monetary policy, fiscal policy and trade policy with reference to Bangladesh.

Economics of development: Dimensions of development, Relevance of theory, the employment problem, Human resource development Economics of planning: Planning and market, Policymodels, Planning experience.

BUS 2112: Principles of Accounting
3.0 Credits

Accounting and its environments, Concepts and conventions of accounting, Generally accepted accounting principles, Accounting equations, Recording business transactions, Accounting cycle, accounting for a merchandising concern, Preparation of financial statements and Accounting for cash, receivables, inventories, fixed assets: acquisition, disposal and depreciation, Analyzing financial statements, implementing accounting system: computerized accounting.

BASIC ENGINEERING & CIVIL ENGINEERING

CE 1101: Engineering Mechanics
3.0 Credits

Coplanar and non-coplanar force systems, moments, analyses of two-dimensional frames and trusses, friction, flexible chords, centroids of lines, areas and volumes, moments of inertia of areas and masses, plane motion, principles of work and energy, impulse and momentum, virtual work principle for rigid bodies.

CE 1102: Civil Engineering Drawing
1.5 Credits

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

CE 1203: Surveying I
3.0 Credits

Reconnaissance survey, linear measurements, traverse survey, triangulation, leveling and contouring, calculation of areas and volumes, problems on heights and distances, curves and curve ranging, transition curve, vertical curves, tachometry: introduction, principles and problems on tachometry.

CSE 1211: Structured Programming
3.0 Credits

Programming Concepts:
a) Problems: How to solve a problem, general problem solving concept.
b) Algorithm and flow chart.
c) Programming, criteria of a good program, programming style, debugging, documentation.
d) Programming designing methodologies.

Structured Programs for Languages and Applications:
a) An introduction to programming structures.
b) Problem solving with sequential logic structures.
c) Problem solving with decisions.
d) Problem solving loops.
e) Problem solving with case logic structure.

Programming Languages:
a) Programming languages and their levels.
b) Programming language concepts: Structured language and other formalism.
c) Survey of different programming languages.
d) Program design methodologies: structured and modular program design.
"C" Language:
a) Preliminaries- Program constructs- variables and data types in C.
b) Input and Output- Character and formatted 110.
c) Arithmetic expressions and assignment statements- loops and nested loops.
d) Decision making
e) Arrays: One-dimensional and multi dimensional.
f) Functions- Re~ value- Arguments of function- Built in functions.
g) Arguments and local variables- Calling functions and arrays- Recursion and recursive functions Structures within structure,
i) Pointers: Pointers and structures- Pointer and functions- Pointer and arrays- Operation and pointer Pointer and memory address.

CE 1305: Surveying II
3.0 Credits

Plane table surveying, Astronomical surveying: definition, instruments, astronomical corrections, systems of time. Photogrammetry: introduction of terrestrial photography, aerial photography, reading of photo mosaic, scale, project surveying, errors in surveying, remote sensing, introduction to geographic information system (GIS) and global positioning system (GPS), GIS in modeling and management.

CE 1307: Civil Engineering Principles
3.0 Credits

Introduction of civil engineering, branches of civil engineering, civil engineering structures, definition of structures and its types, classification of buildings based on occupancy, different components of a building, discussion on loads on structures, importance of soil testing in construction and design, building regulations, water and environment: man and environment, basic population dynamics, water resources, river system in Bangladesh, water pollution, components of environment, ecosystem, flow of matter and energy through an ecosystem, biodiversity, urban air pollution, acid rain, global warming, renewable and non-renewable energy, transportation system, mode of transport, road network, discussion on the national road network of Bangladesh.

CSE 1212: Structured Programming Lab
1.5 Credits

Laboratory works based on CSE 105.

CE 2101: Engineering Materials
3.0 Credits

Properties and uses of bricks, efflorescence; cement, cement chemistry, aggregates, cement and lime mortars, concrete, standard tests of bricks, Cement and concrete, salinity problem in concrete, corrosion and its prevention, paints, varnishes, metallic coating. Design of concrete mixes; atomic structure and bonding, crystal structures, mechanical properties, yielding, fracture, elasticity, plasticity, properties and uses of rubber, timber and plastics. Concrete for special purposes. Ferrocement.

CE 2102: Engineering Materials Laboratory
1.5 Credits

General discussion on preparation and properties of concrete, test for specific gravity, unit weight, voids and bulking of aggregates, moisture content and absorption of coarse and fine aggregates, normal consistency, initial setting time, soundness and fineness test of cement, direct tensile and compressive strengths of cement mortar, gradation of coarse and fine aggregates, design and testing of a concrete mix, sampling and testing of bricks for 1bsorption, unit weight, efflorescence and compressive strength.

CE 2104: Practical Surveying
1.5 Credits

Linear and angular measurement techniques traverse surveying, leveling and contouring, curve setting, tachometry, project surveying, modern surveying equipment and their applications.

CE 2201: Engineering Geology & Geomorphology
2.0 Credits

Geology: Minerals, identification of minerals, common rock forming minerals, physical properties of minerals, mineraloids rocks, types of rocks, cycle of rock change, Earthquake and seismic map of Bangladesh. Structural geology, faults, types of faults: fold and fold type, domes,.

Geomorphology: Basins, erosional process, quantitative analysis of erosional land forms, channel development, channel widening, valley shape, stream terraces, and alluvial flood plains Deltas and alluvial fans: channel morphology, channel patterns and the river basin, Geology and geomorphology of Bangladesh.

CE 2202: Computer Aided Drafting
1.5 Credits

Introduction to computer usage, introduction to CAD packages and computer aided drafting: drawing editing and dimensioning of simple objects, plan, elevations and sections of multistoried buildings, reinforcement details of beams, slabs, stairs etc, plan and section of septic tank, detailed drawings of roof trusses, plans, elevations and sections of culverts, bridges and other hydraulic structures, drawings of building services.

CE 2203: Mechanics of Solids I
3.0 Credits

Concepts of stress and strain, constitutive relationships, deformations due to tension, compression and temperature change, beam statics: reactions, axial force, shear force and bending moments, axial force, shear force and bending moment diagrams using method of section and summation approach, elastic analysis of circular shafts, solid non-circular and thin walled tubular members subjected to torsion, flexural and shear stresses in beams, shear centre, thin walled pressure vessels.

CE 2205: Numerical Methods
3.0 Credits

Systems of linear algebraic equations, interpolation and curve fitting, roots of equations, numerical differentiation, numerical integration, initial value problems, two-point boundary value problems, finite differences, Solution equation by iteration and other methods.

CE 2207: Details of Constructions
1.5 Credits

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, brick laying tools, defects and strength on brick masonry, typical structures in brickwork, load bearing and non-load bearing walls, cavity walls, partition walls, lintels and arch: different types of lintels and arches, loading on lintels, construction of arches, stairs: different types of stairs, floors, ground floors and upper floors, roofs and roof coverings, shoring, underpinning, scaffolding and formwork, plastering, pointing, painting, distempering and white washing, cement concrete construction, sound insulation: acoustics, thermal insulation, house plumbing: water supply and wastewater drainage.

CE 2301: 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.

CE 2302: Fluid Mechanics and Hudraulics Laboratory
1.5 Credits

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.

CE 2203: Mechanics of Solids II
3.0 Credits

Symmetric and unsymmetric bending of beams, stress transformation, failure criteria, beam deflection by direct integration and moment area method, buckling of columns, elastic strain energy and external work, cable and cable supported structures, bolted, riveted and welded joints.

CE 2304: Quantity Surveying
1.5 Credits

Construction procedure, Collection of Materials, Source of Materials, Quality Control, Route mapping. Analysis of rates, detailed estimate of all items of work of a building, bridge, truss, highway. Specifications of materials for the above constructions. Use of software in quantity surveying.

CE 2306: Workshop Laboratory
1.5 Credits

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

Welding shop: Methods of metal joints: Riveting, grooving soldering, welding, Types of welding joints and welding practice, Position of arc welding and polarty: Flat, vertical, horizontal, overhead, Electric Arc welding and its machineries: Welding of different types of materials: Low carbon steel. cast iron, brass, copper, stainless steel, aluminium, Types of electrode, fluxes and their composition, Arc welding defects, Test of Arc welding: Visual, destructive and nondestructive 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.

CE 2306: Mechanics of Solids Laboratory
1.5 Credits

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

EEE 313: Building Services III: Planning Electrical Equipment
2.0 Credits

Electrical units and standards, electrical network and circuit solution series, parallel and mesh current methods, instantaneous current, voltage and power, effective current and voltage, average power. Sinusoidal single phase, RIC circuits, phasor algebra, balanced three phase circuits, electrical wiring for residential and commercial loads, transformer, and induction motors.

STRUCTURAL ENGINEERING

CE 3101: Structural Analysis and Design I
3.0 Credits

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

CE 3102: Structural Analysis and Design Sessional I
1.5 Credits

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

CE 3015: Design of Concrete Structures I
3.0 Credits

Fundamental behavior of reinforced concrete, Introduction to WSD and USD methods, Analysis and design of singly reinforced, double reinforced and T-beams according to strength design method, Shear, diagonal tension and tension and torsion of beams, bond and anchorage, design-of one way slabs, Design of two way edge supported slabs using strip and alternate methods, reinforced concrete floor and roof systems, review of codes, yield line method.

CE 3202: Concrete Structures Design Sessional
1.5 Credits

Analysis and design problems based on CE 3015, design of slab bridge, balanced cantilever bridge and low-rise building.

CE 3301: Structural Analysis and Design II
3.0 Credits

Wind and earthquake loads, approximate analysis of statically indeterminate structures: braced trusses, portal method, cantilever method and vertical load analysis of multi storied building frames, deflection of beams, trusses and frames by virtual work method.

CE 3303: Design of Concrete Structures II
3.0 Credits

Design of column supported slabs, introduction to floor systems, design of columns under uniaxial and biaxial loading, introduction to slender column, structural design of footings, pile caps, seismic detailing, shear wall, structural forms, introduction to prestressed concrete, analysis and preliminary design of prestressed beam sections.

CE 4103: Prestressed Concrete
2.0 Credits

Prestressed Concrete: concepts of prestressing, materials, anchorage systems, loss of prestress, analysis of sections for flexure, shear, bond and bearing, analysis of end block and composite sections, beam deflections, cable layout, partial prestress, Design of prestressed concrete beams for simple and continuous spans, ideas about use of AASHTO -PCI sections for standard spans, design considerations for prestressed concrete pipes, piles, poles and railway sleepers.

CE 4211: Introduction to Finite Element Method
3.0 Credits

Introduction to finite element concepts, basic techniques, shape functions, Finite element formulation of various elastic problems-plane stress, plane strain, axisymmetric and three dimensional cases, Isoparametric elements, the elastic membrane, thick shell and plate elements, body of revolution with pressure and sinusoidal loading,   Local loads from shape function routines, bending of plates axisymmetric shells, Developing and implementing   elements, Convergence the patch test, Solution techniques, front and band solutions, element assembly and equation solving, roundoft errors, Variational principles in finite element analysis.

CE 4213: Theory of Elasticity
3.0 Credits

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

CE 4325: Design of Steel Structures
2.0 Credits

Behavioral principles and design of structural steel, code requirements, design of tension, members, bolted and welded connections, compression members, residual stress, local buckling, effective length, flexural members, lateral torsional buckling, design of beam-columns, connection design, moment connections, column bases, detailing of steel structures.

CE 4019: Dynamics of Structure
3.0 Credits

Fundamentals of structural dynamics, SDOF system: Free vibration and forced vibration, numerical solution of SDOF equation, MDOF system: Eigen value problem, modal analysis, numerical solution of MDOF equations, Earthquake Engineering: fundamentals of earthquake engineering and seismic vibration, building codes, earthquake resistant design of buildings.

CE 4309: Construction Practices and Management
3.0 Credits

Management: Its meaning, Scope and objectives, Functions and Nature of management, Planning: Objectives and types of planning, limits of planning, logistics and strategy, Organizing: groupi.ng of activities, delegation of authority and decentralization, Organization structure-lone, staff and functional organization, committee, span of supervision.

Direction: Motivation and co-ordination, Controlling: Steps in control, requirements, Analytical tools and techniques in construction and production managements, Labor management, Raw material managements etc.

ENVIRONMENTAL ENGINEERING

CE 3201: Environmental Engineering Principal
3.0 Credits

Water quantity and quality, air quality, energy utilization, climate change and sustainability, Material and energy balance, Chemical and biological transformations, Elementary transport and fate modeling, Quantitative description of natural and engineered processes affecting environmental sustainability at local, regional and global scales.

CE 4101: Water and Water Supply
3.0 Credits

Water supply sources, water quality and measurement, water demand, low-cost treatment for rural communities, ground water exploration: aquifer properties and ground water flow, well hydraulics, water well design, drilling, construction and maintenance, water demand for rural communities, shallow hand tube wells and deep set Tara pumps for problem areas.

Surface water collection and transportation, head works, pumps and pumping machineries, water distribution system, analysis and design of distribution network, fire hydrants, water meters, leak detection, unaccounted for water.

CE 4102: Environmental Engineering Laboratory
1.5 Credits

Ethics of Laboratory analysis, sample collection and preparation, sample preservation, introduction to basic chemistry and microbiology of water, measurement of important water quality parameters such as pH, turbidity, conductivity, temperature, alkalinity, hardness, nitrate, phosphate, and microbial quality (media preparation, E coli, fecal coliform bacteria and total coliform bacteria), model tests including estimation of doses of alum for water treatment. Characterization of water and wastewater, measurement of BOD, COD, ammonia nitrogen, salinity, chlorine dose and breakpoint, residual chlorine and microscopic investigation of algae and planktons.

CE 4202: Design of Water Supply, Sanitation & Sewage System (Project/Laboratory)
1.5 Credits

Design of water supply and sewerage system: estimation of industrial, domestic and fire demands, designing deep tubewell and water distribution network, estimation of industrial, domestic and commercial wastewater generation, wastewater network design, household plumbing system design, design of water and wastewater treatment plant, computer application in environmental engineering, field visits and reporting.

CE 4207: Environmental Pollution and Its Control
3.0 Credits

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, ground-water pollution , 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.

Noise Pollution: Effects, sources & control of noise pollution.

Thermal Pollution: Sources, effects and control of thermal pollution, Thermal pollution over different location, possible long range impact of thermal pollution.

Soil Pollution: Effects of pH in soils, Soil reactions and correlation, Tolerance of higher plants to saline and sodic soil, Soil erosion, erodability factors, topographic factors, Computation soil losses, Effects of pesticides on soil and soil organisms, reaction of inorganic contaminants in soil, Soil pollution and its impact on the environment, ground water, Soil improvement methods for removal of pollutants.

CE 4209: Environmental Impact Assessment (EIA)
3.0 Credits

Concept of environmental and social impact assessment, important terms in Environmental Impact Assessment, aims and objectives, project cycle, scoping, initial environmental examination (IEE) and Environmental Impact Assessment (EIA). Methods of impact identification,-matrix, network, and checklist ,method, modeling and simulation, environmental indices and indicators of air, water, land and biota, prediction and assessments of impacts o different environmental media, assessments of visual impacts, social impacts and cultural impacts, methods of evaluation of alternatives, weighting, scaling, rating and ranking of alternatives, decitio matrix, peoples participation, mitigation measures, environmental monitoring, preparation of TOR for an EIA, EIA report.

CE 4323: Solid Waste Management, Environmental Sanitation and Hygiene
3.0 Credits

Sanitation: Dwellers sanitation, Code of practice for adequate environmental facilities in a infrastructure, housing and buildings: Space, lighting, air movement and circulation, temperature control, plumbing facilities, ventilation and air conditioning, Principles of excreta disposal, Duckweed treatment for waste, Bio-gas plant, Different sanitation options, Sanitation practices in Bangladesh.

Solid Waste Management: Sources and characteristics of Solid waste, Solid waste generation, Collection and transportation (Community and Municipality), Volume reduction, sorting, Stabilization, Incineration, Resource recovery and recycling, Land filling, Composting, Planning and socio-economic aspects of solid waste management, Community mobilization in solid waste management, Milk and food sanitation, Hazardous and health-care waste management.
Environmental Health: Disease description/n, mode of transmission of diseases, clean water, sanitation, health, nutrition, application of engineering principles to the control of communicable diseases, water borne and water sanitation related diseases, vector borne diseases and vector control, Insecticides and bactericides, occupational health.
Hygiene Education and Community Participation: Scope and methodology for hygiene education, Development of hygiene promotion program, Cost recovery and sustainability of water supply and sanitation services.

CE 4301: Wastewater and Industrial Wastewater
3.0 Credits

Wastewater and industrial wastewater, characteristics of waste water, Quality and treatment of industrial water, Characteristics and volume of industrial waste, Problems associated with industrial waste water, Waste water treatment objectives, Physical, chemical and biological methods of industrial waste water treatment including neutralization, equalization, oil separation, flotation, sour water strippers, heavy metal removal, air stripping, chemical oxidation, Overview of waste reduction techniques in industries, Waste problems of major industries and their methods of treatment and disposal- such as petroleum industries (gasoline kerosene treatment), textile industries, tannery, cement, fertilizer, paper and pulp, jute processing, dairy, drug and pharmaceutical, food and allied industry, Treatment and disposal of industrial waste sludge, Laws and regulations for industrial wastewater and waste treatment.

CE 4303: Energy and Environment
3.0 Credits

Introduction-history and scope, importance: Energy use, world energy use, reserves. Energy demand and energy supply-approaches to energy balance, production and consumption of energy and pollution, transformation of primary energy to secondary energy, greenhouse gases, final energy: Energy scenario in Bangladesh.

Renewable energy and technologies, Geothermal, wind tidal and ocean energy, importance of renewable energy in Bangladesh, Biomass: biogas digester and design, operational problems and kinetic consideration of biogas digesters, introduction to paralysis and gasification. Clean Development Mechanism (CDM).

GEOTECHNICAL ENGINEERING

CE 3105: Geotechnical Engineering I
3.0 Credits

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

CE 3104: Geotechnical Engineering Laboratory
1.5 Credits

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

CE 3207: Geotechnical Engineering II
3.0 Credits

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

CE 4219: Geotechnical Engineering III
3.0 Credits

Piles subjected to lateral loads, Sheet piles, Retaining walls, Caissons, Coffer dams, Pier and abutments, Analysis and design of machine foundation- elementary vibrations, shear modulus and elastic content, foundation design for vibration, soil improvement technique.

CE 4221: Elementary Soil Dynamics
3.0 Credits

Elementary vibrations, dynamic properties of soil, seismic response of soils: site effects, site amplification, liquefaction problems, remedial measures and earthquake hazards.

CE 4315: Geotechnical Engineering IV
3.0 Credits

Introduction to critical state soil mechanics, SHANSEP and stress path methods, one, two and three dimensional consolidation problems, Pore pressure coefficients, Soil structure interaction, Permeability, capillary and soil suction, Seepage analysis, Stability of natural and man made slope, Numerical solution of Geotechnical engineering problems.

CE 4317: Earth Dam and Stability of Slope
3.0 Credits

Seepage in composite sections, Methods of stability analysis, stability of slopes, Compaction, Measurement of performance, types of embankments, construction and control of embankment, causes of slope failure, Methods of slope protection.

TRANSPORTATION ENGINEERING

CE 3203: Transportation Engineering I: Transportation Planning & Traffic Engineering
3.0 Credits

Transportation engineering, transportation functions, transportation systems, functional components, factors in transportation development, transportation modes, public transportation, emerging modes, intelligent transportation system: components and applications, transport planning: concepts, scope and hierarchy, process, goals and objectives, inventories, socio-economic activities, land use-transport interaction, travel demand forecasting, road safety and accident analysis.

Geometric design of highways: design controls and criteria, cross sectional elements, alignment, sight distance, intersection and interchange layouts, planning and design of bicycle and pedestrian facilities, traffic engineering: fundamentals of traffic engineering, vehicle and traffic characteristics, traffic control devices and systems, traffic studies, planning and design of parking facilities, roadway lighting, transportation in Bangladesh: transportation modes and networks, constraints and challenges, transport demand and modal share, road classification and design standards.

CE 3204: Transportation Engineering Laboratory I: Highway Materials and Traffic Engineering Design
1.5 Credits

Testing and quality control of highway materials, bituminous mix design, roadway traffic and capacity analysis, computer models and application packages.

CE 3305: Transportation Engineering II: Pavement Design and Railway Engineering
3.0 Credits

Pavement materials: bituminous binders, cement, aggregates, embankment material, soil stabilization, mix design methods, low cost roads, flexible and rigid pavement: pavement components and functions, pavement design and construction, road maintenance, railway engineering: general requirements, rolling stock and tracks, stations and yards, points and crossings, signaling, maintenance operations.

CE 4104: Transportation Engineering Laboratory II: Pavement Design and Traffic Studies
1.5 Credits

Design of flexible and rigid pavement and air field pavements, geometric design, road intersection design and interchanges, traffic studies

CE 4217: Traffic Planning and Management
3.0 Credits

The 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 4215: Transportation Engineering III: Traffic Engineering Design and Management
3.0 Credits

Advanced concepts of traffic management, management strategies, analysis of traffic flow characteristics, traffic control devises, intersection control and design, grade separation and interchanges, computer application in traffic system analysis, introduction to micro simulation and ITS, NMT issues and road safety

CE 4311: Highway Drainage & Airport
3.0 Credits

Highway drainage and drainage structures, airports: 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 4313: Port Engineering: Planning and Operations
3.0 Credits

Introduction of Modern Container Ports: Concepts and definitions of physical and operational characteristics of modern container ports and port system, approaches to port operations and management in the context of world-wide production, global supply chains, and modern logistics and liner shipping.

Port Terminal Planning: Infrastructure and capacity, capacity evaluations, needs assessment and demand forecasting, operational terminal planning.

Port Operations—Part I: Port operations and services, port layout and configuration, cargo handling processes, equipment and technologies.

Port Logistics: Network structure of port operations, freight logistics systems and ports, inter-modality and landside port logistics, and integrating ports with global supply chains.

Port Operations—Part II: Multi-disciplinary approach to port performance, measuring port productivity and efficiency, global logistics and port productivity, port automation.

Environmental Management and Ports: Environmental aspects of port operations, port environmental regulations and Green Port Technologies.

WATER RESOURCES ENGINEERING

CE 3107: Hydraulics and Hydraulic Structures
3.0 Credits

Physical properties of water, hydrostatic pressure and forces, classification of flows, conservation of mass, energy and momentum principles of open channel flow, flow measurements, similitude in hydraulics.

Types of hydraulic structure, Embankment, Dam, & Design of Dam, Sluice gate, Spillways, Flood Control Reservoir, Energy dissipator, Diversion head work, Irrigation Structure, Cross drainage works, Regulator Design, Out falls, Gates, Cut off, Sediment and Sediment Transport, Dimensional Analysis and Hydraulic Analysis and Seismic design of Dam.

CE 3307: Water Resources
3.0 Credits

Introduction to water resources, Assessment and classification of water resources, Utilization of water resources, identification of major issues and problem areas regarding water resources, Integrated water resource management, Water resources management techniques, planning and operation of water resources, regional and international river basins, implications of development alternatives, institutional arrangements for planning and development of water resources, legal and economic aspects of water resources management.

CE 3302: Water Resources Engineering Sessional
1.5 Credits

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

CE 4105: Irrigation and Drainage System
3.0 Credits

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

CE 4203: Hydrology
3.0 Credits

Hydrologic cycle, Weather and Hydrology, Precipitation, Evaporation and transpiration, Infiltration, Stream flow, Hydrometry, Application of telemetry and remote sensing in hydrologic data acquisition, Rainfall-runoff relations, Hydrographs, unit hydrographs, Hydrologic routing, Statistical methods in hydrology.

CE 4223: River Engineering and Flood Mitigation
3.0 Credits

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

CE 4225: Coastal Engineering
3.0 Credits

Coast and coastal features, Coastal water level: Tide, storm, cyclone, hurricane, tidal surge, Tide and its equation, docks and harbours, Wave theory: Definition, properties, classification, Basic equation of wave motion, Wave energy, power, group celerity, breaking of waves, forces of waves and tides in the design of coastal and harbour structures, coastal sedimentation processes, deltas and estuaries, shore protection works, dredging and dredgers, wind transport of sand, Management of coastal environment: Coastal water quality, Coastal water supply and sewage, Intrusion of saline water to estuary, Coast pollution, Preservation of coastal environment.

CE 4319: Groundwater Engineering
3.0 Credits

Concept of groundwater, water bearing properties of soils and rocks, Groundwater in hydrologic cycle and its occurrence, Physical properties and principles of groundwater movement, Groundwater and well hydraulics, Seepage and percolations, Technology of groundwater withdraw, 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.

CE 4321: Open Channel Flow
3.0 Credits

Open channel flow and its classification, velocity and pressure distributions, energy equation, specific energy and transition problems, critical flow and control, principles of flow measurement and devices, concept of uniform flow, Chezy and Manning equations, estimation of resistance coefficients and computation of uniform flow, momentum equation and specific momentum, hydraulic jump theory and analysis of gradually varied flow, computation of flow profiles, design of channels, sediment and sediment transport.

CE 4000: Project
5 Credits

The topic and methodology of a project work are decided between the student and faculty advisors, A written proposal must be approved by the dean of the faculty and filed with the registrar, The Project can be done at the School or at other organizations as agreed upon with the advisor, The project report will incorporate the investigation techniques taught in the respective concentration courses.