

**UNIVERSITY OF INFORMATION TECHNOLOGY & SCIENCES (UITS)**

*Modified and revised syllabus as per recommendations and suggestions of the Reviewer of the  
University Grants Commission*

For

**BACHELOR OF SCIENCE**

IN

**CIVIL ENGINEERING**

**Department of Civil Engineering  
School of Science and Engineering**

**1. Program Name** : Bachelor of Science in Civil Engineering.  
Department of Civil Engineering (CE) will run the program.

**2. Awarded Degree:**

Full Name : Bachelor of Science in Civil Engineering

Abbreviation : B.Sc. in Civil Engineering

Degree requirement : Minimum CGPA 2.5 and a minimum 165 credits.

**3. Organizer** : School of Science and Engineering  
University of Information Technology and Sciences (UITS).

**4. Philosophy and Objectives**

▪ **Philosophy**

UITS is more of a “learning institution” than a mere “teaching institution”. Obviously the focus is more on knowledge than mere skills. The faculty members are individuals who are deep researchers qualified to write and critique contemporary textbooks in the area they teach; obviously they do not teach to a “fixed syllabus”. They “design” the courses taking into account current trends and the student background so as to blend what is collectively taught across different courses into a cohesive body of knowledge that prepares the students not just for today but to take on the developments that are likely to take place years ahead. What is laid in the courses is a solid foundation that prepares the individual student to pursue academic or industrial career with rigor and innovation. The lectures are supplemented by several Lab sessions, Tutorials and self-reading (both individually and in groups) as well as projects. It is not sufficient to pick up what is taught in the class or written in the textbooks; it is important to understand, assimilate and demonstrate the individual and collective ability to demonstrate that the student can apply the knowledge to a research/application environment. This is what sets apart UITS from the rest of the Institutions.

▪ **Objectives**

1. To produce engineers equipped with the technical knowledge and skills in both theoretical and practical in the area of electronic and communication engineering with the ability to apply them correctly, efficiently and creatively.
2. To enhance student’s communication skills and their ability to use knowledge in a rapidly changing world
3. To produce socially responsible, morally upright scientists and engineers.

▪ **Goal**

The B. Scin Civil Engineering program at University of Information Technology and Sciences provides an undergraduate education that stresses a basic understanding of engineering principles and how they are applied to the design, analysis, implementation, and testing of electrical, electronic, and digital systems. The overriding goal of the undergraduate electrical-electronic engineering program is to integrate mathematics, science engineering, and computer skills, along with communication and social skills to enhance the productivity and creativity of the engineer. An engineering education, based on a strong liberal arts foundation, prepares students to make contributions to the world guided by concerns for issues of justice and ethical behavior.

Three tracks of study are available in electrical engineering: an electronic track, communication track and a computer track. Courses in all tracks are the same for the first eleven semesters, but then diverge to allow students to focus more intently on specific interests. The curriculum ensures graduates are well-rounded engineers. Technical electives in various specialties are available for students to pursue their particular interests.

## 5. Admission Requirements

Minimum 2<sup>nd</sup> division in both SSC and HSC with science background or five subjects in O – level and 3 major subjects (Math, Physics and Chemistry) in A – level education are required. The students who have completed under GPA system will have to have a minimum CGPA of 2.5. The O- and A – level students must have an average grade of B.

Those having Diploma Engineering in Electrical / Electronic / Computer / Telecommunication / Power / Mechanical are eligible for admission with wavers in some courses as per decision of the departmental equivalence committee. University does not allow GED for any program.

## 6. Admission Criteria

The applicant must pass the admission test (Physics, Mathematics and English) arranged by the University.

## 7. Curriculum Structure

Serial No.	Categories	Credits Requirements
1	Humanities	8.0
2	Basic Sciences	11.0
3	Mathematics	17.0
4	Engineering (Basic)	48.5
5	Structural Engineering	21.5
6	Environmental Engineering	8.5
7	Geotechnical Engineering	8.5
8	Transportation Engineering	8.5
9	Water Resources Engineering	13.0
10	Civil Engineering Practice	5.0
11	Project/Thesis	4.5
12	Elective courses**	
	Theory	8.0
	Lab	3.0
	<b>Total</b>	<b>165.0</b>

\*\*Students specializing in an optional group, such as Structural, Geotechnical, Environmental, Transportation and Water Resources Engineering, shall take project/thesis and at least two optional courses and a corresponding lab course from that group and two more optional courses and another corresponding lab course from any other group.

## 8. Course Designation System

Each Course is designated by two/three letters and three digits.

- The two/three letters represent the name of the discipline to which the subject belongs or the department that offers the course. The abbreviations are as follows:

CE	Civil Engineering
CSE	Computer Science and Engineering
EEE	Electrical and Electronic Engineering
PHY	Physics
CHE	Chemistry
MAT	Mathematics
HUM	Humanities

- Course numbers :
  - 100 – 299 : Lower divisions - for freshmen and sophomores
  - 300 – 499 : Upper divisions – for juniors and seniors
  - The first digit corresponds to the level in which the students normally take the course.
  - The second and third digits are reserved for course numbering.
  - The odd number for theoretical courses and even number for laboratory courses.
  - Zero (0) digit as last digit is reserved for project.
- Distribution of course numbers:

Humanities	: HUM #09 - #10
Basic Science	: PHY/CHE #10 - #12
Mathematics	: MAT #12 - #15
Engineering (Basic)	: CE #15 - #21
Structural Engineering	: CE #21 - #22
Environmental Engineering	: CE #23 - #24
Geotechnical Engineering	: CE #24 - #25
Transportation Engineering	: CE #25 - #26
Water Resources Engineering	: CE #26 - #27
Civil Engineering Practice	: CE #27
Optional Courses	: CE #28 - #32
- Interdisciplinary courses consist of courses from Computer Science and Engineering, Electrical Engineering.

## 9. Definition of Credit

- For three credit hours assigned to a theory course, there are three hours lecture in a week. A class period for theory courses has a minimum duration of one hour.
- One credit of lab course has minimum of 24 hours of actual lab works per semester and each lab class has a minimum duration of 2 hours.
- An academic year is divided into three terms (trimesters) of minimum thirteen weeks each. Each academic year consists of Fall, Spring and Summer.

## 10. Marking System in the Individual Courses

Theory Courses:

Class Attendance and Class Participation (Quiz, Assignments, etc)*	10%
Class Test	20%
Midterm Examination	30%
Final Examination	40%

\*The weight for Class attendance must not exceed 5%

Lab Courses:

The assessment in laboratory/ field work courses is made by observing the student in the respective lab classes and also by taking viva- voce, quizzes and practical tests.

## 11. Grading System

Letter grading will be made to assess student's performance. The grade will be assigned on the overall evaluation of a student's performance on the basis of semester final examination, mid-term examination, case studies, tutorial tests, term papers, assignment and class attendance in aggregate and whatever is applicable for an individual program. The teachers responsible for the course will determine the grades/GPA. The final result will be prepared by cumulating the grade point average over the courses. The UGC approved common grading system is adopted for assigning a letter grade and grade point. This is given in the following table.

Numerical Grade	Letter Grade	Grade Point
80% and above	A + (A plus)	4.00
75% to less than 80%	A (A regular)	3.75
70% to less than 75%	A – (A minus)	3.50
65% to less than 70%	B + (B plus)	3.25
60% to less than 65%	B (B regular)	3.00
55% to less than 60%	B – (B minus)	2.75
50% to less than 55%	C + (C plus)	2.50
45% to less than 50%	C (C regular)	2.25
40% to less than 45%	D	2.00
Less than 40%	F	0.00
	F*	Failure
	I**	Incomplete
	W***	Withdrawal
	R****	Repeat
	Y*****	Audit

\* "F" means failure. Credits for courses with this grade do not apply towards graduation.

\*\* "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. To improve grade say, F to D or better, more than two times repetition of a course is allowed.

\*\*\*\*\* "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 credit is earned.

## 12. List of Courses

<b>Course Name</b>		<b>Credits</b>
<b>A. Humanities</b>		<b>8.0</b>
* HUM 181	English I	3.0
* HUM 187	English II	3.0
<i>Optional Courses: Any 1 (One)</i>		
HUM 281	Bangladesh Studies	2.0
HUM 283	Introduction to Economics	2.0
HUM 285	Sociology	2.0
HUM 289	Principle of Accounting	2.0
<b>B. Basic Sciences</b>		<b>11.0</b>
* PHY 171	Engineering Physics I	3.0
* PHY 173	Engineering Physics II	3.0
* PHY 174	Engineering Physics Lab	1.0
* CHE 175	Engineering Chemistry	3.0
* CHE 176	Engineering Chemistry Lab	1.0
<b>C. Mathematics</b>		<b>17.0</b>
* MAT 161	Fundamental Mathematics	3.0
* MAT 163	Differential and Integral Calculus	3.0
* MAT 165	Ordinary and Partial Differential Equations	3.0
* MAT 167	Coordinate Geometry and Matrix Algebra	3.0
* MAT267	Numerical Methods and Analysis	2.0
<i>Optional Courses : Any 1 (One)</i>		
MAT 263	Probability and Statistics	3.0
MAT 269	Complex Variables and Vector Analysis	3.0
MAT 361	Fourier Analysis and Laplace Transforms	3.0
<b>D. Engineering (Basic)</b>		<b>48.5.</b>
* CSE 151	Computer Fundamental and Web Technology	3.0
* CE 101	Engineering Mechanics	4.0
* CE 103	Surveying	4.0
* CE 201	Engineering Materials	4.0
* CE 203	Engineering Geology and Geomorphology	3.0
* CE 205	Mechanics of Solids I	3.0
* CE 207	Mechanics of Solids II	3.0
* CE 241	Fluid Mechanics	4.0
* EEE 151	Fundamentals of Electrical Engineering	3.0
* EEE 152	Fundamentals of Electrical Engineering Lab	1.0
* CSE 251	Computer Programming (Prerequisite CSE 151)	1.5
* CSE 252	Computer Programming Lab	1.5
* CE 102	Civil Engineering Drawing I	1.5
* CE 104	Civil Engineering Drawing II	1.5
* CE 106	Practical Surveying	1.5
* CE 108	Carpentry Shop, Machine Shop and Welding Shop	1.5
* CE 202	Details of Construction Lab	1.5
* CE 204	Engineering Materials Lab	1.5
* CE 206	Quantity Surveying	1.5
* CE 208	Structural Mechanics Lab	1.5
* CE 242	Fluid Mechanics Lab	1.5
* CE 316	Introduction to Geographic Information Systems	1.5

<b>E. Structural Engineering</b>		<b>21.5</b>
* CE 301	Structural Analysis and Design I	3.0
* CE 303	Structural Analysis and Design II (Prerequisite CE 301)	3.0
* CE 305	Design of Concrete Structures I	3.0
* CE 307	Design of Concrete Structures II (Prerequisite CE 305)	4.0
* CE 401	Structural Analysis and Design III (Prerequisite CE 303)	4.0
* CE 302	Structural Analysis And Design Lab II	1.5
* CE 402	Structural Analysis And Design Lab II	1.5
* CE 308	Concrete Structures Lab	1.5
<b>F. Environmental Engineering</b>		<b>8.5</b>
* CE 311	Environmental Engineering I	3.0
* CE 313	Environmental Engineering II	4.0
* CE 314	Environmental Engineering Lab I	1.5
<b>G. Geotechnical Engineering</b>		<b>8.5</b>
* CE 321	Geotechnical Engineering I (Prerequisite CE 203)	4.0
* CE 323	Geotechnical Engineering II	3.0
* CE 324	Geotechnical Engineering Lab I	1.5
<b>H. Transportation Engineering</b>		<b>8.5</b>
* CE 331	Transportation Engineering I (Transport and Traffic Design)	3.0
* CE 333	Transportation Engineering II (Highway design and Railways)	4.0
* CE 334	Transportation Engineering Lab I (CE 353)	1.5
<b>I. Water Resources Engineering</b>		<b>11.5</b>
* CE 341	Open Channel Flow (Prerequisite CE 241)	4.0
* CE 343	Hydrology	3.0
* CE 345	Irrigation and Flood Control	3.0
* CE 342	Open Channel Flow Lab	1.5
* CE 490	Project/Thesis	4.5
<b>Optional Courses**</b>		
	Theory	8.0
	Lab	3.0
<b>J. Civil Engineering Practice</b>		<b>5.0</b>
* CE 491	Project Planning and Management	3.0
	Optional Course : Any 1 (One)	
CE 493	Professional Practices and Communication	2.0
CE 495	Socio-Economic Aspects of Development Projects	2.0
CE 497	Integrated Water Resources Planning and Management	2.0
<b>Total Credits</b>		<b>165.0</b>

<b>K. Optional Courses</b>		
<b>Structural Engineering</b>		
CE 453	Introduction to Finite Element Method	2.0
CE 405	Prestressed Concrete	2.0
CE 407	Design of Steel Structures	2.0
CE 459	Dynamics of Structures	2.0
CE 408	Structural Analysis And Design Lab III	1.5
<b>Environmental Engineering</b>		
CE 411	Environmental Engineering III	2.0
CE 413	Environmental Engineering IV	2.0
CE 415	Environmental Engineering V	2.0
CE 414	Environmental Engineering Lab II	1.5
<b>Geotechnical Engineering</b>		
CE 421	Geotechnical Engineering III	2.0
CE 423	Geotechnical Engineering IV	2.0
CE 425	Geotechnical Engineering V	2.0
CE 424	Geotechnical Engineering Lab II	1.5
<b>Transportation Engineering</b>		
CE 431	Transportation Engineering III (Traffic Planning and Management)	2.0
CE 433	Transportation Engineering IV (Highway Drainage and Airports)	2.0
CE 435	Transportation Engineering V (Transport Projects and Operations)	2.0
CE 434	Transportation Engineering Lab II	1.5
<b>Water Resources Engineering</b>		
CE 441	Flood Mitigation and Management	2.0
CE 443	Ground Water Engineering	2.0
CE 445	River Engineering	2.0
CE 447	Hydraulic Structures	2.0
CE 449	Coastal Engineering	2.0
CE 448	Water Resources Engineering Lab	1.5
<p>*Subject marked with asterisk (*) indicate compulsory courses</p> <p>**Students specializing in an optional group, such as Structural, Environmental, Geotechnical, Transportation and Water Resources Engineering, shall take Project/Thesis and at least two optional courses and a corresponding lab course from that group and two more optional courses and another corresponding lab course from any other group.</p> <p>***MAT 161 is compulsory for those students whose basic in mathematics is poor.</p>		



### 13. Course Details

#### A. Humanities

##### **HUM 181 : English** (3.0 credits, 3.0 hours/week)

Grammatical Problems: Construction of sentences, grammatical errors, sentence variety and style.

Writing: Principle of effective writing, Organization, Planning and Development, Formation of sentence, paragraphs, composition.

Reading: Introduction to the skills of reading, reading short stories, documents, letters with proper emphasis, tone, rhythm, with the addition of reading comprehension.

Phonetics: phonetics and correct english pronunciation.

Syntax: vocabulary, diction and english sentence; sentence variety and style; grammatical problems.

Report writing: Defining a report, Classification of reports, Structure of a report, Writing a report.

##### Recommended Books:

- a. New Headway Intermediate Student & Work Book, by Liz and John Soars.
- b. Examples from Target English.
- c. Books: Classics (abridged) such as Oliver Twist/ Black Beauty, etc.

##### **HUM 281 : Bangladesh Studies** (3.0 credits, 3.0 hours/week)

British Rule in India, Creation of Pakistan, The Language Movement of 1952, General Election of 1954, Mass Upsurge of 1969, War of Independence of 1971, Social, Culture and Economic Development of Bangladesh.

##### Recommended Books:

- a. Bangladesh: History and Culture (South Asian Studies) by S. R. Chakravarty and Virendra Narain.
- b. Ancient Bangladesh: A Study of the Archaeological Sources by Dilip K. Chakrabarti, S. Dara Shamsuddin, and M. Shamsul Alam.

##### **HUM 283 : Introduction to Economics** (3.0 credits, 3.0 hours/week)

Micro-economics: The theory of demand and supply and their elasticities. Price determination. Nature of an economic theory, applicability of economic theories to the problems of developing countries. Indifference curve technique. Marginal analysis. Production, production function, types of productivity. Rational region of production of an engineering firm. Concepts of market and market structure. Cost analysis and cost function. Small scale production and large scale production. Optimization. Theory of distribution.

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

##### Recommended Books:

- a. Principles of Microeconomics, 7th ed., by Stephen I. Slavin
- b. Economics today: The macro view, 13th edition by Roger Leroy Miller
- c. Macroeconomics, 7th ed., by Stephen I. Slavin

##### **HUM 285 : Sociology** (3.0 credits, 3.0 hours/week)

Introduction: Definition. Scope, relationship with other disciplines; Primary Concepts of Sociology: Society, Community, Association, Organization, Institution, Group, Role and States, Norms and Values. Methods and Measures in Sociology: Scientific method, experiments, survey, participant observation, participatory technique. Social Structure: Definition and theories of social structure. Social Institutions: Family – forms and functions of family, Education, Religion – religion beliefs and rituals. Social Process: Adaptation, Assimilation, Accommodation, conflict, Co-operation and Competition. Social Control: Definition and agencies of social control, Deviance and Crime.

Dynamics of Social Life: Social change, factors of social change, theories of social change, modernization, Civilization.

Recommended Books:

- a. Sociology, 5<sup>th</sup> ed., by Anthony Giddens.
- b. Foundation of Modern Sociology, by Meta spencer.
- c. Sociology: A guide to Problems and Literature, by T.B. Bottomore.
- d. Sociology, by Robertson.

**HUM 289 : Principle of Accounting** (3.0 credits, 3.0 hours/week)

Principles of accounting: accounts, transactions, the accounting procedures 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.

Recommended Books:

- a. Financial Accounting: Weygandt&Keiso, latest edition.
- b. Cost Accounting Planning and Control: Matz&Usry, South-Western Publishing, 8<sup>th</sup> edition.
- c. Management Accounting: Garison&Noren, McGraw Hill Publishing, 10<sup>th</sup> edition.

**B. Basic Sciences**

**PHY 171 : Engineering Physics I**(3.0 credits, 3.0 hours/week)

Waves and oscillations: Differential equation of simple harmonic oscillator, total energy and average energy, combination of simple harmonic oscillations, spring mass system, tensional pendulum; two body oscillation, reduced mass, damped oscillation, forced oscillation, resonance, progressive wave, power and intensity of wave, stationary wave, group and phase velocities.

Optics: Defects of images: spherical aberration, astigmatism, coma, distortion, curvature, chromatic aberration. Theories of light; Interference of light: Young's double slit experiment, displacement of fringes and its uses, Fresnel bi-prism, interference in thin films, Newton's rings, interferometers; Diffraction: Diffraction by single slit, diffraction from a circular aperture, resolving power of optical instruments, diffraction at double slit and N-slits, diffraction grating; polarization: Production and analysis of polarized light, Brewster's law, Malus law, polarization by double refraction, Nicol prism, optical activity, Polarimeters.

Thermal Physics: Heat and work- the first law of thermodynamics and its applications; Kinetic Theory of gases- Kinetic interpretation of temperature, specific heats of ideal gases, equipartition of energy, mean free path, Maxwell's distribution of molecular speeds, reversible and irreversible processes, Carnot's cycle, second law thermodynamics, Carnot's theorem, entropy, Thermodynamic functions, Maxwell relations, Clausius and Clapeyron equation.

Recommended Books:

- a. Introduction to Modern Optics, by Grant R. Fowles, second edition.
- b. Optics, AjoyGhatak, TATA McGraw Hill Publishing Co. Ltd.
- c. Fundamentals of Classical Thermodynamics, Richard E. Sonntag, Claus Borgnakke and Gordon V. Van Wylen., 6th ed., John Wiley & Sons, 1998.
- d. Fundamentals of Engineering Thermodynamics, Michael J. Moran and Howard N. Shapiro, John Wiley & Sons. (any edition).
- e. Introduction to Solid State Physics, Charles Kittel.
- f. Fundamental of Solid State Physics, Gupta & P.N. Saxena.

**PHY 173 : Engineering Physics II** (3.0 credits, 3.0 hours/week)

Electricity and Magnetism: Electric charge and Coulomb's law, Electric field, concept of electric flux and the Gauss's law- some applications of Gauss's law, Gauss's law in vector form, Electric potential, relation between electric field and electric potential, capacitance and dielectrics, gradient, Laplace's and Poisson's equations, Current, Current density, resistivity, the magnetic field, Ampere's law, Biot-Savart law and their applications, Laws of electromagnetic induction- Maxwell's equation.

Modern Physics: Galilean relativity and Einstein's special theory of relativity; Lorentz transformation equations, Length contraction, Time dilation and mass-energy relation, photoelectric effect, Compton effect; De Broglie matter waves and its success in explaining Bohr's theory, Pauli's exclusion principle, Constituent of atomic nucleus, Nuclear binding energy, different types of radioactivity, radioactive decay law; Nuclear reactions, nuclear fission, nuclear fusion, atomic power plant.

Mechanics: Linear momentum of a particle, linear momentum of a system of particles, conservation of linear momentum, some applications of the momentum principle; Angular momentum of a particle, angular momentum of a system of particles, Kepler's law of planetary motion, the law of universal Gravitation, the motion of planets and satellites, introductory quantum mechanics; Wave function; Uncertainty principle, postulates, Schrödinger time independent equation, expectation value, Probability, Particle in a zero potential, calculation of energy.

Recommended Books:

- a. Electricity and Magnetism, Vol. II by Edward M. Purcell
- b. Modern Physics by Kenneth S. Krane.
- c. Classical Mechanics by John R. Taylor.

**PHY 174 : Engineering Physics Lab** (1.0 credit. 2.0 hours/week)

Experiments based on theory learned in Engineering Physics I and Engineering Physics II.

**CHE 175 : Engineering Chemistry**(3.0 credits, 3.0 hours/week)

Atomic Structure, quantum numbers, electronic configuration using  $s, p, d, f$  notations, Definition of relative isotopic mass, relative atomic mass, relative molecular mass, molar mass, Principles and use of the low resolution mass spectrometer to determine relative atomic mass, Periodic table and Periodicity : 1<sup>st</sup> and successive ionization energies, definitions of 1<sup>st</sup> and 2<sup>nd</sup> electron affinities.

Structure and bonding : Nature of ionic, covalent and dative covalent bond, electronegativity, intermolecular forces, understand that how the properties of solids and liquids are related to their structure and bonding. Metallic bonding and uses of it to explain the electrical conductivity of metals and graphites, the melting and boiling points of metals.

Acid, Base and Alkali : Arrhenius definition of acid base, Bronsted – Lowery definition of acid – base. The conjugate acid – base pair, Lewis acids and bases, strong and weak acid, strength of acids, acid dissociation constant, strong and weak alkali, pH.

Enthalpy and enthalpy change, exothermic and endothermic reactions, enthalpy of formation, enthalpy of neutralization, enthalpy of combustion. Kinetics - rate of a chemical reaction. Factors affecting the rate of chemical reaction.

Kinetics : rate of chemical reactions, factors affecting the rate of reactions, activation energy, order and molecularity of reaction.

Redox reactions : Understand oxidation, reduction oxidizing and reducing agents in terms of electron transfer, ionic half equations. Voltaic cell, emf of the cell, electrochemical processes in batteries, corrosion. electrolysis and electrolytic cell - its application in electroplating, galvanizing.

Recommended Books:

- a. Chemistry – The Molecular Nature of Matter and Change by Silberberg
- b. General Chemistry by Ebbing.
- c. Chemistry for Engineering Students by Larry Brown and Tom Holme.
- d. Engineering Chemistry by R. Gopalam, D. Venkappayya, and S. Nagonajan.
- e. Textbook of Engineering Chemistry by S. Dara.
- f. Industrial and Engineering Chemistry by Walter J.; (Ed.) Murphy.
- g. Fundamentals of Engineering Chemistry Theory and Practice by S.K. Singh.

**CHE 176 : Engineering Chemistry Lab** (1.0 credit, 2.0 hours/week)

Volumetric analysis: acid-base titration, oxidation-reduction titrations, pH titrations.

**C. Mathematics**

**MAT 161**

**Fundamental Mathematics 3.0**

Fundamental concepts of algebra, Real numbers, Exponents, Radicals, Algebraic and functional expressions, Equations: Linear and Quadratic, Complex numbers, Inequalities, Graphs of equations, Lines: Parallel and perpendicular, Exponential and logarithmic functions, Sets, counting and probability. Matrices and Systems of Equations, Determinants, Vector space, Matrix multiplication, Transpose, Square matrices, Diagonal and trace, Matrix inversion, Partial Fraction, Binomial Theorem, Summation notation.

Trigonometric functions, values of trigonometric functions, Trigonometric identities and equations, Tangents. Computation of derivatives, The product and quotient rules, Derivatives of Trigonometric, logarithmic and exponential functions, The Chain Rule, Integration review, including Fundamental Theorem of Calculus, Indefinite integrals, Definite integrals, Introduction to area under the curves. (Prerequisite: None)

Recommended Books:

1. Swokowski, E.W., & Cole, J.A. *Algebra and Trigonometry with analytic geometry*
2. Hoffman, L. D. *Finite Mathematics with calculus.*
3. Yee, L. P. *Pure Mathematics*
4. Das, B.C. & Mukharjhee, B. N. (1996). *Integral Calculus.*
5. Das, B.C. & Mukharjhee, B. N. (1996). *Differential Calculus.*

**MAT 163 :Differentials and Integral Calculus** (3.0 credits, 3.0 hours/week)

Differential Calculus: Differential Calculus: Limits, continuity and differentiability; Successive differentiation of various types of functions; Leibnitz's Theorem; Rolle's Theorem; Mean value theorem in finite and infinite forms; Lagrange's form of remainders; Cauchy's form of remainder; Evaluation of indeterminate forms by L'Hospital's rule; Partial differentiation; Euler's Theorem; Maximum and minimum values of functions of single variable.

Integral Calculus : Definition of integration; Integration by the method of substitutions; Integration by parts; Standard integrals; Integration by the method of successive reduction; Definite integrals and its properties and use in summing series; Wallis' formula, improper integrals. Beta function and Gamma function; Trapezoidal rule, Simpson's rule, Jacobian, multiple integrals and its application.

Recommended Books:

- a. Integral Calculus by Anton.
- b. Integral Calculus by Abdul Matin.
- c. Integral Calculus by Khose Mohammad.
- d. Integral Calculus by B.C. Das and B. N. Mukharjhee.

**MAT 165 : Ordinary and Partial Differential Equations** (3.0 credits, 3.0 hours/week)

Degree and order of ordinary differential equations, Formation of differential equations, Solution of first order differential equations by various methods, Solution of first order but higher degree ordinary differential equations, Solution of general linear equations of second and higher orders with constant coefficients, Solution of homogeneous linear equations and its applications.

Recommended Books:

- a. Differential Calculus by B.C. Das and B. N. Mukharjhee.
- b. Ordinary Differential Equation by B.D. Sharma.

**MAT 167 : Coordinate Geometry and Matrix Algebra** (3.0 credits, 3.0 hours/week)

Co-ordinate Geometry: 2-Dimensional co-ordinate geometry: change of axes transformation of co-ordinates, simplification of equations of curves. 3-Dimensional co-ordinate geometry: system of co-ordinates, distance between two points, section formula, projection, direction cosines, equations of planes and lines.

Definition of matrices. Algebra of matrices. Transpose of a matrix and inverse of matrix. Factorization. Determinants. Quadratic forms. Matrix polynomials. Introduction to systems of linear equations. Solution of systems of linear equations : Gaussian elimination method. Gauss – Jordan Elimination method, Inversion of matrices, Euclidean n-space. Linear transformation from  $R^n$  to  $R^m$ . Properties of linear transformation from  $R^n$  to  $R^m$ . Real vector spaces and subspaces. Basis and dimension. Rank and nullity. Inner product spaces. Eigenvalues and eigenvectors. Diagonalization. Linear transformations. Kernel and Range. Application of linear algebra to electric networks.

Recommended Books:

- a. A Text Book of co-ordinate Geometry and Vector Analysis, by Rahman and Bhattacharjee.
- b. Co-ordinate Geometry for Beginners by R C Fawdry.
- c. Linear Algebra by Schaum's Outline Series.
- d. Linear Algebra by AbdurRahman.

**MAT 267 : Numerical Methods and Analysis** (2.0 credits, 2.0 hours/week)

Introduction: Motivation and errors in numerical techniques. Solution of algebraic and transcendental equations: method of iteration, False Position method, Newton-Rhapson method; Solution of simultaneous linear equations: Cramer's rule, Iteration method, Interpolation: diagonal and horizontal difference, differences of a polynomial, Newton's formula for forward and backward interpolation, Integration: general quadrature formula, Trapezoidal rule, Simpson's rule, Weddle's rule; Solution of ordinary differential equations: Euler's method, Picard's method, Taylor's series method, Runge-Kutta method; Least squares approximation of functions: linear and polynomial regression, fitting exponential and trigonometric functions.

Recommended Books:

- a. Numerical Analysis by BD Gupta.
- b. Finite Difference and Numerical Analysis: Dr. Gupta and Malik.
- c. Numerical Analysis: B.S. Goyal, Mittal S. K.

**MAT 263 : Probability and Statistics** (3.0 credits, 3.0 hours/week)

Statistics: Frequency distribution of data: Population and sample, Collection and representation of statistical data. Tabulation of data. Class intervals. Frequency distribution, discrete, continuous and cumulative distributions. Histograms and frequency polygons. Graphical representation of data.

Statistical Measures: Measures of central tendency – arithmetic mean, median, mode, geometric mean, weighted average, harmonic mean. Measures of dispersion – range, standard deviation, variance, coefficient of variation, moments, skewness, kurtosis. Correlation theory: Linear correlation, Measures of correlation and its significance. Regression and curve fitting: Linear and non-linear regression, Methods of least squares. Curve fitting. Time series analysis.

Probability: Definition of probability and related concepts. Laws of probability, Discrete and continuous random variables, Mathematical expectations. Conditional probability. Probability distributions: Binomial, Poisson and Normal distributions and their properties. Stochastic process: Markov chain - discrete and continuous.

Recommended Books:

- a. Theory and Problem of Statistics by Schaum's Outlines Series
- b. Business Statistics by S.P Gupta and M.P Gupta

**MAT 269 : Complex Variables and Vector Analysis** (3.0 credits, 3.0 hours)

Complex Variable: Complex number system. General functions of a complex variable. Limits and continuity of a function of complex variable and related theorems. Complex differentiation and the Cauchy-Riemann equations. Infinite series. Convergence and uniform convergence. Line integral of a complex function. Cauchy's integral formula. Liouville's theorem. Taylor's and Laurent's theorem. Singular points. Residue. Cauchy's residue theorem.

Vector Algebra: Scalars and vectors, equality of vectors; Addition and subtraction of vectors; Multiplication of vectors by scalars; Scalar and vector product of two vectors and their geometrical interpretation; Triple products and multiple products. Linear dependence and independence of vectors.

Vector Calculus: Differentiation and integration of vectors together with elementary applications. Line, surface, and volume integrals. Gradient of a scalar function, divergence and curl of a vector function, various formulae. Integral forms of gradient, divergence and curl. Divergence theorem. Stoke's theorem, Green's theorem and Gauss's theorem.

Recommended Books:

- a. Complex Variable and Applications Brown Churchill.
- b. Complex Variable by Schaum's Outline Series.
- c. A Text Book of co-ordinate Geometry and Vector Analysis, by Rahman and Bhattacharjee.
- d. Vector Analysis by Schaum's Series.

**MAT 361 : Fourier Analysis & Laplace Transforms** (3.0 credits, 3.0 hours/week)

Fourier Analysis: Real and complex form of Fourier series; Finite transform; Fourier Integral; Fourier transforms and their uses in solving boundary value problems of wave equations.

Laplace Transforms: Definition; Laplace transforms of some elementary functions; sufficient conditions for existence of Laplace transforms; Inverse Laplace transforms; Laplace transforms of derivatives. The unit step function; Periodic function; Some special theorems on Laplace transforms;

Partial fraction; Solutions of differential equations by Laplace transforms; Evaluation of improper integrals.

Recommended Books:

- a. Mathematical Methods by AbdurRahman
- b. Fourier Transform by Schaums Outline
- c. Laplace Transform by Schaums Outline

**D. Engineering (Basic)**

**CSE 151: Computer Fundamentals Application Lab**

(2.0 Credits, 2.0 hours/week)

The fundamental computing concepts including data presentation, the binary system, the system unit, memory, storage systems, input devices, output devices, systems software. Key Applications include MS Word, Excel, PowerPoint and Access. Internet, e-mail and the impact of computers on society.

Recommended Books:

- a. Parsons, J. J. & Oja, D. (2005). Practical Computer Literacy [With Accompanying CD]. Boston: Course Technology of Thomson Learning. ISBN: 0-619-21389-2.
- b. Introduction to Computers by Peter Norton.
- c. Using Information Technology by Williams/ Sawyer (A practical introduction to computers and communications).
- d. Computer Today by Timothy J. O'Leary, Linda I. O'Leary.
- e. Mastering HTML by Deborah, S. Ray, Eric J. Ray
- f. Internet and Worldwide Web by Dietel H.M., PJ Dietel, TR Nieto

**CE 101 : Engineering Mechanics (4.0 credits, 4.0 hours/week)**

Introduction to SI units, coplanar concurrent forces, moments and parallel coplanar forces, non-concurrent non-parallel coplanar forces, non-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.

Recommended Books:

- a. Analytic Mechanics (3rd Edition) - Virgil Morning Faires, Sherman Chambers (The Macmillan Company, New York)
- b. Vector Mechanics for Engineers (Static & dynamics) – Ferdinand P. Beer, E. Russel Johnston (Tata McGraw – Hill Publishers)
- c. Engineering Mechanics – Timoshenko & Young (McGraw – Hill Publishers)
- d. Engineering Mechanics (Static & dynamics) – I.H. Shames (Prentice Hall of India)

**CE 103 : Surveying (3.0 credits, 3.0 hours/week)**

Reconnaissance survey; linear measurements; traverse survey; leveling and contouring; calculation of areas and volumes; problems on heights and distances; curves and curve ranging: transition curve, vertical curves; Tacheometry: introduction, principles and problems on tacheometry. Introduction of Astronomical surveying, Photogrammetry, introduction of terrestrial photography, aerial photography, reading of photo mosaic, scale; project surveying; errors in surveying.

Recommended Books:

- a. A text Book of Surveying – M. Shahjahan, M.A. Aziz (Hafiz Book Center)
- b. Surveying: Vol I (3rd Edition) – B.C Punmia (Laxmi Publication)
- c. Surveying: Vol III (9th Edition)- B.C. Punmia (Laxmi Publication)
- d. Surveying and Levelling – N.N. Basak (Tata McGraw – Hill)

**CE 201 : Engineering Materials** (4.0 credits, 4.0 hours/week)

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.

Recommended Books

- Engineering Materials (1995) – M.A. Aziz (Hafiz Book Center, Dhaka)
- Building Materials (1996) – Gurcharan Singh & Jagdish Singh (Standerd Publishers)
- Concrete Technology of Concrete – N Krishnaraju CBS Publishers & Distributors.
- ASTM standard method of mix design

**CE 203 : Engineering Geology and Geomorphology** (3.0 credits, 3.0 hours/week)

Physical Geology: Interior of the earth and geological timescale, plate tectonics, classification of minerals and rocks, weathering process and sedimentation. Soil forming process, geology of Bangladesh, geo-resources of Bangladesh.

Structural geology: classification of faults, classification offold, unconformity and joints, domes, basins, erosional process, quantitative analysis of erosional land forms, landslide, earthquake and seismic map of Bangladesh, hydrocarbon reservoir and traps, structural geology and natural resources.

Geomorphology and Environment: Concept of geomorphology, relationship of geology and geomorphology, geomorphologic environment-alluvial, fluvial and coastal landforms, geomorphology for engineering geological mapping, significance of geomorphology and engineering geology in planning and development, geomorphology of Bangladesh.

Recommended Books

- a. Physical & Engineering Geology – S. K. Garg (Khanna Publishers).
- b. Changing The Face of earth Engineering Geomorphology – Giardino (Amazon Books, New Delhi).
- c. Engineering & General Geology – Prabin Singh (Katson Publishing House).
- d. Environmental Geology – K.S Valdiya ( Tata McGraw-Hill, New Delhi)
- e. Environmental Geology- An Earth System Science Approach by Dorothy J. Merrities; et. Al, W.H. Freeman and Company, Newyork, 1998

**CE 205 : Mechanics of Solids I** (3.0 credits, 3.0 hours/week)

Fundamental concepts of stress and strain. Mechanical properties of materials, strain energy, stresses and strains in members subjected to tension, compression, shear and temperature changes, bending moment and shear force diagrams of beams and frames, flexural and shearing stresses in beams, shear centre, thin walled pressure containers, rivetted and welded joints.

Recommended Books

- a. Engineering Mechanics of Solids –Egor. P. Popov (Prentice-Hall of India).
- b. Strength of Materials (4<sup>th</sup> Edition) – Andrew Pytel, Ferdinand L. Singer (Harper & Row Publishers).
- c. Mechanics of Materials – Ferdinand P. Beer & E. Russel Johnston (Tata McGraw-Hill Publishers).
- d. Strength of Materials (part 1 & 2) – S. Timoshenko (CBS Publishers & Distributors).
- e. Mechanics of Materials – James M. Gere ( McGraw-Hill Publishers).
- f. Theory and Problems of Strength of Materials – William A. Nash (McGraw-Hill Book Company)



**CE 207 : Mechanics of Solids II** (3.0 credits, 3.0 hours/week)

Torsional stresses in shafts and tubes, compound stresses, helical springs, transformation of stresses, deflection of beams by direct integration, moment area, elastic load and conjugate beam methods, buckling of columns.

Recommended Books

- a. Engineering Mechanics of Solids –Egor. P. Popov (Prentice-Hall of India).
- b. Strength of Materials (4<sup>th</sup> Edition) – Andrew Pytel, Ferdinand L. Singer (Harper & Row Publishers).
- c. Mechanics of Materials – Ferdinand P. Beer & E. Russel Johnston (Tata McGraw-Hill Publishers).
- d. Strength of Materials (part 1 & 2) – S. Timoshenko (CBS Publishers & Distributors).
- e. Mechanics of Materials – James M. Gere (McGraw-Hill Publishers)

**CE 241 : Fluid Mechanics** (4.0 credits, 4.0 hours/week)

Development and scope of fluid mechanics, fluid properties, fluid statics, kinematics of fluid flow, fluid flow concepts and basic equations, 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 : Pilot tube, orifice, mouthpiece, nozzle, venturimeter weir. Pipe flow problems – pipes in series and parallel, branching pipes, pipe networks.

Recommended Books:

- a. Engineering Mechanics with Engineering Applications –L. Daugherty, Finnemore, Franjini (McGraw-Hill Book Company).
- b. A Text Book of Hydraulics, Fluid Mechanics & Hydraulics Machines-R.S. Khurmi (S. Chand & Company Ltd).
- c. Fluid Mechanics (1<sup>st</sup> SI Edition)-Victor Streeter, Benjamin Wylie (McGraw-Hill Book Company).
- d. Elementary Fluid Mechanics (7<sup>th</sup> Edition)-Robert Street, G. Z. Watters, J.K. Vennard (John Wiley & Sons).
- e. Introduction to Fluid Mechanics and Machines-Som and Biswas (Tata McGraw-Hill Publisher).

**CSE 251: Computer Programming** (1.5 Credits, 1.5 hours/week)

Basic concepts of programming, algorithm and flowchart.Number system; internal representation of data. Element of structured programming language: constants, variables, data types, operators, expression, Formatted input/output Functions, control statement, arrays, strings, functions, pointers and file management. Fundamental of object oriented programming (OOP) techniques:object design, classes, inheritance, data abstraction, data encapsulation, polymorphism, operator overloading and templates. Development of programs related to Civil Engineering.

**CSE 252 : Computer Programming Lab** (1.5 Credits, 3.0 hours/week)

Experiments based on Computer Programming course, CSE 251. Visual Studio 6.0

Recommended Books:

- a. Programming in C (3rd Edition) (Developer's Library), Stephen Kochan (Paperback - Jul 8, 2004).
- b. The C Programming Language (2nd Edition), Brian W. Kernighan, Dennis Ritchie, and Dennis M. Ritchie (Paperback - Mar 22, 1988).
- c. Object-Oriented Programming by Peter Coad and Jill Nicola (Textbook Binding - Feb 3, 1993)
- d. Introduction to Object-Oriented Programming Using C++, Peter Muller.

- e. Programming with C, Byron Gottfried.
- f. Programming in ANSI C (2nd Edition), E Balagurusamy.
- g. Object oriented programming with C++, E Balagurusamy.
- h. Java how to program, Deitel.
- i. Tech yourself C (3rd Edition), Herbert Schildt.

**EEE 241 : Fundamentals of Electrical Engineering** (3.0 Credits, 3.0 hours/week)

Electrical units and standards; electrical network and circuit solution: series, parallel, node and mesh analysis; instantaneous current, voltage and power, effective current and voltage, average power; sinusoidal single phase RLC circuits: phasor algebra, balanced three-phase circuits; Alternating current: Instantaneous and rms values of current, voltage, power, average power, Introduction to transformer and induction motors.

Recommended Books:

- a. Boylestad Robert L., Introductory Circuit Analysis, 11/e, Pearson Prentice Hall, New Jersey, 2007.
- b. Alexander Charles K., Sadiku Matthew N.O., Fundamental of Electric circuits, 2/e, Mc Grow Hill, New York, 2004.
- c. Theraja B. L., A.K. A text Book of Electrical Technology, Vol.I: Basic Electrical Engineering, 34/e, S. Chand & Company Ltd., new Delhi, 2004.

**EEE 242 : Fundamentals of Electrical Engineering Lab** (1.0 Credit, 2.0 hours/week)

Experiments based on Fundamentals of Electrical Engineering.

**CE 102 : Civil Engineering Drawing I** (1.5 credits, 3.0 hours/week)

Introduction – Lines and lettering; Plane geometry : drawing of linear and curved geometric figures, e.g., pentagon, hexagon, octagon, ellipse, parabola, hyperbola. Solid geometry : Projections of cube, prism, cone, cylinder; developments, true shapes and section of cube, pyramid, cone, prism; isometric and oblique drawings of cube, pyramid, cone. Plan, elevations and sections of one storied buildings and bridges.

Recommended Books

- a. Engineering Graphics and Drafting – Gill (Kataria & Sons)
- b. Fundamentals of Engineering Drawing – J. Wareen, Luzzadder (Prentice Hall of India)

**CE 104 : Civil Engineering Drawing II** (1.5 credits, 3.0 hours/week)

Introduction to CAD packages and computer aided drafting; drawing editing and dimensioning of simple objects. Plan, elevations and sections of multi-storied buildings; reinforcements 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; Building services drawings.

Recommended Books

- a. Mastering tm AutoCAD ® 2006 and AutoCAD Ltd ® 2006 – George Omura, September 2005, Sybex, Inc.

**CE 106 : Practical Surveying** (1.5 credits, 3.0 hours/week)

Three (3) weeks of field work.

**CE 108 :Workshop Sessional(1.5 credits, 3.0 hours/week)**

Carpentry Shop (3/2 hours per 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; 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 hours per week)

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

Welding Shop (3/4 hours per 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 machineries; Welding of different types of materials; Low carbon steel, cast iron, brass, copper, stainless steel, aluminium; Types of electrode, fluxes and their composition; Arc welding defects; Test of arc welding: Visual, destructive and non-destructive tests.

Types of gas welding system and gas welding equipment; Gases and types of flames; welding of different types of materials; Gas welding defects; test of gas welding.

**CE 202 : Details of Construction Lab (1.5 credits, 3.0 hours/week)**

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

Recommended Books

- a. Building Construction – Sushil Kumar (Standard Publishers, Delhi)
- b. Building Construction – B.C Punmia (Laxmi Publication Pvt. Ltd. New Delhi)
- c. Complete Construction Masonry & Concrete – Christine Beall (McGraw-Hill Book Company.)

**CE 204 : Engineering Materials Lab (1.5 credits, 3.0 hours/week)**

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 and initial setting time of cement; direct tensile and compressive strengths of cement mortar; gradation of coarse and fine aggregates; design and testing of a concrete mix.

Recommended Books

- a. Building Materials (1996) – Gurcharan Singh & Jagdish Singh (Standard Publishers).
- b. Concrete Technology – A.M. Neville & J.J Books (Peeson Education Ltd).

**CE 206 : Quantity Surveying (1.5 credits, 3.0 hours/week)**

Quantity estimates of items of civil works, e.g., building, bridge, truss and highway. Analysis of rates; use of software in quantity surveying; Specifications of materials of construction projects.

Recommended Books

- a. Estimating – AbulFaraz Khan (Sadbik Publishers).
- b. Estimating, Costing & Valuation (Civil) – Pasrija, Arora, Inderjit Singh (New Asian Publishers, Delhi).
- c. A Text Book on Estimating & Costing (Civil) With Drawings – D. Kohli, R.C.Kohli (Ambala Ramesh Publication).
- d. BNBC & PWD rate-charts are helpful.

**CE 208 : Structural Mechanics Lab** (1.5 credits, 3.0 hours/week)

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

**CE 242 : Fluid Mechanics Lab** (1.5 credits, 3.0 hours/week)

Centre 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 302 :Engineering Computation Lab** (1.5 credits, Lab 3.0 hours/week)

Introduction to hi-level computational programming tools; application to numerical analysis: basic matrix computation, solving systems of linear equations, non-linear equations, differential equations, interpolation and curve fitting, numerical differentiation, numerical integration; application to engineering problems: solving problems related to mechanics, numerical solution of equation of motion etc.

**CE 303 :Introduction to Spatial Information System Lab** (3.0 credits, 3.0 hours/week)

- 1)Concepts and Background of Spatial Information and Engineering
  - a)History of Mapping and Map Applications
  - b)Spatial thoughts and concepts
  - c)Importance of Spatial Information in Engineering
  - d)Maps in cellular technology and future
- 2)Geodesy, GNSS and Survey
  - a)Land Measurement and Coordinate system
  - b)Understanding Map Projection
  - c)GPS, DGPS,
  - d)GPS Data Applications
- 3)Geographic Information System/Science (GIS)
  - a)Introduction: Background, Scope, Mapping Applications
  - b)Spatial Data Format, Structure, and Design
  - c)Spatial SQL, Geoprocessing and Spatial Analysis
  - d)DSS and SDSS (Spatial Decision Support System)
  - e)Application of GIS in Engineering and
  - f)Environmental Modelling
- 4)Remote Sensing
  - a)Scope; Concepts and Foundations of Remote Sensing;
  - b)Remote Sensing Data Acquisition and Interpretation;
  - c)Aerial Photograph; Fundamentals of Photo Interpretations;
  - d)Satellite Remote Sensing--- Satellites and Sensor Characteristics
  - e)Remote-sensing Data Processing and Analyses;
  - f)Spectral Reflectance of Vegetation, Soil and Water;
  - g)Selected Application of Remote Sensing; Bridging of GIS and Remote Sensing;
  - h)Current and Future Trends in Remote Sensing.

**CE 304 :Introduction to GIS Lab** (1.0 credits, Lab 2.0 hours/week)

- 1.Introduction: Scope, Fundamentals of GIS, Maps and Map Projections; Scale and Coordinate system
- 2.GIS data: Distinguish the different types of data used in a GIS, Vector Data Structures; Raster Structures; Sources of GIS data, Understand the concept of spatial data; Identify the different types of attributes (such as nominal, ordinal, interval, ratio); Know the main geographical data formats (such as coverage, geodatabase, shapefile, grid, dxf, dwg, geotiff, GML)

- 3.Data Acquisition: Digitizing, Editing; Vectorize , Rasterize, Attribute data, Managing Attribute Tables; Attribute Queries; Relational database
- 4.Spatial Analysis: Raster spatial analysis, Single layer vector spatial analysis, Multi-layer Vector spatial analysis, Attributes based analysis
4. Application of GIS in Engineering and Environmental Modeling

## **E. Structural Engineering**

### **CE 301 : Structural Analysis and Design I (3.0 Credits, 3.0 hours/week)**

Stability and determinacy of structures; analysis of statically determinate trusses and arches; influence lines; moving loads on beams, frames and trusses; cables and cable supported structures e.g. suspension bridges.

#### **Recommended Books:**

- a. Theory of Simple Structures (2<sup>nd</sup> Edition) - T. C. Shedd& J. Vawter (John Wiley & Sons, Inc)
- b. Elementary Structural Analysis (4<sup>th</sup> Edition) - Charles Norris, J. Wilbur & SenolUtku (McGraw-Hill Int'l Edition)
- c. Theory of Structure-S. Timoshenko (CBS Publishers & Distributors)

### **CE 303 : Structural Analysis and Design II (3.0 Credits, 3.0 hours/week)**

Wind and earthquake loads; approximate analysis of statically statically indeterminate structures, e.g., braced trusses, portal frames, mill bent and multi storied building frames, trusses and frames by virtual work method; space trusses; analysis of statically indeterminate structures by consistent deformation.

#### **Recommended Books**

- a. Theory of Simple Structures (2<sup>nd</sup> Edition) – T. C. Shedd& J. Vawter (John Wiley & Sons, Inc.)
- b. Elementary Structural Analysis (4<sup>th</sup> Edition)-Charles Norris, J. Wilbur & SenolUtku (McGraw-Hill Int'l Edition)
- c. Theory of Structure-S. Timoshenko

### **CE 305 : Design of Concrete Structures I (3.0 Credits, 3.0 hours/week)**

Fundamental behavior of reinforced concrete; introduction to strength design and alternate design methods; flexural design of beams (singly reinforced, doubly reinforced, T-beam) using strength design method; shear, diagonal 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.

#### **Recommended Books:**

- a. Design of Concrete Structures (7<sup>th</sup> Edition)-George Winter, o' Rourke, Nilson (Tata McGraw-Hill Publisher, New Delhi)
- b. Design of Concrete Structure (13<sup>th</sup> Edition)- Nilson, Drawing, Charles Dolan (McGraw-Hill Higher Education)
- c. Reinforced Concrete Design (6<sup>th</sup> Edition)-Chukia Wang & Charles G. Salmon (John Wiley & Sons)
- d. Civil & Structural Engineering Design of Reinforced Concrete Structure – Alan Williams (Kaplan AEC Education)
- e. Reinforced Concrete Fundamentals-Ferguson, Breen, Jirsa (John Wiley & Sons, Inc.)
- f. Reinforced Concrete Design – George F. Limbrunner& Leonard Spigel (Prentice – Hall of India Pvt. Ltd.)

**CE 307 : Design of Concrete Structures II** (3.0 Credits, 3.0 hours/week)

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.

Recommended Books

- a. Design of Concrete Structures (7<sup>th</sup> Edition)-George Winter, o' Rourke, Nilson (Tata McGraw-Hill Publisher, New Delhi)
- b. Design of Concrete Structure (13<sup>th</sup> Edition)- Nilson, Drawing, Charles Dolan (McGraw-Hill Higher Education)
- c. Reinforced Concrete Design (6<sup>th</sup> Edition)-Chukia Wang & Charles G. Salmon (John Wiley & Sons)
- d. Civil & Structural Engineering Design of Reinforced Concrete Structure – Alan Williams (Kaplan AEC Education)
- e. Design of Prestressed Concrete Structures (3<sup>rd</sup> Edition)-T.Y. Lin, Ned H. Burns (John Wiley & Sons, Inc.)
- f. Reinforced Concrete Design – George F. Limbrunner & Leonard Spigel (Prentice – Hall of India Pvt. Ltd.)

**CE 401 : Structural Analysis and Design III** (3.0 Credits, 3.0 hours/week)

Analysis of statically indeterminate structures by slope deflection method, moment distribution and stiffness methods, member stiffness; stiffness transformations; assembly of stiffness matrices and solution for beams, frames and trusses. Flexibility matrix. Influence lines for statically indeterminate beams and frames.

Recommended Books

- a. Matrix Analysis of Framed Structures (2<sup>nd</sup> Edition)-William Weaver, James Gere (CBS Publishers & Distributors)
- b. Elementary Structural Analysis (4<sup>th</sup> Edition)-Charles Norris, J. Wilbur & Senol Utku (McGraw-Hill Int'l Edition)
- c. Indeterminate Structural Analysis-J. S. Kinney (Oxford & IBH Publishing Company Ltd)
- d. Statically Indeterminate Structures-C. K. Wang (McGraw-Hill Book Company)

**CE 302 : Structural Analysis and Design Lab I** (1.5 Credits, 3.0 hours/week)

Analysis of steel structures, e.g. truss, plate girder; design of members and joints of structures; use of software in analysis and design problems.

**CE 402 : Structural Analysis and Design Lab II** (1.5 Credits, 3.0 hours/week)

Design of various reinforced concrete structures, e.g. cantilever bridge and multistoried building.

Recommended Books

- a. Different Manuals From AISC/AREA can be used as guideline

**CE 308 : Concrete Structures Lab** (1.5 Credits, 3.0 hours/week)

Analysis and design problems based on the course 'Design of Concrete Structures I'; design of slab bridge, simple girder bridge and a low rise building.

Reference Books:

- a. AASHTO Bridge Design Manual 2002
- b. Design of Concrete Structures (10<sup>th</sup> Edition)-George Winter, Nilson (McGraw-Hill Higher Education)
- c. Design of Bridges-N. Krishana Raju (Oxford & IBH Publishing Co, New Delhi)

## **F. Environmental Engineering**

### **CE 311 : Environmental Engineering I** (3.0 credits, 3.0 hours/week)

Introduction to Environmental Engineering, ecology, climate change, biodiversity.

Water supply engineering: introduction; water demands, water supply sources, ground water exploration; aquifer properties and ground water flow, well hydraulics, water well design, drilling, construction and maintenance; water demand for rural communities; shallow hand tubewells 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 networks; fire hydrants; water meters; leak detection; unaccounted for water.

Water treatment – plain sedimentation, flocculation and settlement, filtration, disinfection; miscellaneous treatment methods; low cost treatment methods for rural communities.

#### Recommended Books

- a. Water Supply Engineering (1<sup>st</sup> Edition)- M. A. Aziz (Hafiz Book Center, Dhaka)
- b. Sewage Treatment in Hot Climates (1976)-Duncan Mara (John Wiley & Sons, London)
- c. Water Supply & Sewerage (November 1990)-Terence McGhee. E. W. Steel (McGraw-Hill Int'l Edition)
- d. Water & Waste Water Treatment (4<sup>th</sup> Edition)-Mark J. Hammer (Prentice-Hall of India Pvt. Ltd).

### **CE 313 : Environmental Engineering II** (3.0 credits, 3.0 hours/week)-----??????

Wastewater engineering: introduction; water supply, sanitation and health; estimation of wastewater; wastewater collection systems; hydraulic of sewer; design, construction and maintenance of sanitary sewer and storm drainage system; sewer appurtenances; plumbing systems.

Microbiology of sewage and waste water; wastewater characteristics; preparatory, primary and secondary treatment methods and disposal; treatment and disposal of industrial effluents; sludge treatment and disposal; sanitation for low income communities – on-site sanitation systems for rural communities; low cost small bore sewerage for small townships; design and construction of septic tanks, soak wells and subsurface drain fields; rural sanitation in Bangladesh.

Sustainability of water and sanitation services; participatory development approach in water and sanitation sector; community management of water and sanitation services; introduction to environment pollution; protection and management.

#### Recommended Books

- a. Water Supply & Sanitation (2<sup>nd</sup> Edition, 1974)-M. Feroze Ahmed, Md. MujiburRahman (ITN Bangladesh)
- b. Environmental Engineering (1985)-Howard Peavy, Rowe, Tchobanoglous (McGraw-Hill Book Company)
- c. Sewage Treatment in Hot Climates (1976)-Duncan Mara (John Wiley & Sons, London)
- d. Water Supply & Sewerage (November 1990)-Terence McGhee. E. W. Steel (McGraw-Hill Int'l Edition)
- e. Water & Waste Water Treatment (4<sup>th</sup> Edition)-Mark J. Hammer (Prentice-Hall of India Pvt. Ltd)
- f. Waste Water Engineering: Treatment, Disposal, Reuse (3<sup>rd</sup> Edition)-Metcalf & Eddy, Inc. (McGraw-Hill Inc.)
- g. Plumbing & Heating-William J. Hornung (Prentice-Hall, Inc. Newjersey)
- h. Plumbing-Harold E. Babbitt (McGraw-Hill Book Company)

**CE 314 : Environmental Engineering Lab** (1.5 credits, 3.0 hours/week)

Water quality requirements, water and waste water sampling techniques, sample preservation, physical, chemical and biological tests of water and wastewater; breakpoint chlorination, alum coagulation, sampling and laboratory analysis of air, sampling and laboratory analysis of solid waste.

Recommended Books

- a. USEPA (U. S. Environment Protection Agency) Standard Test Method.
- b. WHO (World Health Organization) Standard Test Method.
- c. Water & Waste Water Treatment (4<sup>th</sup> Edition)-Mark J. Hammer (Prentice-Hall of India Pvt. Ltd)

**CE 315 :Building Service** (2.0 credits, 2.0 hours/week)

Introduction to plumbing, water requirements in a building, water supply and distribution in buildings; plumbing of multistoried buildings. House wiring; air conditioning; lift installation; air handling unit, generator and other electrical and mechanical installations in building, rain water harvesting unit, solar panel, fire fighting, fire escape.

**G. Geotechnical Engineering**

**CE 321 : Geotechnical Engineering I** (4.0 credits, 4.0 hours/week)

Introduction geotechnical Engineering: formation, type and identification of soils; soil composition; soil structure and fabric; index properties of soil; 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.

Recommended Books:

- a. Foundation Engineering (2<sup>nd</sup> Edition, 1974)-Ralph B. Peck, Hanson, Thornburn (Wiley Eastern Limited, India)
- b. Principles of Geotechnical Engg (6<sup>th</sup> Edition)-B. M. Das (Thomson Brooks/Cole)
- c. Geotechnical Engineering-Principles & Practice-Donald P. Codute (Prentice-Hall of India)
- d. Soil Mechanics & Foundation (13<sup>th</sup> Edition)-B. C. Punmia (Laxmi Publication, New Delhi)

**CE 323 : Geotechnical Engineering II** (3.0 credits, 3.0 hours/week)

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

Recommended Books:

- a. Foundation Engineering (2<sup>nd</sup> Edition, 1974)-Ralph B. Peck, Hanson, Thornburn (Wiley Eastern Limited, India)
- b. Foundation Analysis & Design-Joseph E. Bowles (McGraw-Hill Book Company)
- c. Geotechnical Engineering-Principles & Practice-Donald P. Codute (Prentice-Hall of India)
- d. Soil Mechanics & Foundation (13<sup>th</sup> Edition)-B. C. Punmia (Laxmi Publication, New Delhi)
- e. An Introduction to Soil Mechanics & Foundation (3<sup>rd</sup> Edition)-C. R. Scott (Applied Science Publishers, London)
- f. Foundation Design & Construction-M. J Tomlinson (Addison Wesley Longman Ltd)
- g. Foundation Design & Construction-W. C Teng (McGraw-Hill Book Company)



### **CE 324 : Geotechnical Engineering Lab (1.5 credits, 3.0 hours/week)**

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

#### Recommended Books

- a. Soil Testing for Engineers (1951)-T. William Lambe (MIT).
- b. Soil Testing Manual: Procedure, Classification Data & Sampling Practices (2001)- Robert W. Day (McGraw-Hill Book Company)
- c. Field Instrument In Geotechnical Engineering (1985)-T. H. Hanna (Trans Tech Publication, USA.)
- d. ASTM or AASHTO Standard Test Method Must be Adopted.

## **H. Transportation Engineering**

### **CE 331 : Transportation Engineering I (3.0 credits, 3.0 hours/week)**

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.

#### Recommended Books:

- a. Principles of Railway Engineering (14<sup>th</sup> Edition)-Rangwala (Charotar Publishing House, India).
- b. Highway Engineering (7<sup>th</sup> Edition)-Paul H. Wright, Karen Dixon (John Wiley & Sons, Inc.).
- c. The Asphalt Hand Book-The Asphalt Institute.
- d. Manuals on Design of Flexible / Rigid Pavement- BRRI (Bangladesh Road Research Institute).

### **CE 333 : Transportation Engineering II (4.0 credits, 4.0 hours/week)**

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

#### Recommended Books:

- a. Highway Engineering (7<sup>th</sup> Edition)-Paul H. Wright, Karen Dixon (John Wiley & Sons, Inc.).
- b. Transportation Engineering & Planning (3<sup>rd</sup> Edition)-C. S. Papacostas, P. D. Prevedouros (Prentice-Hall of India).
- c. Traffic Engineering & Transportation Planning (2<sup>nd</sup> Edition)-L. R. Kadiyali (Khanna Publishers).

- d. Transportation Engineering: An Introduction (3<sup>rd</sup> Edition)-JotinKhistry, Kent Lall (Prentice Hall Publication).
- e. Transport Sector Status Report-Transport Sector Coordination Wing: Planning Commission, Government of Bangladesh.
- f. RHD Road Network Database: Annual Report-Roads & Highways Department: Ministry of Communications, Government of Bangladesh.
- g. Road Design Standards – Bangladesh Gadget: September 5, 2004
- h. Geometric Design Standards of RHD.
- i. Information Book of Bangladesh Railway, 2004.
- j. Introduction to Transportation Engineering-William W. Hay (John Wiley, New York).

**CE 334 : Transportation Engineering LabI** (1.5 credits, 3.0 hours/week)

Tests of bituminous materials, tests on subgrade, sub-base and base materials; bituminous mix design; roadway capacity analysis; application of analytical, simulation and statistical packages.

**I. Water Resources Engineering**

**CE 341 : Open Channel Flow** (4.0 credits, 4.0 hours/week)

Open channel flow and its classification, Velocity and its pressure distributions, Energy equation, specific energy and transition problems.

Critical flow and control.Principle of flow measurement and devices.Concept of uniform flow, Chezy and Manning equations, estimation of resistance coefficients and computation of uniform flow.Momentum equation and specific momentum.Hydraulic jump.Theory and analysis of gradually varied flow. Computation of flow profiles. Design of channels.

Recommended Books:

- a. Open Channel Hydraulics (1959)- VenTe Chow (McGraw-Hill Book Company)
- b. Flow Through Open Channels-K. G. RangaRaju (Tata McGraw-Hill Publisher, India)

**CE 343 :Engineering Hydrology** (3.0 credits, 3.0 hours/week)

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

Recommended Books:

- a. Applied Hydrology-V. T. Chow, David R Maidment, Larry (McGraw-Hill Book Company)
- b. Engineering Hydrology (2<sup>nd</sup> Edition)-K. Subramanya (Tata McGraw-Hill Publisher, India)

**CE 345 : Irrigation Engineering**(2.0 credits, 2.0 hours/week)

Importance of irrigation, Sources and quality of irrigation water, Soil-water relationship, Consumptive use and estimation of irrigation water requirements.Methods of irrigation.Design of irrigation canal system.Irrigation structures. Irrigation pumps. Problems of irrigated land.Flood and its control.

Reference Books:

- a. Irrigation Engineering & Hydraulic Structures (17<sup>th</sup> Edition, 2003)-Santosh K. Garg (Khanna Publishers)
- b. Irrigation Principles & Practices-V. Hansen, W. Israelsen, Stringham (John Wiley & Sons, Inc.)

- c. Irrigation Water Management Principles & Practice-D. K. Majumder, (Prentice-Hall of India Pvt. Ltd)

**CE 342 : Open Channel Flow Lab** (1.5 credits, 3.0 hours/week)

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

**J. Civil Engineering Practice**

**CE 491 : Project Planning and Management** (3.0 credits, 3.0 hours/week)

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

Recommended Books:

- a. Project Management: A Systems Approach to Planning, Scheduling & Controlling (7<sup>th</sup> Edition)-Harold Kerzner (John Wiley & Sons)
- b. Production Systems: Planning Analysis & Control (3<sup>rd</sup> Edition)-James L. Riggs (John Wiley & Sons, New York)
- c. Construction Project Management 4<sup>th</sup> Edition (August 2000)-Richard H. Clough, G.A. Sears, (John Wiley & Sons)

**CE 493 : Professional Practices and Communication** (2.0 credits, 2.0 hours/week)

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

Interpretation of literature, documents, etc.; communication; preparation of reports; industrial and labour relations; professional ethics in civil engineering.

**CE 495 : Socio – Economic Aspects of Development Projects** (2.0 credits, 2.0 hours/week)

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

**CE 497 : Integrated Water Resources Planning and Management**

(2.0 credits, 2.0 hours/week)

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

Recommended Books:

- a. Principles of water resource planning, Alvin S Goodman,
- b. Water resource planning and management, Otto J Helweg.
- c. Water resource management, Larry W Mays.

## **K. Optional Courses**

### **CE 453 : Introduction to Finite Element Method** (2.0 credits, 2.0 hours/week)

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

#### Recommended Books:

- a. Theory & Problems of Finite Element Analysis-Georg R. Buchanon (McGraw-Hill Book)
- b. Introduction to Finite Element In Engineering-Chandrupatla, D. Belegundu (Prentice-Hall, Inc.)

### **CE 455 :Prestressed Concrete** (2.0 credits, 2.0 hours/week)

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

#### Recommended Books

- a. Prestressed Concrete, T. Y. Lin, NED H Burns, 3<sup>rd</sup> Edition.

### **CE 407: Design of Steel Structures** (2.00 credits, 2 hrs/week.)

Behavioral principles and design of structural steel; design of tensionmembers, bolted and welded connections; compression members;residual stress, local buckling, effective length; flexural members;lateral torsional buckling; design of beam-columns; connectiondesign, moment connections, column bases; detailing of steelstructures.

#### Recommended Books:

- a. Design of Steel Structures-Gaylord & Gaylord (McGraw-Hill Inc)

### **CE 357 :Design of Concrete Structures III**(2 Credits, 2.0 hours/week)

Analysis and design for torsion; design of one way and two way joistslabs with or without beam on the column line; design and detailingof lateral load resisting components: shear wall, lift cores, diaphragmetc.; design of reinforcement at joints.

#### Recommended Books

- a. Design of Concrete Structures (7<sup>th</sup> Edition)-George Winter, o' Rourke, Nilson (Tata McGraw-Hill Publisher, New Delhi)
- b. Design of Concrete Structure (13<sup>th</sup> Edition)- Nilson, Drawing, Charles Dolan (McGraw-Hill Higher Education)
- c. Reinforced Concrete Design (6<sup>th</sup> Edition)-Chukia Wang & Charles G. Salmon (John Wiley & Sons)
- d. Civil & Structural Engineering Design of Reinforced Concrete Structure – Alan Williams (Kaplan AEC Education)
- e. Design of Prestressed Concrete Structures (3<sup>rd</sup> Edition)-T.Y. Lin, Ned H. Burns (John Wiley & Sons, Inc.)
- f. Reinforced Concrete Design – George F. Limbrunner& Leonard Spigel (Prentice – Hall of India Pvt. Ltd.)

### **CE 459 : Dynamics of Structures** (2.0 credits, 2 hours/week)

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.

#### Recommended Books

- a. Dynamics of Structures, Clough and Tenzial.

**CE 454 :Computer Aided Analysis and Design Lab**(1.5 credits, 3.0 hours/week)

Computer aided analysis and design of structures: Use of structural analysis and design software; design of various reinforced concrete structures, e.g. building, water tower, folded plate roof.

**CE 411 : Environmental Engineering III** (2.0 credits, 2.0 hours/week)

Solid waste management; sources and types of solid wastes; physical and chemical properties of solid wastes; solid wastes generation; on-site handling, storage and processing; collection of solid wastes; transfer stations and transport; ultimate disposal methods; resources and energy recovery; soil pollution.

Recommended Books:

- a. Environmental Engineering-Peavy, Rowe, Tchobanoglous (McGraw-Hill Inc.)
- b. Hazardous Waste Management (2<sup>nd</sup> Edition)-Lagrega, Buckingham, J. Evans (McGraw-Hill Book Company)

**CE 413 : Environmental Engineering IV** (2.0 credits, 2.0 hours/week)

Environment pollution and its control; water pollution – sources and types of pollutants; waste assimilation capacity of streams; dissolved oxygen modeling; ecological balance of streams; industrial pollution; heavy metal contamination; detergent pollution and eutrophication; ground-water pollution; marine pollution; pollution control measures – water quality monitoring and management.

Recommended Books

- a. Introduction To Environmental Engineering & Sciences (2<sup>nd</sup> Edition)-Gilbert M. Masters (Prentice-Hall of India)
- b. An Introduction To Water Quality & Pollution Control (2003)-Kenneth Vigil (Oregon State University Press)

**CE 415 : Environmental Engineering V** (2.0 credits, 2.0 hours/week)

Environment and development projects; environment and sustainable development; environmental politics and legislation; environmental implication of sectoral development; environmental quality standards; environmental issues and priorities; environmental impact assessment of development schemes – baseline studies, assessments methodologies; economics of environmental management; special topics.

Recommended Books:

- a. Environmental Impact Assessment For Developing Countries In Asia-ADB, 1997
- b. Environmental Impact Assessment-Larry W. Canter (McGraw-Hill Book Company)

**CE 414 : Environmental Engineering Lab II** (1.5 credits, 3.0 hours/week)

Design of water supply and sewage system; design of water and wastewater treatment plant; computer application in environmental engineering; field visits and reporting.

**CE 421 : Geotechnical Engineering III** (2.0 credits, 2.0 hours/week)

Foundation for structures subjected to lateral loads; retaining walls and abutments; operation and methods of construction, dewatering 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, fundamental of soil liquefaction.

Recommended Books

- a. Foundation Analysis & Design-Joseph E Bowles (McGraw-Hill Book Company)
- b. Foundation Design & Construction-W.C Teng (McGraw-Hill Book Company)
- c. Vibration Theory (1998)-Louis V. Schmidt (Aiaa Education Series)
- d. Principles of Geotechnical Engg (6<sup>th</sup> Edition)-B.M.Das (Thomson Books/Cole.)

**CE 423 : Geotechnical Engineering IV** (2.0 credits, 2.0 hours/week)

Introduction to critical state soil mechanics, SHANSEP and stress path methods; Stress deformation and failure of soil masses. One, two and three dimensional consolidation problems; pore pressure coefficients; soil structure – interaction; earthquake and liquefaction problems; soil improvement; numerical solution of geotechnical engineering problems.

Recommended Books

- a. Foundation Analysis & Design-Joseph E Bowles (McGraw-Hill Book Company)
- b. Foundation Design & Construction-W.C Teng (McGraw-Hill Book Company)
- c. Geotechnical Engineering: Principles & Practice-Donald P. Coduto (Prentice-Hall of India)
- d. Soil Mechanics & Foundations (13<sup>th</sup> Edition)-B.C. Punmia (Laxmi Publication, New Delhi)
- e. Principles of Geotechnical Engg (6<sup>th</sup> Edition)-B.M.Das (Thomson Books/Cole.)

**CE 425 : Geotechnical Engineering V** (2.0 credits, 2.0 hours/week)

Introduction to soil-water interaction problems. Permeability, capillarity and soil suction. Seepage analysis, stability of natural, man made slopes and excavations subjected to seepage, water current, wave ACTION, ETC. Theories of filters and revetment designs; hydraulic fills.

Recommended Books:

- a. Foundation Analysis & Design-Joseph E Bowles (McGraw-Hill Book Company)
- b. Foundation Design & Construction-W.C Teng (McGraw-Hill Book Company)
- c. Principles of Geotechnical Engg (6<sup>th</sup> Edition)-B.M.Das (Thomson Books/Cole.)

**CE 424 : Geotechnical Engineering Lab II** (1.5 credits, 3.0 hours/week)

Computer aided design of foundations, retaining walls and reinforced soils, slope stability analysis, techniques of soil improvement, use of computer in geotechnical engineering.

**CE 431 : Transportation Engineering III : Traffic Planning and Management**

(2.0 credits, 2.0 hours/week)

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.

Recommended Books:

- a. Highway Engineering (7<sup>th</sup> Edition)-Paul H. Wright, Karen Dixon (John Wiley & Sons, Inc.)
- b. Traffic Engineering & Transportation Planning (2<sup>nd</sup> Edition)-L.R. Kadiyali (Khanna Publishers)
- c. Highway-Traffic Planning & Engineering-C.A. O’Flaherty (Edward Arnold, UK)
- d. The Institute of Transportation Engineers, Transportation & Traffic Engineering Hand Book, Prentice-Hall (1982)

**CE 433 : Transportation Engineering IV : Highway Drainage and Airports**

(2.0 credits, 2.0 hours/week)

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.

Recommended Books:

- a. Highway Engineering (7<sup>th</sup> Edition)-Paul H. Wright, Karen Dixon (John Wiley & Sons, Inc.)
- b. Planning & Design Of Airports (4<sup>th</sup> Edition, 1994)-Robert Horonjeff, McKelvey (McGraw-Hill Book Company)
- c. Federal Aviation Administration (FAA) Guidelines.

**CE 435 : Transportation Engineering V : Transport Projects and Operations**

(2.0 credits, 2.0 hours/week)

Highway needs study; highway planning, economics of 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.

Recommended Books

- a. Transportation Engineering & Planning (3<sup>rd</sup> Edition)-C.S. Papacostas, Prevedouros (Prentice-Hall of India)
- b. Highway Engineering (7<sup>th</sup> Edition)-Paul H. Wright, Karen Dixon (John Wiley & Sons, Inc.)
- c. Documents on Traffic Engineering Administration and Legislation in Courtesy of RHD, LGRD, City Corporation, Planning Commission

**CE 434 : Transportation Engineering Lab II : (1.5 credits, 3.0 hours/week)**

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

**CE 441 : Flood Mitigation and Management (2.0 credits, 2.0 hours/week)**

Flood and its causes. Methods of flood management: structural and non-structural measures such as reservoirs, levees and flood walls, channel improvement, interior drainage, floodways, land management, flood proofing, flood zoning, flood hazard mapping, flood forecasting and warning.

Recommended Books:

- a. Flood Control & Drainage, S. N. Ghosh
- b. Flood in Bangladesh, Mohiuddin Ahmed

**CE 443 : Groundwater Engineering (2.0 credits, 2.0 hours/week)**

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 mining and land subsidence. Groundwater pollution and contaminant transport. Recharge of groundwater, Saline water intrusion in aquifers. Groundwater management.

Recommended Books:

- a. Ground Water Hydrology, David Keith Todd.
- b. Ground Water Hydrology, Bouwer Herman.
- c. Ground Water Hydrology, H M Raghunath.
- d. Ground Water Hydrology, J G M Uffink.

**CE 445 : River Engineering (2.0 credits, 2.0 hours/week)**

Behaviour 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.

Recommended Books:

- a. Irrigation Engineering & Hydraulic Structures (17<sup>th</sup> Edition, 2003)-Santosh K. Garg (Khanna Publishers)
- b. Petersen, M.S. (1986). River Engineering. Prentice-Hall
- c. Graf, W.H: Hydraulics Of Sediment Transport, McGraw-Hill
- d. R.J.Grade, K.G.RangaRaju:Mechanics of Sediment Transportation & Alluvial Stream Problems. (2<sup>nd</sup> Edition), Wiley Eastern Ltd.

**CE 447 : Hydraulic Structures** (2.0 credits, 2.0 hours/week)

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

Recommended Books

- a. Irrigation Engineering & Hydraulic Structures (17<sup>th</sup> Edition,2003)-Santosh K. Garg (Khanna Publishers)
- b. Text Book of Irrigation Engineering & Hydraulics Structures-R.K. Sharma (Oxford and IBH Publishing, New Delhi)
- c. Different Design Manual/Handbook/Annual Reports of Bangladesh Water Development Board.

**CE 449 : Coastal Engineering** (2.0 credits, 2.0 hours/week)

Coast and coastal features, Tides and currents.Tidal flow measurement.Waves and storm surges.Docks and harbours. Forces of waves and tides in the design of coastal and harbour structures. Coastal sedimentation processes. Deltas and estuaries. Shore protection works. Dredging and dredgers.

Recommended Books:

- a. Basic Coastal Engineering-Robert M. Sorensen (John Wiley & Sons)
- b. Coastal Engineering an Introduction To Ocean Engineering (1978)-K. Horikawa (University of Tokyo Press)
- c. Introduction To Coastal Engineering & Management (1999)-J.W.Kamphuis (World Scientific Publishing)
- d. Coastal Processes With Engineering Applications (2001)-R.G. Dean, and R. Dalrymple (Cambridge University Press)

**CE 448 : Water Resources Engineering Lab** (1.5 credits, 3.0 hours/week)

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

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