



United International University
DEPARTMENT OF CIVIL ENGINEERING

Bachelor of Science in Civil Engineering (BSCE) Curriculum



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United International University (UIU)
Department of Civil Engineering
Program: B.Sc. in Civil Engineering

Courses and Curriculum

General

Bachelor of Science in Civil Engineering primarily involves the study of a number of core courses that every CE graduate should know. There also exists an opportunity to choose fields of specialization from five distinct divisions of Civil Engineering: Structural Engineering, Geotechnical Engineering, Transportation Engineering, Environmental Engineering and Water Resources Engineering. Core courses build the foundation and specialized courses prepare the students for the specific areas of Civil Engineering. To understand the underpinning theory of the courses of Civil Engineering, a number of courses on language, mathematics, general education (social science, business, arts and humanities) and basic science have been felt mandatory to include in the curriculum. In addition, some courses related to Civil Engineering Practices (e.g., Project Planning and Management) and interdisciplinary courses have been incorporated in the curriculum. These courses make the curriculum a balanced and reasonably complete one, and accordingly these courses help the UIU CE graduates to meet the competency level defined by international standards set by different agencies: University Grant Commission of Bangladesh, Washington Accord and ABET. In brief, the mission of the undergraduate program in Civil Engineering at UIU is to produce skilled and competent graduates who will acquire national and international recognition by providing sustainable solutions to infrastructural development, improvement of public health and combatting natural and man-made disasters. The graduates shall also contribute to the development of climate resilient society.

Academic Calendar

The BSc in Civil Engineering is a 4-year program. Each academic year comprises two semesters: Spring (typically January to June) and Fall (typically July to December). In every semester, the duration of the classes is fourteen (14) weeks. The length of a theory class is 55 minutes per class for 3.0 credit hours while the length of a Lab class is 160 minutes per class for 1.5 credit hours.

Lab Facilities

The department has already developed the following laboratories, which are fully functional:

- Strength of Material Lab
- Fluid Mechanics Lab
- Engineering Materials Lab
- Surveying Lab
- Drafting Studio
- Transportation Engineering Lab
- Geotechnical Engineering Lab
- Environmental Engineering Lab
- Computer Lab

Admission Requirements

Every applicant, without any exception, must fulfill the admission requirements as laid down by the university. Candidates have to appear at the admission test and interview for admission into a semester as decided by the university.

A higher secondary certificate or its equivalent in science with mathematics, chemistry and physics are the basic educational requirements.

Degree Requirements

The B.Sc. in Civil Engineering degree requirements will be as follows:

- (a) Completion of 151.5 credit hours
- (b) Completion of the “Final Year Design Project” with at least a “C” grade
- (c) Passing of all courses individually and maintaining a minimum CGPA of 2.0

In addition, every student has to select two courses from two of the following divisions each: Structural Engineering, Geotechnical Engineering, Environmental Engineering, Transportation Engineering and Water Resources Engineering.

Grading and Performance Evaluation

Grading System

The performance of a student in a given course is made through continuous evaluation that comprises quizzes/ in-course tests, class participation, attendance, homework/assignment, case study, mid-terms and semester final examinations. Letter grades and grade points are used to evaluate the performance of a student in a given course. The table below shows the grading policy.

Letter Grade	Grade Point	Assessment
A	4.00	Outstanding
A-	3.67	Excellent
B+	3.33	Very Good
B	3.00	Good
B-	2.67	Above Average
C+	2.33	Average
C	2.00	Below Average
C-	1.67	Poor
D+	1.33	Very poor
D	1.00	Pass
F	0.00	Fail

Assessment Methods

For theoretical courses, assessment is generally made through continuous class assessment (i.e., class performance, assignments, and class tests), a mid-term examination and a final examination. The percentile distribution of marks for a theoretical course is as follows:

Assessment Types	Marks
Class Attendance	5%
Assignment	5%
Class Tests	20%
Mid Term	30%
Final Exam	40%

For Lab courses assessment is generally made through continuous class assessment (e.g., class performance, report writing, viva and presentation on project), a mid-term examination and a final examination. The percentile distribution of marks for a Lab course is as follows:

Assessment Types	Marks
Class Attendance	5%
Class Performance/ Viva	20%
Report	25%
Mid Term	20%
Final Exam	30%

Calculation of GPA/CGPA

Grade Point Average (GPA) is the weighted average grade of a semester while Cumulative Grade Point Average (CGPA) is the weighted average of the grade points obtained in all the courses completed by a student in all the semesters. For example, if a student passes/completes four courses in a semester having credits of C₁, C₂, C₃ and C₄, and his grade points in these courses are G₁, G₂, G₃ and G₄ respectively then his GPA will be calculated as follows:

$$GPA = \frac{\sum_{i=1}^n C_i G_i}{\sum_{i=1}^n C_i} = \frac{C_1 G_1 + C_2 G_2 + C_3 G_3 + C_4 G_4}{C_1 + C_2 + C_3 + C_4}$$

Earned Credit Hours

A student shall earn credit hours for a course if he/she can secure a “D” or higher grade in that course. Any course in which a student obtains “F” grade will not be counted towards his/her earned credit. In that case he/she will have to retake the course.

Incomplete (I)

Incomplete (I) grade may be assigned in special circumstances at the discretion of the course teacher. The student has to take the initiative to remove the “I” grade within 15 days of the following semester. If action is not taken, the “I” grade will revert to “F”.

Retaking a Course (R)

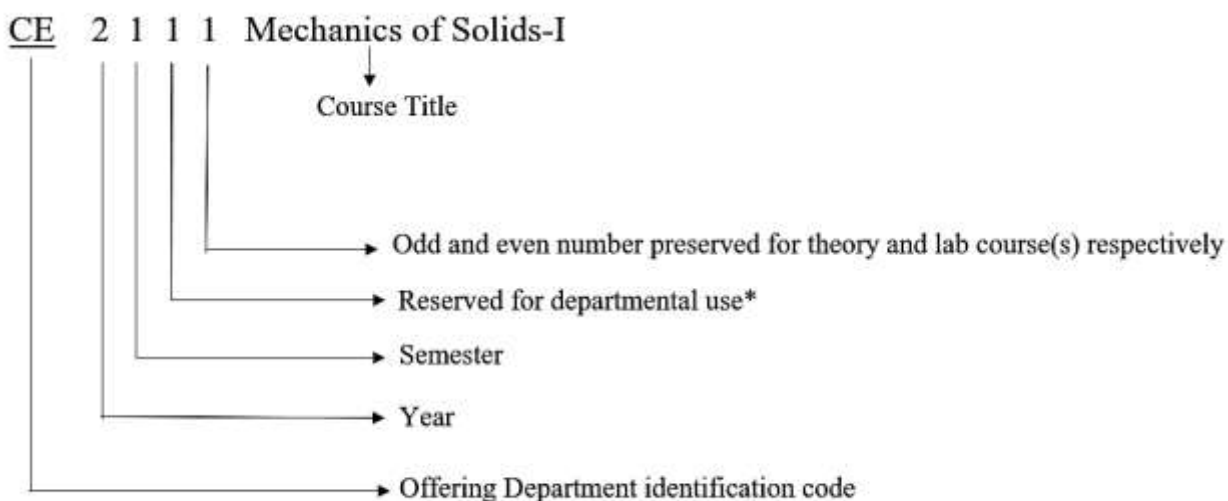
Students may retake a course if he or she thinks grade improvement is possible. Students who wish to retake a course must re-register the course and pay tuition and other applicable fees.

Course Designation System

Each course is designated by a two to four letter word identifying the department offering the course followed by a four-digit number with the following criteria:

- The first digit corresponds to the year in which the course is taken by the student.
- The second digit represents the semester in which the course is taken by the student.
- The third digit is reserved for departmental use. It usually identifies a specific division/ area within the department.
- The last digit is 'odd' for a theoretical course and 'even' for a lab course.

The course designation system is illustrated as follows:



*Note: 0 is for basic/other civil engineering courses; 1 for Structural Engineering group; 3 for Environmental Engineering group; 4 for Geotechnical Engineering group; 5 for Transportation Engineering group; 7 for Water Resource Engineering group

Summary of Course Curriculum

Sl. No.	Group	Theory	Lab	Project	Total
1	Language	6	--	--	6
2	Mathematics	12	--	--	12
3	Basic Sciences	6	3	--	9
4	General Education	11	--	--	11
5	Civil Engineering Basic	24	13.5	--	37.5
6	Civil Engineering Core	39	10.5	--	49.5
7	Civil Engineering Electives	8	--	--	8
8	Civil Engineering Practices	6	1.5	--	7.5
9	Final Year Design Project	--	--	6	6
10	Other Engineering	2	3	--	5
	Total	114	31.5	6	151.5

List of Courses

A. Language Courses: 6.0 Credit Hours		
ENG 1011	English I	3.0
ENG 1013	English II	3.0
B. Mathematics: 12.0 Credit Hours		
MATH 1101	Differential and Integral Calculus	3.0
MATH 1201	Linear Algebra, Ordinary and Partial Differential equations (Pre Math 1101)	3.0
MATH 2101	Matrices and Vector Analysis	3.0
MATH 2103	Laplace Transformation, Probability and Statistics	3.0
C. General Education: 11.0 Credit Hours		
BDS 1201	History of the Emergence of Bangladesh	2.0
Select three from below (Humanities/Business)		
SDV 1107	Introduction to Sustainable Development	3.0
ACT 2111	Financial and Managerial Accounting	3.0
ECO 4101	Economics	3.0
IPE 3401	Industrial Management	3.0
PSY 2101	Psychology	3.0
BAN 2501	Bangla	3.0
URC 1101	Life Skills for Success	3.0
MGT 3107	Principles of Management	3.0
SOC 4101	Introduction to Sociology	3.0
D. Basic Sciences: 9.0 (6+3) Credit Hours		
Theoretical:		
PHY 1201	Physics	3.0
CHEM 1211	Chemistry	3.0
Lab:		
PHY 1202	Physics Lab	1.5
CHEM 1212	Chemistry Lab	1.5
E. Civil Engineering Basic: 37.5 (24+ 13.5) Credit Hours		
Theoretical:		
CE 1101	Engineering Mechanics	3.0
CE 1201	Surveying	3.0
CE 2101	Engineering Materials	3.0
CE 2111	Mechanics of Solids I (Pre CE 1101)	3.0
CE 2171	Fluid Mechanics	3.0

CE 2201	Engineering Geology and Geomorphology	3.0
CE 2203	Numerical Analysis and Computer Programming	3.0
CE 2211	Mechanics of Solids II (Pre CE 2111)	3.0
Lab:		
CE 1100	Civil Engineering Drawing I	1.5
CE 1200	Civil Engineering Drawing II	1.5
CE 1202	Practical Surveying	1.5
CE 2100	Construction Detailing and Estimation Lab	1.5
CE 2102	Engineering Materials Laboratory	1.5
CE 2104	GIS and Remote Sensing Lab	1.5
CE 2172	Fluid Mechanics Laboratory	1.5
CE 2200	Details of Construction	1.5
CE 2212	Structural Mechanics and Materials Laboratory	1.5
F. Civil Engineering Core: 49.5 Credit Hours		
Structural Engineering		16.5
Theoretical:		
CE 3111	Structural Analysis and Design I (Pre CE 2111)	3.0
CE 3113	Design of Concrete Structures	3.0
CE 3211	Design of Steel Structures (Pre CE 2211)	3.0
CE 4111	Structural Analysis and Design II (Pre CE 3111)	3.0
Lab:		
CE 3112	Reinforced Concrete Structure Design Lab (Pre CE 3113)	1.5
CE 3212	Steel Structure Design Lab	1.5
CE 4110	Computer Applications in Civil Engineering	1.5
Environmental Engineering		7.5 (6+1.5)
Theoretical:		
CE 3131	Water Supply Engineering	3.0
CE 3231	Wastewater Engineering	3.0
Lab:		
CE 3132	Environmental Engineering Laboratory	1.5
Geotechnical Engineering		7.5 (6+1.5)
Theoretical:		
CE 3241	Soil Mechanics	3.0
CE 4141	Foundation Engineering (Pre 3241)	3.0
Lab:		
CE 3242	Geotechnical Engineering Laboratory	1.5

Transportation Engineering		7.5 (6+1.5)
Theoretical:		
CE 3251	Transportation Planning and Traffic Engineering	3.0
CE 4151	Highway Design and Railway Engineering	3.0
Lab:		
CE 4152	Highway Materials and Traffic Engineering Design Laboratory	1.5
Water Resources Engineering		10.5 (9+1.5)
Theoretical:		
CE 2271	Engineering Hydrology	3.0
CE 3171	Open Channel Flow	3.0
CE 4171	Irrigation and Flood Control	3.0
Lab:		
CE 3172	Open Channel Flow Laboratory	1.5
G. Civil Engineering Electives: 8.0 Credit Hours		
Structural Engineering		
CE 4211	Introduction to Structural Fire Protection	2.0
CE 4213	Introduction to Steel-Concrete Composite Structures	2.0
CE 4215	Prestressed Concrete	2.0
CE 4217	Design of Concrete Structures II	2.0
CE 4219	Introduction to Finite Element Method	2.0
CE 4221	Dynamics of Structures	2.0
Environmental Engineering		
CE 4231	Solid and Hazardous Waste Management	2.0
CE 4233	Environmental Pollution Management	2.0
CE 4235	Environmental and Sustainable Management	2.0
Geotechnical Engineering		
CE 4241	Earth Retaining Structures	2.0
CE 4243	Elementary Soil Dynamics	2.0
CE 4245	Soil-water Interaction	2.0
Transportation Engineering		
CE 4251	Traffic Engineering Design and Management	2.0
CE 4253	Pavement Management, Drainage and Airport	2.0
CE 4255	Urban Transportation Planning and Management	2.0
Water Resources Engineering		
CE 4271	Flood Mitigation and Management	2.0
CE 4273	Groundwater Engineering	2.0

CE 4275	River Engineering	2.0
CE 4277	Hydraulic Structures	2.0
CE 4279	Coastal Engineering	2.0
H. Civil Engineering Practices: 7.5 (6+1.5) Credit Hours		
CE 3201	Project Planning and Construction Management	3.0
CE 4201	Engineering Ethics and Professional Practices	3.0
CE 4202	Industrial Attachment and Professional Practices	1.5
I. Projects: 6.0 Credit Hours		
CE 4000A	Final Year Design Project I	3.0
CE 4000B	Final Year Design project II (Pre CE 4000A)	3.0
J. Other Engineering: 5.0 (2+3) Credit Hours		
EEE 1201	Basic Electrical Engineering	2.0
CSE 2100	Computer Programming Lab	1.5
ARCH 3200	Architectural, Engineering & Planning Appreciation	1.5

Term wise Distribution of Courses

1st year 1st Semester

Sl. No.	Course Code	Course Title	Cr. Hrs.
1.	ENG 1011	English I	3.0
2.	MATH 1101	Differential and Integral Calculus	3.0
3.	ACT 2111	Financial and Managerial Accounting	3.0
4.	CHEM 1211	Chemistry	3.0
5.	CE 1201	Surveying	3.0
6.	CE 1100	Civil Engineering Drawing I	1.5
7.	CHEM 1212	Chemistry Lab	1.5
8.	CE 1202	Practical Surveying	1.5
Total			19.5

1st year 2nd Semester

Sl. No.	Course Code	Course Title	Cr. Hrs.
1.	ENG 1013	English II	3.0
2.	MATH 1201	Linear Algebra, Ordinary and Partial Differential equations	3.0
3.	CE 1101	Engineering Mechanics	3.0
4.	PHY 1201	Physics	3.0
5.	EEE 1201	Basic Electrical Engineering	2.0
6.	BDS 1201	History of the Emergence of Bangladesh	2.0
7.	CE 1200	Civil Engineering Drawing II	1.5
8.	PHY 1202	Physics Lab	1.5
Total			19.0

2nd year 1st Semester

Sl. No.	Course Code	Course Title	Cr. Hrs.
1.	MATH 2101	Matrices and Vector Analysis	3.0
2.	CE 2101	Engineering Materials	3.0
3.	CE 2201	Engineering Geology and Geomorphology	3.0
4.	CE 2111	Mechanics of Solids I	3.0
5.	CE 2171	Fluid Mechanics	3.0
6.	CSE 2100	Computer Programming Lab	1.5
7.	CE 2102	Engineering Materials Laboratory	1.5
8.	CE 2172	Fluid Mechanics Laboratory	1.5
Total			19.5

2nd year 2nd Semester

Sl. No.	Course Code	Course Title	Cr. Hrs.
1.	MATH 2103	Laplace Transformation, Probability and Statistics	3.0
2.	CE 2203	Numerical Analysis and Computer Programming	3.0
3.	CE 2211	Mechanics of Solids II	3.0
4.	CE 2271	Engineering Hydrology	3.0
5.	ECO 4101	Economics	3.0
6.	CE 2200	Details of Construction	1.5
7.	CE 2104	GIS and Remote Sensing Lab	1.5
8.	CE 2212	Structural Mechanics and Materials Laboratory	1.5
Total			19.5

3rd year 1st Semester

Sl. No.	Course Code	Course Title	Cr. Hrs.
1.	CE 3111	Structural Analysis and Design I	3.0
2.	CE 3113	Design of Concrete Structures	3.0
3.	CE 3131	Water Supply Engineering	3.0
4.	CE 3241	Soil Mechanics	3.0
5.	SDV 1107	Introduction to Sustainable Development	3.0
6.	CE 2100	Construction Detailing and Estimation Lab	1.5
7.	CE 3132	Environmental Engineering Laboratory	1.5
8.	CE 3142	Geotechnical Engineering Laboratory	1.5
Total			19.5

3rd year 2nd Semester

Sl. No.	Course Code	Course Title	Cr. Hrs.
1.	CE 3211	Design of Steel Structures	3.0
2.	CE 3231	Wastewater Engineering	3.0
3.	CE 4141	Foundation Engineering	3.0
4.	CE 3251	Transportation Planning and Traffic Engineering	3.0
5.	CE 3171	Open Channel Flow	3.0
6.	ARCH 3200	Architectural, Engineering & Planning Appreciation	1.5
7.	CE 3112	Reinforced Concrete Structure Design Lab	1.5
8.	CE 3172	Open Channel Flow Laboratory	1.5
Total			19.5

4th year 1st Semester

Sl. No.	Course Code	Course Title	Cr. Hrs.
1.	CE 3201	Project Planning and Construction Management	3.0
2.	CE 4111	Structural Analysis and Design II	3.0
3.	CE 4151	Highway Design and Railway Engineering	3.0
4.	CE 4171	Irrigation and Flood Control	3.0
5.	CE 3212	Steel Structures Design Lab	1.5
6.	CE 4152	Highway Materials and Traffic Engineering Design Lab	1.5
7.	CE 4000A	Final Year Design Project I	3.0
Total			18.0

4th year 2nd Semester

Sl. No.	Course Code	Course Title	Cr. Hrs.
1.	CE 4201	Engineering Ethics and Professional Practices	3.0
2.	CE 42XX	Optional I	2.0
3.	CE 42XX	Optional II	2.0
4.	CE 42XX	Optional III	2.0
5.	CE 42XX	Optional IV	2.0
6.	CE 4202	Industrial Attachment and Professional Practices	1.5
7.	CE 4110	Computer Applications in Civil Engineering	1.5
8.	CE 4000B	Final Year Design Project II	3.0
Total			17.0

Summary of Term wise Theory and Lab Courses

Year/ Semester	Credit Hours			Total
	Theory	Lab	FYDP	
1 st Year 1 st Semester	15.0	4.5	--	19.5
1 st Year 2 nd Semester	16.0	3.0	--	19.0
2 nd Year 1 st Semester	15.0	4.5	--	19.5
2 nd Year 2 nd Semester	15.0	4.5	--	19.5
3 rd Year 1 st Semester	15.0	4.5	--	19.5
3 rd Year 2 nd Semester	15.0	4.5	--	19.5
4 th Year 1 st Semester	12.0	3.0	3.0	18.0
4 th Year 2 nd Semester	11.0	3.0	3.0	17.0
Total	114	31.5	6.0	151.5

Course Description

ENG 1011: English I Credits: 3.0

Reading and Writing: Cohesion, Skimming, Coherence, Scanning; Main ideas, Brainstorming and Taking notes, Comprehensions; Linking and Transitional words; Grammatical Knowledge: Parts of Speech, Punctuation, Subject-Verb Agreement, Preposition, Tense, Article, WH Questions, Paraphrasing; Summarizing; Creative Writing; Presentation

Speaking and Listening: Speaking and Listening strategies; Pronunciation and Intonation; Vocabulary, Educated guess from content; Linking words and Fillers; Introduction to Drama; Performing Play; Art of Questioning; Famous Speeches; Listening Activities; How to make and present a brochure; Impromptu Speaking; Group Presentation

ENG 1013: English II Credits: 3.0

Writing: Free Writing; Guided Writing: Paragraph writing with guidelines (based on hints, Wh questions); Process of Writing; Structure-based Paragraph Writing (types: Descriptive, Narrative and Process); Editing (Identification and correction of mistakes in Articles, Capitalization, Homonym, Fragment, Preposition, Pronoun, Punctuations, Run-on sentences, Faulty parallelism, Spelling, Subject-verb agreement, Tense); Application Writing; Email Writing; Steps of essay writing; Essay Writing in 5 paragraphs: (Cause and Effect essay, Compare and Contrast essay, Argumentative essay); Vocabulary: Sentence making practice on Academic word list (1-10)

Reading: Practice on Reading Comprehensions

Speaking: Public speaking; Argumentative Presentation

Listening: Listening practice from various sources

MATH 1101: Differential and Integral Calculus Credits: 3.0

Differential Calculus: Function, Domain and Range of a Function. Translation and reflection of a function. Even and Odd functions, Inverse functions, One to One and many to one function. Limit, continuity and differentiability, Tangent line, Differentiation of different types of functions, Maxima and minima of functions of single variables.

Integral Calculus: An overview of area problem, Newton's anti-derivative method in finding area, Indefinite integral, fundamental theorem of calculus, Definite integral, Area between two curves. Different types of Integration (Principles of Integral evaluation, Integration by parts, Trigonometric Substitution).

MATH 1201: Linear Algebra, Ordinary and Partial Differential Equations Credits: 3.0

Pre-requisite MATH 1101

Indeterminate forms; Analysis of Function I: Slope and Concavity, Analysis of function II: Relative Extrema and Polynomials, Partial Derivatives, The Chain Rule, Expansion of functions, gamma function, beta function; Formation of differential equations; solution of first order differential equations by various methods, general solutions of second or, higher order homogenous and non-homogeneous linear differential equations with constant co-efficient; formation and solutions of different types of partial differential equations. Solution of different types of system of linear equations.

MATH 2101: Matrices and Vector Analysis

Credits: 3.0

Matrices: Operations of matrix algebra, transposition, inversion, rank of matrices; Solution of system of equations by matrix method; Eigenvalues and Eigenvectors; Cayley-Hamilton theorem.

Vectors: Rectangular co-ordinate in 3-space, cross and dot product of vectors, operations on vectors, parametric equation of straight lines, plane in 3-space, tangent and normal line, Cylindrical and spherical coordinate systems, integrals of multi-variable functions (double and triple integrals including polar coordinates). Gradient of scalar fields, divergence and curl of vector fields. Line integrals, Gauss's theorem, conservative vector field and Green's theorem, surface integral, flux, divergence theorem, Stokes' theorem and their applications.

MATH 2103: Laplace Transformation, Probability and Statistics

Credits: 3.0

Laplace transforms: Integral transforms, Properties of Laplace transforms; Laplace transforms of derivatives; the unit step function; partial fraction; solutions of differential equations by Laplace transforms.

Probability: Elementary probability theory and discontinuous probability distribution; continuous probability distributions: normal and exponential distribution.

Statistics: Measures of central tendency and standard deviation; moments, skewness and kurtosis; Application of statistical methods to engineering problems: Random variables; discrete and continuous probability distributions; functions of random variables and derived distributions; expectation and moments of random variables; point estimation of distribution parameters: methods of moments and maximum likelihood, Bayesian analysis; confidence intervals; hypothesis tests; nonparametric statistical tests; simple and multiple linear regression and model selection; uncertainty and reliability analysis; project level decision making and quality control.

BDS 1201: History of the Emergence of Bangladesh

Credits: 2.0

Partition of Bengal (1947); Language Movement (1952); Movement for Autonomy; 6-point and 11-Point Programs; The 1970 Election; Speech on 7th of March 1971; Military Action, Genocide in the East Pakistan; The Liberation War; The Emergence of Bangladesh as a Sovereign Independent State in 1971; Constitution of Bangladesh and citizen rights; Culture: Cultural diffusion and change, Bengali culture and problems of society; social problems of Bangladesh; Social change: theories of social change; social change in Bangladesh; urbanization process and its impact on Bangladesh society.

SDV 1107: Introduction to Sustainable Development

Credits: 3.0

Understanding of the origins of the concept of development; A Brief History of Economic Development: Industrial Revolution; Conventional thinking of Development: Economic Growth; Environment and Development discourses: the complexity and various forms and dimensions of development and environment issues (ex. Pollutions and Resources depletion); Development Issues: "Is development sustainable?"; Changing Perceptions of Development: key insights and contributions from a range of disciplinary and interdisciplinary perspectives; Pathways to the concept of Sustainability & Sustainable Development: Knowing the landmark events that have contributed to today's notion of sustainability; Theoretical understanding of Sustainable Societies and Sustainable Development; Models of Sustainability and Sustainable Development; UN MDGs and SDGs; Sustainable Development

Indicators; Case study and lessons from new sustainability practices for achieving different Sustainable Development Goals: healthy lives and well-being, water supply and sanitation, Green economy, inequalities, resilient infrastructure, safe cities and communities, responsible consumption and production, climate action, ecosystem and biodiversity.

ACT 2111: Financial and Managerial Accounting

Credit: 3.0

Financial Accounting: Objectives and importance of accounting; Accounting as an information system; computerized system and applications in accounting. Recording system: double entry mechanism; accounts and their classification; Accounting equation; Accounting cycle: journal, ledger, trial balance; Preparation of financial statements considering adjusting and closing entries; Accounting concepts (principles) and conventions; Financial statement analysis and interpretation: ratio analysis.

Cost and Management Accounting: Cost concepts and classification; Overhead cost: meaning and classification; Distribution of overhead cost; Overhead recovery method/rate; Job order costing: preparation of job cost sheet and quotation price; Inventory valuation: absorption costing and marginal/variable costing techniques; Cost-Volume-Profit analysis: meaning breakeven analysis, contribution margin approach, sensitivity analysis.

Short-term investment decisions: relevant and differential cost analysis. Long-term investment decisions: capital budgeting, various techniques of evaluation of capital investments.

ECO 4101: Economics

Credit: 3.0

Definition of Economics; Economics and Engineering; Principles of Economics.

Micro-Economics: Fundamental economic problems and the mechanism through which these problems are solved; Theory of demand and supply and their elasticities; Theory of consumer behavior; Cardinal and ordinal approaches of utility analysis; Price determination; Price –ceiling and Price – floor, Nature of an economic theory; Applicability of economic theories to the problems of developing countries; Indifference curve techniques; Theory of production, Production function, Types of productivity; Cost analysis and cost function; Revenue, Cost and Profit analysis; Law of diminishing marginal product; Relationship among total, marginal and average concepts; Small scale production and large scale production; Concepts of market and market structure; Different types of Market Structure and analyzing their pricing and quantity determining factors; Optimization; Theory of distribution.

Macro-Economics: National income analysis; Measuring a nation's income (GDP, GNP, NNP); Measuring a nation's cost of living (CPI); The Financial System (Stocks, Bonds, Banks and Mutual Funds); Savings; Investment, Employment/Unemployment; Money (Functions of money, Money Creation/ Money Multiplier); Money, Banking and Policy options; Inflation; Monetary policy; Fiscal policy and Trade policy with reference to Bangladesh; Economics of development and planning.

IPE 3401: Industrial Management

Credit: 3.0

Introduction, evolution, management function, organization and environment.

Organization: Theory and structure; Coordination; Span of control; Authority delegation; Groups; Committee and task force; Manpower planning; Personnel Management: Scope; Importance; Need hierarchy; Motivation; Job redesign; Leadership; Participative management; Training; Performance appraisal; Wages and incentives; Informal groups; Organizational change and conflict, Cost and Financial Management; Elements of costs of products depreciation; Break-even analysis; Investment analysis; Benefit cost analysis.

Management Accounting: Cost planning and control; Budget and budgetary control; Development planning process.

Marketing Management: Concepts; Strategy; Sales promotion; Patent laws.

Technology Management: Management of innovation and changes; Technology life cycle; Case studies.

PSY 2101: Psychology

Credit: 3.0

Basic concepts and principles of psychology pertaining to real-life problems; fundamental processes that occur within organism-biological basis of behavior, perception, motivation, emotion, learning, memory and forgetting and also to the social perspective-social perception and social forces that act upon the individual.

BAN 2501: Bangla

Credits: 3

(অ) বাংলা সাহিত্য

ক। নির্বাচিত প্রবন্ধ : (যে কোনো ৩টি): (১) হরপ্রসাদ শাস্ত্রী: তৈল, (২) বঙ্কিমচন্দ্র চট্টোপাধ্যায়: বাঙালাভাষা (৩) রবীন্দ্রনাথ ঠাকুর: সভ্যতার সংকট, (৪) প্রমথ চৌধুরী: বীরবলের হালখাতা, (৫) মোতাহের হোসেন চৌধুরী: শিক্ষা ও মনুষ্যত্ব, (৬) অন্যান্য প্রবন্ধ (সহায়ক গ্রন্থ হতে নির্বাচিত)

খ। নির্বাচিত গল্প: (যে কোনো ৩টি): (১) রবীন্দ্রনাথ ঠাকুর: পোস্টমাস্টার / স্ত্রীর পত্র/ একরাত্রি, (২) বনফুল: নিমগাছ, (৩) বিভূতিভূষণ বন্দ্যোপাধ্যায়: পুঁইমাচা, (৪) বেগম রোকেয়া সাখাওয়াত হোসেন: অবরোধবাসিনী, (৫) সৈয়দ ওয়ালীউল্লাহ: নয়নচারা, (৬) অন্যান্য গল্প (সহায়ক গ্রন্থ হতে নির্বাচিত)

গ। নির্বাচিত কবিতা: (যে কোনো ৩টি): (১) রবীন্দ্রনাথ ঠাকুর: নির্ব্বরের স্বপ্নভঙ্গ, (২) কাজী নজরুল ইসলাম: আজ সৃষ্টি সুখের উল্লাসে, (৩) জীবনানন্দ দাশ: বনলতা সেন, (৪) শামসুর রাহমান: তোমাকে পাওয়ার জন্য হে স্বাধীনতা, (৫) নির্মলেন্দু গুণ: হুলিয়া (প্রেমাংশুর রক্ত চাই), (৬) অন্যান্য কবিতা (সহায়ক গ্রন্থ হতে নির্বাচিত)

ঘ। উপন্যাস (যে কোনো ১টি): বিভূতিভূষণ বন্দ্যোপাধ্যায়: আরণ্যক, অদ্বৈত মল্লবর্মণ: তিতাস একটি নদীর নাম, মানিক বন্দ্যোপাধ্যায়: দিবারাত্রির কাব্য

(আ) প্রায়োগিক বাংলা

(ক) বাংলাভাষায় লিখন-দক্ষতা: (১) বাংলা ধ্বনিতত্ত্ব (ধ্বনি, বর্ণ, ধ্বনি পরিবর্তন, যুক্তবর্ণ), (২) বাংলা বানান: বাংলা একাডেমির বাংলা বানানের নিয়ম, শব্দের অপপ্রয়োগ, শব্দের বানান ও অশুদ্ধি, (৩) বাক্যের শুদ্ধি- অশুদ্ধি: বাক্যের গঠনগত শুদ্ধি-অশুদ্ধি, বিরামচিহ্ন, (৪) বাংলা লিখন কৌশল: রেজুলেশন লিখন, অনুষ্ঠান সঞ্চালন পাণ্ডুলিপি প্রস্তুত, বিজ্ঞাপন লিখন, প্রুফ সংশোধন।

(খ) বাংলাভাষায় শ্রবণ ও কথন-দক্ষতা: (১) বাংলা উচ্চারণের নিয়ম: স্বরবর্ণ ও ব্যঞ্জনবর্ণের উচ্চারণের স্থান, উচ্চারণরীতি, (২) বাংলা উচ্চারণ- সূত্র ও তার প্রয়োগ

URC 1103: Life Skills for Success

Credits: 2.0

The course is intended for fresh entrants at the first trimester who need to be oriented and adapted to university survival skills, as well as achieving soft skills for success as a responsible citizen in the society. Complementary to this core object, students need to be motivated and inspired to study attentively with a sense of integrity and ethical orientation. In addition, this course will create students' awareness to build a successful career as well as becoming a successful individual in the society. The course will cover lectures on rules and regulations of the university, the importance of student life, contribution of family, building professional ethics and personal integrity, time management, study skills, etiquettes and manners, social responsibility including environmental concerns, effective communication, dealing with health and psychological issues, etc. The course is expected to take care of this broad gamut of soft skills that would immensely inspire towards developing a quality person.

MGT 3101: Principles of Management

Credit: 3.0

Meaning and Importance of Management; Evolution of Management thought; Decision making process; environmental impact on management; Corporate social responsibility; Basic functions of management - Planning; setting objectives; Implementing plans; Organizing; Organization design; Human resource management: Direction; Motivation; Leadership; Managing work groups; Controlling: Control principles; Process; and problems; Managers and Changing Environment.

SOC 4101: Introduction to Sociology

Credit: 3.0

Societal concepts; primary social institutions; social structure and stratification; religion; methods and different techniques of social research.

PHY 1201: Physics

Credits: 3.0

Properties of matter: Elasticity, Comparison in different states of matter, behavior of solid under stress-strain, elastic constants and energy calculation, Poisson's ratio.

Waves & Oscillations: Differential equation of a simple harmonic oscillator, total energy and average energy, combination of simple harmonic oscillations, Lissajous figures, spring-mass system, calculation of time period of torsional pendulum, damped oscillation, determination of damping co-efficient; forced oscillation, resonance, two-body oscillations, reduced mass, differential equation of a progressive wave, power and intensity of wave motion, stationary wave, group velocity and phase velocity.

Acoustics: Intensity of sound, Bel, acoustic intensity, architectural acoustics, noise insulation and reduction, sound distribution, Sabine's formula; room acoustics; requisites of a good auditorium.

Physical Optics: Theories of light; Interference of light, Young's double slit experiment, displacement of fringes, Interference in different media, Newton's rings, interferometers; diffraction of light; Fresnel and Fraunhofer diffraction, diffraction by different types of slit, resolving power, diffraction grating; polarization; production and analysis of polarized light, Brewster's law, Malus law, polarization by double refraction, Nicol prism, optical activity, Polarimeters, polaroid.

Heat and Thermodynamics: Principle of temperature measurements: thermometer and thermocouple, pyrometer; kinetic theory of gases: Maxwell's distribution of molecular speeds, mean free path, collisions, equipartition of energy, degrees of freedom, Brownian motion, Vander Waal's equation of state, review of the first law of thermodynamics and its application, reversible and irreversible processes, second law of thermodynamics, Carnot cycle; efficiency of heat engines, COP, Carnot's theorem, entropy and disorder, thermodynamic functions, Maxwell relations, Clausius-Clapeyron equation, Gibbs phase rule, third law of thermodynamics.

PHY 1202: Physics Lab

Credit: 1.5

Determination of line frequency by Lissajous figures using an oscilloscope and a function generator and verification of the calibration of time/div knob at a particular position for different frequencies; determination of frequency of a tuning fork by Melde's apparatus; determination of the spring constant and the effective mass of a loaded spring; to draw magnetic induction versus current curve for a circular coil using Biot-Savart law and hence to verify tangent law; determination of the moment of inertia of a fly-wheel about its axis of rotation; determination of rigidity modulus of the material of a wire by static method; determination of the pressure-coefficient of air by constant volume air thermometer; determination of the

thermal conductivity of a bad conductor by lee's method; to plot the thermo electromotive force vs temperature (calibration) curve for a given thermocouple (e5); determination of the melting point of a solid using the calibration curve obtained in experiment-e5; determination of the mechanical equivalent of heat by electrical method; determination of the focal length of (i) a convex lens by displacement method and (ii) a concave lens by an auxiliary lens method; determination of the radius of curvature of a plano-convex lens by Newton's ring method; determination of specific rotation of sugar solution by a polarimeter; to verify Malus' law of polarization; determination of the threshold frequency for the material of a photocathode and hence find the value of the Planck's constant; determination of lattice constant by x-ray.

CHEM 1211: Chemistry
Credits: 3.0

The Structure of atom and periodic properties of elements; Chemical bond and geometries of molecules; Chemistry of Halogen, alkali metals, alkaline earth metals, non-metals and heavy metals; Acid–base, pH and indicator concept; Solution and theory of dilute solution; Electrochemistry; Colloids; Adsorption; Reaction kinetics; Chemistry of water, its pollution and treatment; Chemistry of cements, silicates and limes; Chemical corrosion.

CHEM 1212: Chemistry Lab
Credit: 1.5

Volumetric analysis: acidimetry-alkalimetry; titrations involving redox reactions; determination of Cu, Fe and Ca volumetrically; determination of Ca and Mg in water.

CE 1100: Civil Engineering Drawing I
Credits: 1.5

Lines; plane geometry: drawing of linear and curved geometric figures, e.g. pentagon, hexagon, octagon, ellipse, parabola, hyperbola; solid geometry: concept of isometric view and oblique view, theory of projections; drawing of isometric view of 3d objects such as cube, prism, pyramid, cone and cylinder; projections of cube, prism, cone, cylinder; developments of cube, pyramid, cone, cylinder; plan, elevations and sections/perspective views of one storied and duplex building.

CE 1101: Engineering Mechanics
Credits: 3.0

Coplanar Concurrent, Parallel Coplanar and non-concurrent coplanar parallel force systems; moments; analyses of two-dimensional frames and trusses; centroids of lines, areas and volumes; moments of inertia of areas and masses; friction; plane motion; principles of work and energy; impulse and momentum.

CE 1200: Civil Engineering Drawing II
Credits: 1.5

Introduction to computer usage; introduction to CAD packages and computer aided drafting: drawing editing and dimensioning of simple objects; plan, elevations and sections of multi-storied buildings; reinforcement details of beams, slabs, stairs etc.; plan and section of septic tank; drawings of building services, detailed drawings of roof trusses and steel structures; Introduction to Building Information Modeling (BIM).

CE 1201: Surveying
Credits: 3.0

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; Tacheometry: introduction, principles and problems on tacheometry; Introduction to hydrographic surveying; Photogrammetry: introduction of aerial photography, reading of photo mosaic, scale; project surveying; errors in surveying.

CE 1202: Practical Surveying
Credits: 1.5

Linear and angular measurement techniques; field works on Plain Table, traverse surveying; leveling and contouring; curve setting; house setting; calculation of area and height; Total Station based survey; Drone based survey.

CE 2100: Construction Detailing and Estimation Lab
Credits: 1.5

Earthwork excavation for roadway and railway embankment, earthwork computation from spot levels; estimation for residential building: estimation of slab, beam, column, footing; analysis of rates and cost modeling, specifications, costing of residential building; estimation and costing of septic tank; estimation and costing of underground water reservoir; estimation and costing of retaining wall; estimation and costing of slab culvert; estimation of steel truss; computer aided quantity estimation; construction site survey and estimation.

CE 2101: Engineering Materials
Credits: 3.0

Properties and uses of aggregates, brick, cement; sand, lime, mortars; grouts; concrete; concrete mix design; Reinforcement; Wood products; advanced fiber reinforced polymer (FRP) composites and its application to civil engineering; elasto-plastic and elasto-visco-plastic materials; ferrocement: advantages and uses; corrosion prevention of steel in RC structures, Geotextiles, Building protection materials: Crystallization slurry/grout in-depth damp/or waterproofing and Membrane for water protection.

CE 2102: Engineering Materials Laboratory
Credits: 1.5

Determination of 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 absorption, unit weight, efflorescence and compressive strength.

CE 2104: GIS and Remote Sensing Lab
Credits: 1.5

Emergence of the Science of 'Where'; Introduction to Digital Map; Geographic Coordinate System and Map Projection; Introduction to Remote Sensing; Introduction to Global Positioning System (GPS); Introduction to Geographical Information System; GIS data models; Data Sources and Data Entry, Digitizing; Attribute Data: Queries and Analysis; Spatial Data: Spatial Queries and Basic Spatial Analysis;

Characteristics of Satellite Images; Image interpretation and Analysis; Application of GIS and RS in Civil Engineering.

CE 2111: Mechanics of Solids I

Credits: 3.0

Pre-requisite CE 1101

Concepts of stress and strain, constitutive relationships; deformations due to tension, compression and environmental change (shrinkage, creep & temperature); 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; flexural and shear stresses in beams; shear center; thin walled pressure vessels.

CE 2171: Fluid Mechanics

Credits: 3.0

Fluid properties; fluid statics; kinematics of fluid flows; fluid flow concepts and basic equations- continuity equation, Bernoulli's equation, energy equation, momentum equation and forces in fluid flow; 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; pipe flow problems-pipes in series and parallel, branching pipes, pipe networks.

CE 2172: Fluid Mechanics Lab

Credits: 1.5

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 2200: Details of Construction

Credits: 1.5

Types of building, components of a building, design loads, framed structure and load bearing wall structure; foundations: shallow foundation and deep foundation, retaining wall, shore protection, site exploration, bearing capacity of soil, standard penetration test; brick masonry: types of brick, bonds in brickwork, supervision of brickwork, bricklaying tools, defects and strength on brick masonry, typical structures in brickwork, load bearing and non-load bearing walls, cavity walls, partition walls; lintels and arches: different types of lintels and arches, loading on lintels, construction of arches; 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 2201: Engineering Geology and Geomorphology

Credits: 3.0

Minerals; identification of minerals, common rock forming minerals; physical properties of minerals; mineraloids rocks; types of rocks, cycle of rock change; earthquake and seismic map of Bangladesh. Structural geology; faults; types of faults; fold and fold type; domes; basins; erosional process; quantitative analysis of erosional landforms. Channel development; channel widening; valley shape; stream terraces; alluvial flood plains; deltas and alluvial fans; channel morphology; channel patterns and the river basin; geology and geomorphology of Bangladesh.

CE 2203: Numerical Analysis and Computer Programming**Credits: 3.0**

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. 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.

Introduction to high-level computational programming tools, application to numerical analysis: basic matrix computation.

CE 2211: Mechanics of Solids II**Credits: 3.0****Pre-requisite CE 2111**

Elastic analysis of circular shafts, solid non circular and thin walled tubular members subjected to torsion; Torsional Stress and Rotation; symmetric and asymmetric bending of beams; stress transformation: Mohr's circle; beam deflection by direct integration and moment area method; buckling of columns; elastic strain energy and external work; bolted, riveted and welded joints

CE 2212: Structural Mechanics and Materials Laboratory**Credits: 3.0**

Tension, direct shear and impact tests of mild steel specimen; slender column test; static bending test; hardness test of metals; helical spring test; determination of shear center; study of structural models: truss, beam, frame.

CE 2271: Engineering Hydrology**Credits: 3.0**

Hydrologic Cycle; 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.

CE 3111: Structural Analysis and Design I**Credits: 3.0****Pre-requisite CE 2111**

Stability and determinacy of structures; analysis of statically determinate arches; analysis of suspension bridge; wind load and earthquake load; influence lines; moving loads on beams, frames and trusses; vertical load analysis of multi storied building frames; deflection of beams, trusses and frames by virtual work method; analysis of space truss.

CE 3112: CE 3112: Reinforced Concrete Structure Design Lab**Credits: 1.5****Prerequisite CE 3113**

Analysis and design of low-rise RC moment frame buildings for gravity load; design of staircase; structural design of shallow and deep foundations; Computer application for building analysis and design.

CE 3113: Design of Concrete Structures**Credits: 3.0**

Fundamental behavior of reinforced concrete and loads on structure; 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 criteria of beams; bond and anchorage; design of one-way slabs; design of two-way edge supported slabs using alternate (coefficient) method; design of columns under uniaxial and biaxial loading; seismic detailing.

CE 3131: Water Supply Engineering**Credits: 3.0**

Introduction to Environment and climate change; Water Supply Engineering: introduction, Water demands; Water supply scenario in Bangladesh and SDG targets; 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 tube wells, deep tube wells, deep set pumps, rainwater harvesting and alternative water supplies for problem areas, Surface water collection and transportation; head works; Pumps and pumping machineries; Water distribution systems; analysis and design of distribution network; fire hydrants; water meters; leak detection; unaccounted for water, water treatment technologies, Water safety plans, Miscellaneous treatment methods; Low-cost treatment methods for rural communities

CE 3132: Environmental Engineering Laboratory**Credits: 1.5**

Water and wastewater sampling techniques, sample preservation, Water quality requirements: physical, chemical and biological tests of water and wastewater; sampling and laboratory analysis of air, sampling and laboratory analysis of soil and solid waste.

CE 3171: Open Channel Flow**Credits: 3.0**

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, diffusion and dispersion of open channels.

CE 3172: Open Channel Flow Laboratory**Credits: 1.5**

State of flow; broad-crested weir; sluice gate; venturi flume; parshall flume; cutthroat flume; hydraulic jump; velocity distribution profile; discharge and mean velocity; specific force and specific energy.

CE 3201: Project Planning and Construction Management**Credits: 3.0**

Project planning and evaluation; feasibility reports; cash flows, payback period, internal rate of return; benefit-cost ratio; cost-benefit analysis case studies; Planning and scheduling, PERT, CPM; resource scheduling; linear programming and application.

Construction management: principles, project organization, methods and practices, technology, management of materials and equipment, site management, contracts and specifications, inspection and quality control, safety, economy. Conflict management; psychology in administration: human factors in management; human resource management. Demand forecasting; inventory control; stores management; procurement; legal issues in construction; environmental regulations.

CE 3211: Design of Steel Structures**Credits: 3.0****Prerequisite CE 2211**

Behavioral principles and design of structural steel; introduction to floor systems for steel buildings; design of tension members: bolted and welded connections; design of compression members: residual stress, local buckling, effective length; design of flexural members: flexure and shear strength, deflection; design of beam-columns; connection design: simple shear connection, moment connections, column bases

CE 3212: Steel Structures Design Lab**Credits: 1.5**

Analysis and design of low-rise moment frame building for gravity and lateral loads with computer application; design of members, connections and column bases.

CE 3231: Wastewater Engineering**Credits: 3.0**

Wastewater Engineering: introduction; estimation of wastewater; Wastewater collection systems; Hydraulics of sewer; Design, construction and maintenance of sanitary sewer and storm drainage system; Sewer appurtenances; Plumbing system, Microbiology of wastewater; wastewater characteristics; Wastewater treatment and disposal; Treatment and disposal of industrial effluents; Sludge treatment and disposal; Sanitation and health; Sanitation coverage in Bangladesh and SDG targets; Fecal sludge management, Decentralized wastewater treatment system, Low-cost sanitation technology; septic tank system; Sustainability of water and sanitation services; Participatory development approach in water and sanitation sector; community management of water and sanitation services.

CE 3241: Soil Mechanics**Credits: 3.0**

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 3242: Geotechnical Engineering Laboratory

Credits: 1.5

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 3251: Transportation Planning and Traffic Engineering

Credits: 3.0

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, land use-transport interaction, travel demand forecasting; road safety and accident analysis. Road safety and 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, roadway lighting; transportation in Bangladesh: transportation modes and networks, constraints and challenges, transport demand and modal share, road classification and design standards.

CE 4000A: Final Year Design Project I

Credits: 3.0

Planning, analysis and design of an integrated civil engineering project with emphasis on structural engineering/environmental engineering/ transportation engineering/ geotechnical engineering specialization. Students shall work in teams to apply civil engineering theories, methodologies, and skills to assess the technical, environmental, and social feasibility of the project including design and cost estimation. Students shall engage their diverse civil engineering and cross-disciplinary knowledge to prepare plans and specifications of the project including Bill of Quantity (BoQ) and tender documents.

Experimental and theoretical investigation of various topics in structural engineering, environmental engineering, transportation engineering and geotechnical engineering. Individual or group study of one or more topics from any of the aforementioned fields.

CE 4000B: Final Year Design Project II

Credits: 3.0

Prerequisite CE 4000A

Implement the problem defined by the group of students in the course CE 4000A; demonstrate the outcome of the project.

development and management; Legal aspects of professional practice (contracts, risk management, insurance and bonds); Communication skills; Legal, Ethical, and Practical Aspects of Communication.

CE 4110: CE 4110: Computer Applications in Civil Engineering
Credits: 1.5

Design of Slab Bridge; Design and detailing of a balanced cantilever bridge; design and detailing of a PC Girder Bridge.

CE 4111: Structural Analysis and Design II
Credits: 3.0
Prerequisite CE 3111

Approximate analysis of statically indeterminate structures: mill bents, braced trusses, portal method, cantilever method; Analysis of statically indeterminate beams, frames and trusses by moment distribution, consistent deformation/flexibility and stiffness methods; influence lines of statically indeterminate structures.

CE 4141: Foundation Engineering
Credits: 3.0
Prerequisite CE 3241

Soil investigation techniques; types of foundations; bearing capacity of shallow and deep foundations; settlement and distortion of foundations; design and construction of footings: rafts, piles; slope stability analyses, ground improvement techniques: sand drain/pile, stone pile, perforated vertical drain.

CE 4151: Highway Design and Railway Engineering
Credits: 3.0

Highway materials: bituminous binders, cement, aggregates, embankment material, sub grade, sub base and base courses, soil stabilization; mix design methods; low-cost roads; flexible and rigid pavement: pavement components and functions, pavement (rigid and flexible) design and construction, road maintenance; railway engineering: general requirements, rolling stock and tracks, alignment, permanent way, stations and yards, points and crossings, signaling, maintenance operations.

CE 4152: Highway Materials and Traffic Engineering Design Lab
Credits: 1.5

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

CE 4171: Irrigation and Flood Control
Credits: 3.0

Importance of irrigation; sources and quality of irrigation water; soil water relationship; consumptive use and estimation of irrigation, methods of irrigation, water requirements, quality of irrigation water, design of irrigation, canal system; irrigation structures; irrigation pumps; problems of irrigated land; Flood and its Control.

CE 4201: Engineering Ethics and Professional Practices
Credits: 3.0

Introduction to ethical theories and principles; Code of ethics for professional engineers, Common ethical issues and making ethical decision; Professional practice and responsibility; Responsibilities to professional engineer employers, clients, other professionals and business practices; Civil engineer's role in project.

CE 4202: Industrial Attachment and Professional Practices

Credits: 1.5

Application of communication theory and professional practice approaches in a controlled class room environment; this may include case study analysis, role playing, preparing small reports and proposals, class room presentations and individual reports etc.

EEE 1201: Basic Electrical Engineering

Credits: 2.0

Circuit variables: voltage, current, power and energy, Voltage and current independent and depended sources, Circuit elements resistance, inductance and capacitance. Modeling of practical circuits, Ohm's law and Kirchoff's laws, Solution of simple circuits with independent sources, Series-parallel resistance circuits and their equivalents, Voltage and current divider circuits, Delta-Wye equivalent circuits

Techniques of general DC circuit analysis (containing independent sources): Node-voltage method, Mesh-current method. Definitions of ac voltage, current, power, volt-ampere and various factors (including power, peak, etc.)

Introduction to sinusoidal steady state analysis: Sinusoidal sources, phasor, impedance, reactance; voltage, current, power of R, L, C, R-L, R-C, R-L-C circuits with sinusoidal source.

Introduction to the importance of designing the electrical building services for residential buildings, industrial buildings, multistoried office buildings, multistoried multipurpose buildings, Bangladesh National Building Code (BNBC) and Wiring regulations. Basic Symbols and Notations for the creation of Electrical Drawings consistent with BNBC standards and codes, Current Ratings, Legends of conduits, Mounting locations, Demonstration on a simple Architectural Structure. Fitting and Fixtures layout, Conduit layout (Light loads wiring, Heavy loads wiring) Switchboard connection diagram, Sub-Distribution board connection diagram, Switchboard grouping, Switchboard to SDB connection diagram, Cable TV, Telephone, Internet and Calling Bell wiring, Substation wiring, Lift wiring SDB, Solar panel wiring.

CSE 2100: Computer Programming Lab

Credits: 1.5

Introduction to Python; Python setup: installation, IDE, modules and packages, Github; Object and data structure basics: numbers, strings, lists, dictionaries, tuples, set, booleans; comparison operators; Python statements: if, elif, else, loop, nested statement, list comprehensions; methods and functions: methods, functions, lambda expressions, map and filter functions; errors and exception handling; Data visualization with Python: matplotlib, seaborn; Data analysis with Python: pandas, numpy; Application of Python.

ARCH 3200: Architectural, Engineering & Planning Appreciation

Credits: 1.5

Evolution of Architecture, Basic Design, Understanding Architecture and its relation to Civil Engineering, Plan arrangement with special consideration in functional flow, lighting and ventilation, Spaces & Forms in Architecture & Urban Design, Spatial Structures of Cities; Study with relevant examples from Composition, Fundamentals of electrical and mechanical components, Architecture and Urban Planning, Environmental and social issues.

List of Civil Engineering Elective Courses

CE 4211: Introduction to Structural Fire Protection **Credits: 2.0**

Introduction to Fire Safety Engineering; Behavior of Natural Fire; Design philosophies; Standard Fire Tests; Performance Criteria; Prescriptive Approach; Standard Calculation Method for Structural Fire Protection: Concrete and Steel Construction.

CE 4213: Introduction to Steel-Concrete Composite Structures **Credits: 2.0**

Introduction to composite structures; advantages of composite construction; interaction between steel and concrete, shear connectors, elastic analysis of composite beams, beam-column connections, behavior of different types of composite columns, axial load capacity and interaction diagrams for composite columns.

CE 4215: Prestressed Concrete **Credits: 2.0**

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 4217: Design of Concrete Structures II **Credits: 2.0**

Analysis and design for torsion; design of column supported slabs; Introduction to slender columns; design and detailing of shear wall; design of reinforcement at joints.

CE 4219: Introduction to Finite Element Method **Credits: 2.0**

Introduction to finite element method as applied to stress analysis problems; basic equations in elasticity, matrix displacement formulation, element shapes, nodes, nodal unknowns and coordinate system, shape functions, strain displacement matrix, methods for assembling stiffness equations e.g. direct approach, Galerkin's method, virtual work method, principle of minimum potential energy; introduction to isoparametric formulation; discretization of a structure and mesh refinement, one dimensional stress-deformation and two dimensional plane stress and plane strain analysis of stress deformation problems; numerical integration and computer application.

CE 4221: Dynamics of Structures **Credits: 2.0**

Single degree of freedom system, formulation of equation of motion; free vibration response; response to harmonic, impulse and general dynamic loading; response spectra; MDOF system: Eigenvalue problem, modal analysis

CE 4231: Solid and Hazardous Waste Management**Credits: 2.0**

Solid Waste Management: sources and types of solid wastes; physical and chemical properties of solid wastes; solid waste generation; onsite handling, storage and processing; collection of solid wastes; transfer stations and transport; ultimate disposal methods; resources and energy recovery and recycling; 3R strategy; Solid waste management policy in Bangladesh, Hazardous Waste Management: identification, sources and characteristics of hazardous wastes; hospital waste management practices; legal aspects; auditing and prevention; methods of treatment and disposal: physical, chemical, biological and thermal treatment; stabilization and solidification, engineering storage, incineration, landfill and deep burial

CE 4233: Environmental Pollution Management**Credits: 2.0**

Environmental pollution and its Control; water pollution: sources and types of pollutants; water quality problems in Bangladesh, industrial pollution; heavy metal contamination; detergent pollution and eutrophication; groundwater 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, climate change and ozone layer depletion; acid rain; air pollution monitoring and control measures; introduction to air quality models, noise pollution and control measures, introduction to soil pollution

CE 4235: Environmental and Sustainable Management**Credits: 2.0**

Environment and development projects: environment and sustainable development; environmental policies and legislation; environmental implication of sectoral development; environmental quality standards; environmental issues and priorities; environmental impact assessment of development schemes-baseline studies, assessment methodologies; economics of environmental management; contemporary issues; case studies.

CE 4241: Earth Retaining Structures**Credits: 2.0**

Foundation of structures subjected to lateral loads; rigid and flexible earth retaining structures; methods of construction: dewatering and slurry-wall construction, braced excavation, sheet piles, cofferdams, caissons.

CE 4243: Elementary Soil Dynamics**Credits: 2.0**

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

CE 4245: Soil-water Interaction**Credits: 2.0**

Introduction to soil-water interaction problems: permeability, capillarity and soil suction; slopes subjected to water current, wave action etc.; theories of filters and revetment design; geotechnical design of landfills.

CE 4251: Traffic Engineering Design and Management
Credits: 2.0

Advanced concepts of traffic management, management strategies; analysis of traffic flow characteristics; traffic control devices; 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 4253: Pavement Management, Drainage and Airport
Credits: 2.0

Pavement management systems; evaluation and strengthening of pavements; drainage: 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 4255: Urban Transportation Planning and Management
Credits: 2.0

The urban transport problems and trends; road network planning; characteristics and operation of different transit and paratransit modes, planning transit network; estimating system costs and benefits, pricing and financing, evaluation, transit users attitude, policies and strategies for transit development in metropolitan cities; freight traffic planning and management; selected transport case studies, congestion management; safety management; environmental issues and sustainable transport.

CE 4271: Flood Mitigation and Management
Credits: 2.0

Flood and its causes; methods of flood management: structural and nonstructural measures such as reservoirs, levees and floodwalls, channel improvement, interior drainage, floodways, land management, flood proofing, flood zoning, flood hazard mapping, flood forecasting and warning. Economic aspects of flood management: flood risk and vulnerability analysis, direct and indirect losses of flood, flood damage assessment, flood damage in urban and rural areas.

CE 4273: Groundwater Engineering
Credits: 2.0

Groundwater in the 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.

CE 4275: River Engineering
Credits: 2.0

Behavior of alluvial rivers; river channel pattern and fluvial processes; aggradation and degradation, local scours, river training and bank protection works; navigation and dredging sediment movement in river channels, bed form and flow regimes.

CE 4277: Hydraulic Structures**Credits: 2.0**

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

CE 4279: Coastal Engineering**Credits: 2.0**

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