الجامعة الإسلامية للتكنولوجيا

UNIVERSITÉ ISLAMIQUE DE TECHNOLOGIE

ISLAMIC UNIVERSITY OF TECHNOLOGY (IUT)

ORGANISATION OF ISLAMIC COOPERATION (OIC)

COURSE STRUCTURE AND COURSE CONTENTS

Department of Civil and Environmental Engineering (CEE)

2024

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(New Syllabus applicable from
Semester 1, Session 2023-2024)

Version - VI

DEPARTMENT OF CIVIL AND ENVIRONMENTAL ENGINEERING (CEE)

2024

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“This updated syllabus was instrumental in helping the Department of Civil and Environmental Engineering (CEE) achieve accreditation from the Board of Accreditation for Engineering and Technical Education (BAETE), recognized under Washington Accord for six years, from 12th July 2023 to 12th July 2028.”

GENERAL INFORMATION

The Department of Civil and Environmental Engineering (CEE) started its journey in 2008 with a four-year B. Sc. in Civil Engineering program. The curriculum of the program covers courses from different areas, such as general science and mathematics, arts and humanities, basic engineering, capstone courses, and elective engineering courses from different branches of civil engineering - structural engineering, environmental engineering, geotechnical engineering, transportation engineering, and water resources engineering. Elective courses in the different branches of civil engineering are taught in third and fourth years to enhance/widen the depth of knowledge in particular subjects. The total number of credit hours of the program is 181.0, including 139 credit hours from theory courses, and 42 credit hours from sessional courses. The curriculum of the program is revised regularly based on feedback from the students, employer, faculties, and other stakeholders. The fourth revision of the syllabus of the B.Sc. in Civil Engineering program was made in October 2015. In 2021 further moderation was made to introduce the CEE 4806, Final Year Design Project (FYDP).

In addition to the theoretical and sessional courses, the department regularly organizes industrial visits for the students. Also, seminars, workshops, and conferences are organized regularly in the department to give opportunity to the students to be familiar with recent development of knowledge in the field of civil engineering. It also helps the students to understand the necessity of continuous learning for serving the society effectively.

At present, forty-five students are admitted in the B. Sc. in Civil Engineering programme every year. Each year comprises two semesters - the summer semester and the winter semester. At present, the total number of undergraduate students in the department is about 380.
The department has started a two-year Master of Science in Civil Engineering programme in 2012 to enhance capability of research works in the department. For graduation, a student needs to complete 36 credit hours. Currently, the total number of master students is about 100. For further enhancement of research activities in the department, the department has started Ph.D. programme from session 2019-2020.

VISION

To be a recognized leader in Civil Engineering education, research, and learning experience.

MISSION

- Providing a dynamic learning environment emphasizing open-ended design, system-level thinking, service-based learning, communication, leadership, and managerial skills through innovative course content and delivery.

- Producing ethically strong global engineers who will impart knowledge and excellence in civil engineering practice and research.

- Creating a center of excellence in civil engineering education and research.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

The graduates of Bachelor of Science in Civil Engineering are expected to acquire and demonstrate the following program education objectives (PEOs) down to three to five years of graduation.

PEO1	Have high-level expertise in mathematical, scientific, and engineering principles to develop solutions for complex engineering problems.
PEO2	Have adequate knowledge to pursue advanced engineering studies for professional growth leading to certifications, professional licenses, and advanced academic degrees.
PEO3	Possess outstanding leadership abilities, effective communication and be innovative in planning, designing, and managing civil engineering projects.
PEO4	Practice in civil engineering fields with due consideration to society, environment, sustainability, and ethical norms.

PROGRAM OUTCOMES (POs)

Program Outcomes (POs) are narrower statements that describe what students are expected to know and be able to do by the time of graduation. These relate to the knowledge, skills and attitudes that students acquire while progressing through the program. The program must demonstrate that by the time of graduation, students have attained a certain set of knowledge, skills and behavioral traits to some acceptable minimum level. The Department of CEE, IUT specifically requires that students acquire the following graduate attributes.

PO1: **Engineering knowledge**: Apply knowledge of mathematics, natural science, engineering fundamentals and an engineering specialization as specified in K1 to K4 respectively to the solution of complex engineering problems.

PO2: **Problem analysis:** Identify, formulate, research literature and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences. (K1 to K4)

PO3: **Design/development of solutions:** Design solutions for complex engineering problems and design systems, components or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations. (K5)

PO4: **Investigation:** Conduct investigations of complex problems using research-based knowledge (K8) and research methods including design of experiments, analysis and interpretation of data, and synthesis of information to provide valid conclusions.

PO5: **Modern tool usage:** Create, select and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modelling, to complex engineering problems, with an understanding of the limitations. (K6)

PO6: **The engineer and society:** Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues, and the consequent responsibilities relevant to professional engineering practice and solutions to complex engineering problems. (K7)

PO7: **Environment and sustainability:** Understand and evaluate the sustainability and impact of professional engineering work in the solution of complex engineering problems in societal and environmental contexts. (K7)

PO8: **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice. (K7)

PO9: **Individual work and teamwork:** Function effectively as an individual, and as a member or leader in diverse teams and in multi-disciplinary settings.

PO10: **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11: **Project management and finance**: Demonstrate knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12: **Life-long learning:** Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

To successfully attain the previously mentioned Program Outcomes, Department of Civil and Environmental Engineering ensured that the curriculum encompasses all the attributes of the Knowledge Profile (K1-K8) as presented in Table. 1 as included in the PO statements. Moreover, the ranges of Complex Engineering Problem Solving (P1-P7) and Complex Engineering Activities (A1-A5) are given in Table 2 and Table 3, respectively.

Table 1: Knowledge Profile

	Attribute
K1	A systematic, theory-based understanding of the natural sciences applicable to the discipline
K2	Conceptually based mathematics, numerical analysis, statistics and formal aspects of computer and information science to support analysis and modelling applicable to the discipline
K3	A systematic, theory-based formulation of engineering fundamentals required in the engineering discipline
K4	Engineering specialist knowledge that provides theoretical frameworks and bodies of knowledge for the accepted practice areas in the engineering discipline; much is at the forefront of the discipline
K5	Knowledge that supports engineering design in a practice area
K6	Knowledge of engineering practice (technology) in the practice areas in the engineering discipline
K7	Comprehension of the role of engineering in society and of the identified issues in engineering practice in the discipline: ethics and the engineer's professional responsibility to public safety; the impacts of engineering activity in economic, social, cultural, environmental and sustainability terms
K8	Engagement with selected knowledge in the research literature of the discipline

Table 2: Range of Complex Engineering Problem Solving

Attribute	Complex Engineering Problems have characteristic P1 and some or all of P2 to P7:
Range of conflicting requirements	Involve wide-ranging or conflicting technical, engineering, and other issues

Depth of analysis required	Have no obvious solution and require abstract thinking and originality in analysis to formulate suitable models
Depth of knowledge required	Require research-based knowledge, much of which is at or informed by the forefront of the professional discipline, that allows a fundamental-based, first-principles analytical approach
Familiarity of issues	Involve infrequently encountered issues
Extent of applicable codes	Are outside the problems encompassed by standards and codes of practice for professional engineering
Extent of stakeholder involvement and level of conflicting requirements	Involve diverse groups of stakeholders with widely varying needs
Consequences	Have significant consequences in a range of contexts
Interdependence	Are high-level problems that include many component parts or sub-problems

Table 3: Range of Complex Engineering Activities

Attribute	Complex activities means (engineering) activities or projects that have some or all of the following characteristics:
Range of resources	Involve the use of diverse resources (for this purpose, resources include people, money, equipment, materials, information and technologies)
Level of interaction	Require the resolution of significant problems arising from interactions between wide-ranging or conflicting technical, engineering or other issues
Innovation	Involve the creative use of engineering principles and research-based knowledge in novel ways

Consequences for society and the environment	Have significant consequences in a range of contexts, characterized by their difficulty of prediction and mitigation
Familiarity	Are outside the problems encompassed by standards and codes of practice for professional engineering

PROGRAMMES OFFERED by CEE Department

Undergraduate

- Bachelor of Science in Civil Engineering

Postgraduate

- Ph.D. in Civil Engineering
- Master of Science in Civil Engineering
- Master of Engineering in Civil Engineering

CEE FACULTY

Head of the Department

Prof. Dr. Shakil Mohammad Rifaat
Ph.D. (University of Calgary, Canada); M.Sc. (The National University of Singapore, Singapore); B.Sc. Eng. (BUET)

Professors

Dr. Md. Tarek Uddin, PEng.
Ph.D. (Tokyo Institute of Technology, Japan); M. Sc. Eng. (Asian Institute of Technology, Thailand); B.Sc. Eng. (BUET)

Dr. Md. Rezaul Karim
Ph.D. (Yamaguchi University, Yamaguchi, Japan); M.Sc. (BUET); B.Sc. Eng. (BUET)

Dr. Hossain Md. Shahin
Ph.D. (Nagoya Institute of Technology, Nagoya, Japan);
M. Sc. Eng. (Nagoya Institute of Technology, Nagoya, Japan); B.Sc. Eng. (BUET)

Dr. Moinul Hossain
Ph.D. (Tokyo Institute of Technology, Japan);
M. Eng. (Tokyo Institute of Technology, Japan); M.Eng. (Asian Institute of Technology, Thailand); B.Sc. Eng. (BUET)

Associate Professors

Dr. Nazmus Sakib
Ph.D. (The University of Texas at Austin, USA) M.Sc. (The University of Texas at Austin, USA); B.Sc. Eng. (BUET)

Dr. Amimul Ahsan
Ph.D. (University of Fukui, Japan); M.Sc. (KUET); B.Sc. Eng. (KUET)

Assistant Professors

Dr. Md. Imran Kabir
Ph.D. (University of New South Wales, Australia); M.Sc. (Concordia University, Canada); B.Sc. Eng. (BUET)

Dr. Tanvir Ahmed
Ph.D. (The University of Western Australia),
M.Sc. (IUT), B.Sc. Eng. (IUT)

Mr. Mohammed Zunaied-Bin-Harun
M.Sc. (IUT), B.Sc. Eng. (IUT)

Mr. Md. Habibur Rahman Khan Bejoy
M.Sc. (IUT), B.Sc. Eng. (IUT)

(On Leave for Higher Study)

Ms. Farnia Nayar Parshi
Ph.D. (Ongoing, BUET); M.Sc. (BUET); B.Sc. Engg. (BUET)

Mr. Ijaj Mahmud Chowdhury
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Mr. Mozaher Ul Kabir
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Ms. Nafisa Islam
Ph.D. (Ongoing, North Carolina State University, USA) M.Sc. (BUET), B.Sc. Eng. (BUET)

Lecturers

Mr. Fuad Bin Nazrul
M.Sc. (Ongoing, IUT), B.Sc. Eng. (IUT)

Mr. Niaz Ahmed
M.Sc. (Ongoing, IUT), B.Sc. Eng. (IUT)

Mr. K.B.M. Ibrahim
M.Sc. (Ongoing, BUET), B.Sc. Eng. (IUT)

Mr. Farhan Anjum Badhon
M.Sc. (Ongoing, IUT), B.Sc. Eng. (IUT)

Ms. Anika Tahsin Nabila
M.Sc. (Ongoing, BUET), B.Sc. Eng. (IUT)

Ms. Mahanaz Faiza
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Ms. Maisha Hossain
M.Sc. (Ongoing, IUT), B.Sc. Eng. (IUT)

Mr. Mohammad Abu Umama
M.Sc. (Ongoing, IUT), B.Sc. Eng. (IUT)

Mr. Syed Rafiuzzaman
M.Sc. (Ongoing, BUET), B.Sc. Eng. (BUET)

(On Leave for Higher Study)

Mr. Md. Asif Hasan Anik
Ph.D. (Ongoing, Dalhousie University, Canada) Master of Applied Science in Civil Engineering (Dalhousie University, Canada), B.Sc. Eng. (IUT)

Mr. Zihan Mahmood Nahian
Ph.D. (Ongoing, Florida State University, USA), B.Sc. Eng. (IUT)

Mr. Musaddik Hossain
Ph.D. (Ongoing, Georgia Institute of Technology, USA), B.Sc. Eng. (IUT)

Mr. Daud Nabi Hridoy
Ph.D. (Ongoing, Virginia Tech, USA), B.Sc. Eng. (IUT)

COURSE STRUCTURE FOR UNDERGRADUATE PROGRAMME

L = Lecture, P = Practical

First Semester

Course Number	Course Title	Contact Hours		Credit Hours
		L	**P**	
Math 4153	Differential and Integral Calculus, Matrix	3		3
CEE 4103	Surveying	4		4
Phy 4153	Physics I	3		3
Chem 4153	Chemistry I	3		3
CEE 4101	Introduction to Civil Engineering	2		2
Hum 4157	Islamiat	2		2
Hum 4152/ Hum 4154	Arabic I / English I		2	1
Phy 4154	Physics I Lab		1.5	0.75
Chem 4154	Chemistry I Lab		1.5	0.75
CEE 4102	Civil Engineering Drawing I		3	1.5
MCE 4104	Workshop Practice		3	1.5
	Total L-P	**18**	**11**	**22.5**
	Total Hours	**29**		

Second Semester

Course Number	Course Title	Contact Hours		Credit Hours
		L	**P**	
Math 4253	Vector Algebra, Vector Calculus, ODE	3		3
Phy 4253	Physics II	3		3
Chem 4253	Chemistry II	3		3
CEE 4201	Analytic Mechanics	4		4
Hum 4257	Islamic History Science and Culture	3		3
GS 4253	Ecology and Environment	3		3
Phy 4254	Physics II Lab		1.5	0.75
Chem 4254	Chemistry II Lab		1.5	0.75
Hum 4252/ Hum 4254	Arabic II/ English II		2	1.0
CEE 4202	Civil Engineering Drawing II		3	1.5
CEE 4204	Practical Surveying*			1.5
	Total L-P	**19**	**11**	**24.5**
	Total Hours	**30**		

* Two weeks of field work.

Third Semester

Course Number	Course Title	Contact Hours		Credit Hours
		L	**P**	
Math 4353	Laplace Transformation, Series, PDE	3		3
GS 4351	Engineering Geology and Geomorphology	3		3
CEE 4311	Mechanics of Solids I	3		3
CEE 4361	Fluid Mechanics	3		3
EEE 4385	Electrical and Electronic Technology	3		3
GS 4353	Numerical Methods and Computer Programming	3		3
CEE 4312	Mechanics of Solids Lab		3	1.5
GS 4354	Computer Programming and Application Lab		3	1.5
CEE 4362	Fluid Mechanics Lab		3	1.5
EEE 4386	Electrical and Electronic Technology Lab		1.5	0.75
	Total L-P	**18**	**10.5**	**23.25**
	Total Hours	**28.5**		

Fourth Semester

Course Number	Course Title	Contact Hours		Credit Hours
		L	P	
Math 4453	Probability and Statistics	3		3
CEE 4413	Mechanics of Solids II	3		3
CEE 4411	Engineering Materials and Concrete Technology	4		4
CEE 4431	Water Supply Engineering	3		3
CEE 4441	Soil Mechanics	4		4
Hum 4459	Science, Technology and Islam	2		2
CEE 4412	Engineering Materials and Concrete Technology Lab		3	1.5
CEE 4432	Environmental Engineering Sessional I		1.5	0.75
CEE 4442	Soil Mechanics Lab		3	1.5
	Total L-P	**19**	**7.5**	**22.75**
	Total Hours	**26.5**		

Fifth Semester

Course Number	Course Title	Contact Hours		Credit Hours
		L	**P**	
CEE 4511	Design of Concrete Structures I	3		3
CEE 4513	Structural Analysis and Design I	4		4
CEE 4565	Open Channel Flow	3		3
CEE 4551	Transportation and Traffic Engineering	3		3
CEE 4563	Hydrology	3		3
CEE 4543	Foundation Engineering	3		3
CEE 4566	Open Channel Flow Lab		3	1.5
Hum 4552	Technical Report Writing and Presentation		3	1.5
	Total L-P	**19**	**6**	**22**
	Total Hours	**25**		

Sixth Semester

Course Number	Course Title	Contact Hours		Credit Hours
		L	**P**	
CEE 4633	Waste Management and Environmental Sanitation'	3		3
CEE 4653	Pavement and Railway Engineering	3		3
Hum 4651	Project Planning and Management	3		3
CEE 4611	Design of Concrete Structures II	3		3
Hum 4659	Technology, Environment, and Society	3		3
CEE 46XX	Elective Subject 6-I	3		3
CEE 4614	Structural Analysis and Design Sessional I		3	1.5
CEE 4612	Design of Concrete Structures Sessional		3	1.5
CEE 4652	Transportation Engineering Sessional I		3	1.5
CEE 4634	Environmental Engineering Sessional II		1.5	0.75
	Total L-P	**18**	**10.5**	**23.25**
	Total Hours	**28.5**		

Elective Subject 6-I:

1. CEE 4613: Design of Pre-stressed Concrete Structures
2. CEE 4635: Environmental Economics
3. CEE 4645: Theoretical Geomechanics
4. CEE 4655: Civil Engineering Data Analysis
5. CEE 4665: Irrigation and Drainage Engineering

Seventh Semester

Course Number	Course Title	Contact Hours		Credit Hours
		L	P	
CEE 4700	Project and Thesis I		3	1.5
CEE 4806	Final Year Design Project		3.75	
CEE 47XX	Elective Subject 7-I	3		3
CEE 4711	Structural Analysis and Design II	3		3
CEE 4735	Environmental Pollution and Its Control	3		3
Hum 4753	Engineering Economics and Accounting	3		3
CEE 47XX	Elective Subject 7-II	3		3
CEE 4712	Structural Analysis and Design Sessional II		3	1.5
CEE 4790	Industrial Training		2	1
CEE 4708	Quantity Surveying		3	1.5
	Total L-P	**15**	**14.75**	**20.5**
	Total Hours	**29.75**		

Elective Subject 7-I:

1. CEE 4703: GIS Application in Civil Engineering
2. CEE 4713: Design of Steel Structures
3. CEE 4731: Energy and Environment
4. CEE 4747: Earth Retaining Structures
5. CEE 4767: Groundwater Engineering

Elective Subject 7-II:

1. CEE 4715: Dynamics of Structures
2. CEE 4733: Industrial Wastewater Engineering
3. CEE 4749: Soil Dynamics
4. CEE 4759: Airport Planning and Design
5. CEE 4769: River Engineering and Flood Mitigation

Eighth Semester

Course Number	Course Title	Contact Hours		Credit Hours
		L	**P**	
CEE 4800	Project and Thesis II		3	1.5
CEE 4806	Final Year Design Project		7.5	3.75
Hum 4851	Practice, Communication, and Professional Ethics	3		3
CEE 48XX	Elective Subject 8-I	3		3
CEE 4831	Environmental and Social Impact Assessment	2		2
CEE 48XX	Elective Subject 8-II	3		3
CEE 48XX	Elective Subject 8-III	3		3
CEE 4816	Details of Construction		3	1.5
CEE 48XX	Elective Sessional 8-I		3	1.5
	Total L-P	**14**	**16.5**	**22.25**
	Total Hours	**30.5**		

Elective Subject 8-I:

1. CEE 4813: Earthquake Resistant Design
2. CEE 4833: Solid and Hazardous Waste Management
3. CEE 4843: Soil Improvement
4. CEE 4807: Socioeconomic Aspects of Development Projects
5. CEE 4863: Coastal Engineering and Management

Elective Subject 8-II:

1. CEE 4815: Introduction to Finite Element Method
2. CEE 4835: Environmental Modeling
3. CEE 4845: Seepage Analysis and Slope Stability
4. CEE 4855: Transportation Projects and operations
5. CEE 4865: Integrated Water Resources Management

Elective Subject 8-III:

1. CEE 4853: Public Transportation System
2. CEE 4817: Construction Technology
3. CEE 4837: Aquatic Chemistry
4. CEE 4847: Sub-surface soil investigation and in-situ testing
5. CEE 4819: Hydraulic Structure

Elective Sessional 8-I:

1. CEE 4834: Environmental Engineering Design Sessional
2. CEE 4844: Geotechnical Engineering Design Sessional
3. CEE 4854: Transportation Engineering Sessional II
4. CEE 4864: Water Resources Engineering Design Sessional

UNDERGRADUATE COURSE CONTENTS

Math 4153 Differential and Integral Calculus, Matrix 3-0 Credit: 3.00

Differential Calculus: Definition and concept of limit; Continuity and differentiability of function, differentiation of different functions, successive differentiation; Expansion of function by different theorems; Tangent and normal, maxima and minima; Determination of curvature and their properties, curve tracing; Partial differentiation.
Integral Calculus: Integration by parts, standard integrals, integration by the method of successive reduction; Definite integrals; Beta function; Gamma function; Multiple integrals. Matrices: Definition of different kinds of matrices; Algebra of matrices; Inverse of matrix; Rank and elementary transformation of matrices; Solution of system of linear equation; Eigen values and Eigen vectors; Cayley-Hamilton theorem.

Phy 4153 Physics I 3-0 Credit: 3.00

Simple Harmonic Motion; Total energy and average energy; Two-body oscillations, combination of simple harmonic Oscillations; Lissajous Figures; Damped oscillation, determination of damping co-efficient, forced oscillation; Resonance; Differential equation of a progressive wave, power and intensity of wave motion, stationary wave; Group velocity and phase velocity; Audible, ultrasonic and supersonic sound, speed of sound, doppler effect; Architectural acoustics; Noise pollution; Combination of lenses; Defects of images; Spherical aberration and Chromatic aberration, optical instruments; Interference of light, Huygens principle, Young's double slit experiment, Fresnel biprism; Newton's rings, diffraction of light, diffraction at single and double slits, diffraction grating; Polarization of light, production and analysis of polarized light; Optical activity and specific rotation;
Measurement of high temperatures; Kinetic theory of gases, law of equipartition of energy, mean free path of a gas molecule, degrees of freedom of a gas, specific heats of gases, van der Waal's equation, critical constants of a gas; Thermodynamic equilibrium, first law of thermodynamics and its applications; Reversible and irreversible processes, Carnot cycle, second law of thermodynamics, Carnot's theorem; Entropy.

Chem 4153 Chemistry I 3-0 Credit: 3.00

Solution; Solution of gas in liquid; Atomic structure; Electronic configuration of atoms; Quantum numbers; Periodic table; Phase rule; Properties and uses of noble gases; Different types of chemical bonds and their properties; Thermo- chemistry; Chemical kinetics; Properties of dilute solutions; Chemical Equilibrium; Ionization of water and pH concept; Electrical properties of solution; Types of chemical reaction: Isomeric transformation; Polymerization and de- polymerization.

CEE 4103 Surveying 4-0 Credit: 4.00

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; Astronomical surveying: definition, instruments, astronomical corrections, systems of time; Photogrammetry; Introduction of terrestrial photography, aerial photography, reading of photo mosaic, scale; Project surveying; Errors in surveying; Remote sensing; Introduction to global positioning system (GPS).

CEE 4101 Introduction to Civil Engineering 4-0 Credit: 4.00

Introduction to Civil Engineering programme; Attributes of a civil engineer; Civil Engineering history; Different branches of Civil Engineering and its applications; Civil Engineering as a career; Professional societies and registration; Sustainability and sustainable design in Civil Engineering; Disaster management; Importance of written and oral communication for civil engineers; Concepts of data analysis, interpretation of results and decision making; Information collection; Relevant national and international codes and laws related to Civil Engineering; Engineering ethics and professional development.

Hum 4157 Islamiat 2-0 Credit: 2.00

Islam as Din; Sources of Islamic code of life; Social, economic and political system of Islam; Islamic ethics; Human values in Islam, dignity of man, women & Islam family ties; Moral values, decency and decorum, brotherhood, friendship and amity in human society, truthfulness, honesty, sincerity; Righteousness, piety and religiousness; Social vices; Role of Islam in eradicating social evils; Islam and environment; Islam and the world peace.

Hum 4152/ Arabic I/ 2-0 Credit: 1.00
Hum 4154 English I

Arabic I: Reading comprehension; Letters and pronunciation; Construction of words; Letters (Shamsi & Kamari) in words; Determiners and pronouns; Interrogatives; Nominal and verbal sentences; Adverbs; Tenses; Feminine and masculine genders; Numerals; Conjunctive adverbs; Conversation and dialogues in real life; Improvement of communication skill using audio-visual aid.

English I: Listening & Speaking: Situational dialogues; Use of dialogues in conversations; Reading out, talks; Listening to prescribed cassettes; Watching documentaries; Reading: Reading comprehension; Reading for pleasure; Reading for understanding; Reading with strategies. Writing & Grammar: Word classes, sentence types; Number, person, gender; Tenses and sequences of tenses; Nouns and determiners; Operators; If-clauses; Paragraphs & letters; Text analysis; Vocabulary: In lists; Contextualized; In talks; In exercises.

Phy 4154 Physics I Lab 0-1.5 Credit: : 0.75

To determine the modulus of rigidity of the material of a wire by static method; To determine the spring constant and effective mass of a given spiral spring and hence to calculate the rigidity modulus of the material of the spring; To determine the pressure coefficient of a gas at constant volume by a constant-volume air thermometer; To determine the thermal conductivity of a bad conductor by lee and Cholton's method;

To determine the focal length and hence the power of a convex lens by displacement method with the help of an optical bench; To determine the focal length and hence the power of a concave lens by using an auxiliary convex lens; To determine the value of g, acceleration due to gravity by means of a compound pendulum.

Chem 4154 Chemistry I Lab 0-1.5 Credit: 0.75

Laboratory experiments, studies and visits to industrial units based on Chem 4153.

CEE 4102 Civil Engineering Drawing I 0-3 Credit: 1.50

Lines and lettering; Plane geometry; Drawing of linear and curve geometric figures, e.g. pentagon, hexagon, octagon, ellipse, parabola, hyperbola; Solid geometry; Concept of isometric view and oblique, theory of projections; Drawing of isometric view of 3D objects such as cube, prism, pyramid, cone and cylinder; Projection of cube, pyramid, cone, cylinder; Developments of cubes, pyramid, cone, cylinder; Plan, elevations and section of one storied and duplex building.

MCE 4104 Workshop Practice 0-3 Credit: 1.50

Carpentry shop; Machine shop and Welding shop sessional. Wood working tools; Wood working machine: Band saw, scroll saw, circular saw, jointer, thickness planer, disc sander, wood lathe; Types of sawing; Common cuts in wood works; Types of joint; Defects of timber: Natural defects and artificial defects; Seasoning; Preservation; Substitute of timber; Commercial forms of timber; Characteristics of good timber; Use of fastening; Shop practice: Practical job, planning and estimating of a given job.

Kinds of tools; Common bench and hand tools; Marking and layout tools, measuring tools, cutting tools, machine tools, bench work with job; Drilling, shaper, lathe and milling machines: Introduction, type, size and capacity, uses and applications.

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, aluminum; Types of electrode, fluxes and their composition; Arc welding defects; Test of arc welding: Visual, destructive and non-destructive tests; Types of gas welding system and gas welding equipment; Gases and types of flame; Welding of different types of materials; Gas welding defects; Test of gas welding.

Math 4253 Vector Algebra, Vector Calculus, ODE 3-0 Credit: 3.00

Vector Algebra: Scalar, vector and their representation to physical quantities; Dot and cross products and their application; Triple and multiple products.
Vector Calculus: Formal definition of differentiation and integration and mechanics; Scalar point function and vector point function; Definition and physical interpretation of gradient of scalar function, divergence and curl of a vector function; Vector formula; Theorems of Gauss, green and stokes.
Ordinary Differential Equation: Formation of differential equations; Solution of first order differential equations by various methods; Solution of differential equation of first order but higher degrees; Solutions of general linear differential equations of second and higher order with constant coefficients; Solution of Euler's homogeneous linear differential equations.

Phy 4253 Physics II 3-0 Credit: 3.00

Electric charge, coulomb's law, electric field and electric field strength; Electric dipole; Gauss' law; Electric potential, capacitance, dielectrics and gauss' law, current electricity, magnetic effect of current, magnetic induction, magnetic force on moving charges, torque on a current carrying loop; Biot and Savart's law; Ampere's law; Faraday's laws of electro-magnetic induction; Lenz's law; Magnetic properties of matter. Special theory of relativity; Michelson-Morley experiment; Lorentz transformations; Consequence of special theory of relativity; Mass-energy relation; Photo-electric effect, Compton effect; Dual aspect of matter, de-Broglie waves;

Schrodinger equation; Radioactivity; Atomic nucleus; Alpha, beta and gamma rays.
State of Matter, classification of solids, different types of bonds in solids; X-rays, x-ray diffraction-Bragg's law, metal, insulator and semi-conductor; Statistical mechanics.

Chem 4253 Chemistry II 3-0 Credit: 3.00

Chemical treatments of boiler feed water and water for other industrial applications; Corrosion and its control; definition, classification, importance, various forms, theories of corrosion, bimetallic corrosion, stray current corrosion, corrosion control by design, material selection, inhibitors, cathodic protection, applying various coatings; Classification of engineering materials, their different properties, composite materials, structure of solids, types of solids, crystal structure, different crystal systems, packing of atoms, solid state defects; Insulator, semiconductor; Cement: types, Portland cement, raw materials, methods of manufacture, setting and hardening; Glass: properties of glass, raw materials, methods of manufacture, chemical reactions in furnace, some special glasses; Ceramics: classification, properties, raw materials, manufacturing process; Refractories: definition, classifications, characteristics, raw materials, fire clay bricks, its manufacture and uses; Lubricants: functions, classification, Polymer: classification, different polymerization processes, important plastics and their uses; Natural and synthetic rubber, compounding of rubber, vulcanization.

CEE 4201 Analytic Mechanics 4-0 Credit: 4.00

Coplanar and non-coplanar force systems, moments; Analysis of two dimensional frames and trusses; Friction; Flexible chord; Centroids of lines, areas, and volumes; Moments of inertia of areas and masses; Plane motion; Principles of work and energy; Impulse and momentum; Virtual work principle for rigid bodies.

Hum 4257 Islamic History, Science and Culture 3-0 Credit: 3.00

Life and works of the Prophet Muhammad (peace and blessings be upon him); Caliphate of the pious caliphs.; Islamic culture & Islamic festivals; Islamic arts and crafts; Importance of acquiring knowledge of science and technology in the light of the holy Quran and the sunnah; Relation between science & technology and Islam; Scientific indications in the holy Quran; Impact of science, technology and religion on society and social development; Contributions of Islamic civilization and scientific achievement on the development of modern science and technology.

GS 4253 Ecology and Environment 3-0 Credit: 3.00

Ecology: Concept, definition, and components of ecology; Ecosystem: Concept, principles, structure and functioning of ecosystem; Types of ecosystem; Energy and materials flow in ecosystem; Food chain, biodiversity and stability in ecosystems; Biochemical cycles: Carbon cycle, nitrogen cycle, sulfur cycle and phosphorous cycle, cycle of trace elements; Population dynamics and carrying capacity; Environment: Introduction to environment; Components of the environment; Environmental resources; Environment-human interaction and environmental degradation; Types of environmental pollution; Environmental conservation; Global environmental concerns: Climate change, ozone layer depletion, global warming and greenhouse effects, sea level rise, el nino, la nino.

Phy 4254 Physics II Lab 0-1.5 Credit: 0.75

To determine the refractive index of a liquid by plane mirror and pin method using a convex lens; To determine the Boy's method (i) the radius of curvature of a lens and (ii) the refractive index of the material of the lens; To determine the radius of curvature of a lens by Newton's rings method; To determine the value of unknown resistance with the help of a post office box and to verify the laws of series and parallel resistances; To compare the E.M.F. of two cells by using a potentiometer; To determine the value of J, the mechanical equivalent of heat, by electric method; To determine the specific rotation of a sugar solution by means of a polarimeter.

Chem 4254 Chemistry II Lab 0-1.5 Credit: 0.75

Laboratory experiments, studies and visits to industrial units based on Chem 4253.

Hum 4252/ Arabic II/ 0-2 Credit: 1.00
Hum 4254 English II

Arabic II: Reading comprehension, general exercise and revision of lessons; Nouns; Singular, plural and various modifications; Use of verbs and pronouns, new words, different parts of speech.
English II: Listening & Speaking: Listening to dialogues, watching movies/documentaries; Conversations, picture description, storytelling, etc.; Conversational traits; Reading: Reading for comprehension; Intensive reading; Time reading; Strategy-based reading; Reading comprehension exercises; Writing & Grammar: Conditionals, sentence change; Passivation; Reported speech; Modality, prepositions; Adverbs, adjectives; Embedded and super-ordinate clauses, operators; Letters and paragraphs; Writing letters, e-Mails, reports, stories on familiar and unfamiliar subjects; Miscellaneous: Vocabulary development; Contextualized vocabulary items; Word-games; Culture in language; Tenses and usage.

CEE 4204 Practical Surveying 4-0 Credit : 4.00

Two weeks of field work based on CEE 4103

CEE 4202 Civil Engineering Drawing II Credit : 1.50

Introduction to computer usage; Introduction to CAD packages and computer aided drafting; Drawing editing and dimension of simple objects; Plan, elevations and sections of multi storied buildings; Reinforcement details of beam, slabs, stairs etc.; Plan and section of septic tank; Detailed drawings of roof trusses; Plans, elevations and sections of culverts,bridges and other hydraulic structures; Drawings of building services.

Math 4353 Laplace Transformation, Series, PDE **3-0** **Credit: 3.00**

Laplace Transformation: Laplace transformation and application; Use of Laplace transformation in solution of ordinary and partial differential equation. Series Solution: Bessel function; Legendre function; Fourier series, even and odd functions; Fourier integral, Fourier transformation and their uses in solving boundary problems. Partial Differential Equations: Introduction, equation of the linear and non-linear first order standard forms; Linear equations of higher order; Equations of the second order with variable coefficients.

GS 4351 Engineering Geology and Geomorphology **3-0** **Credit: 3.00**

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 land forms; 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.

CEE 4311 Mechanics of Solids I **3-0** **Credit: 3.00**

Concepts of stress and strain, constitutive relationships; Deformations due to tension, compression and temperature change; Beam statics: Reactions, axial force, shear force and bending moments; Axial force, shear force and bending moment diagrams using method of section and summation approach; Elastic analysis of circular shafts, solid non-circular and thin-walled tubular members subjected to torsion; Flexural and shear stresses in beams; Shear center; Stress transformation.

CEE 4361 Fluid Mechanics 3-0 Credit: 3.00

Development and scope of fluid mechanics; Fluid properties, fluid statics, kinematics of fluid flow; Fluid flow concepts and basic equations- continuity equation, Bernoulli's equation, energy equation, momentum equation and forces in fluid flow; Similitude and dimensional analysis; Steady incompressible flow in pressure conduits; Laminar and turbulent flow; General equation for fluid friction; Empirical equations for pipe flow, minor losses in pipe flow; Fluid measurement: pitot tube, orifice, mouthpiece, nozzle, venturimeter, weir, pipe flow problems- pipes in series and parallel, branching pipes, pipe networks.

EEE 4385 Electrical and Electronic Technology 3-0 Credit: 3.00

Electrical Units and standards; electrical networks and circuit solution techniques, delta-wye- transformation; Circuit Theorems; Basic principle of generation of alternating and direct Current; Introduction to Phasor Algebra as applied to AC circuit analysis; Solution of AC circuits: RLC circuits- series and parallel; Resonances; AC power analysis; Ampere's circuital law; B - H curve, solution of magnetic Circuits, hysteresis and eddy current losses, an application of magnetic force; Introduction to magnetic circuits; Three phase AC circuits: Three phase EMF generation, delta and Y - connections, line and phase quantities, solution of three phase circuits, balanced supply voltage and balanced load, phasor diagram, measurement of power in three phase circuits; DC machines; Specification and characteristics of DC generators and motors; Transformers: Introduction to transformer, auto transformer, CT & PT and their characteristics, specification, and ratings; Induction Motor: Classification, specification, torque-speed and its characteristics; Introduction to synchronous machines and fractional horse power motor; Introduction to electronic switch devices, rectifier, amplifier, oscillator and SMPS; Introduction from gate to microcontroller and its applications; Electric wiring for residential and commercial loads; Basic idea of grounding and earthling of electric installation.

GS 4353 Numerical Methods and Computer Programming 3-0 Credit: 3.00

Concept of simple difference and divided difference and their relation; Newton's forward and backward interpolation formula; General interpolation formula of Newton and Lagrange; Lagrange's inverse interpolation formula; Inverse interpolation by successive approximation; Numerical differentiation; Numerical integration; General quadrature formula for equidistant ordinates; Simpson's rule, Weddle's rule, trapezoidal rule and their comparative study; Gauss quadrature formula; Study of least square principle and its application in curve fitting; Solution of algebraic and transcendental equation by graphical method and Newton- Raphson method; Newton-Raphson method for the solution of simultaneous equations; Numerical solution of simple first order differential equation by Euler's method, Picard's method and Runge-Kutta method.

Introduction to computer programming; Programming languages; Programming concepts and algorithms; Number systems; Internal representation of data; Elements of structured programming language: data types, operators, expressions, control structures, functions, pointers and arrays, input and output; Concept of object oriented programming (OOP): encapsulation, inheritance, polymorphism and abstraction; Template functions and classes.

CEE 4312 Mechanics of Solids Lab 0-3 Credit: 1.50

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 center; Load-deflection behavior of simple beam.

GS 4354 Computer Programming and Application Lab 0-3 Credit: 1.50

Problem solving techniques, algorithm specification and development; Programming style, debugging and testing, documentation; Program design methodologies and modular program design; Character sets, identifiers and keywords, data types, constants, variables, statements, symbolic constant; Development of programs related to Civil Engineering using Python programming skills; Project-based learning.

CEE 4362 Fluid Mechanics Lab 0-3 Credit: 1.50

Center of pressure; Proof of Bernoulli's theorem; Flow through venturimeter; Flow through orifice; Coefficient of velocity by coordinate method; Flow through mouthpiece; Flow over V- notch; Flow over sharp crested weir; Fluid friction in pipe; Open ended experiment on a particular topic.

EEE 4386 Electrical and Electronic Technology Lab 0-1.5 Credit: 0.75

Laboratory based on EEE-4385.

Math 4453 Probability and Statistics 3-0 Credit: 3.00

Measures of central tendency and standard deviation; Moments, skewness and kurtosis; Elementary probability theory and discontinuous probability distribution, continuous probability distributions, e.g. normal and exponential; Hypothesis testing and regression analysis.
Measures of Variability; Normal Distribution; Standardization and z score; Standard Errors; Statistical Significance; Effect size and confidence intervals; Correlation; t Tests; One-way analysis of Variance; Factorial analysis of variance; Repeated-measures ; Analysis of Variance; Regression; Chi- square test of independence; Factor analysis and reliability analysis: Data reduction techniques.

CEE 4411 Engineering Materials and Concrete Technology 3-0 Credit: 3.00

Properties and uses of bricks, blocks, 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, Consumption of construction materials and its impact on environment, sustainability of construction materials.

CEE 4431 Water Supply Engineering 3-0 Credit: 3.00

Water Supply Engineering: Introduction, water requirements and demand forecasting, water sources; Water sources; Ground water exploration, aquifer properties and ground water flow, well hydraulics, water well design, drilling, construction and maintenance; Shallow hand tube wells and deep set Tara pumps for problem areas; Rainwater harvesting; Surface water collection and transportation; Pumps and pumping machinery.

Water quality: Impurities in water, important water quality parameters, guidelines and standards for drinking water.

Water treatment: Plain sedimentation, coagulation and flocculation, filtration, disinfecting, miscellaneous treatment methods, low cost treatment methods for rural communities. Water distribution system: Distribution system classification, analysis and design of distribution network, fire hydrants, water meters; Leak detection, unaccounted-for water. Introduction of water safety plan.

CEE 4441 Soil Mechanics 4-0 Credit: 4.00

Introduction to geotechnical engineering; Formation, type and identification of soils; Soil composition; Soil structure and fabric; Index properties of soils; Engineering classification of soils; Soil compaction; Principles of total and effective stresses; Permeability and seepage; Stress-strain-strength characteristics of soils; Compressibility and settlement behavior of soils; Lateral earth pressure.

CEE 4413 Mechanics of Solids II 3-0 Credit: 3.00

Symmetric and unsymmetric bending of beams; Failure criteria; Thin-walled pressure vessels; Beam deflection by direct integration, moment area and singularity function methods; Buckling of columns; Elastic strain energy and external work; Bolted and welded joints.

Hum 4459 Science, Technology and Islam 2-0 Credit: 2.00

Relation between science and technology; Development of science and technology till date; Islam, concept, origin and examples of main religions & their tenets; Comparative study among Islam, Christianity, Judaism, Hinduism and Buddhism; Relation between science and technology and Islam; Science and technology in different religions; Creation of the universe, scientific approach the big bang theory of primordial ball; Approach through different religions, Islamic-Kum-Faya-Kum concept; Scientific indications in the holy Quran; Impact of science, technology and religion on society and social development; Contributions of Islamic civilization; Contributions of western civilization; Islam and the west.

CEE 4432 Environmental Engineering Sessional I 0-1.5 Credit: 0.75

Water sampling techniques and preservation; Physical, chemical and biological tests of water; Breakpoint chlorination; Jar Test; Design of tube well; Case study/Open ended project.

CEE 4442 Soil Mechanics Lab 0-3 Credit: 1.5

Field identification test; Grain size analysis by sieve and hydrometer; Particles specific gravity test; Atterberg limits test; Permeability test; Unconfined compression test; Compaction test; Maximum and minimum density test; Direct shear test; Consolidation test.

CEE 4412 Engineering Materials Lab 0-3 Credit: 1.50

Overview of testing standards; Test for particle specific gravity; Unit weight and voids in 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; Open ended experiment on a particular topic related to concrete technology.

CEE 4511 Design of Concrete Structures I **3-0** **Credit: 3.00**

Fundamental behavior of plain & reinforced concrete; Introduction to WSD and USD methods; Analysis and design of singly reinforced, doubly reinforced and T- beams according to strength design method; Shear, diagonal tension and torsion of beams; Bond & anchorage; Design of one-way slabs; Prestressed Concrete.

CEE 4565 Open Channel Flow **3-0** **Credit: 3.00**

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..

CEE 4563 Hydrology **3-0** **Credit: 3.00**

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

CEE 4543 Foundation Engineering **3-0** **Credit: 3.00**

Principle of virtual work, Equations of bearing capacity by limit analysis; Bearing capacity factors; Types of foundations; Bearing capacity of shallow and deep foundations; Settlement and distortion of foundations; Slope stability analyses; Soil investigation techniques.

CEE 4551 Transportation and Traffic Engineering 3-0 Credit: 3.00

Introduction to transportation engineering; Development of transportation systems; Elements of transportation system; Transportation in Bangladesh; Modal share; Transportation planning concepts; Collection, study and analysis of basic data; Highway location and surveys; Geometric design of highways: elements of design, cross-section elements, curves and sight distances; Road intersections; Traffic engineering: the road/traffic system, vehicle and traffic characteristics, traffic control devices, traffic studies, parking and roadway lighting; Waterways and terminals.

CEE 4513 Structural Analysis and Design I 4-0 Credit: 4.00

Stability and determinacy of structures; Analysis of statically determinate trusses and arches; Influence lines; Moving loads on beams and trusses; Cable and cable supported structures. Wind and earthquake loads; Approximate analysis of statically indeterminate structures, e.g. braced trusses and multi storied building frames (portal and cantilever method for lateral load analysis and approximate method for vertical load analysis); Deflection of beams, trusses and frames by virtual work method.

Hum 4552 Technical Report Writing and Presentation 0-3 Credit: 1.50

Definition; nature, basic concepts and principles of technical report writing; Importance of technical report writing; Process of technical reporting; Fundamentals of report writing, planning steps of preparing technical report; Technical writing style, format, techniques of writing, technical writing process, role of language in report writing, referencing; Preparation of draft report, editing the draft report, finalization of the report; Presentation of the report before the audience; Role of computer in report preparation, structure and layout of presentation the report, prepare a visual presentation of report; Oral presentation of a report through computer and multimedia projector, use of related computer software.

CEE 4566 Open Channel Flow Lab 0-3 Credit: 1.50

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.

CEE 4611 Design of Concrete Structures II **3-0** **Credit: 3.00**

Design of two-way edge supported slabs using strip and alternate methods; Reinforced concrete floor & roof systems; Yield line methods; Design of column supported slabs; Introduction to slender columns; Design of columns under uni- axial and bi-axial loading; Design of footings, pile cap, and retaining walls; Seismic detailing; Shear wall.

Hum 4651 Transportation and Traffic Engineering **3-0** **Credit: 3.00**

Principles of management; Principles of construction management; Construction contracts and specifications; Inspection and quality control; Construction safety; Construction planning and scheduling: PERT, CPM, case studies, resource scheduling; Linear programming; Psychology in administration; Materials management; Demand forecasting; Inventory control; Stores management; Procurement; Project planning and evaluation; Feasibility reports, cash flow, payback period, internal rate of return, benefit-cost ratio, construction equipment and plants; Replacement studies.

Hum 4659 Technology, Environment, and Society **0-3** **Credit: 3.00**

Definition of technology, environment, society and development; Inter-dependence of technology, environment, society and development; Growth of technologies and TVE contribution to human development; Current state of technology and future application of TVE as an instrument of change in the 21st century; Impact of technology on the environment and climate; Environment friendly technology; Technology and development; Renewable energy and environments; Technology and environmental hazards, remedy by TVE; Major hazards of industry, improvement of working conditions in the industry.

CEE 4653 Pavement and Railway Engineering **3-0** **Credit: 3.00**

Highway materials; Subgrade, sub-base 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; Highway drainage; Equipment; Life cycle analysis; Railways: general requirements, alignment, permanent way, station and yards, signaling, points and crossings, maintenance

CEE 4633 Waste Management and Environmental Sanitation **3-0** **Credit: 3.00**

Introduction of waste: Solid and liquid wastes; Generation and characterization of MSW; Management of MSW: Collection, transportation and disposal, resource recovery, reuse, recycling, waste-to-energy, sanitary landfill; Relevant regulations of MSW, Circular economy.
Estimation of sewage; Collection and transportation of sewage; Characteristics of sewage; Preparatory, primary and secondary treatment of sewage; Waste stabilized ponds; Design of wastewater collection system; Sewage disposal; Treatment of industrial wastewater; Sludge management.
Sanitation and health, sanitation coverage in Bangladesh and SDG targets, Sanitation in low-income communities; On-site sanitation systems; Sustainable sanitation; Faecal Sludge Management (FSM); Relevant regulation of FSM in Bangladesh.

CEE 4614 Structural Analysis and Design Sessional I **0-3** **Credit: 1.50**

Analysis and design problems; design of members and connection of steel structures e.g. moment frame building for gravity and wind loads; Trusses and plate girders; Use of software in analysis and design problems.

CEE 4612 Design of Concrete Structures Sessional **0-3** **Credit: 1.50**

Use of structural analysis and design software; Analysis and design problems based on CEE4511 and CEE 4611; Design of a slab bridge, simple girder bridge and a low-rise building.

CEE 4634 Environmental Engineering Sessional II **0-1.5** **Credit: 0.75**

Solid waste: Sampling and test for waste characterization, physical and chemical properties and calorific value.
Layout of an industrial village and design components using computer-aided analysis (AutoCAD and MS Excel); Water well design; Water demand and distribution network design.
Estimation of industrial, domestic and commercial wastewater generation; Design of sewerage network; Field visits and reporting.

CEE 4652 Transportation Engineering Sessional I **0-3** **Credit: 1.50**

Tests on bituminous materials, tests on subgrade, sub-base and base materials; Mix design; Roadway capacity studies; Project-based learning

CEE 4700 Project and Thesis I **0-6** **Credit: 3.00**

Experimental and theoretical investigation of various topics in structural engineering, environmental engineering, geotechnical engineering, transportation engineering and water resources engineering; Individual or group study of one or more topics from any of the above fields, the students will be required to submit thesis/project report at the end of their research works.

Hum 4753 Engineering Economics and Accounting **3-0** **Credit: 3.00**

Introduction to engineering economic decision; Time value of money, equivalence and compound interest; Cash flow analysis and basic concepts of discounting; Cost of capital; Rate of return equivalence; Payback period and sensitivity analysis; Uncertainty and risk analysis; Depreciation; Income taxes; Break-even analysis; Cost/benefit analysis (economic and financial).
Introduction to accounting; Reporting framework and accounting equation; Balance sheet and income statement; Current and non-current assets/liabilities and owner's equity; revenues, expenses, accruals and cash flow statement; Financial statement analysis.

CEE 4711 Structural Analysis and Design II **3-0** **Credit: 3.00**

Analysis of statically indeterminate beams and frames by moment distribution, consistent deformation/flexibility and stiffness methods; Algorithms for implementing direct stiffness method in a computer; influence lines of statically indeterminate beams and frames.

CEE 4735 Environmental Pollution and Its Control 3-0 Credit: 3.00

Water pollution: Sources and types of pollutants; Dissolved oxygen models and waste assimilation capacity of water bodies/streams; Industrial pollution; Groundwater pollution; Marine pollution; Pollution control measures; Water quality monitoring and management; Water quality index (WQI) models.
Air pollution: Sources and types of pollutants; Effects on health, properties and plants; Air pollution monitoring and control measures; Sources, effects and control of noise pollution; Sources, effects, control of thermal pollution; Soil pollution, control and remediation; Air quality index (AQI) models; Software-based learning.

CEE 4712 Structural Analysis and Design Sessional II 0-3 Credit: 1.50

Staircase Design; Shear Wall Design; Bridge Design; Software Demonstration.

CEE 4790 Industrial Training 0-2 Credit: 1.00

Students will apply the knowledge that they learn in the university to link with real life problems (environmental /water/transportation/geotechnical/structural engineering).

CEE 4708 Project and Thesis II 0-6 Credit: 3.00

Experimental and theoretical investigation of various topics in structural engineering, environmental engineering,

CEE 4806 Final Year Design Project (FYDP). 0-7.5 Credit: 3.75

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. Students shall present their projects and submit project reports at the end of the work.

Hum 4851 Practice, Communication, and Professional Ethics 3-0 Credit: 3.00

The project cycle; Project proposal; Contractual provisions; Techniques of specification writing; Evaluation of bids; Project evaluation.
Interpretation of literature, documents; Communicating; Preparation of report; Industrial and labor relations; Professional ethics in Civil Engineering.

CEE 4831 Environmental and Social Impact Assessment 3-0 Credit: 3.00

Definition, aims and objectives of Environmental Impact Assessment (EIA); Environmental issues in development projects; Initial Environmental Examination (IEE); EIA Methodologies; Impact identification, prediction, analysis and evaluation; Environmental Management Plan (EMP); EIA Guidelines; Organization of EIA; Definition of social impact assessment, aims and objectives, social impact in development project; Impact identification assessment; Key informant interview; Focus group discussion, Case studies.

CEE 4816 Details of Construction 0-3 Credit: 1.50

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.

Elective Courses

CEE 4613 Design of Pre-stressed Concrete Structures 3-0 Credit: 3.00

Pre-stressed concretes: Materials; Pre-stressing systems; Loss of pre-stress; Analysis of sections for flexure, shear, bond and bearing; Beam deflections and cable layout; Partial pre-stress; Design of pre-stressed sections for flexure, shear, bond and bearing.

CEE 4635 Environmental Economics 3-0 Credit: 3.00

Concept and systems of environmental economics; Environment, economic growth and sustainability; The economy and environment: Natural resources economics, the fundamental balance, environment as an economic and social asset; Analytical tools: Benefits and costs, supply and demand, economic efficiency and markets; Economics of environmental quality: Pollution control - a general model, environmental damages, efficient level of emission, abatement cost, enforcement cost; Environmental analysis: Impact analysis, cost-effectiveness analysis, benefit-cost analysis, risk analysis; Economics of enforcement: Environmental taxes, Incentive- based strategies, emission and effluent charges, abatement subsidies; Institutional strengthening and capacity building.

CEE 4645 Theoretical Geomechanics 3-0 Credit: 3.00

Dimensional stress-strain relation for elasto-plastic material, relation between strain and deformation; Equilibrium and consistency equations; Effective stress and failure criteria for soils, UU, CU, CD tests for soils and their explanation, failure criteria and its uniqueness; Application of the critical-state soil mechanics; Formulation of Cam-Clay model.

CEE 4655 Civil Engineering Data Analysis 3-0 Credit: 3.00

Descriptive Statistics; Presenting Data; Discrete probability distributions, continuous probability distributions; Interval estimation; Hypothesis testing; Population comparison; Testing goodness of fit; Linear regression; Count data models; Discrete outcome models; Non-parametric statistics.

CEE 4665 Irrigation and Drainage Engineering 3-0 Credit: 3.00

Importance of irrigation; Sources and quality of irrigation water; Soil-water relationship; Consumptive use and estimation of water requirements; Methods of irrigation; Design of irrigation canal systems; Irrigation structures; Irrigation pumps; Problems of irrigated land; Irrigation water management; Importance of land drainage; Drainage systems and design

CEE 4703 GIS Application in Civil Engineering 3-0 Credit: 3.00

Definition of GIS, data, database and information; Techniques of data input and digitizing geographical features; Database management in GIS environment; Data manipulation techniques, sub-model formation, weighting and multi-criteria evaluation for selecting sites for establishment safeguarding environment. Mapping concepts: Definition of map and map features, characteristics of map, concept of layers, topographical maps, thematic maps, attribute information and display information; Image enhancement and image classification; Application of GIS for resources identification and environmental planning and management.

CEE 4713 Design of Steel Structures 3-0 Credit: 3.00

Behavior of structural steel members and steel frames; Code requirements; Design of tension and compression members by WSD and LFD methods; Design of beam, beam-columns; Joint design.

CEE 4731 Energy and Environment 3-0 Credit: 3.00

Introduction: Definition, classification and sources of energy, importance and use of energy, renewable and non-renewable energy, transformation of energy; Fossil fuel: Sources, exploration, abstraction and related environmental problems, burning of fossil fuel and emission of pollutants, acid rain and trans boundary effects; Nuclear energy- environmental problems and safety associated nuclear power plants; Environmental issues related to Solar and geothermal energy, hydro, tidal and wind power energy; Energy consumption, emission of green-house gases, climate change and international initiatives to combat climate change; Energy policies.

CEE 4747 Earth Retaining Structures 3-0 Credit: 3.00

Limit analysis; Lower bound and upper bound theories; Fundamentals of earth pressure and classical methods of analysis; Braced excavations; retaining walls; Design of sheet piling systems; Cofferdam design; Reinforced earth walls; Computation of earth pressure in steady water flow condition using the concept of flow-nets.

CEE 4767 Groundwater Engineering 3-0 Credit: 3.00

Groundwater in hydrologic cycle and its occurrence; Physical properties and principles of groundwater movement; Groundwater and well hydraulics; Hand, shallow, deep set shallow and deep tube wells, their design, drilling, construction and maintenance; Groundwater resource evaluation, groundwater levels and environmental influences; Water mining and land subsidence; Groundwater pollution and contaminant transport; Recharge of groundwater; Saline water intrusion in aquifers; Groundwater management, groundwater exploration.

CEE 4715 Dynamics of Structures 3-0 Credit: 3.00

Formulation of equation of motion; Free vibration response; SDOF and MDOF systems; Response to harmonic and impulse loading and vibration analysis by Rayleigh's method.

CEE 4733 Industrial Wastewater Engineering 3-0 Credit: 3.00

Characteristics and volume of industrial wastewater; Estimation of pollution load; Environmental chemistry and microbiology; Physical, chemical and biological treatment of industrial wastewater; Problems associated with treatment of wastewaters from different industries; Toxicity and biodegradability; Treatment and disposal of sludge; Advanced treatment process: Electrochemical processes, membrane bioreactors, sequential batch reactor, etc.; Tertiary treatment; Hybrid and combined processes; Resources recovery, reuse and recycling of industrial wastewater; Zero discharge technologies; Energy production; Sustainable treatment approaches; Software-based learning.

CEE 4749 Soil Dynamics 3-0 Credit: 3.00

Fundamentals of vibrations; Dynamic properties of soils, dynamic soil structure interaction; Foundation vibration; Machine foundation; Earthquake, waves and wave propagation, Seismic soil response; Earthquake hazards and liquefaction problems - mechanism, evaluation techniques, preventive techniques; Seismic stability of earth embankments.

CEE 4759 Airport Planning and Design 3-0 Credit: 3.00

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; Evaluation and strengthening of pavements, importance, advantages and trends in air transportation.

CEE 4769 River Engineering and Flood Mitigation 3-0 Credit: 3.00

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

CEE 4702 Application of Software in Civil Engineering 0-1.5 Credit: 0.75

Application of Contemporary Software of structural engineering /environmental engineering/ geotechnical engineering/ transportation engineering / water resource engineering.

CEE 4704 Statistical Modeling Lab 0-1.5 Credit: 0.75

Use of SPSS/ STATA/ R software for different statistical analysis; Hypothesis Testing, ANOVA, Goodness of Fit, Multiple Linear Regression Model, Logistic Regression Model, Count Data Models, Discrete Outcome Models.

CEE 4813 Earthquake Resistant Design 3-0 Credit: 3.00

Introduction; Elementary engineering seismology; Earthquake ground motions; Earthquake response spectra; Design earthquake motion; Earthquake analysis procedures of structures; Earthquake resistant design of buildings; Code requirements and detailing of structures; Approaches for earthquake resistance; Topic on recent earthquakes and associated damage.

CEE 4833 Solid and Hazardous Waste Management 3-0 Credit: 3.00

Solid wastes: Sources and types of solid wastes; Physical and chemical properties of solid wastes; Solid wastes generation; Collection of solid wastes; Community participation in solid waste collection; Transfer and transport; On-site handling and shorting; Volume reduction and recycling; Recovery of resources, conversion products and energy; Final disposal of solid wastes and residual products.
Hazardous wastes: Identification and classification of hazardous wastes; Generation, on-site storage, collection and transport of hazardous wastes; Physical, chemical and biological processes of treatment; Disposal of hazardous wastes. Generation, storage, collection, treatment and disposal of hospital wastes.

CEE 4843 Soil Improvement 3-0 Credit: 3.00

Field and laboratory compaction; Compaction equipment and methods; Methods of stability analysis; Stability analysis for static and dynamic forces; Seepage in composite sections, piping, pinhole test; Core design; Measurement of performance; Construction control of embankments; Ground improvement methods; Field instrumentations: installation of piezometers, settlement plates, inclinometers; Maintenance of dams and embankments.

CEE 4807 Socioeconomic Aspects of Development Projects 3-0 **Credit: 3.00**

Economic and social structure; Development and economic growth; Socio-economic indicators; Population, prosperity and poverty; Employment of workforce; Population displacement; Rehabilitation strategy; Productivity, land loss, land use 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.

CEE 4863 Coastal Engineering and Management 3-0 **Credit: 3.00**

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.

CEE 4815 Introduction to Finite Element Method 3-0 **Credit: 3.00**

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; Truss element. Beam element, Interface element; Basic Finite Element analysis techniques for dynamic calculation.

CEE 4835 Environmental Modeling 3-0 **Credit: 3.00**

Introduction, objectives and applications of environmental models; Physical, mathematical and conceptual models; Modeling parameters, model formulation, solution, calibration, verification and sensitivity analysis; Modeling of surface and ground water quality: sources and sinks of contaminants, dispersion and hydraulic transport processes, mathematical formulation, and solution techniques. Biochemical system, nutrient cycle, and ecosystem models; Air pollution models; Software-based studies of environmental problems; Project-based learning.

CEE 4845 Seepage Analysis and Slope Stability **3-0** **Credit: 3.00**

Permeability of soils; one-dimensional and two-dimensional flows; Piping; Seepage analyses of earth dam, concrete dam, cutoff wall, embankment, seepage in composite sections; Methods of stability analysis: Taylor's method, Fellenius method, Bishop's methods, Morgenstern and Price's method; Stability for dynamic forces; Construction control of embankments; Field instrumentations.

CEE 4855 Transportation Projects and operation **3-0** **Credit: 3.00**

Highway needs study; highway planning, economics and financing; Evaluation and analysis of transportation projects; Management, monitoring; Organization and implementation of transportation projects; Selected case studies; Traffic engineering administration and legislation; Urban public transportation and freight movement.

CEE 4865 Integrated Water Resources Managements **3-0** **Credit: 3.00**

Introduction to IWRM and climate change; Drivers and impacts of climate change; Impacts of climate change on water uses; Strategy development and planning for adaptation in the context of IWRM; IWRM and conflicts resolution; Water agreements; Implication for IWRM.

CEE 4853 Public Transportation System **3-0** **Credit: 3.00**

Introduction to public transport systems: history, current state and trends from a global perspective; Service planning; Scheduling (crew and vehicle); Network design; Operations planning; Service quality assessment; Service reliability and control; Travel demand & ridership forecasting; Cost characteristics and modeling; Facility design; Public transport sector organization; Data collection methods; ITS in public transport systems.

CEE 4817 Construction Technology 3-0 Credit: 3.00

Construction contracts; Value engineering in construction; Project network analysis (CPM); Selection of construction equipment; Fundamentals of earth moving; Soil stabilization and compaction; Tractor and related equipment, scrapers, excavating equipment, trucks and wagons, operation analyses; Belt-conveyor systems; Compressed air; Drilling rock and earth; Blasting rocks; Tunneling; Foundation grouting; Pile and pile driving equipment, pumping equipment; Production of crushed-stone aggregates; Concrete technology; Scaffolding and form works.

CEE 4837 Aquatic Chemistry 3-0 Credit: 3.00

Introduction to redox chemistry in natural systems, pc-pH diagrams; Review of chemical thermodynamics that is followed by discussion of acid-base, precipitation-dissolution, coordination, and reduction-oxidation reactions; Emphasis is on equilibrium calculations as a tool for understanding the variables that govern the chemical composition of aquatic systems and the fate of inorganic pollutants; Details quantitative treatment of chemical processes in aquatic systems such as lakes, oceans, rivers, estuaries, groundwater and wastewaters.

CEE 4847 Sub-surface soil investigation and in-situ testing 3-0 Credit: 3.00

Soil investigation techniques: Pit sampling, wash boring, borehole stability, borehole logging, sample quality, preservation, transportation, preparation for testing; Stress release effects; Standard Penetration tests; Cone penetration tests; Pressure meter tests; Vane shear tests; Plate load tests; Field permeability tests; Installation of settlement plates, slope indicators etc.; Subsoil exploration program; Interpretation of topographic, geological and agricultural soil maps; Soil investigation report writing.

CEE 4819 Hydraulic Structures 3-0 Credit: 3.00

Types of hydraulic structures; Principles of design, design of different types of hydraulic structures: regulators, dams, barrages; Cross-drainage works; Pump house, etc.

CEE 4834 Environmental Engineering Design Sessional **3-0** **Credit: 3.00**

Computer based design of water distribution and sewerage networks; Household plumbing system design; Design of water and wastewater treatment plant; Field visit and reporting.

CEE 4844 Geotechnical Engineering Design Sessional **3-0** **Credit: 3.00**

Computer aided design of foundation: footing, pile and pile cap, pier, raft/mat foundations and caisson; Retaining structures: shore pile, abutment, retaining walls; Reinforced soils.

CEE 4854 Geotechnical Engineering Design Sessional **3-0** **Credit: 3.00**

Design of rigid and flexible pavement and air field pavements; Geometric design: Roadway intersections design and interchanges; Traffic studies.

CEE 4864 Water Resources Engineering Design Sessional **3-0** **Credit: 3.00**

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

POSTGRADUATE COURSE CONTENTS

CEE 6101 Structural Dynamics 3-0 Credit: 3.00

Fundamentals of structural dynamics. SDOF system: Free vibration response, response to harmonic, periodic, impulsive and general dynamic loading, dynamic magnification factor; MDOF system: Eigenvalue problem, modal analysis, solution in the frequency domain; Control of Structures, active control system and passive control system, Base isolation. Selected advanced topics.

CEE 6103 Finite Element Method 3-0 Credit: 3.00

Introduction to finite element concepts, basic techniques, shape functions. One-dimensional elements, two-dimensional elements, strain-displacement and compatibility equations, constitutive (stress-strain) relationships. Numerical integration and modeling considerations. Weighted residual methods, Galerkin finite element method, weak formulation; three- dimensional stress analysis. Convergence and accuracy of solutions, types of error and measures of error, patch test. Solution techniques: front and band solutions, element assembly and equation solving. Computer implementation of finite element method. Field problems.

CEE 6105 Theory and Design of Steel Structure 3-0 Credit: 3.00

Tension members - Design criteria; Compression members - Buckling of Column; Residual Stress; Column Strength curves; AISC design formulas for working stress design; Buckling of plates; Design of column as affected by local buckling. Design of laterally supported beam; Shear on beams; Biaxial bending; Stresses due to torsions; Analogy between torsion and plane bending; Design for combined procedures for laterally unsupported beams. Beam column; AISC working stress design criteria for combined bending and axial-load; Connections.

CEE 6107 Advanced Design of Concrete Structures **3-0** **Credit: 3.00**

Review of principles; beams, slabs and columns, Design of columns; long columns, two-way slab systems, grids, waffle slabs, ribbed slab, deep beams, curved beams shear walls, building frames, Design for torsion. Bulk storage structures, creep and temperature effects. Details of reinforced concrete members, Advanced problems in foundations of structures, Codes and specifications and their influence in design. An individual or group project to design a complete structural system. Prestressed concrete structures.

CEE 6109 Advance Concrete Technology **3-0** **Credit: 3.00**

Properties of plain concrete, physico-chemical aspects of behavior; Constituent materials; Cements, hydration of cements, mineral admixtures and blended cements, chemical admixtures; Mix design of concrete, response of concrete to stress; Durability, permeability and porosity; physical and chemical deterioration. Field control and acceptance. Destructive and non- destructive testing. Concrete for special purposes, high strength concrete, lightweight concrete, cement-polymer composites, fiber-reinforced concrete.

CEE 6111 Advance Finite Element Analysis **3-0** **Credit: 3.00**

Weak formulation and finite element concepts, degenerated beam and plate elements, nonlinear finite element formulation. Newton-Raphson and Modified Newton Raphson solution procedures. Geometric Nonlinearity- Large displacement and structural instability, Lagrangian and Eulerian approaches; Material modelling. yield criteria, plasticity, creep, elasto- plasticity, viscoplasticity, elasto viscoplasticity, modeling of reinforced concrete. Modeling of dynamic problems and solution procedure. Finite element with size effect and mesh-free methods. Students will attend the hands-on sessions, complete a finite element project and present their work in the class.

CEE 6113 Analysis and Design of Tall Buildings **3-0** **Credit: 3.00**

Structural forms of tall buildings: Floor system, vertical load resisting systems, lateral load resisting systems; Choice of systems optimum design; Shear walls and coupled shear walls systems, continuous medium, wide column analogy, finite element solutions; Interaction of walls and frames; Tubular structures: Approximate methods, computer analysis; Masonry high-rise buildings; The future of high-rise building.

CEE 6115 Earthquake Resistant Design **3-0** **Credit: 3.00**

Earthquake Damage Mechanisms, Seismic Design Theories of Structures, Seismic Design Criteria, Basic Requirement for Seismic Resistant Structures
Earthquakes, Earthquake Parameters, Seismic Intensity, Earthquake Mechanisms, Seismic Waves, Recorded Ground Motions, Characteristics of Strong Ground Motion, Factors Influencing Strong Ground Motions, Response Spectra, Properties of Response Spectra, Four-Way Logarithmic Diagram of Response Spectra, Smoothed Spectrum, Artificial Design Spectrum, Design Accelerograms, Design Procedure and Design Code, Structural Analysis Models, Equivalent Lateral Force Procedure, Modal Analysis, Nonlinear Dynamic Analysis, Determination of Building Structural Forms, Reinforced Concrete Buildings, Steel Skeleton Buildings, Earthquake Damage of Girder Bridges, Earthquake Resistant Design of Superstructures, Earthquake Resistant Design of Foundations, Arch Bridges and Suspension Bridges, Base Isolation, Energy Dissipating Devices.

CEE 6117 Wind Engineering **3-0** **Credit: 3.00**

Wind characteristics: Nature and types of wind, statistical analysis of extreme wind speeds, stochastic model of wind turbulence; Wind loading and bluff-body aerodynamics: Aerodynamic drag, lift, moment, pressure, vortex-induced forces, random wind forces; Aeroelastic phenomena: Torsional divergence, vortex induced vibration (VIV), galloping, torsional flutter; Effect of wind loading on buildings, towers, trussed frameworks, bridges; Wind-resistant design of structures: Tall
buildings, long-span bridges, suppression of wind-induced response.

CEE 6119 Construction Project and Site Control **3-0** **Credit: 3.00**

Concepts, methodologies and tools for project control, organization, planning and scheduling a project for execution; In- place controls for schedule and cost; Methods for managing work interfaces and improving productivity, including advanced methodologies such as lean construction, considerations in equipment selection and fleet size determination, Work improvement and optimization methods related to allocation of resources, theory of constraints and critical chain; Issues of contract management, safety, health, environment, quality and document management for proper site control.

CEE 6121 Engineering Economics & Project Evaluation **3-0** **Credit: 3.00**

Analytical methods and techniques to evaluate projects from an economic perspective; Cost concepts; Time value of money relationships; Methods for evaluating alternatives; Inflation and foreign exchange; Depreciation and income tax; Cost estimates and sensitivity study; Handling risk and uncertainty; Equipment replacement studies; Public projects.

CEE 6123 Construction Equipment and Methods **3-0** **Credit: 3.00**

An overview of the construction methods available in civil engineering, industrial, offshore and building type projects; planning for earthwork construction; design of formwork, trench supports and cofferdams; evaluation and selection of equipment; estimating project cost; Work improvement and optimization methods related to resource allocation, transportation, process planning and inventory; and systems analysis and optimization.

CEE 6301 Water Treatment and Process Design **3-0** **Credit: 3.00**

Water and its impurities. Water quality standard; Planning and design consideration. Intake facilities. Conventional Water Treatment processes. Advanced water treatment process: Ion exchange, Membrane processes, Activated carbon adsorption, Desalination, Demineralization. Control of taste and odor.

CEE 6303 Municipal Wastewater Treatment & Process Design 3-0 **Credit: 3.00**

Composition, properties and analysis of municipal wastewater. Principles of physical, chemical and biological treatment processes. Tertiary treatment of effluents. Advanced processes in anaerobic treatment and nutrient removal. Wastewater disinfection; Wastewater reclamation and reuse. Sludge treatment and disposal.

CEE 6305 Surface Water Quality Modeling 3-0 **Credit: 3.00**

Objectives of modeling, applications; Mass balance and transport; biochemical processes and particle phenomena in natural environment; Mass loading for point source, tributary and intermittent sources; Low flow estimates, travel time and velocity estimates; Steady state stream equations; Estuarine hydrology; Distribution of water quality in rivers and estuaries, dispersion coefficients, hydraulic transport processes, mathematical formulations, water quality parameters, solution techniques, multi-dimensional models; Physical and hydrologic characteristics of lakes, lake wide response to inputs, finite segment steady state lake models, model calibration and verification, sensitivity analysis parameter estimation.

Principal components of dissolved oxygen (DO) analysis, dissolved oxygen and algal dynamics; engineering control of DO; sediment-water-pollutant interactions; modeling application to rivers and estuaries. Case studies.

CEE 6307 Contaminated Site Assessment & Remediation 3-0 **Credit: 3.00**

Site assessment and remediation issues. Hydro-geological and geochemical aspects of site characterization. Contaminant fate and transport in the subsurface environment. Site remediation techniques. Principles and application of remedial technology.

CEE 6309 Air Quality Management 3-0 Credit: 3.00

Classification and legislation. Atmospheric properties. Meteorological conditions, pollutants distribution and interaction. Engineered systems for removal of particulate, biological and gaseous pollutants. Indoor air quality. Monitoring and models. Global warming.

CEE 6311 GIS and Remote Sensing in Environmental Modeling 3-0 Credit: 3.00

Definition of GIS, Necessity of GIS, Required functions for GIS, Areas of GIS application, Data Model, Geometry and topology of vector data, Topological data structure, Topological relationships between spatial objects, Geometry and topology of Raster data, Topological features of raster data, Thematic data modeling. Basic principles of remote sensing (RS) and global positioning systems (GPS): definition, data acquisition, spectral characteristics of land cover, multi-spectral analysis, image interpretation, Digital Elevation Model, surface analysis, Flood mapping, wild fire modeling, soil erosion and non-point source modeling.

CEE 6501 Highway Engineering 3-0 Credit: 3.00

Introduction to highway planning and engineering; human factors; road vehicle performance characteristics; highway capacity and level of service; highway classification; design consistency; alignment elements, cross section elements, intersections, interchanges, traffic barriers; road safety audits. Planning and design of pedestrian/bicycle facilities. Environmental impact of highways. Explicit evaluation of safety in road design.

CEE 6503 Traffic Engineering and Operations 3-0 Credit: 3.00

Introduction to traffic engineering, traffic stream components, traffic stream characteristics, traffic studies, data collection, speed, travel time and delay studies, speed limits and advisory speeds, accident studies, parking studies, traffic barriers, traffic noise, capacity and level of service, warrants for traffic control devices, principles of intersection signalization, actuated and pretimed signals, signal control systems, progression, traffic systems management, local area traffic management studies, intelligent transportation systems, road safety issues.

CEE 6505 Transportation Planning 3-0 Credit: 3.00

Techniques and processes used in solving transportation problems, relationship between trip generation and land use, collection and characteristics of base year data, formulation of mathematical models to simulate existing travel patterns, forecasting procedures and evaluation of transportation systems.

CEE 6511 Introduction to Traffic Safety 3-0 Credit: 3.00

Theory and evidence in accident analysis and prevention. Topics include Haddon's matrix, crash data analysis, traffic enforcement, road safety advertising, fleet safety, road safety audits, vehicle safety and program evaluation.

CEE 6515 Applied Probability and Statistics in Engineering 3-0 Credit: 3.00

Review of probability theory; extreme value distributions; engineering reliability; conditional distributions; applications of common probability models; parameter estimation and confidence intervals; significance testing; elementary Bayesian analysis; simple stochastic processes.

CEE 6701 Advanced Soil Mechanics I 3-0 Credit: 3.00

Soil classification; characteristics of soils. Compression. One and three dimensional consolidation theory and settlement analysis. Soil shear strength, concept of cohesion and internal friction. Stress-strain-strength behavior of cohesionless and cohesive soils. Excavation and embankment problems. Lateral earth pressures. Bearing capacity. Slope stability. Laboratory and field methods for evaluation of soil properties in design practice.

CEE 6703 Constitutive Modeling of Soils 3-0 Credit: 3.00

Stress Tensor, Strain Tensor, Tensor Analysis. Fundamentals of conventional elastoplasticity - one-dimensional and multidimensional modeling of elastoplastic materials. Modeling of one-dimensional soil behavior. Modeling of three-dimensional soil behavior. Modeling of over consolidated and structured soils. Modeling of time-dependent behavior of soils. Application of constitute model to bearing capacity, retaining wall, tunnel excavation and slope stability problems.

CEE 6705 Advanced Soil Mechanics II 3-0 Credit: 3.00

The effective stress principle. Hydraulic fracturing. Principles governing flow of water through soils. Soil seepage analysis for isotropic and anisotropic conditions. Numerical techniques for vertical and radial drainage. Description, design procedure and usage of current site improvement techniques, preloading, earth reinforcement, dynamic compaction, blasting densification, sand drain, and prefabricated vertical drain (PVD).

CEE 6000 Thesis 0-36 Credit: 18.00

For M.Sc. Engg. Degree

CEE 6002 Project 0-12 Credit: 6.00

For M.Sc. Engg. Degree

CEE 6000 Thesis 0-36 Credit: 18.00

For Ph.D. Degree

THIRD
BACK
COVER

ORGANISATION OF ISLAMIC COOPERATION (OIC)
ISLAMIC UNIVERSITY OF TECHNOLOGY (IUT)
منظمة التعاون الاسلامي (أو ائي سي)
الجامعة الإسلامية للتكنولوجيا (ائي يو تي)
ORGANISATION DE COOPÉRATION ISLAMIQUE (OCI)
UNIVERSITÉ ISLAMIQUE DE TECHNOLOGIE (UIT)