Kingdom University

College of Engineering and Design

Department of Civil and Environmental Engineering

Course Descriptions

Bachelor of Science in Civil and Environmental Engineering

(BSCEE)

September 2024

1. Program Structures

Civil & Environmental Engineering Department - KU				Subject Area (Credit Hours)				Total Credit Hours
List all courses in the program by term starting with the first term of the first year and ending with the last term of the final year.				Math & Basic Sciences	Major Topic	University Topic	PRE-Requisite	
#	Course	Code	Title					
Semester 1	ENGL	103	English for Academic Purposes I			3	ENGL012	
	MATH	111	Calculus I	3			MATH099	
	PHYS	111	General Physics I	3				
	CHM	101	General Chemistry I	3				
	GS	111	Arabic Language Skills			3		
	SUM							15
Semester 2	ENGL	104	English for Academic Purposes II			3	ENGL103	
	MGT	100	Introduction to Entrepreneurship			2		
	MATH	112	Calculus II	3			MATH111	
	PHYS	113	General Physics II	3			PHYS111	
	BIO	114	Biology	3				
	CEE	171	Engineering Graphics & CAD		3			
	SUM							17

Civil & Environmental Engineering Department - KU				Subject Area (Credit Hours)				Total Credit Hours
List all courses in the program by term starting with the first term of the first year and ending with the last term of the final year.				Math & Basic Sciences	Engineering Topics	General Education	PRE-Requisite	
#	Course	Code	Title					
Semester 3	ENGL	202	English Writing for Communication			3	ENGL104	
	MATH	210	Calculus III	3			MATH112	
	MATH	212	Probability and Statistics	3			MATH112	
	MATH	213	Differential Equations	3			MATH112	
	CEE	215	Engineering Mechanics-Statics		3		MATH111+ PHYS111	
	CEE	218	Properties and Testing of Materials		3		PHYS113	
	SUM							18

Semester 4	GS	133	History of Bahrain			3		
	LAW	106	Human Rights			2		
	CEE	232	Introduction to Environmental Engineering		3		CHM101+ BIO114	
	MATH	214	Numerical Methods	3			MATH213	
	CEE	275	Computer Programming using MATLAB		3		MATH112	
	CEE	235	Fluid mechanics and Hydraulics		3		CEE215+ MATH210	
	SUM							17

Civil & Environmental Engineering Department - KU				Subject Area (Credit Hours)				
List all courses in the program by term starting with the first term of the first year and ending with the last term of the final year.				**Math & Basic Sciences**	**Engineering Topics**	**General Education**	**PRE-Requisite**	**Total Credit Hours**
#	**Course**	**Code**	**Title**					
Semester 5	CEE	341	Surveying		3		MATH212	
	CEE	321	Structural Analysis I		3		CEE215	
	CEE	333	Water Supply and Sewerage Networks		3		CEE171+ CEE235	
	CEE	351	Project Management		3		MGT100	
	CEE	331	Physical Geology		3		CEE218	
	CEE	334	Environmental Impact Assessment		3		CEE232	
	SUM							18
Semester 6	CEE	322	Structural Analysis II		3		CEE321	
	CEE	325	Concrete Design I		3		CEE218 + CEE321	
	CEE	342	Highway and Traffic Engineering		3		CEE341	
	CEE	326	Geotechnical Engineering		3		CEE215+ CEE331	
	CEE	335	Water and Wastewater Treatment Plants		3		CEE333	
	CEE	350	Sustainable Design and Construction		3		CEE334	
	SUM							18

Civil & Environmental Engineering Department - KU	Subject Area (Credit Hours)		

List all courses in the program by term starting with the first term of the first year and ending with the last term of the final year.				Math & Basic Sciences	Engineering Topics	General Education	PRE-Requisite	Total Credit Hours
#	Course	Code	Title					
	CEE	367	Industrial Training		2		Completion of 80 Cr.	**2**

Civil & Environmental Engineering Department - KU				Subject Area (Credit Hours)				
List all courses in the program by term starting with the first term of the first year and ending with the last term of the final year.				Math & Basic Sciences	Engineering Topics	General Education	PRE-Requisite	Total Credit Hours
#	Course	Code	Title					
Semester 7	CEE	425	Concrete Design II		3		CEE325	
	CEE	426	Steel Design		3		CEE325	
	CEE	461	Engineering Practice and Ethics		3		CEE351	
	CEE	4xx	Elective I		3			
	CEE	4xx	Elective II		3			
	CEE	432	Solid Waste Management and Treatment		3		CEE333	
	SUM							**18**
Semester 8	CEE	450	Engineering Economy		3		CEE351	
	CEE	4xx	Elective III		3			
	CEE	4xx	Elective IV		3			
	CEE	4xx	Elective V		3			
	CEE	466	Graduation Project		3		Completion of 120 Cr.	
	SUM							**15**

Civil & Environmental Engineering Department - KU	Subject Area (Credit Hours)	

	Math & Basic Sciences	Engineering Topics	General Education	Total
Total Cr. Hr.	**30**	**89**	**19**	**138**
Percentage (%)	**21.7**	**64.5**	**13.8**	**100%**

Civil & Environmental Engineering Department - KU

Elective Tracks

1. Structure

#	Course	Code	Title	Cr. Hr.	PRE-Requisite
1	CEE	421	Advanced Structural Design	3	CEE322+CEE325
2	CEE	422	Pre-stressed Concrete	3	CEE425
3	CEE	423	Reinforced Masonry	3	CEE325
4	CEE	429	Advanced Steel Design	3	CEE426
5	CEE	428	Bridge Design	3	CEE425

Civil & Environmental Engineering Department - KU

Elective Tracks

2. Water Resources and Environmental Management

#	Course	Code	Title	Cr. Hr.	PRE-Requisite
1	CEE	431	Coastal Engineering	3	CEE333
2	CEE	433	Transportation and the Environment	3	CEE232 + CEE342
3	CEE	434	Water Resource Systems	3	CEE333
4	CEE	435	Introduction to Geo-Environmental Engineering	3	CEE232+CEE326
5	CEE	436	Special Topics in Environmental Engineering	3	CEE432+CEE333

Civil & Environmental Engineering Department - KU

Elective Tracks

3. Transportation and Remote Sensing

#	Course	Code	Title	Cr. Hr.	PRE-Requisite
1	CEE	441	Advanced Traffic Engineering	3	CEE342
2	CEE	442	Sustainable Pavement Materials and Design	3	CEE350+CEE326
3	CEE	443	Urban Transportation Planning	3	CEE342
4	CEE	444	GIS Applications in Civil Engineering	3	CEE341
5	CEE	445	Remote Sensing Applications in Civil Engineering	3	CEE341

Civil & Environmental Engineering Department - KU

Elective Tracks

4. Construction Engineering and Management

#	Course	Code	Title	Cr. Hr.	PRE-Requisite
1	CEE	451	Specifications and Quantity Surveying	3	CEE351
2	CEE	452	Building Information Modelling	3	CEE351
3	CEE	453	Construction Methods and Management	3	CEE351
4	CEE	454	Construction Estimation and Cost Control	3	CEE451
5	CEE	455	Risk Management in Construction Industry	3	CEE351

Courses Description

First Year

First Semester

Code	Title	Subject Area (Credit Hours)			PRE-Requisite	Total Credit Hours
		Math & Basic Sciences	Engineering Topics	General Education		
ENGL103	English for Academic Purposes I			3	ENGL012	

This is an introductory course that prepares the students to communicate in correct English for academic and professional purposes. Students enhance their reading, writing, listening as well as speaking skills through classroom activities and compose ideas in varied specified formats. This course will help the students to develop contextual analysis, teamwork, word processing, documentation, and professional communication.

Code	Title	Subject Area (Credit Hours)			PRE-Requisite	Total Credit Hours
		Math & Basic Sciences	Engineering Topics	General Education		
MATH111	Calculus I	3			MATH099	

This course is first course in calculus and involves the study of functions, limits, continuity, computations of derivatives including sum, product, and quotient formulas, chain rule, implicit differentiation, applications of derivatives, related rate problems, mean-value theorem, and definite integrals.

Code	Title	Subject Area (Credit Hours)			PRE-Requisite	Total Credit Hours
		Math & Basic Sciences	Engineering Topics	General Education		
PHYS111	General Physics I	3				

This course introduces the basic concepts in physics and includes units and dimensions, motion in a straight line, vectors, motion in two dimensions, Newton's laws of motion, circular motion, work and energy, conservation of energy, and universal gravitation.

Code	Title	Subject Area (Credit Hours)			PRE-Requisite	Total Credit Hours
		Math & Basic Sciences	Engineering Topics	General Education		
CHM101	General Chemistry I	3				

This course provides students by the principles of chemistry applied in civil and environmental engineering. The course enables students to understand the knowledge of thermodynamic and kinetic basics including Gaseous State - Mass and heat balance in Fuel Combustion - Electrochemistry & Corrosion - Properties of Solutions & Alloys - Treatment of Water- Air Pollution - Dynamic Equilibrium in Physical & Chemical Processes- Building materials Petrochemicals- Polymers and engineering properties of materials.

Code	Title	Subject Area (Credit Hours)			PRE-Requisite	Total Credit Hours
		Math & Basic Sciences	Engineering Topics	General Education		
GS111	Arabic Language Skills			3		

دراسة أساسيات اللغة العربية صياغةً وتركيبًا ومعجمًا ودلالة وإملاءً ، ومعالجة أساليبها قراءةً وتذوقًا ونقدًا، وبيان خصائصها الجمالية وقيمها الدلالية والتعبيرية من خلال نصوص تتناول الأجناس الأدبية شعرًا ونثرًا.

Second Semester

Code	Title	Subject Area (Credit Hours)			PRE-Requisite	Total Credit Hours
		Math & Basic Sciences	Engineering Topics	General Education		
ENGL104	English for Academic Purposes II			3	ENG103	

This is a course that develops the interpretative skills related to listening, speaking, reading and writing tasks that constitute professional communication. This course covers a process-based approach namely brainstorming, drafting, developing, revising as well as editing in writing and speaking tasks, plus skimming as well as scanning for the interpretation of the text in reading and listening tasks systematically. This course helps the students describe events, make comparisons and express their preferences and recommendations.

Code	Title	Subject Area (Credit Hours)			PRE-Requisite	Total Credit Hours
		Math & Basic Sciences	Engineering Topics	General Education		
MGT100	Introduction to Entrepreneurship			2		

This is an introductory course in entrepreneurship which focuses on fundamentals and specifics of Entrepreneurship. This course discusses contributions to environmental improvements and the circular economy and learn how to identify and evaluate business opportunities. The course further develops students' skills to enable them to launch new ventures, strategies, products and technologies that address society's environmental and natural resource problems.

Code	Title	Subject Area (Credit Hours)			PRE-Requisite	Total Credit Hours
		Math & Basic Sciences	Engineering Topics	General Education		
MATH112	Calculus II	3			MATH111	

This is the second course in calculus. It continues the study of calculus by focusing on the integration techniques and applications of integration. The topics covered are techniques of integration, areas between curves, volumes of revolution, parametric calculus and polar coordinates, sequences and series, Taylor series representation of analytic functions.

Code	Title	Subject Area (Credit Hours)			PRE-Requisite	Total Credit Hours
		Math & Basic Sciences	Engineering Topics	General Education		
PHY113	General Physics II	3			PHYS111	

This is the second course in physics. This course introduces electricity and magnetism. Topics covered include electric charges, electric fields, and Gauss' law; magnetic fields and Ampere's law, capacitance and inductance, DC and AC circuits, Maxwell's equations, and electromagnetic waves.

Code	Title	Subject Area (Credit Hours)			PRE-Requisite	Total Credit Hours
		Math & Basic Sciences	Engineering Topics	General Education		
BIO114	Biology	3				

This course introduces the fundamental biological principles needed to analyse important biological processes in engineering. Specific applications include: the biological treatment of municipal and industrial wastes, public health microbiology, and microbial ecology of engineered and natural systems. The course will cover basic microbiology, survey key microbial groups and their metabolisms, cover biodegradation/catabolism of the basic

macromolecules (carbohydrates, lipids, proteins), and introduce microbial ecology concepts, including molecular approaches.

Code	Title	Subject Area (Credit Hours)			PRE-Requisite	Total Credit Hours
		Math & Basic Sciences	Engineering Topics	General Education		
CEE171	Engineering Graphics & CAD		3			

This course provides students with a general introduction to engineering drawing, lettering, use of instruments and types of lines, oblique and orthographic projections, isometric, and extracting sectional drawings. The course provides an introduction to AutoCAD for two dimensional drawings, structural drawings, miscellaneous civil engineering drawings.

Second Year

Third Semester

Code	Title	Subject Area (Credit Hours)			PRE-Requisite	Total Credit Hours
		Math & Basic Sciences	Engineering Topics	General Education		
ENGL202	English Writing for Communication			3	ENG104	

This is a course in English as a foreign Language that builds upon the critical, analytical and research skills to prepare students for future academic study. This covers compiling reviews, reports, notes, summaries, presentations as well as cite references. This course develops the students' academic reading strategies, ability to differentiate literal and inferential meanings plus competent speaking skills to defend their observations.

Code	Title	Subject Area (Credit Hours)			PRE-Requisite	Total Credit Hours
		Math & Basic Sciences	Engineering Topics	General Education		
MATH210	Calculus III	3			MATH112	

This is the third course in calculus. It discusses the double integration, vectors and surfaces, Limits, derivatives, and integrals of vector-valued functions. It deals with Multiple and line integrals and their applications, Partial differentiation and Green's and Stokes' Theorems.

Code	Title	Subject Area (Credit Hours)			PRE-Requisite	Total Credit Hours
		Math & Basic Sciences	Engineering Topics	General Education		
MATH212	Probability and Statistics	3			MATH112	

Descriptive statistics, Introduction to probability and probability distributions. Some of probability Densities, Sampling distributions. Central limit theorem. t and F distributions. Estimation. Tests of hypotheses. Goodness of fit tests. Regression and correlation.

Code	Title	Subject Area (Credit Hours)			PRE-Requisite	Total Credit Hours
		Math & Basic Sciences	Engineering Topics	General Education		
MATH213	Differential Equations	3			MATH112	

Differential equations of first and second order and their solution. Separable and exact equations. Equations convertible to separable type. Higher order linear equations with constant coefficients (homogeneous and non-homogeneous). Power series method for

second order linear equations. Variation of parameters. Laplace transform technique. Applications of differential equations in Civil Engineering.

Code	Title	Subject Area (Credit Hours)			PRE-Requisite	Total Credit Hours
		Math & Basic Sciences	Engineering Topics	General Education		
CEE215	Engineering Mechanics - Statics		3		MATH111+ PHYS111	

This course is an introductory course to engineering mechanics which provides the fundamentals of force vectors, free-body diagram, equilibrium of particles, moment of forces and couples, force-couple system, distributed loading, equilibrium of rigid-body, friction, and analysis of trusses. Students will learn the types of internal stresses in structural members including shear, moment, and normal stresses diagrams. The course introduces of centre of gravity, centroid and moment of inertia of solid bodies.

Code	Title	Subject Area (Credit Hours)			PRE-Requisite	Total Credit Hours
		Math & Basic Sciences	Engineering Topics	General Education		
CEE218	Properties and Testing of Materials		3		PHYS113	

The course introduces the fundamentals of Physical and mechanical properties of building materials used in construction such as aggregates, concrete, cement, masonry, and steel. It describes the methods of testing and standardization, classification of natural and manufactured building materials. Learners are learning the behaviour and deterioration of building material under natural conditions.

Fourth Semester

Code	Title	Subject Area (Credit Hours)			PRE-Requisite	Total Credit Hours
		Math & Basic Sciences	Engineering Topics	General Education		
GS133	History of Bahrain			3		

يتناول المقرر موقع البحرين وأهميته عبر العصور ، كما يبرز الخصائص الجغرافية للبحرين ، ويركز في تاريخ البحرين القديم والوسيط والحديث والمعاصر ، فيبرز التطورات والتحولات السياسية والاقتصادية والاجتماعية والثقافية وصولا إلى بيان أهمية الدولة المعاصرة وإنجازاتها.

Code	Title	Subject Area (Credit Hours)			PRE-Requisite	Total Credit Hours
		Math & Basic Sciences	Engineering Topics	General Education		
LAW106	Human Rights			2		

يتناول هذا المقرر المفاهيم الأساسية لحقوق الإنسان في القانون الدولي والمواثيق العالمية والمعاهدات والتوصيات المنبثقة عن المؤتمرات والتجمعات الدولية، كما يتناول دراسة الحقوق والحريات الأساسية بموجب الاتفاقيات الدولية والحماية المقررة للأفراد بموجب الدساتير والإعلان العالمي لحقوق الإنسان.

Code	Title	Subject Area (Credit Hours)			PRE-Requisite	Total Credit Hours
		Math & Basic Sciences	Engineering Topics	General Education		
CEE232	Introduction to Environmental Engineering		3		CHM101+BIO114	

This course provides an introductory overview to different aspects of environmental engineering, it provides the idea of applying the environmental regulations and standards, environmental parameters including concepts of sustainability, natural systems, water quality management, water and wastewater treatment, air , soil/land, noise, light and thermal pollution, renewable energies (biomass, wind, and solar energy), solid/hazardous waste management & treatment, and Environmental Impact Assessment for projects.

Code	Title	Subject Area (Credit Hours)			PRE-Requisite	Total Credit Hours
		Math & Basic Sciences	Engineering Topics	General Education		
MATH214	Numerical Methods	3			MATH213	

This course provides the numerical techniques commonly used by engineers such as: roots of an equation; solutions of systems of algebraic equations; curve fitting; interpolation; integration; ordinary and partial differential equations.

Code	Title	Subject Area (Credit Hours)			PRE-Requisite	Total Credit Hours
		Math & Basic Sciences	Engine-ering Topics	General Education		
CEE275	Computer Programming using MATLAB		3		MATH112	

This course introduces students to the basic elements and practicalities of computer programming through the MATLAB mathematical computing environment. The course will cover programming fundamentals, input/output operations, mapping, and other data visualization techniques. This course provides a practical introduction to scientific computer programming techniques and applications in Civil and Environmental Engineering.

Code	Title	Subject Area (Credit Hours)			PRE-Requisite	Total Credit Hours
		Math & Basic Sciences	Engineering Topics	General Education		
CEE235	Fluid Mechanics & Hydraulics		3		CEE215+ MATH210	

This course provides students by the basic knowledge of Fluid Mechanics and Hydraulics concerns the continuous deformation of gases and liquids under shear stress. It covers the properties of fluids and introduces hydrostatic principles before delving into dynamics of flow for incompressible fluids with an emphasis on water. Students will learn how to formulate and solve fluid hydrostatics and pressure problems, analyze pipe flow situations using the Bernoulli equation, determine appropriate pump sizes for pipe systems, and analyze open channel flow situations using Manning's equation.

Third Year

Fifth Semester

Code	Title	Subject Area (Credit Hours)			PRE-Requisite	Total Credit Hours
		Math & Basic Sciences	Engineering Topics	General Education		
CEE341	Surveying		3		MATH212	

The course introduces the fundamentals of land surveying as well as measurements and instruments, it is an introductory course to plane surveying as related to the construction industry. The course enables students to learn how to measure, record, adjust and calculate directions, distances and elevations using standard field instruments like distance measurement tools, compass, theodolite, level, and total station. Topics are designed to cover basics of linear measurements (observations, corrections and calculations), surveying mathematics, map scale, basic error theory in measurements, traverse field techniques and levelling works, total station operation & applications and intro. to GPS Measurements.

Code	Title	Subject Area (Credit Hours)			PRE-Requisite	Total Credit Hours
		Math & Basic Sciences	Engineering Topics	General Education		
CEE321	Structural Analysis I		3		CEE215	

This course introduces the stability and determinacy of structures. Analysis of statically determinate structures including beams, frames, arches, and truss. Drawing normal, shear, and moment diagrams. Analysis of structures due to settlement of supports. Calculating deformation in determinate structures using integration method, virtual work, and conjugate beam methods. Influence lines for determinate beams and trusses.

Code	Title	Subject Area (Credit Hours)			PRE-Requisite	Total Credit Hours
		Math & Basic Sciences	Engineering Topics	General Education		
CEE333	Water Supply and Sewerage Networks		3		CEE171+CEE235	

This course is designed to provide the concepts and fundamentals of Water Supply and Sewerage Networks including the following items: An introduction about water systems, sources, and its quality and the importance of water storage in ground and elevated tanks for residential area, population studies, consumption rates, designing water networks. Moreover, an introduction about the characteristics of collected wastewater, define the sewer systems and its accessories, finally studying the inlet design, and make a case study in water cad and sewer cad programs.

Code	Title	Subject Area (Credit Hours)			PRE-Requisite	Total Credit Hours
		Math & Basic Sciences	Engineering Topics	General Education		

CEE351	Project Management		3		MGT100	

The course describes the Characteristics of Construction Projects, Main Participants (Players), Project Life Cycle (Stages), Project Delivery Systems, Tendering, Construction Documents (Detailed Drawings, Tender (bid), Estimation, and Soil Investigation Reports), Project Planning, Project Scheduling, Project Monitoring, Risk assessment- Management, and Site Management.

Code	Title	Subject Area (Credit Hours)			PRE-Requisite	Total Credit Hours
		Math & Basic Sciences	Engineering Topics	General Education		
CEE331	Physical Geology		3		CEE218	

This course provides students by an introduction to geology as a science and an overview of its basic principles. Students will explore aspects of Earth systems related to Earth materials and processes. Students will gain an appreciation for the complexities of Earth systems, fundamental of geology including igneous rocks and magma formation, volcanoes, earthquakes, sediments, sedimentary rocks, geologic structures, folds, faults, Earth's Interior and magnetism, mountain belts and continents.

Code	Title	Subject Area (Credit Hours)			PRE-Requisite	Total Credit Hours
		Math & Basic Sciences	Engineering Topics	General Education		
CEE334	Environmental Impact Assessment		3		CEE232	

This course will introduce students to the theory and practice of Environmental Impact Assessment (EIA), including the following topics: definition, importance, objectives, principles and main features, components, stages, and activities of the EIA process, national and international environmental laws, air, water, soil, and socioeconomic factors. In addition, ethical concerns in EIA, professional standards and conduct, climate change implications, and career options in EIA , as well as real-world EIA cases.

Sixth Semester

Code	Title	Subject Area (Credit Hours)			PRE-Requisite	Total Credit Hours
		Math & Basic Sciences	Engineering Topics	General Education		
CEE322	Structural Analysis II		3		CEE321	

This course introduces students to analyse of indeterminate structures: beams, frames, and trusses. Analysis of indeterminate structures deformations by slope deflection, moment distribution, Three Moments Equation and stiffens displacement methods. Students learn how to draw Influence lines for indeterminate beams, frames, and trusses.

Code	Title	Subject Area (Credit Hours)			PRE-Requisite	Total Credit Hours
		Math & Basic Sciences	Engineering Topics	General Education		
CEE325	Concrete Design I		3		CEE218 + CEE321	

The course provides students a thorough understanding of reinforced concrete structure design. Students will learn how to design beams and slabs for both flexure and shear; how to detail reinforcement for both flexure and shear; how reinforced concrete members behave under flexure and axial loads; how to design short columns; and how slender columns behave and look. BS 8110 is the British Standard for designing members under flexure, shear, and axial loads.

Code	Title	Subject Area (Credit Hours)	PRE-Requisite	Total Credit

		Math & Basic Sciences	Engineering Topics	General Education		Hours
CEE342	Highway & Traffic Engineering		3		CEE341	

The course covers basic of highway and transportation engineering including an introduction to both transportation systems, highway planning and surveys, principles of highway locations, geometric design of highways, the fundamentals of road traffic flow and its analysis, using this as a basis for you to be able to undertake operational analysis and design of key features of the road transport system, particularly the design of the various types of road junction.

Code	Title	Subject Area (Credit Hours)			PRE-Requisite	Total Credit Hours
		Math & Basic Sciences	Engineering Topics	General Education		
CEE326	Geotechnical Engineering		3		CEE215+CEE331	

This course provides students by the understanding of the design of geotechnical engineering systems. It covers; site investigations and in situ testing, lateral earth pressures and retaining wall design, foundation design, loading induced stresses and displacements, bearing capacity of shallow foundations, analysis and design of shallow foundations and the stability of slopes.

Code	Title	Subject Area (Credit Hours)			PRE-Requisite	Total Credit Hours
		Math & Basic Sciences	Engineering Topics	General Education		
CEE335	Water and Wastewater Treatment Plants		3		CEE333	

This course is designed to provide the concepts and fundamentals of water and wastewater treatment technologies by making design for all units inside the plants. The course includes the following items: an introduction about water resources, water quality and its importance for urban communities, population studies, consumption rates, design of water treatment units (sedimentation, filtration, and disinfection processes). Moreover, an introduction about wastewater works, wastewater characteristics, estimation of wastewater quantities and sources, design of wastewater treatment units (preliminary, primary, biological, and tertiary treatment). Furthermore, sludge characteristics, treatment, and management are described in the course.

Code	Title	Subject Area (Credit Hours)			PRE-Requisite	Total Credit Hours
		Math & Basic Sciences	Engineering Topics	General Education		
CEE350	Sustainable Design and Construction		3		CEE334	

The course introduces the importance of adopting forward-looking sustainable development goals and strategies, and of approaching each construction project with a clear set of sustainability targets/KPIs. It covers critical elements to consider at the design and planning stages of a project in order to incorporate sustainable construction principles. The course provides students with the knowledge of sustainable design and construction and introduce the main requirements, technologies, tools, methods, processes and systems required to develop a sustainable building.

Summer Semester

Code	Title	Subject Area (Credit Hours)			PRE-Requisite	Total Credit Hours
		Math & Basic Sciences	Engineering Topics	General Education		
CEE367	Industrial Training		2		Completion of 80 Cr.	300 training Hrs.

In this course, all students in the Civil and Environmental Engineering program must participate in an approved training program in the relevant industry. At the completion of 300 hours of supervised training each student must submit a formal report and conduct an oral presentation.

Fourth Year

Seventh Semester

Code	Title	Subject Area (Credit Hours)			PRE-Requisite	Total Credit Hours
		Math & Basic Sciences	Engineering Topics	General Education		
CEE425	Concrete Design II		3		CEE325	

This is the second course of Reinforced Concrete, it describes the design of two-way solid slabs with beams, Design of Waffle Slabs, Design of Flat and Hollow Block Slabs, Design of braced and unbraced slender columns, staircases, isolated and compound foundations. Serviceability requirements for concrete structures are applied.

Code	Title	Subject Area (Credit Hours)			PRE-Requisite	Total Credit Hours
		Math & Basic Sciences	Engineering Topics	General Education		
CEE426	Steel Design		3		CEE325	

This course provides the fundamentals of design of steel tension and compression members, beams, columns, members subjected to axial load and bending, bolted and welded connections, composite steel sections, elastic and plastic design methods, design applications.

Code	Title	Subject Area (Credit Hours)			PRE-Requisite	Total Credit Hours
		Math & Basic Sciences	Engineering Topics	General Education		
CEE461	Engineering Practice & Ethics		3		CEE351	

The course provides develop deeper understanding the theory and practice of Engineering Practice & Ethics; it helps students to prepare themselves for their professional carriers. Students can develop their understanding and thoughts about ethical issues and the practice in which they arise. The study of ethics helps students to progress widely the applicable skills in communication, reasoning and reflection. These skills enhance students' abilities and help them engage with other aspects of the engineering activities such as group work and work situations.

Code	Title	Subject Area (Credit Hours)			PRE-Requisite	Total Credit Hours
		Math & Basic Sciences	Engineering Topics	General Education		
CEE4xx	Elective I		3			

Refer to Elective course descriptions.

Code	Title	Subject Area (Credit Hours)			PRE-Requisite	Total Credit Hours
		Math & Basic Sciences	Engineering Topics	General Education		
CEE4xx	Elective II		3			

Refer to Elective course descriptions.

Code	Title	Subject Area (Credit Hours)			PRE-Requisite	Total Credit Hours
		Math & Basic Sciences	Engineering Topics	General Education		
CEE432	Solid Waste Management and Treatment		3		CEE333	

This course provides the principles of integrated solid waste management and treatment, including solid waste types, sources, characteristics, quantities, solid waste management, treatment, sanitary landfill, and reuse, recycle reduction and energy recovery strategies via different technologies from environmental, energetic, and economic perspectives. Moreover, the disposal methods and their threats to air, land, and water pollution. Furthermore, management of hazardous wastes, health and environmental issues related to solid waste management, sustainable waste management, and integrated waste management with circular economy.

Eights Semester

Code	Title	Subject Area (Credit Hours)			PRE-Requisite	Total Credit Hours
		Math & Basic Sciences	Engineering Topics	General Education		
CEE450	Engineering Economy		3		CEE351	

This course describes the elements of feasibility studies; role of economic analysis; the decision-making process; Interest and equivalence; Interest formulae; Worth analysis;

Cash flow analysis; Rate of return analysis; Incremental analysis; Depreciation; Income taxes; Replacement analysis.

Code	Title	Subject Area (Credit Hours)			PRE-Requisite	Total Credit Hours
		Math & Basic Sciences	Engineering Topics	General Education		
CEE4xx	Elective III		3			

Refer to Elective course descriptions.

Code	Title	Subject Area (Credit Hours)			PRE-Requisite	Total Credit Hours
		Math & Basic Sciences	Engineering Topics	General Education		
CEE4xx	Elective IV		3			

Refer to Elective course descriptions.

Code	Title	Subject Area (Credit Hours)			PRE-Requisite	Total Credit Hours
		Math & Basic Sciences	Engineering Topics	General Education		
CEE4xx	Elective V		3			

Refer to Elective course descriptions.

Code	Title	Subject Area (Credit Hours)			PRE-Requisite	Total Credit Hours
		Math & Basic Sciences	Engineering Topics	General Education		
CEE466	Graduation Project		3		Completion of 120 Cr.Hrs	

In this is course student will apply the gained previous knowledge, design and conducted experiments, design a system, function on multi-disciplinary teams, identify, formulate, and solve engineering problems. Students are expected to adhere to professional and ethical responsibilities, communicate, understand global and local impact of engineering and environmental solutions on society, engage in lifelong learning, have knowledge of contemporary issues and use modern engineering tools for engineering practice.

Elective Tracks

Track 1: Structures

Code	Title	Subject Area (Credit Hours)			PRE-Requisite	Total Credit Hours
		Math & Basic Sciences	Engineering Topics	General Education		

CEE421	Advanced Structural Design		3		CEE322+ CEE325	

This course provides the design methods of reinforced concrete rectangular ground tanks, circular ground tanks, elevated tanks, circular elevated tanks with central support, Reinforcement detailing in various components.

Code	Title	Subject Area (Credit Hours)			PRE-Requisite	Total Credit Hours
		Math & Basic Sciences	Engineering Topics	General Education		
CEE422	Prestressed Concrete		3		CEE425	

This course provides the basic principles of prestressed concrete, Restressing systems, materials, analysis and design of sections for flexure, shear and torsion, partial losses of prestressed force, composite beams, continuous beams, camber and downward deflections.

Code	Title	Subject Area (Credit Hours)			PRE-Requisite	Total Credit Hours
		Math & Basic Sciences	Engineering Topics	General Education		
CEE423	Reinforced Masonry		3		CEE325	

Structural analysis of loadbearing brick and block masonry. Structural design of walls, columns and beams in unreinforced and reinforced masonry. Production of masonry and properties of constituents. Application of simple structural models for calculation and design of building parts and detailing.

Code	Title	Subject Area (Credit Hours)	PRE-Requisite	Total Credit

		Math & Basic Sciences	Engineering Topics	General Education		Hours
CEE429	Advanced Steel Design		3		CEE426	

This course focuses on the analysis and design of Steel frames and trusses using ASD and LRFD, the behaviour of various steel lateral load resisting systems and their structural components, Design of bolted and welded connections, Plastic Design of Continuous beams and Frames, Design of Cold-Formed Steel Sections.

Code	Title	Subject Area (Credit Hours)			PRE-Requisite	Total Credit Hours
		Math & Basic Sciences	Engineering Topics	General Education		
CEE428	Bridge Design		3		CEE425	

The course provides bridge components; bridge-type selection criteria; bridge loads and design philosophy; design of reinforced concrete bridges; design of prestressed concrete bridges; design of steel bridges.

Track 2: Water Resources and Environmental Management

Code	Title	Subject Area (Credit Hours)			PRE-Requisite	Total Credit Hours
		Math & Basic Sciences	Engineering Topics	General Education		

CEE431	Coastal Engineering		3		CEE333	

This course focuses on the basic elements of coastal engineering; it covers essential theoretical concepts for coastal engineers. The syllabus includes water wave theory, wave transformation processes, tides and sediment transport and their application in the near shore coastal zone, shallow water waves, coastal environments, climate change impact, near shore hydrodynamics and design of coastal structures. Emphasis is given to the interactions between coastal structures and processes.

Code	Title	Subject Area (Credit Hours)			PRE-Requisite	Total Credit Hours
		Math & Basic Sciences	Engineering Topics	General Education		
CEE433	Transportation and the Environment		3		CEE342+CEE232	

The course focus on teaching the negative environmental externalities of transportation on the economic development of nations, overview of the potential for changing travel behaviour to promote environmental quality; parking, road congestion pricing, and transit options; the congestion-air quality nexus; energy consumption implications; and what we mean by sustainable transportation. It will discuss the comparative international transportation policies; fundamentals of transportation modes, principles of planning, evaluation, selection, adoption, financing, and implementation of alternative sustainable transportation systems.

Code	Title	Subject Area (Credit Hours)			PRE-Requisite	Total Credit Hours
		Math & Basic Sciences	Engineering Topics	General Education		
CEE434	Water Resource Systems		3		CEE333	

This course focuses on teaching the hydrologic cycle, meteorological data, hydrologic processes: precipitation; evaporation; transpiration Infiltration, rainfall, runoff, detention,

flood flows, watersheds, hydrograph of basin outflow, storage routing for natural channels and aquifers, groundwater movement and aquifer characteristics. Students learns the probability concepts in design recurrence intervals, flood frequency analysis and flow direction curves, hydraulics of wells, boundary effects, wells construction and maintenance.

Code	Title	Subject Area (Credit Hours)			PRE-Requisite	Total Credit Hours
		Math & Basic Sciences	Engineering Topics	General Education		
CEE435	Introduction to Geo-Environmental Engineering		3		CEE232+ CEE326	

This course provides students the basic knowledge of soil physics, soil chemistry, hydrogeology, and biological processes along with the principles of soil mechanics. Geo-environmental engineering" is a blend of geotechnical engineering and environmental concepts, the course covers fundamentals of geo-environmental engineering, concepts of unsaturated soil in geo-environmental engineering, multiphase behaviour of soil, Soil-water contaminant interaction studies, Waste containment system, design practices, vertical barriers, and advanced soil characterization for geo-environmental applications.

Code	Title	Subject Area (Credit Hours)			PRE-Requisite	Total Credit Hours
		Math & Basic Sciences	Engineering Topics	General Education		
CEE436	Special Topics in Environmental Engineering		3		CEE432+ CEE333	

This course provides students by advanced topics in environmental engineering and science including Wastewater treatment and reuse, Basic concepts and applications of environmental health studies, concepts and functions of a hydro geologic system, Energy performance and the Carbon Impact of Information and Communication Technologies

Track 3: Transportation and Remote Sensing

Code	Title	Subject Area (Credit Hours)			PRE-Requisite	Total Credit Hours
		Math & Basic Sciences	Engineering Topics	General Education		
CEE441	Advanced Traffic Engineering		3		CEE342	

The course provides a good understanding of the advanced techniques in traffic engineering, know basic quantitative methods required by traffic engineers, and understand how different road user groups interact and the consequences for traffic engineering. Examples relating to current industrial practice will be used to illustrate these key concepts.

Code	Title	Subject Area (Credit Hours)			PRE-Requisite	Total Credit Hours
		Math & Basic Sciences	Engineering Topics	General Education		
CEE442	Sustainable Pavement Materials &Design		3		CEE350+CEE326	

The course explores innovative design methods that were developed to investigate distress mechanisms of pavements including alternatives intended to address some environmental performance goals. It investigates decision making and design tools that will encourage the use of more sustainable pavement materials and structures, such as permeable pavements, rubber asphalt, recycled asphalt pavement (RAP) and alternative cement binders. It also discusses the possible applications of pavement design strategies that can have a considerable impact on fuel consumption, vehicle maintenance costs, greenhouse gas (GHG) emissions, and life-cycle costs.

Code	Title	Subject Area (Credit Hours)			PRE-Requisite	Total Credit Hours
		Math & Basic Sciences	Engineering Topics	General Education		
CEE443	Urban Transportation Planning		3		CEE342	

The course illustrates the role of urban transportation in the economic development of nations, overview of transport modes, growth trends, transportation planning in the developing world; and comparative international transportation policies; Fundamentals of transportation, Principles of planning, evaluation, selection, adoption, financing, and implementation of alternative urban transportation systems; formulation of community goals and objectives.

Code	Title	Subject Area (Credit Hours)			PRE-Requisite	Total Credit Hours
		Math & Basic Sciences	Engineering Topics	General Education		
CEE444	GIS Applications in Civil Engineering		3		CEE341	

This course introduces the basic principle of Geographic Information Systems (GIS), it provides the concepts, techniques, and applications of spatial analysis and modelling. Topics include spatial statistics; overlay analysis; map algebra, spatial interpolation; surface analysis and terrain modelling. Emphasis will be placed on how spatial analysis and

modelling is used in civil engineering applications, and a functional component of a modern spatial information system.

Code	Title	Subject Area (Credit Hours)			PRE-Requisite	Total Credit Hours
		Math & Basic Sciences	Engineering Topics	General Education		
CEE445	Remote Sensing Applications in Civil Engineering		3		CEE341	

This course provides the basic principles of remote sensing for civil engineers, it includes the basics concepts of remote sensing, characteristics of remote sensors, and remote sensing applications in civil and environmental applications. Students will be able to understand the structure of remotely sensed data and how to retrieve the needed information and to decide which remote sensing techniques suite their specific needs. The course contents introduce the structure of satellite orbits, sensor ranges and characteristics, image acquisition and data collection, basics of image processing and interpretation. Applications in civil engineering will be provide such as; land use and land cover, network analysis, hydrology, environmental applications, road allocation, sustainable development, urban planning, and more.

Track 4: Construction Engineering and Management

Code	Title	Subject Area (Credit Hours)			PRE-Requisite	Total Credit Hours
		Math & Basic Sciences	Engineering Topics	General Education		
CEE451	Specifications & Quantity Surveying		3		CEE351	

The course presents an introduction to international Construction specifications systems. Specifications classification base, purpose and coding of American MasterFormat™ and

UniFormat™ are explained in detail. Moreover, the course covers role of quantity surveyors, quantity-take of process, pre-printed forms and calculation of waste in construction and building material. Students will be trained to prepare detailed bill of quantities.

Code	Title	Subject Area (Credit Hours)			PRE-Requisite	Total Credit Hours
		Math & Basic Sciences	Engineering Topics	General Education		
CEE452	Building Information Modelling		3		CEE351	

The course introduces students to the principles of Building Information Modeling (BIM) such as the Autodesk Revit for civil engineering application. Students have knowledge of functions of menus, options and tools of Revit civil including user interface, straight and flexing parameters, system and non-system families, massing, components of building elements such as walls, beams, doors, floors, columns, stairs, ramps, etc. BIM creates an accurate virtual model of a building, the model is used for planning, designing, constructing, and operating the facility. Through a simulated environment, students can visualize what is to be built and identify potential design, construction, and operational problems.

Code	Title	Subject Area (Credit Hours)			PRE-Requisite	Total Credit Hours
		Math & Basic Sciences	Engineering Topics	General Education		
CEE453	Construction Methods and Management		3		CEE351	

The course provides the construction methods, equipment, and cost estimating of the earthmoving, rock excavation, and concrete production phases of civil engineering construction projects. Students learn the mechanical, electrical and piping systems, preparing construction documents for planning, methods and management of construction processes and construction risk management. The course explains

construction practices, the legal implications of contracts, common and regulatory law to manage a construction project as well as methods of project delivery.

Code	Title	Subject Area (Credit Hours)			PRE-Requisite	Total Credit Hours
		Math & Basic Sciences	Engineering Topics	General Education		
CEE454	Construction Estimation and Cost Control		3		CEE451	

This course introduces the fundamental definition and concepts of estimation, conceptual estimation, preliminary estimation, detailed estimation, building systems, measurements, pricing, computer tools and applications, bidding extensions of estimation to cash flow analysis.

Code	Title	Subject Area (Credit Hours)			PRE-Requisite	Total Credit Hours
		Math & Basic Sciences	Engineering Topics	General Education		
CEE455	Risk Management in Construction Industry		3		CEE351	

Construction risks including aspects such as: costs, time, physical (personal and property), environmental, jurisdictional, reputation, and general liability. Risk levels and sensitivity for every project. The concepts, tools and techniques of construction risk management. Understanding the rationale used in developing effective risk management systems.