



A'Sharqiyah University

College of Engineering

Department of Energy and Sustainable Engineering

Bachelor of Engineering in Environmental Engineering Program

Course Descriptions

University Requirements (12 CH)

ISLM101 Islamic Civilization (3 CH)

This course aims to introduce students to the concept of civilization, the composition and evolution factors, introduce them to the most important political and administrative systems and economic and social development in the Islamic civilization, and aims to the statement of contributions to Islamic civilization in other civilizations, especially the European civilization, also aims to publicize the importance of the site Oman and how to interact with other previous civilizations in different eras, and the factors that allowed it to be a center of cultural divisions history.

ENGL101 English Communication Skills I (3 CH)

This course develops students' proficiency through grammar instruction and fluency exercises. While the emphasis of the class is on speaking and listening, there are also reading and writing exercises which reinforce the grammar and vocabulary students learn. Finally, students are required to participate in discussions regularly basis and give several presentations.

ENGL102 English Communication Skills II (3 CH) (Pre-R: ENGL101)

This course further develops reading sub-skills, comprehension, and vocabulary. The texts are more demanding lexically and structurally than ENGL101 and are mainly literary. Written and oral activities require students to respond to these texts critically.

MNGT313 Entrepreneurship (3 CH) (Pre-R: 60 CH)

This course is an introductory course in Entrepreneurship and Innovation. The course aims to expose students to business venturing and entrepreneurial activity. The students would apply knowledge and skills acquired during the course by developing and evaluating their business ideas. This course is an introductory entrepreneurship course that focuses on the vital role played by entrepreneurs and entrepreneurship in the 21st-century global economy. The process of successfully launching and growing an entrepreneurial venture by applying the entrepreneurial process is examined. The course integrates several different disciplines, ranging from sociology and psychology to economics, finance, marketing, and human resource management. It is a course that mixes theory with practice by applying principles, concepts, and frameworks to real-world situations.

College Requirements (42 CH)

ENGR111 Computer Applications (3 CH)

The course teaches students how to use MATLAB and visual basic programming languages in a numerical computing and integrated development environment. The topics covered in the course include using variables, solving problems, data analysis functions, manipulating matrices, plotting, data presentation, logical operators, flowcharts, pseudocode, selection structures, and an introduction to Visual Basic programming language with its applications.

MATH101 Calculus I (3 CH)

The aim of this course is to lay a firm foundation for students in calculus. The course will introduce students to the concepts of limits, continuity, derivatives, hyperbolic functions and integrals. It will develop mathematic critical thinking and problem-solving skills.

PHYS101 Physics I (3 CH)

This course presents concepts and methodologies for understanding physical phenomena. Topics include kinematics, Newton's laws, work and energy, the universal law of gravitation, systems of particles, rotational motion, momentum, angular momentum, mass and energy conservation laws, thermodynamics, vibrations and waves, oscillations, and transverse waves.

CHEM101 Chemistry (3 CH)

This course presents the basic concepts and methodologies for understanding chemical phenomena. Stoichiometry of chemical reactions, quantum mechanical description of atoms, the elements and periodic table, chemical bonding, real and ideal gases, thermochemistry, introduction to thermodynamics and equilibrium, introduction to chemical kinetics, acid-base and solubility equilibria, introduction to oxidation-reduction reactions.

MATH102 Calculus 2 (3 CH) (Pre-R: MATH101)

The aim of this course is to lay a firm foundation for students in calculus. The course will introduce students to the concept's definite integrals, integration by substitution, integration by parts, sequences and series. This course also introduces students to the concepts of vector and scalar product, partial derivatives, solution of first-order ODE's and PDE's.

PHYS102 Physics 2 (3 CH) (Pre-R: PHYS101)

This course presents introduction to electricity, magnetism, electromagnetic waves, optics, and modern physics. Topics include Coulomb's Law, electric fields, Gauss' Law, electric potential, capacitance, circuits, magnetic forces and fields, Ampere's Law, induction, Maxwell's equations, electromagnetic waves, and geometrical optics.

ENGR201 Engineering Drawing (3 CH)

This course provides basic knowledge and skills of engineering drawing so that students can efficiently develop engineering plans and details. Main topics include freehand sketching, principles of orthographic projection, dimensioning, section, isometric and working drawings, 2D and 3D drawings using AutoCAD.

ENGR202 Technical Writing and Presentation (3 CH) (Pre-R: ENGL102)

The objectives of this course are to develop engineering students' abilities to improve the communication skills and specialist language knowledge of engineers; to listen to and speak about engineering-related situations; to ask and answer important engineering-related questions; and to present engineering projects in an engaging and convincing format.

MATH215 Linear Algebra (3 CH) (Pre-R: MATH101)

The course aims to introduce students to different methods of solving systems of linear equations using matrices and to teach the representation of geometric transformations through matrices. The course covers topics such as the algebra of matrices and vector spaces, as well as applications of matrices to solutions of systems of linear equations and geometric transformations.

MATH203 Differential Equations (3 CH) (Pre-R: MATH102)

Solution of first-order ODE by analytical, graphical, and numerical methods. Linear ODE's with emphasis on the second order with constant coefficients. Sinusoidal and exponential signals. Fourier series and periodic solutions. Delta functions, convolution, and Laplace Transform methods. Matrix and first-order linear systems. Classical partial differential equations of applied mathematics are covered: diffusion, Laplace/Poisson, and wave equations. Methods and tools for solving PDEs: separation of variables, Fourier series, and transforms.

MATH204 Probability and Statistics (3 CH) (Pre-R: MATH102)

Basic concepts of descriptive statistics, statistical inference, regression, correlation analysis, hypotheses test, and confidence intervals, elements of set theory, sample space and events, probability, conditional probability and independence, examples of discrete and continuous probability distributions, multivariate probability distributions, functions of random variables, and central limit theorem.

MATH305 Numerical Methods (3 CH) (Pre-R: MATH102)

Programming for numerical calculations, round-off error and approximation, solving nonlinear equation, solving system of linear equations, curve fitting and interpolation, numerical differentiation and integration, and solution of ordinary differential equations. Practice on the computer.

MATH406 Calculus III (3 CH) (Pre-R: MATH102)

Multivariable Calculus: partial derivatives, directional derivatives, chain rules, tangent planes, maximum, and minimum, Lagrange multiplier, cylindrical and spherical coordinates, multiple integrals, and substitutions. Theorems of Green, Gauss and Stokes.

ENGR404 Engineering Economics (3 CH) (Pre-R: MATH204)

The objective of this course is to introduce the basic concepts of engineering economy and to demonstrate the importance of financial management and engineering decisions in financial project analysis. The topics covered includes an overview of financial accounting, time-value of money, risk in financial decisions, and book and tax depreciation.

ENGR322 Summer Internship (0 CH)

This course is basically focused on practical and project based-training, research and development, communication and development skills, costing and safety awareness, exposure to data collection,

troubleshooting, improvement, design and development of systems, and understanding on system operation as whole.

Program Requirements (74 CH)

ENGR110 Engineering Laboratories (3 CH)

The course aims to introduce students to the core disciplines of civil engineering such as transportation engineering, structural engineering, materials engineering, environmental engineering, geotechnical engineering, and thermo-fluids engineering. The course includes laboratory sessions in each of these disciplines, where students will conduct experiments related to structures and materials, environmental engineering, transportation engineering, and thermofluids.

CVEN310 Surveying (3 CH) (Pre-R: MATH101)

The course focuses on teaching students the fundamentals of measuring distance, elevation, and angles using surveying instruments, as well as determining areas and volumes. Additionally, the course covers the setting out of construction works and introduces students to GPS and GIS. The course includes intensive field work to provide hands-on experience to the students.

ENEN301 Environmental Chemistry (3 CH) (Pre-R: CHEM101)

This course discusses the basic chemical aspects of environmental engineering. Topics covered include inorganic chemistry, chemical kinetics, acid- base chemistry, oxidation- reduction, precipitation dissolution, element of organic chemistry and thermodynamics of chemical reactions.

ENGR220 Statics (3 CH) (Pre-R: MATH101)

The course aims to help students apply their knowledge of mathematics and science to understand the basic principles of mechanics and apply them to solve a wide range of engineering problems. Topics covered in the course include vector operations, free body diagrams, moments, distributed loads, truss analysis, centroids, center of gravity, composite bodies, composite areas, radius of gyration, and Mohr's circle.

CVEN232 Engineering Geology (2 CH) (Pre-R: CHEM101)

The course focuses on the study of the earth's structure, including rocks, sediments, and geological structures. It also covers the use of rocks in construction and mapping techniques. Additionally, the course includes the study of soil, groundwater, and rivers, with a focus on their relevance to civil and environmental engineering.

ENEN201 Renewable Energy (3 CH) (Pre-R: MATH102)

In this course, students will receive an overview of underlying technological principles of renewable energy including solar energy, biomass, hydro, wind, wave tidal, and geothermal energy sources. Students will gain an understanding of some techniques involved in the analysis of the economics of renewable energy.

CVEN361 Environmental Engineering (3 CH) (Pre-R: CHEM101)

This course teaches environmental science from engineering approach. It covers an introduction to environmental engineering, water pollution, air pollution, soil contamination, hazardous and solid waste.

CVEN302 Environmental Microbiology (3 CH) (Pre-R: CHEM101)

This course discusses the basic biological aspects of environmental engineering. Topics covered include microbial cells and their metabolic capabilities, microbial genetics and their potentials, growth of microbes and kinetics of growth, microbial ecology and diversity, the microbiology of wastewater treatment, probing of microbes, public health microbiology, and pathogen control.

ENGR321 Dynamics (3 CH) (Pre-R: ENGR220)

This course focuses on the fundamental principles of engineering mechanics with a focus on dynamics. Topics covered in the course include the kinematics and kinetics of a particle, work and energy, and impulse and momentum.

CVEN332 Civil Engineering Materials (3 CH) (Pre-R: ENGR110)

This course introduces students to geology and its impact on the design and construction of civil engineering constructed facilities. Students will learn about the engineering elements of rocks and geologic processes from an engineering perspective.

ENEN422 Environmental Measurements (3 CH) (Pre-R: ENEN301)

The course focuses on teaching students the fundamentals of measuring distance, elevation, and angles using surveying instruments, as well as determining areas and volumes. Additionally, the course covers the setting out of construction works and introduces students to GPS and GIS. The course includes intensive field work to provide hands-on experience to the students.

CVEN471 Engineering Project Management (3 CH) (Pre-R: ENGR201)

This course prepares students to build their skills in areas of Project Management. It includes training on MS Project 2013/Primavera P6. Main topics cover organizational structure on a project, roles and responsibilities of project manager, the components of time management, purpose of activity definition and sequencing, different diagramming techniques, factors affecting activity duration, estimating activity duration, usage of mathematical analysis techniques for schedule development, schedule control, and the importance of schedule adherence.

ENEN431 Water & Wastewater Treatment (3 CH) (Pre-R: CVEN361)

This course introduces a discussion of physical, chemical, and biological processes for water, and wastewater treatment, process kinetics, coagulation, flocculation, sedimentation, activated sludge, trickling filters, rotating biological contactors, filtration, disinfection, ion exchange, air stripping, electro-dialysis and reverse osmosis.

CVEN350 Thermofluids Engineering (3 CH) (Pre-R: PHYS102)

The course covers the fundamental principles of fluid mechanics, heat transfer, thermodynamics, and fluid flow. Topics covered include properties of fluids, fluid statics, momentum, entropy and energy principles, similitude, dimensional analysis, fluid flow, and heat transfer.

ENEN360 Environmental Law (3 CH) (Pre-R: ENEN301)

This course plans to present the students with an important area of environmental law and policy. The course will cover the basic concepts and principles of environmental law nationally and internationally, pollution presentation regulations and Sustainable development, regulations for wastewater discharge and reuse, water pollution offenses, and building drainage, contaminated land legacy and regime,

marine laws and clean water act, evolution and jurisprudence of forest and wildlife laws, toxic substances and chemicals regulation, regulations for the management of solid non-hazardous waste, the legal framework on air pollution, climate change and disaster laws, the evolution of international environmental law, regulations for noise pollution control in the public environment, and regulations for the management of solid hazardous waste.

ENEN582 Desalination Engineering (3 CH) (Pre-R: CVEN332)

This course aims to improve the understanding of the underlying basic governing principles of desalination technologies design and operation. The course topics include raw water quality, membrane processes (reverse osmosis, electrodialysis) design and operation, evaporative processes (multi-stage flash and multiple effects), fouling and pre-treatment (scaling/plugging and their amelioration; cleaning), calculation of membrane design and operational parameters.

CVEN451 Hydraulics Engineering (3 CH) (Pre-R: CVEN350)

This course covers the applications of fluid mechanics for designing water works such as pipelines, pipe networks, open channels, and turbomachinery. It also includes the design of hydraulic structures and an introduction to coastal and harbour engineering. The fundamental concepts of applied fluid mechanics are taught to solve problems in municipal water and wastewater systems design while considering codes, standards, and regulatory requirements. Topics include fluid properties and basic equations, pipeline design and analysis, pump and pump system design, design of open channels and culverts.

ENEN572 Environmental Impact Assessment (3 CH) (Pre-R: CVEN361)

The course evaluates the impact of water resources projects on environmental quality considering environmental legislation. It also provides methods of assessment and management, data analysis; data interpretation techniques, and report writing for water & environmental projects.; project benefits; environmental cost benefit analysis.

CVEN491 Capstone Design Project I (3 CH) (Pre-R: 90 CH)

This course deals with a design project of environmental engineering system that involves more than one specialization. Students work in groups under close supervision of faculty members.

CVEN554 Hydrogeology & Groundwater Contamination (3 CH) (Pre-R: CVEN451)

This course focuses on providing students with a comprehensive understanding of hydrogeology and groundwater contamination, including basic topics and models. Through the course, students will learn about subsurface flow, confined and unconfined aquifers, groundwater flow equation solutions, aquifer property estimation, analysis of multiple well systems, design of well fields and aquifer pumping tests, groundwater quality, contaminant transport models, and computer models.

ENEN441 Air Pollution (3 CH) (Pre-R: CVEN361)

This course discusses the basics of air pollution and its sources. Topics covered include measurement techniques, physical, chemical and biological effects on ecology; common air pollution in the Middle East, and their sources; transport, dispersion, and diffusion of air pollutants, air pollution control processes, air pollution control legislation, and Kyoto agreement.

ENEN461 Solid Waste Management (3 CH) (Pre-R: CVEN361)

This course introduces students to the basics of nature and environmental effects of solid wastes and sludge including hazardous wastes. The topics covered are engineering management principles, practices, and techniques for management of solid and sludge waste. Solid waste generation, storage, collection and transport processing, resource recovery, and disposal. Administration of solid waste management and health and safety considerations.

CVEN592 Capstone Design Project II (3 CH) (Pre-R: CVEN491)

This course is a continuation of the course CVEN 491. The aim is to prepare students for professional engineering work. The course involves planning, design, and presentation including engineering drawings. Typical projects could be water-distribution or wastewater-collection systems, transportation system, structural system, air pollution, project planning, scheduling time management, leadership, team building skills, and technical communications written, oral and graphical.

CVEN553 Water Resources Engineering (3 CH) (Pre-R: CVEN451)

This course provides students with an understanding of water resources, their quality, and engineering models used to manage them. The course covers topics such as water quality, surface water bodies, and their management, including the fate of man-made discharges. The course also addresses the technical and non-technical considerations for water resource planning and management projects.

CVEN552 Engineering Hydrology (3 CH) (Pre-R: CVEN451)

This course introduces the basics of hydrology and its principles for water resources engineering design, including hydrologic cycle, statistics, design storm, and aquifer modeling. It also covers topics such as urban storm-water drainage, flood damage mitigation, and seawater intrusion in coastal aquifers.

Program Electives (Choose three courses of 9 CH)

CNMN405 Building Information Modelling (3 CH) (Pre-R: ENGR201)

The course introduces students to the innovative concepts and processes of Building Information Modelling (BIM). It gives students a practical hands-on Autodesk's BIM software (Revit Architecture) as used in professional applications and analysis of current and future trends in BIM design. The course will be focusing on the processes involved in developing a full 3D design object model, not for the purpose of visualization alone, but more importantly as a tool for understanding and documenting how a proposed building design fits together and how it will perform during use.

ENEN531 Advanced Wastewater Treatment (3 CH) (Pre-R: ENEN431)

The course introduces the main concepts to understand the physical, biological, and advanced treatment of wastewater. It covers topics such as physical unit operations and design, biological unit processes, design of facilities for the biological treatment of wastewater, and advanced wastewater treatment and design of facilities for the treatment and disposal of sludge is also discussed.

ENEN561 Industrial and Hazardous Waste (3 CH) (Pre-R: CVEN 361)

The course describes: source; quantity; quality; treatment; disposal; and regulation of industrial and hazardous waste; and waste management schemes. Safety and worker protection are reviewed.

ENEN571 Environmental Pollution (3 CH) (Pre-R: CVEN 361)

The course provides knowledge about the fate of contaminants in the environment within a single medium and between media. The course will emphasize contaminant dispersion within the air, soil, and water (surface water, and groundwater). For some applications, students will be taught to identify the dominant transport mechanisms, develop the appropriate equations that quantify the mechanisms, and simplify the system to arrive at appropriate solutions.

ENEN581 Climate Change (3 CH) (Pre-R: CVEN 361)

This course introduces different topics in climate change include, radiation heat transfer and the greenhouse effect, scattering and absorption by gases, clouds, and aerosols, feedback due to water vapor, clouds, ice, and vegetation, chemistry of greenhouse gases, climates of the past, the global-warming debate, economic and political aspects of climate change, and methods for climate change mitigation.

ENEN583 Waste and Energy (3 CH) (Pre-R: CVEN 461)

This course introduces the environmental effects of energy development using fossil and fissile fuels, geothermic, photosynthesis, and other sources. Topics covered are, relationship of elemental cycles to the life-supporting systems, generation of energy from waste, and biofuels and bio-resources.

ENEN584 Sustainable Engineering (3 CH) (Pre-R: CVEN 361)

This course introduces sustainable engineering and involves the responsible use of resources in a way that does not compromise the ability of future generations to meet their own needs. Shifting to sustainable engineering requires review of the short and long-term social, economic, and environmental impacts of engineering solutions. We will examine processes for sustainable land development and resource use, perform life cycle assessments, and review cases of sustainable engineering solutions at the local and global scale. The course will be based on selected readings and a text.

COEN280 Construction Methodology (3 CH)

The purpose of this course is to expose students to various types of construction methodologies that will be encountered in the field. It covers the basic principles, techniques, terminology, codes, specifications, communications, and safety issues of the construction industry as well as skills associated with reading and interpreting construction plans.

COEN282 Construction Equipment (3 CH)

This course provides basic knowledge of construction equipment to students so that they can efficiently identify types and uses of construction equipment. It covers time value of money, cost estimating associated with equipment, fundamentals of earthmoving (Tractors, loaders, scrapers, excavators, trucks, haulers, and graders), soil compaction and stabilization, lifting and loading equipment, operational analysis, and equipment fleet management.

COEN585 GIS Application in Civil Engineering (3 CH)

This course prepares students with the basic knowledge and skills of Geographic Information System so that they can be applied efficiently in civil, construction and environment engineering. Main topics cover an introduction to GIS, spatial data structures, map projections and coordinate systems, raster and vector spatial data models, topology and relational query, selecting and editing features, feature

proximity, containment, intersection, spatial joins, overlays, buffers, geo-processing, image processing, supervised and unsupervised classification, and image rectification.

COEN586 Sustainable Construction (3 CH) (Pre-R: CVEN 361)

This course prepares students with the fundamentals and principles of sustainable construction. It provides information on technical requirements of the LEED Green Building Rating System for New Construction & Major Renovations (LEED-NC). Additionally, it provides an understanding of how LEED is being used nationally throughout the design and construction industries to define various levels of sustainable project design, the resources available for successfully achieving LEED project certifications.

CVEN260 Geotechnical Engineering (3 CH)

The course covers the fundamental principles of geotechnical engineering, with a focus on soil mechanics. Topics covered include the basic characteristics of soils, the effective stress principle, seepage and flow nets, consolidation, and shear strength of soils.

CVEN564 Coastal Engineering (3 CH) (Pre-R: CVEN 451)

This course introduces coastal and harbour engineering and its applications in the design of coastal structures. It covers the physical processes and theory of waves, tides, and sediment transport in coastal areas. The course aims to equip students with the fundamental concepts of coastal engineering to solve problems encountered in coastal areas, such as determining sea parameters, wave properties, and sediment transport.