

**Civil Engineering Program Course Descriptions**

(2019/2020)

Faculty: Engineering**Department: Civil Engineering****❖ College Compulsory Requirements:****A0111101 Mathematics (1) {3} [3-3]**

Functions and Models: Four ways to represent a function, Trigonometric Functions, Exponential Functions, Inverse Functions and Logarithms; Limits and Derivatives : The Limit of a Function, Continuity, Limits at Infinity, Horizontal Asymptotes, Derivatives of Polynomials and Exponential Functions, Hyperbolic Functions; Applications of Differentiations : L'Hospital's Rule and Indeterminate Forms, Maximum and Minimum Values, Optimization Problems; Integrals and Applications : The Definite and Indefinite Integrals, The Substitution Rule, Areas between Curves, Volumes, Volumes by Cylindrical Shells.

Prerequisite: None**A0111102 Mathematics (2) {3}[3-3]**

Techniques of Integration: Integration by Parts, Integration, Trigonometric Integrals, Trigonometric Substitution, Integration by Partial Fractions, Strategy for Integration, Improper Integrals; Polar Coordinates and its Applications; Sequences and Series: Sequences and Series Convergence Tests, Maclaurin's and Taylor's Formulas, Applications on Sequences and Series.

Prerequisite: A0111101 Mathematics (1)**A0111201 General Physics (1){3} [3-3]**

Units Physical Quantities; Vectors; Motion in One Dimension; Motion in Two Dimensions; The Laws of Motion: Force and Interaction, Newton's laws, Mass and Weight, Friction; Energy of a System: Work, Kinetic Energy, Potential Energy, Power; Momentum Impulse and Collisions; Dynamics of Rotational Motion: Torque, static, Conditions for Equilibrium, Center of Gravity; Fluid Mechanics: Static Fluid, Dynamic Fluid; Oscillatory Motion; Wave Motion.

Prerequisite: None

**Civil Engineering Program Course Descriptions**

(2019/2020)

Faculty: Engineering**Department: Civil Engineering****A0111202 General Physics (2) {3} [3-3]**

Electrostatics: Electric Charges, Coulomb's Law, Electric fields; Gauss's law; Electric potential; Capacitance and Dielectrics; DC-Circuits: Current, Resistance, Electromotive Force; Magnetostatics: Magnetic Field, Magnetic Forces; Sources of Magnetic Field; Electromagnetic Induction; Inductance; Alternating Current Circuits; Electromagnetic Waves.

Prerequisite: A0111201 General Physics (1)**A0111203 General Physics Lab. {1} [1-2]**

Experimental error and data analysis; Measurements; Force Table; Motion in One and Two Dimensions; Newton's Second Law; Friction; Work and Energy; Simple Harmonic Motion: Simple Pendulum, Spring Mass system; Electricity: Ohm's Law, and Kirchhoff's Law.

Co-requisite: A0111201 General Physics (1)**A0111301 General Chemistry [3-3] {3}**

Matter Classification and Properties: Elements, Atoms, Ionic and Covalent Compounds; Measurements and Dealing with Numbers; Periodic Table Chemical Calculations; Chemical Reactions in Solutions; Redox Reactions; Electronic Structure of Atoms; Basics of Chemical Bonding and Structure of Molecules; Properties of Gases, Liquid and Solid State; Intermolecular Forces; Solutions and Concentrations; Physical Properties of Solutions; Kinetics: To Study The Rates of Reactions, Acid-Base Equilibrium, pH Measurements, Thermo Chemistry and Thermodynamics, Energy and Chemical Changes.

Prerequisite: None

**Civil Engineering Program Course Descriptions**

(2019/2020)

Faculty: Engineering**Department: Civil Engineering****A0112101 Linear Algebra {3} [3-3]**

Linear algebra: Matrices, Vectors, Determinants, Solution of Linear Systems of Equations, Inverse of a Matrix; Matrix Eigenvalues Problems: Eigenvalues, Eigenvectors, and Diagonalization; Complex Analysis: Complex Numbers and Functions, Analytic and Harmonic Complex Functions, Exponential, Trigonometric and Logarithmic Complex Functions.

Prerequisite A0111102 Mathematics (2)**A0811201 Computer Skills (Engineering) {3} [3-3]**

The Basic Concepts of Programming using C++ language: C++ Programming; Controls Structures; Functions; Arrays; Pointers; An introduction to Classes and Objects.

Prerequisite: A0331700 Computer Skills (Remedial)**A0811202 Engineering Workshops {1} [1-2]**

Workplace safety and use of tools; Basic skills of measuring and machining; Basic skills of welding; Household electric circuit installation; Basics of carpentry and its tools.

Prerequisite: None**A0831201 Engineering Drawing {2} [1-3]**

Use of instruments; lettering; Drawing of basic views and projection method; orthographic; isometric drawing and sketching; sectional views; computer aided design applications using AutoCAD (2D & 3D) in all engineering aspects.

Prerequisite: None

**Civil Engineering Program Course Descriptions**

(2019/2020)

Faculty: Engineering**Department: Civil Engineering****A0812201 Communication Skills and Professional Ethics {3} [3-3]**

Basics of Communication Skills: Communication Process, Verbal and Non-Verbal Communication, Barriers to Communication; Listening Skills, Types of Listening, Speaking Skills: Strategies for Developing Speaking Skills, types of Speaking, Effective Presentation Strategies; Reading Skills: Reading Techniques, Reading Comprehension; Writing Skills: Attributes of Technical Writing, Benefits of Technical Writing, Types of Writing, Research Papers, Technical Reports, Job Application.

Engineering ethics: applied engineering ethics and moral principles; engineer's right's responsibilities and obligations towards society, clients and his engineering profession; engineering code of ethics.

Prerequisite: A0161201 English Communication Skills**A0832101 Differential Equations {3} [3-3]**

Different methods of solving ordinary differential equations applicable to the first, second and higher-order DEs, modeling of some engineering, physical, and social problems. Series Solutions of ODEs. Laplace Transforms, Transforms of Derivatives, solving ODEs by Laplace method.

Prerequisite: A0111102 Mathematics (2) (to be passed)**A0832102 Engineering Statistics {3} [3-3]**

Applications of statistics in engineering; Introduction to descriptive statistics, presentation and treatment of data; introduction to probability theory and probability distribution (discrete and continuous); counting techniques; sampling theory; statistical estimation; statistical hypothesis testing; correlation; finding regression equations and regression analysis.

Prerequisite: A0111101 Mathematics (1)



Civil Engineering Program Course Descriptions

(2019/2020)

Faculty: Engineering

Department: Civil Engineering

A0833101 Numerical Analysis {3} [3-3]

General numerical methods: equation solving via iteration, interpolation; numerical integration, and numerical differentiation; numerical methods in linear algebra, Gauss elimination, least squares method, numerical methods for differential equations.

Prerequisite: A0112101 Linear Algebra

**Civil Engineering Program Course Descriptions****(2019/2020)****Faculty: Engineering****Department: Civil Engineering****❖ Compulsory Major Requirements****A0862301 Engineering Geology {3} [3-3]**

Earth structure; minerals; clay minerals; type of rocks and their properties; site investigation and exploration; use of rocks as construction materials; ground water, earthquake; landslides; soil classification.

Prerequisite : A0161201 English Communication Skills**A0862302 Engineering Materials Science{3} [3-3]**

Definition of engineering materials. Classification of materials and their properties. Metallic and non-metallic materials. Metals, alloys and composite materials. Conductors, insulators and semiconductors. Mechanical, Magnetic, Thermal and electrical characteristics of materials. Industrial applications of different types of materials.

Prerequisite : A0862301 Engineering Geology**A0862303 Surveying {3} [3-3]**

Introduction; units and significant Figures; theory of errors in observations; distance measurement; leveling, angles, azimuths, bearings; coordinate geometry in surveying calculations; area and volume; introduction to GPS, Photogrammetry /and GIS.

Prerequisite: A0111101 Mathematics (1)

**Civil Engineering Program Course Descriptions**

(2019/2020)

Faculty: Engineering**Department: Civil Engineering****A0862304 Surveying Lab. {1} [2-1]**

Pacing and taping; slope distance measurement using tapes and clinometers; horizontal distance measurement through obstacle; building layout; leveling; measurement of elevation by rise and fall method; contour map and scale; profile leveling; application of theodolite.

Co-requisite: A0862303 Surveying**A0862401 Statics {3} [3-3]**

Principles of mechanics; system of units; force vectors; resultant forces; equilibrium of a particle; rigid bodies; equivalent systems of forces; centriods and centers of gravity; analysis of structures: frames, machines, and trusses; shear forces and bending moments; friction; moments of inertia; principle of virtual work.

Prerequisite A0111201 General Physics (1)**A0862402 Strength of Materials {3} [3-3]**

Mechanical properties of materials; stresses and strains in members subjected to tension, compression, and shear; torsion stresses; flexural and shearing stresses in beams; combined stresses; transformation of stresses and strains; deflection of beams; buckling of columns.

Prerequisite: A0862401 Statics (to be passed)**A0862403 Dynamics {3} [3-3]**

Kinematics and kinetics of particles and systems of particles with applications to central force motion, impact and relative motion, single-degree of freedom free and force vibration, dynamics of rigid bodies, relative motion, and gyroscopic motion, computer application.

Prerequisite: A0862401 Statics

**Civil Engineering Program Course Descriptions**

(2019/2020)

Faculty: Engineering**Department: Civil Engineering****A0862501 Concrete Technology {3} [3-3]**

Cement production; properties and types of cement; hydration of cement; aggregate properties and mixing water; mixing, placing, compaction and tests of fresh concrete; types and applications of admixtures and additives; strength, durability and tests of hardened concrete; concrete mix design.

Prerequisite: A0862301 Engineering Geology**A0862502 Concrete Technology Lab. {1} [2-1]**

Fineness of cement test; density of cement test; normal consistency of cement pastes and initial and final setting times tests; sieve analysis of aggregate test; Los Angeles abrasion test; impact value test; bulk density of coarse aggregates; specific gravity and absorption of fine and coarse aggregates; fresh concrete slump test; Vebe test; compaction factor test; Schmidt hammer test, cube test; concrete cube destructive test.

Co-requisite: A0862501 Concrete Technology**A0863501 Structural Analysis (1) {3} [3-3]**

Introduction to structural analysis; loads: static, environmental and dynamic loading; classification of structural elements; stability and determinacy of structures: determinate trusses, cables, beams and frames; influence lines of beams and trusses; deflections in elementary structures.

Prerequisite: A0862402 Strength of Materials**A0863502 Structural Analysis (2) {3} [3-3]**

Analysis of statically indeterminate structures: Force Method, Slope-Deflection Method, Moment Distribution Method; introduction to matrix structural analysis.

Prerequisite: A0863501 Structural Analysis (1)

**Civil Engineering Program Course Descriptions**

(2019/2020)

Faculty: Engineering**Department: Civil Engineering****A0863601 Hydraulics {3} [3-3]**

Fluids in static state and motion; flow in pipes; head losses; cavitation; design of pipe networks; pump characteristics and selection; open Channel flow; uniform flow; Chezy and Manning equations; varied flow; specific energy; critical depth; hydraulic jump; engineering applications.

Prerequisite: A0833603 Fluid Mechanics**A0863602 Fluid Mechanics and Engineering Hydraulics Lab. {1} [2-1]**

Center of pressure; Flow above opening and control gates; Pressure in pipes; Flow under control gate; Hydraulic jump; Type of flow; Venture meter.

Prerequisite: A0863601 Hydraulics**A0863701 Traffic and Transportation Engineering {3} [3-3]**

Introduction to transport and transportation engineering; types passenger and freight transportation; transportation systems and elements; design criteria for transportation systems; traffic flow theory and queuing theory; introduction to capacity analysis and quality of service; logistic in transportation; transportation enviromental impact; introduction to transportation planning.

Prerequisite: A0862303 Surveying , A0832102 Engineering Statistics (to be passed)**A0863702 Traffic and Transportation Engineering Lab. {1} [2-1]**

Conducting traffic studies in the field, including speed and travel delay studies, volume counting; road side interview and travel demand studies. Parking studies.

Co-requisite: A0863701 Traffic and Transportation Engineering

**Civil Engineering Program Course Descriptions****(2019/2020)****Faculty: Engineering****Department: Civil Engineering****A0863703 Geometric and Highway Design {3} [3-3]**

Classification of highway and railway systems; Geometric design concepts for highways and railways; design control and criteria; sight distance requirements; design of horizontal and vertical alignments; cross-section elements; super-elevation attainment; side slopes and drainage requirements; earthwork computations; highway intersection types; design of at grade-intersections and grade separation intersection; route alternative evaluation; practical applications; computer applications in geometric design.

Prerequisite: A0863701 Traffic and Transportation Engineering**A0863801 Geotechnical Engineering {3} [3-3]**

Introduction to soil mechanics; formation and structure of soil; Atterberg's limits; classification of soil; compaction; permeability; seepage flow; stress distribution; consolidation; shear strength; lateral earth pressure; stability of slopes.

Prerequisite: A0862402 Strength of Materials (to be passed)**A0863802 Geotechnical Engineering Lab. {1} [2-1]**

Specific gravity; moisture content; liquid; plastic and shrinkage limits; consolidation test; sieve analysis; field density; compaction test; permeability; Shear strength of soil: direct shear, unconfined and triaxial tests; consolidation test.

Co-requisite: A0863801 Geotechnical Engineering

**Civil Engineering Program Course Descriptions****(2019/2020)****Faculty: Engineering****Department: Civil Engineering****A0864301 Civil Engineering Drawing{2} [2-2]**

Introduction; primary structural plans: topographic and site plans; reinforced concrete building plans; detailing of: footing columns, slabs, beams section, stairs; detailing of steel structures; AutoCAD. Corridor selection; cross-section elements; curves for horizontal and vertical alignments; superelevation arraignment; drainage facilities (pipes and culverts); traffic signs and marking; intersections and interchanges; reading and executing highway plans.

Prerequisite: A0864501 Reinforced Concrete Design (1) , A0831201 Engineering Drawing (to be passed)

A0864501 Reinforced Concrete Design (1) {3} [3-3]

Materials properties; load calculations according to ACI; flexural analysis and design of beams; design for shear and diagonal tension; bond, anchorage and development length; design of one way slabs; short columns under compression combined with moment (interaction diagrams); design of foundation (spread footing and wall footing).

Prerequisite: A0862501 Concrete Technology , A0863501 Structural Analysis (1)

A0864502 Design of Steel Structures {3} [3-3]

Introduction: specifications, loads and methods of design; analysis and design of tension and compression members; design of beams for flexure, shear, and torsion; analysis and design of beam-columns; bolted and welded connections.

Prerequisite: A0863502 Structural Analysis (2)

**Civil Engineering Program Course Descriptions**

(2019/2020)

Faculty: Engineering**Department: Civil Engineering****A0864601 Engineering Hydrology {3} [3-3]**

Hydrological cycle; Surface runoff; Rainfall-runoff analysis; Hydrograph analysis; Unit hydrograph; Synthetic unit hydrograph development; Hydraulic channel routing; Hydrologic reservoir routing; Basics of groundwater hydrology; Probability and statistics concepts in hydrologic design; Rational method design; Engineering applications.

Prerequisite: A0863601 Hydraulics**A0864602 Water, Environmental and Sanitary Engineering {3} [3-3]**

Definitions of the environmental engineering concepts; Pollution sources and types; Pollution prevention; Air pollution, sources and causes; Principles of water chemistry and Microbiology; Design of water distribution systems; Drinking water treatment; Wastewater characteristics and treatment. Contemporary issues

Prerequisite: A0863601 Hydraulics**A0864603 Environmental and Sanitary Engineering Lab. {1} [2-1]**

Analysis of drinking water and wastewater to determine: acidity, turbidity, alkalinity, hardness, ammonia, and chlorine content; Coagulation; Biological Oxygen Demand (BOD) and Chemical Oxygen Demand (COD); Dissolved and suspended solid materials; Ion exchange; Carbon adsorption.

Co-requisite: A0864602 Water, Environmental and Sanitary Engineering

**Civil Engineering Program Course Descriptions**

(2019/2020)

Faculty: Engineering**Department: Civil Engineering****A0864701 Pavement Design {3} [3-3]**

Types of pavements; stress analysis in flexible and rigid pavements; traffic load forecasting and analysis; design of flexible and rigid pavement for highways; asphalt mix design; introduction pavement distresses type and causes and evaluation economic analysis and optimization of pavement alternatives; computer applications in pavement design.

Prerequisite: A0863701 Traffic and Transportation Engineering**A0864702 Pavement Design Lab.{1} [2-1]**

The tests of asphaltic materials: Saybolt viscosity, Penetration, Ductility, Flash and Fire Point, Softening Point; Loss on Heating; Asphalt Mix Design (Marshall Method); Maximum Specific Gravity; Extraction Test; Skid Resistant and Surface Texture; British Pendulum; California Bearing Ratio test.

Co-requisite: A0864701 Pavement Design**A0864801 Foundation Engineering {3} [3-3]**

Site investigation; foundation classifications; bearing capacity; foundation settlement; factors affecting foundation design; spread footing; combined footing; wall footing; mat foundations; lateral earth pressure and retaining walls; settlement.

Prerequisite: A0863801 Geotechnical Engineering , A0864501 Reinforced Concrete Design (1)**A0864901 Specifications, Contracts, and Quantity Surveying {3} [3-3]**

Introduction to the Jordanian legal systems and law applicable to the construction industry; Introduction to value engineering and quality control; An introduction to the legal aspects of construction projects, emphasis on legal problems directly applied to the practice of project management; Contracts and specifications documents, codes and zoning laws and labor laws; Quantity survey procedure, methods and analysis; quantity surveys and pricing; bidding and negotiating.

Prerequisite: A0864501 Reinforced Concrete Design (1)

**Civil Engineering Program Course Descriptions**

(2019/2020)

Faculty: Engineering**Department: Civil Engineering****A0864902 Field Training {3} [6-3] [Eight Weeks]**

Students are required to conduct field training after passing 110 credit hours for eight weeks in a pre approved and recognized institute, department, company or firm in one of the various areas in civil engineering.

Prerequisite: A0812201 Communications Skills & professional Ethics , Pass 115 Cr.H.**A0865501 Reinforced Concrete Design (2) {3} [3-3]**

Serviceability of beams and one-way slabs; continuous beams: loading patterns, moment envelopes; design of biaxial Loaded columns; slender columns; design for torsion, torsion plus shear; design of two-way slabs; design of combined footings.

Prerequisite: A0864501 Reinforced Concrete Design (1) (to be passed) , A0863502 Structural Analysis (2)**A0865901 Construction Project Management {3} [3-3]**

Concepts and definition; Planning; Project scheduling techniques (Ghantt Chart, CPM, PERT); Developing the schedule; Cost management; Risk management; Project organization (site and resources).

Prerequisite: A0864901 Specifications, Contracts, and Quantity Surveying**A0865902 Graduation Project (1) {1} [1-1]**

Students work in groups to conduct a graduation project in two phases, graduation project I is the first phase which includes developing proposal, literature review, problem identification and data collection.

Prerequisite: A0864902 Field Training (to be passed)



Civil Engineering Program Course Descriptions

(2019/2020)

Faculty: Engineering

Department: Civil Engineering

A0865903 Graduation Project (2) {2}[2-2]

This is a continuation of graduation project I, where students start their analysis and design to conclude with.

Prerequisite: A0865902 Graduation Project (1)

**Civil Engineering Program Course Descriptions**

(2019/2020)

Faculty: Engineering**Department: Civil Engineering****❖ Elective Major Requirements****A0865502 Bridge Engineering {3} [3-3]**

Identification of material properties in reinforced concrete; load calculations by AASHTO; analysis of bridges in the form of one direction; analysis of bridges with gravity on reinforced concrete; design of reinforced concrete bridges and prestressed.

Prerequisite: A0864501 Reinforced Concrete Design (1)**A0865503 Earthquake Engineering {3} [3-3]**

Concept of seismic design; analysis of earthquake effects; choice and design of earthquake resistance systems; the behavior of reinforced concrete under cyclic loading; analysis according to static force procedure, response spectrum; analysis, design of reinforced concrete sections to resist earthquake loads.

Prerequisite: A0865501 Reinforced Concrete Design (2)**A0865504 Prestressed Concrete {3} [3-3]**

Introduction; pre-stressed concrete concepts and materials; detailed estimation of losses, design for flexure; design for shear and torsion; slab and beam design; Composite construction and design; shear-friction theory; computer applications.

Prerequisite: A0865501 Reinforced Concrete Design (2)

**Civil Engineering Program Course Descriptions**

(2019/2020)

Faculty: Engineering**Department: Civil Engineering****A0865601 Water Resources {3} [3-3]**

Hydrologic and hydraulic design concepts for water resources systems; Functions and design of hydraulic structures; Storm water systems design; Groundwater occurrences and Darcy's law; Equations of groundwater flow; Well hydraulics; Flow in confined and unconfined aquifers; Engineering economy concepts in planning and management of water resources systems; Computer applications in water resources; Contemporary issues.

Prerequisite: A0864601 Engineering Hydrology**A0865602 Irrigation, Drainage, and Dam Engineering {3} [3-3]**

Sources of irrigation water; Long term storage; Design of dams and reservoirs; Design of irrigation structures and drainage canals; Design of culverts and measurement structures; Contemporary issues

Prerequisite: A0863601 Hydraulics**A0865603 Treatment of Liquid and Solid Wastes {3} [3-3]**

Wastewater conveyance systems; Design of sewers; Wastewater management; Advanced wastewater treatment and reuse; Sources, types, and composition of solid wastes; sanitary landfills; landfill techniques for domestic, industrial, and hazardous wastes; landfill rehabilitation. Contemporary issues.

Prerequisite: A0864602 Water, Environmental and Sanitary Engineering

**Civil Engineering Program Course Descriptions****(2019/2020)****Faculty: Engineering****Department: Civil Engineering****A0865701 Pavement Maintenance and Rehabilitation {3} [3-3]**

Introduction to pavement maintenance management process; pavement networks definitions and classifications; pavement distress evaluation and rating procedure; Pavement testing types (destructive and nondestructive tests); pavement condition forecasting; overview of maintenance and rehabilitation techniques; network level management; project level management; computer applications in pavement maintenance and rehabilitation.

Prerequisite: A0864701 Pavement Design**A0865902 Computer Applications in Civil Engineering [3-3] {3}**

Practical applications using civil engineering computer software packages in structure, transportation, soil, or management. Using available software in the analysis and design of projects.

Prerequisite: A0863703 Geometric and Highway Design, A0865501 Reinforced Concrete Design (2)**A0865903 Selected Topics in Civil Engineering {3} [3-3]****Prerequisite: Department Approval.**

**Civil Engineering Program Course Descriptions**

(2019/2020)

Faculty: Engineering

Department: Civil Engineering

❖ **Ancillary Major Requirements:****A0813101 Applied Engineering Mathematics {2}[2-2]**

Mathematical modeling of engineering systems; Systems of differential equations; Introduction to Matlab for solving algebraic and differential equations, matrix operations, graphing etc.; Fourier series and integrations; Introduction to partial differential equations and their solutions using: Separation of variables, Laplace transformation and finite difference techniques.

Prerequisite: A0833101 Numerical Analysis**A0833603 Fluid Mechanics {3}[3-3]**

Fundamentals of fluid mechanics; Pressure Variations and measurements; Hydrostatic force principles; Fluid Kinematics; Bernoulli equation; Mass, Energy and Momentum principles; Forces on submerged bodies; Laminar and turbulent flows in closed conduits; Engineering applications.

Prerequisite: A0862401 Statics (to be passed)**A0813201 Engineering Economy and Management {3} [3-3]**

Engineering Project Development; Decision Making; Basic Concepts of Capital Investment: Formulas and Applications, Rates of Return, Economic Feasibility of Projects (Net Future Value, Net Present Value, and Equivalent Uniform Cash Flow); Comparison of Mutually Exclusive Proposals; Benefit-Cost Ratio Method; Depreciation; Corporate Taxation; Resource Allocation.

Prerequisite: A0111101 Mathematics (1)



Civil Engineering Program Course Descriptions

(2019/2020)

Faculty: Engineering

Department: Civil Engineering

A0111302 General Chemistry Lab {1} [1-2]

Introduction to laboratory safety rules; physical separation of mixtures: distillation, extraction, and recrystallization; empirical formula of compound; determination of acid and base in vinegar; indicators; buffers; measurement of pH; identification of chemical substances; solutions.

Co-requisite: A0111301 General Chemistry