

Description for compulsory and elective courses for civil engineering department

04032101 Engineering Drawing (3 Cr. Hrs., Prerequisite: None)

Drawing instruments and their usage, lettering and numbering, tangents and basic drawing techniques, geometric projections, orthographic projection, isometric projection, sections, introduction to descriptive geometry, isometric and oblique 3D drawing, engineering applications, using computer in drawing (CAD).

04031202 Engineering Ethics (1 Cr. Hr., Prerequisite: None)

General ideas about the writing styles and forms, writing in business, industry and government, adequacy and excellence, analyzing the communication context, basic writing techniques, types of written communication, revising for excellence, college writing and professional writing, major types of on-job writing, writing categories, report design report writing procedures, preparing own resumes and CV's, practical experience on how to perform interviews, whit an expert ,effective methods of professional presentation , proper methods of conducting academic and scientific research .

04033101 Technical Writing (2 Cr. Hrs., Prerequisite: 1101112)

General ideas about writing styles and forms, official writing in the fields of industry, entrepreneurship, public and government correspondence, types of writing in terms of competence and excellence, analysis of the context of communication, basic writing techniques, types of written communication, revision of the writing and its evaluation and how to be distinguished, professional writing, types and categories Writing, the principles of writing the technical report and the procedures of designing and preparing the technical report in English, and the preparation of private CVs, and practical experience in how to prepare psychological and good preparation for attending interviews for work.

04033102 Administration and Engineering Economy (3 Cr. Hrs., Prerequisite: 11031101)

Basic concepts in engineering economy, interest formulas, economic decision-making, application of interest formulas: present worth, future worth, annual series, rate of return, benefit-cost analysis, methods of depreciation accounting, effects of depreciation on economic decision, analysis of multiple alternatives, inflation, sensitivity analysis of economic decision

04032111 Engineering Mathematics (3 Cr. Hrs., Prerequisite: 11031202)

Differential equation: first-order differential equations, linear second-order differential equations, higher order linear differential equations with constant coefficients, Laplace transforms, Fourier series, partial differential equations.

04032121 Civil Drawing (1 Cr. Hr., Prerequisite: 04031201)

Basic principles of structural drawing, types of structural drawings and numbering system, drawing projections and sections of various structural elements, reading and drawing details of the reinforcement of foundations, columns, tiles, and walls. Reading and drawing foundation plans, columns, and tiles, types of sections of steel structures. Reading and drawing for the details of the elements of the steel structures: frames, joints, screws and welding, computer use for drawing (AutoCAD).

04032122 Engineering Geology (3 Cr. Hrs., Prerequisite: None)

Introduction to geology and its importance for civil engineers, earth sub layers, earth components, mineral and crystals, types of rocks, internal and external earth motion, physical and mechanical properties of rocks, classification of rocks, geophysics, rock and soil mechanics, landslides, soil classification and measurements. Practical: Studies of various types of crystals, minerals and rocks. Maps: topographic maps, geological maps, cross-sections and profiles, geophysics and its applications.

04032123 Surveying (3 Cr. Hrs., Prerequisite: 11031101)

Introduction to surveying, types of surveying, principles and basic definition of surveying, types of measurements, chain surveying, scale, errors in measurements, linear measurements, bearings, leveling, profiles and cross-sections, contour lines, theodolite, area and volume calculation ,plane coordinates system – traversing.

04032124 Surveying Lab. (1 Cr. Hr., Prerequisite or Simultaneously with 04032123)

Application on linear measurements using tapes and electronic devices, vertical and horizontal angle measurements, setting out details, elevation measurements, profile and cross-section plotting, contour mapping, topographical mapping, application on planometer, compass and slopes measurement devices.

04032131 Statics (3 Cr. Hrs., Prerequisite: 11031101 + 11021101)

Introduction, force systems, resultant, components, torque and coupling, particles and solids equilibrium, constructions (trusses and structures), centroid, resultant of distributed forces, moment of inertia, shear and bending moment diagrams.

04032132 Dynamics (2 Cr. Hrs., Prerequisite: 11021101+ 04032132)

Motion description of point particles: continuous motion with a straight path and discontinuous motion, motion with a curved path, absolute motion of two point particles and relative motion; Transitional motion, rotation around a fixed axis, relative motion of solid objects.

04032201 Programming for Civil Engineering (2 Cr. Hrs., Prerequisite or Simultaneously with: 04032213)

The course is a training for students to an engineering program using MatLab.

04032211 Calculus (3) (3 Cr. Hrs., Prerequisite: 11031202)

Vectors, line equations, quadratic surfaces, vector functions and their engineering applications, functions in several variables, partial derivatives, maximum and minimum values, multiple integrals and their use in calculating areas, volumes and centers of gravity, integrals in cylindrical coordinates and spheres, linear and surface integrals, theories of major vector analysis.

04032212 Engineering Statistics (3 Cr. Hrs., Prerequisite: 11031202)

Design of experiments, sampling techniques, basic probability, inferential and descriptive statistics, Normal distribution, confidence intervals, hypothesis testing, correlation and linear regression.

04032213 Numerical Analysis (3 Cr. Hrs., Prerequisite: 04032111)

Approximations and numerical errors, roots of equations, methods of solving linear and nonlinear equations, numerical integration, numerical differentiation, theory of curve fitting, the use of numerical techniques and computer to solve civil engineering.

04032231 Strength of Material (3 Cr. Hrs., Prerequisite: 04032131)

Types of loads, structures and supports, Hooks law, deformation, stresses and strains under axial loads, thermal stresses, torsion, analysis of internal forces in beams, stresses and strains under pure bending moments, composite sections, shear forces, shear stresses, shear center, compound stresses ,plane stress and strain Mohr circle buckling of columns.

04032232 Strength of Materials Lab. (1 Cr. Hr., Prerequisite or Simultaneously with 04032231)

Tensile test for buckling test, torsion test, stiffness test, creep test, bending test, impact test, hardness test.

04033131 Fluid Mechanics (3 Cr. Hrs., Prerequisite: 04032132)

Fluid properties, static and dynamics of fluids, buoyancy and floating, kinematics of fluids, energy factors in steady flow and applications of momentum and flowing forces, atmospheric pipe flow, lifting forces, drag forces for submerged bodies in compressible and non-compressible fluids.

04033141 Structural Analysis (1) (3 Cr. Hrs., Prerequisite: 04032231)

Classification of structures, supports and loads; equations of equilibrium, determinacy and stability, determination of reactions at supports ; analysis of statically determinate trusses; internal loadings developed in statically determinate structures: axial, shear, and bending moment diagrams for beams and frames; influence lines for statically determinate structures, influence lines for beams, trusses and floor girders, maximum influence at a point due to a series of concentrated loads; deflections, first and second moment area theorems, and conjugate beam; deflections using energy methods, virtual work, and Castigliano's theorem.

04033151 Geotechnical Engineering (1) (3 Cr. Hrs., Prerequisite or Simultaneously with 04032122)

General introduction to soil and its engineering properties, classification of soils, soil compaction, permeability of soil, stresses in soil, compressibility of soil, shear strength of soil and methods of its determination in lab.

04033152 Geotechnical Engineering Lab. (1 Cr. Hr., Prerequisite or Simultaneously with 04033151)

Water content, liquid limit, plastic limit, shrinkage limit, sieve analysis, hydrometer, compaction test, consolidation test, unconfined compression test, triaxial test, direct shear test.

04033161 Traffic & Transportation Engineering (3 Cr. Hrs., Prerequisite: 04032212)

Introduction to transportation engineering, importance of transportation, transportation requirements, introduction to traffic engineering, traffic systems components, traffic engineering studies, basic principles of traffic flow, traffic control at intersections, road safety, capacity and service level on road, capacity and service level at intersections .

04033221 Materials of Construction (3 Cr. Hrs., Prerequisite: 04032231)

Types and manufacturing of cement, properties of cement, cement hydration, properties of aggregates, design of concrete mixes. Initial and final setting time. Consistency of concrete, workability of concrete, segregation, strength of concrete (compression, tension, flexure), elasticity of concrete, shrinkage, creep, durability of concrete, measurements and measuring devices, electrical and mechanical stress standards, other tests for materials such as stone and bricks.

04033222 Materials of Construction Lab. (1 Cr. Hr., Prerequisite or Simultaneously with 04033221)

Cement tests: setting time, surface area (fineness of cement), volume change, compression and tension strength. Aggregate test: Los Angeles abrasions test, impact resisting test, density, grading, and water absorption. Fresh concrete tests: slump test, compaction factor, void ratio, cubic and cylindrical specimens. Hardened concrete tests: flexure, compression and tensile strength, Schmidt hammer test, porosity, ultrasonic test.

04033241 Structural Analysis (2) (3 Cr. Hrs., Prerequisite: 04033141)

Determinate, indeterminate, stable and unstable structures. Analysis of statically indeterminate structures. Equilibrium and compatibility equations. Virtual Work Method for indeterminate; trusses, beams and frames. Castigliano's second theorem for indeterminate; trusses, beams and frames. Three Moment Equation Method for beams. Slope Deflection Method for beams and frames with and without side sway. Moment Distribution Method for beams and frames with and without side sway. Analysis frames and beams with variable cross-sections.

04033261 Highway Design (3 Cr. Hrs., Prerequisite: 04032123 + 04033161)

Importance of highways. Economic, social and political, characteristics of highways, types and classification of highways, investigation of highway route, factors affecting the geometric, traffic characteristics design of highways, stopping and passing sight distances elements and design of simple circular horizontal curves, lateral clearance on horizontal curves, super elevation compound. curves reverse, transition curves, rotation diagrams, coordination of horizontal alignment, characteristics, types and design of vertical curves, sight distance on vertical curves, highest and lowest points on vertical curves, coordination of vertical alignment highway drainage.

04033271 Hydraulics (3 Cr. Hrs., Prerequisite: 04033131)

Steady flow in open channels. the hydraulic jump, valid flow in open channels, water surface profiles, introduction to theory of membrane, characteristics of laminar and turbulent flow, separation and eddy formation, hydraulic machines, selection and performance of pumps and turbines.

04033272 Hydraulics and Fluid Lab. (1 Cr. Hr., Prerequisite or Simultaneously with 04033271)

Center of flow, floating bodies, jet impact, head loss in pipes during laminar and turbulent flow, logarithmic velocity curve in pipe system, flow measuring devices, openings gates and orifice, Venturi meter, flow over sharp crested wires and over broad crested weirs, uniform flow in channel, wave speed, specific energy and critical depth, hydraulic jump resisting forces for cylindrical bodies, lifting and drag forces for irregular shape bodies, Venturi meters, partial channel, hydraulic machines, pump performance, fans, radial flow fans, centrifugal pumps, pumps in series and pumps in parallel.

04033273 Engineering Hydrology (3 Cr. Hrs., Prerequisite: 04033131)

Hydrological cycle, precipitation, evaporation, seepage, infiltration and percolation, ground water hydrology, ground water movement and methods of usage, surface water, hydrograph analysis, flood analysis, hydrological prediction.

04034141 Reinforced Concrete (1) (3 Cr. Hrs., Prerequisite or Simultaneously with 04033241)

Properties of concrete and steel, flexural behavior of reinforced concrete beams, cracking and uncracking sections, working stress design method, allowable stresses, ultimate strength design method, singly and doubly reinforced for rectangular and t- sections, irregular sections, design for shear, development length and splices, short columns, axially loaded, load and bending moment, interaction curves.

04034151 Foundation Engineering (1) (3 Cr. Hrs., Prerequisite: 04033151)

Site investigation, shallow foundations, bearing capacity of soil, stress distribution beneath foundations, settlements of soil below foundations, design and analysis of shallow foundations. Deep foundations, introduction to design and analysis of deep foundations, lateral earth pressure, and introduction to earth-retaining structures.

04034161 Pavement Design (3 Cr. Hrs., Prerequisite: 04033221 + 04033261)

Types of pavements materials used in flexible and rigid pavements, preparation of the sub-grade, earth work calculation, and mass-hole diagram, strength properties of pavement structural layers, axle loads, design methods of highway flexible and rigid pavement, marshal method for hot mix design. Super pave hot mix design, pavement maintenance.

04034162 Highway Engineering Lab. (1 Cr. Hr., Prerequisite or Simultaneously with 04034161)

California bearing ratio, ductility of bituminous materials, penetration of bituminous materials, flash and softening points, specific gravity of semi-solid bituminous materials, method of hot mix design (Marshal test), extraction test, separation of asphalt from aggregates, road surface roughness and ripples, pendulum friction.

04034171 Water Treatment Engineering (1) (3 Cr. Hrs., Prerequisite: 04033273 + 11011101)

Water sources, water consumption, design periods, population projection. Water: chemical, physical and biological characteristics. Water treatment for drinking purposes including: precipitation, sedimentation, coagulation, flocculation, hard and soft water, smell taste and odor, biological unit chlorinating process, hydraulic of water distribution networks.

04034172 Practical Water Engineering (1 Cr. Hr., Prerequisite or Simultaneously with 04034171)

Wastewater analysis, drinking water analysis including: pH, alkalinity, chloride, hard and soft water, chlorine, dissolved oxygen, BOD (biological oxygen demand), COD (chemical oxygen demand), coli form test, suspended and dissolved solids, coagulation and flocculation, water hardness removal.

04034241 Reinforced Concrete (2) (3 Cr. Hrs., Prerequisite: 04034141)

Design for working stress, crack control and deflection calculations, design for torsion, design of one-way solid and ribbed slabs continuous spans, design two-way slab supported by beams, coefficient method, design flat slab, direct design method, design slender column fixed or not fixed by moment magnify method, continuous beams and frames, alternate for live load, moment redistribution, design single and double footing.

04034242 Steel Structures (1) (3 Cr. Hrs., Prerequisite or Simultaneously with 04033241)

Properties types of steel structures, loads and load combinations, design basis using LRFD method, tension members, compression members, elastic and inelastic buckling of compression members by flexure and torsion, flexural members, limit state of yielding, elastic and inelastic lateral-torsional buckling, design against shear force, design for deflection, members under combined stresses, simple bolted connections.

04034281 Specifications and Quantity Surveying (3 Cr. Hrs., Prerequisite: 04034141)

General introduction, types of tenders, contracts, tender documents, Jordanian general conditions, specifications for buildings, quantities and cost estimation, introduction to value engineering.

04034282 Construction Management (3 Cr. Hrs., Prerequisite: 04033102, Prerequisite or Simultaneously with 04034281)

Scientific methods in project management, traditional linear planning, network analysis by circuit and Pert methods, sequencing method with interconnected networks with multiple relationships, project control, network modernization, resources and distribution methods.

04034291 Engineering Training (3 Cr. Hrs., Prerequisite: None)

Practical training with a minimum of (280) hours after completion of (115) credit hours according to the training instructions.

04035191 Graduation Project (1) (3 Cr. Hrs., Prerequisite: 04034291)

A guided study in civil engineering, an introduction to scientific research methods, and seminars on topics of interest in civil engineering. The first stage in the graduation project.

04035291 Graduation Project (2) (3 Cr. Hrs., Prerequisite: 04035191)

Planning, designing, writing a scientific report, and preparing engineering drawings for the project.

04035101 Special Topics in Civil Engineering (3 Cr. Hrs., Prerequisite: Department Approval)

To be offered according to the department capabilities. The course description shall be prepared by the instructor and shall be submitted for approval by the department. The material must contain an application project.

04035102 Geographic Information System (3 Cr. Hrs., Prerequisite: Department Approval)

Geographic and non-geographic information, Types of geographic information system, Relation between survey and geographic information, Relation between geographic information and cartography, location of geographic information system in civil engineering. Term project.

04035201 Computer Applications in Civil Engineering (3 Cr. Hrs., Prerequisite: Department Approval)

The course is a training for students to use one or more of the engineering programs that are used in various civil engineering fields (roads and transportation, water and environment, construction and geotechnical).

04035181 Building Construction (3 Cr. Hrs., Prerequisite: 04032121)

The development of building philosophy, types of buildings, structural elements in buildings, the transfer of loads to structural elements, types of foundations, design of geometric forms of foundations, brick and floor works and insulation against moisture, joints in structures, drawing sections and details of civil engineering works such as bridges, foundations, retaining walls, sections and steel joints.

04035182 Methods of Construction (3 Cr. Hrs., Prerequisite: 04034282)

Methods for selecting heavy-duty construction instruments based on technological and economic factors for earthworks, transportation, compaction and placement of earthwork. Evaluation of factors that may affect productivity, estimating construction cost economical based on economic analysis or owning and operating construction equipment, framework design, and introduction to methods of planning in construction works. The course includes a term project submitted by the end of the semester.

04035281 Building Services (3 Cr. Hrs., Prerequisite: Department Approval)

Ventilation, air distribution, solar energy, elevators, escalators, fire protection systems for buildings, water supply systems for buildings, drainage and rain drainage systems, waste disposal, quarterly project.

04035141 Matrix Structural Analysis (3 Cr. Hrs., Prerequisite: 04033241)

General review of linear algebra. Basic principles for complete structural analysis: static and kinematics relations, material elastic properties, introduction to force method using matrices, displacement method, direct-stiffness method, displacement-force coupling, structural applications using the direct stiffness method: spring and bar elements, beam element, plane frame element and grid element. The course includes a term project submitted by the end of the semester.

04035142 Steel Structures (2) (3 Cr. Hrs., Prerequisite: 04034242)

Introduction to bolted connections, bolts subject to concentric and eccentric loading, types and methods of welding, welds subjected to concentric and eccentric loading, shear connections, moment connections, base plates, unsymmetrical bending, plate girders, and composite beams. Term Project.

04035143 Prestressed Concrete (3 Cr. Hrs., Prerequisite: 04034241)

Introduction to prestressed concrete, types and concepts of prestressed concrete, pre-stressing methods, types of concrete and pre-stressing steel. Flexural analysis using elastic stresses, flexural strength analysis, partial pre-stressing, flexural design of beams, beams design with load balancing. Design based on strength requirements, flexural crack control. Loss of pre-stress force, composite beams. The course includes a term project submitted by the end of the semester.

04035241 Bridges Engineering (3 Cr. Hrs., Prerequisite: 04034241)

Types of bridges, design specifications, loads, distribution of loads, distribution of wheel loads on concrete slabs construction details, design of reinforced concrete load bridge, design of deck-girder bridge, design of a composite bridge, influence line of continuous bridge, design of continuous bridges. The course includes a term project submitted by the end of the semester.

04035242 Introduction to Seismic Design (3 Cr. Hrs., Prerequisite: 04034241)

Introduction to seismology, flexible response curves, seismic response to single and multi-kinetic systems, building code requirements, design seismic forces, equivalent static load method, seismic force distribution, shear wall design, seismic details, quarterly project.

04035243 Special Topics in Structural Engineering (3 Cr. Hrs., Prerequisite: Department Approval)

To be offered according to the department capabilities. The course description shall be prepared by the instructor and shall be submitted for approval by the department. The material must contain an application project.

04035151 Geotechnical Engineering (2) (3 Cr. Hrs., Prerequisite: 04033151)

Site investigation study, soil classification for highways, landslides and slope stability, problematic soils, methods of soil stabilization and enhancing its engineering properties, and box culverts. During the course, the student is requested to submit and discuss a project concerning one of the subjects given above.

04035152 Earth Retaining Structures (3 Cr. Hrs., Prerequisite: 04034151)

Introduction to soils' shear strength and lateral earth pressure, types of earth retaining structures, theories of soils' lateral earth pressure, design of gabion walls, design of sheet pile walls, design of reinforced earth walls, braced excavations. During the course, the student is requested to submit and discuss a project concerning one of the subjects given above.

04035153 Foundation Engineering (2) (3 Cr. Hrs., Prerequisite: 04034151)

Advanced subjects in site investigation, analysis and design of combined and raft foundations, analysis and design of foundations supported by rocks, advanced subjects for deep foundations, bearing capacity, settlement, design and analysis of deep foundations using different methods. During the course, the student is requested to submit and discuss a project concerning one of the subjects given above.

04035251 Soil Improvement and Slope Stability (3 Cr. Hrs., Prerequisite: 04033151)

Introduction to soils' shear strength and compressibility, problematic soils, principles of soil stabilization, dynamic compaction, soil replacement, sand drains, grouting, earth reinforcement. Overview to the methods of slope stability, stability of excavation slopes and open cuts, stability of slopes under the action of earthquakes. During the course, the student is requested to submit and discuss a project concerning one of the subjects given above.

04035161 Highways Rehabilitation and Management (3 Cr. Hrs., Prerequisite: 04034161 + 04034282)

Introduction to pavement management process; pavement networks definitions and classifications; pavement distress survey and rating procedure; deflection; roughness, skid resistance; overview of maintenance and rehabilitation techniques; network level management; project level management, term project.

04035162 Railroads and Airports Engineering (3 Cr. Hrs., Prerequisite: 04034161)

Airport Engineering: investigation of airport location and requirements. Design of runways: orientation, lengths, and cross-sections. Design and requirements of airport terminals. Railroad engineering: railroad element cross-sections, intersection design, horizontal and vertical curves of railroad.

04035163 Highway Roots (3 Cr. Hrs., Prerequisite: 04033261)

Principles of the design for the road lanes, horizontal, vertical and complex curves, visibility distance, cross-section of roads and its elements, quantity surveying for earth works.

04035164 Transportation Planning (3 Cr. Hrs., Prerequisite: 04033261)

Types of planning, transportation and land use models, transportation studies, land use studies, traffic volume studies, environmental impacts of transportation, construction of transportation models, assessment of transportation alternatives, quarterly project.

04035261 Highway Traffic Safety (3 Cr. Hrs., Prerequisite: 04033261)

Importance of highway safety, classification of traffic accidents, accidents causes, accident reporting, collision diagram, highway safety programs, design criteria, of highway safety. The course includes a term project submitted by the end of the semester.

04035262 Special Topics in Highway & Transportation Engineering (3 Cr. Hrs., Prerequisite: Department Approval)

To be offered according to the department capabilities. The course description shall be prepared by the instructor and shall be submitted for approval by the department. The material must contain an application project.

04035263 Advanced Surveying (3 Cr. Hrs., Prerequisite: 04032123)

Theory of errors, transverse surveying and trigonometric works land surveying, coordinates systems astronomical determination of bearings. Term project.

04035264 Photogrammetry (3 Cr. Hrs., Prerequisite: 04032123)

Principles of aerial photography, kinds of aerial photography. Principles of measurement using stereoscopic viewing, stereoplotting, displacement and adjustment production of normal, pictorial digital maps, aerial triangulation application of Photogrammetry in civil engineering. Term project.

04035171 Solid Waste Management (3 Cr. Hrs., Prerequisite: Department Approval)

Solid waste specifications, collection methods, waste transport strategy, solid waste treatment and disposal, recycling.

04035172 Design of Water and Wastewater Networks (3 Cr. Hrs., Prerequisite: 04034171)

Design period, population, population projection. Drinking water and wastewater quantities, principles of network design, water distribution systems, hydraulics of waters and wastewater systems, wastewater collection systems, principles of treatment units in water and wastewater. The course includes a term project submitted by the end of the semester.

04035173 Groundwater Hydrology (3 Cr. Hrs., Prerequisite: 04033273)

Elements of hydrological cycle, the nature of porous media, hydraulic conductivity and permeability, groundwater aquifers, general hydrodynamic equations of flow in isotropic and anisotropy media, groundwater wells, artificial ground water recharge, introduction to contaminant transport, selected computer applications. The course includes a term project submitted by the end of the semester.

04035174 Environmental Impact Assessment (3 Cr. Hrs., Prerequisite: Department Approval)

Environmental risk assessment process; environmental auditing. Procedures including an introduction to ISO14000 and its impact on the environmental auditing process; legal requirements relating to environmental assessments and impact assessments; strategies for waste minimization and pollution prevention. The course includes a term project submitted by the end of the semester.

04035271 Environmental Engineering (3 Cr. Hrs., Prerequisite: 04034171)

Environmental definitions, and environmental systems. Water: sources and types of water pollution and methods of treatment and control. Air: physical and chemical principles, air pollutant standards, static and dynamic pollution sources and methods of control, solid waste: definition, sources, collection, its impacts over the environment and the engineering methods for treatment and disposal. Hazardous and Industrial Wastes: definitions, environmental impacts and methods of treatment and disposal, herbicides and pesticides: types, environmental impacts and alternatives.

04035272 Water Treatment Engineering (2) (3 Cr. Hrs., Prerequisite: 04034171)

Advanced water and wastewater treatment techniques, reverse osmosis method; ion-exchange; tertiary treatment units; reuse and recycle of the treated wastewater, and project

04035273 Special Topics in Water and Environment Engineering (3 Cr. Hrs., Prerequisite: Department Approval)

To be offered according to the department capabilities. The course description shall be prepared by the instructor and shall be submitted for approval by the department. The material must contain an application project.