Department of Civil Engineering
B.Sc. Course Description

0901230   Engineering Geology **(3 Cr. Hrs.)**
   Prereq. (---)
Introduction to Geology, Minerals and Rocks, Superficial Deposits, Structural Geology, Groundiater, Properties and classifiqation of Rocks, Use of Rocks for Engineering Purposes, Site Investigation, Engineering Geology in Practice.

0901231 Geotechnical Engineering **(3 Cr. Hrs.)**
   Prereq. (0901242)
Index properties of soils, soil classification, plow in porous media: one   dimensional and two dimensional flow, soil-stresses, compaction, distribution of stresses due to surface loads, consolidation theory and effect of construction period, shear strength of soils and shear strength tests.

0901232 Geotechnical Engineering Lab. **(1 Cr. Hr.)**
   Prereq. /Coreq. (0901231)
Water content determination, liquid and plastic limits, shrinkage limit, grain-size distribution (Sieve analysis), hydrometer analysis, compaction, in-situ field density, constant and falling head permeability tests, consolidation test, unconfined compression test, triaxial test, direct shear box.

0901241 Statics **(3 Cr. Hrs.)**
   Prereq. (0301101)
Force systems (2D and 3D), equilibrium of particles and rigid bodies (2D and 3D), structures (trusses, frames and machines), distributed forces (centroids and centers of mass), beams (shearing force and bending moment diagrams), friction, moments of inertia and virtual work.

901242 Strength of Materials **(3 Cr. Hrs.)**
   Prereq. (0901241)
Axial loading, material properties obtained from tensile tests, Stresses and strains due to axial loading, thermal stresses, elementary theory of torsion, solid and hollow shafts, thin-

walled tubes, rectangular cross-section, stresses in beams due to bending, shear and combined forces, composite beams. Analysis of plane stress, Mohr's Circle, combined stresses. Thin-walled pressure vessels. Deflection of beams. Buckling of columns. Energy Methods.

0901243 Structural Mechanics   (3 Cr. Hrs.)
Prereq. (0301101)
Scalars and vectors, force components, moments, resultants. Rigid and deformable bodies, equilibrium, types of supports, free body diagram, structures, trusses, beams, method of joints and method of sections, shear and bending moment diagrams, distributed forces, centroids, second moment of area, composite areas, stresses and strains. Axial deformations, flexural stresses, shear stresses.

0901253 Introduction to Structural Design   (3 Cr. Hrs.)
Prereq. (0901243)
Structural properties of concrete, grades of concrete, cube test, bond between concrete and reinforcement. Simplified stress block, design of reinforced concrete sections for bending. Rectangular and T sections. Design of one-way slabs, design of R.C. columns for axial loads. Structural steel sections, design of steel sections for tension, compact sections, design for bending and shear. Steel   connections.

0901281 Surveying   (3 Cr. Hrs.)
Prereq. (0301101)
Principles and basic definitions, units of measurements, plotting scale, linear measurements, leveling, bearings, the Theodolite and its applications, contour lines, traversing, locating points by intersection and resection, areas and volumes.

0901282 Surveying Lab.   (1 Cr. Hr.)
Prereq./Coreq. (0901281)
Distance measurement and adjustment, leveling exercises, Theodolite exercises, contouring exercises, topographic surveys, determination of areas and volumes, traversing exercises.

0901283 Surveying for Architects   (2 Cr. Hrs.)
Prereq. (0301101)
Principles and basic definitions, units of measurements, plotting scale, linear measurements, leveling, bearings, the Theodolite and its applications, contour lines, areas and volumes.

0901301 Engineering Numerical Methods   (3 Cr. Hrs.,)

Prereq. (0301202)

Review of determinants and matrices. Algorithms to solve linear and non-linear equations. Solution of simultaneous linear equations using various methods: Gaussian elimination, Gauss-Jordan and LU decomposition method. Iteration methods for linear systems: Jacobi and Gauss-Siedel method. Interpolation and approximation. Curve fitting. Numerical differentiation and integration. Numerical solution of differential equations. Eigenvalue problems. Numerical error analysis. Applied examples from various areas of engineering. Discussion.

901303 Computer Applications   (3 Cr. Hr.,)
Prereq. (0901301)

Computer packages for mathematical and symbolic manipulations (Matlab, Mathematica). Windows environment. Graphics packages and spread sheets (Excel). Engineering packages for computation in water resources & structures spreadsheets. Application in Civil Engineering. Data processing and statistical packages.

0901331 Foundations   (3 Cr. Hrs.)
Prereq. (0901232)

Site investigation, bearing capacity of soils and rocks, distribution of stresses in soils, settlement of shallow foundations, factors to consider in foundation design, deep foundations capacity and settlement, lateral earth pressure and retaining walls, foundation on expansive soils, stability of slopes.

0901341 Structures (1)   (3 Cr. Hrs.)
Prereq. (0901242)

Structural forms, types of supports, stability and determinacy,   reactions, determinate structures, plane trusses, method of joints, method of sections, space trusses, shear and moment diagrams for beams and frames, three hinged arches, moving concentrated and distributed loads, influence lines for beams and trusses, Muller-Breslau principle. Deflections: direct integration, moment area theorems, conjugate beams, real and virtual work,   Maxwell's reciprocal theorem, Williot and Williot-Mohr diagrams, approximate analysis of statically indeterminate structures.

0901342 Structures (2)   (3 Cr. Hrs.)
Prereq. (0901341)

Introduction to indeterminate structures, static and kinematic indeterminacies, principle of superposition, method of consistent deformations, influence lines of continuous beams, qualitative influence lines, indeterminate trusses, influence lines for

indeterminate trusses, slope deflection, moment distribution for beams and frames, frames subject to side-sway.

0901351 Properties of Concrete   (3 Cr. Hrs.)
Prereq./ Coreq. (0901242)

Cement types and manufacturing, properties of cement and hydration, properties of aggregates. Fresh concrete: Workability, segregation and mixing tests of fresh concrete. Strength of concrete: compressive, tensile and flexural. Elasticity, shrinkage and creep, durability of concrete, testing of hardened concrete, mix design.

0901352 Properties of Concrete Lab.   (1 Cr. Hr.)
Prereq./Coreq. (0901351)

This laboratory includes tests for a number of construction materials, especially concrete, concrete materials, aggregates in general, hollow blocks, bricks, asbestos, tiles, in addition to concrete mixes and casting concrete.

0901361 Fluid Mechanics   (3 Cr. Hrs.)
Prereq. (0301201 or concurrent)

Introduction, Fluid properties, Basic units. Fluid statics. Pressure and its measurements. Forces on plane and curved submerged surfaces, buoyancy & floatation. Fluids in motion. Flow kinematics and visualization. Basic control volume approach. Differential and integral continuity equation. Pressure variation in flowing fluids. Euler's and Bernoulli's equations. Applications of Bernoulli equation. Momentum principle and its applications. Navier-Stokes equations. Energy equation, Hydraulic and energy grade lines dimensional analysis and similitude. Surface resistance and introduction to boundary layer theory. Flow in conduits, laminar and turbulent flows, frictional and minor losses, piping systems.

0901362 Hydraulics   (3 Cr. Hrs.)
Prereq. (0901361)

Steady flow in open channels, gradually varied flow in open channels, steady flow in pressure conduits, fluid measurements.   Hydromachinery: pumps and turbines.

0901363 Hydraulics Lab.   (1 Cr. Hr.)
Prereq./Coreq. (0901362)

Center of pressure, triangular and rectangular notches, Venturi and orifice meters, impact of a jet, head loss in pipes, critical depth, turbulent pipe flow, centrifugal pumps, axial flow pumps, hydraulic jump, Pelton wheel, radial flow fan.

0901371 Water Supply Engineering   (3 Cr. Hrs.)
Prereq. (0901361)

Principles of aqueous and inorganic chemistry, chemical equilibrium. Drinking water engineering: water consumption rate, design period, population estimation, sources of water, physical, chemical, and biological quality of water. Drinking water treatment: coagulation, flocculation, sedimentation, filtration, disinfection, and softening. Removal of taste and odor, water distribution networks.

0901401 Engineering Statistics   (3 Cr. Hrs.)
Prereq. (0301102)

Descriptive statistics, discrete and continuous random variables and probability distributions, joint probability distributions, point and interval estimation, tests of hypothesis, correlation and regression, analysis of variance, time series.

0901420 Engineering Economy   (3 Cr. Hrs.)
Prereq. (---)

Major elements of feasibility studies. Principles of engineering Economy. Equivalence and compound interest formula. Single payment model. Uniform payment model. Gradient payment model. Exponential payment model. Decision criteria for single and multiple alternatives: present worth, annual worth, future worth, internal rate of return, benefit cost ratio and payback methods. Income-tax effect on decision making Management concepts, management cycle. Theories of management. Project scheduling techniques using Gantt and Precedence methods.

0901421 Contracts, Specifications   (3 Cr. Hrs.)
Prereq. (0901451)

Contractual procedures, types of contracts, contract documents, bills of quantities, specification drafting, quantity measurement.

0901431 Earth Retaining Structures   (3 Cr. Hrs.)
Prereq. (0901331)

Review of fundamentals, lateral earth pressure, retaining walls, sheet-pile walls, cantilever sheet-pile walls, anchored sheet-pile walls, braced-excavation, reinforced earth, retaining walls with metallic strip reinforcement, retaining walls with metallic geotextile, gabions.

0901451 Reinforced Concrete (1)   (3 Cr. Hrs.)
Prereq. (0901352 & 0901341)

Properties of concrete and steel, working stress design, allowable stresses, cracked and uncracked sections, strength design, stress block, singly and doubly reinforced sections, rectangular, T-sections and other shapes, concepts of ductile and brittle behavior, design for bending, shear design, bond requirements, development length, one-way solid and ribbed slabs, approximate methods for two-way slabs, design of columns, axially and eccentrically loaded, short columns, interaction curves.

0901452 Reinforced Concrete (2)   (3 Cr. Hrs.)
Prereq. (0901342 & 0901451)

Isolated and wall footings, combined footings, eccentrically loaded footings, slender columns,   moment magnification, continuous beams and frames, pattern loading, moment envelopes, moment redistribution, estimation of dead and live loads, structural layout, deflections, crack control, detailing of reinforcement.

0901453 Steel Structures   (3 Cr. Hrs.)
Prereq. (0901342)

Properties of structural steel, load resistant factor design (LRFD), design of rolled and built-up tension members, design of concentric compression elements, simple welding and bolting, design of beams provided with and without adequate lateral bracing, beam- column elements, design of column base plate.

0901464 Hydrology   (3 Cr.Hrs.)
Prereq. (0901363 , 0901401)

Introduction, the hydrologic cycle and its components, precipitation, evaporation and transpiration, infiltration, stream flow. Rainfall-runoff analysis and its application, peak flow calculations, flood routing. Design floods, hydrologic forecast and design criteria. Groundwater hydrology and well hydraulics. Computer applications.

0901471 Wastewater Engineering   (3 Cr. Hr.)
Prereq. (0901371)

Sources of wastewater, quantities and quality. Primary treatment for removal of suspended solids. Chemical reaction and reactor type. Secondary treatment: activated sludge, trickling filters, and stabilization ponds. Management of treatment residuals. Design of sewer systems.

0901472 Environmental Engineering Lab.   (1 Cr. Hr.)
Prereq./Coreq. (0901471)

Water and Wastewater analysis: acidity, alkalinity, chloride, hardness, Ammonia, dissolved oxygen; biochemical oxygen demand, chemical oxygen demand, coliform bacteria, solids determination, coagulation, and softening.

0901481 Highway and Traffic Engineering (3 Cr. Hrs.)
    Prereq. (0901282)

Highway systems, highway evaluation, driver, pedestrian and vehicle characteristics, traffic characteristics, geometric alignment, roadside design, intersections and interchanges design, drainage and drainage structures, contracts and supervision, traffic accidents and safety, parking, pedestrian, speed, travel time and traffic volume studies, traffic signals and control devices.

0901482 Pavement Design (3 Cr. Hrs.)
    Prereq. (0901481)

Pavement types, structural design: stress analysis, vehicle and traffic consideration, structural design of flexible and rigid pavements, pavement materials: bituminous materials and their uses, asphalt concrete mix design, pavement distress and maintenance, preparation and construction of pavements. Planning of maintenance works.

0901483 Highway Engineering Laboratory (1 Cr. Hr.)
    Prereq./Coreq. (0901482)

Includes the following tests:

Penetration, softening point, flash point, ductility, CBR, viscosity, stripping, loss on heat, Marshall, extraction, aggregate air content, specific gravity, skid resistance, profilograph, and surface texture.

0901521 Construction Management (3 Cr. Hrs.)
    Prereq. (--)

Planning, construction management concepts, Network-analysis using arrow techniques Network analysis using precedence technique, overlapping networks, project monitoring, project control, time-cost trade off, resourse leveling, PERT.

0901522 Construction methods (3 Cr. Hrs.)
    Prereq. (--)

Understanding and selection of heavy construction equipment, earthmoving, tunneling, compaction, construction equipment productivity, factors affecting equipment productivity, economic analysis of plant ownership.

0901523 Project Management (3 Cr. Hrs.)
Prereq. (0901521)

Project management concepts, construction strategic planning, legal aspects of the construction process, management structure, project finance and funding, budgeting,

construction material management, personnel management, manpower planning, total quality management.

0901541 Structures (3) (3 Cr. Hrs.)
Prereq. (0901342)

Force method, flexibility matrix, effect of displacement of joints: environmental effects, effect of displacements at coordinates, three moment equation, displacement method, stiffness matrix, environmental effects, comparison between the two approaches, symmetry and anti-symmetry, influence lines of frames and arches of prismatic and non-prismatic members, effect of axial and shear forces.

0901551 Reinforced Concrete (3) (3 Cr. Hrs.)
Pereq. (0901452)

Design of slabs using the ACI building code, Direct Design Method, Equivalent Frame Method, design of bearing walls, shear walls and basement walls, biaxial bending of columns, torsion, design of staircases and water tanks, estimation of wind loads and earthquake loads.

0901553 Introduction to Earthquake Engineering (3 Cr. Hrs.)
Prereq. (0901452)

Introduction to earthquake engineering, origin and characteristics of earthquakes, introduction to structural dynamics, vibration characteristics of buildings, periods and mode shapes, response spectrum, earthquake-induced forces and displacements.

Introduction to inelastic behavior, force reduction and ductility requirements for concrete and steel material, seismic design and provisions of reinforced concrete frames and shear walls according to ACI code. Introduction to Jordanian seismic code and international building seismic codes such as UBC code.

0901555 Bridge Engineering (3 Cr. Hrs.)
Prereq. (0901452 , 0901453)

Classification of bridges, Structural components, Superstructures and Substructures, Bridge loading, Primary loads, Secondary loads, Distribution of live loads, Analysis and design of bridges according to AASHTO specifications. Prestressed and non-prestressed bridges, Steel bridges, Bearing Pads.

0901561 Design of Hydraulic Structures (3 Cr. Hrs.)
Prereq. (0901363)

Design Discharge: run-off, design flood and estimation of peak flood. Seepage and uplift pressure: Bligh's creep and Lane's weighted creep theory. Hydraulic jump and energy

dissipation devices: normal and sequent depths, forms, energy dissipaters and stilling basin, and U/S and D/S protections. Control structures: diversion works, weirs, sediment control devices, falls and transitions. Cross drainage works: siphon, aqueduct, culverts and outlet works.

0901562 Water Resources Engineering (3 Cr. Hrs.)
Prereq. (Hydrology 0901464)

Systems analysis of surface water, groundwater, and combined water resources. Analysis and design of convertible, distributing, conservation, and flood control reservoirs. Analysis and design of water transporting, and distributing systems using channels and pipe lines. Planning and management of water resources. Water resources economics. Local and international water law. Usage of statistics and probability in water resource design and management decision making.

0901572 Environmental Engineering (3 Cr. Hrs.)
Prereq. (0901472)

Environmental systems and sub-systems. Water pollution and water quality parameters. Natural water and wastewater treatment processes. Mass conservation and dissolved oxygen balance in water. Sources, characteristics and impacts of air pollutants. Atmospheric dispersion and air pollution control. Solid waste classification, handling, processing and ultimate disposal. Sources, quantities, and treatment processes of industrial wastewaters. Noise pollution and control.

0901573 Environmental Impact Assessment (EIA) (3 Cr. Hrs.)
Prereq. (0901471)

Study of environmental impacts of engineering projectson the environmental components of water, air, and soil. Social, economical, and cultural impacts will also be studied. Various impacts will be identified and predicted and mitigational measures will be suggested.

0901574 Water Reuse (3 Cr. Hrs.)
Prereq. ()

Uses of reclaimed water that include potable uses such as for irrigation, industrial uses, and recreation and the non-direct potable uses such as aquifier recharge the suitability of reclaimed water quality for each use, the impact of water reuse on human health, animal health, plants, and on the environment in general, case studies of water reuse in different countries including Jordan.

0901582 Transportation Engineering (3 Cr. Hrs.)
     Prereq. (0901482)

Air transportation: Airport planning, aircraft characteristics, airport configuration, landing area, airport capacity, and terminal area planning. Rail transportation: Cross sections, horizontal and vertical alignments superelevation, trains speed, rail sections, joints and crossings. Water transportation: Harbor types, harbor components, and harbor site selection. Urban transportation planning: Demand forecast, evaluation techniques, transportation system management, and mass transit.

0901583 Photogrammetry (3 Cr. Hrs.)
     Prereq. (0901282)

Introduction to photogrammetry, aerial cameras systems, photo scale, scale distortion, types of photos, stereoscopic vision, planning aerial photography missions, ground control points, image displacements, stereoplotters, photo mosaics, application of aerial surveys to highway design and maintenance.

0901584 Remote Sensing (3 Cr. Hrs.)
     Prereq. (0901282)

Introduction to remote sensing technology, forms of target interactions, remote sensing systems, the requirements and sources for remote sensing applications, role and significance of remote sensing in variety of fields, selected exercises.

0901599 Project (3 Cr. Hrs.)
     Prereq. (Passing 124 Cr. Hrs.)

In coordination with the department, the student or group of students will choose a theoretical or practical project that is related to the Civil Engineering major.

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