B.Sc. Course Description for Courses Offered By The Civil Engineering Department

(X, Y, Z) : X= Lecture hours, Y = Practical hours, Z= Course Credit hours
* = Co-requisite Course

110401211 Statics: (3,0,3), Prereq. (110108101 & 110102101)

Vectors, force systems (2D and 3D), equilibrium of particles and rigid bodies (2D and 3D), structures (trusses, cables, frames and machines), distributed forces (centroids and centers of mass), fluid pressure, internal forces (shearing force and bending moment diagrams), friction, moment of inertia and virtual work.

110401214 Engineering Mechanics: (3,0,3), Prereq. (110108101 & 110102101)

Application of mathematical and physical principles to solve engineering problems, develop a basic understanding of forces and the effects they produce on particles and rigid bodies that are at rest, evaluate and satisfy conditions of static equilibrium, develop understanding of the behavior of solids subjected to various types of loading, shear and moment diagrams, determine the stresses, strains and displacements in structures and components due to the loads acting on them.

110401315 Structural Analysis: (3,0,3), Prereq. (110402212)

Structural forms, reactions, determinate structures, degree of determinacy, shear and moment diagrams for beams and frames, influence lines for beams, deflections (principle of virtual work and conjugate-beam methods), Analysis of indeterminate structures by approximate methods (force method, moment distribution method, stiffness method (trusses, beams, and frames)).

110401313 Structural Analysis for Architectural Students: (3,0,3) Prereq. (110401214)

Structural forms, types of supports and determinacy, reactions, determinate structures, plane trusses, shear and moment diagrams for beams and frames, deflections, indeterminate structures, moment distribution method, introduction to stiffness method.

110401324 Reinforced Concrete and Steel Structures for Architectural Students: (3,0,3), Prereq. (110401313 + 110407331)

Properties of concrete and steel reinforcement, dead and live loads, analysis and design for bending, shear, axial forces, one way ribbed and solid slabs, short columns, wall footings, single footings, detailing of reinforcements, properties of structural steel, analysis and design of tension and compression steel members, analysis and design of steel beams for bending and shear, detailing of simple connections structural system layouts.

110401337 Building Materials: (3,0,3), Prereq. (110402212* & 110103107)

Cement (types, manufacture, properties and hydration), aggregates, fresh concrete, hardened concrete (strength, strength development, shrinkage, creep), durability, mix design by ACI and DoE methods, brick and brick work, compliance with specifications.

110401339 Building Materials Lab.: (0,3,1), Prereq. (110401337*)

Introduction to testing & specifications, concrete and mortar tests, aggregate testing, fresh and hardened concrete testing, non-destructive tests, design & testing of concrete mixes, brick testing.

110401336 Geotechnical Engineering: (3,0,3), Prereq. (110401212 & 110103107)

Index and classification of soils, water flow in soils (one and two dimensional water flow), soil stresses, soil compaction, distribution of stresses in soil due to external loads, consolidation and consolidation settlement, shear strength of soils, slope stability.

110401338 Geotechnical Engineering Lab. : (0,3,1), Prereq. (110401336*)

Water content of soils, specific gravity, grain size distribution, consistency limits of soils, compaction test, field density test, coefficient of permeability of soils (constant and falling head), consolidation test, direct shear test, unconfined compression test, tri-axial test.

110401346 Construction Project Management: (3,0,3), Prereq. (110401337)

Basic concepts of construction project management, Construction planning, project time Management, project cost management, project quality management, project human resources management, construction safety, value engineering and project life cycle, construction process optimization.

110401348 Construction Contracts Administration: (3,0,3), Prereq. (110401337)

Principles of construction contracts administration. Contract ingredients, project delivery approaches, bidding procedures, contract pricing formats, contract documents, specifications, drawings, bonds, subcontracting, delays, alternative methods of dispute resolution. FIDIC Conditions of Contract for Construction.

110401356 Hydraulics: (3,0,3), Prereq. (110402310)

Hydraulic machines, turbines, impulse turbines, Pelton wheel, reaction turbines, Francis turbine, Propeller and Kaplan turbines, water pumps, pressure pumps, centrifugal pump, multistage pump, propeller pump, and cavitations. Steady open channel flow, uniform flow, normal depth, Chezy and Manning equations, design of sections, specific energy, critical depth, nonuniform flow, rapidly varied flow, hydraulic jump, gradually varied flow, backwater curves.

110401358 Fluid and Hydraulics Lab.: (0,3,1), Prereq. (110401356*)

Center of pressure on a plane surface, stability of a floating body, Venturi and orifice meters, impact of jets, flow over a rectangular notches, flow over a weirs, head loss through pipes, critical depth and specific energy, flow under a sluice gate, roughness of open channel, hydraulic jump, performance of impulse and reaction turbines, performance characteristics of a centrifugal pump.

110401365 Surveying: (3,2,3), Prereq. (110400202)

Principles of surveying; Tape measurements (procedures, errors, and adjustments); Leveling and its application in contouring, profiles and cross-sections; Areas, volumes, and earthwork; Measurement of angles and directions; traverse surveys, topographic surveys; Electronic distance measurements (EDM); Introduction to GPS and applications. Horizontal and vertical alignment; Setting out horizontal and vertical curves.

LAB: Tests on distance measurements, levels and theodolites, directions and angular measurements, topographic surveys, areas and volumes; traverse surveys; Setting out horizontal and vertical curves, Training on Total Station.

110401369 Surveying and Building Documentation: (3,1,6), Prereq. (110407222)

This course seeks to teach the students about the basic concepts of surveying and architectural documentation and their different methods and techniques. Presenting the different archiving systems according the existing international standards. Explaining the role of new technologies in surveying and documentation, through introducing the development and evolution of the different surveying and architectural documentation methods and techniques. Through a series of exercises, the students will be able to perform practical applications using surveying and documentation instruments, methods and techniques and field studies. This also includes the process of preparing the different architectural and engineering documentation drawings.

110401367 Transportation Planning: (3,0,3), Prereq. (110403242)

Urban transportation system issues and challenges; Land use; demand forecasting; Transportation modeling including, trip generation, trip distribution, modal split, and traffic assignment. Urban mass transportation systems, Computer applications.

110401368 Highway Engineering and Design: (3,0,3), Prereq. (110401365)

Principles of route location. Horizontal alignment; design and setting out (circular curve element, superelevation). Sight distance; stopping and passing sight distance. Vertical alignment; design and setting out; Geometric design of intersections; highway drainage and drainage facilities.

110401421 Reinforced Concrete (1): (3,0,3), Prereq. (110401337 & 110401315)

Properties of concrete and steel, cracked and untracked section analysis, strength design, stress block, design for bending and shear, singly, doubly reinforced sections, rectangular sections, and T-sections, design of continuous beams, load cases and moment envelopes, bond requirements, development length and bar cutoffs, one-way solid and one-way ribbed slabs, design of short columns.

110401422 Reinforced Concrete (2): (3,0,3), Prereq. (110401421)

Structural layout, estimation of dead and live loads, serviceability, deflections and crack control, design for torsion, design of frames, moment redistribution, slender

columns, biaxial bending of columns, design of deep beams, approximate methods for two-way slabs, design of footings detailing of reinforcement.

110401425 Steel Structures: (3,0,3), Prereq. (110401315)

Properties of structural steel, load resistant factor design (LRFD), design of tension members, design of concentric compression elements, design of beams ,beam-column elements, design of column base plates, simple welding and bolting connections.

110401435 Foundation Engineering: (3,0,3), Prereq. (110401336)

Site investigation, bearing capacity of shallow foundation, distribution of stresses in soils, settlement of shallow foundation, factors to be considered in foundation design, introduction to deep foundation, lateral earth pressure and retaining walls, sheet pile walls, braced excavations.

110401436 Engineering Geology: (3,2,3), Prereq. (110401336)

Earth material, rock minerals and their characteristics, rock types and classification, rock cycle, engineering properties of rocks, weathering and weathered rocks, geologic structures, site investigation, mass movement and rock slopes, earthquakes, surface and underground water. Introduction to foundation on rocks, topographic and geologic maps.

LAB: Rock minerals, types, and classifications, geologic structures, rock logging, abrasion of rock, rock deformation and strength, slake durability, rock hardness, point load, direct shear, uniaxial, and sonic velocity.

110401454 Engineering Hydrology: (2,0,2), Prereq. (110402310)

Hydrologic cycle and the hydrologic budget; Evaporation; Infiltration; Transpiration; Precipitation: point precipitation, aerial precipitation; Runoff; Hydrographs; Watershed characteristics; Introduction to statistical methods in hydrology; Frequency analysis; Aquifers; Darcy's law; Well hydraulics.

110401455 Wastewater Engineering: (3,0,3), Prereq. (110401356)

Definition of pollutions as applied to water, soil and air; Basic concepts in environmental chemistry, microbiology and biochemistry; water sources; chemical, physical and biological water quality and water quality parameters; standards and criteria; population estimation; stream pollution, organic loading and oxygen depletion model; process kinetics and reactor types: CSTR, plug flow and batch reactors; continuity equation and mass balance approach; introduction to unit process and operations used in water and wastewater treatment plants

110401552 Environmental Engineering: (3,0,3), Prereq. (110401455)

Quantities and units; environmental systems and transformation processes; material balance relationships and reactor concepts; energy fundamentals; thermodynamics and equilibrium constants; environmental chemistry: stoichiometry, chemical equilibria, and organic chemistry; transport processes; interphase mass transfer; interphase partition phenomena: fugacity and mass

transfer; water pollution; air pollution; basic environmental microbiology; mathematics of growth.

110401466 Pavement Design: (3,0,3), Prereq. (110401368)

Pavement types, Pavement materials; subgrade stabilization methods; Principles of mix design using SUPERPAVE; Analysis of stresses in flexible and rigid pavement, Design methods of highway flexible and rigid pavements; Design of airport flexible and rigid pavement; Overlay design, Computer applications.

110401467 Highway Engineering Lab.: (0,3,1), Prereq. (110401466*)

Tests on asphalt binders include: penetration, softening and flash points, ductility, viscosity, and specific gravity; Tests on subgrade soils include: CBR test, Test on aggregate include: sieve analysis, specific gravity, absorption, aggregate blending, Tests on hot mix asphalts include: Marshall mix design, extraction, skid resistance.

110401368 Traffic Engineering: (2,0,2), Prereq. (110401367)

Traffic Flow Theory; Traffic Studies (volume, speed, travel time, and parking); Traffic control devices; Introduction to traffic signal timing, Parking facilities; Traffic safety studies.

110401513 Computer Applications in Structural Engineering: (3,0,3) Prereq. (110401315)

Review of the fundamentals of the stiffness and finite elements methods, analysis and design of different types of structures using available computer packages.

110401513 Pre-stressed Concrete : (3,0,3), Prereq. (110401422)

Introduction to prestressed concrete, types and concepts of prestressed concrete, prestressing methods, types of concrete and prestressing steel, flexural analysis using elastic stresses, flexural strength analysis, partial prestressing. Flexural design of beams, beams design with load balancing. Design based on strength requirements, flexural crack control, loss of pre-stress force, composite beams.

110401525 Introduction to Earthquake Engineering: (3,0,3), Prereq. (110401422)

Historical perspective of earthquake engineering. Introduction to earthquake seismology. Introduction to linear and nonlinear structural dynamics. Ductility concept and member's nonlinear behavior. Design response spectrum. Methods of lateral load analysis including but not limited to equivalent lateral force. Reinforced concrete beam, column, shear walls, and joint design issues

110401531 Soil Stabilization and Ground Reinforcement: (3,0,3), Prereq. (110401336)

Dynamic compaction, vibro-compaction, compaction grouting, preloading and prefabricated vertical drains, Blast-densification, lime-cement columns, vibro

stone columns, vibro concrete column, jet grouting, deep mixing, Micropiles, ground anchors, fiber reinforced soils, soil nailed retaining structures, geosynthetics in ground improvement, dewatering, admixtures, geopiers.

110401541 Construction Planning & Scheduling: (3,0,3), Prereq. (110401346)

Principles of planning, monitoring, and controlling construction projects. Developing schedules using bar charts, precedence diagrams, program evaluation and review techniques (PERT), and linear schedules. Resource histograms and s-curves. Resource allocation and resource leveling. Schedule constraints. Earned value concept.

110401542 Construction Methods: (3,0,3), Prereq. (110401337)

Study of construction operations as dynamic production processes. Earthmoving materials and operation, excavating and lifting, loading and hauling operations, compacting and finishing, paving and surface treatment operations, measuring and improving productivity, construction equipment economics.

110401543 Construction Cost Analysis & Estimating: (3,0,3), Prereq. (110401346)

Perceptions of construction cost, engineering economic analysis, risk and uncertainty, range estimating, cost fundamentals, types of cost estimating, estimating construction materials cost, estimating construction labor cost, estimating construction equipment cost, cost of concrete structures, estimating project cost, time/cost trade-off analysis, bidding strategies, cash flow analysis.

110401545 Building Construction: (3,0,3), Prereq. (110401421)

Construction processes for buildings and other structures. These processes include; codes and standards, structural and architectural components and systems, formwork and bracing design, erection and assembly methods.

110401551 Surface Water Hydrology: (3,0,3), Prereq. (110401454)

Advanced statistical methods in surface hydrology; Catchments, watersheds and drainage basins; Urban hydrology: approaches and effects of urbanization on runoff, peak flow methods; hydrograph routing; floods and droughts; design floods; snowmelt hydrology; Hydrologic design standards; Hydrologic simulation and Computer applications.

110401554 Water and Wastewater Treatment: (3,0,3), Prereq. (110401455)

Principles of aqueous and inorganic chemistry, chemical equilibrium, drinking water engineering, chemical and biological quality of water, coagulation, flocculation, sedimentation, filtration, disinfecting, softening, removal of taste and odor. Primary treatment for removal of suspended solids, chemical reaction and reactor type, second treatment, activated sludge, trickling filters, and stabilization ponds, management of treatment residuals.

110401556 Solid Waste Management: (3,0,3), Prereq. (110401455)

What is solid wastes, characteristics of solid wastes, components of solid wastes, protection of public health, recycling, collection and transportation systems, separation, processing and conversion of municipal solid waste, disposal of solid wastes, landfills, design of landfills, leachate generation control.

110401563 Pavement Management Systems: (3,0,3), Prereq. (110401466)

Pavement maintenance management concepts and components, Evaluation methods of highway elements (Pavements, Shoulders, Bridges, and Drainage structures); Flexible and rigid pavement distresses, Pavement condition survey and rating procedures; Highway maintenance and repair procedures; Assessment of maintenance needs; Evaluation and selection of proper maintenance alternatives, Computer applications.

110401564 Traffic Accidents & Analysis: (3,0,3), Prereq. (110401468)

Accidents and road safety: the problem; Traffic safety studies, capacity analysis of basic freeway segments, multilane, and two-lane highways, vehicle, roadway and driver characteristics, Computer applications, Traffic control methods and devices; Operational considerations for safety, Roadway lighting and highway traffic noise.

110401566 Geographic Information System (GIS): (1,6,3), Prereq. (110401365 & 110401369)

This course focuses on learning the basics and principles of GIS. The course presents a thorough introduction to GIS technology and linkage with map principles. It emphasizes on how spatial data can be organized, manipulated, analyzed and displayed, traditionally represented in maps, tables and aerial photographs. The course will focus on how the digital data layers are input and analyzed using GIS. Application of GIS in civil engineering.

110401595 Special Topics in Civil Engineering: (3,0,3), Prereq. (Dept. Consent)

Special up-to-date topic in one of the civil engineering streams, (structural engineering, construction engineering & management, water and environmental engineering and highway and traffic engineering).

110401500 Practical Training: (0,0,3), Prereq. (Passing 112 credit ours of the plan successfuly)

Practical (8 weeks) training in a Civil Engineering Project or any other place approved by the department, and according to the regulations drafted by the college of Engineering Training Committee.

110401598 Graduation Project (1): (0,3,1),
Prereq. (Passing 112 credit hours + 110401422* & 110401348*)

Preparation and starting of a engineering project in one of the civil engineering fields, such as; structures, water and environmental engineering, highway engineering, and construction management.

110401599 Graduation Project (2): (0,6,2), Prereq. (110401598)

Continuation of phase (1) including; writing a technical report and drawing the project drawings and details.