

UNDERGRADUATE COURSE DESCRIPTIONS (Compulsory)

1610101 **Engineering Drawing** 2 Cr. Introduction to the concept of engineering drawing, orthographic drawing sketching, sections and conventions. Pictorial drawing and sketching, isometric and oblique, two point perspective, additional short problems in Architectural drawing. **Prerequisite:** -

1210108 **Engineering Geology I** 2 Cr. The nature and scope of physical geology, matter and energy. Minerals. Igneous activity and rocks, Sedimentary rocks, metamorphic rocks, erosion on hill slopes, running water, underground water, tectonic. Earthquakes. **Prerequisite:** -

1610102 **Statics** 3 Cr. Force systems, equilibrium, structures, distributed forces, friction, moments and products of inertia.

Prerequisite: Calculus I 1914101

1610119 & 1610120 **Surveying & Field Work I** 3 Cr. Introduction, shape and size of the earth, theory of errors, measurement of distance, angle and elevation, surveying network, plane and topographic surveying.

Prerequisite: Calculus I 1914101

1610205 **Dynamics** 3 Cr. Dynamics of particles & rigid bodies at general plane motion including kinematics, dynamic equilibrium, work & energy, and impulse & momentum. **Prerequisite:** Statics 1610102 & Physics of Mechanics 2010115

1610200 **Building Materials** 2 Cr. Cement, aggregates, and concrete building units concrete admixtures, brick and tile, stone, ferrous and nonferrous metals, gypsum and lime, glass, bituminous materials, building papers, plastics, building boards, exterior wall materials, flooring & roofing materials, insulating materials, acoustical materials interior finishing materials, adhesives, sealers, sealants, protective and decorating coatings.

Prerequisite: Engineering Geology I 1210108

1612210 **Strength of Materials** 4 Cr. Tension, compression, torsion, bending, shear, combined stresses in beams and frames, Mohr circle, beam deflection, buckling of column. **Prerequisite:** Statics 1610102

1610222 **Principles of Architectural and Urban Planning** 2 Cr. Lecture-seminar on aspect of aesthetic in architectural design, architectural criticism.

Prerequisite: Engineering Drawing 1610101

1614226 **Fluid Mechanics I** 3 Cr. Fluid statics: pressure force on surfaces, buoyancy, fluid dynamics: continuity, energy and momentum principles, dimensional analysis & hydraulic similitude, drag force, laminar-flow, flow in pipes.

Prerequisite: Dynamics 1610205 & Strength of Materials 1612210

1616330 **Soil Mechanics** 3 Cr. In this course, the physical and mechanical properties of soil are discussed. These properties are categorized in seven subjects as: Strength of soil, permeability, compaction, consolidation, stress distribution, slope stability and ranking states of equilibrium.

Prerequisite: Strength of Materials 1612210

1612224 **Structural Analysis I** 3 Cr. Determinacy and Indeterminacy, stability, internal forces of frames, trusses, zero load method, influence line, deflection of structures, area moment method, virtual work, unit load method, settlement, thermal effect, misfit, force method, three moment equation.

Prerequisite: Calculus II 1914102 and Strength of Materials 1612210

1612334 **Concrete Technology** 2 Cr. Cement, aggregates, water, fresh concrete, mixing, handling, placing, compacting, admixtures, temperature problems, testing, mix design.

Prerequisite: Building Materials 1610200

1610324 **Architectural Design** 2 Cr. Introduction to project program development with emphasis on the analysis of functional and structural needs, additional problems in housing, common building design and presentation,.

Prerequisite: Principles of Architectural and Urban Planning 1610222

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1614308 **Hydraulics** 2 Cr. Types of flow in open channels, specific energy, critical depths, constant head energy, principles of momentum in open channels flow, uniform flow, gradually varied flow.

Prerequisite : Fluid Mechanics I 1614226.

1616320 **Highway Engineering** 3 Cr. Earthwork, circular curves, compound and reverse curves, parabolic vertical curves, transition spirals, element of highway safety: curve super elevation, widening on curves, sight distance, intersections.

Prerequisite: Soil Mechanics 1616330; Surveying I 1610119.

1612312 **Structural Analysis II** 2 Cr. Indeterminate structures, displacement methods, slope deflection, moment distribution, influence lines, non prismatic beams.

Prerequisite: Structural Analysis I 1612224.

1610300 **Building Materials lab.** 1 Cr. Evaluation of chemical, physical, and mechanical properties of Portland cement, lime, gypsum, stone, mineral aggregates, fresh and hard concrete, brick and tile, in accordance with specification and designation indicated in annual book of ASTM Standards.

Prerequisite: Concrete Technology 1612334.

1612302 **Steel Structures Design I** 3 Cr. General principles of structural design, mechanical properties of steel, tension member, design of beam, design of compression member, design of member in bending and compression, castellated beams, design of base plates.

Prerequisite: Structural Analysis I 1612224

1614315 **Environmental Engineering** 3 Cr. The Principles of water and wastewater treatment, water quality management, air pollution, solid waste, noise pollution and soil treatment will be discussed.

1610316 **Technical English in Civil Engineering** 2 Cr. Technical terms in areas of: Drawing, concrete, materials, construction, soil, road, structures, transportation, water, etc... are discussed.

Prerequisite: English for Engineers 2510111

1612402 **Strength of Materials Lab.** 1 Cr. Measurement of beams reactions, and deflection, tension and compression of bars, torsion test, impact test, stability of columns, strain measurement in beams, stability of structures.

Prerequisite: Strength of Materials 1612210.

1614330 **Engineering Hydrology** 3 Cr. Hydrological cycle, atmospheric water, precipitation, hydrological abstractions, surface water, rainfall-runoff relationships, groundwater, statistical hydrology.

Prerequisite : Mechanics of Fluids 1614226, Engineering Statistics and Probability 1912291

1614342 **Fluid Mechanics Lab.** 1 Cr. Friction pipes & joints, hydraulic jump in open channel, hydrostatic force on surfaces, flow discharge measuring devices, jet impact.

Prerequisite: Hydraulics 1614308.

1612348 **Design of Concrete Structures I** 3 Cr. Introduction, physical and mechanical properties of concrete, design methods and requirements, analysis and design of rectangular, T, I section in bending, shear, torsion, members in compression and bending, interaction curves for columns, effect of slenderness in design of columns. **Prerequisite:** Structural Analysis I 1612224.

1616356 **Highway Engineering Project** 1 Cr. Design of a highway, and highway facilities.

Prerequisite: Highway Engineering 1616320.

1612344 **Loading of Structures** 2 Cr. Probability laws for wind, earthquake and live loads, forces generated by wind, Iranian code, forces generated by earthquakes, Iranian code & U.B.C. approach, vertical loads, approximate solutions for vertical & horizontal loads, some systems to carry vertical & horizontal loads.

Prerequisite: Engineering Statistics and Probability 19211, Simul. Structural Analysis II 1612312.

1616360 **Soil Mechanics Lab.** 1 Cr. Standardized laboratory tests for determination of soil engineering properties which are defined in soil mechanics.

Prerequisite: Soil Mechanics 1616330.

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1612334 **Steel Structures II** 3 Cr. Analysis and design of beams by plastic methods design of composite beams, design of plate girders; torsion in I beams bolts, welds, design of connections.

Prerequisite: Steel Structures Design I 1612302.

1616406 **Foundation Engineering** 2 Cr. Subsurface exploration, ultimate bearing capacity of shallow foundations, settlement of shallow foundations, lateral earth pressure and retaining walls, pile foundations.

Prerequisite: Soil Mechanics 1616330.

1614404 **Water and Wastewater Systems** 3 Cr. Introduction to municipal water and wastewater treatment and network systems: sources of public water supply, water quality and quantity requirements, design and analysis of water distribution network, quantity and characteristics of wastewater, design of wastewater collection systems, fundamentals of water and wastewater treatment processes.

Prerequisite: Engineering Hydrology I 1614330, Simul. Hydraulics 1614308.

1612418 **Steel Structure Project** 1 Cr. Analysis and design of a building and or an industrial building.

Prerequisite: Loading 16345; Structural Analysis II 1612312; Steel Structures Design II 1612334.

1612427 **Concrete Structures II** 3 Cr. Bond stress and development length, one way slabs, two way slabs, yield line theory, foundations, crack widths and deflection, shear friction, corbels.

Prerequisite : Steel Structures Design I 1612344; Simul. Structural Analysis II 1612334.

1612413 **Construction of Buildings & workshop** 2 Cr.

1612457 **Earthquake Engineering** 3 Cr. Earthquake signals & filtration, baseline correction, frequency filtering method, low-pass & high-pass filters, modal analysis under earthquake loading, spectra & response spectrum, earthquake codes, earthquake damage, shaking table tests.

Prerequisite: Structural Analysis II 1612334; Design of Concrete Structures I 1612348.

1612436 **Reinforce Concrete Project** 1 Cr. A complete concrete structure project design including a 10-story building site concrete slab and shear wall. Design of all structural elements in the building.

Prerequisite : Structural Analysis II 1612334; Design of Concrete Structures II 1612427

1610424 **Estimating & Projects** 2 Cr. General Introduction to get acquainted with types of contract, conditions of contract and getting tenders. Developing relationship with employer, consulting engineers, contractor, and formulating duties of groups. Methods of measurement for some type of constructions. Cost analysis for different types of constructions.

Prerequisite: Architectural Design 1610324.

1614425 **Water and Wastewater Project** 1 Cr. Practices in the analysis and design of municipal water distribution system.

Prerequisite: Water & Wastewater Systems 1614404.

1616475 **Pavement Design** 3 Cr. Stress in flexible pavements, materials characterization, climate and environmental effects, sub grade stabilization, design of flexible pavements, pavement distress, flexible overlay design, geo grade use in asphalt overlays.

Prerequisite: Highway Engineering 1616320.

1614432 **Water Distribution Systems** 3 Cr. Design principles for small dams. Design of open channels. Intakes and turnouts. Design of weirs on permeable foundations. Design of hydraulic jump stilling basins. Water conveyance structures.

Prerequisite: Soil Mechanics 1616330 and Hydraulics 1614308.

UNDERGRADUATE COURSE DESCRIPTIONS (Elective) (Water Engineering)

1614373 **Chemistry and Microbiology of Water & Wastewater** 3 Cr.

Prerequisite: Environmental Engineering 1614315.

1614486 **Groundwater** 2 Cr. Groundwater and aquifers, physical properties of aquifers, Darcy's law and hydraulic conductivity, well-flow systems, measurement of hydraulic conductivity, transmissivity, specific yield, and storage coefficient, groundwater exploration, well construction, pumping, and groundwater quality.

Prerequisite: Engineering Geology 1210108, Simul. Engineering Hydrology 1614330.

1616362 **Road Building Machinery & Methods** 2 Cr. Operational hydraulic systems excavators, loaders, crawler road engineering tractors, rollers, graders, scrapers, management project control, road construction Method.

Prerequisite: Highway Engineering 1616320.

1614371 **Statistical Hydrology** 2 Cr.

Prerequisite: Engineering Hydrology 1614330.

1614236 **Fluid Mechanics II** 2 Cr.

Prerequisite: Fluid Mechanics I 1614226.

1614441 **Hydraulics Machinery & Pump Stations** 2 Cr. Hydraulic machines- turbines fluid systems, reciprocating pumps, indicator diagrams, centrifugal pumps, multistage centrifugal pumps, cavitation, water hammer, air vessels, structure of pumping station 2 Cr.

Prerequisite: Fluid Mechanics I 1614226.

1614380 **Purification Processes of Water & Wastewater** 3 Cr.

Prerequisite: Chemistry and Microbiology of Water & Wastewater 1614373

1614373 **Principles of Harbor Engineering** 2 Cr. Coastal and harbor structures, 2-D wave equations, finite amplitude waves, wave refraction, diffraction and reflection, coastal water level fluctuations, wind generated waves, analysis of harbor and coastal structures, coastal zone processes,

Prerequisite: Hydraulics 1614308.

1614463 **Small Dams** 2 Cr. Principles of small dams, flood hydrology studies, selection of type of dam, construction and materials, design principles of different small dams, diversion dams, embankments, forces acting on the gravity dams, requirements for stability, stress and stability analysis, hydraulics of spillways, hydraulics of control structures, hydraulics of free and pressurized flow, hydraulics of outlets, fish ways and sediment channels, sedimentation in reservoirs,

Prerequisite: Water Distribution Systems 1614432.

UNDERGRADUATE COURSE DESCRIPTIONS (Elective) (Geotechnical Engineering)

1616362 **Road Building Machinery & Methods** 2 Cr. Operational hydraulic systems excavators, loaders, crawler road engineering tractors, rollers, graders, scrapers, management project control, road construction Method

Prerequisite: Highway Engineering 1616320.

1616317 **Applied Geotechnics** 2 Cr.

Prerequisite: Foundation Engineering I 1616406.

1616435 **Traffic Engineering** 2 Cr. Elements of traffic engineering, travel time and delay studies, spot speed studies, volume studies, traffic theory, highway capacity, parking studies, traffic control devices.

Prerequisite: Highway Engineering 1616320, Engineering Statistics and Probability 1912291.

1616437 **Tunnel Engineering** 3 Cr. This course covers the principles of the methods and technology for underground excavations, the basic computational methods to design the supports and lining for tunnels.

Prerequisite: Foundation Engineering I 1616406.

1616431 **Earth Dams** 2 Cr. In this course the design and analysis of earth and rock fill dams are discussed and it can be divided in five basic subjects as: materials, cut off methods, drainage systems, design and foundations.

Prerequisite: Soil Mechanics Lab 1616360.

1616373 **Railway Engineering** 2 Cr.

Prerequisite: Highway Engineering 1616320.

1616371 **Foundation Engineering II** 2 Cr.

Prerequisite: Foundation Engineering I 1616406.

UNDERGRADUATE COURSE DESCRIPTIONS (Elective) (Structural Engineering)

1612484 **Matrix Analysis of Structures** 3 Cr. Matrix algebra, mathematical modeling of members, stiffness method, plane structures, space structures, special topics in stiffness method, flexibility method.

Prerequisite: Structural Analysis II 1612312, Elementary Numerical Methods 1914271.

1612459 **Plastic Analysis and Design of structures** 3 Cr. Basic concepts, plastic bending, ultimate loads of beams and frames, plastic design of beams and columns, beam-columns, deflections.

Prerequisite: Steel Structures Design I 1612302.

1612470 **Bridge Engineering Credits** 3 Cr. Analysis and design of different bridge decks including: concrete slabs, T beam decks multi-beam decks (steel or prestressed), box beam bridges (steel or concrete), segmental post-tensioned box girder bridge.

Prerequisite: Steel Structures Design I 1612302; Design of Concrete Structures II 1612427.

1612471 **Prestressed Concrete** 3 Cr. Different types of prestressing transfer stresses service load stresses. Ultimate flexural strength shear strength, prestress losses, end block design statically indeterminate prestressed structures.

Prerequisite: Design of Concrete Structures I 1612348.

1610134 **Welding Workshop** 1 Cr.

Prerequisite: Steel Structures Design I 1612302.

1612210 **Strength of Materials II** 2 Cr.

Prerequisite: Structural Analysis I 1612339.