

UNDERGRADUATE PROGRAM

Undergraduate students must take 20 credits in general courses, 26 credits in basic courses, 84 credits in compulsory courses and 10 credits in elective courses (Totally 140 credits) for B.Sc. in Civil Engineering.

Curriculum for the Degree of Bachelor of Science in Civil Engineering

COURSE CODE	COURSE TITLE	CREDITS
Semester I		
2010115	Physics I	3
1914106	Calculus I	4
1610101	Engineering Drawing	2
2510111	General English for Engineers	3
2010116	Physics Lab I	1
-	General Courses	4
Semester II		
1914107	Calculus II	4
1914251	Differential Equations	3
1610108	Engineering Geology	2
1610102	Statics	3
1610119	Surveying	2
1610120	Field Work for Surveying	1
-	General Courses	4
Semester III		
1730150	Computer Programming	3
1912291	Engineering Statistics and Probability	3
1610206	Dynamics	3
1610200	Building Materials	2
1612210	Strength of Materials	4
-	General Courses	3
Semester IV		
1914271	Elementary Numerical Methods	2
1610222	Principles of Architecture and Urban Planning	2
1614226	Fluid Mechanics I	3
1616230	Soil Mechanics	3
1612224	Structural Analysis I	3
1612234	Concrete Technology	2
1612402	Strength of Materials Lab	1
-	General Courses	2
Semester V		
1610325	Architectural Design	2
1614308	Hydraulics	2
1616320	Highway Engineering	2
1612314	Structural Analysis II	3
1610300	Building Materials Lab	1
1614342	Fluid Mechanics Lab	1
1612302	Steel Structures Design I	3
1614315	Environmental Engineering	2
1610316	English for Civil Engineering	2
Semester VI		
1614328	Engineering Hydrology	3
1612348	Design of Reinforced Concrete Structures I	3
1616357	Highway Engineering Project	1
1612344	Loading	2
1616360	Soil Mechanics Lab	1
1612334	Steel Structures Design II	3
1616408	Foundation Engineering	3
-	Elective Courses	2
Semester VII		
1614404	Water & Wastewater Systems	3
1614432	Water Distribution Systems	3
1612416	Steel Structures Project	1

1612427	Design of Reinforced Concrete Structures II	3
1612413	Construction of Buildings & workshop	2
-	General Courses	2
-	Elective Courses	6
Semester VIII		
1612457	Earthquake Engineering	3
1612435	Reinforced Concrete Structures Project	1
1610423	Estimation of Project	2
1614424	Water and Wastewater Project	1
1616475	Pavement Design	2
-	General Courses	2
-	Elective Courses	2
Elective Courses		

1614377	Chemistry and Microbiology of Water & Wastewater	3
1614486	Groundwater	2
1616362	Road Building Machinery & Methods	2
1614371	Statistical Hydrology	2
1614236	Fluid Mechanics II	2
1614441	Hydraulic Machinery & Pump Stations	2
1614380	Purification Processes of Water & Wastewater	3
1614373	Principles of Harbor Engineering	2
1614463	Small Dams	2
1614448	Engineering Economics and Water Planning	3
1610444	Surveying and Field Work II	2
1616317	Applied Geotechnics	2
1616435	Traffic Engineering	2
1616437	Tunnel Engineering	2
1616431	Earth Dams	2
1616453	Railway Engineering	2
1616452	Foundation Engineering II	2
1612484	Matrix Analysis of Structures	3
1612459	Plastic Analysis and Design of structures	3
1612470	Bridge Engineering	3
1612471	Pre-stressed Concrete	3
2410134	Welding Workshop	1
1612339	Strength of Materials II	2
1612393	Masonry Structures	2

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: -

1610108 Engineering Geology

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 in 2D and 3D, moments, equilibrium, structures, trusses, frames, machines, distributed forces, moments and products of inertia, beams, cables.

Prerequisite: Calculus I 1914106

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 1914106

1610206 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 1610108

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, urban planning.

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 1610206 – Calculus II 1914107

1616230 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 1914107 - Strength of Materials 1612210

1612234 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: Engineering Drawing 1610101

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

2 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 1616230 - Surveying I 1610119

1612312 Structural Analysis II

3 Cr.

Indeterminate structures, displacement methods, slope deflection, moment distribution, influence lines, non-prismatic beams.

Prerequisite: Structural Analysis I 1612224 - Elementary Numerical Methods 1614271

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, etc. in accordance with specification and designation indicated in annual book of ASTM Standards.

Prerequisite: Concrete Technology 1612234.

1612302 Steel Structures Design I

3 Cr.

General principles of structural design, mechanical properties of steel, tension in 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

2 Cr.

The Principles of water and wastewater treatment, water quality management, air pollution, solid waste, noise pollution and soil treatment will be discussed.

Prerequisite: Fluid Mechanics I 1614226

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 – Structural Analysis I 1612224

1614328 Engineering Hydrology

3 Cr.

Hydrological cycle, atmospheric water, precipitation, hydrological abstractions, surface water, rainfall-runoff relationships, groundwater, statistical hydrology.

Prerequisite: Fluid Mechanics 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 Reinforced 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 – Concrete Technology 1612234

1616357 Highway Engineering Project

1 Cr.

Practical design of a highway and highway facilities.

Prerequisite: Highway Engineering 1616320.

1612344 Loading

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 1912291 - Structural Analysis II 1612314

1616360 Soil Mechanics Lab.

1 Cr.

Standardized laboratory tests for determination of soil engineering properties which are defined in soil mechanics.

Prerequisite: Soil Mechanics 1616230.

1612334 Steel Structures Design 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

3 Cr.

Subsurface exploration, ultimate bearing capacity of shallow foundations, settlement of shallow foundations, lateral earth pressure and retaining walls, pile foundations.

Prerequisite: Soil Mechanics 1616230.

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 1614328 - Hydraulics 1614308

1612416 Steel Structure Project

1 Cr.

Analysis and design of a building and an industrial building made of steel.

Prerequisite: Loading 1612344 - Steel Structures Design II 1612334

1612427 Design of Reinforced 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: Design of Reinforced concrete Structures I 1612348 - Structural Analysis II 1612334

1612413 Construction of Buildings & workshop

2 Cr.

Prerequisite: Steel Structures Design I 1612302 – Design of Reinforced Concrete Structures I 1612348

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 1612314 - Loading 1612344

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: Loading 1612344 - Design of Reinforced Concrete Structures II 1612427

1610423 Estimation of 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 1610325

1614424 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 1616230 - Hydraulics 1614308 – Fluid Mechanics Lab 1614342

UNDERGRADUATE COURSE DESCRIPTIONS (Elective)

1614377 **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 Hydrology 1614328

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 1614328

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.

Prerequisite: Fluid Mechanics I 1614226

1614380 **Purification Processes of Water & Wastewater**

3 Cr.

Prerequisite: Chemistry and Microbiology of Water & Wastewater 1614377

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

1616317 Applied Geotechnics

2 Cr.

Prerequisite: Foundation Engineering 1616408

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 1616408

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

1616453 Railway Engineering

2 Cr.

Prerequisite: Pavement Design 1616475

1616452 Foundation Engineering II

2 Cr.

Prerequisite: Foundation Engineering 1616408

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 1612314 - 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 pre-stressed), box beam bridges (steel or concrete), segmental post-tensioned box girder bridges.

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

1612471 Pre-stressed Concrete

3 Cr.

Different types of pre-stressing, transfer stresses service load stresses. Ultimate flexural strength shear strength, pre-stress losses, end block design statically indeterminate pre-stressed 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.

1612393 Masonry Structures

2 Cr.

Prerequisite: Building Materials 1610200.