

**ISTINYE UNIVERSITY FACULTY OF ENGINEERING**  
**DEPARTMENT OF CIVIL ENGINEERING**  
**COURSE DESCRIPTIONS**

**1. Semester**

**Differential and Integral Calculus (2+2), 6**

Analytic geometry, functions and limits, derivatives, techniques and applications of differentiation, logarithmic and trigonometric functions. Definite and indefinite integrals, techniques of integration, with applications in sciences and engineering.

**Computational Thinking (3+2), 7**

Introduction to the central idea of computational thinking as it applies to a wide variety of human endeavors, including natural and physical sciences; computational mathematics with Sage, Matlab, and Mathematica; introduction to programming with Python.

**Engineering Physics (3+1), 6**

Vectors. Motion in one and two dimensions. Newton's laws and its applications. Work and energy. Conservation of mechanical energy. Momentum and motion of systems. Static equilibrium of rigid bodies. Rotation and angular momentum. Newton's law universal gravitation.

**Computing Literacy (2+2), 5**

Email and IM usage and etiquette; Computer security basics; Mobile and Cloud computing basics; Google apps and services: Docs, Sheets, Slides, Drive, Calendar, Keep, Scholar; Apple apps and services.

**Engineering Design (3+0), 4**

Introduction; The Design Process; Creative style; Brainstorming. Effective graphic and verbal communication of design ideas to groups and individuals, Student will learn how to research an engineering problem, where to find information and how to assess its validity, Students will be give an overview of key achievements in the history of engineering. There will also be stories with ethical implications.

**Turkish Language I (2+0), 2**

To teach the importance of language in human and social life; showing the classification of languages and teaching of Turkish among the world languages; to teach the characteristics of Turkish in terms of phonology, morphology, syntax; to analyze spelling and writing rules of Turkish.

**2. Semester**

**Linear Algebra with Applications (2+2), 6**

Systems of linear equations, matrix algebra, determinants, vector spaces and subspaces, basis and dimension, linear transformations, eigenvalues and eigenvectors, diagonalization, and orthogonality; singular-value decomposition.

**Computational Mathematics (3+2), 7**

A function approach integrating algebra, trigonometry, and differential calculus; properties and graphs of polynomial, rational, exponential, and logarithmic functions; properties and graphs of trigonometric functions; functions and limits; derivatives; techniques and applications of

differentiation; logarithmic and trigonometric functions; Integral calculus, including definite and indefinite integrals; techniques of integration, with applications in social and life sciences.

#### **Computer Aided Design (2+2), 5**

General technical drawing information. Drawing 2D and 3D drawings. Understanding the standard and alternative views. Learning to use REVIT (a computer aided drawing software).

#### **Introduction to Civil Engineering (3+0), 5**

Selected realized or on-going civil engineering projects around the world will be studied and discussed through presentations and video lectures. These case study project selections will be made such as to cover as many sub fields of civil engineering including structural, geotechnical, transportation and hydraulic engineering. Technical site visits will be planned to on-going local civil engineering projects. The students will be asked to prepare written reports on the case studies that are covered in the course.

#### **Statics (3+0), 5**

Concept of modeling and basic principles; Rigid bodies: Equivalent systems of forces; Equilibrium of rigid bodies, analysis of planar rigid body systems; Distributed forces; Normal and shear forces and moment diagrams; Virtual work principle.

#### **Turkish Language II (2+0), 2**

To teach spelling, writing and punctuation rules, to teach basic elements of writing essays, to introduce Turkish and World literary canons; to teach writing creative texts of literature especially story, poem and essay ; to teach writing scientific paper and texts; To analyse expression and punctuation disorders, to contribute lectures.

### **3. Semester**

#### **Differential Equations (2+2), 6**

First and second order differential equations; separation of variables; linear differential equations; systems of first order equations; nonlinear differential equations and stability

#### **Constructionarium (2+2), 5**

Constructionarium provides a “hands-on” construction experience for students and professionals; where participants construct scaled down versions of bridges, buildings, dams and civil engineering projects from all around the world. The principle is to link academic institutes with industry and to ensure that the students are able to apply the knowledge they have gained in a practical, safe and relevant environment.

#### **Materials Science (2+0), 4**

Materials and properties. Atomic bonding and arrangement. Structural imperfections. Atom movements. Elastic and viscoelastic deformation of materials. Phase diagrams. Metals, ceramics, polymers. Mechanical properties and failure. Modification of properties of materials through changes in structure. Composites. Corrosion and degradation of materials. Laboratory.

#### **Surveying (2+2), 5**

Four weeks of field work. Practice in the use of measuring tapes, transits, levels and plane tables, topographic map generation of an area using the stadia and the plane table method; triangulation, precise leveling and astronomical observations.

**General English I (2+0), 2**

The English of the terms and concepts encountered in various branches of engineering are examined in depth, and for the proper use of these terms, Turkish-English bilingual translations are explained. English language training for students starts from simple forms and intended to develop over time.

**Ataturk's Principles and History of Revolution I (2+0), 2**

The Collapse of the Ottoman Empire, Tanzimat and Reform Edict, I. and II. Constitutional Era, Tripoli and Balkan Wars, World War I, Mudros Armistice, War of Independence; Amasya Circular, National Congresses, Establishment of Turkish Grand National Assembly, Declaration of Republic

**Manifest of Istinye I (0+1), 1****4. Semester****Probability Theory and Stochastic Processes (2+2), 6**

Concepts of probability; random variables; combinatorial probability; discrete and continuous distributions; joint distributions, expected values; moment generating functions; law of large numbers and central limit theorems; Distribution of sample mean and sample variance; summarizing data by statistics and graphs; estimation theory for single samples; hypothesis testing: likelihood ratio test; confidence intervals.

**Engineering Geology (2+2), 4**

Origin of the earth; formation, distribution and properties of minerals and rocks. Processes of alteration; weathering, sedimentation, metamorphism. Geological structures. Use of geological maps. Engineering geology.

**Vector Calculus (2+2), 6**

Calculus of functions of several variables; vector-valued functions; scalar and vector fields; integration along paths, double and triple integrals; integration over surfaces and applications of integrals; integral theorems of vector calculus; infinite series; Fourier series; integrals and transforms; partial differential equations

**Strength of Materials I (2+2), 4**

Concepts of stress and deformation. Uniaxial tension test. Temperature effects in bars. Torsion of circular shafts. Simple bending of beams and beam deflections due to bending. Shear stresses in beams. Combined stresses due to bending, torsion, shear and axial loads. Transformation of stress, principal stresses, and Mohr's circle. Introduction to energy principles. Failure criteria. Stability and buckling.

**General English II (2+0), 2**

The English terms and concepts encountered are examined in depth and Turkish-English bilingual translations are used in order to use the concepts correctly. To be able to master professional English language, the students are informed about grammatical structures of sentences, spelling and pronunciation.

**Ataturk's Principles and History of Revolution II (2+0), 2**

Revolutions in Turkish politics, political parties and multi-party system attempts, revolutions in law, reorganization of public life, reforms in economics, Turkish foreign policy 1923-1938, Turkish domestic and international politics in post-Atatürk era.

**Manifest of Istinye II (0+1), 1**

## **5. Semester**

### **Structural Analysis I (3+2), 5**

Assumptions, principles of equilibrium in determining reactions, bending moments and shear diagrams. Influence lines. Determination of displacements by virtual work. Castigliano's theorem and moment area theorems. Statically indeterminate structures. Force and displacement method of approach using slope-deflection method. Flexibility and stiffness methods. Virtual work, strain energy, moment area and moment distribution methods. Matrix methods of structural analysis. Introduction to computer programs and use of program packages for structural analysis.

### **Soil Mechanics (3+2), 5**

Physical properties of soils, soil classification, soil structure, moisture effects; compressibility and consolidation; stress, deformation, and strength characteristics; stress distribution and analysis; lateral earth pressures; slope stability. Basic laboratory experiments and solution of selected problems.

### **Strength of Materials II (2+2), 5**

Plastic stresses and strains due to axial and shear loading and bending and torsional moments. Transformations of stress and strain, multidimensional stress-strain relations. Stresses due to combined loading. Failure criteria. Deflection of beams. Elastic stability. Elastokinetics.

### **Fluid Mechanics (2+2), 5**

Fundamental principles of fluid mechanics and their application to engineering problems. Fluid statics. Kinematics of fluid flow: continuity equation, stream function, irrotational flow velocity potential. Fluid dynamics: flow of viscous fluids. Newtonian fluids, simple laminar flow systems, turbulence, flow in pipes. Selected topics from compressible flow, open channel flow, boundary layer theory.

### **Construction Materials (2+2), 5**

Cementing materials, aggregates, concrete, ceramics and masonry, structural metals, polymers, timber and composite materials. Illustration of their applications in civil engineering. Laboratory sessions on cementing materials, aggregates and concrete.

## **6. Semester**

### **Reinforced Concrete I (3+2), 5**

Mechanical properties of structural concrete. Behavior of reinforced concrete elements under different natural and physical conditions and under normal force, shear, moment and torsion. Ultimate design of reinforced concrete beams, floor systems and columns. Introduction to Turkish Standard Reinforced Concrete Design and the codes related of the American Concrete Institute for reinforced concrete buildings.

### **Structural Analysis II (3+1), 5**

Methods for the analysis of statically indeterminate structures such as Force Method, Cross Method, Slope Deflection, Moment Distribution & Stiffness Method.

### **Transportation Engineering (2+2), 5**

Principles of the design of transportation facilities with emphasis on highways and airports. Planning, geometric design, drainage, pavement design, air photogrammetry and mapping, geophysical subsurface explorations, sampling of materials and testing and roadway construction.

**Hydraulics (2+2), 5**

A quantitative introduction to the principles of hydrology, hydraulics and water resources planning for design and analysis of systems concerned with the use and control of water, storage, water transmission; design of open channels and pressure conduits. Ground water engineering, economical analysis of water resources projects.

**Steel Structures (2+2), 5**

Design of steel structures, material properties of steel. Allowable stress design approach. Introduction to Turkish standards, Eurocodes and AISC codes. Connections, tension members, compression members, beam-columns. Beams and girders. Design of frames, trusses and industrial buildings.

**7. Semester****Capstone Project I (3+2), 7**

This no-lecture course includes an appropriate design project with all the design phases starting from project selection to completion and presentation, and which leads the students use the knowledge they gained during their tenure in the department and gain complete design experience. In this course, design of a machine, system or process is conducted in the framework of an open-ended engineering problem and a team of students develops the solution.

**Construction Management (3+0), 4**

This course aims to provide a basic knowledge of the project management in construction industry and develop an understanding of the facility delivery process, labor productivity, construction costs, and scheduling. Course also includes total quality management, teams, partnering, negotiating, diversity, communication, leadership, ethics, and change management.

**Environmental Engineering (2+2), 4**

Water supply sources, transmission, water distribution reservoirs and networks; wastewater collection and disposal; introduction to water and wastewater treatment methods.

**Manifest of Istinye III (0+1), 1****8. Semester****Capstone Project II (3+2), 7**

This no-lecture course includes an appropriate design project with all the design phases starting from project selection to completion and presentation, and which leads the students use the knowledge they gained during their tenure in the department and gain complete design experience. In this course, design of a machine, system or process is conducted in the framework of an open-ended engineering problem and a team of students develops the solution.

**Water Supply and Sewerage Systems (3+0), 3**

Planning, design and construction of water distribution and wastewater collection systems. The course is focused on water distribution systems which covers estimation of urban water consumption, hydraulic design of water distribution networks, water storage, pumping systems, analysis of water quality in the distribution systems and wastewater and surface runoff collection that will introduce the main sources of wastewater and runoff production.

**Foundation Engineering (3+2), 4**

Application of soil mechanics and other related techniques to design of foundations. Methods of site and soil exploration; bearing capacity and settlements; shallow and deep foundations; bracing and retaining structures. Case studies.

**Reinforced Concrete II (2+2), 4**

Analysis and design of reinforced concrete deep beams, shells and folded plate members, substructures, retaining walls, chimneys, tanks, silos and bridges. Principles of prestressed concrete: Creep, shrinkage and temperature effects. Special provisions for aseismic design of reinforced concrete elements. Precast concrete.

**Manifest of Istinye IV (0+1), 1****DEPARTMENT ELECTIVE COURSE DESCRIPTIONS****Direct Research (2+2), 5**

The students are involved in projects that are going on research centers. They are required to attend meetings, develop code, help to build devices, and give presentations as needed. The lecturer covers basic research techniques, search, writing papers in LaTeX, and working with data.

**Engineering Ethics (2+2), 5**

The origins of ethical thought; ethical principles and basic theories; personal, academic and professional ethics for engineers; environmental ethics; ethical implications of technology, computer ethics; ethics in research and experimentation.

**Intelligent Transportation Systems (2+2), 5**

The background of Intelligent Transportation Systems (ITS), the relationship of ITS to other areas of transportation, the current implementations of ITS, analysis of sample deployments, the practical issues and implications of ITS.

**Numerical Methods in Civil Engineering (2+2), 5**

Use of numerical techniques to investigate case studies in civil engineering topics including hydraulics, geotechnics and structures. Interpolation and numerical integration techniques; numerical solutions to ordinary differential equations using Runge-Kutta and multistep techniques; application of finite difference techniques to partial differential equations including parabolic and elliptic equations; convergence and error analysis, development and application of computer programs to case studies derived from civil engineering practices.

**Hydraulic Engineering II (2+2), 5**

Irrigation and drainage, water supply network design, reservoirs. Hydraulic machinery: pump-turbines. River control, problem of excess drainage, erosion and sediment transport, flood control, operation and maintenance of water resources systems.

**Coastal Engineering (2+2), 5**

The coastal zone; wave classification; water waves; engineering properties of water waves; standing waves; wave energy, transformation of waves, shoaling, refraction, diffraction; wave breaking; wave generation and prediction; tides, wave forces; design of breakwaters, seawalls, pile structures and beach fills.

**Aseismic Design of Structures (2+2), 5**

Review of aseismic design codes; alternate philosophies in earthquake design principles; concept of ductile design principles and regulations in reinforced concrete, steel and prefabricated structures; Introduction to active and passive control in structures against seismicity.

**Road Safety Engineering (2+2), 5**

The global and national importance of the road safety problem. Accident studies. Role of human, vehicle and road factors in road safety. Operation, control and management of highway and street networks for safety. Operation, control and management of highway and street networks for safety. Safety improvement programs. Relationship among highway design elements and safety. Safety evaluation methods for countermeasures. Evaluation of effectiveness and the benefit/cost of

**Computer Aided Civil Engineering Design (2+2), 5**

An introduction to the use of commercial software programs used in practice for the design and analysis of various civil engineering systems.

**Construction Site Management (2+2), 5**

This course aims to give the keys of management a construction site and reliable information to run a project efficiently; collecting of basic knowledge and skills in this branches: Participant of Building-up, Preparing, before-preparing, operating preparing, Time planning, Building Technologies, Building site outfit.