IZMIR INSTITUTE OF TECHNOLOGY
FACULTY OF ENGINEERING
DEPARTMENT OF CIVIL ENGINEERING
UNDERGRADUATE PROGRAM
(Course Contents Valid for the 2024-2025 Academic Year and After)

COURSE CONTENTS

CHEM 121 General Chemistry I (3+0)3 5 Ects
Matter, its properties and measurement. Introduction to atomic theory, stoichiometry. The structural and chemical properties of matter. Gases, liquids and solids. Intermolecular forces. Atomic and molecular structure. Compounds, molecules and molecular formulas. Ions and ionic compounds. Atomic and electronic configurations and periodicity. Basic concepts of chemical bonding, ionic, covalent and metallic bonding.

CHEM 141 General Chemistry Laboratory I (0+2)1 2 Ects
Experiments complementary to the course material related to the topics discussed in CHEM 121 General Chemistry I lectures will be carried out in this laboratory section.

ENG 101 Development of Reading and Writing Skills I (3+0)3 3 Ects
The overall aim of this course is to develop freshman students' English academic reading and writing skills. The course also aims at equipping students with basic study skills they will need throughout their academic life. Students are encouraged to write and present what they read; therefore, speaking skills are introduced and make the students use them while presenting a topic.

ENG 102 Development of Reading and Writing Skills II (3+0)3 3 Ects
The overall aim of this course is to develop freshman students' English academic writing skills, evaluating original articles and to make them able to write an original article about their own opinions on that topic. Students are encouraged to present what they have written.

PHYS 121 General Physics I (3+2)4 7 Ects
Basic concepts of mechanics using vectors and calculus; Newton`s laws of motion; conservation of energy and momentum. Kinematics and dynamics of particle and rigid bodies undergoing rectilinear, rotational, and oscillatory motion. Gravitation. Laboratory experiments complement the lectures.

PHYS 122 General Physics II (3+2)4 8 Ects
Continuation of General Physics I. The fundamental laws of electricity and magnetism, including electromagnetic oscillation and applications to circuits and instruments. Coulomb`s law; electric fields; Gauss`s law; electric potential; capacitance. Simple circuits; RC circuits. Magnetic force; forces and magnetic dipoles; magnetic field; Faraday`s law; self-inductance. Laboratory experiments complement the lectures.

MATH 141 Basic Analysis I (3-2)4 5 Ects
Functions. Limits and Continuity. Derivatives. Applications of Derivatives; Mean Value Theorem, Intermediate Value Theorem. Integral. Applications of Integrals; Volume, Surface Area, and Arc Length. Transcendental Functions. Integration Methods; Substitution, Partial Integration, Trigonometric Integrals.

MATH 142 Basic Analysis II (3-2)4 6 Ects

L'Hopital's Rule. Improper Integrals; Convergence Tests. Sequences and Infinite Series; Convergence Tests. Polar Coordinates. Multivariable Functions and Their Derivatives. Double Integrals, Double Integrals in Polar Coordinates. Prerequisite: MATH 141

MATH 241 Analysis III (3-2)4 5 Ects

Vector-valued functions and space curves, analysis of vector-valued functions, motion in space, multiple integrals over square regions, integrals in polar, cylindrical, and spherical coordinates, change of variables in multiple integrals, vector fields, divergence and curl, properties and applications of line integrals, surface integrals, conservative fields, fundamental theorem of calculus, Green's theorem, Stokes' theorem, divergence theorem. Prerequisite: MATH 142.

GCC101 Career Planning And Development (2+0)0 2 Ects

IYTE Career, Leadership and Entrepreneurship Center (CLEC) provides the activities that support students' skills enhancement. It also follows the course's activities such asseminars, invitation of speakers, webinars, arrangements with guest lecturers and students' communities. The supportive activities of IYTE Career, Leadership and EntrepreneurshipCenter (CLEC) designed to present core methods and tools used in professional job applications. Also the activities are designed in a way to use these methods and tools in mosteffective way in career planning and development. By collaboration with IYTE Alumni Office and IYTE Alumni Association, graduates share their experiences and introduce differentbusinesses to the students. The course is constructed over 3 modules. Module 1: Internal stakeholders; IYTE Career, Leadership and Entrepreneurship Center (CLEC), IYTE AlumniOffice, course lecturer participations. Career center presents available supplementary activities for IYTE students' career planning and development. Module 2: Guest speakers; IYTEgraduates, IYTE student communities, IYTE lecturers present career development opportunities present in IYTE campus. Module 3: Guest speakers and panels with externalstakeholders; professionals from the public and private sector, academia, NGOs; sharing methods, tools and experiences about career planning and development.

CE 101 Introduction to Civil Engineering (2+0)2 6 Ects

The objective of the course is to introduce the civil engineering profession and civil engineering department to first year students. An orientation course to provide counsel to the students on the major areas of Civil Engineering including information on typical activity of civil engineers, integrated course sequences and content, and an introduction of the faculty. Professional engineering practice. Oral and written engineering communication. The students will have a better opinion of what civil engineering is and where they will get a formal civil engineering education.

CE 102 Technical Drawing (2+2)3 5 Ects

The objectives of this course are to enable the students to understand the general concepts of engineering drawing and general principles on a CAD and extend this knowledge to general use of CADs. An introductory course to provide orientation to the language of engineering graphics and interaction with integrated computer aided drafting. General Cad Terminology and CAD User Interface and Drawing Editor. Technical Drawing Concepts: Orthographic drawing, isometric and oblique projections and sectioning, basic dimensioning techniques, plotting and printing techniques. Introduction to model space and paper space concepts. Civil Engineering applications.

CE 221 Engineering Mechanics I: Statics (2+2)3 6 Ects

Introduction to rigid body mechanics. Concepts of moment, couple, resultant. Equations of equilibrium, free-body diagram. Structural analysis of trusses and beams. Shear force and bending moment diagrams of beams. Moment and centroid of area. Moments of inertia, principal directions. Prerequisite(s):MATH 145

TURK 201Turkish Language I (2+0)0 2 Ects
The course is organized in such a way that the students develop a consciousness of and an interest in Turkish language, which is the native language for most of the students.

TURK 202 Turkish Language II (2+0)0 2 Ects
Grammatical and linguistic knowledge, poems, stories, novels and essays written by the Turkish writers who use the language most skillfully. Besides, some panels and conferences are held, related to the books selected.

TURK 203 Turkish For Foreigners I (2+0)0 2 Ects
Turkish sound knowledge of basic level, simple sentence structures, establish a dialogue, introducing yourself

TURK 204 Turkish For Foreigners II (2+0)0 2 Ects
Grammatical and linguistic knowledge, poems, stories, novels and essays written by the Turkish writers who use the language most skillfully. Besides, some panels and conferences are held, related to the books selected.

HIST 201 Principles of Atatürk I (2+0)0 2 Ects
Discusses the modernization of the Ottoman Empire during the nineteenth and early twentieth centuries, the spread of nationalism among its subject peoples, and the revolutionary changes in Ottoman institutions and society that led to the Empire's demise and the transitional period from the Empire to the national state and the foundation of the Turkish Republic following the national struggle led by Mustafa Kemal Atatürk.

HIST 202 Principles of Atatürk II (2+0)0 2 Ects
Discusses major events that have taken place from 1923 to 1950, the structuring of the Republic of Turkey and the political, social, economic, and cultural revolutions introduced by Mustafa Kemal Atatürk.

HIST 203 History Of Turkish Revolution I (2+0)0 2 Ects
The modernization of the Ottoman Empire during the nineteenth and early twentieth century's, the spread of nationalism, and the revolutionary changes in Ottoman institutions and society that led to the Empire's demise, the transitional period from the Empire to the national state and the foundation of the Turkish Republic following the national struggle led by Mustafa Kemal Atatürk.

MATH 255 Differential Equations (4+0)4 6 Ects
First order equations and various applications. Second order linear equations. Higher order linear differential equations. Power series solutions: ordinary and regular singular points. The Laplace transform: solution of initial value problems. Systems of linear differential equations: solutions by operator method, by Laplace transform. Fourier series and boundary value problems.

MATH 265 Basic Linear Algebra (3+0)3 4 Ects
Matrices, determinants and systems of linear equations. Gaussian elimination. LU Decomposition. Vector spaces; subspaces, sum and direct sums of subspaces. Linear dependence, bases, dimension. rank and nullity, change of basis, canonical forms, inner product, Gram-Schmidt orthogonalization process, QR decomposition. Eigenvalues, eigenvectors, diagonalization, similarity. Quadratic Forms. Complex vector spaces, Complex eigenvalues, Unitary and Hermitian Matrices. Least-squares.

CE 203 Engineering Geology (2+2)3 4 Ects

This course explores the fundamentals of geology applied to civil engineering problems. Topics include rock and mineral types, soil properties, rock mechanics, geologic structures, active tectonics and earthquake hazards, slope stability and landslides, groundwater, dams and tunnel and effect of geological factor on environmental and engineering structure. Team projects include classic engineering geology case studies and site assessment field investigations. Instruction is conducted through lecture and field trips.

CE 204 Engineering Surveying (2+2)3 4 Ects

Basic surveying concepts, error and uncertainity, vertical and horizontal controls, distances, angles, conventional control surveys, control positions, survey instruments (simple/tacheometry), mapping techniques (triangulation/orthogonal), height measurements, area-volume calculations, satellite positioning, earthworks setting out, underground/tunnel surveying, marine surveying, photogrametry, application software:NETCAD.

CE 205 Statistical Methods For Engineers (3+0)3 4 Ects

Probability and random variables; basic concepts; hypotheses; Normal, continuous and discrete distributions; variability; expectations and moments; functions of random variables; inferences, estimations and model verifications; observed data and graphical representations; linear models and linear regression; correlations.

CE 221 Statics (2+2)3 6 Ects

Introduction to rigid body mechanics. Concepts of moment, couple, resultant. Equations of equilibrium, free-body diagram. Structural analysis of trusses and beams. Shear force and bending moment diagrams of beams. Moment and centroid of area. Moments of inertia, principal directions.

CE 222 Engineering Mechanics II: Dynamics (3+0)3 5 Ects

Nodal mass kinematics; Nodal mass motion; work and enegy; impuls and momentum; rigidbody kinematics; two and three dimensional motion of rigid bodies; Energy and momentum principles of rigid bodies; Mechanical vibrations; *Prerequisite(s):PHYS121*

CE 224 Mechanics of Materials (2+2)3 5 Ects

Tension, compression, and shear; axially loaded members; Torsion of circular shafts; Equilibrium, compatibility, and constitutive relations; Stresses in beams; Analysis of stress and strain; Deflection of beams; Buckling of columns. *Prerequisite(s): CE 122*

CE 231 Engineering Economy (3+0)3 3 Ects

Introduction to engineering economy. Interest and money-time relationship. Depreciation, valuation depletion. Basic methods for making economy studies. Risk-decision analysis. Selection between alternatives and the replacement problem. Applications related to various constructions projects. Quantity measurement and cost estimating of a building project.

CE 232 Structural Engineering (3+0)3 5 Ects

Introduction, financial and operational planning in construction projects, financial control and accounting of operations, project cost control, bid preparation, equipment organization, and applications related to computer and expert systems for construction costs.

CE 240 Introduction to Computer Programming (2+2)3 5 Ects

The objective of the course is to provide first knowledge and basic skill of programming. Introduction to programming concepts, using constants, variables, expressions and statements. Selection, repetition. Simple data structures and arrays. Functions and modular programming.

CE 241 Materials Science (2+2)3 4 Ects

General requirements for engineering materials. The structure of matter, atomic arrangements, structural imperfections, atom movements. Force, stress, deformation, strain, elastic and plastic behavior, brittleness, ductility, toughness, resilience, viscosity, rheological models, creep, hardness and fatigue.

CE 244 Materials of Construction (3+2)4 4 Ects

Properties and behavior of basic construction materials such as ferrous and non-ferrous metals, clay products, timber, building stones, mineral aggregates, lime, gypsum, cements, pozzolans and concrete. Factors affecting their properties, pertinent standard specifications and tests, their use in constructions and production techniques.

CE 272 Fluid Mechanics (3+0)3 4 Ects

Definitions, physical properties, Hydrostatics, Kinematics, Basic principles and methods of analysis, Principles of conservation of mass, momentum and energy, Bernoulli equation, Dimensional analysis and similitude.

CE300 Summer Practice I 7 Ects

The summer practice provides students a chance for observing engineering project implementation on site and be a part of an engineering team at work for a minimum period of 20 workdays, in which they would have opportunity to bridge the gap between the education they receive and the real life applications. A summer practice daily logbook needs to be kept during the summer practice, and should be submitted together along with a formal technical report providing the explanation of the work observed and tasks carried out during the internship.

CE 307 Numerical Methods in Engineering (4+0)4 5 Ects

Solutions of system of linear equations, Iterative methods, Interpolation, Cubic Splines, Numerical differentiation, Numerical Integration, Numerical solution of nonlinear equations, Initial value problems, Numerical solution of ordinary differential equations, Finite difference method, Engineering application problems.

Prerequisite(s): MATH 241

CE 321 Introduction to Structural Mechanics (3+0)3 6 Ects

Unsymmetrical bending of beams. Shear centre. Analysis of statically indeterminate structures. Work and energy principles. Principle of virtual work. Castigliano's first and second theorems. Analysis of determinate and indeterminate structures by the Force Method. *Prerequisite(s): CE 224.*

CE 322 Introduction to Structural Analysis (3+0)3 6 Ects

Introduction to structural analysis. Virtual work principles. Displacement methods: Slope deflection, moment distribution, special topics. Stiffness method, derivation of element stiffness matrices, assembly procedures. *Prerequisite(s): CE 224.*

CE324 Fundemantals of Reinforced Concrete Design (3+0)3 6 Ects

Mechanical behavior of concrete and reinforcing steel. Creep and shrinkage of concrete. Behavior and design of uniaxially loaded members, confinement. Behavior and design of reinforced concrete members under flexure. Behavior and design of reinforced concrete members under combined axial load and bending. Design of reinforced concrete members under combined bending and shear. Design of single and spread footings. *Prerequisite(s): CE 224.*

CE 351 Introduction to Transportation Engineering (2+2)3 5 Ects

Introduction to transportation systems. Vehicles, network, terminals and stations as components of transportation systems engineering. Design of transportation facilities with respect to highway, railway, port and airport engineering. Operations planning of transportation systems and traffic engineering. Models of traffic flow. Traffic analysis at intersections. Basic definitions and computations of level of service. Planning and management techniques.

CE 361 Soil Mechanics I (3+2)4 5 Ects

Soil formation and identification. Physical and mechanical properties of granular and cohesive soils. The nature and flow of water in soils, stress distribution, analysis of deformation and stregth of soils. Site investigation techniques. Laboratory testing and evaluation of soil composition and properties.

CE 362 Foundation Engineering I (3+0)3 5 Ects

Soil exploration and sampling. Stress distribution in soils. States of equilibrium, bearing capacity of soils and settlement of structures. Principles of foundation engineering. Design of shallow and deep foundations (piles and caissons). Lateral earth pressures, retaining walls, braced excavations, and slope stability.
Prerequisite(s): CE 361.

CE 371 Hydromechanics (3+2)4 4 Ects

Introduction, Hydrostatics, Basic equations and their applications, Pipe flow, Open channel flow.
Prerequisite(s): CE 272.

CE 372 Engineering Hydrology (3+0)3 5 Ects

Hydrologic cycle, Precipitation, Streamflow, Evaporation and transpiration, Streamflow hydrographs, Hydrologic routing, Stochastic hydrology, Groundwater hydrology.

CE374 Introduction to Coastal Engineering (3-0)3 5 Ects

Phenomena, Governing Equations and Boundary Conditions, Linear Wave Theory, Changes in Wave Form in Coastal Waters, Generation of Ocean Waves, Types of Coastal Structures

CE383 Structural Site Practice (0-0)0 7 Ects

Working as an engineering intern at a site involving construction of building type of structures for a minimum period of 20 workdays. Observation of the application of the theory learned in courses to practice on-site. Keeping a daily logbook and writing a formal technical report explaining the work observed and tasks done during the internship.

CE385 Geotechnical Site Practice (0-0)0 7 Ects

Working as an engineering intern at a site involving geotechnical site applications for a minimum period of 20 workdays. Observation of the application of the theory learned in courses to practice on-site. Keeping a daily logbook and writing a formal technical report providing an explanation of the work observed and tasks carried out during the internship.

CE387 Transportation Site Practice (0-0)0 7 Ects

Working as an engineering intern at a site involving construction and application of transportation structures and systems such as roads, highways, and railways for a minimum period of 20 workdays. Observation of the application of the theory learned in courses to practice on-site. Keeping a daily logbook and writing a formal technical report providing an explanation of the work observed and tasks carried out during the internship.

CE389 Water Structures Site Practice (0-0)0 7 Ects

Working as an engineering intern at a site involving construction of water structures such as dams, water channels, and coastal structures for a minimum period of 20 workdays. Observation of the application of the theory learned in courses to practice on-site. Keeping a daily logbook and writing a formal technical report providing an explanation of the work observed and tasks carried out during the internship.

CE391 Materials of Construction Site Practice (0-0)0 7 Ects

Working as an engineering intern at a site involving the production and application of materials of construction for a minimum period of 20 workdays. Observation of the application of the theory learned in courses to practice on-site. Keeping a daily logbook and writing a formal technical report providing the internship.

CE 391 Fundamentals of Structural Dynamics (3-0)3 5 Ects

Basic concepts related to dynamic analysis, dynamic behavior of single degree of freedom systems, undamped and damped free and forced vibrations, response spectrum, dynamic behavior of multi-degree of freedom systems, mode superposition method.

CE400 Summer Practice II 7 Ects

The summer practice provides students a chance for practical training in an engineering office environment to observe the operation in design process and resume some responsibilities to be part of the engineering team in the office for a minimum period of 20 workdays. A summer practice daily logbook needs to be kept during the summer practice, and should be submitted together along with a formal technical report providing the explanation of the work observed and tasks carried out during the internship.

CE404 Structural Engineering Design 3 (0+6) 12 Ects

Involving the students in structural engineering design and emphasizing the importance of interdisciplinary planning, coordination, communication, technical report writing, and ethics. Integrating information, ideas, and concepts from previous courses of structural engineering into a comprehensive design effort. Working on methodology for formulating and solving design problems in an open-ended solution space.

Prerequisite: At least one technical elective design course in the field of structural engineering.

CE406 Geotechnical Engineering Design 3 (0+6) 12 Ects

Involving the students in geotechnical engineering design and emphasizing the importance of interdisciplinary planning, coordination, communication, technical report writing, and ethics. Integrating information, ideas, and concepts from previous courses of geotechnical engineering into a comprehensive design effort. Working on methodology for formulating and solving design problems in an open-ended solution space.

Prerequisite: At least one technical elective design course in the field of geotechnical engineering.

CE408 Transportation Engineering Design 3 (0+6) 12 Ects

Involving the students in transportation engineering design and emphasizing the importance of interdisciplinary planning, coordination, communication, technical report writing, and ethics. Integrating information, ideas, and concepts from previous courses of transportation engineering into a

comprehensive design effort. Working on methodology for formulating and solving design problems in an open-ended solution space.

Prerequisite: At least one technical elective design course in the field of transportation engineering.

CE410 Materials of Construction Engineering Design 3 (0+6) 12 Ects

Involving the students in materials of construction engineering design and emphasizing the importance of interdisciplinary planning, coordination, communication, technical report writing, and ethics. Integrating information, ideas, and concepts from previous courses of materials of construction engineering into a comprehensive design effort. Working on methodology for formulating and solving design problems in an open-ended solution space.

Prerequisite: At least one technical elective design course in the field of materials of construction engineering.

CE412 Water Structures Engineering Design 3 (0+6) 12 Ects

Involving the students in water structures engineering design and emphasizing the importance of interdisciplinary planning, coordination, communication, technical report writing, and ethics. Integrating information, ideas, and concepts from previous courses of water structures engineering into a comprehensive design effort. Working on methodology for formulating and solving design problems in an open-ended solution space.

Prerequisite: At least one technical elective design course in the field of water structures engineering.

CE414 Construction Management Engineering Design 3 (0+6) 12 Ects

Involving the students in construction management engineering design and emphasizing the importance of interdisciplinary planning, coordination, communication, technical report writing, and ethics. Integrating information, ideas, and concepts from previous courses of construction management engineering into a comprehensive design effort. Working on methodology for formulating and solving design problems in an open-ended solution space.

Prerequisite: At least one technical elective design course in the field of construction management engineering.

CE 421 Fundamentals of Structural Steel Design (3+0)3 4 Ects
Analysis and desgin of tension members, beams, columns, and bolted and welded connections.
Prerequisite(s): CE 224.

CE 471 Water Resources Engineering (3+0)3 4 Ects
Introduction to water resources, Dams, Spillways, Energy dissipation facilities, Water supply, Irrigation and drainage.
Prerequisite(s): CE 371.

CE402 Civil Engineering Design (0-6)3 12 Ects
Students will be grouped in teams to tackle with a real life project that will need the expertise of more than one division of civil engineering profession. Purpose will be to prepare the students to multi-dimensional environment of real life projects in a team formation. Teams will be formed and work with the guidance of the faculty members.

TECHNICAL ELECTIVE COURSES

CE 422 Structural Design: Concrete Structures (3+0)3 5 Ects
Structural elements. Design of two way slabs. Shear walls. Foundations. Structural safety. Structural systems. Approximate methods for structural analysis. Design procedures for gravity and seismic loads. Design codes. Software use in structural analysis and design.
Prerequisite(s): CE 324.

CE 425 Structural Analysis (3+0)3 5 Ects
System modelling; Coordinate axes and their transformation; End forces and end displacements; Stiffness matrices; Transformation matrices; Structural stiffness matrix assembly; Constraint handling; natural frequency calculation; Earthquake structural analysis.

CE 426 Theory of Matrix Structural Analysis (3+0)3 5 Ects
Matrix Algebra; Relation among members end forces and end displacements; Displacement method; Application of the matrix displacement method to two and three dimensional systems; Matrix force method; Nonlinear Analysis for geometric nonlinear systems, material nonlinearities, and calculation of buckling loads; Structural analysis due to external dynamic loads, earthquake effects.
Prerequisite(s): CE 301.

CE 428 Structural Design: Steel Structures (3+0)3 5 Ects
Design of steel buildings, beam columns, composite beams, plate girdersi and connections.
Prerequisite(s): CE 421.

CE 429 Computer Applications in Structural Engineering (3+0)3 5 Ects
Procedure- and event-oriented programming. Introduction to visual programming. Applications for structural mechanics problems. Programming considerations for the numerical modeling of structural systems and the finite element method. Commercial software for analysis and design of structures.

CE 430 Reinforced Concrete (3+0)3 5 Ects
Behavior of reinforced concrete members. Deformation characteristics under axial and flexural loads. Analysis and design for shear and torsion. Design of slabs using yield line theory. Development and splices of reinforcement. Anchorage. Seismic design considerations. Repair and strengthening of reinforced concrete members.
Prerequisite(s): CE 324

CE 441 Principles of Earthquake-Resistant Design (2-2)3 5 Ects
Basic concepts related to dynamic analysis, dynamic behavior of single degree of freedom systems, undamped and damped free and forced vibrations, response and design spectra, dynamic behavior of multi-degree of freedom systems, equivalent earthquake load and mode superposition methods. Prerequisites: CE 324, CE 391.

CE 442 Construction Materials Design (2+2)3 5 Ects
Principles of mix-design of cementitious materials, ordinary and special concretes. General requirements for engineering materials. Laboratory work on the design of selected construction materials having predefined performance requirements, such as low cost, high workability, high strength or high durability against severe exposure conditions.

CE 443 Introduction to Historical Construction Materials (3+0)3 5 Ects
Properties of historical construction materials such as wood, lime, gypsum, clay, pozzolan, building stone etc. Types of construction materials used by different civilizations. Laboratory research techniques in the analysis of the historical construction materials.

CE 451 Planning and Analysis of Transportation Systems (3+0)3 5 Ects

Planning of Transportation systems. Development of transportation demand and supply models. Analysis of cost functions and cost estimating methods. Merging supply and demand models for network equilibration. Simulation and optimizing approaches for equilibrium. Evaluation of alternative transportation systems. Transport regulation in an inefficient or in an excessive competitive environment. Cost and demand conditions of a good regulated industry. Capacity calculations of transportation systems. *Prerequisite(s): CE 351.*

CE 452 Highway and Airport Pavement Materials (3+0)3 5 Ects

Chemical and physical properties of asphalt. Its production, classification, sources, and uses. Tests on it. Classification and properties of mineral aggregates and related tests on them. Asphalt-aggregate combinations and their applications for design. Asphalt paving mix-design for highway and airport pavements.
Prerequisite(s): CE 351.

CE 453 Highway, Railway, Port and Airport Design (3+0)3 5 Ects

Planning of highways, geometric design of highways. Aggregate testing. Types of roads and pavements. Low coast, stabilized and bituminous roads. Design of flexible and rigid pavements. Drainage and maintenance. Cuts and fills. Geometric design of railways. Railway surveying. Railway infrastructure design. Track maintenance. Highway and railway design on bridges and

CE454 Traffic Engineering (3+0)3 5 Ects

Time – space diagrams, speed estimations. Investigating relationships among traffic volume – speed – density. Deterministic and stochastic models of traffic processes. Queue length and delay estimations. Signalized intersections and design methods. Capacity analysis for different types of roadways. Traffic management techniques. Softwares for traffic predictions.

CE 461 Soil Mechanics II (2+2)3 5 Ects

Stress path dependent behavior and consolidation. Shear strength and compaction. Soil plasticity, suction and capillarity. Soil-structure interaction. Computational methods in soil mechanics. Laboratory testing and evaluation of soil composition and properties. *Prerequisite(s): CE 361.*

CE 462 Introduction to Soil Dynamics (3+0)3 5 Ects

Earthquakes and ground vibrations. Shear modulus and damping in soils. Study of soil behavior under dynamic loading conditions. Response of soil layers to earthquake motions. Stability of slopes and dams under seismic loads. Mononobe-Okabe active earth pressure theory. Field and laboratory techniques for determining dynamic soil properties and liquefaction potential.
Prerequisite(s): CE 361.

CE 463 Foundation Engineering II (3+0)3 5 Ects

Shallow and deep foundations. Footing types and their design. Piles and pile foundations, types of piles, pile foundation design. Types of sheet pile walls. Types and design of caissons. Underpinning of existing structures.
Prerequisite(s): CE 362.

CE 464 Soil Modeling and Computational Soil Mechanics (3+0)3 5 Ects

Basic formulation of static and dynamic soil behavior, constitutive laws for geologic media, a generalized model for description of soil behavior by visco-plasticity, numerical and physical modeling, stability analyses by plasticity theory, flow through porous media, introduction to static and dynamic FEM analyses, introduction to TALREN, PLAXIS and FLAC programs. *Prerequisite(s): CE 301, CE 361.*

CE 472 Computer Applications in Water Resources (3+0)3 5 Ects
Software and computer tools relevant to hydraulic engineering problems including design of orifices and weirs, water level computations, drainage inlet design, culvert hydraulics, pressure piping systems and water quality analysis, and storm sewer design.
Prerequisite(s): CE 272, CE 301

CE 473 Design of Water Distribution Systems (3+0)3 5 Ects
Pumps, valves, friction loss, Water transmission by pipelines, Design of pipelines, Hydraulics, operation and design of water distribution systems, Municipal water requirements, extension of population, Hardy-Cross method, Newton-Raphson method. *Prerequisite(s) :* CE371

CE 474 Introduction to Groundwater Flow Modeling (3+0)3 5 Ects
Basic concepts of groundwater modeling. Fundamentals of mathematical models. Governing equations of groundwater flow. Review of modeling techniques and their comparison. Analytical models. Numerical models by finite differences. Application of selected models. *Prerequisite(s) : CE301, CE372.*

CE 475 Design of Hydraulic Structures (3+0)3 5 Ects
Hydraulic design of intake structures, Spillways, Dams, Stilling basins and energy dissipators, Hydraulic design of urban drainage systems.
Prerequisite(s): CE371, CE471

CE 476 Groundwater Monitoring and Assessment (3+0)3 5 Ects
Fundamental concepts, hydrologic cycle, ground water, aquifer types, differential equations of confined and unconfined aquifers. Well hydraulics. Analytical and graphical solution. Modeling of ground water flow. Construction of wells. Management of ground water: Ground water budget, concepts of basin yield, basin management, artificial recharge, Hidrogeochemistry. Surface and subsurface investigations of ground water. Saline water intrusion in aquifers.
Prerequisite(s) : CE371.

CE 477 Planning and Development of Hydropower Structures (3+0)3 5 Ects
Hydropower engineering concepts; Design criteria; Dams; Design of spillways and other structures; hydraulic turbines; Planning and design of pumped storage plants; Physical model.

CE 478 Introduction to GIS applications in Water Engineering (3+0)3 5 Ects
GIS Fundamentals, applications and software, GIS Data, GIS in hydrology: Digital Elevation Models (DEMs), Delineating streams and watersheds, Estimating runoff curve numbers, Stormwater management, GIS based mapping applications: Water distribution systems, Wastewater systems.

CE 479 Coastal Hydraulics (3+0)3 5 Ects
An introduction to coastal hydraulics, basic wave mechanics, the Small Amplitude Wave Theory, refraction, shoaling, diffraction and reflection of waves, wave breaking phenomenon. Wave-structure interactions. Wave Climate and Statistics .Coastal currents, principles of coastal sediment transport**.**

CE 480 Design Of Coastal Structures (3+0)3 5 Ects
Wave Climate, design wave, wave forces on vertical walls, rubble mounds and circular cylinders, design of harbour structures;quays, piers, gravity and floating breakwayers. design of breakwater lay-out and

harbour tranquillity. Design of seawalls, revetments and groins. design of concrete block quaywalls, sheet pile walls and piled quay walls. Seismic design.

CE482 Design of Coastal Protection Structures (3+0)3 5 Ects

Wave climate, Overtopping, Wave force and Pressure, Coastal Protection Structures; Sea Walls, Dikes, Revetments, Groins, Detached Breakwaters, Sill or Submerged breakwaters, Beach Nourishments

CE483 Structural Office Practice (0-0)0 7 Ects

Working as an engineering intern at an engineering office conducting structural design for a minimum period of 20 workdays. Observation of the application of the theory learned in courses to practice in an engineering office. Keeping a daily logbook and writing a formal technical report providing an explanation of the work observed and tasks carried out during the internship.

CE485 Geotechnical Office Practice (0-0)0 7 Ects

Working as an engineering intern at an engineering office conducting geotechnical design applications for a minimum period of 20 workdays. Observation of the application of the theory learned in courses to practice in an engineering office. Keeping a daily logbook and writing a formal technical report providing an explanation of the work observed and tasks carried out during the internship.

CE487 Transportation Office Practice (0-0)0 7 Ects

Working as an engineering intern at an engineering office conducting design of transportation structures and systems for a minimum period of 20 workdays. Observation of the application of the theory learned in courses to practice in an engineering office. Keeping a daily logbook and writing a formal technical report providing an explanation of the work observed and tasks carried out during the internship.

CE489 Water Structures Office Practice (0-0)0 7 Ects

Working as an engineering intern at an engineering office conducting design of water structures such as dams, water channels, and coastal structures for a minimum period of 20 workdays. Observation of the application of the theory learned in courses to practice in an engineering office. Keeping a daily logbook and writing a formal technical report providing the explanation of the work observed and tasks carried out during the internship.

CE 505 Open Channel Hydraulics (3-0)3 8 Ects

Energy and momentum principles. St. Venant equations. Flood routing. Flow in channels of nonlinear alignment and nonprismatic section. Flow over spillways. Energy dissipation. Method of characteristics. Explicit and implicit methods. Stability of numerical scheme.

CE 520 Prestressed Concrete Members. (3-0)3 8 Ects

Theory, advantages, and limitations. Various systems of prestressing. Composite construction. Continuous span theory.

CE 544 Stability of Soils **(3-0)3** **8 Ects**

Design and construction of slopes: Embankments for various purposes/retaining walls/deep excavations with shoring/anchorages/tie-backs/bored piles/reinforced concrete prefabricate or cast- in-situ displacement piles effect and control of ground water table.

CE 551 Optimization and Design **(3-0)3** **8 Ects**

Introduction to operation research. Optimization techniques such as linear programming, dynamic programming, and non-linear programming. Application in water quality, air quality and waste management.

CE 571 Artificial Intelligence Methods in Engineering **(3-0)3** **8 Ects**

The aim of this course is to give the fundamental concepts of artificial neural networks, fuzzy logic, neuro-fuzzy systems and genetic algorithms. The course shall also cover the material related to the applications of these intelligence methods in solving different engineering problems.

CE 578 Marine Renewable Energy **(3-0)3** **8 Ects**

Marin renewable energy, wave energy, wave energy converters, power take off systems, tidal energy, offshore wind energy, Combined systems.