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**SEMESTER 1:**

**TRD 111 - Turkish I (2+0):**

What is language? Importance of language and its place in a nation's life, language-culture relationship. Definition of grammar, function of grammar and departments of grammar. Phonetics: sounds and audio features of Turkish. Morphology; formal properties of Turkish (roots-adds). Words and word phrases. General information about composition, subject, perspective, ideas, main and ancillary ideas, paragraphs, intellectual order. Written expression, paragraph, the content and types (entrance, development and conclusion paragraphs). Expression forms, explanatory, descriptive, argumentative, narrative expression. Written expression; petition writing, quoting, footnotes and bibliography writing. Oral expression; speech and speech types (prepared speeches, panel, and discussion policies). Literary types; artistic (poetry, short stories, novels, theater and intellectual (articles, paragraphs, essays, criticism, interviews...)). Reading and studying the works that about literature and idea world. Analyzing an editing text (story, novel, theater).

**ATA 111 - History of Turkish Revolution I (2+0):**

This course covers the analysis of the causes and the consequences of the First World War; the searches for independence of the Turkish nation in Anatolia and salvation of the Turkish lands that were occupied after the Armistice of Montrose; the development and activities of Nationalist militias and the societies against them; the evaluation of the congress administrations that were formed after 19 May, 1919 in terms of their form and content; the structure of the Grand National Assembly and the process through which it gained legitimacy; the leadership of Turkish War of Independence; Treaty of Lausanne, and the Establishment of the Republic.

**CHM 101 – Chemistry (3+0):**

Properties of Matter, Fundamental Laws Of Chemistry, The Atomic Theory, Electron configuration, The concept of the mole, The Periodic Table, Chemical Compounds, Thermochemistry-enthalpy-entropy, internal energy, Solutions and their physical properties, Chemical Kinetics-Determination of

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the rate of reaction, Chemical equilibrium, Acids and Bases, Electrochemistry, Batteries and Electrolysis, Redox reactions

**PHYS 113 - Physics I (2+2):**

Vectors. Kinematics. Newton's Law of Motion. Work and energy. Conservation of energy. Linear momentum and its conservation. Rotation of rigid bodies about a fixed axis. Rotational kinetic energy.

**MATH 113 – Mathematics I (3+2):**

Functions and Their Graphs, Combining Functions; Shifting and Scaling Graphs, Trigonometric Functions. Rates of Change and Tangents to Curves, Limit of a Function and Limit Laws, The Precise Definition of a Limit, One-Sided Limits, Continuity, Limits Involving Infinity; Asymptotes of Graphs. Tangents and the Derivative at a Point, The Derivative as a Function, Differentiation Rules, The Derivative as a Rate of Change, Derivatives of Trigonometric Functions, The Chain Rule, Implicit Differentiation, Related Rates, Linearization and Differentials. Extreme Values of Functions, The Mean Value Theorem, Monotonic Functions and the First Derivative Test, Concavity and Curve Sketching, Applied Optimization, Antiderivatives. Area and Estimating with Finite Sums, Sigma Notation and Limits of Finite Sums, The Definite Integral, The Fundamental Theorem of Calculus, Indefinite Integrals and the Substitution Method, Substitution and Area Between Curves, Volumes Using Cross-Sections, Volumes Using Cylindrical Shells, Arc Length, Areas of Surfaces of Revolution. Inverse Functions and Their Derivatives, Natural Logarithms, Exponential Functions, Indeterminate Forms and L'Hopital's Rule, Inverse Trigonometric Functions, Hyperbolic Functions.

**CE 101 – Introduction to Civil Engineering (3+0):**

The primary purpose of the class is to provide understanding the concepts of various disciplines of Civil Engineering in introductory level. The course objectives are: obtain information about Civil Engineering education, and curriculum at Okan University, understand the responsibilities of a Civil Engineer, understand the ethical and professional responsibilities of a Civil Engineer, inquire information about various disciplines of Civil Engineering by reading pre-selected papers in outstanding projects, learn the technical words in various disciplines of Civil Engineering to prepare for the classes that you will take during your education, learn to be a team member by working on class presentations with your class mates in your group, improve presentation skills, and ability to convey message.

**Foreign Language Elective (2+2)**

Every semester various foreign language classes (i.e. German, Russian, Chinese, Arabic, and advance English) offered at the university. Students can select the language of interest.

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**TRD 112 - Turkish II (2+0):**

The place of Turkish language among the world languages, alphabets that Turks are used. The historical development of Turkish language, dialects of Turkish language. Turkish's syntax features, sentence analysis studies. Etymology, Semantics I (basic meanings, connotations) and Sense Events (meaning contraction, meaning expansion, meaning shift), Words' meaning relationship. Semantics II, metaphors, transfers ( name transfer, phrase transfer) words, idioms, proverbs, slogans and terms. Expression (language) mistakes and applications. Oral expression, speech and speech types (panel, discussion principles). Written expression; business letters, minutes, report and news writing techniques. Ways to improve thinking in the paragraph, identification, sampling, comparison, utilization of numerical data, producing a witness. Literary types; artistic( poetry, short stories, novels, theater) and intellectual (articles, paragraphs, anecdotes, essays, criticism, travel, biography, memoirs, letter...) Reading and studying the selected sample texts from the literature and idea world. Reviewing a scientific text.

**ATA 112 - History of Turkish Revolution II (2+0):**

Lausanne Peace Treaty resulting success that is being converted to a modern state via announcement of Republic, and being gained to this state a modern, convenient to development identity, and placing Ataturk's Thought System to the memories precisely by the following revolutions of this process, so that our young people are made conscious and durable against to the threats to their personalities and to their countries.

**PHYS 114 - Physics II (2+2):**

Charge and matter. The electric field. Gauss' Law. Electrostatic potential. Capacitance. Current and resistance. Electromotive force and circuits. RC circuits. The magnetic field. Ampère's law. Faraday's Law of Inductance.

**MATH 114 - Mathematics II (3+2):**

Integration by Parts, Trigonometric Integrals, Trigonometric Substitutions, Integration of Rational Functions by Partial Fractions, Improper Integrals. Sequences, Infinite Series, The Integral Test, Comparison Tests, The Ratio and Root Tests, Alternating Series, Absolute and Conditional Convergence, Power Series, Taylor and Maclaurin Series, Convergence of Taylor Series. Three-Dimensional Coordinate Systems, Vectors, The Dot Product, The Cross Product, Lines and Planes in Space, Cylinders and Quadric Surfaces. Functions of Several Variables, Limits and Continuity in Higher Dimensions, Partial Derivatives, The Chain Rule, Directional Derivatives and Gradient Vectors, Tangent Planes and Differentials, Extreme Values and Saddle Points, Lagrange Multipliers. Double and Iterated Integrals over Rectangles, Double Integrals over General Regions, Area by Double Integration, Double Integrals in Polar Form, Triple Integrals in Rectangular Coordinates, Triple Integrals in Cylindrical and Spherical Coordinates, Substitutions in Multiple Integrals.

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**CE 102 – Statics (3+0):**

Definition and classification of mechanics. Principles of statics. System of planar forces, constraints of planar bodies and computation of constraint. Gerber beams. Systems of three hinges. Plane trusses. Cables. Space system of forces. Central axis. Parallel forces in space. A static equilibrium. Center of gravity. Constraints in space. Spatial trusses. Principle of virtual work. Friction.

**CLP 001 – Career and Life Planning (0+2):**

Professional and personal development, seminars, workshops, specialized certification programs, industry and business-field demonstrations, meetings with professionals, on-site training sessions, social-sporting events.

**Foreign Language Elective (2+2)**

Every semester various foreign language classes (i.e. German, Russian, Chinese, Arabic, and advance English) offered at the university. Students can select the language of interest.

**SEMESTER 3**

**MATH 215 – Mathematics III (2+2):**

Systems of linear equations; Solution sets of linear equations; Linear dependence and independence; Matrix Algebra; Inverse of a matrix and its characterization; Partitioned matrices; Determinants and their properties: Calculation of determinants; Column and row expansions; Minor and cofactors and inverse matrix; Cramer's rule; Vector spaces: Subspaces, null spaces and column spaces (Image); Basis and coordinate transformations; Linear transformations and their representations; Representation of coordinate transformation; Eigenvalues and eigenvectors : Characteristic polynomial and Cayley-Hamilton Theorem; Diagonalization of linear transformations and matrices; Matrix polynomials; Diagonalization of symmetric matrices and projections; Generalized eigenvectors and eigenspaces; Inner product spaces : Orthonormal sets, Gram-Schmidt process; Singular value decomposition; Pseudo inverse; Least squares

**CE207 – Dynamics (3+0):**

Introduce the principles of engineering mechanics and their applications in the design and analysis of mechanical systems. Determine the kinematic parameters, position, velocity, and acceleration of a moving object. Understand the difference between velocity, acceleration, angular velocity and angular acceleration. Represent a mechanical system using free body diagrams. Understand how unbalanced forces lead to the movement of objects that can be treated as particles, and analyze the basic aspects of this process. Determine unbalanced forces and kinematic parameters of mechanical systems by using the principles of mechanics. Analyze basic aspects of motion of rigid bodies consisting of connected links, rollers, pins and sliders. Understand how unbalanced forces lead to the movement of the center of mass

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of rigid bodies, and analyze the basic aspects of this process. Analyze the basic aspects of how this leads to the spinning, rotation of rigid bodies.

**CE 203 – Engineering Geology (3+0):**

Rock characteristics. Discontinued structures. Engineering geology maps. Mass Movements. Dam, tunnel and foundation geologies. Excavation and excavations safety. Industrial minerals and rocks. Effects of groundwater on engineering applications. Importance geological knowledge in rural and urban planning

**ME 201 – Computer Aided Technical Drawing (2+2):**

Introduction to computer aided technical drawing. Geometrical constructions. Principles of orthographic projection; projection of principal views from three dimensional models. Drawing techniques for basic manufacturing processes and standard features. Projection of third principal view from two given principal views; free hand drawing techniques. Three dimensional drawing techniques; simple shapes, inclined surfaces, skew surfaces. Principles of dimensioning. Principles of sectioning; full and half sections. Further work on sectioning, conventional practices. Solid Drawing

**CE 201 - Strength of Materials I (3+0):**

Definition and principles of statics, planar forces, supports on the plane, trusses, cables, friction, forces in the space. Definition of the strength of materials and its principles, stress, deformation and strains, stress - strain relations, strength hypotheses, internal forces in the bars and diagrams, normal force, simple shear, torsion of the circular sections, moments of inertia, simple and nonsymmetric bendings, bending with shear, elastic curve, combined loadings.

**CE 205 – Materials Science (3+0):**

Introduction to materials science and engineering, classification of materials. Atomic structure and interatomic bonding: ionic bonding, covalent bonding, metallic bonding, Van der Waals bond. The structure of crystalline solids: crystal structures, crystallographic points, directions and planes, crystalline and noncrystalline materials. Imperfections in solids: point defects, miscellaneous imperfection. Diffusion. Mechanical properties of metals: tensile test, stress-strain relations, brittle behavior, ductile behavior, shear effect, hardness. Dislocations and strengthening mechanisms: recovery, re-crystallization and grain growth. Failure: ductile fracture, brittle fracture, fatigue, creep. Phase diagrams.

**SEMESTER 4**

**MATH 216 – Mathematics IV (2+2):**

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Introduction and Classification of Differential Equations; First Order Differential Equations: Solution of Separable and Linear Differential Equations; Substitution Methods and Exact Differential Equations; Order reduction; Higher Order Differential. Equations: Linear, homogeneous Equations with Constant Coefficients; Nonhomogeneous Equations and Method of Undetermined Coefficients; Method of Variation of Parameters; Laplace Transform: Solution of initial value problems; Linear Systems of Differential Equations; Homogeneous Differential equations in R<sup>2</sup>; Solution via eigenvalues and eigenvectors; Homogeneous Differential equations in R<sup>3</sup>; Matrix exponential and Fundamental matrix solution; Solution of Nonhomogeneous Equations; Laplace transform methods; Power Series Method: Series Solution Near Ordinary Points; Regular Singular Points; Method of Frobenius

**MATH 265 - Probability and Statistics I (3+0):**

Set Theory, Random Variable, Sample Space, Important Theorems on Probability, Conditional Probability, Bayes' Theorem, Tree Diagrams, Permutations, Combinations, Binomial Coefficients, Stirlings Approximation, Discrete and Continuous Probability Distributions, Mathematical Expectation, Variance and Standard Deviation, Joint Distributions, Normal, Binomial, Poisson, Multinomial, Hypergeometric etc. Distributions

**CE 210- Strength of Materials II (3+0):**

Bending with shear. The shear center. The shear center of thin walled sections. Elastic curve for symmetrical cross-sections. Study of elastic curve by various methods. Effect of shear on the elastic curve. Axial force with bending. Materials not resistant to tension. Bending with torsion. Energy methods. Theorem of virtual work. Theorems of Betti and Castigliano. Minimum principles. Elastic stability. Euler cases. Buckling beyond the elastic limit, method of omega multiplier, approximate methods, Rayleigh ratio.

**CE 204 - Fluid Mechanics (3+0):**

Introduction: Liquids and gases, the continuum assumption, dimensions and units. Fluid Properties: Compressibility, viscosity, surface tension, vapor pressure. Fluid Statics: Pressure variation with elevation, forces on plane surfaces, forces on curved surfaces, buoyancy, stability of immersed and floating bodies. Kinematics of Fluids: Euler's and Bernoulli's equation, rotation and vorticity. Control Volume Approach: The continuity equation, cavitation. Momentum Equation: Common applications, Navier-Stokes equation. Flow in Conduits: Laminar and turbulent flow. Flow Measurements: Measuring velocity, pressure, and flow rate. Drag and Lift: Terminal velocity. Dimensional Analysis and Similitude.

**CE 206 – Building Materials (3+0):**

Steel; advantages and disadvantages, classifications with respect to phases and carbon content, quenching, annealing, tempering, structural steels, corrosion, Aluminum, Aggregates; aggregate types,



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physical and mechanical properties, granulometry, deleterious substances, Portland Cement; hydration, physical and mechanical properties of cement, cement types, Mixing Water, Admixtures; chemical and mineral admixtures, Concrete; properties of fresh and hardened concrete, concrete production, durability, compressive strength formulas, mix design, special concretes, Masonry, Asphalt Binders and Mixtures, Wood, Composites.

**CE 208 - Surveying (2+2):**

Introduction, the shape of the earth and model surfaces for earth, units of measurements. Errors and error propagation. Weight concept. Maps and applications. Horizontal control surveys: Distance and horizontal angle measurements. Point positioning, triangulation, trilateration, traversing. Vertical control surveys: Differential leveling and trigonometric leveling. Area, volume and slope computation.

**SEMESTER 5**

**CE 301 - Hydraulics (3+0):**

Water Flow in Pipes: Forces in pipe flow, energy in pipe flow, friction head loss-discharge relationships, types of local head losses. Pipelines and Pipe Networks: Pipelines connecting two reservoirs, Hardy-Cross method, water hammer phenomenon in pipelines. Water Pumps: Centrifugal, propeller, jet type of pumps, pumps in parallel or in series. Water Flow in Open Channels: Flow classifications, uniform flow in open channels, energy principles, hydraulic jumps, gradually varied flow, hydraulic design of open channels.

**CE 303 – Soil Mechanics I (3+0):**

Introduction to Geotechnical Engineering, Rock Cycle and the Origin of Soil, Soil-Particle Size, Clay Minerals, Specific Gravity, Weight-Volume relationships, phase diagrams, Plasticity and Structure of Soil, Classification of Soil, General principles of soil compaction, field compaction, Permeability, Bernoulli's Equation, Darcy's Law, Laplace's Equation of Continuity, flow nets, Seepage calculation from a flow net, In-Situ Stresses, Stresses in a Soil Mass, stress increase due to loading, fundamentals of consolidation, one-dimensional laboratory consolidation test. Laboratory sections of the class includes grain size distribution (Sieve and Hydrometer Analyses), moisture content, specific gravity, Atterberg Limits (Liquid Limit and Plastic Limit), standard proctor, sand cone, constant and falling head permeability, and incremental loading Consolidation tests.

**CE 305 – Earthwork and Railway Construction (3+0):**

Introduction to earthworks. Volumes of fills and cuts. Mass diagram. Optimization of earth moving. Excavation methods and machines. Excavators and dampers. Introduction to railroad engineering. Train

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dynamics. Geometric standards of track. Gradients, curves, transition curves, location of track, superstructure elements and materials. Layout of track.

**CE 309 - Theory of Structures I (3+0):**

General concepts. Analysis of statically determinate structures. Determination of internal forces, internal force diagrams. Analysis for moving loads: influence lines. Analysis of basic statically determinate systems: multi-span compound systems, three-hinged frames and arches, trusses. Principle of Virtual Work. Computation of deformations and displacements for statically determinate structures.

**SEMESTER 6**

**CE 302 - Hydrology (3+0):**

Introduction. Precipitation. Evaporation. Infiltration. Groundwater. Stream flow measurement and analysis of data. Surface flow. Hydrograph analysis. Application of probability theory and statistics in hydrology.

**CE 304 – Soil Mechanics II (3+0):**

Shear strength of soil, laboratory determination of shear strength (direct shear and triaxial strength tests), in-situ determination of shear strength (borehole shear and vane shear tests), CD, CU, UU tests, lateral earth pressure: at-rest, active and passive pressures, Rankine's and Coulomb's Theories, lateral earth pressure: curved failure surface, bracing systems, slope stability, factor of safety, finite and infinite slopes, stability analysis by method of slices, steady state and rapid drawdown stability analysis, Introduction to soil bearing capacity, landfill liners and geosynthetics: geotextiles, geomembranes, geogrids and geonets, Planning subsurface soil explorations, boring and sampling methods, soil exploration report.

**CE 310 - Theory of Structures II (3+0):**

Analysis of statically indeterminate structures by force (energy) method under dead and live loads, temperature changes and support settlements. Computation of displacements by virtual work principle. Reduction theorem. Systems with elastic supports and connections. Analysis for moving loads, influence lines. Analysis of structures for most unfavourable loading conditions. Analysis of systems by displacement methods: slope-deflection and moment distribution method for the systems without joint translations. Slope-deflection equations for the frames with joint translations.

**CE 306 - Highway Engineering (3+0):**

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Basic concept in highway engineering. Characteristics of driver-pedestrian-vehicles. General properties of highway traffic. Geometric standards and design traffic of highways. Highway capacity. Highway location and horizontal alignment. Vertical alignment and curves. Horizontal curves. Urban roads. Intersection control and design. Soil engineering for highway design. Drainage.

**SEMESTER 7**

**CE 415 - Reinforced Concrete I (3+0):**

Reinforced concrete members. Concrete, reinforcing steel. Mechanical properties of concrete and steel. Mechanism of bond transfer. Development of anchorage and splicing of reinforcement. Loads and load effects. Structural failure providing safety in reinforced concrete. Material factors. The load factors. Load groups. Mechanics of reinforced concrete beam. Under-over reinforced beam. Balanced beam. Ultimate strength design. Analysis of reinforced concrete beams. Analysis of flanged beams. Column capacity. Eccentrically loaded columns. Column interaction diagram. Bi-axially loaded columns. Tied and spiral columns. Diagonal tension failure of beam without stirrup. Load transfer in a cracked beam. Shear reinforcement. Shear design procedures. Behavior of reinforced concrete members subjected to torsion. Design for torsion. Shear and moment. Analysis and design of slender columns. Determination of moment magnification factor. Elastic design assumptions. Elastic analysis of beams with rectangular cross-sections. Frames, beam-column joints. Redistribution. General construction knowledge.

**BUS 220 – Entrepreneurship (2+2):**

Principals of entrepreneurship, Strategic management for entrepreneurship, creativity, human resources management and communication for entrepreneurs, Business Planning, Entrepreneurship in Turkey / Success stories.

**SEMESTER 8**

**CE 411 - Graduation Project (0+2):**

Design of an engineering structure and presentation.

**CE 416 - Reinforced Concrete II (3+0):**

Design of reinforced-concrete slabs supported by beams, girdered slabs, slabs without beams subjected to vertical loads. Information about Turkish Earthquake Code of 1998. Determination of lateral EQ forces affecting reinforced-concrete structures according to the code and distribution of internal forces in structural elements. Calculation of the internal forces at foundations (wall foundations, singular foundations, continuous foundations on elastic soil, plate foundations) of masonry and reinforced-concrete structures subject to vertical and lateral loading. Introduction to staircase systems and

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determination of internal forces at inclined and landing plates and design. Introduction to resisting walls, design of resisting wall sections under the affecting soil forces and live loads.

**CE 404 - Foundation Engineering (3+0):**

Site exploration, types of shallow foundations and construction techniques, shallow foundation limit bearing capacity and settlement, shallow foundation design, types of piles and their installation, analysis and design of single piles, pile driving analysis and quality control of piling operations, pile groups and pile rafts, retaining structures.

**Departmental Elective**

**CE 307 – Construction Engineering and Management (3+0):**

Construction industry overview and profile. Types of contracts and project delivery methods. Planning, scheduling, CPM and cost estimating. Construction risks and construction project management. Equipments and materials.

**CE 312 - Computer Aided Structural Modelling and Analysis (3+0):**

Introduction to computer aided structural modeling and an overall view for the analysis background. Definition of loads, load groups, and load combinations. Definition frame, area and volume elements and their fields of use. Modeling of frame structures and analysis under vertical, seismic, temperature, creep and shrinkage loads. The effects will be discussed thoroughly. Modeling of buildings with shear walls and shear wall buildings such as tunnel form buildings. Modeling of foundation settlement and foundation rotation. Modeling of mat foundations. Modeling of slabs, and vibration control. Modeling under seismic forces, Equivalent Elastic Force Modeling under seismic forces, Natural Frequency of a building and the Spectral Analysis

**CE 314 – Railway Project (3+0):**

Railway traffic survey. Project standards. Horizontal alignment - route study. Horizontal alignment – railway plan. Horizontal alignment – superelevation and transition curves. Vertical alignment – railway profile. Train graphs. Economical analysis.

**CE316 – Fundamentals of Traffic Engineering (3+0)**

Basic parameters of traffic flow. Basic relationship of traffic flow. Data collection methods. Traffic flow models. Microscopic flow models. Capacity and the level of service. Traffic signs. Road markings. Parkings. Intersections. Roundabouts. Traffic signal design.

**CE 321 – Advanced Materials Technology (3+0):**

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Phase transformations; microstructural and property changes in iron-carbon alloys. Applications and processing of metal alloys; types, fabrication and thermal processing of metals. Structures and properties of ceramics; imperfections, mechanical properties. Application and processing of ceramics, Polymer structures, thermoplastic and thermosetting polymers, Characteristics, applications and processing of polymers, Composites, fiber reinforced composites, structural composites, Corrosion and degradation of materials.

**CE 323 – Composite Materials (3+0):**

Composite material structure and processing, fibre reinforced composite, particulate reinforced composite, mechanical models of internal structure, mechanical properties, durability and degradation of materials, fibre orientation, mix optimization for fibre reinforced composites, failure modes, biaxial strength theories

**CE 403 - Water Supply and Sewage Systems (3+0):**

Importance of water supply and sewerage systems. Water resources. Stages of water from the source to the disposal of the waste water. Water demand. Methods of water diversion. Storage of water. Intake types. Typical problems encountered in supply lines. Computation of rainwater drainage systems. Computation of wastewater (sewerage) systems. Treatment and disposal of wastewater.

**CE 404 - Foundation Engineering (3+0):**

Site exploration, types of shallow foundations and construction techniques, shallow foundation limit bearing capacity and settlement, shallow foundation design, types of piles and their installation, analysis and design of single piles, pile driving analysis and quality control of piling operations, pile groups and pile rafts, retaining structures.

**CE 405 - Steel Structures I (3+0):**

Historical development of steel structure, advantage and disadvantage of steel usage in structural design, application areas of steel products. Properties of structural steel and general information about steel design procedures. Reliability, loads and load combinations. Connections, connecting members, riveted, bolted, welded connections and related design principals. Tension member design, its splice and employment principles in structural system. Design principles for compression members including built-up compression members and batten plates, lacing members design. Design procedures for beam-columns. Design principals of roof truss, purlins and stability bracing systems. Design procedure for beams having rolled and built-up rolled cross sections, design rules for their splice, bi-axial bending, procedures for lateral buckling control.

**CE 407 - Water Resources Engineering (3+0):**

Introduction to water resources and equilibrium of river channels. Sediment transport. Dams. Reservoir. Diversion weirs and gates. Intake structures. Energy dissipators. Hydroelectric power. Irrigation. Drainage. Flood control. River regulation. Economic analysis in water resources.

**CE 420 - Environmental Sanitation (3+0):**

The common microorganisms in environmental sanitation, waste management, pollution, indicator microbes, classification of water sanitation, air sanitation, soil sanitation, solid wastes sanitation, chemical and physical wastes of industrial pollution.

**CE 421 – Rock Blasting Technology (3+0):**

Theory and application of explosives in the mining and construction industry; explosives, initiating systems, characteristics of explosive reactions and rock breakage, fundamentals of blast design, drilling and blasting, regulatory and safety considerations, environmental problems produced from ,blasting-vibration, air blast

**CE 422 – In-Situ Soil Testing (3+0):**

Methods of in-situ soil exploration, planning the exploration program, soil boring, soil sampling, underwater sampling, standard penetration test (SPT), cone penetration test (CPT), Marchetti dilatometer (DMT), field vane shear testing (FVST), borehole shear test (BST), pressuremeter test (PMT), soil report.

**CE 424 – Water Power (3+0):**

Physical properties of hydraulic fluids, Energy and global warming, Renewable energy, Energy and power in hydraulic systems, Hydroelectric power plants and components, Water power for the future.

**CE 426 – Risk Management in Construction (3+0):**

Concept of risk and introduction to risk management. Identification, analysis and management of risk. Qualitative and quantitative methods of risk analysis. Monte Carlo simulation. Utilization of methods and tools in construction risk management.

**CE 428 – Construction Project Management (3+0):**

Project concept. Project management knowledge areas. Project life cycle and organization. Project management in construction context.

**CE 430 – Irrigation and Drainage (3+0):**

Water and the environment, physical properties of soils and water, water resources in irrigation, flow of water in saturated and unsaturated soils, irrigation system components, design and evaluation of surface

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irrigation systems, steady and non-steady flow to drains, design of surface and subsurface drainage systems.

**CE 434 – Earthquake Resistant Design and Performance Evaluation (3+0):**

Introduction to earthquake resistant design of building structures. Introduction to the current Earthquake Code of Turkey (Deprem Bölgelerinde Yapılacak Binalar Hakkında Yönetmelik – 2007). Definition of loads, and load combinations both for cast in place and precast structures. Spectral analysis and equivalent load analysis for a seismic design. Steps in design and analysis towards a seismic reinforced concrete design. Definition of ductility and its way of existence in reinforced concrete structures. Control points for a ductile design. Definition of irregularities in plan and elevation, and investigation of the analysis outputs to highlight the possible irregularities. Structures with mixed ductility levels in two orthogonal directions. Ductile design of beams, columns and shear walls according to high and medium ductility levels.