FIRAT UNIVERSITY INSTITUTE OF SCIENCE

Master of Civil Engineering Technologies Program

INS501 MSc. Seminar (0 2 1)

INS503 Theoretical Fundamentals of Urbanization (3 0 3) ... ECTS: 6

Urban theories: (a) Traditional theories, (b) Contemporary theories; Planning theories, overview of the evolution of urban planning; basic problems of urbanism and regional planning in Turkey; Experiments in regional planning, metropolitan planning; planning education and personnel.

INS504 Architecture-City Planning-Environment (3 0 3) ... ECTS: 6

Physical environment; general concept of building; architecture and society; building and ornamentation; contemporary city and architecture; planning process; planning-regulation concept; spatial dimension-urban planning; legal dimension of urban planning in our country; master plan; architectural plan; practice plan; human settlement and environment relations in comprehensive planning concept; transportation and land use planning.

INS505 Binder and Technology (3 0 3) ... ECTS: 6

General information about binders. Additives: Substances that affect setting and hardening, change the rheology of fresh concrete, increase resistance to chemical and physical effects, and expand. Precautions to be taken when using admixtures. Super plasticizing additives. Turkish Standards Production of Cements. Complex compositions in cements: Calcium silicates, calcium aluminates. Bogue formulas. Hydration phenomena, setting and solidification phenomena. Hardening phenomena, standard tests of cements. Main binders. Fineness of cements. Effects of cement properties and environmental conditions on strength. Volume change and shrinkage of cements. Acceleration of strength increase by heat treatment.

INS506 Aggregate Analysis and Technology (3 0 3) ... ECTS: 6

Aggregate composition and granulometry. Fineness modulus. FERET triangle, effect of shape and form of aggregate grains on concrete properties. Porosity and water content of aggregates. Unit weight, specific gravity, compatibility, frost resistance of aggregates. Aggregates: Resistance to compression, abrasion, impact. Harmful substances in aggregates. Presence of clay and silt in aggregates. Special aggregates, lightweight aggregates, high temperature resistant aggregates, plastic aggregates. Aggregate tests and remedies to improve aggregate properties. Turkish standard criteria and calculation methods.

INS507 Analysis of Concrete Behaviors (3 0 3) ... ECTS: 6

Properties required in concrete, factors affecting compressive strength. Compressive strength formulas. Amount of mixed water, characteristic compressive strength of concrete. Workability and measurement. Internal and external frictional forces and wall effect. Determination of void volume in concrete. Hardened concrete: physical and thermal properties. Behavior of concrete under compressive strength, deformation of concrete under tensile strength TS concrete tests Behavior of concrete under shear strength, creep, fatigue and loosening phenomena in concrete, concrete mix design, curing, water impermeability and water vomiting, strength in triaxial stress.

INS508 New Products and Technologies in Construction Materials (3 0 3) ... ECTS: 6

Block materials. Masonry and wood materials applied by laying: Polyurethane / bitumen based materials. HiTuff roofing membranes PVC roofing systems. Wood based materials. Materials applied by spreading. Paint based materials. Materials applied by coating. Fill materials. Plumbing materials. Steel form systems. Plastic-fiberglass form systems. Planar system facade cladding. Resin application.

INS509 Computer Aided Statistical Analysis (3 0 3) ... ECTS: 6

Calculating sample size; (the logic of hypothesis testing); hypothesis testing with the t-distribution; calculating the correlation coefficient (the Pearson product-moment correlation coefficient); probability; the concept and properties of probability; possible outcomes and independent events (permutations and combinations); problems.

INS510 Advanced Highway Techniques (3 0 3) ... ECTS: 6

Cross section elements, guardrails, road types, intersection ribs, compound ribs, transition curves, parabolic vertical ribs, circular vertical ribs, driving slope piles, road base soil survey, road drainage, level intersections, intersections at different levels.

INS511 Concrete Construction Elements (3 0 3) ... ECTS: 6

Introduction, Issues to consider when selecting structural systems, General information on preliminary design of structural systems and structural system design, Types of loads to which the structural system is exposed, Principles of structural system arrangement, Plane structural systems, Loading cases in plane carriers, Structural systems used in reinforced concrete high-rise buildings and prefabricated structures.

INS512 Special Concretes (3 0 3) ... ECTS: 6

Shotcrete concrete and its properties. Protection and use of Shotcrete. Air entrained concrete and its properties. Blinding concretes and their properties. Formation of flocculation phenomena. Production of light and heavy concretes. Production and properties of foamed concrete, aerated concrete. Production and properties of heavy concretes for X-ray equipment, nuclear power plants. Special concretes with BKM, concretes with plastic aggregates.

INS513 Calculation Methods of Concrete Composition (3 0 3) ... ECTS: 6

Concrete composition data. The way to analyze the data. Volumetric and analytical methods. Application examples. Checking the calculated composition. Determination and calculation of material ratios in concrete composition according to different standards (TS802, ACI211 etc.). Evaluation of the results and making necessary arrangements. Evaluation of the results of concrete composition control. Analytical and experimental evaluation of control results regarding workability and strength results. Application of other methods for determination of concrete composition. Sample applications. Analysis of the materials entering the composition of concrete.

INS514 Advanced Building Constructor's Supply Shed Planning and Techniques (2 2 3-6) (3 0 3) ... ECTS: 6

Quarry operations. Determination of service roads. Decovil lines. Wooden and steel bridges for service roads. Site telephone lines. Construction site buildings: offices, lodgings, health units, workshops, garages, canteen-cafeteria units, dormitories. Material stores and warehouses. Construction of site projects. Layout and characteristic details of the site. Site organization. Preparation of sample plans.

INS515 Analysis of Concrete Construction Elements (3 0 3) ... ECTS: 6

Application of horizontal force calculations to reinforced concrete frames. Reinforced concrete joints. Retaining walls: Optimal design, calculation, and foundation principles. Stability of retaining walls: Investigation of overturning, sliding, total collapse, and soil stresses under the footing. Preliminary design of retaining walls. Quay walls. Reinforced concrete shafts. Application examples.

INS516 Sound Control and Noise in The Building (2 2 3) ... ECTS: 6

Fundamentals of sound, free and reverberant fields, volume constant, finding the sound pressure level from the sound power level in free and reverberant fields. Sound transmission loss of materials, noise reduction by walls, noise control by covering the noise source, noise control by obstructions, noise control by changing the acoustics of the room with sound-absorbing materials, noise control with earplugs, liquid-borne noise problems, and some precautions. Detailed principles of noise control. Definitions, physical properties, units, and calculations of sound as they relate to building acoustics. Sound transmission and evaluation of sound transmission losses in terms of building components and cross-sectional properties, sound transmission loss calculations. Volume shapes and design criteria. Effect of dimensions of enclosed volumes on acoustic properties. Acoustic model studies. Acoustic materials and details.

INS517 Hydraulic Structures (3 0 3) ... ECTS: 6

Definitions, aquifer and groundwater, continuity equation, differential equations of groundwater flow in pressurized flows, flow network drawings, analytical solution methods, potential flow theory, hydraulic conductivity in stratified media, numerical solution methods, experimental solution of groundwater problems, electrical analogues, well hydraulics, brine advection in coastal aquifers.

INS518 Water Insulation at Buildings (3 0 3) ... ECTS: 6

Waterproofing and its importance. Bituminous coverings, plastic coverings, sliding pastes, cement-based materials, crystallized materials, drains, ventilation shafts, pressure lamellas, harpuştalar, mastic pastes. Ground moisture, unpressurized-pressurized water, principles of detailing waterproofing in foundations. Roofing systems and detailing principles of vehicular and non-vehicular roofs. Waterproofing techniques in foundations, decks and roofs, wet areas and pools. Some mistakes and precautions due to materials, workmanship and applications.

INS519 Experimental Methods in Buildings (3 0 3) ... ECTS: 6

Model theory analysis, loading systems, dimensional approach, model design and construction, loading systems, load distribution methods, unit deformation measurements, slope rotation and curvature

measurements, calibration, recording measurements, determination of effective parameters by estimation or preliminary experiments.

INS520 Advanced Topography (2 2 3) ... ECTS: 6
Introduction; measuring geometric heights; measuring lengths with electronic instruments; precision polygons; using takeometric surveying methods; using zoning plans; and using drawing land applications.

INS521 Construction Chemicals (2 0 2) ... ECTS: 4
Use of admixtures. Classification of admixtures: air-entraining admixtures for concrete, chemical admixtures for concrete, and mineral admixtures. Air-entraining concrete admixtures. Chemical admixtures used to reduce the water content of concrete. Admixtures that reduce the high amount of water in concrete mixes. Concrete set retarding admixtures. Accelerating admixtures. Mineral admixtures. Other types of admixtures: are binder supply admixtures, anti-corrosion admixtures, waterproofing admixtures, expansion admixtures, and grouting admixtures. Mold-release agents.

INS522 Plasticity Analysis of Steel Constructions (3 0 3) ... ECTS: 6
Introduction, Principles of plastic calculus, Scope of application, Types of steel, Safety in plastic calculus, Identification of boundary conditions, Identification of effects and cross-sectional zones, Cross-sectional strength calculations, Stability calculations, Deformations, Total instabilities of systems, Joints.

INS523 Advanced Construction Materials Science (2 2 3) ... ECTS: 6
State of the material under triplee stress, Mohr-Caguot theory, Octaedral shear stress theory, Rheology and rheological models, Material deformation measurement technique, Detection parameters, Histogram, Degree of safety, Determination of elastic modulus by resonance frequency method, Application activities.

INS524 Basement Mechanics and Analysis in Buildings (2 2 3) ... ECTS: 6
Identification of soils, hydraulics of soils, clays and sands, stabilization concept, compaction methods, grouting techniques, failure and yielding, plastic equilibrium in soils, compaction of soils, lateral soil pressures, retaining walls, slope stability, sample applications.

INS525 Construction Biology (2 2 3) ... ECTS: 6
The use of bio-approaches in construction includes considerations of geological effects and electro-pollution, as well as the analysis of enclosed spaces. The next section examines lighting in buildings, addressing key concepts such as area, luminous flux, and the interplay between quantity and quality of lighting on visual perception. The text then examines visual comfort in the home, addressing issues to be considered in the design of interior spaces, the selection of materials, and the negative effects of materials on humans. The text concludes with an examination of the beneficial effects of sunlight on buildings and people. The text will also address some basic properties of spaces in terms of building biology and building materials in terms of building biology. The human-housing relationship is examined, including air requirements, indoor temperature, and indoor humidity. The human-color relationship is also explored, including color selection and paint selection.
Finally, the text discusses the environmental damage caused by certain building materials and their effects on human health.

INS526 Scientific Research Methods (3 0 3) ... ECTS: 6 ... ***Recommended:***
The definition and meaning of science; the relationship between science and formal disciplines; the scientific method and its scope; the method of scientific thinking; the process of scientific research; basic and applied research; research methods and models (functionalist and structuralist); data collection techniques; methods of report writing in research; formal problems and bibliography. The final topic is scientific research in the field of architectural education.

INS527 Structural Damages (3 0 3) ... ECTS: 6
Types of Cracks and Damage in Reinforced Concrete and Masonry Structures. Causes of crack formation. Classification of cracks. Cracks and defects in load-bearing and non-load-bearing structures. Types and causes of damage in shear walls and slabs. Causes of earthquake damage. Seismic damage levels in reinforced concrete structures. Damage levels in rural structures. Damage estimation. Principles of repair and strengthening. Approaches to repair methods. Repair of cracks. Methods of joining old and new concrete. Anchoring reinforcement to concrete. Application examples, material selection and application techniques.

INS528 Advanced Wooden Construction Technique-I (3 0 3) ... ECTS: 6
Construction woods, general information. Lumber sizes and shapes. Wood classes and properties. Strength of wood. Joining elements in wood structures. Trusses and wedge beams. Plate wedge beams. Triple-jointed frames with plate wedges. Wood shells and their characteristics. Ribbed and unribbed shells. Torsion shears. Arches, frames. Example calculations and applications.

INS529 Advanced Wooden Construction Technique -II (2 2 3) ... ECTS: 6

Timber high-rise buildings: Loads, safety loads, connection elements, assembly, assembly and connection specifications. Structural systems in space and their characteristics, double-sided and honeycomb vaults. Characteristics of timber construction systems. Use of prefabricated timber structures in disaster situations. Prefabricated timber elements. Assembly and insulation in prefabricated timber structures. Application areas of prefabricated timber structures and preparation of sample application projects.

INS530 Using of Prefabrication Elements in Construction Elements (2 2 3) ... ECTS: 6

Principles of dimensioning in the standardization of element types, dimensioning of purlins, beams and T-plates and fire resistance, wall panels, dimensioning, node formation in prefabricated structural elements, construction of columns, fire resistance classification of prefabricated structural elements, construction of rigid and articulated connections of prefabricated structural elements, combined systems (concrete + structural steel), Foundations, rules of reinforcement, principles of connection of superficial elements, formation of fugas and joints, stability of structures made of prefabricated elements.

INS531 Computer Aided Analysis of Construction Elements (2 2 3) ... ECTS: 6

(a) Reinforced Concrete Elements: Determination of reinforcement in simple and continuous beams, shear reinforcement, foundation calculations, medium slenderness column calculations, application of the finite element method to slabs, bearing capacity calculations. (b) Timber Elements: Timber beams, steel-timber beams, nail and bolt calculations, rafter and purlin calculations, timber columns, buckling length, gerber beams, trusses. (c) Steel Elements: Steel beams, buckling calculations, simple and compound bending, deformation calculations. (All section effects, calculations and dimensioning are done using a PC).

INS532 The Dimensioning Principles of Stone Construction (3 0 3) ... ECTS: 6

Analysis of uniaxial and biaxial basement walls according to earth pressure, construction of masonry walls, dimensioning of masonry walls, auxiliary norms and calculation principles used, deformation and crack safety of masonry walls, moisture protection in masonry building construction, sound insulation in masonry building construction, plaster norms, scaffolding technique in masonry building construction, new building materials and construction techniques in masonry building construction.

INS533 Pre and Post Stressed Concrete Applications (2 2 3) ... ECTS: 6

Prestressed concrete and its properties. Prestressing steels, elements and applications. Use of prestressed concrete in industrial construction. Prestressed piles. T-beams. Double T beams. Hollow floor slabs. I-beams. Box beams. Columns. Stair units. Hollow wall panels. Measurements during prestressing. Application examples and calculations. Checks to be made during post-tensioning. Coupling and maintenance. Moment coefficients and their meaning. Friction losses. Application examples for prestressed concrete.

INS534 Security Control at Building (2 2 3) ... ECTS: 6

Structure safety. Material, load and element coefficients. Conformity, effects and coefficients in reinforced concrete. Condition of structures. Changes of concrete strength with time. Control of excessive deflection. Determination of reinforcement. Safety check of masonry structures: Foundation, vertical load and seismic check. Vertical and horizontal load safety check for reinforced concrete structures.

INS535 Pozzalanic Materials (3 0 3) ... ECTS: 6

Introduction, Definition of pozzolanic material, Determination of pozzolanic activity and activity index, Classification of pozzolanic materials, Physical and chemical properties of pozzolanic materials, Sources of pozzolanic materials in Turkey and in the world, Principles of pozzolanic use in concrete and cement production, Some applications and results abroad, Natural pozzolanic materials (Tras, etc.), Artificial pozzolans: fly ash, silica fume, blast furnace slag, rice husk ash, bituminous shale ash, wheat stalk ash, alunite limestone based filler (limestone flour), phosphogypsum, ferrochrome slag, definitions, applications, advantages and disadvantages.

INS536 Housing Construction Systems-I (3 0 3) ... ECTS: 6

Basic approaches to housing systems. Housing in development plans. Developments in the housing sector. Structure of the housing sector and proposed target policies: housing needs and demand. Housing production, financing, prices. Forms of housing provision for lower income groups and slum upgrading. Housing planning legislation. Management and operation of public housing estates.

INS537 Housing Construction Systems-II (3 0 3) ... ECTS: 6

Traditional and industrialized housing construction systems. Housing construction process and the macro and micro approaches followed. Economic and technological evaluation factors. Housing cost-user affordability relationship. Functional solvency and suitability evaluation methods. Structural suitability. Cost analysis of poor quality housing construction practices.

INS538 Glass and Ceramic Construction Materials (2 0 2) ... ECTS: 4

Glass building materials and their use in construction. Plate and window glass. Solar control glasses. Glass floor blocks. Glass wall blocks. Glass covering materials. Glass mosaics. Glass fibers: sheets, mattresses, pipe coatings and glass foam. Properties and principles of use in construction. Hollow, hollow and semi-hollow ceramics: types, properties and applications in construction. Load-bearing and non-load-bearing ceramic wall materials. Application of wall materials. Ceramic flooring materials and their use in construction.

INS539 Cost of Poor Quality at Construction (3 0 3) ... ECTS: 6

Total quality concept. Productivity and quality. Total quality management and control. Total quality management processes. Quality economics. Total quality management in construction (education). Optimum quality problem. Dynamics of quality.. Optimal quality approaches. Quality control and costs. Poor quality. Cost drivers and sources of poor quality. Measuring costs. Research on the cost of poor quality. Rational approaches. Case studies.

INS540 Reinforcement Corrosion in Structure (3 0 3) ... ECTS: 6

Reinforced concrete steel and material properties. Gasir technique. Reinforcement shell relationship. Importance of concrete quality. Selection of steel according to loading and stress conditions. Internal and external factors causing corrosion. Harmful chemicals that cause corrosion. Atmospheric conditions. Effect of relative humidity. Effect of oxides. Hydration evolution and corrosion relationship. Tingling and flaking effect on steel. Inhibitors. Corrosion prevention approaches and solutions.

INS541 Rules of Reinforce of Reinforced Concrete (2 0 2) ... ECTS: 4

Cross-section effects and general reinforcement rules. General concepts. Anchorage and attachment of reinforcement. Reinforcement for shear forces. Reinforcement of slabs. Reinforcement of beams and frames. Reinforcement of high beams. Reinforcement and detailing of short brackets, compression reinforcement and foundations.

INS542 Solar Radiation and Building Design (2 0 2) ... ECTS: 4

Introduction to solar radiation, its types and factors influencing its variation. Calculation of solar radiation on building surfaces. Introduction to passive solar energy systems and evaluation of structural parameters to optimize the solar effect. Calculation of solar radiation shading and shadow length on building surfaces.

INS543 Orientation of Urban and Buildings (3 0 3) ... ECTS: 6

The effects of direction, slope, topography, vegetation and atmospheric conditions on the choice of settlement area. Determination of the relationship of solar radiation to transportation axes and parcel layouts in order to orient buildings, and thus cities, in an optimal manner. Determine the most appropriate building form and urban structure for buildings in different climatic zones. Introducing the effects of shading elements, windbreaks, and landscaping tools on urban design.

INS544 Basics of Advanced Building Physics (3 0 3) ... ECTS: 6

Materials and their physical classification. Material selection and internal construction. Relationship between building physics problems and materials. Standardization and quality control of materials. Effects of mechanical, physical and physicochemical properties of building materials on the structure. Structural deterioration, causes and solutions.

INS 545 Material Defects in Structural Damages and Repairing Principals (3 0 3) ... ECTS: 6

Main principles: Concrete surface problems (dusting, bubble formation on the surface, pieces breaking off from the concrete surface, color irregularities on the concrete surface, efflorescence, spalling on the concrete surface, deterioration of the concrete surface mortar, plastic shrinkage cracks, cracks due to incorrect jointing, cracks due to lack of isolation jointing), cracks caused by freeze-thaw, irregular cracks, settlement cracks, cold joints, voids on the concrete surface) that can occur during the concrete casting and placing process (loss of consistency, failure of the concrete aggregate to penetrate the reinforcement, failure of the concrete pump to pump the concrete, early setting of the concrete, late setting of the concrete, segregation). Determine the causes of these failures and repair principles.

INS546 Durability Experiments (3 0 3) ... ECTS: 6

Introduction, definitions, alkali-silica reaction experiments (ASTM C 1260 rapid mortar bar method, ASTM C227 test method, ASTM C 289 test method, ASTM 295 test method, ASTM 1293 test method), corrosion experiments (ASTM C876 potential measurement test method, linear polarization resistance method, measurement of electrical resistance of concrete, accelerated corrosion experiments), freeze-thaw tests (ASTM C666 test method, ASTM D 5312 test method, ASTM C 310 test method, ASTM C 672-84 test method, TS 3449 test method), sulfate resistance tests (ASTM 1012 test method, ASTM C 452 test method, ASTM C 1038 test method), rapid chlorine permeability test (ASTM 1202 test method), carbonation depth test, abrasion test, high-temperature effect tests.

INS547 Fiber Concrete and General Characteristics (3 0 3) ... ECTS: 6
Basic information about concrete and cements, purposes of manufacturing fiber reinforced concrete, fibers used in concrete and their properties, steel wire, carbon fiber, glass fiber, polymer fiber, methods of manufacturing fiber reinforced concrete, properties of fresh concrete, matrix properties of fiber reinforced concretes, properties of fiber reinforced concretes, porosity and permeability of fiber reinforced concretes, stress-strain curves under compression and tension, fracture patterns in matrix-synthetic fiber systems.

INS548 Destructive and Non-Destructive Concrete Experiments and Evaluation (2 2 3) ... ECTS: 6
Introduction, definitions, comparison of destructive and non-destructive methods. Cement and aggregate testing of concrete composition elements, fresh and hardened concrete testing, concrete durability testing, non-destructive and destructive concrete testing, reinforced concrete steel testing, testing of other building materials such as curbs, parquet, concrete pipes, bricks, tiles, etc. Basic characteristics of sound waves. Principles of sound propagation. Power loss of sound waves. Reflection coefficients. Snell's rule and critical angles. Ultrasonic characterization, velocity and dispersion. Surface waves. Principles of ultrasonic experiments. Pulse methods. Pulse transitions. Acoustic impedance. Ultrasonic test equipment. Generation of ultrasonic waves. Velocity measurement. Thickness and distance measurement. Defects and other applications of ultrasonic techniques. Data Analysis. Concrete measurement by ultrasonic experiments.

INS549 Persistence in Reinforced Concrete Structures (3 0 3) ... ECTS: 6
Classification of physical and chemical effects that cause deterioration of reinforced concrete structures. Physical effects are freeze-thaw effect, seawater effect (corrosion), fire effect. As chemical effects, acid effect, thomacite formation (C-S-H deterioration and softening of concrete), sulfate effect, alkali silica reaction, reinforcement corrosion, seawater effect, environmental one classes.

INS550 Cement Chemistry (3 0 3) ... ECTS: 6
Historical development and production of Portland cement, chemistry of raw materials of Portland cement, chemical reactions in rotary kiln, oxides and main components of Portland cement, chemical reactions of main components of Portland cement, hydration of Portland cement and properties of hydration products, structure of cement paste.

INS551 Concrete Morphology (3 0 3) ... ECTS: 6
Optical microscopy and electron microscopy methods used to study concrete microstructure and mix properties. Methods complementary to concrete microscopy methods; microanalysis methods (EDS and WDS), X-ray diffraction, XRF examinations.

INS552 Usage of Industrial Wastes in Concrete (3 0 3) ... ECTS: 6
Use of tire waste in concrete production, use of waste marble particles and powder in concrete production, use of waste glass in concrete production, use of waste tile in concrete production, use of waste concrete in concrete production, use of waste aerated concrete in concrete production, use of bottom ash in concrete production, use of waste water treatment sludge ash in concrete production, use of rice husk ash in concrete production, use of pozzolanic materials such as granulated blast-furnace slag, fly ash, silica fume in concrete production.

INS553 Excel Applications in Civil Engineering (2 2 3) ... ECTS: 6
Enter information in cells and format cells. Create charts and formulas. Analyze available data in an Excel environment. Entering and analyzing data in the field of civil engineering (static, hydraulic, concrete and reinforced concrete, etc.). Solving and analyzing problems in the field of civil engineering by editing tables and formulas created in Excel.

INS554 Loose Boundary Hydraulics (3 0 3) ... ECTS: 6
The importance of two-phase currents in engineering applications and problems related to two-phase currents in practical applications. Formation and properties of solid grains. Grain size, grain shape, and grain settling velocity. Definition of fluid and flow properties. Determination of shear stress and velocity distributions. Determination of dimensionless quantities characterizing two-phase flow by dimensional analysis and physical interpretation. Initiation of solid motion. Critical velocity, critical shear stress, and critical buoyancy criteria. Formation, evolution and types of sand waves. Resistance to flow and decomposition of resistance into components. Determination of sediment flow rate. Determination of suspended solids flow rate. Determine total solids flow rate. Stable channel design. River regulation and bank protection studies.

INS555 Hydraulic Models and Measurements (3 0 3) ... ECTS: 6

Fundamentals of the physical model concept. Unit systems, dimensional analysis, dimensional homogeneity. Important dimensionless numbers used in hydrodynamics. Error theory and concept of meaningful numbers. Similarity theory. Model concept, obtaining dynamic simulation conditions. Distortionless and distorted models. Obtaining Reynolds and Froude numbers from NAVIER-STOKES equations, physical interpretations. Reynolds and Froude model concepts. Monitoring, measurement and evaluation methods used in hydraulic models. Flow models: Stationary models; Sediment transport in streams; Movement-based models. Investigation of dynamic behavior of structures under the influence of currents or waves. Autoexcitation. Vibration models in water structures. Cavitation models. Hydrodynamic effects on hydraulic structures: Hydrodynamic phenomena in energy breaking structures. Modeling of Weirs and Energy Breaking Structures. Stratified flow models: Discharges; Internal wave models; Sedimentation models. Reservoir, cooling pond models; groundwater flow models; coastal structure models.

INS556 Flood Control (3 0 3) ... ECTS: 6

Types of floods, Damage caused by floods, Classification of flood damage, Determination of flood damage, Relationship of floods with time, Notification of floods, Flood protection methods, Determination of flood wave, Flood control structures, Flood insurance.

INS557 Hydrology of Droughts and Floods (3 0 3) ... ECTS: 6

Analysis of extreme events. Flood forecasting methods. Statistical methods. Analysis of flood frequency. Parameters of probability distributions. Important probability distributions for floods. Partial continuity series. Extreme floods. Envelope curves. Regional flood frequency analysis. Flood management. Low flow analysis. Statistical Analysis of Low Flows. Probability distributions of low flows, analysis of dry periods (run analysis). Trend analysis. Regional drought analysis. Drought management.

INS558 Hydrologıc Modeling with Remote Sensing and Geographic Information System (3 0 3) ... ECTS: 6

Introduction to remote sensing and geographic information systems. Fundamentals of Remote Sensing. Use of Remote Sensing Data and Methods. Water resources and coastal monitoring. Sediment transport.

Investigation of water quality and pollutant effects with remote sensing. Geographic Information System. Basics of Geographic Information System. Data Structure in Geographic Information System. Hardware and software; combination of geographic information system and remote sensing. Analysis of geographic data. Water quality monitoring using satellite data. Monitoring of Bathymetry, Currents, Winds and Temperatures with Satellite Data and Necessary Variables. Application of hydrological models with geographic information system techniques of remote sensing. Modeling of hydrology with remote sensing and geographic information system techniques.

INS559 Water Resources Systems (3 0 3) ... ECTS: 6

Water Resources and System Analysis. Identification of objectives. Cost-benefit analysis. Optimization, Production Function, Optimality Conditions. Classical optimization methods. Linear programming. Dynamic programming. Simulation, multiobjective optimization. Consideration of Uncertainty. Decision theory. Cost-benefit analysis in flood control projects. Cost-benefit analysis in hydroelectric projects.

INS560 Water Law and Policy (3 0 3) ... ECTS: 6

Introduction; overview of topics to be covered in the course. Status of water resources in the world. Status of water resources in Turkey. Major water resources development projects in the world and Turkey. International dimension of CAP. "Environmental and socio-economic issues in water resources projects. National Water Laws, Policies and Water Resources Management Model. International water law and policy. EU Water Framework Directive and Turkey. Transboundary Waters of Water Resources. Turkey's problems related to transboundary waters.

INS561 Hydrological Models (3 0 3) ... ECTS: 6

System and Model Concepts in Hydrology. Basic Equations of Hydrological Processes. Flow in Unsaturated Zone. Infiltration Models. Conversion of Precipitation to Runoff. Residual Precipitation and Direct Runoff. Snowmelt. Precipitation - Runoff Models. Linear Systems. Unit Hydrograph Model. Rational Method Model. Parametric Models. Translation of Hydrograph along the River. Short Term Current Prediction Models. Long Term Streamflow Forecasting Models. Flood Flow Probability Distribution Models. Hydrological Design Models. Design and Operation of Impoundments Basic Concepts. Natural Product of the River. Critical Dry Period. Reservoir Design with Empirical Methods. Range Analysis. Deficit Analysis. Stochastic Reservoir Theory. Simulation Reservoir Design. Design of Multi Hopper Systems. Dead Volume. Flood Control Capacity. Spillway Capacity. General Operating Concepts. Standard Operating Rules. Operating Curves. Linear Programming. Models with Chance Constraints. Dynamic Programming. Simulation of Reservoir Operation. Flood Control. Operation of Multi Reservoir Systems.

INS562 Applied Statistical Methods in Civil Engineering (3 0 3) ... ECTS: 6
Introduction, parameter estimation, frequency analysis, confidence intervals, hypothesis testing, distribution functions and tests, analysis of variance, correlation, regression, multivariate regression, introduction to time series, ARMA models, synthetic series, periodic models, multi-station models, forecasting. Basic probability concepts, total probability, Bayes theorem, applications of Bayes theorem, Bayesian decision theory, reliability analysis, performance analysis, reliability of multi-element systems, probabilistic design, Poisson process, Markov chains, queuing models, stochastic storage theory, random step.

INS563 Urban Drainage (3 0 3) ... ECTS: 6
This course covers the following various methods used in the design of residential stormwater drainage projects: Rainfall and runoff in residential areas, Obtaining peak flows in residential areas using the rational method, Obtaining effective composite stormwater hydrographs in drainage basins of different characteristics using flow curve numbers, Methods of obtaining unit and S hydrographs, Calculation methods used to obtain unit hydrographs at different hours using the available unit hydrographs, Calculating the capacities of water intake structures to be used in residential stormwater drainage systems.

INS564 Fuzzy Logic Modeling in Engineering (3 0 3) ... ECTS: 6
Concepts of uncertainty; Classical sets and characteristic values; Fuzzy sets and membership functions; Membership functions; Fuzzification; Fuzzy set operations, velems, validation and discarding, fuzzy relations; Fuzzy mathematics, addition, subtraction, multiplication and division; Fuzzy logic propositions, premises, conclusions, inferences; Fuzzy rules and systems; Applications.

INS565 Basin Hydrology (3 0 3) ... ECTS: 6
Basin characteristics, definitions, river network characteristics, topology and river networks, aggregate and diffuse models (general), examples of aggregate and diffuse models such as the Nash model, etc., unit hydrograph, flood displacement, linear channel, linear reservoir, instantaneous unit hydrographs, synthetic unit hydrographs, geomorphic unit hydrographs, generalized Rodriguez-Valdes approach.

INS566 Hydroclimatology (3 0 3) ... ECTS: 6
In this course, the global climate system, the general circulation, the global hydrological cycle, natural variability and anthropogenic climate change, climate feedback mechanisms, climate system modeling, hydrological modeling, spatial and temporal changes in hydroclimatic variables, large-scale oscillations in the climate system and their effects on hydroclimatic variables will be discussed, and the climate and hydrology of the Mediterranean Basin will be examined in the light of all this information.

INS567 Hillslope Hydrology (3 0 3) ... ECTS: 6
This course introduces components of the hydrologic cycle at the watershed slope scale. These components can be listed as retention, infiltration, subsurface flow, and surface runoff. Watershed slope erosion is also introduced. By the end of the course, students will have the knowledge necessary to build a watershed scale hydrologic model.

INS568 Experimental Methods in Geotechnics (3 0 3) ... ECTS: 6
Introduction, Determination of basic soil properties by various methods, Soil stress tests, Principles and techniques of soil tests, Interpretation of data obtained from soil tests, Soil test standards.

INS569 Geotechnical Modelling (3 0 3) ... ECTS: 6
Introduction to geotechnical models: moments, mean and variance tests, nonparametric methods, analytical and numerical optimization techniques, computer applications.

INS570 Ground Behavior (3 0 3) ... ECTS: 6
Introduction, Natural structure of soils, Physical and chemical applications for understanding the engineering behavior of soils, Clay mineralogy, Behavior of swelling and collapsing soils. Rheology.

INS571 Bearing Capacity Theory in Geotechnic (3 0 3) ... ECTS: 6
Introduction, foundation collapse or soil failure, Terzaghi bearing capacity theory, plate load test, minimum bearing capacity calculations, eccentrically loaded foundations.

INS572 Computer Applications in Civil Engineering (3 0 3) ... ECTS: 6
System modeling techniques. Linear and nonlinear material behavior. Two and three dimensional element types and behavior. Static and dynamic loading cases. Defining boundary conditions. Static, dynamic, linear and nonlinear analysis. Evaluation of the results. Applications.

INS573 Experimental Methods in Earthquake Engineering (3 0 3) ... ECTS: 6
Vibrations, vibration classification and analysis. Single and multiple degrees of freedom systems. Determination of frequency and mode shapes, Fourier transform, FFT. Instrumentation, data acquisition systems. Experimental steps in vibration analysis, digital signal processing, windowing and filtering. Modeling, model improvement. Structural damage and damage assessment methods.

INS574 Seismic Isolation Methods in Buildings (3 0 3) ... ECTS: 6
Introduction, Basic principles of seismic isolation systems. Study and classification of isolation systems. Mechanical properties and modeling of isolation systems. Design examples. Computer applications. Presentation of papers.

INS575 Active and Passive Control Methods in Constructions (3 0 3) ... ECTS: 6
Mathematical information needed for control. Define active and passive control. Introduction to passive and active control mechanisms. Active tendon control, passive and active mass dampers, viscous dampers, base isolation systems. Modeling and general formulation of multistory structures as a mass system. Control algorithms. Classical linear optimal control, pole assignment method, instantaneous optimal control, predictive approximate optimal control. Solution Techniques. Optimal control of nonlinear systems.

INS576 Transportation Systems Analysis (3 0 3) ... ECTS: 6
Transportation system analysis, relationships between transportation system and event system, transportation demand forecasting: Discrete behavior models, utility functions and indifference curve, deterministic consumer behavior model, stochastic consumer behavior model, aggregated behavior models, transportation presentation: Cost functions, internalization of external costs, congestion pricing, performance of transportation systems and performance functions, operating plans, network analysis, evaluation and selection process, cost-benefit analysis and multi-criteria evaluation techniques for evaluating transportation projects, general evaluation.

INS577 Introduction to Transportation Engineering and Planning (3 0 3) ... ECTS: 6
Impact of transportation on economic development, impact of transportation on the environment; development of transportation, types of transportation, transportation infrastructure, freight and passenger transportation, public transportation, transportation planning and policy, transportation demand analysis, transportation and land use, transportation management and operations, transportation design engineering, highway superstructures.

INS578 Safety in Highway Design (3 0 3) ... ECTS: 6
Overview of Road Safety, Road Safety in Turkey. Principles of safe highway design. Design of road safety elements and road lighting. Effective human, road and vehicle related factors in highway accidents, identification of points and sections with highway safety problems, simple improvement measures. Institutions, organizations and sectors related to highway safety, risk factors on highways, relationship between highway safety and quality of life.

INS579 Occupational Safety and Health in Construction Industry (3 0 3) ... ECTS: 6
Definition and evolution of occupational safety and health. Basic occupational safety and health concepts and statistics. Culture, purpose and importance of OSH. Causes of occupational accidents. Occupational safety and health legislation. Minimum safety and health conditions for construction sites, excavation and shoring works, formwork and scaffolding works, demolition and dismantling works, tools, equipment, machinery and devices used in construction works, personal protective equipment and methods of use.

INS580 Soil Mechanics for Transportation Engineers (3 0 3) ... ECTS: 6
Soil Mechanics in Transportation. Field investigation, sub-base, foundation, sub-base layers, soil related problems and stabilization of these layers. Compaction of pavement layers and comparison of compaction techniques. Utilization of industrial waste materials in infrastructure and superstructure. AASHTO highway soil classification and comparison with other soil classifications. Comparison of tests used to measure the bearing capacity of highways. Drainage of transportation structures and drainage structures.

INS581 Basic Occupational Safety Precautions, Equipment and Hardware (3 0 3) ... ECTS: 6
Basic concepts related to production. Occupational safety in hand tools, occupational safety in manual lifting and transportation, occupational safety in working at heights, occupational safety in electrical work, occupational safety in forklifts, occupational safety in motor vehicles, occupational safety in maintenance and repair work, occupational safety in working with pressure vessels, occupational safety in welding work, occupational safety in confined spaces, occupational safety in working with shielded vehicles. Introduction of equipment in occupational safety, technical specifications, international and national legislation for equipment, where and how to use safety equipment, equipment selection, personal safety equipment, emergency equipment, safety equipment and its preparation, fire equipment and equipment, warning systems, emergency crowd management.

INS582 Reinforced Concrete Slabs (3 0 3) ... ECTS: 6
General information about slabs, reinforced concrete design of slabs, special cases of beam slabs working in one and two directions, example solutions for beam slabs. Non-beam slabs, geared slabs in one and two directions and example solutions. Structural Analysis with Elastic Plate Theory, Structural Analysis with Equivalent Frame Method.

INS583 Reinforced Concrete Structural Systems (3 0 3) ... ECTS: 6 Design principles of reinforced concrete structures. Principles of column and shear frame design, plan, vertical plane arrangement and irregularities, torsional irregularities. Principles of arrangement of frame and shear frame systems. Design of structural elements for tall building systems. Computer aided design examples.
INS584 Performance Based Structural Analysis (3 0 3) ... ECTS: 6
Fundamentals of force-based design, performance-based design, and parameter definition. Seismic ground motion and performance objectives. Definition of performance levels. Analysis methods for performance evaluation, performance evaluation of an existing structure.
INS585 Measurement and Certification Systems of Buildings (3 0 3) ... ECTS: 6 General characteristics of buildings and construction. Structures, functions, working systems and institutional principles of international measurement and certification systems. Preliminary technical investigation. Planning, design and implementation. Reflection level of spatial qualities. Assessment of bioharmological suitability of living spaces. User satisfaction. Application examples.
INS599 Master Thesis - - - -
İNS601 Specialization Field Course (6 0 0-24)