토 목 공 학 과 (건설시스템공학과)

(DEPARTMENT OF CIVIL ENGINEERING)

**Department Introduction**

The Department of Civil Engineering at Yeungnam University is committed to educate graduate students with cutting-edge academics, practices, and interdisciplinary researches and services for our local and nation’s civil engineering industry. Yeungnam University is located near Daegu area, southeastern part of Korea, where three million populations with a vast construction market for urban infrastructures exist. The department has reached this day after being combined with newly established engineering and construction department of Daegu University (civil engineering major) by having the civil engineering department of Cheonggu University established in 1950 as the predecessor. The graduate program at Yeungnam University started in 1961 and civil engineering doctorate program was established in 1973. Since then, 366 engineering masters and 62 engineering doctors (including 2 honorary engineering doctors) have been discharged to currently play a pivotal role at the position of related fields. For the department facility and professor team, 14 professors are currently in charge of lectures and researches on various major areas with the best national standard.

**List of Faculty Members**

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| Position | Name | Last School Graduated | Degree | Major |
| Associate Professor | Kwon, Hyug-Moon | Yeungnam Univ, 1990 | Ph.D. | Repair and Maintenance of Concrete Structures,Eco-construction materials Porous Concrete |
| Professor | Kwon, Young-Bong | Univ. of Sydney, 1993 | Ph.D. | Steel Structures, Composite Structures. |
| Professor | Park, Yeong-Mog | Saga Univ.Japan, 1994 | Ph.D. | Soft Ground, Geosynthetics, Slope Stability, Drai ing system development of ContinuousMoist Field |
| Professor | Son, Kwang-Ik | Utah State Univ, 1992 | Ph.D. | Fluvial Hydraulics,Hydraulic Eng. Environmental Water Resources Eng. Disaster Prevention Eng. |
| Professor | Shin, Young-Shik | SungGyunKwan Univ, 1988 | Ph.D. | Finite Element Structural Analysis |
| Professor | Ahn, Young-Ho | Kyungpook National Univ, 1995 | Ph.D. | Water Supply and Wastewater Engineering, Biotransformation Of Contaminants in Water Environment, Anaerobic Treatment Processes |
| Professor | Oh,SeBoong | KAIST, 1996 | Ph.D. | Unsaturated Soil Mechanics, Elasto-plastic Constitutive Modeling of Soils, Nonlinear Finite Element Analysis of Geotechnical Systems |
| Professor | Woo, Kwang-Sung | Vanderbilt Univ, 1988 | Ph.D. | Structural Engineering, Finite Element Analysis, Fracture Mechanics, Highway Safety Structures, Composite Laminated Structures |
| Professor | Lee, Young- Huy | Asian Institute of Technology, 1986 | Ph.D. | Stability Analysis of the Cut Slopes, Analysis of the Soft Ground, Underground Excavation and Tunneling |
| Professor | Lee, Jae-Hoon | Univ.of Wisconsin, Madison, 1991 | Ph.D. | Design of Concrete Structure, Seismic Design Precast System FRP Reinforced Concrete |
| Professor | Lee, Jong-Dal | Yeungnam Univ, 1989 | Ph.D. | Characteristics between Highway Geometry and Vehicle, GIS and GPS, System Dynamics, Neuro-fuzzy Inference for AGV, Micro Simulation with Cellular Autometa |
| Professor | Jee, Hong Kee | Dongkuk Univ, 1989 | Ph.D. | 3D River Modeling Hydrology and WaterResources System, Analysis And Design of Storm Water Management and Sewer System  |
| Assistant Professor | Jang, Won-Suk | University of Maryland at College Park, 2007 | Ph.D. | Construction Automation, Wireless Sensor Applications in Civil Infrastructure, Construction Management |
| Associate Professor | Choi, Hyun-Il | Univ of Illinois at Urbana-Champaign, 2006 | Ph.D. | Hydrology, Hydroclimatology, Land-atmosphere Interactions |

**Academic programs**

The graduate program in civil engineering department at Yeungnam University is categorized into structural engineering major, water resource/environmental engineering major and soil/road engineering. The main education and research details of civil engineering are all fields related to the design and construction of social overhead capital such as bridge, dam, port, road, railroad, tunnel, water & sewage and base environmental facility, etc. In the structural engineering major, the academics of structural interpretation, steel structure, rebar concrete structure, bridge, earthquake-proof construction and construction materials are researched. in water resource/environmental engineering major, the academics of fluid, water supply, sluice gate, water resource, water & sewage and environmental sanitation, etc. are researched. In soil/road engineering, the academics related to soil & basic engineering, civil engineering work, basic & applied measurements, GIS and GPS are researched with focus. The indoor experiment, large scale model experiment and field experiment applied to education and research details are performed on each major. Through such research and education, the basic objective is set as training professional technicians and researchers who can actively cope with various problems in the actual scene possessing theoretic and practical abilities at the same time.

**Course Description**

교육과정(Course Description)

**■ 기초공통(Basic Major Courses)**

GIS특론 3 credit

(ADVANCED GEOGRAPHICAL INFORMATION SYSTEM)

This course covers advanced technical topics within geographic information systems science.

The course will help you develop advanced theoretical and practical knowledge in spatial analysis and GIS modeling, in particular with reference to field GIS model. The students will be expected to read assigned articles and online lecture materials. Lab assignments focus on building skills and knowledge important for civil engineers and students of other disciplines who incorporate GIS in their research.

건설시스템 최적화론 3 credit

(Construction Optimization)

This class will discuss a variety of circumstances that may occur during the entire process of construction and civil engineering system, and will study the optimization process to solve the problems with numerical formulation and decision process. This class will deal with linear system, linear programming, sensitivity analysis, decision making process, and forecasting for optimal solution in construction and civil engineering system.

수자원개발론 3 credit

(WATER RESOURCES DEVELOPMENT)

This class analyzes indicators Water Resources, the spatio-temporal distribution of groundwater resources, water demand patterns

In addition, water resources planning, development, location, method, comparative analysis, and evaluation (economic, social, and environmental), and replaces a Water Resources Development Studies.

재료역학특론 3 credit

(ADVANCED MECHANICS OF MATERIALS)

This course is concerned with governing differential equations of structural problems, deformations of structures, stresses & strains, stress functions of structures under static loads, torsions, nonlinear beams, shear beams, beams on elastic supports, and thermal stresses.

지반공학특론 3

(ADVANCED GEOTECHNICAL ENGINEERING)

This course focuses on understanding of soil engineering properties, design (structures, shallow foundations, deep foundations, harbor structures, hypotheses) and research (construction methods).

컴퓨터수치해석 3credit

(COMPUTER-AIDED NUMERICAL ANALYSIS)

This course is the process of formalizing a mathematical model of the physical phenomena. The class covers numerical analysis using the computer program for the computation of the matrix eigenvalue problem, the solution of simultaneous equations and differential equations, interpolation and numerical integration of the numerical method.

탄성론 3 credit

(THEORY OF ELASTICITY)

This class deals with the classical theory of elasticity: plane stress and plane strain, torsion of structural members with non-circular cross sections. Applications of energy methods and numerical techniques to problem in continuum mechanics will be discussed.

토목계획및시스템해석 3 credit

(CIVIL ENGINEERING SYSTEMS ANALYSIS)

This course will introduce the tools of operations research and engineering economy as applied to civil engineering problems. Problem formulation, linear programming, economic analysis, and decision analysis will be presented. This lecture will include optimization, minimum cost, utility methods, applicable to structural optimization, traffic flow, resource allocation and environmental design.

토목통계및확률론 3 credit

(STATISTICAL AND PROBABILISTIC THEORY IN CIVIL ENGINEERING)

This course will introduce the applications of probability and statistics to civil engineering problems. Probability models (distributions) and selected statistical estimation techniques will be presented. More advanced techniques also may be discussed as follows, analysis of uncertainty, queuing theory, and system simulation.

토질역학특론 3 credit

(ADVANCED SOIL MECHANICS)

This course covers the following topics: the origin and nature of soils; physical and mechanical behavior; stress-strain-strength behavior of cohesionless and cohesive soils and application to lateral earth stresses, bearing capacity and slope stability; consolidation theory and settlement analyses.

환경관리및계획 3 credit

(ENVIRONMENTAL MANAGEMENT AND POLICIES)

This course covers the following topics: introduction of environmental policies and management; environmental regulations and laws; environmental quality; environmental education; environmental dispute and settlement act; environmental technology; conservation of clean air, water and soil; environmental economics; international agreements; sustainable development strategy.

**■ 전공(Major Courses)**

개별연구(1) 3 credit

(INDEPENDENT STUDY (1))

This course is offered to make it possible for master's degree students to thoroughly investigate a topic related to his or her research interests.

개별연구(2) 3 credit

(INDEPENDENT STUDY (2))

This course is offered to make it possible for doctoral degree students to thoroughly investigate a topic related to his or her research interests.

토목공학과세미나 1 credit

(SEMINAR IN CIVIL ENGINEERING)

This course is for the special challenges in each sector of the civil engineering research and practice, and discussion.

특수문제연구(1) 3 credit

(SPECIAL STUDY(1))

This class is intended to introduce recent academic fields that are newly emerging in each major field. This class is also opened as an inter-disciplinary subject in association with other major.

특수문제연구(2) 3 credit

(SPECIAL STUDY(2))

The goal of this course is to introduce newly emerging research topics. The class may be offered jointly with other departments.

특수문제연구(3) 3 credit

(SPECIAL STUDY(3))

The goal of this course is to introduce newly emerging research topics. The class may be offered jointly with other departments.

* **구조공학전공(STRUCTURAL ENGINEERING MAJOR)**

PS콘크리트설계특론 3 credit

(ADVANCED PRESTRESSED CONCRETE DESIGN)

This course focuses on basic concepts and principles of prestressed concrete, properties of materials, tendon installation methods, and construction phase review, prestressing losses, stress analysis of flexural members, flexural strength analysis, and inelastic behavior of PC steel stress change. Also the course covers the second moment of indeterminate structures, cross-sectional changes due to creep mechanisms, step-by-step structure analysis, calculation of the ultimate moment method, PC structures design, shear strength and the design of PC steel anchorage device.

강구조공학특론(1) 3 credit

(ADVANCED STEEL STRUCTURES Ⅰ)

The purpose of this lecture is to understand mechanical properties of steel under tensile & compressive force, behavior characteristics of beams and columns, welded joints, and the structural behavior & provisions designed for practical applications.

강구조공학특론(2) 3 credit

(ADVANCED OF STEEL STRUCTURES Ⅱ)

The purpose of this lecture is to cover thermodynamic behavior of the structure, local buckling design method, torsional members, and design and construction of steel composite structure.

강구조설계 3credit

(DESIGN OF STEEL STRUCTURES)

This course focuses on the design of steel tension members, flexural members, compression members, beams, columns, regulations (domestic and overseas) according to the highway bridge specifications.

건설재료학특론 3 credit

(ADVANCED CONSTRUCTION MATERIALS)

This course covers the property of the construction materials, introduces repair-reinforcement methods for presenting the effective maintenance and management methods of superannuated structure by a brazing fire. In addition, the course also deals with the analysis of the damaged structure by structural, material and environmental factor.

교량공학특론(1) 3 credit

(ADVANCED BRIDGE ENGINEERING Ⅰ)

The aim of this lecture is to convey characteristics of bridge component materials, bridge types and formats, load calculation method, applicable to the design of the bridge (girder, slabs, trusses, and simple reinforced concrete, steel composite).

교량공학특론(2) 3 credit

(ADVANCED BRIDGE ENGINEERING Ⅱ)

The course focuses on the complex type of bridge design (PS concrete bridges, long-span bridge, railway bridge, suspension bridge, and special bridges).

구조동역학 3학점

(STRUCTURAL DYNAMICS)

This course covers analysis of single and multi-degree-of-freedom systems, mode-superposition method, nonlinear dynamic analysis and numerical methods, Frequency-domain analysis, applications in structures subjected to earthquake and impact forces, and introduction to random vibrations.

구조동역학특론 3 credit

(ADVANCED STRUCTURAL DYNAMICS)

The purpose of this lecture is to provide dynamic analysis of structures, stiffness, mass calculations, modal damping matrix calculations, response spectrum analysis, dynamic analysis of structures due to earthquakes, time integration scheme, domain analysis, vibration characteristics, matrix operations, regression analysis, and numerical analysis.

구조물내진설계 3 credit

(SEISMIC DESIGN OF STRUCTURES)

This course provides design methods based on structural dynamics, vibration analysis for single-degree-of-freedom system and multi-degree-of-freedom system, and seismic design load. Time-history analysis and response spectrum analysis are covered for analysis, and basic seismic design concept and design method and procedure for reinforced concrete structures are covered in this course.

구조물의안정신뢰성 3credit

(SAFETY AND RELIABILITY OF STRUCTURES)

This lecture covers concepts and definitions of safety, statistical approach of load distribution, structures, the concept and calculation method of safety factor and reliability index, structural safety of diagnostic and test methods, fracture analysis of structures, the theoretical background of the specification clause, buildings and bridges, etc.

구조물의최적설계 3credit

(OPTIMUM DESIGN OF STRUCTURES)

This course focuses on the basic principles and concepts of structural design optimization, and the design of decision variables and objective function, Sensitivity analysis of the objective function according to the variables, the optimal design algorithm, and optimal design of materials according to structural types (beam, truss, arch, steel construction, reinforced, concrete structures, prestressed concrete structures, and steel concrete composite structure) will be covered.

구조해석특론 3credit

(ADVANCED STRUCTURAL ANALYSIS)

This course covers fundamentals of continuum mechanics including behavior and deformation of structures and matrix force and displacement methods for structural analysis.

내진구조해석 3 credit

(SEISMIC ANALYSIS OF STRUCTURES)

The aim of this lecture is to convey to the physical phenomenon of the earthquake, the earthquake analysis, design loads for equivalent static analysis, the regional factor, importance factor, dynamic factor, basic vibration cycle, soil modulus, and the response modification coefficient. Also the course deals with the dynamic analysis of seismic design criteria, and pseudo-dynamics, and examples of earthquake analysis and planning.

비선형구조해석 3 credit

(NONLINEAR STRUCTURAL ANALYSIS)

This course will cover the following topics: geometric nonlinearity, Lagrangian and Eulerian coordinate system, Green's strain tensor and Piola-Kirchhoff stress tensor, Almansi and Cauchy strain tensor material nonlinearity, incremental theory of plasticity, Prandel-Reuss equation, strain hardening rule, associated plastic flow, isotropic hardening, yield criteria, initial and tangential stiffness method, incremental linearized scheme, and introduction to numerical method for nonlinear problem.

소성론 3 credit

(THEORY OF PLASTICITY)

This lecture covers inelasticity in the absence of the stress-strain relationship, load-displacement relationships, plasticity, strain-hardening, and strain reversal. In addition, research topics of yield criterion and Prandel-Reuss equation for calculating the plastic strain incremental theory, two-dimensional problems for nonlinear formulation, and material nonlinear analysis using the computer program will be discussed.

쉘이론 3 credit

(THEORY OF SHELLS)

This lecture covers basic concepts of shell structure, the governing equations and boundary conditions, membrane action, bending action, symmetric load for the interpretation of the shell, conical shell, spherical shell, membrane theory, surface analysis, behavior of thin, thick, deep and shallow shells), and numerical analysis techniques.

유한요소법의기초 3 credit

(FUNDAMENTALS OF FINITE ELEMENT METHOD)

This course studies on the basic concepts and formulation methods of finite element analysis and shape functions, numerical integration techniques and derivation of bending elements.

유한요소법의응용 3 credit

(APPLICATIONS OF FINITE ELEMENT METHOD)

This course studies on plate, shell, axisymmetric elements and dynamic and nonlinear finite element analysis of structures.

철근콘크리트설계특론(1) 3 credit

(ADVANCED REINFORCED CONCRETE DESIGN Ⅰ)

The purpose of this lecture is to provide structural design concept, design characteristics, nonlinear structural analysis, geometric nonlinear structural analysis, material properties, pillar moment curvature analysis, bending moment curvature analysis, bending strength of precision analysis, simplified equation, the design flexural ductility index, fractional shares, design and analysis of long column, deflection analysis, and transverse tension crack interpretation.

철근콘크리트설계특론(2) 3 credit

(ADVANCED REINFORCED CONCRETE DESIGN Ⅱ)

The purpose of this lecture is to provide inelastic behavior of reinforced concrete structures and interpretations, interpretation of drying shrinkage and creep modulus, non-cracked section creep analysis, creep crack cross-section analysis, the long-term deflection of structures, design of deep beams, shear strength analysis, design of reinforced concrete, bond characteristics, and design of strut tie.

콘크리트공학특론 3 credit

(ADVANCED CONCRETE ENGINEERING)

This course covers materials consisting of concrete, aggregate, cement, compound in the properties of materials, the mechanism of strength revelation in concrete, the property of concrete hardening, the mixture design of concrete, creep and dry shrinkage, etc. The mechanical properties of materials upon time, compression strength, tension strength, fatigue strength and the property of compression stress- strain curve depending on changing strength are studies.

탄성안정론 3 credit

(THEORY OF ELASTIC STABILITY)

This course of study includes various kinds of analysis method of stability problems; buckling of columns, approximate methods of analysis such as the energy method, beam-columns, torsional buckling and buckling of plates. The buckling and post-buckling behavior are studied by the finite element method to evaluate stability problem of whole structures.

파괴역학 3 credit

(FRACTURE MECHANICS)

The purpose of the education is to provide the need for fracture mechanical competence to judge risk for failure and to compute stiffness reductions due to cracks. The aim is that the student should gain knowledge of linear and non-linear fracture mechanics and to serve as an industrial resource with the ability to analyze failures, suggest models for calculation and suggest structural improvement of engineering structures.

평판이론 3 credit

(THEORY OF PLATES)

The aim of this lecture is to convey the fundamentals of the Kirchhoff theory, governing equations for the boundary conditions, stress-strain relations, interpretation of the rectangular and circular plates by Fourier Series and Airy's Stress Function Reissner-Mindlin's plate theory, and numerical solution using the energy method

* **수자원ㆍ환경공학전공**

(WATER RESOURCES & ENVIRONMENT ENGINEERING)

개수로의수리 3 credit

(OPEN CHANNEL HYDRAULICS)

This course covers the following areas: advanced hydraulics of free surface flow in rivers and open channels; discussion of theory, analytical and numerical solution techniques, and their applications to gradually and rapidly varied nonuniform flows, unsteady flow, and flow in open-channel networks.

고도처리기술 3 credit

(ADVANCED TREATMENT TECHNOLOGY)

This course covers the overview of advanced treatment technology such as; unit processes for advanced water treatment- GAC, membrane filtration, ozonation; basic theory and design of biological nutrient removal processes; nitrification-denitrification/nitritation-denitritation systems; biological kinetics and modeling; steady state design; causes and control of activated sludge bulking; anaerobic nitrogen removal; removal of P by lime, Fe- and Al-salts addition; and P crystallization processes (MAP, HAP).

물환경관리및모델링 3 credit

(WATER QUALITY MANAGEMENT AND MODELING)

This course provides fundamentals of water quality management and modeling; sources of environmental contaminants; physicochemical and microbiological characteristics' environmental quality standards; environmental impact assessment(EIA); tools and strategy of environmental management; total maximum daily load and waste loading allocation; mass balance; contaminant movement; water quality management and modeling in river, lakes(reservoirs), estuaries and groundwater.

상수처리단위공정 3 credit

(UNIT PROCESSES IN WATER TREATMENT)

This course covers the following subjects: theory and design of coagulation and flocculation units; sedimentation and flotation; rapid and gravity sand filters; softening and stabilization; iron and manganese removal; disinfection by chlorination and ozonation; control of colour, taste and odour problems; Design methods for energy losses through a water treatment works; and disposal of water sludge.

상하수도공학특론 3 credit

(SPECIAL TOPICS IN WATER AND WASTEWATER ENGINEERING)

This course provides fundamentals of water supply and sewerage systems; water resources in Korea, water demand and management; information-oriented water policy; energy estimations; design and management of water supply and sewerage systems; estimation and control of infiltration/inflow; management of stormwater and CSOs control; and parameter estimation and application of pipe networking model.

수공구조물특론 3 credit

(HYDRAULIC STRUCTURES)

The aim of this lecture is to cover river structures, dams, harbors and coastal structures, basis of interpretation of hydraulic structures planning, design, construction, and facilities maintenance and management methods.

 수리모형실험 3 credit

(HYDRAULIC MODEL TEST)

The specific objectives of the course are to provide the student with an opportunity to 1) explore the fundamental principles of fluid mechanics through similarity and experimentation  2) demonstrate and analyze key hydraulic phenomena using hands-on physical devices  and 3) apply computer modeling as a practical tool for solving hydraulics problems.

수문수자원설계론 3 credit

(HYDROLOGIC AND WATER RESOURCES DESIGN)

This course mainly introduces and implements GIS which is an important tool for modeling and helping to manage water resources development. This course will deal with the use of GIS in water resources planning and management such as stream network delineation, analysis of DEM data, analysis of rainfall data, analysis of soils data, HEC-HMS coupled to GIS, etc.

수문시스템 3 credit

(HYDROLOGIC SYSTEM)

This course covers hydrological system of basic theory and deterministic processes, review and how to interpret research, runoff by the model and its Simulation method of investigation.

수문학특론(1) 3 credit

(HYDROLOGICAL ANALYSIS AND MEASUREMENT Ⅰ)

This course focuses on fundamentals of water cycle, hydrology, analysis methods and observations of numerical and analytical methods

수문학특론(2) 3 credit

(ENGINEERING HYDROLOGY Ⅱ)

Engineering hydrology focuses on preventing floods and lessening the effects of floods, droughts and other natural disasters. This course is chiefly concerned with the flow and storage of water. Topics commonly covered include design rainfall analysis, design flood estimation, urban drainage design, and water supply plan.

수자원세미나 3 credit

(WATER RESOURCES SEMINAR)

This course evaluates various aspects of water resources including quality, flooding, supply and allocation, and the interaction of these issues with global warming. This course will also consider water resource planning and management from various scales including local, state, national and international.

수자원시스템(1) 3 credit

(WATER RESOURCES SYSTEMS Ⅰ)

This course is concerned with physical modeling and quantitative methods for analyzing large-scale water resource problems. Topics covered include governing equations and numerical implementations for terrestrial hydrologic cycles, such as subsurface water movements and surface water flow.

수자원시스템(2) 3 credit

(WATER RESOURCES SYSTEM Ⅱ)

This course is concerned with physical modeling and quantitative methods for analyzing large-scale water resource problems. Topics covered include governing equations and numerical implementations for atmospheric water movements and land surface-atmospheric interactions.

수자원의사결정론 3 credit

(WATER RESOURCES DECISION THEORY)

This course focuses on decision making process for the use of water resources, development, planning required in the design methodology and techniques.

슬러지처리및자원화 3 credit

(SLUDGE TREATMENT AND DESPOSAL)

This course covers overview of sludge management and disposal; sludge production and treatment, basic theory and technology; definition of biosolids, regulation and appropriate technology; thickener/flotation/drying/dewatering; carbon recovery; aerobic digestion, autothermal process, acidic or alkaline treatment; anaerobic digestion and mathanification; composting; land application; incineration; and solidification.

유사침식론 3 credit

(SEDIMENT AND EROSION)

This course provides introduction to sediment transport in steady flows with emphasis on physical principles governing the motion of sediment particles. Topics include sediment characteristics, initiation of particle motion, particle suspension, bedforms, streambed roughness analysis, sediment discharge formulae, and modeling of scour and deposition in rivers and channels

유체역학특론 3 credit

(ADVANCED FLUID DYNAMICS)

This course will teach the theory of momentum, shear stress, and its application. This course also covers not only laminar flow but also turbulent flow, Reynolds transform continuum, Navier-Stokes equation, Bernoulli principal, potential flow theory. Three dimensional fluid dynamics and thermal flow theory will be discussed. From Newtonian flow to mass flow equipment analysis, students will learn the theories and practices.

유해물질및산업폐수관리 3 credit

(HAZARDOUS AND INDUSTRIAL WASTE MANAGEMENT)

This course covers the following areas: unit operations in hazardous and industrial waste treatment; priority pollutants; physical, chemical and biological characterization of wastewaters; equalization tanks; aerobic activated sludge systems; aerobic digestion; anaerobic processes; toxicity response and reduction; sulfide production; refractory organics; and treatment and detoxification of hazardous waste.

응용수리학특론 3 credit

(ADVANCED APPLIED HYDRAULICS)

This course covers hydraulic analysis and design of engineering systems: closed conduits and pipe networks; hydraulic structures, including spillways, stilling basins, and embankment seepage; selection and installation of hydraulic machinery.

응용유체역학특론 3 credit

(ADVANCED APPLIED FLUID MECHANICS ＆ HYDRODYNAMICS)

This course covers incompressible fluid mechanics with particular emphasis on topics in analysis and applications in civil engineering areas; principles of continuity, momentum and energy, kinematics of flow and stream functions, potential flow, laminar motion, turbulence, and boundary-layer theory.

지하수학 3 credit

(GROUND WATER HYDROLOGY)

This is an introductory course emphasizing the fundamental principles governing the movement of groundwater. Topics covered include physical properties of groundwater and aquifer, principles and fundamental equations of porous media flow, well hydraulics and pumping test analysis, groundwater-surface interactions, and role of groundwater in the hydrologic cycle for engineering applications.

추계수문학 3 credit

(STOCHASTIC HYDROLOGY)

This course will cover statistical methods used for hydrological design, some standard time-series methods applied to the modelling of hydrological variables, use of Monte-Carlo simulation in quantifying uncertainty, some stochastic models used for the rainfall input to hydrological systems, etc.

토양·지하수오염및복원 3 credit

(POLLUTION AND REMEDIATION IN SOIL AND GROUNDWATER)

This course provides introduction of soil and groundwater pollution; toxic chemicals and its environmental effects; regulation and related law biogeological cycling in soil and groundwater system; halogenated organic compounds; and off-site and in-site remediation by physicochemical and biological Methods.

통합폐기물관리시스템 3 credit

(INTEGRATED SOLID WASTE MANAGEMENT)

This course covers evolution of solid waste management; legislative trends and impacts; physicochemical and biological properties; engineering principles; collection, transportations, processing and disposals; separation and recycling; design, management and rehabilitation of sanitary landfills; and leachate treatment.

해안공학특론 3 credit

(COASTAL & HARBOR ENGINEERING)

This course covers linear theory of water waves, wave transformations due to boundary conditions, sediment motion, and elementary tidal theory; shoreline protection methods; and applications illustrated by laboratory experiments and selected case histories.

해안수리학 3 credit

(COASTAL HYDRAULICS)

This course covers theory of water waves, classical water wave problem and approximate solution techniques, evolution equations for and their solutions wave systems, viscous damping effects and mass transport, nonlinear shallow-water waves and the Korteweg-deVries equation, and waves on beaches.

혐기성환경생물공학 3 credit

(ANAEROBIC BIOTECHNOLOGY)

This course covers perspective on biological treatment; principles of anaerobic biotechnology; operational considerations; treatability protocol; biomass immobilization; reactor configurations; bicarbonate alkalinity and buffer capacity; trace metals and nutrients; toxicity response; and sulfide production; refractory organics.

환경관리현안문제세미나 3 credit

(SEMINAR IN ENVIRONMENTAL MANAGEMENT)

This course covers management and innovative technology in surface water, groundwater and soil environments; literature review and seminars in special topics; project and examination.

환경미생물학특론 3 credit

(ADVANCED ENVIRONMENTAL MICROBIOLOGY)

This course covers fundamentals of environmental microbiology; type and physological properties; cell growth; water environment and extremophile; sampling and analysis; microscopic observations; biogeological cycle; organic pollutants and heavy metal pollutions; microbial application in water processing; and disinfection; toxicity analysis.

환경생물공학 3 credit

(ENVIRONMENTAL BIOTECHNOLOGY)

This course covers overview of environmental biotechnology such as; basic microbiology; biological stoichiometry and bioenergetics; basic kinetics; reactor configurations; elements and design of AS process; aerobic biofilm processes; biological nitrogen/phosphorous removal; activated sludge modification; liquid-solid separation; sludge settleability and secondary settling tank; and plant analysis and design on anaerobic digestion of municipal sludge.

환경시스템분석 3 credit

(ENVIRONMENTAL SYSTEM ANALYSIS)

This course covers environmental management system and its status; public owned treatment works; environmental quality standards; environmental impact; and environmental quality monitoring and analysis.

환경화학특론 3 credit

(ADVANCED ENVIRONMENTAL CHEMISTRY)

This course provides fundamentals of environmental chemistry; physical, organic and bio-chemistry; equilibrium chemistry; water and wastewater analysis; turbidity; color; acid/base chemistry; BOD; COD; N; P; solids; trace inorganics; gas chromatograph; ion chromatograph; and high performance liquid chromatograph.

* **토질ㆍ도로공학전공**

(TEOTECHNICAL AND HIGH-WAY ENGINEERING)

GIS및교통계획 3 credit

(GEOGRAPHICAL INFORMATION SYSTEMS AND TRANSPORTATION)

This course introduces transportation and traffic engineering, intelligent transportation systems, land-use and transportation systems, multimodal transportation, public transportation, and applications of geographic information systems to transportation (GIS-T)

ITS 3credit

(INTELLIGENT TRANSPORTATION ENGINEERING)

This course provides a broad overview of the concepts and policies surrounding Intelligent Transportation Systems. The course covers the ITS architecture, planning issues related to ITS development and deployment, sensing technologies used to support ITS functions, applications of technologies to enhance traffic operations, transit operations, transportation safety and vehicle control.

건설경제성 공학 3 credit

(Introduction to Construction Economics)

This class will discuss the concept of cost management and construction economics for applications of schedule management and cost-savings method. Detailed theory and applications of construction cost management, cash flow, life-cycle cost, and project financing will be delivered in this class.

건설 시뮬레이션 기법 3 credit

(Construction Simulation)

This class will discuss the simulation techniques to analyze process cycle of construction and civil engineering. Theoretical and quantitative analysis will be taught to let the students be able to solve various problems and challenges through the simulation approach.

교통시설설계 3 credit

(DESIGN OF TRANSPORT FACILITIES)

This course covers system components, and vehicle characteristics and human factors.

The course also covers highway design objectives, constraints and controls, design principles for alignment, and cross section and intersections. Application of design principles to an actual design project will be covered.

The objects of this course is to identify and characterize the key attributes of the vehicles, operators and highway systems that affect geometric design.

기초공학특론(1) 3 credit

(ADVANCED FOUNDATION ENGINEERING Ⅰ)

This course focuses on foundation soil and embankment materials, on-site investigation, indoor test various techniques, learning, estimate the strength and the laboratory test results of comparative analysis, the bearing capacity of the pile foundation buried structures and interpretations, groundwater fluctuations, and disturbances fat behavior analysis

기초공학특론(2) 3 credit

(ADVANCED FOUNDATION ENGINEERING Ⅱ)

This course covers earthquakes, traffic load, tide fluctuations, groundwater table fluctuations, soil behavior, the dynamic interaction of soil structure and soil, soil-structure design, stable, review, and foundation soil behavior predictions

도로공학세미나 3 credit

(HIGHWAY ENGINEERING SEMINAR)

Topics covered weekly seminars on highway planning, design, operations, policy, financing, and management.

도로교통계획특론 3 credit

(ADVANCED HIGHWAY TRANSPORTATION PLANNING)

This course introduces the highway transportation as related to studies, planning, operation, and administration. This course requires extra works, including assigned readings and a term paper, in order to understand the planning and design of complex highway projects involving the relationship of traffic data and interpretation for design and applications.

도로교통류이론 3 credit

(TRAFFIC FLOW THEORY)

This course presents the fundamental aspects of Traffic Flow Theory, both at the microscopic and macroscopic levels. The course covers a variety of models and theories used in the study of complex traffic systems, ranging from traditional conventional theories to recently developed new concepts.

무선센서 네트워크개론 3 credit

(Introduction to Wireless Sensor Network Applications)

This class will focus on the basics of wireless sensor network for possible ubiquitous computing applications in civil engineering. The component and architecture of hardware and software will be covered through theory and application basis, and educational experiment with sensor kit will be performed to design and apply the wireless sensor in civil engineering areas.

보강토공법(1) 3 credit

(REINFORCED EARTH METHOD Ⅰ)

This course focuses on soft ground reinforced method, principles of reinforced earth, slope stability, reinforced earth retaining wall, reinforcement (metal, synthetic fibers), a bunch epidemiological characterization, selecting suitable stiffener members, and the interaction of soil and the stiffener.

보강토공법(2) 3 credit

(REINFORCED EARTH METHOD Ⅱ)

This course covers geosynthetic fiber reclamation on soft ground to facilitate the consolidation, to increase performance, to identify their interactions and relationship factors that affect the drainage of the soil, and to analyze drainage mechanism.

암반역학(1) 3 credit

(ROCK MECHANICS Ⅰ)

The aim of this lecture is to convey to classification of the rock mass, the basic theory of continuum mechanics, the physical properties of rocks and test methods, the mechanical properties of the rock and test methods, rock strength and fracture criterion, the deformation characteristics of the rock is related to the dynamical model for the interpretation of rock structures, and investigate how characteristics of rock discontinuities.

암반역학(2) 3 credit

(ROCK MECHANICS Ⅱ)

This class covers joint development of the rock structures, survey and mapping, rock engineering classification of rock discontinuities using the stereographic projection technique, display and modeling techniques, the mechanical properties of discontinuity, stress-strain analysis theory, rock slope stability analysis, and countermeasure methods.

이론토질역학(1) 3 credit

(THEORETICAL SOIL MECHANICS Ⅰ)

This class covers theory required to understand spoil behaviors, basic theory on the plasticity, yielding criteria and constitutive laws of soils based on elasto-plasticity, advanced constitutive model and application to the actual behavior.

이론토질역학(2) 3 credit

(THEORETICAL SOIL MECHANICS Ⅱ)

This course covers representative theory to describe the behavior of the geomaterials. Also, this class focuses on limit analysis and critical state theory, applications to the various analysis techniques for soft ground, and stability analysis of geotechnical problems.

전산토질역학 credit

(COMPUTATIONAL SOIL MECHANICS)

This course covers numerical geotechnical problems, use of the basic OA tools, numerical analysis techniques, finite difference/finite element analysis program, analysis of the site investigation data, slope stability analysis, pile foundation interpretation, and water seep and consolidation problems.

지반개량특론 3 credit

(ADVANCED GROUND IMPROVEMENT)

This course covers ground characteristics for constructing structural buildings (static, dynamic, and flooding, improve, admixture, and new materials applicable) and investigation of the optimum soil conditions.

지오신세틱스 3 credit

(GEOSYNTHETICS)

This is an introductory course focusing on effectiveness review to apply the chemical separation, maintenance and reinforcement with geosynthetic soft ground. This course also deals with synthetic chemical products used in civil engineering, and structural, geotechnical, mutual behavior analysis and mechanism.

측지공학특론 3 credit

(ADVANCED GEOMETIC SURVEYING)

This course introduces the methods of digital representation of maps, coordinate development, digitizing, stereocompilation, scanning, remote sensing, hardware and software systems, file conversion, integration into GIS systems, attribute development.

터널공학 3 credit

(TUNNEL ENGINEERING)

This is an introductory course focus on tunnel classification according to the soil conditions for tunnel design, geotechnical investigation techniques, step-by-step excavation, soil stress-displacement analysis, testing, geotechnical characteristics, and the joint design and construction methods (NATM technology).

토목지질학 3 credit

(ENGINEERING GEOLOGY)

The aim of this lecture is to provide understanding of the process of soil formation, classification of sediments and engineering characteristics, classification and properties of the rock, geological structure, a kind of cause, and generation of the mineral composition of groundwater movement, surveys, reservoir and dam lipid irradiation.

토목철도공학 3 credit

(RAILWAY IN CIVIL ENGINEERING)

This course introduces the design of railway track, and includes alignment design as well as the design and construction of track-form and formation. Junctions are considered, and issues of capacity and speed are addressed.

현장계측기법 3 credit

(FIELD INSTRUMENTATION)

This course is an introductory level of instrumentation techniques used in many areas of civil engineering. Fundamentals of measurement theories, interpretation, considerations, instrumentation, and application areas will be covered. In addition, both wired and wireless measurement techniques will be introduced to follow up fast changing technologies used in field instrumentation.

현장조사및시험 3 credit

(SITE INVESTIGATION)

The class covers site survey planning, field-situ testing, sampling, laboratory tests, and optimal design technique based on physical, mechanical properties of measurement.

흙구조물설계 3 credit

(DESIGN OF SOIL STRUCTURES)

This is an introductory course emphasizing a study on the design method (earth dam, seawall, tunnels, retaining walls, and sheathing), soft ground improvement method, consolidation process, the substitution process, reinforcing process, pile foundations, the theoretical analysis, and the applicability of the actual ground structure design.

흙의동역학 3 credit

(SOIL DYNAMICS)

This is an introductory course emphasizing on the load characteristics of vibrations acting on clay, the stability of dynamic loads due to earthquakes, elastic vibration, the propagation theory, and vibration load bearing capacity of the foundation settlement.

교통시스템분석및평가 3 credit

(TRANSPORTATION SYSTEMS ANALYSIS AND EVALUATION)

This course identifies concepts fundamental to the planning, design, operation, and management of transportation systems. Transportation systems analysis is a multidisciplinary field with a unified theoretical basis and a diversity of practical applications that incorporates concepts from economics, engineering, operations research, statistics, management, psychology, and public policy analysis. Topics include the basic demand-supply microeconomic framework, analysis of transportation demand, transportation system performance, network equilibrium, and associated case studies.