Descriptions of Courses

❒ Undergraduate Program

CE201 Mechanics of Materials
This course covers properties of structural members. These properties include tension, compression and shear forces, strain energy, stress-strain relationship, axially loaded member, torsional members, shear force and bending moment on beams, stresses in beams, stress and strain analysis, principal stress and strain, yielding condition of materials, and deflection of beams

CE202 Structural Mechanics I
This course covers types of structures, forces and stresses, analysis of beams, trusses, frames and grid structures to obtain reactions, stresses, and displacements. It also covers the behavior of structures under moving loads, influence line, behaviors of columns and application of energy methods to structural mechanics.

CE203 Fluid Mechanics
This course covers properties of fluids (weight, density, viscosity), fluid statics, flow patterns, stream line equation, continuity equation, momentum equation, behaviors of incompressible fluids, and kinetics of fluids.

CE205 Engineering Drawings and Computer Graphics
This course covers practice of drawing fundamentals, understanding existing and detailed drawings, drawings for construction works and learning how to use computer graphic programs in drawings.

CE207 Elementary Structural Engineering and Laboratory
This course introduces structural engineering, fundamental theory of material properties, studies on structural analysis and design methods for various types of structures through experiments.

CE210 Architectural Programming&Planning
The goal of this course is to provide students with 1) basic knowledge of concepts of architectural planning relevant to design and 2) ability to use these concepts to plan and design buildings and structures. This course covers topics on design strategy and approach, planning strategy, architectural programming, site analysis, planning strategy y construction type, planning examples and field survey.

CE230 Soil Mechanics and Laboratory Ⅰ
This course deals with origin of soils, structures, fundamental properties and related problems. It is also taught to explain flow of water in ground, 1-dimensional compression, effective stress, and stress distribution in soils.

CE231 Soil Mechanics and Laboratory Ⅱ
This course deals with fundamental geotechnical problems and their solutions. It contains consolidation, shear strength, lateral earth pressure, slope stability, environmental geotechnology, subsoil exploration, etc.

CE251 Hydraulics
This course covers properties of water, characteristics of open channel flows and pipe flows. The students investigate and analyze several flow problems in view of civil engineers.

CE272 Environmental Science
This course introduces the fundamentals of environmental science such as the relationship of human and

environment, importances of environmental conservation and water pollution problems.

CE273 Environmental Microbiology
This course is focused on the characteristics of micro-organisms such as chemical composition, biological activity, metabolism, etc. Futhermore, applications of micro-organisms to the energy and metal recovery of refuse, water and wastewater treatment, fuel and biomass productions are briefly introduced.

CE291 Surveying and GIS
This course deals with introduction to surveying, distance surveying, leveling, plane table surveying, transit and theodolite, traverse surveying, route surveying. Also GIS concepts, GIS structures, data processing, digital terrain model, and case studies are introduced.

CE303 Vibration Engineering
This course covers basic concepts of structural dynamics, free and forced vibration of single- and multi-degree of freedom systems, time and frequency domain solution techniques including convolution and Fourier transforms, approximate solution techniques, and vibration and modal analysis of continuous systems such as bars, beams and frames.

CE312 Structural Mechanics II
This course covers application of the principle of least work and the principle of virtual work, deflection and structural behavior of unsymmetrical elements, analysis of curved elements and analysis of statically indeterminate structures.

CE313 Computational Methods in Structural Analysis
This course introduces the finite element method, basic topics of finite element technology, domain discretization, polynomial interpolation, application of boundary conditions, assembly of global arrays, and solution of the resulting algebraic systems.

CE314 Design of Reinforced Concrete Structures
This course introduces design code for concrete structures: design of beams, columns, slabs, and footings.

CE315 Reinforced Concrete and Laboratory
This course covers properties of concrete material, flexural behavior of beam, axial and flexural behavior of column, shear and torsion, bond and anchorage, deflection and crack. Laboratory work is also performed.

CE331 Rock Mechanics
This course covers the origin of rock and its classification, the characteristics and behaviors of rock mass, the shear strength of rock mass, the laboratory and field testing methods of rock, the state of stress, rock mass classification, the mechanical behavior of rock mass, and the applications of rock mechanics to engineering problems.

CE332 Foundation Engineering
This course deals with site investigation, in situ testing, bearing capacity and settlement of shallow foundation; the topics of site improvement, earth pressure theory, retaining wall, pile and pier foundations are also treated.

CE333 Soil Dynamics
This course deals with elastic wave propagation (bar, infinite media, half space), site investigation using elastic waves, dynamic soil properties, nondestructive test and evaluation, vibration criteria, monitoring and control, machine foundations, seismic design code, earthquake ground motion, liquefaction.

CE354 Coastal and Harbor Engineering
This course deals with fundamental topics such as ocean wave mechanics, near-shore current, costal sediment, and coastal surveys. These subjects are related to the design and construction of coastal structures and harbors.

CE371 Environmental Chemistry
The goal of this course is to study basic knowledge of chemistry to identify natural phenomena in air, water, and soil systems and to develop students ability to apply to the treatment of natural and engineered environments contaminated by toxic chemical compounds.

CE372 Water and Wastewater Engineering
This course deals with distribution systems of water, collection systems of wastewater, properties of pumps, and physical, chemical, biological unit processes.

CE373 Hydrology
The water cycle and its component processes are introduced. The topic of surface runoff water is discussed in depth. All of the topics are relevant to provide an engineering basis for quantity management of rivers and lakes.

CE374 Unit Operation in Environmental Engineering
This course introduces the fundamentals of unit operations in water and wastewater treatment.

CE376 Waste Management Engineering
Students will learn 1) waste generation, collection, and transportation, 2) waste treatment an treatment and treatment technologies, and 3) waste recycling and recovery technologies. This course also covers domestic wastes, general solid wastes, and hazardous wastes and provides basic knowledge for the development of waste treatment technologies.

CE411 Practice in Structural Engineering
This course covers design codes and drawings, usage of general purpose computer software packages for structural analysis, bridge construction methods, experimental techniques and structural testing, non-destructive testing, and solution methods for practice problems.

CE412 Design of Steel Structures
This course covers material properties and behavior of steel, understanding and comparison of design codes for steel structures, design of beam-to-column joints, design of steel members such as beams and columns, and fundamental theories for buckling of structural members.

CE413 Prestressed Concrete
This course covers basic concepts of prestressed concrete, material properties, flexural design, shear and torsion, bond and anchorage, anchorage zone design, partial loss of prestress force, composite beams, analysis of continuous beams and deflections.
CE414 Structural Planning
This course introduces structural planning, significance of structural planning, economic and efficient structural planning, further study of application to various structures.

CE415 Design in Civil Engineering
This course covers load, investigation of field, design codes, design of reinforced concrete and steel

structures, introduction of bridge design, design of retaining walls and foundations, design of offshore structures, fundamentals of seismic design, etc.

CE417 Structural Design of Building
This course introduces structural system of high-rise building, building code for reinforced concrete, building code for steel structure, practice of structural design of reinforced concrete and steel high-rise building.

CE418 Design Practice of Structure
Based on the overall understanding for the structural engineering, design practices for real structures including bridges, buildings, tunnels, and special purpose structures are introduced, and the integrated understanding for structures and their design procedures is achieved through a series of practices such as visiting construction site and making a model structure.

CE431 Geotechnical Engineering Practice
Based on the fundamental soil mechanics theory, this course deals with various solutions on geotechnical engineering problems and designs of practical geotechnical structures. It specially concentrates on the updated solution techniques and methods applied to real in situ geotechnical problems.

CE433 Pavement and Traffic Engineering
It is the purpose of this course to give undergraduate students a treatment of the principles of pavement and traffic engineering. The design of pavement structure, the characteristic of traffic, pavement management system are included.

CE434 Computer Methods in Geotechnical Engineering
This course deals with an introduction to general theory of numerical analysis, computer application to geotechnical engineering, computer-based analysis and automatic design of foundations and earth structures, reliability assessment through comparison of results obtained by field tests and those calculated by numerical analysis, and so on.

CE435 Geotechnical Engineering Ⅰ
This course is aimed at performing geotechnical engineering design for practice, based on soil mechanics and foundation engineering principles, such as site characterization and geotechnical properties, consolidation and settlement, seepage and its control, retaining wall, slope stability, and foundation.

CE436 Geotechnical Engineering Design II
This course is aimed at performing geotechnical engineering designs for practice, based on soil mechanics and foundation engineering principles, such as excavation sheet pile structures, soil improvement, rock blasting, underground structure and tunnel, pre-reinforcement, and landfill liner.

CE471 Sanitary Systems Engineering and Design
This course covers fundamental hydraulics related with pipe flows, design of water and wastewater system by estimating demand capacity, and optimal operations of the systems.

CE472 Remediation System Design and Engineering
Students will develop understanding of basic approach to remediating contaminated sites and ability to screen, choose, and design appropriate technologies for environmental remediation.

CE474 Environmental Management Engineering
This course deals with various management tools of environmental engineering except water quality management. It deals with life-cycle assessment, risk assessment, and environmental software packages which currently get much attention, and conflict management to adjust the environmental problems. What is learned in this course will be very helpful in multi-disciplinary decision making which incorporates the environment, economy and risk.

CE481 Environmental Engineering Practices
This class is to introduce contemporary special topics environmental engineering emphasizing field practices and application.

CE491 Civil Construction Technology
It deals with construction technology of civil structures. It contains earth works, foundation, excavation, concrete works, construction, planning, bridge works, pavement works, retaining works, tunnels, dams, harbor works, etc.

CE493 Construction Management and Project Scheduling
This course introduces concepts in construction management. Topics include: selection of construction sites, decision of construction method, estimation, strategy for a bid, reception of an order, contract, construction organization, information system for construction site management, planning method of construction schedule, optimal application method of resources(manpower, equipment, material, money), safety supervision and quality management, etc.

CE490 B.S. Thesis Research

CE495 Individual Study

❐ Graduate Program

CE501 Advanced Mechanics of Solids
This course covers stress-strain relations, fundamental theories of elasticity based on the tensor method, introduction of plasticity and fracture mechanics, shear and torsion analysis of box sections, introduction of energy theorems and the principle of least work.

CE502 Advanced Soil Mechanics
This course deals with fundamental characteristics of soil behavior, shear strength, consolidation theory for drainage-installed soft ground and some field performance of embankment on soft clay. Several analytical methods of consolidation theories are explained and their results are discussed. The analytical results are compared with those obtained in the field measurements.

CE503 Advanced Fluid Mechanics
This course covers flow of ideal fluid, theory of boundary conditions, numerical analysis of fluid behaviors, and computer aided analysis by understanding governing equations.

CE504 Advanced Environmental Chemistry Ⅰ
The goal of this course is to understand the concept of advanced chemistry and develop the ability of application for the identification of chemical phenomena occurred in natural and engineered environments. The course will provide basic knowledge to properly conduct important environmental researches and to fully

understand environmental problems in hazardous waste treatment, wastewater treatment, and contaminated soil and groundwater remediation.

CE505 Applied Mathematics
This course introduces fundamental mathematical techniques related to applied mechanics, dealing with vectors, tensors, analysis of vector fields, matrix and linear equations, eigen-value problems, linear spaces, linear operations, functionals, variational and approximate methods, complex variables, conformal mapping, Fourier transformation and Laplace transformation, etc.

CE513 Properties of Concrete
This course introduces the chemical composition of cement, fracture and fatigue behavior of concrete, strain rate effect, thermal stress due to hydration heat, creep and shrinkage behavior of concrete and concrete structures, and new construction materials.

CE514 Structural Dynamics
This course covers single- and multiple-degree-of-freedom vibration problems, normal mode superposition methods, modal analysis and matrix formulation of vibration problems, natural frequency and mode, principle of D'Alembert, Newton's second law, principle of virtual work, and Lagrange's equations for systems of particles and for rigid bodies.

CE515 Mechanics of Composite Materials
This course introduces materials and their applications, anisotropic elasticity, failure theories, hydrothermal behavior, 3-D stress analysis of laminates, hybrid composites and advanced topics, design principles for bracings and members subjected to torsion, design of composite beams, columns, and beam-columns, behavior and design of shear, and semi-rigid and moment connections.

CE516 Finite Element Analysis
The course covers the fundamental theory of Finite Element Methods and its application in structural engineering. It includes shape functions, stiffness matrix, direct methods, variational method, weighted residual method, assembly of stiffness matrix and solution of equilibrium equations, static and dynamic analysis, linear and non-linear problems, and computer programming.

CE517 Computer Methods in Structural Engineering
The course covers FORTRAN programming, computational structural analysis, structure estimation, and software packages for design of structures.
CE518 Reliability Analysis of Structures
This course introduces probability and statistics, extreme value distributions, probability of failure, reliability, reliability index, failure modes of structures, reliability of structures, system reliability, Monte-Carlo simulation, and load and resistance factor design.

CE519 Bridge Engineering
This course covers design code, influence line, load, the Rahmen bridge, the slab bridge, and the PS concrete box-girder bridge.

CE520 Introduction to Smart Structure Technology
This course offers an introduction to the emerging technologies in smart structure systems and the application of smart structures technologies to civil infra-structures. Contents of lectures include the concepts of smart materials and their properties, advanced sensors, signal / information processing, structural health monitoring method, control theories (passive / semiactive / active) and their applications to civil infra-structures. Students

will gain understanding of the state-of-the-art smart structures technologies through lectures and laboratory tests and have chances to work on their application to civil infra-structures.

CE521 Design of Structures under wind Load
The course covers engineering understanding of wind and wind effects on buildings and structures, wind effects analysis by wind tunnel testing, how to use the provisions of foreign codes and standards, and guidance on the design of wind resistant buildings.

CE522 Solid Continuum Mechanics
A unified introduction to the mechanics of elastic, plastic, and time-dependent engineering materials and structures. Review of elementary theory of elasticity, kinematics of deformation, constitutive equations, two-and three-dimensional linear elastostatic problems by special techniques, linear viscoelasticity, classical rate-independent plasticity theory.

CE531 Geotechnical Experiments
This course deals with transducer characteristics, calibration, direct shear test, triaxial test (UU, CU, and CD), permeability test (fixed wall, flexible wall), consolidation test, free-free resonant column test, small-strain triaxial test, impact echo test, vibration monitoring, and cross-hole tests.

CE532 Rock Engineering
This course covers an introduction to stress analysis, the physical properties of rock, underground stresses, laboratory and field instrumentation, model studies, rock mass properties, excavation and blasting, and the discussion of a number of rock mechanics field applications associated with civil, mining, and petroleum engineering, and geoscience.

CE533 Site Investigation and Monitoring
This course deals with site investigation plan, boring method, SPT, CPT, DMT, Field Vane Test, PMT, refraction survey, cross-hole test, SASW test and also includes in situ monitoring plan, equipments and case studies.

CE534 Theoretical Soil Mechanics
This course focuses on the critical state theory. Based on the theory, some models to describe the soil behavior are discussed. Especially, Cam-Clay model and its design properties are deeply explained. Upper and lower bound theories are also dealt with to calculate the bearing capacity of foundations.

CE535 Advanced Foundation Engineering
The design of deep foundations is the main subject of this course. The load-transfer mechanism, bearing capacity, settlement, static and dynamic load tests, analysis of group piles are discussed for the vertically and horizontally loaded driven piles and drilled shafts.

CE536 Underground Structures
This course is designed for graduate students. Special attention is paid to highlight the common principles unifying the presented set of topics such as geological and geotechnical explorations required, design considerations, construction of tunnels and shafts, geo-mechanical analysis, design of ground water control, and instrumentation and monitoring.

CE537 Soil Improvement & Reinforcement
This course deals with choice, applicability, analysis methods and construction methods of various improvement and reinforcement techniques for soft ground. This offering contains soft ground characteristics,

choice and applicability of various methods, design analysis, construction methods of various improvement and reinforcement methods.

CE539 Earth Retaining Structures
This course includes treatments of earth pressure theory, retaining wall, sheet pile wall, braced excavation, reinforced earth wall, soil nailing, ground response adjacent excavation, and excavation maintaining.

CE571 Environmental Engineering Laboratory
This course deals with theories and experiments related to the manufacture of physical, chemical and biological reactors, operational and experimental plans, scale-up problems, and analysis / application of environmental data.

CE573 Biological Wastewater Treatment Processes
This course examines biological wastewater processes to remove organic materials and nutrients from municipal, industrial or other wastewater and some factors that are important to understand microbial activity in biological wastewater treatment. It also includes anaerobic digestion and aerobic composting of sewage sludge. The completion of a term project is required for all students.

CE575 Industrial Wastewater Treatment
This course provides with not only the basic information such as status, regulations, characteristics of wastewater but also its applications including various treatment processes and economic analysis. The completion of a term project is required for all students.

CE577 Water Quality Management
This course introduces the fundamentals and applications of environmental management, especially about environmental soundly sustainable development (ESSD) in the area of water quality management.

CE578 Advanced Groundwater Engineering
This is a course emphasizing the fundamental principles governing the movement of water and contaminants in groundwater systems, and the construction of mathematical models and their solution by numerical techniques.

CE579 Hazardous and Industrial Waste Treatment
This course consists of clean technologies, reduction technologies, intermediate and final waste disposal technologies in hazardous and industrial waste management. It also includes purification technologies for contaminated soil and groundwater. Term projects are required for all students.

CE611 Inelastic Analysis of Reinforced Concrete Structures
This course covers creep and shrinkage in RC structures, thermal effects and analysis of RC structures, limit design and yield line theory, application of fracture mechanics to concrete structures, and nonlinear analysis by Finite Element Method.

CE612 Plastic Design
This course introduces plasticity, compatibility conditions, plastic deformation of beam and frame structures, plastic analysis for the static and dynamic loads, plastic hinge analysis, yield line theory, etc.

CE613 Optimal Design of Structures
This course covers optimization theories, linear and nonlinear programming (secondary or geometric programing), weight optimization and topology optimization of structures with or without constraints.

CE614 Stability of Structures

This course covers buckling theories for the elastic to inelastic stability of structural members, buckling of plate and shell, energy methods, characteristic function, numerical analysis. characteristic of post-buckling and torsional buckling.

CE615 Application of Finite Element Method

The course covers application of finite element method on civil engineering area, FE modeling and solution techniques using package program, various structural engineering examples, structural design optimization, soil-structure interaction and solid-fluid interaction.

CE616 Probabilistic Methods in Structural Dynamics

This course introduces probability, random processes, correlation functions, power spectral density, spectral analysis, structural analysis for random excitation, random vibration of nonlinear systems, probabilistic fatigue analysis, and system identification

CE617 Earthquake Engineering

This course covers the mechanism of earthquake occurrence, tectonic plate theory, engineering characteristics of earthquake, seismic hazard analysis, earthquake ground motion, response spectra, dynamic responses of structures subjected to earthquake, nonlinear structural responses, frequency domain analysis, preventive design of structures (buildings, bridges, and underground structures), soil-structure interaction, probabilistic earthquake risk analysis, and earthquake mitigation and management.

CE618 Computational Methods in Structural Dynamics

This course covers theory and application of computational structural dynamics, equilibrium and compatibility, principle of virtual work, Lagrange's equations, response of linear and simple nonlinear structures to dynamic loads, use of computer programs for structural analysis, modeling of single- and multi-degree of freedom structures, and verification and interpretation of structural response by computer program.

CE619 Vibration Control of Structures

This course introduces the theory of structural passive and active control, applications to vibration isolation, damping treatment, and dynamic absorbers, application to tall buildings, cable-stayed bridges, and tension structures, design of classical feedback control systems for civil structures, and simulation studies using customized computer software.

CE620 Nonlinear computational Mechanics

This course deals with stress-strain relationships, basic governing equation of nonlinear analysis, material nonlinear, geometric nonlinear, formulation, solution methods, etc.

CE621 Advanced Design of Steel Structures

This course covers material properties of steel, buckling theory, buckling behavior of plate, design of beam-column, design of stiffeners, LRFD method, etc.

CE622 Structural Analysis of Plates and Shells

This course covers basic theory of plate and thin shell, large deformation theory, stability of plate and shell, numerical methods, design of reinforced concrete shell roofs, analysis and design of containment vessels and pressure vessels, etc.

CE631 Advanced Numerical Soil Mechanics

This course discusses the applicable numerical methods to geotechnical problems. The geotechnical problems that are dealt with in this course are seepage, consolidation, displacements of retaining and underground structures, excavations, embankment, etc. The numerical analysis methods such as the finite difference method (FDM), the finite element method (FEM), the boundary element method (BEM), and the discrete element method (DEM) are used to solve the geotechnical problems.

CE632 Soil Behavoir

The constitutive equations applicable to geomaterials are discussed in this course. the stress-strain relationships based on microscopic and macroscopic aspects and their implementation to the numerical analysis methods are explained. Some example problems are solved by computer programs and their results are discussed.

CE633 Advanced Soil Dynamics

This course deals with elastic wave propagation(bar, infinite media, half space), site investigation using elastic waves, dynamic soil properties, nondestructive test and evaluation, vibration criteria, monitoring and control, and machine foundations.

CE634 Signal Processing for Civil Engineering

This course covers signal processing and system identification for civil engineering problems focused on signals and systems, time and frequency domain analysis, nonlinear system, discrete inversion analysis, system identification analysis, and tomography imaging.

CE635 Seepage & Slope Stability

This course deals with flow characteristics in soils, seepage analysis and slope stability analysis. In consideration of national slope failure characteristics, it contains a coupled seepage and slope stability analysis and seepage in unsaturated soils.

CE636 Geotechnical Earthquake Engineering

This course deals with performance based seismic design code, earthquake ground motion, soil liquefaction, evaluation of dynamic soil properties, seismic design of various geotechnical structures.

CE637 Theory of Geophysics

This course covers the principles of elastic and electromagnetic waves, applied to geophysical characterization, to understand the interaction of soil and water, conduction and diffusion, elastic wave in soil, electromagnetic wave in soil, wave velocity and attenuation, elastic and electromagnetic wave measurements in laboratory, and their applications.

CE638 Pavement Engineering

This course is designed for graduate students in civil engineering to get ability for the analysis and design of pavement structure, and understanding for the characteristics of pavement materials, and principal of pavement management system

CE671 Water Quality Modeling

This course introduces the fundamentals and applications of water quality models for lakes, rivers, estuaries, and aquifers.

CE672 Physical Principles in Environmental Engineering

This course introduces the fundamentals and applications of the physical unit operations in the design of

environmental facilities.

CE673 Theory of Remediation
The goal of this course is to identify the fate and transport of toxic contaminants in soil and groundwater environments, to understand physicochemical and biological phenomena, and to develop an ability to apply basic and advanced theories of remediation processes to the in-situ and ex-situ treatments.

CE674 Advanced Environmental Chemistry Ⅱ
This course focuses on the reactions of environmental physical chemistry affecting anthropogenic and naturally occurring organic and inorganic compounds. Physicochemical properties of the compounds will be used to understand chemical transfers among the environmental media and quantitative structure activitgy relationship (QSAR) will be set up to predict the fate of toxic chemical compounds.

CE715 Special Topics in Structural Engineering
All structural problems uncovered in other classes are covered in this course: seismic design and analysis, soil-structure interaction analysis, wind analysis and design, wave load analysis and design, fluid-structure interaction analysis, system identification technology and vibration control, etc.

CE731 Special Topics in Geotechnical Engineering
This course deals with various practical geotechnical engineering problems excluded in the regular program. It contains design, analysis and construction methods of special geotechnical problems, and contemporary R/D topics.
CE771 Special Topics in Environmental Engineering
This class is to introduce contemporary special topics in environmental engineering emphasizing problems and new technologies.

CE960 M.S. Thesis

CE966 M.S. Seminar

CE980 Ph.D. Thesis

CE986 Ph.D. Seminar