Descriptions of Courses

ENV501 Introduction to Clean Technology
This course deals with clean technologies to solve environmental problems fundamentally through pollution prevention. It examines pollutant reduction processes, clean production processes, and zero-discharge / pollutant free processes.

BS532 Applied and Environmental Microbiology
This course introduces characteristics and application fields of environmental microorganisms.

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. Term projects are required for all students.

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 includes purification technologies for contaminated soil and groundwater. Term projects are required for all students.

CBE672 Air Pollution Control
This course deals with source, measure and chemical reaction of air pollutants. It also provides fluid dynamics for particles and the principle and design of atmospheric pollution control system.

CBE673 Water Pollution Control
This course consists of physics, chemistry, biological wastewater treatment, advanced wastewater treatment for refractory pollutants, nitrogen and phosphorus treatment, small scale wastewater treatment systems, and sludge disposal and treatment technologies.

NQE522 Nuclear Power Plant Design Project
This course examines the nuclear reactor and other device design with nuclear engineering theories. It includes the original design of a reactor core that meets the specific shape of reactor, power generation, and other parameters.

NQE541 Radioactive Waste Management
This course is designed for integrated radioactive waste management. It deals with sources and treatment technologies of gas, liquid, and solid waste, solidification and volume reduction technologies, etc. in a nuclear power plant.

BS760 Selected Topics in Environmental Biotechnology
This course provides recent research trends of environmental biotechnology and microbiology and investigates the research methodology and results of up-to-date technologies.

BS536 Environmental Toxicology
This course deals with presence of toxic substances in food and medicine from a viewpoint of bacterial poison, mycotoxin, food poison, insecticide, pesticide, heavy metal and food additives. It includes function mechanism, public health, and the relationship between poisonous substance and detoxification.

CBE503 Numerical Methods for Chemical Engineers

This course is designed for the application of numerical methods to solve complex chemical process problems. It consists of linear algebra, linear equations, non-linear equations, initial / boundary value problems in ordinary differential equations, and the finite element method for partial differential equations.

CBE511 Design of Reaction systems

The objective of this course is to analyze and design reaction systems for chemical engineering. Major contents are reaction kinetics, experimental design, systems with multiple reactions, ideal reactors, heat and mass transports, residence time distribution and nonideal flow reactor design, and stability analysis.

CBE512 Introduction to Catalysis Engineering

This course is designed to serve as an introduction of heterogeneous catalysis and its application for chemical engineering. Topics include catalyst activation, elective adsorption, reaction rate expressions, catalyst preparation, metal catalysts, acid catalysts, zeolite catalysts, and oxidation catalysts.

CBE532 Mass Transfer

This course deals with basic physical concepts, numerical modelling and practical application of transfer phenomena using diffusion theory and coefficient of mass transfer.

ENV521 Environmental Microbial Experiment

This course consists of a series of basic microbial experiments including pure isolation, culture, etc. Students are expected to investigate microbial distribution in environmental systems.

ENV521 Soil and Groundwater Pollution Management Engineering

This course introduces remediation technologies for polluted soil and groundwater. It includes examination of soil properties, treatment methods, and shielding.

ENV661 Toxics Management Engineering

This course deals with basic technologies for hazardous waste from sources to final disposal. Term projects are required for all students.

ENV731 Advanced Water Quality Management Engineering

This course examines management of water quality and water resources. It deals with pollutants to reach various natural systems (surface water, groundwater, estuaries, and coasts) and systematic management of those pollutants. It further discusses management models for long-term improvement in water quality.

ENV741 Advanced Air Pollution Control Technology

This course introduces recent technologies for various air pollution sources. It further designs air pollution control equipments based on literature survey.

ENV791 Special Topics in Environmental Engineering

This course deals with emerging issues, technologies or policies related to environmental engineering.

CE504 Advanced Environmental Chemistry

This course provides fundamental chemical concepts of complex environmental processes treating water, wastewater, hazardous waste, air, and soil / groundwater. Topics include water chemistry, atmospheric chemistry, soil chemistry, and advanced oxidation technologies.

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.

CE575 Industrial Wastewater Treatment - 삭제
This course provides not only the basic information such as status, regulations, characteristics of wastewater but also its applications including various treatment processes and economic analysis. Term projects are required for all students.

CBE571 Energy Engineering
This course is designed for the understanding of alternative energy development and application technologies of coal energy.

CBE680 Membrane Technology
Generally, high molecular and ceramic membranes are used for dialysis, ultra-filtration, reverse osmosis, gas separation and high concentrated cell culturing. Special membranes including Langmuir-Blodgett and conductive membrane are used for manufacturing various biosensors. This course examines membrane materials, membrane manufacturing, standardization, transfer phenomena, polarization, fouling and membrane regeneration.

CBE632 Colloids and Surface Chemistry
This course deals with phase transitions and colloidal forces due to soluble polymer, colloidal stability, equilibrium phase behavior and liquid and self-assembling fluids.

CBE761 Bioprocess Analysis and Control
The topics of this course are biosensor systems for on-line monitoring of bioreactors and indirect estimation of parameters which can not be measured. It consists of the optimization of batch-type reactors and the stability and control of continuous-type reactors.

MAE513 Advanced Combustion
This course deals with fundamental methodologies to analyze and understand reacting flows, which is needed for the design of the efficient thermal engines. Also, this subject introduces governing equations of multi-component system and theory of combustion in detail.

MAE654 Noise Control
This course is about basic and comprehensive items about human hearing characteristics, characteristics of sound sources and paths, noise control methodology, and control elements that engineers must know for living and working environments.

MAE810 Special Topics in Thermal & Fluid Engineering
This course deals with the theory and application of thermal fluid mechanics. Detailed information will be decided on and announced before the opening of lecture.

MGT537 Environmental and Resource Economics
This course is about the inhibition factors, for efficient control of resource / environment, such as moral hazard, informational rent and free-rider effect. It also suggests the role of government and industries for the solution and deals with game theory for setting the conflicts between economists.

NQE512 Nuclear Reactor Analysis and Design
This course is designed to cover nuclear reactor analysis and design, introduction of neutron transport equation, approximation of diffusion theory, solution of few-group and multi-group neutron diffusion equation, calculation of energy distribution of fast and thermal neutrons, and homogenization of heterogeneous reactors. It also includes recent methods (i.e., nodal method) to predict the spatial and

temporal distribution of neutrons and computer code practice used to design practical nuclear reactors.

NQE513   Neutron and Radiation Transport Theory
This course is designed to cover the particle transport solution theory, numerical algorithms, and computational methods for continuous, one-group, multi-group neutron and radiation transport phenomena. Major contents are singular eigenfunction expansion, Green's function, spherical harmonics, discrete ordinates, integral transport, even-parity transport, method of characteristics, Boltzmann-Fokker-Planck transport methods for various quantum particle (neutrons, photons, electrons, positrons, protons, etc.), transport phenomena, radiation shielding facilities, analysis of radiation, and energy deposition profiles in systems such as nuclear fusion reactor, accelerator, nuclear bio-medical equipment, semiconductor electronics system, and nuclear imaging problems including nuclear prospecting, nuclear assay, computed tomography.

NQE523   Nuclear Reactor Safety I
This course consists of safety objectives, safety features, safety analysis methods and diagnostic techniques for a nuclear power plant.   A probabilistic safety assessment is emphasized, which includes deterministic analysis for transient state, system reliability, severe accident generation rate, and phenomena. It also deals with the TMI and Chernobyl accidents and other severe reactor accidents as practical examples.

NQE624   Nuclear Fuel and Core Design
This course deals with basic theory and practical applications of thermal-hydraulic, mechanical, and uncertainty analysis to fuel and core design.   Discussion is made on these subjects: methodology on how these parts are coordinated and integrated to yield economical and safe fuel and core design.

NQE575   Nuclear Energy Policy
Historical development and utilization of Nuclear Energy are reviewed from the dawn of atomic age.   This important alternative energy technology is evaluated comparatively in terms of technoeconomic, social-political and environmental aspects of nuclear energy use.   The nuclear energy utilization programs of major countries, regional or global basis are assessed for the characterization of different nuclear energy policy. In view of the established international nonproliferation regime and International Atomic Energy Agency (IAEA), the prospect of Nuclear Energy Policy Alternatives should be analyzed in conformity with changing policy issues.

ENV960   Thesis <Master's Student>

ENV966   Seminar <Master's Student>

ENV980   Thesis <Ph.D. Student>

ENV986   Seminar <Ph.D.>