

Department of Chemical Engineering

Master of Engineering Program in Chemical Engineering (International Program)

M.Eng. (Chemical Engineering)

Plan A Option 2:

Total credits required: minimum 36 credits

(1) Major courses: minimum 24 credits

- Seminar: 2 credits

01202597 Seminar 1,1

- Major requirements: 13 credits

01202511 Advanced Transport Phenomena 3(3-0-6)

01202512 Advanced Chemical Engineering Thermodynamics 3(3-0-6)

01202513 Advanced Mathematics in Chemical Engineering 3(3-0-6)

01202541 Advanced Chemical Reaction Engineering 3(3-0-6)

01202591 Research Methods in Chemical Engineering 1(1-0-2)

- Major electives: minimum 9 credits

Students are required to choose at least 3 credits from the list below and/or choose at least 6 credits of 500 level courses from other related fields. He/she must gain approval from advisory committee, Head of Department, and the Dean of the Graduate School.

01202521 Process Analysis and Simulation 3(3-0-6)

01202522 Advanced Process Control 3(3-0-6)

01202523 Computer Process Control 3(3-0-6)

01202524 Chemical Process Optimization 3(3-0-6)

01202525 Chemical Process Evaluation and Design 3(3-0-6)

01202526 Process Synthesis 3(3-0-6)

01202531 Current Topics in Chemical Engineering 3(3-0-6)

01202542 Chemical Reactor Analysis and Design 3(3-0-6)

01202543 Applied Heterogeneous Catalysis 3(3-0-6)

01202551 Biochemical Engineering 3(3-0-6)

01202552 Biological Waste Utilization 3(3-0-6)

01202561 Energy Conservation and Management 3(3-0-6)

01202562 Safety and Environmental Risk Analysis 3(3-0-6)

01202563 Cleaner Technology and Eco-Design 3(3-0-6)

01202564 Principle of Biofuel Engineering 3(3-0-6)

01202571 Advanced Polymer Engineering 3(3-0-6)

01202572 Advanced Ceramic Engineering 3(3-0-6)

01202573 Polymer Characterization 3(3-0-6)

01202574 Polymer Reaction Engineering 3(3-0-6)

01202575 Computational Polymer Science and Engineering 3(3-0-6)

01202581 Residue Oil Upgrading 3(3-0-6)

01202582 Advanced Project and Production Management in
Chemical Engineering 3(3-0-6)

01202596 Selected Topic in Chemical Engineering 1-3

01202598	Special Problems	1-3
(2) Thesis: minimum 12 credits		
01202599	Thesis	1-12

Course Description

01202511	Advanced Transport Phenomena	3(3-0-6)
	Methods of solving transport problems; coupled system where two or more transport processes interact; unsteady state and steady state transport; momentum transfer, heat transfer, and mass transfer.	
01202512	Advanced Chemical Engineering Thermodynamics	3(3-0-6)
	Principle of classical thermodynamic concepts. System and its environment. Energy with work and heat interactions. Application of the first law for closed and open systems, reversibility, thermodynamic relations of pure materials and mixtures, phase and chemical equilibria. Thermodynamics of surfaces.	
01202513	Advanced Mathematics in Chemical Engineering	3(3-0-6)
	Mathematical formulation and solution of problems drawn from transport phenomena, chemical reaction engineering, and other typical chemical engineering problems employing ordinary or partial differential equations, approximation methods and other advanced mathematical techniques.	
01202521	Process Analysis and Simulation	3(3-0-6)
	Analysis and formulation of mathematical models of chemical processes for steady-state and dynamic behavior. Use of computer and packaged software for process simulation. Analysis and formulation of mathematical models of chemical processes for steady-state and dynamic behavior. Use of computer and packaged software for process simulation.	
01202522	Advanced Process Control	3(3-0-6)
	Advanced control techniques. Multivariable systems. Supervisory and optimization control. Case studies involving the application of advanced control to large chemical process systems.	
01202523	Computer Process Control	3(3-0-6)
	Advanced real-time digital techniques. Digital communication and control algorithms. Analog-to-digital and digital-to-analog converters. Data acquisition technique and microcomputer-based systems. Distributed control system. Control theory. Computerized control system design.	
01202524	Chemical Process Optimization	3(3-0-6)
	Operation and control of chemical processes. Formulation of objective functions. Optimization of problems with constraints. Methods for solving problems using linear and nonlinear programming. Graphical optimization. Regression analysis. Global optimization.	
01202525	Chemical Process Evaluation and Design	3(3-0-6)
	Computer-aided design of unit operations, chemical reactors and integrated plants. Operability characteristics of chemical processes. Design for optimum operability safety, reliability, control.	
01202526	Process Synthesis	3(3-0-6)
	Flowsheet invention. Systematic methods for devising chemical process networks. Representation, search strategies and decision rules, measures of quality. Application to	

	energy recovery and power systems, refrigeration, evaporation, separation sequences and total flowsheets. Thermodynamic efficiency and flow sheet improvement.	
01202531	Current Topics in Chemical Engineering Current Topics in chemical engineering at the master's degree level. Topics are subject to change each semester.	3(3-0-6)
01202541	Advanced Chemical Reaction Engineering Flow behavior of fluid in chemical reactors. Mixing of fluids. Fluid-particle reactions. Fluid-fluid reactions. Catalytic reaction of solid catalysts. Deactivation of catalysts.	3(3-0-6)
01202542	Chemical Reactor Analysis and Design Principle of reaction kinetics and kinetics of heterogeneous catalytic reactions. Transport processes with reactions catalyzed by solids, Gas-solid and gas-liquid reactions. Batch and semibatch reactor. Plug flow reactor. Fixed bed catalytic reactors. Nonideal flow patterns and population balance models. Fluidized bed and transport reactors. Multiphase flow reactors.	3(3-0-6)
01202543	Applied Heterogeneous Catalysis Principle of heterogeneous catalysis. Physical and chemical characteristics of catalysts. Design and modification of catalysts. Catalyst preparation. Analysis of physical and chemical characteristics of catalysts. Industrial applications of catalysts.	3(3-0-6)
01202551	Biochemical Engineering Applications of biochemical process in industry. Kinetics of microbial growth. Mathematical model of biological system. Cell and cell growth. Bioreactor and design. Theory of microbial growth and cultivation. Purification units.	3(3-0-6)
01202552	Biological Waste Utilization The utilization of waste or by-product from the biochemical and other industries by physical, chemical and biological processes.	3(3-0-6)
01202561	Energy Conservation and Management Energy conservation in industry. Energy audit and analysis in lighting system, air conditioning system, thermal system, air compressor and electrical system. Energy management for optimum efficiency and utilization.	3(3-0-6)
01202562	Safety and Environmental Risk Analysis Concepts of risk analysis. Process descriptions. Hazard identification. Fault tree diagram. Quantitative risk assessment. Health and environmental risk assessment. Risk management. Regulations and standards on safety and environment.	3(3-0-6)
01202563	Cleaner Technology and Eco-Design Environmental management systems. Principles of cleaner technology. Pollution source reduction. Process analysis. Cleaner technology audit. Heat and mass exchange network using pinch technology. Life cycle assessment. Ecological and economical design of equipment and production process. Applications of quantitative environmental risk assessment in Eco-Design.	3(3-0-6)
01202564	Principle of Biofuel Engineering Principle of biofuel engineering, Biomass and biofuel, Environmental impact of biofuel. Bioenergy from conventional and advanced biotechnology. Biofuel from fermentation. Production technology for biodiesel, bio-ethanol, biogas, and bio-hydrogen.	3(3-0-6)
01202571	Advanced Polymer Engineering Development of polymer materials. Chemical nature and state of aggregation in polymers. Relation of structure to thermal, mechanical, chemical, electrical and optical	3(3-0-6)

	properties. Additive for polymer materials. Principles of the processing of polymers. Principles of product and structural design.	
01202572	Advanced Ceramic Engineering Types of advanced ceramics and their applications, Controlling diffusion processes. Controlling microstructures. Chemical synthesis of advanced ceramics, Fabrication. Characterization.	3(3-0-6)
01202573	Polymer Characterization Polymer microstructure. Models of polymer molecules. Theory of polymer solutions. Techniques for determination of polymer molecular weight. Techniques for determination of comonomer composition. Thermal and mechanical analysis techniques.	3(3-0-6)
01202574	Polymer Reaction Engineering Concepts in polymer engineering. Principles of polymer reaction engineering. Step-growth and chain growth polymerization. Copolymerization. Polymerization processes. Polymer stability and degradation.	3(3-0-6)
01202575	Computational Polymer Science and Engineering Computational methods in polymer science and engineering. Stochastic and deterministic simulation. Simulation of polymerization. Simulation of structural unit sequencing in polymer molecule. Simulation of polymer chain conformation. Simulation of morphology developments during crystallization and phase separation. Simulation of polymer processing.	3(3-0-6)
01202581	Residue Oil Upgrading Physical properties and chemical composition of residual oil. Thermodynamic and transport properties. Chemistry of upgrading reactions. Kinetic analysis of upgrading reactions. Hydroconversion processes of residue oil.	3(3-0-6)
01202582	Advanced Project and Production Management in Chemical Engineering Sophisticated chemical engineering project planning reflecting considering economics and legal frameworks, organization change and conflict management, product demand forecast, supply and logistics, resource management, and marketing-production linkage.	3(3-0-6)
01202591	Research Methods in Chemical Engineering Principle and research methods in chemical engineering, problem analysis for research topic identification, data collection for research planning, identification of techniques. Analysis, interpretation and discussion of research result; report writing for presentation and publication.	1(1-0-2)
01202596	Selected Topic in Chemical Engineering Selected topics in chemical engineering at the master's degree level. Topics are subject to change each semester.	1-3
01202597	Seminar Presentation and discussion on current interesting topics in chemical engineering at the master's degree level.	1
01202598	Special Problems Study and research in chemical engineering at the master's degree level and compile into a written report.	1-3

Research at the master's degree level and compile into a thesis.