Doctor of Philosophy Program in Integrated Chemical Engineering

(International program)

Department of Chemical Engineering, Faculty of Engineering

Mahidol University

~~~ Doctor of Philosophy Program in Integrated Chemical Engineering (International program) ~~~
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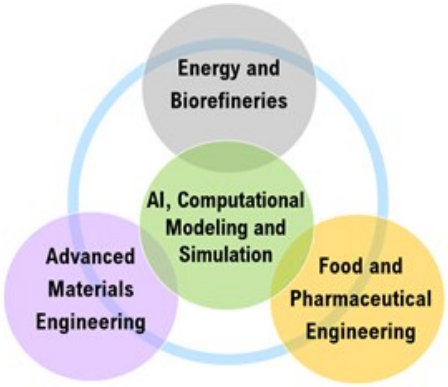
Doctor of Philosophy Program in Integrated Chemical Engineering
(International program)

Doctor of Philosophy Program in Integrated Chemical Engineering (International Program) is an engineering program that aims to produce doctorates who have skills and knowledge both in chemical engineering and integration with other fields in order to create and develop research on the basis of morality, ethics, and international academic and professional standards. The research themes of our curriculum are focused on (*i*) Energy and Biorefineries, (*ii*) Advanced Materials Engineering, (*iii*) Food and Pharmaceutical Engineering and also (*iv*) AI, Computational Modeling and Simulation. Besides, our curriculum focuses on the research collaboration with the private sectors in order to produce the research that is consistent with the actual industrial problems and able to initiate the industrial-based research and innovation in integrated chemical engineering. According to our strong collaborations with industrial, the students are able to gain real working experiences.



Research Grants

Staff at the Department of Chemical Engineering has received many research grants from local agencies (e.g., National Science and Technology Development Agency (NSTDA), National Research Council of Thailand (NRCT)) and overseas granting agencies and the private industries.

Expected Learning Outcomings (ELOs) Upon completion of this program, graduate students are able to:

- Apply advanced knowledge for chemical, food and pharmaceutical engineering to solve the industrial problems and able to integrate fundamental knowledge to create new knowledge
- Create and develop modern experimental designs in chemical engineering and related fields by using advanced research techniques
- Demonstrate the professional ethics, morality and social responsibility
- Work effectively as a team and communicate effectively with an international audience
- Apply modern information technology to develop advanced professional knowledge for life-long learning

Admission Requirements

Two program plans are available for prospective students; thesis-based plan (Plan A) and coursework-based plan (Plan B), allowing all prospective students to choose to continue their studies according to their qualifications and experiences. Applicants who meet these qualifications are welcome to apply.

1. Applicants must be studying in the last semester at the Master level, or hold a degree in M.Eng. (any area) or a Master's degree in M.Sc. with GPAX of at least 3.50 from the institute or university which approved by the office of the Higher Education Commission
2. Applicants must be studying in the last semester at the Bachelor level, or hold a degree in B.Eng. (any area) or a Bachelor's degree in B.Sc. with GPAX of at least 3.50 from the institute or university which approved by the office of the Higher Education Commission
3. All applicants listed in 1 and 2 must pass the entrance requirement of the English Proficiency for Postgraduate Student set by the Faculty of Graduate Studies, Mahidol University. The English Proficiency must be submitted online via Faculty of Graduate Studies web site (http://www.grad.mahidol.ac.th).
4. Applicants whose credentials differ from that listed in 1, 2 and 3 may be selected under a consideration of the program director and the Dean of Faculty of Graduate studies.
5. Applicants may receive exception to any of the requirements above, if the permission is granted by the Administrative Program Committee in concurrence with the Faculty of Graduate Studies

Career paths and Job Opportunities

Graduates can work in educational organizations, public and private organizations both in Thailand and abroad as executive managers, process engineers or engineers in related fields such as environmental and safety engineers, factory consultants, researchers and academics.

Curriculum Structure

Our curriculum structure is set in compliance with Announcement of Ministry of Education on the subject of Criteria and Standards of Graduate Studies 2015 with specified curriculum structure of Doctoral's degree as follows:

	Plan A.1	**Plan B.1**	**Plan B.2**
Fundamental Courses	Without credits	Without credits	Without credits
Required Courses	-	6	12
Elective Courses at least	-	6	12
Dissertation	48	36	48
Total, not less than	48	48	72

Course Requirements

1. Fundamental courses

		Credits (lecture - practice - self-study)
EGCH 501	Transport Processes	3(3-0-6)
EGCH 502	Chemical Engineering Kinetics and Reactor Design	3(3-0-6)
EGCH 503	Principles and Calculations in Chemical Engineering	3(3-0-6)
EGCH 504	Food Chemistry and Biochemistry	3(3-0-6)
EGCH 505	Industrial Microbiology	3(3-0-6)
EGCH 508	Chemical Engineering Thermodynamics	3(3-0-6)

2. Required Courses

Credits (lecture - practice - self-study)

Plan B.1 For students with Master's degree

EGCH 760	Modern Technology in Advanced Integrated Chemical Engineering	3(3-0-6)
EGCH 761	Seminar in Advanced Integrated Chemical Engineering	3(3-0-6)

Plan B.2 For students with Bachelor's degree

EGCH 701	Advanced Transport Process	3(3-0-6)
EGCH 762	Advanced Engineering Thermodynamics	3(3-0-6)
EGCH 760	Modern Technology in Advanced Integrated Chemical Engineering	3(3-0-6)
EGCH 761	Seminar in Advanced Integrated Chemical Engineering	3(3-0-6)

3. Elective Courses

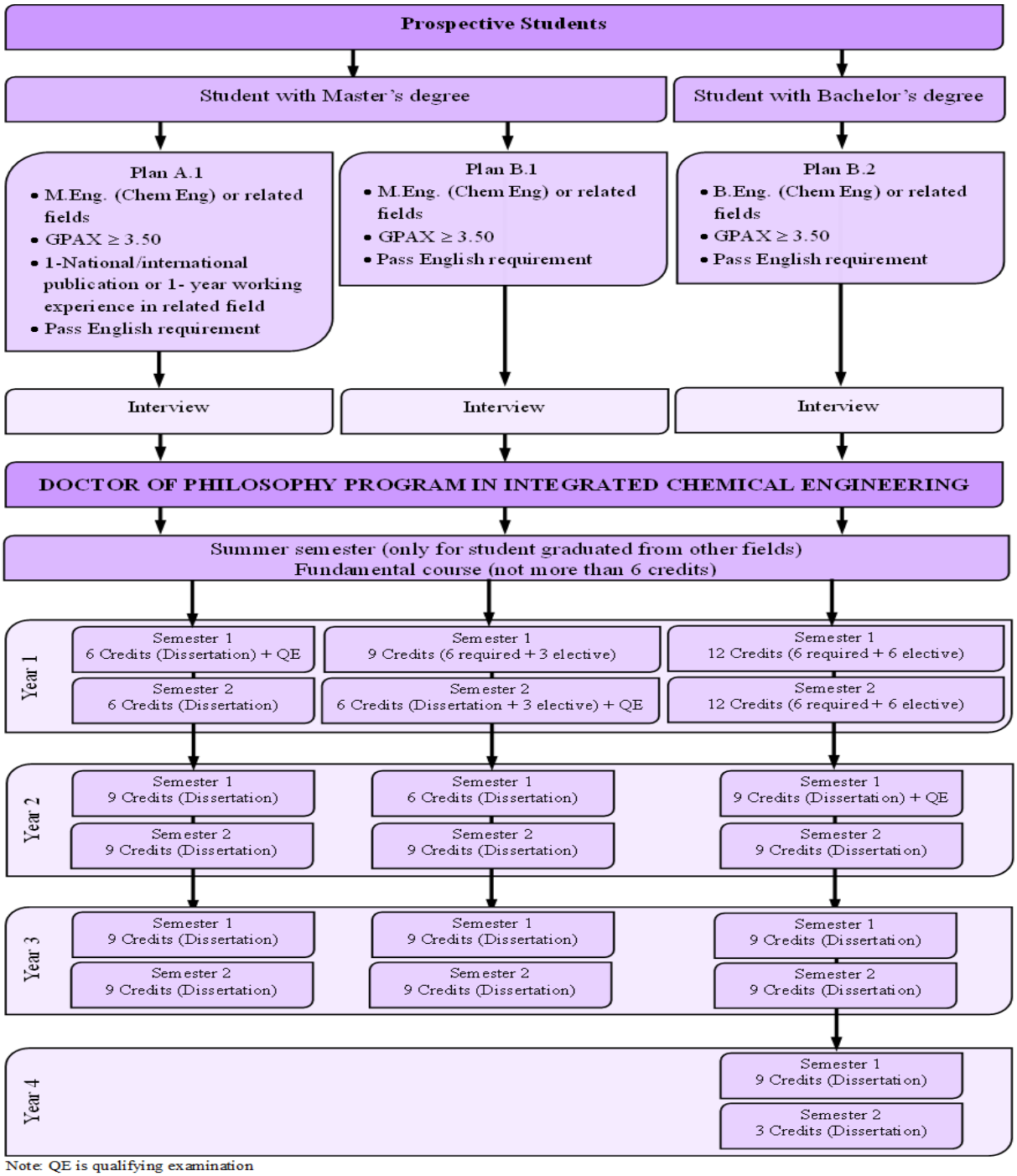
		Credits (lecture - practice - self-study)
EGCH 515	Advanced Process Modeling and Control in Chemical Engineering	3(3-0-6))
EGCH 516	Energy System and Sustainability	3(3-0-6)
EGCH 517	Operational Excellence in Chemical Industry	3(3-0-6)
EGCH 518	Advanced Treatment Technologies for Water, Wastewater and Reuse	3(3-0-6)
EGCH 520	Product Development and Cosmetic Formulations	3(3-0-6)
EGCH 522	Advanced Drug Development	3(3-0-6)
EGCH 523	Corrosion Application in Chemical, Food and Pharmaceutical Industries	3(3-0-6)
EGCH 524	Advanced Chemical Engineering Kinetics and Chemical Reactor Design	3(3-0-6)
EGCH 605	Separation Processes in Chemical Engineering	3(3-0-6)

		Credits (lecture - practice - self-study)
EGCH 613	Sensors Technology	3(3-0-6)
EGCH 617	Advanced Particle Technology	3(3-0-6)
EGCH 618	Electrochemical and Corrosion Engineering	3(3-0-6)
EGCH 619	Industrial Catalytic Processes	3(3-0-6)
EGCH 620	Modeling and Simulation in Chemical Engineering	3(2-2-5)
EGCH 641	Numerical Computations in Food Process Engineering	3(3-0-6)
EGCH 642	Food and Pharmaceutical Processes Technology	3(3-0-6)
EGCH 643	Food Properties and Quality Assessment	3(3-0-6)
EGCH 645	Non-Thermal Process Engineering	3(3-0-6)
EGCH 649	Bioprocess Optimization	3(3-0-6)
EGCH 680	Optimization Theory in Chemical Processes	3(3-0-6)
EGCH 681-689	Current Topics in Chemical Engineering	3(3-0-6)
EGCH 671	Project Management for Engineers	3(3-0-6)
EGCH 674	Pharmaceutical Facilities, Equipment and Process Design	3(3-0-6)
EGCH 711	Distillation System Design	3(3-0-6)
EGCH 712	Advanced Industrial Process Control	3(3-0-6)
EGCH 713	Modeling of Computational Fluid Dynamics	3(3-0-6)
EGCH 721	Advanced Biopolymer and Nanomaterial	3(3-0-6)
EGCH 722	Applied Chemical and Biological Sensor	3(3-0-6)
EGCH 723	Precious Metal Extraction and Recycling	3(3-0-6)
EGCH 731	Renewable Energy Technology	3(3-0-6)
EGCH 732	Integrated Environmental Technologies	3(3-0-6)
EGCH 741	Advanced Food and Biochemical Engineering	3(3-0-6)
EGCH 742	Biomass Processing Technology and Biorefinery System	3(3-0-6)
EGCH 743	Advanced Food Plant Design and Layout	3(3-0-6)
EGCH 751	Advanced Pharmaceutical Technologies	3(3-0-6)
EGCH 752	Advanced Packaging Food and Pharmaceutical Technologies	3(3-0-6)
EGCH 753	Advanced Safety and Occupational Health Management	3(3-0-6)
EGCH 780-789	Current Topics in Advanced Chemical Engineering	3(3-0-6)

4. Thesis

			Credits (lecture - practice - self-study)
Plan A.1	EGCH 898	Dissertation	48(0-144-0)
Plan B.1	EGCH 699	Dissertation	36(0-108-0)
Plan B.2	EGCH 799	Dissertation	48(0-144-0)

Program structure of the Doctor of Philosophy Program in Integrated Chemical Engineering with the paths that students can go through from application process toward completion or termination of the degree is displayed below.



Note: QE is qualifying examination

Course Description

1. Fundamental courses

EGCH 501 Transport Processes

Conservation of mass and material balances; conservation of energy and heat balances; principles of momentum transfer and overall balances, principles of momentum transfer and applications, principles of steady–state heat transfer, principles of unsteady–state heat transfer, principles of steady–state mass transfer, principles of unsteady–state and convective mass transfer.

EGCH 502 Chemical Engineering Kinetics and Reactor Design

Chemical kinetics, diffusion and catalysis, concepts of reactor design, the effect of reactor geometry, operation of reactor design, flow characteristics on mass and energy conservation equations, single and multiple reactor systems.

EGCH 503 Principles and Calculations in Chemical Engineering

Engineering calculations, stoichiometry and material balance calculations, recycle, bypass and purge, use of chemical and phase equilibrium data, energy and energy balances, use of thermodynamic data, study of typical chemical processes, solving material and energy balances, industrial applications.

EGCH 504 Food Chemistry and Biochemistry

Chemical compositions in food, Organic and inorganic substances, foundations of biochemistry, amino acid, peptides, protein, enzymes, carbohydrates and glycobiology, nucleotides and nucleic acids, and lipid.

EGCH 505 Industrial Microbiology

Type of microorganisms important in food, pharmaceutical and chemical industries, Classification and identification of microorganisms, Biological and biochemistry basics, Physical and chemical methods for sterilization, Cell work and cell growth, Factors affecting microbial growth, Stoichiometry of microbial growth and product formation, Engineering principles for bioprocesses, The applications of microorganisms in food, pharmaceutical and chemical industries, Case studies.

EGCH 508 Chemical Engineering Thermodynamics

Laws of thermodynamics and their applications, criteria of equilibrium in physical and chemical changes, behaviors of real fluids and mixtures, chemical reaction equilibria and phase equilibria, Raoult's law for an ideal system, VLE calculations for an ideal system, equilibrium flash calculations for ideal systems, fugacity and fugacity coefficients, thermodynamics of non-ideal multicomponent systems, modified Raoult's law and flash calculations for a non-ideal system, chemically reacting systems and chemical equilibria, equilibria of multiple reaction systems.

2. Required Courses

EGCH 701 Advanced Transport Process

Transport phenomena in momentum, energy, and mass, the equations of momentum, energy, and mass, equations of change for isothermal system, non-isothermal system, and multicomponent system.

EGCH 760 Modern Technology in Advanced Integrated Chemical Engineering

Advanced control in chemical process; Simulation in Advanced chemical engineering; Modern production technology for chemical industry; Technique in food processing; Packaging development; Drug delivery system; Design of food and pharmaceutical manufacturing.

EGCH 761 Seminar in Advanced Integrated Chemical Engineering

Discussion in topics related to development of advanced chemical engineering; Production technology in current topics of chemical industry; Food and drug industry; Literature review; Professional research presentation; Field trip in industrial sector.

EGCH 762 Advanced Engineering Thermodynamics

Advanced thermodynamics; equation of state in chemical engineering; first law of thermodynamics for closed system; first law of thermodynamics for open system; entropy balance; second law of thermodynamics; cycles in advanced thermodynamics; gas law; relations between state; vapor-liquid equilibrium system; application of advanced thermodynamics in real system.

3. Elective Courses

EGCH 515 Advanced Process Modeling and Control in Chemical Engineering

Process modeling and analysis in chemical engineering; Simulation of unit operation; Chemical process control principle; Modern control technology; Optimization in chemical engineering.

EGCH 516 Energy System and Sustainability

Evolution of technology and energy consumption; Energy source and energy demand; Petroleum; Nuclear energy; Renewable energy; Life cycle assessment; life cycle impact assessment; Carbon footprint; Utilization of carbon dioxide; Chemical looping system; Industrial ecology.

EGCH 517 Operational Excellence in Chemical Industry

Operational excellence; Process modeling and analysis; Computational fluid dynamics; Chemical reactor design; Data reconciliation; Error detection; Multicomponent reaction; Economics in chemical industry; Case study in petroleum and petrochemical industry.

EGCH 518 Advanced Treatment Technologies for Water, Wastewater and Reuse

Environmental Engineering ethics, Industrial law and standard of water and effluent wastewater,

Drinking water process; Mixing, Flocculation, Softening, Ion exchange, Oxidation, Adsorption, Disinfection, And membrane process, Wastewater treatment; Wetland, Activated sludge, Immobilized microbiology, Advanced oxidation process, And integrated treatment for effluent water reuse.

EGCH 520 Product Development and Cosmetic Formulations

Ethical research in people, cosmetic regulations and standards; Natural and organic cosmetics; Materials and formulations for the production of cosmetics; Aerosols, lotion, and powder; Skin types; skin hydration; Skin perception; Types of packaging; Satisfaction evaluation test; Formulations and product development of targeted cosmetic; Hair, face, and body; Cosmetic industry, trend of cosmetics.

EGCH 522 Advanced Drug Development

Drug development technology; advance drug delivery; Drug formulation; Design and engineering of well-defined molecular structures and architectures; Pharmacokinetics; Controlled release and organ targeted delivery; Medical device technology.

EGCH 523 Corrosion Application in Chemical, Food and Pharmaceutical Industries

Principles of electrode processes; Electrochemical and charge transfer phenomena; Kinetics and thermodynamics of electrochemical cell; Electrochemical phenomenon of corrosion; Thermodynamics and kinetics of corrosion; Forms of corrosion and corrosion testing; Environments and high-temperature corrosion; Corrosion prevention and control; Materials selection; Case studies for corrosion problems in chemical; Food and pharmaceutical industries.

EGCH 524 Advanced Chemical Engineering Kinetics and Chemical Reactor Design

Kinetic reaction and rate equations, theory of reaction processes, diffusion, types of reactors, catalysis, mechanical arrangement of reactors for agitation, heat and mass transfer, methods of designing chemical and mass transfer, methods of designing chemical reactors with emphasis on continuous processing.

EGCH 605 Separation Processes in Chemical Engineering

Mechanism of separation; selection of separation processes; thermodynamics of separation operations; principles of separation processes; distillation adsorption; absorption and membrane separation.

EGCH 613 Sensors Technology

Principles of sensor and its operation, basic electronics, specific examples of sensors available from suppliers today, sensor work, the limited factors of using sensors for measurements, the sensor selection for specific applications.

EGCH 617 Advanced Particle Technology

Particle properties, characterization of physical properties of particles, physical chemistry properties of colloid particles, behavior of colloid and nano particles, particle synthesis, grain growth, transport phenomena related to particles, advanced particle operation in industry.

EGCH 618 Electrochemical and Corrosion Engineering

Principles of electrode processes, electrochemical and charge transfer phenomena, kinetics and thermodynamics of electrochemical cell, electrochemical phenomenon of corrosion, thermodynamics and kinetics of corrosion, forms of corrosion and corrosion testing, environments and high- temperature corrosion, corrosion prevention and control, materials selection, electrochemical application in industry, batteries and fuel cells.

EGCH 619 Industrial Catalytic Processes

Catalysis phenomena, catalyst materials, properties and preparation, catalyst characterization, catalyst deactivation, hydrogen production and synthesis gas reactions, hydrogenation and dehydrogenation of organic compounds, oxidation of inorganic and organic compounds, environmental catalysis.

EGCH 620 Modeling and Simulation in Chemical Engineering

Model and simulation setups; application of process simulation software; simulation of unit operations in chemical engineering; parameter sensitivity analysis; optimization.

EGCH 641 Numerical Computations in Food Process Engineering

Mathematical modeling of engineering operations in food processing and preservation; review of analytical and numerical methods for problem solving; using computer programming for data analysis, modeling and numerical computations; artificial neural network applications in food process modeling and simulation; numerical modeling of food processing operations; case studies and software applications.

EGCH 642 Food and Pharmaceutical Processes Technology

Properties of foods and pharmaceutical; processing theory; process control; raw material preparation; size reduction; mixing; centrifugation; pasteurization; sterilization; evaporation; filtration; dehydration; baking and roasting; frying; chilling; freezing; controlled atmosphere storage; coating; packaging; aseptic packaging; filling and sealing; material handling; storage and distribution; quality assurance.

EGCH 643 Food Properties and Quality Assessment

Principles involved in measuring engineering properties of fresh and prepared foods, food physical characteristics, mechanical, thermal, electrical and optical properties, analysis, interpretation and

application of property measurement data in relation to the objective assessment of food quality, functionality and stability, advanced techniques based on acoustic, odour, taste and image analysis, and infrared spectroscopy.

EGCH 645 Non-Thermal Process Engineering

New techniques on food preservation for green environment, the interdependency of factors underlying the science of food, consumer satisfaction, the relationships between nutrition, flavor, colour, food security, green technology for food preservation ozonation, high-pressure technology, high-electric field pulses, supercritical carbon dioxide, radio-frequency, membrane separation, ultrasonic and food irradiation, osmotic dehydration, aseptic packaging technology.

EGCH 649 Bioprocess Optimization

Bioprocesses, principles of upstream and downstream bioprocessing, type of bioreactors, bioreactor design, development and scale up, bioprocess control and monitoring systems, sterilization principles and practices, aeration and agitation systems for bioreactors, transport phenomenon in bioreactors, isolation and extraction of bioproducts or enzymes, recovery and purification of bioproducts or enzymes, scale up and optimization of bioprocesses, bioprocess economics, neural networks and mathematical modeling in bioprocesses, role of computer in bioprocess control and applications.

EGCH 680 Optimization Theory in Chemical Processes

Optimization; Model and objective function; Unconstrained problem, linear programming; Nonlinear programming; Global optimization; Applications of optimization to chemical processes.

EGCH 681-689 Current Topics in Chemical Engineering

Current research interest in chemical engineering, for instance, nanotechnology, fuel cell, or alternative energy resources.

EGCH 671 Project Management for Engineers

Study of project feasibility, strategy for project planning and operation, budgeting and cost control, application of various tools to control and assess engineering project, engineering project management.

EGCH 674 Pharmaceutical Facilities, Equipment and Process Design

Facility layout and design principles, process flow, piping and instrumentation, design and construction of critical services, design, control and validation of water, gas, heating, ventilation, air condition, and cooling systems, clean room design, process safety, good manufacturing practice (GMP) for critical equipment, tablet production systems, tablet coating systems, capsule filling systems, practice of facility validation.

EGCH 711 Distillation System Design

Thermodynamics properties and phase equilibrium; Column design methods and distillation system synthesis methods for ideal and nonideal mixtures, homogeneous and heterogeneous azeotropic mixtures; Other advanced distillation techniques, Dividing-wall column, Reactive distillation.

EGCH 712 Advanced Industrial Process Control

Theoretical Models; Laplace transforms; transfer function; dynamic behavior; frequency response; stability; PID design; fuzzy logic; neural network; model predictive control; plantwide structure.

EGCH 713 Modeling of Computational Fluid Dynamics

Partial differential equation; finite element; computing method; transfers of heat, mass and momentum; modeling of tubular chemical reactor, shell and tube heat exchanger, centrifugal pump, multiphase flow, sedimentation and biological process.

EGCH 721 Advanced Biopolymer and Nanomaterial

Definition of biopolymer, detailed knowledge of the structure, function, properties and use of biopolymers, Molecular architecture for biological structures, The concept of nature as a model for polymeric materials, Survey and introduction to biomedical materials and drug delivery formulations, degradation mechanisms in polymeric materials with respect to degradation products in different environments, types of bioplastics and production in industry.

Definition of nanomaterial and nanotechnology focusing on approaches for material synthesis, reaction mechanisms, reaction control, advantages/disadvantages of each synthesis approaches, analytical instruments for a study of chemical/ electrical/ surface properties of the nanomaterial, application of nanomaterial in fields of research and industries.

EGCH 722 Applied Chemical and Biological Sensor

Studies of basic components, and sensing mechanisms of chemical sensors and biosensors, basic principles of sensor design focusing on selections of recognitive element/sensing material that are suitable for a detection of a target analyte, immobilizations of organic and inorganic molecules on sensing material, determination of sensing parameters including sensitivity, selectivity, and accuracy, integration of sensor technology in the fields of research and industry. Surface chemistry properties of materials, molecular structure on chemical surface properties of materials, electrical properties on material surface, electrical double layers, interaction forces on surface, van der Waals force, electrical repulsion force, electrophoresis.

EGCH 723 Precious Metal Extraction and Recycling

Advanced metallurgical thermodynamics, kinetics and transport phenomena to precious metal extraction; relevant development for producing a particular material (especially precious metals) by means

of hydrometallurgical, pyrometallurgical and electrometallurgical processes; applications of metallurgical processes for precious metal recycling from scraps and industrial waste or by-product.

EGCH 731 Renewable Energy Technology

Introduction to energy systems and renewable energy resources emphasizing on alternate energy sources and their technology and application; society' s present needs and future energy demands; conventional energy sources and systems; fossil fuels and nuclear energy; and then focus on alternate, renewable energy sources; solar, biomass energy, fuel cell energy, microbial fuel cell, wind power, geothermal, and hydro; Energy conservation methods will be emphasized.

EGCH 732 Integrated Environmental Technologies

Integrated environmental technology concepts; Environmental standard and guidelines; Advanced treatment technology in air pollutants, wastewater, solid wastes and hazardous waste; Material and Energy balances; Environmental impact assessment; and Waste Minimization technology.

EGCH 741 Advanced Food and Biochemical Engineering

Advanced concepts regarding behaviour of biological systems used in modern technologies; Principles of biochemical engineering applied to design; development and analysis of processes that use biocatalysts; Technology of conventional and non-conventional fermentation based food products fruits, vegetables, milk; Studies on changes in colour and flavour test during processing and storage of food; Evaluation and standardization of quality and safety of food product; The future of bioengineering, Ethical and Financial issues in biochemical engineering.

EGCH 742 Biomass Processing Technology and Biorefinery System

Biomass fiber morphology; cellulose; hemicellulose; lignin; chemistry and their chemical analyses; biomass pretreatment/ fractionation; enzymatic hydrolysis of lignocellulose and biochemical conversion of hydrolysate to biofuels; ethanol; butanol, bioenergy and bioproducts from woody biomass; lignocellulosic biomass valorization.

EGCH 743 Advanced Food Plant Design and Layout

Plant design concepts; Feasibility considerations; Flow Chart for Plant Design; Technical and Financial Analysis; Plant location decision; Food plant utilities; Basic type of plant layout; Symbols for food plant design; Engineering economy; and life of asset analysis.

EGCH 751 Advanced Pharmaceutical Technologies

Advance on pharmaceutical science and technologies; Pharmaceutical formulation design and development; Advanced unit operation in pharmaceutical production, Plant facilities; Techniques in drug analysis; Biotechnology of medicinal herb; Design and development of novel drug delivery system and

Validation.

EGCH 752 Advanced Packaging Food and Pharmaceutical Technologies

Type of Packaging; Development and design of packaging; Characteristic of packaging materials in physical, chemistry and morphology characteristics; Polymers and metal packaging; Caps and closure system; Aseptic packaging; Printing; Packaging machinery and Packaging legislation, standard and regulation.

EGCH 753 Advanced Safety and Occupational Health Management

Safety and Occupational Health in Design Philosophy; Safety and Occupational Health standard and guidelines; Hazard analysis and risk assessment; Process safety management; Achieving acceptable risk levels; Lean concepts; Management of change systems; Incident Investigation; The procurement process; Hierarchy on safety controls; Safety Design related problems; Insurance and risk management.

EGCH 780-789 Current Topics in Advanced Chemical Engineering

Current research interest in chemical engineering including: advance chemical engineering; biochemical process; alternative energy and environmental technology; advanced material; food and pharmaceutical technology.

4. Dissertation

EGCH 699 Dissertation

Identifying chemical engineering research proposal; conducting research; ethics in conducting research and publishing research results; writing research progress report and research findings; presenting and publishing research in standard academic journal and conference proceedings; ethics for presenting and publishing research findings.

EGCH 799 Dissertation

Identifying chemical engineering research proposal; conducting research; ethics in conducting research and publishing research results; writing research progress report and research findings; presenting and publishing research in standard academic journal and conference proceedings; ethics for presenting and publishing research findings.

EGCH 898 Dissertation

Identifying chemical engineering research proposal; conducting research; ethics in conducting research and publishing research results; writing research progress report and research findings; presenting and publishing research in standard academic journal and conference proceedings; ethics for presenting and publishing research findings.

For More Information, please contact

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~~~ Welcome to our program ~~~

Doctor of Philosophy Program in Integrated Chemical Engineering (International program)

Department of Chemical Engineering, Faculty of Engineering

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