Department of Chemical and Petroleum Engineering

Chairperson *Yasmine Fouad*
Associate Professors *Zahi Khalil , Rami Harkouss*
Full-time Instructors *Hussein Ghorayeb, Shareef El-Mostafa, Aya El Hajj Chehade*

Chemical Engineering Program

Mission

The mission of the Chemical Engineering (ChE) program is to empower our students with a rigorous foundation in chemical engineering principles, fostering creativity, professionalism, leadership qualities and ethical practices to design sustainable solutions that address critical local and global challenges and advance the wellbeing of societies. Graduates will be qualified to pursue successful careers in their profession or in graduate studies in different areas.

Objectives

The educational objectives of the Chemical Engineering (ChE) program are determined to support career advancement of the graduates and as they pursue their career goals. Graduates are intended:

1. To be effective in problem-solving strategies for a wide variety of technical processes, to meet the needs of the local and international chemical industries
2. To contribute successfully in careers in different professional areas including industry, academia, government and research
3. To act adequately in a new work environment with professional responsibility and leadership roles

Learning Outcomes

UPON COMPLETION OF THE PROGRAM, GRADUATES SHALL HAVE:

1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.
3. an ability to communicate effectively with a range of audiences.
4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.
5. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.
6. an ability to develop and conduct appropriate experimentation, analyze, interpret data, and use engineering judgment to draw conclusions.
7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

Degree Requirements

The undergraduate curriculum for the degree of Bachelor of Engineering in Chemical Engineering consists of 150 credit-hours of course work + IC3 + 30 credits transferred from Lebanese Baccalaureate or equivalent.

Career Opportunities

Chemical engineers bridge sciences and manufacturing by applying the principles of science and engineering, to solve problems involving modification of raw materials into required products in a variety of industries including oil and gas; mineral industry, pharmaceuticals; energy; water treatment; food and drink; plastics and toiletries.

Program Overview

The **Student's Study Plan** is given to every student upon his/her enrollment. The ChE curriculum consists of the following components:

I. Common Requirements	**Credits**
General Education Requirements	16

Basic Sciences and Mathematics	37
General Engineering topics	15
II. ChE Program-Specific Requirements	**Credits**
A. Chemical Engineering Core	59
B. Engineering topics from outside the major	6
C. Chemical Engineering Technical Electives	12
D. Final Year Project	4
E. Internship	1

I. Common Requirements

The list of the Common Requirement courses and their descriptions are presented in the introductory pages of the Faculty of Engineering section in this catalog. In particular, the ChE curriculum includes 15 credits offered as general engineering topics. These courses are listed in the table below.

Code	Name	Crs.
MCHE 213	Dynamics	3
COMP 208	Programming I	3
INME 221	Engineering Economy	3
CVLE210	Statics	3
MCHE201	Engineering Drawing and Graphics	3

II. CHME Program-Specific Requirements

A. Chemical Engineering Core Courses

The Chemical Engineering core courses are listed in the table below.

Course	Title	Credits	Pre-requisites
CHME202	Introduction to Chemical Engineering	3	
CHME204	Mass transfer Operations	3	CHME 202
MCHE 225	Thermodynamics for Chemical Eng.	3	PHYS280 OR PHYS282
MCHE 226	Applied Thermodynamics for Chem. Eng.	3	MCHE225
MCHE 338	Pumps and Piping Systems	3	MCHE331 + CHME 202
CHME301	Separation Processes	3	CHME204
CHME302	Chemical Reactions Engineering	3	MCHE226
CHME305	Catalysis and Catalytic Processes	3	CHEM345
CHME340	Process Simulation	3	CHME301
CHME402	Unit Operations	3	CHME301
CHME403	Process Control	3	CHME301
CHME405	Reactor Design	3	CHME302
CHME408	Chemical Process Design	3	CHME301+CHME302
CHME409	Transportation of Hydrocarbons	3	MCHE338
CHME413	Colloids and Interfaces	3	CHEM248
ENGR500	Research Methodology	2	ENGL211
CHME507	Process Optimization	3	CHME403
CHME511	Polymer Engineering	3	CHEM248
CHME 515	Instrumental Analysis	2	CHEM 282
CHME 516	Biochemistry	2	CHEM 331
CHME 517	Legislations for Chemical Engineering	2	BLAW 001

Description of Core Courses

CHME 202 INTRODUCTION TO CHEMICAL ENGINEERING (3Crs:3Lec): The course provides an overview of chemical engineering, its applications and the contribution of Chemical Engineering to the society. The course covers also the fundamentals of Chemical Engineering calculations, the concepts of material and energy balances, energy and mass transport and kinetics of chemical reactions.

CHME 204 MASS TRANSFER OPERATIONS (3Crs:3Lec,0Lab): The course provides the necessary data about diffusional and convective mass transfer and its application to continuous contact operation. It covers also the introduction to the operating principles, including fundamentals of mass balance and the selection criteria of separation processes: distillation, liquid-liquid extraction, gas-liquid absorption, humidification. ***Pre-req.: CHME 202***

MCHE 225 THERMODYNAMICS FOR CHEMICAL ENG. (3Crs.:3Lec,0Lab): Heat and work, first law of thermodynamics, properties of steam and gases, steam tables and charts, entropy, second law, air standard cycle, compressors, reversibility, availability and second law efficiency, real gases. ***Pre-req.: PHYS280 or PHYS282***

MCHE 226 APPLIED THERMODYNAMICS FOR CHEMICAL ENG. (3Crs.:3Lec,0Lab): Power and refrigeration cycles, vapor cycles, Carnot, Rankine, reheated, regenerative, gas power cycle, gas turbine, reciprocating engine cycles. Refrigeration and heat pump cycles, vapor compression cycle, absorption refrigeration cycle, thermodynamic tables. ***Pre-req.: MCHE 225.***

MCHE 338 PUMPS AND PIPING SYSTEMS (3Crs.: 3Lec, 0Lab): Pipeline and piping system, Pump types and operation, Centrifugal pumps operation, pump selection, pump in parallel and series, viscosity effect on centrifugal pumps, pump problem (Cavitation), priming of centrifugal pumps. ***Pre-req. : MCHE 331 and CHME 202***

CHME 301 SEPARATION PROCESSES (3Crs.:3Lec,0Lab) The course provides necessary background on the concepts of the thermodynamics, mechanisms, processes, and design of equilibrium separation processes such as adsorption, ion exchange, chromatography, and crystallization. ***Pre-req.: CHME 204***

CHME 302 CHEMICAL REACTIONS ENGINEERING (3Crs.: 2Lec, 2 lab): The course provides the necessary knowledge of the principles of reaction engineering, the different types of chemical reactors, the stoichiometry applications in combination with a rate equation. It covers also the continuous-operation and batch-operation reactors. **It covers also experimental work related to the above-mentioned topics.** ***Pre-req.: MCHE226***

CHME 305 CATALYSIS AND CATALYTIC PROCESSES (3 Crs: 3 Lec, 0 Lab): This course provides an introduction to catalysis, the fundamentals of catalytic science, the catalyst properties and the kinetics of the catalysis mechanism. It also covers the catalyst preparation and characterization techniques as well as the deactivation mechanisms. Applications to industrial catalytic processes are also covered: Hydrogen Production and Synthesis Gas Reactions (Fischer-Tropsch Process), Hydrogenation and dehydrogenation of organic compounds. ***Pre-req.: CHEM345***

CHME 340 Process Simulation (3cr.: 2 lec; 2lab): This course introduces students to the fundamental principles and applications of process simulation in engineering. Students will get introduced to the use of simulation tools for designing, analyzing, and optimizing industrial processes. They will gain hands-on experience with advanced simulation software to create models and address practical engineering challenges. ***Pre-req.: CHME301***

CHME 402 UNIT OPERATIONS (3Crs: 2Lec, 2 Lab): The course covers the principles of unit operations with emphasis on distillation, absorption, extraction, and fluid-solid systems. Property prediction of multi-component fluids. Cases will cover principles of heat-exchanger design, multi-component fractionation, absorption, stripping and extraction. **It covers also experimental work related to the above-mentioned topics.** ***Pre-req.: CHME301***

CHME 403 PROCESS CONTROL (3Crs.: 2Lec, 2 Lab): This course provides the key concepts in automatic control and instrumentation of process plants, the feed-back and feed-forward controls and the proportional-integral-derivative (PID) control. It also covers the commonly used sensors and actuators, the design methodology for process control and the energy audit in industrial facilities. **It covers also experimental work related to the above-mentioned topics.** ***Pre-req.: CHME301***

CHME 405 REACTOR DESIGN (3Crs.3Lec,0Lab): The course provides the necessary background of basic principles of chemical reaction engineering, the analysis of kinetic data. It covers also the ideal reactor description

modeling and design. The isothermal and non-isothermal reactor design and the reaction engineering principles in modern technologies. ***Pre-req.: CHME302***

CHME 408 CHEMICAL PROCESS DESIGN (3Crs.:3Lec,0Lab): The course provides essential knowledge about the process design development, general design considerations, flow-sheeting, materials handling and transfer, materials fabrication and selection. It covers also the optimum design, mass balance including scale up in design and energy balance including combustion reactions and change of state. ***Pre-req.: CHME301, CHME302***

CHME 409 TRANSPORTATION OF HYDROCARBONS (3Crs.:3Lec,0Lab): Reservoir fluids. Introduction to Oil and Gas Industry. Oil and Gas Processing. Storage Tanks of crude Oil. Incompressible and compressible fluid flow. Pumps and compressors, Piping system design, gas gathering systems; Petroleum shipping, maintenance, and repair. ***Pre-req.: MCHE338***

CHME 413 COLLOIDS AND INTERFACES (3Crs.3Lec,0Lab): This course provides the fundamentals of surface and colloid chemistry, the mixed colloids and aggregation stability, the interfacial phenomena as well as the dynamic surface tension and interaction of surfactant. It also covers some colloidal applications such as emulsion, foams and aerosol. The principles of corrosion and their prevention control are also reviewed. ***Pre-req.: CHEM248***

CHME 499 INTERNSHIP (1Cr) This is a professional training which should not be less than four weeks. The training is followed by a presentation session where the students are supposed to present what they have learned.

ENGR 500 RESEARCH METHODOLOGY (2Crs.:2Lec,0Lab): The course provides the different steps for conducting and leading a successful research: formulating and managing a research problem, conceptualizing a research design, constructing an instrument for data collection, writing and presenting a research proposal. ***Pre-req.: ENGL211***

CHME 507 PROCESS OPTIMIZATION (3Crs.3Lec,0Lab): This course provides the conceptual design and building up methods of industrial chemical processes, the process flow schemes as well as the economic, investment and profitability analysis. It also covers the techniques of modifying equipment internals and upgrading the process. Various methods and techniques to optimize processing energy efficiency in process plants are also reviewed**.** ***Pre-req.: CHME403***

CHME 511 POLYMER ENGINEERING (3Crs.:3Lec,0Lab): This course provides a good understanding of the synthesis of polymers, their applications and their properties including molecular, physical, chemical and thermal properties. It also covers the mechanisms and kinetics of the chain and step polymerizations with an overview on the polymers processing techniques to form plastics. ***Pre-req.: CHEM248***

CHME 515 INSTRUMENTAL ANALYSIS (2Crs.: 1Lec, 2Lab):
This course provides applications of advanced analytical techniques methods which covers qualitative and quantitative chemical analysis such as: UV, HPLC, visible absorption, GC and fluorescence spectroscopy. This course includes experimental work related to the techniques mentioned above. ***Pre-req.: CHEM 282***

CHME 516 BIOCHEMISTRY (2 Crs.: 1Lec, 2Lab):
This course provides basic principles of biochemistry to understand the structure and function of biomolecules. In addition, experimental and practical work to be given in the biochemistry laboratory. ***Pre-req.: CHEM 331***

CHME 517 LEGISLATIONS FOR CHEMICAL ENGINEERING (2 Crs.: 2Lec)
This course is designed to provide chemical engineers with a general overview of the field of environmental laws and regulations related to air and water quality, pollution prevention, and the protection of natural resources. It also covers laws and regulations in food industry and pharmaceutical manufacturing; in addition to an overview of the main types of contracts in oil and gas industries. ***Pre-req.: BLAW 001***

B. Engineering topics from outside the major

This part of the ChE curriculum includes 15-credits courses offered by other engineering programs. These courses are listed in the table below.

MCHE 331	Fluid Mechanics I	3	PHYS280 OR PHYS282
MCHE 421	Heat Transfer	3	MATH284 + MCHE225

Descriptions of this group of courses are given below:

MCHE 331 FLUID MECHANICS I (3Crs.:3Lec,0Lab): Fluid static, Forces on immersed surfaces, buoyancy and stability of floating bodies, Fluid kinematics, fluid masses subjected to acceleration, vortex motion, hydrodynamics, momentum equation, Euler's and Bernoulli's equations, fluid flow in pipelines, PI- Theorem. ***Pre-req.: PHYS280 OR PHY282***

MCHE 421 HEAT TRANSFER (3Crs.:3Lec,0Lab): Concepts and laws of conduction, convection and radiation heat transfer and their application to solving engineering thermal problems. Steady and transient heat conduction. Heat generation. Extended surfaces. External and internal forced convection of laminar and turbulent flows. Natural convection. Heat exchanger principles. Thermal radiation, view factors, and radiation exchange between gray bodies. Boiling and condensation. Computer aided applications. ***Pre-req.: MATH 284 and MCHE 225.***

C. Chemical Engineering Technical Electives

The CHME curriculum includes four 3-credit hour courses as technical electives.

Elective Courses			
Course	**Title**	**Credits**	**Pre- requisites**
CHME304	Membrane Science	3	CHME301
CHEM355	Petro-chemistry	3	
PTRE419	Petroleum Economics and Management	3	MATH381
PTRE503	Crude Oil Processing	3	CHEM331
PTRE511	Petroleum Refining Operations	3	CHEM331
PTRE514	Hydrogen Energy	3	PTRE201 or CHME202
CHME510	Modern Industrial Technologies	3	
CHME503	Biomass Engineering	3	
CHME512	Chemical Product design	3	CHME403
CHME513	Water and Waste Management	3	
CHME514	Air Pollution problems & control	3	
CHME518	Environment and Safety	3	CHME202
CHME520	Environmental Technologies	3	CHME202 Or PTRE201
COMP424	Artificial Intelligence and Robotics for Engineers	3	COMP208
INME482	Engineering Project Management	3	ENGL300
MCHE525	Renewable energy Technologies	3	MCHE321 Or MCHE225
MCHE226	Solar Thermal Energy Systems	3	MCHE421

Description of Technical Elective Courses

CHME 304 MEMBRANE SCIENCE (3Crs.:3Lec): The course is mainly addressed to membranes and membrane processes typical of process industry as well as of environmental engineering. It covers the basic elements of membrane separation technologies and applications, the types of membrane processes, the liquid diffusion through pores and the gas diffusion through porous membranes. It also provides knowledge in membrane technology area from medicine to wastewater engineering as well as reverse osmosis. ***Pre-req.: CHME301***

CHEM 355 PETROCHEMISTRY (3Crs.:3 Lec): A study of the chemicals obtained directly and indirectly from petroleum, including their chemistry and their industrial production and applications.

PTRE 419 PETROLEUM ECONOMY, RISK AND MANAGEMENT (3Crs.:3Lec,0Lab): This unit aims to teach the student about the economics and risk management of petroleum asset development, supply and demand economics, profit maximization, depreciation and all aspects of oil field project management required to fully understand the risk involved in exploration, production, capital cost and expenditure on assets. ***Pre-req.: MATH381***

PTRE 503 CRUDE OIL PROCESSING (3Crs.:3Lec,0Lab): This course includes the following topics: Crude Oil

Composition and Classification, Fundamentals of a Refinery Plant, Oil processing, Role of Catalyst in Refineries, Desalting of Crude Oil, Conversion Processes, Distillation Unit, Coking Process, Flexicoking Process, Catalytic Process, Fundamentals of phase separators***. Pre-req.: CHEM331.***

PTRE 511 PETROLEUM REFINING OPERATIONS (3Crs.:3Lec,0Lab): The course provides the refining and associated downstream processing technologies, the crude oil preparation and separation methods, the types of crude oil processing, the refinery products and their test methods. It covers different refinery units such as the atmospheric and vacuum distillation columns; the fluid catalytic cracking (FCC), the hydro-treating and the catalytic reforming processes. ***Pre-req.: CHEM331***

PTRE 514 HYDROGEN ENERGY (3Crs.:3Lec,0Lab): This course covers the Hydrogen production and conversion, Hydrogen technologies, Environmentally Sustainable hydrogen, Hydrogen economy & financial market opportunities, and Storage & Carbon Capture processes. ***Pre-req.: PTRE201 OR CHME202.***

CHME 510 MODERN INDUSTRIAL TECHNOLOGIES (3Crs.:3Lec,0Lab): this course provides the fundamentals of the cement process including Kilns, mills, burning and drying of Clinker. It provides the knowledge of the paint industry including Resin preparation, the basic building material preparation (Epoxies, water-proofing material, antirust and fibers), the isolation material in contemporary industries and other innovative industrial technologies.

CHME 503 BIOMASS ENGINEERING (3Crs.:3Lec,0Lab): This course provides the fundamental principles and practical applications of biomass-to renewable energy processes as well as thermo-conversion of biomass and waste materials for renewable energy production. It also covers the biodiesel and bioethanol production, the anaerobic digestion for solid waste, the fermentation and microbial growth kinetics as well as the bioreactors and bioprocess engineering.

CHME 512 CHEMICAL PRODUCT DESIGN (3Crs.:3Lec,0Lab): This course covers the application of the design process to products based on chemical technology. It covers the entire design process from initial identification of product needs to the generation and selection of product ideas and culminates in the manufacture of a new product. ***Pre-req.: CHME403***

CHME513 WATER AND WASTE MANAGEMENT (3Crs.:3Lec,0Lab): The course provides essential knowledge about quality and types of water and wastewater; testing for physical, chemical, and biological parameters. It covers also the primary, secondary, tertiary treatment and the sludge treatment.

CHME514 AIR POLLUTION PROBLEMS AND CONTROL (3Crs.:3Lec,0Lab): The course provides an introduction to air pollution, the sources of air pollution as well as their problems. It covers the monitoring of air pollution, its indicators and their measurements, the air quality monitoring systems, the air quality modeling, the Gaussian Dispersion Model and the proper control technologies.

CHME 518 ENVIRONMENT AND SAFETY (3Crs.:3Lec,0Lab): This course provides fundamentals of environmental control technology for chemical plants including refineries, water and waste treatment and disposal, chemical and biological hazards, and air pollution monitory. It also covers the concepts of occupational safety and health to prevent injuries and illness at work place. ***Pre-req.: CHME 202***

CHME 520 Environmental Technologies (3 crs:3 Lec,0 Lab): This course provides students with a solid and broad scientific and technical knowledge of environmental domains, allowing them to identify sources of pollution caused by industrial activities and assess their environmental implications. It gives the necessary information for implementing control and mitigation strategies, techniques, and devices, as well as treatment procedures. It also enables students to learn about environmental technology in the context of hazardous materials and safety in the oil and gas sectors. ***Pre-req.: PTRE201 OR CHME202***

COMP 424 ARTIFICIAL INTELLIGENCE AND ROBOTICS FOR ENGINEERS (3 Crs.: 3 Lec, 0Lab): Introduction to artificial intelligence and machine learning. Introduction to robotics. Programming in Python: data type, expressions, functions, loops and control. Data plotting and analysis. Smart agent models. Supervised and unsupervised learning. Knowledge representation and reasoning**. *Pre-req: COMP 208***

INME 482 ENGINEERING PROJECT MANAGEMENT (3Crs.: 3Lec, 0Lab) The course covers the characteristics, techniques and challenges associated with initiating, planning, executing, controlling and closure of projects. Project management skills are discussed as they apply to projects, with special focus on leadership, teaming,

and coordinating individual and group efforts. MS Project is introduced to provide hands-on practical skills in building a project plan, scheduling tasks, assigning resources, managing dependencies, monitoring progress and costs, keeping projects on track, and communicating project data through Gantt charts. ***Pre-req: ENGL 300***

MCHE 525 RENEWABLE ENERGY TECHNOLOGIES (3Crs.: 3Lec, 0Lab): Overview of the main renewable energy sources including solar energy, wind energy, geothermal energy, hydro-energy, biofuel and biomass, and ocean energy. Solar angles, estimation of hourly and daily solar radiation, selected heat transfer topics, energy storage, flat-plate solar collector, solar building-heating active and passive, concentrating collector, wind energy, introduction to alternative energy technologies such as hydro, geothermal, and ocean thermal energy conversion. Engineering economy and environmental impact of utilization of renewable energy systems will be also discussed. ***Pre-req.: MCHE 321 or MCHE225***

RNEE 526 Solar Thermal Energy Systems (3Cr.: 3Lec, 0Lab): Study of the different heat transfer mechanisms, principles of solar thermal engineering. Overview on low- and high-temperature solar thermal energy collectors (design and installation), medium and high solar thermal plants (thermal analysis and design), thermal energy storage, solar space air heating, and solar cooling systems (absorption) analysis. Solar energy utilization for desalination technology. Sizing and simulating solar domestic and industrial applications of hot water supply. ***Pre-req.: MCHE 421.***

D. Final Year Projects

CHME501 FINAL YEAR PROJECT I (1Cr) / CHME502 FINAL YEAR PROJECT II (3Crs)
After completing 110 credits of course work, the student becomes eligible to sign up for the Final Year Project (FYP) that extends over two semesters, beginning in Fall-semester by CHME501 (Pre-req: ENGR500) and ending in the following Spring-semester by CHME502 (Pre-req. CHME501). The FYP experience requires students to work in teams to complete a specific project, submit a technical report, and give a presentation on a significant, relevant, and comprehensive engineering problem. The FYP is intended to stimulate student leadership, creativity and critical thinking, making decisions, build skills in formulating, designing, developing, communicating, and managing engineering projects. The project aims to provide students with a transitional experience from the academic world to the professional world.
CHME 501*: *Pre-req: ENGR500
CHME 502: Pre-req. CHME501.

E. Internship (Approved Experience/ Faculty-Supervised Project)

CHME 499 INTERNSHIP (1Cr) This is a professional training which should not be less than four weeks. The training is followed by a presentation session where the students are supposed to present what they have learned

Study Plan

Bachelor of Engineering in Chemical Engineering (150 Credits)

First Semester (15 Credits)		**Crs.**	**Pre/Co-requisites**
COMP208	Programming I	3	
CVLE210	Statics	3	
MCHE201	Engineering Drawing and Graphics	3	
MATH281	Linear Algebra	3	
PHYS280	Classical Physics	3	

Second Semester (17 Credits)		**Crs.**	**Pre/Co-requisites**
MCHE213	Dynamics	3	
MATH282	Calculus	3	Pre: MATH111
PHYS281	Electricity & Magnetism	3	
CHME202	Introduction to Chemical Engineering	3	
CHEM281	Principles of Chemistry I	3	
ENGL001	English Language	2	

Summer I Semester (7 Credits)		**Crs.**	**Pre/Co-requisites**
ARAB001	Arabic Language	2	
ENGL211	Advanced Writing	2	Pre: ENGL001
BLAW001	Human Rights	1	
	Elective (General)	2	

Third Semester (16 Credits)		**Crs.**	**Pre/Co-requisites**
MATH283	Differential Equations	3	Pre: MATH281 + MATH282
MCHE225	Thermodynamics For Chemical Eng. I	3	Pre: PHYS280 OR PHYS282
MCHE331	Fluid Mechanics I	3	Pre: PHYS280 OR PHYS282
CHEM282	Principles of Chemistry II	3	Pre: CHEM281
CHEM282L	Principles of Chemistry II Lab	1	Pre-req OR Co-req: CHEM282
CHEM331	Organic Chemistry	3	Pre: CHEM281

Fourth Semester (18 Credits)		**Crs.**	**Pre/Co-requisites**
MCHE226	Applied Thermodynamics for Chemical Eng.	3	Pre: MCHE225
MCHE338	Pumps and Piping Systems	3	Pre: MCHE331 + CHME 202
CHME204	Mass transfer Operations	3	Pre: CHME 202
CHEM248	Physical Chemistry I	3	Pre: CHEM282
CHEM345	In-organic Chemistry I	3	Pre: CHEM282
MATH284	Numerical Analysis and Techniques	3	Pre: MATH283

Summer II Semester (6 Credits)		**Crs.**	**Pre/Co-requisites**
ENGL300	Speech Communication	2	Pre: ENGL001
WRNL200	Work Ready Now	3	
	Elective (General)	1	

Fifth Semester (17 Credits)		Crs.	Pre/Co-requisites
ENGR500	Research Methodology	2	Pre: ENGL211
CHME301	Separation Processes	3	Pre: CHME204
CHME302	Chemical Reactions Engineering	3	Pre: MCHE226
CHME305	Catalysis and Catalytic Processes	3	Pre: CHEM345
MCHE421	Heat Transfer	3	Pre: MATH284 + MCHE225
	Technical Elective	3	

Sixth Semester (18 Credits)		Crs.	Pre/Co-requisites
MATH381	Probability & Statistics	3	Pre: MATH282
CHME340	Process Simulation	3	Pre: CHME301
CHME403	Process Control	3	Pre: CHME301
CHME405	Reactor Design	3	Pre: CHME302
	Technical Elective	3	
INME221	Engineering Economy	3	

Summer III Semester (1 Credit)		Crs.	Pre/Co-requisites
CHME499	Internship (Approved Experience / Independent Study)	1	

Seventh Semester (18 Credits)		Crs.	Pre/Co-requisites
CHME409	Transportation of Hydrocarbons	3	Pre: MCHE338
CHME 516	Biochemistry	2	Pre: CHEM331
CHME413	Colloids and Interfaces	3	Pre: CHEM248
CHME408	Chemical Process Design	3	Pre: CHME302
CHME501	Final Year Project 1	1	Pre-req: ENGR500
CHME511	Polymer Engineering	3	Pre: CHEM248
	Technical Elective	3	

Eighth Semester (17 Credits)		Crs.	Pre/Co-requisites
CHME402	Unit Operations	3	Pre: CHME301
CHME515	Instrumental Analysis	2	Pre: CHEM282
CHME517	Legislations for Chemical Engineering	2	Pre: BLAW001
CHME502	Final Year Project 2	3	Pre: CHME501
CHME507	Process Optimization	3	Pre: CHME403
ENGR001	Engineering Ethics	1	
	Technical Elective	3	