College Required Courses

Course	Course Name	Catalogue Description	Prerequisites
GENG106	Computer Programming	This course introduces the student to computer concepts, control structures, functions, arrays: single and multi-dimensional, and string processing. The course also examines input/output statements including data file I/O, arithmetic, logical and comparison operators, along with an introduction to classes.	None
GENG107	Engineering Skills and Ethics	Introduction to engineering and engineering disciplines, engineering ethics, communication skills, study skills and problem solving skills, introduction to design.	None
GENG200	Probability & Statistics for Engineers	Classification of Data. Graphical representation. Arithmetical description. Probability theory, probability of an event and composite events. Addition rule and multiplication rule, independent events. Counting techniques. Random variables and probability distributions. Expected values. Continuous and discrete random variables. Normal distribution. Binomial distribution. Poisson distribution. Joint and marginal probability distributions. Independence of random variables. Covariance and correlation. Random sampling. Unbiased estimates. Statistical intervals and test of hypothesis for a single sample.	MATH 102
GENG231	Material Science	A study of relationships between the structure and the properties of materials. Atomic structure, bonding, crystalline and molecular structure and imperfections. Mechanical properties of metals, alloys, polymers, and composites. Electrical properties of materials, semiconductors and ceramics. Creep, fatigue, fracture and corrosion in metals. Laboratory experiments.	CHEM 101
GENG300	Numerical Methods	The numerical methods course involves solving engineering problems drawn from all fields of engineering. The numerical methods include: error analysis, roots of nonlinear algebraic equations, solution of linear and transcendental simultaneous equations, matrix and vector manipulation, curve fitting and interpolation, numerical integration and differentiation, solution of ordinary and partial differential equations.	(GENG 106 OR CMPS 151) AND (MATH 211 OR (MATH 102 AND MATH 231)
GENG360	Engineering Economics	Principles of Engineering Economy. Equivalence and compound interest formula. Single payment model. Uniform payment model. Gradient payment model. Decision criteria for single and multiple alternatives: Present worth, annual worth, future worth, internal rate of return, and benefit cost ratio. Before and after tax analysis.	MATH 102

CHME Major Required Courses

Course	Course Name	Catalogue Description	Prerequisites
CHME201	Introduction to Chemical Engineering I	The basic principles and techniques used for calculation of material balances in chemical engineering processes are introduced. The material covered involves fundamentals of material balance calculations, including reactive and non-reactive systems, formulation and solution of increasingly complex chemical engineering process problems and familiarization with physical properties and behavior of ideal and real gases.	PHYS 191 Concur. AND CHEM 101
CHME202	Introduction to Chemical Engineering II	Vapor-liquid equilibrium calculations for systems containing one condensable component and for ideal multi-component solutions, including bubble and dew point calculations. Forms of energy, the first law of thermodynamics, thermodynamic data, energy balance equation for closed and open systems, simultaneous material and energy balances. Balances on non-reactive systems that involve heating and cooling, compression and decompression, phase changes, mixing of liquids, and dissolving of gasses and solids in liquids. Balances on reactive systems using either the heat of reaction method or the heat of formation method.	CHME 201
CHME212	Chemical Engineering Thermodynamics I	Fundamental concepts. Thermodynamic properties of fluids. Equations of state. Diagrams, tables, and generalized correlations of thermodynamic properties. Work and heat. First law of thermodynamics. Heat effect. Second law of thermodynamics. Power and refrigeration cycles.	CHME 201 Concur.
CHME213	Fluid Mechanics	Fluid statistics. Viscosity of fluid and type of flow. Mass, energy, and momentum balance. Bernoulli's equation. Pressure and Flow measurements. Potential flow. Fluid friction in pipes and fittings. One dimensional gas flow. Pump and compressor design. Flow in packed beds and Ergun equation. Fluidization. Introduction to gas-liquid flow. Surface forces.	CHME 201 Concur
CHME235	Physical Chemistry for Chemical Engineers	This course considers basic concepts of physical chemistry from an engineering perspective. Topics covered include properties of matter, phase diagrams, surface and colloid chemistry, adsorption, chemical kinetics, homogeneous and heterogeneous catalysis, electrochemistry and corrosion. These topics emphasize applications and examples of physical chemistry as they relate to chemical engineers.	CHEM 102

CHME Major Required Courses

Course	Course Name	Catalogue Description	Prerequisites
CHME311	Heat Transfer	Conduction, convection and radiation. Insulation and fins. Thermal boundary layer and turbulence. Empirical relations for convection. Heat transfer for various geometries. Boiling and condensation heat transfer. Heat exchanger design.	CHME 202 AND CHME 213 AND GENG 300 Concur.
CHME312	Chemical Engineering Thermodynamics II	Non-ideal behavior in systems of variable composition. Calculation of thermodynamic energy functions. Residual properties. Partial properties. Thermodynamic property tables and diagrams. Fugacity and fugacity coefficients. Heat effects of mixing. Excess properties and activity coefficients. Introduction to Vapor-liquid equilibria. Phase equilibria at low- to moderate-pressures. Dew point, bubble point and flash calculations. Chemical reaction equilibria. Equilibrium constants and dependence on temperature. Calculation of equilibrium conversions for single and multi-reactions.	CHME 212 AND CHME 235 Concur.
CHME313	Mass Transfer I	Molecular mass transfer. Estimation & measurement of diffusion coefficient. Analogies among mass, heat, & momentum transfer. Turbulence effects. Correlations for mass-transfer coefficients in laminar & turbulent flow. Interface mass transfer, Continuous two-phase transport. Design of absorption and stripping columns. Adsorption. Drying.	CHME 311 Concur.
CHME314	Reaction Engineering	The rate of reaction, interpretation of kinetic data, batch reactors, continuous flow reactors, design equations for batch and flow reactors, reactors in series, the reaction rate constant, the reaction order, elementary, non-elementary, reversible, irreversible and multiple reactions, reactor sizing, volume change with reactions, isothermal and non-isothermal reactor design, pressure drop in reactors, unsteady state operation of reactors.	CHME 202 AND CHME 212
CHME315	Mass Transfer II	Distillation, liquid-liquid extraction and leaching. Humidification. Crystallization.	CHME 313
CHME324	Fluid Mechanics and Heat Transfer Lab	Experiments in fluid flow and heat transfer: Frictional pressure losses in pipes & fittings, Pump performance, Convection, and Double pipe and Shell & tube heat exchangers.	CHME 311 Concur.
CHME325	Unit Operations Lab	Experiments in mass transfer and separation processes: drying, humidification, gas absorption, molecular diffusion in gases, batch and fractional distillation. One experiment on fixed and fluidized bed.	CHME 313

CHME Major Required Courses

Course	Course Name	Catalogue Description	Prerequisites
CHME327	Comp Meth ChE	The aim of the course is to introduce simulation tools for analysis, planning and management of chemical processes. Students will attain knowledge and skills to apply advanced chemical engineering software packages (e.g., Aspen Plus/Hysys, HTRI) to conduct design and simulation of chemical processes.	CHME 315 Concur
CHME399	Practical Training	Supervised six-week training period at an approved engineering facility (consulting, contracting, industrial, government), intended to provide students with hands-on experience at the workplace. Evaluation is based on: daily performance, supervisors input, students report, and a short presentation.	Department Approval (finished 90 credits hrs.)
CHME406	Chemical Process Industries	This course considers the processing of raw materials into useful products. It aims to expose students to both established and emerging industries. Energy, fuels, process utilities, water conditioning and environmental protection will be addressed. Natural gas processing (such as LNG and GTL) and petrochemical industries will be studied. Safety related to chemical process industry will also be highlighted.	CHME 313
CHME421	Senior Design Project I	This course offers students the opportunity to work on practical real-world engineering process design via industrial projects. It focuses on process route selection, considering relevant and realistic constraints, development of process flow diagrams (PFDs), process material balances and energy requirements, utilizing simulation software; optimization of an industrial process using advanced integration design tools, and exposure to industrial safety. The design work will continue in CHME 422 (Senior Design Project II).	CHME 315
CHME422	Senior Design Project II	In this course, students continue to work on the process selected in CHME 421 (Senior Design Project I). It focuses on conducting an environmental impact assessment of the designed process, economic & profitability analysis using Key Economic Performance Indicators (KPIs), detailed mechanical design of major process units (e.g. heat exchangers, separators, distillation columns, and reactors) according to standards and codes, and using advanced computer aided software (e.g. excel, Hysys and ASPEN Plus).	CHME 421 AND GENG 360 Concur

CHME Major Required Courses

Course	Course Name	Catalogue Description	Prerequisites
CHME423	Process Control	Introduction to practical and theoretical aspects of process control, process modeling, transfer functions, dynamics of open-loop systems, Control Station, feedback control system, instruments of control system, control laws (P, PI ,PD and PID), block diagrams, dynamics of closed-loop systems, Stability analysis, root-locus analysis, tuning of controllers, frequency analysis, Bode stability, cascade control, feed-forward control, other control schemes.	CHME 314 AND MATH 217
CHME426	Reaction Engineering and Process Control Lab	Experiments in process control, reaction kinetics and membrane separation. Batch and flow reactors used for generating rate data. Includes the use of analog and digital control equipment.	CHME 314 AND CHME 423 Concur.
CHME458	Process Safety Hazard Prevention	This course aims to establish concepts that lead to enhance process safety and hazards prevention, especially in chemical process industries. It includes application of chemical process safety principles, risk assessment and management, hazard and operability analysis, chemical engineering principles for risk reduction, industrial hygiene, and hazard identification. Case studies and term projects will be used to enhance students¿ mastering of these principles	CHME 312

CHME Major Elective Courses

Course	Course Name	Catalogue Description	Prerequisites
CHME413	Process Modelling & Simulation	Mathematical modeling of chemical processes. Principles of formulation of fundamental and empirical models. Steady state and dynamic models. Applications using spreadsheets and commercial simulators.	CHME 314 AND MATH 217
CHME431	Petroleum Refining Processes	Origin of crude oil, introduction to exploration, drilling and production, refinery feedstock, refinery products, crude oil distillation, fluid catalytic cracking, hydrotreating, catalytic reforming, isomerization, polymerization, product blending, light end unit and other supporting processes, laboratory experiments in petroleum characterization.	CHEM 211 Concur. OR CHEM 209 Concur.
CHME433	Petrochemical Technology	Petrochemical industry. Raw materials. Aliphatic and aromatic petrochemicals. Petrochemicals from methane. Petrochemicals from normal paraffin. Production of olefins. Petrochemicals from aromatics. Polymerization processes. Synthetic rubber. Fibers and proteins.	CHEM 211 Concur. OR CHEM 209 Concur.
CHME435	Polymer Engineering	This course provides the basic building blocks of polymer science and engineering: the structure and properties of polymers; polymerization reactions; polymer solutions and molecular weight characterization; viscoelasticity and rubber elasticity; polymer processing and rheology; mechanical properties; and some special topics.	CHME 213 AND (CHEM 211 Concur. OR CHEM 209 Concur.)
CHME445	Desalination	Industrial desalination processes such as multistage flash, multiple effect distillation, reverse osmosis, and electrodialysis. Technical and economic analysis of desalination processes. Water quality and analysis.	CHME 311
CHME451	Introduction To Gas Engineering	Characterization of natural gas. Properties of reservoir fluids. Qualitative phase behavior. Vapor-liquid equilibrium calculations. Separator selection and design. Natural gas economics. Industrial utilization. Laboratory experiments in gas characterization.	CHME 312

CHME Major Elective Courses

Course	Course Name	Catalogue Description	Prerequisites
CHME454	Natural Gas Treatment	The course presents an overview of the natural gas industry, from wellhead to marketplace, with emphasis on gas plant operations. Physical, chemical and thermodynamic properties of natural gas. Phase behavior of natural gas. Water hydrocarbon systems. Pipelines. Major processes for gas compression, dehydration, acid gas removal and sulfur recovery. Cryogenic Processes. LNG production. Storage and transportation. Field trips to LNG plants are also involved.	CHME 312
CHME455	Introduction to Biochemical Engineering	This course aims to introduce main aspects of biochemical engineering. It includes application of engineering principles to biochemical processes that employ living cells or enzymes. Topics covered include basic biology and biochemistry, enzyme kinetics, microbial growth kinetics, bioreactor design and scale-up, and transport phenomena. Biological waste treatment and bioseparation applications will be addressed.	CHME 314 Concur.
CHME462	Pollution Control	Characteristics and composition of industrial wastes, sampling and methods of analysis of industrial wastes, and remedial measures for treatment, in-plant conservation, material, reclamation, recycling and disposal, NOX, SOX and global warming, Membrane separation, waste identification, water treatment.	CHEM 102
CHME464	Wastewater Treatment	This course aims to provide an overview of the engineering approach to wastewater treatment systems. It starts with a basic description and understanding of the principle unit operations and processes used in the treatment of wastewaters. Physical, chemical, and biological processes are presented, including sedimentation, filtration, biological treatment, disinfection, and sludge processing. It will extend to understanding the kinetic theory of biological growth, applying it to typical aerobic processes, and appreciating the purpose and practice of sludge treatment.	CHME 315 Concur.

CHME Major Elective Courses

Course	Course Name	Catalogue Description	Prerequisites
CHME466	Special Topics in Chemical Engineering I	Selected topics from specialized areas of chemical engineering, aimed at broadening or deepening students¿ knowledge and skills. The specific contents of the course are published one semester in advance.	None
CHME467	Special Topics in Chemical Engineering II	Selected topics from specialized areas of chemical engineering, aimed at broadening or deepening students¿ knowledge and skills. The specific contents of the course are published one semester in advance.	None
CHME470	Fundamentals of Petroleum Engineering	The course covers different disciplines in petroleum engineering of the upstream operation, wellbore flow performance, production behavior and reservoir management. The course incorporates external lecturers from industry, to talk about one of the major petroleum engineering disciplines, as well as a field trip to see the drilling operations and surface facilities. In addition, a term project is included, to cover different disciplines of Petroleum Engineering.	CHME 213 AND CHME 312
CHME474	Process Equipment Design	Material selection and mechanical design of heat exchangers, cooling towers, VLE columns, pumps/compressors, furnaces and pressure vessels. Factors influencing the design of vessels. Design of shell for float-bottomed cylindrical vessels. Proportioning and head selection for cylindrical vessels with formed closures. Design of cylindrical vessels with formed closures operating under high pressure.	CHME 315 Concur.
CHME477	Process Integration	The course introduces advances in process integration and synthesis. It presents systematic techniques to gain insight into process mass and energy flows and it shows how these insights can be used to optimize process performance. Various mathematical and visualization tools are covered. Special focus is given to integration and synthesis methods.	CHME 315 Concur
CHME486	Corrosion Engineering	Study of corrosion mechanisms and techniques used in prevention and control. Electrochemistry and its application to corrosion. Materials selection for different environments	CHEM 102