CHEMICAL ENGINEERING (CHE)

CHE 1100 Introduction to Chemical Engineering (1 credit)

Introduction to chemical engineering career opportunities and process principles including problem solving and documentation skills. Graded Pass/Fail.

CHE 1230 Computations in Chemical Engineering (2 credits)

Methods of analyzing and solving problems in chemical engineering using personal computers; spreadsheet applications, data handling, data fitting, material balances, experimental measurements, separations, and equation solving. Coordinated lecture and lab periods.

Prereqs: Minimum 520 SAT Math or minimum 22 ACT Math or 49 COMPASS Algebra or MATH 1143 or MATH 1170; or Permission. **Coreqs:** MATH 1143, MATH 1170, or higher

CHE 2040 (s) Special Topics (1-16 credits, max 99) Credit arranged

CHE 2100 Integrated Chemical Engineering Fundamentals (1 credit)

Recitation support for fundamental STEM courses and process principles including problem solving and documentation skills. Twice a week, 2 hour recitation sessions. Graded Pass/Fail.

Prereqs: CHE 1100 and CHE 1230

CHE 2200 Programming for Chemical Engineers (3 credits)

Algorithm development, principles of structured programming techniques, coding of numerical and graphical techniques for solutions of engineering systems.

Prereqs: MATH 1170, CHEM 1111, and CHE 1230; or Instructor Permission

CHE 2230 Material and Energy Balances (3 credits)

Conservation of mass and energy calculations in chemical process systems.

Prereqs: CHEM 1120, CHEM 1120L, MATH 1750

CHE 2990 (s) Directed Study (1-16 credits, max 99) Credit arranged

CHE 3070 Group Mentoring (1 credit, max 3)

Mentoring of student groups in engineering classes where a process education environment is used; students taking this course will improve their engineering skill in the area they are mentoring as well as improving their team, communication, and leadership skills. Students must attend all classes or labs where group activities in the process education environment are done (a minimum of 2 mentoring sessions per week). **Prereqs:** Permission

CHE 3260 Chemical Engineering Thermodynamics (3 credits)

Behavior and property estimation for nonideal fluids; phase and reaction equilibria; applications to industrial chemical processes. **Prereqs:** CHE 2230, ENGR 3200 and ENGR 3350, MATH 3100 **Coreas:** CHEM 3050

CHE 3300 Separation Processes I (3 credits)

Equilibrium stagewise operations, including distillation, extraction, absorption.

Prereqs: CHE 3260, CHEM 3050

CHE 3400 Transport and Rate Processes I (4 credits) Cross-listed with MSE 3400

Transport phenomena involving momentum, energy, and mass with applications to process equipment design. Coordinated lecture-lab periods.

Prereqs: ENGR 3350, MATH 3100, and CHE 2230 or ENGR 2150

CHE 3410 Transport and Rate Processes II (4 credits)

Transport phenomena involving momentum, energy, and mass with applications to process equipment design. Coordinated lecture-lab periods.

Prereqs: CHE 3400

CHE 3930 Chemical Engineering Projects (1-3 credits, max 9) Problems of a research or exploratory nature. Preregs: Permission of department

CHE 3980 (s) Engineering Cooperative Internship (3 credits)

Supervised internship in professional engineering settings, integrating academic study with work experience; requires written report; positions are assigned according to student's ability and interest. Graded Pass/ Fail.

Prereqs: Permission

CHE 4000 (s) Seminar (1-16 credits, max 99) Credit arranged

CHE 4040 (s) Special Topics (1-16 credits, max 99)

Credit arranged

Prereqs: Permission

CHE 4150 Integrated Circuit Fabrication (3 credits)

Growth of semiconductor crystals, microlithography, and processing methods for integrated circuit fabrication. Recommended Preparation: CHE 2230 Typically Offered: Varies.

CHE 4230 Reactor Kinetics and Design (3 credits)

Chemical reaction equilibria, rates, and kinetics; design of chemical and catalytic reactors.

Prereqs: CHE 2230, MATH 3100, CHEM 3050

CHE 4330 Chemical Engineering Lab I (1 credit)

Senior lab experiments in chemical engineering. Prereqs: CHE 3300, CHE 3410, CHE 4230

CHE 4340 Chemical Engineering Lab II (1 credit)

Senior lab experiments in chemical engineering. Prereqs: CHE 3300, CHE 3410, CHE 4230

CHE 4440 Process Analysis and Control (3 credits)

Process modeling, dynamics, and analysis. Coordinated lecture-lab periods. Recommended Preparation: CHE 2230, MATH 3100.

CHE 4450 Digital Process Control (3 credits)

Cross-listed with ECE 4770

Dynamic simulation of industrial processes and design of digital control systems. Coordinated lecture-lab periods. Recommended Preparation: CHE 4440 (Recommended Preparation for EE majors: ECE 3500).

CHE 4530 Process Analysis & Design I (3 credits)

Cross-listed with MSE 4530

Estimation of equipment and total plant costs, annual costs, profitability decisions, and optimization; design of equipment, alternate process systems and economics, and case studies of selected processes. CHE/ MSE 4530 and CHE/MSE 4540 are to be taken in sequence. Typically Offered: Fall.

Prereqs: CHE 3300, CHE 3410, and CHE 4230; or ENGR 2150, MSE 3080, MSE 3130, MSE 3400, and MSE 4120

CHE 4540 Process Analysis and Design II (3 credits)

General Education: Capstone Experience

Cross-listed with MSE 4540

Estimation of equipment and total plant costs, annual costs, profitability decisions, optimization; design of equipment, alternate process systems and economics, case studies of selected processes. CHE 4530 and CHE 4540 are to be taken in sequence. Typically Offered: Spring. **Prereqs:** CHE 4530 or MSE 4530

CHE 4550 Surfaces and Colloids (3 credits)

Chemical and physical phenomena near material interfaces and behaviors of colloidal particles in dispersing media. **Prereqs:** CHE 3260 or CHEM 3050 or permission

CHE 4600 Biochemical Engineering (3 credits)

Joint-listed with CHE 5600

Application of chemical engineering to biological systems including fermentation processes, biochemical reactor design, and biological separation processes. Additional projects/assignments required for graduate credit.

CHE 4840 Process Safety (3 credits)

Joint-listed with CHE 5840

This course focuses on the fundamentals of chemical process safety. Topics will include process safety terminology, toxicology and chemical reactivity, industrial hygiene, chemical release and transport, dust, fire and explosions, mitigation and inherently safe design, and hazard identification and risk assessment. Additional work is required for graduate credit. Typically Offered: Fall. Prereqs or

Coreqs: CHE 3300, CHE 4230, and CHE 4440 Cooperative: open to WSU degree-seeking students

CHE 4910 Senior Seminar (1 credit)

General Education: Capstone Experience Cross-listed with BE 4910

Professional aspects of the field, employment opportunities, and preparation of occupational inventories. Graded Pass/Fail. Typically Offered: Varies.

Prereqs: Senior standing.

CHE 4980 (s) Internship (1-16 credits, max 99) Credit arranged

CHE 4990 (s) Directed Study (1-16 credits, max 99) Credit arranged

CHE 5000 Master's Research and Thesis (1-16 credits, max 99) Credit arranged

CHE 5010 (s) Seminar (1 credit, max 99) Cross-listed with BE 5010 Graded Pass/Fail. Typically Offered: unknown. Preregs: Permission

CHE 5020 (s) Directed Study (1-16 credits, max 99) Credit arranged

CHE 5040 (s) Special Topics (1-16 credits, max 99) Credit arranged

CHE 5050 (s) Professional Development (1-16 credits, max 99) Credit arranged

CHE 5150 Transport Phenomena (3 credits)

Advanced treatment of momentum, energy, and mass transport processes; solution techniques.

Prereqs: B. S. Ch. E. and equivalent of CHE 3400, CHE 3410, or Permission Cooperative: open to WSU degree-seeking students.

CHE 5170 Chemicals and Materials Analysis (3 credits)

Theory and experiments in photon/particle interactions, including xray diffraction, electron spectroscopy and microscopy techniques for chemical and physical property analyses applied to chemical, materials and nuclear engineering.

Prereqs: Graduate Standing or Permission

CHE 5270 Thermodynamics (3 credits)

Thermodynamic laws for design and optimization of thermodynamic systems, equations of state, properties of ideal and real fluids and fluid mixtures, stability, phase equilibrium, chemical equilibrium, applications of thermodynamic principles.

Prereqs: B. S. Ch. E. and equivalent of CHE 3260 or Permission Cooperative: open to WSU degree-seeking students.

CHE 5290 Chemical Engineering Kinetics (3 credits)

Interpretation of kinetic data and design of reactors for heterogeneous chemical reaction systems; heterogeneous catalysis, gas-solid reactions, gas-liquid reactions; packed bed reactors, fluidized bed reactors. **Prereqs:** B. S. Ch. E. and equivalent of CHE 4230 or Permission Cooperative: open to WSU degree-seeking students.

CHE 5360 Electrochemical Engineering (3 credits)

Cross-listed with NE 5360

Application of chemical engineering principles to electrochemical systems; thermodynamics, kinetics, and mass transport in electrochemical systems; electrochemical process design. Recommended preparation: graduate engineering standing.

CHE 5410 Chemical Engineering Analysis I (3 credits)

Mathematical analysis of chemical engineering operations and processes; mathematical modeling and computer applications. **Prereqs:** B. S. Ch. E. and equivalent of CHE 4440 or Permission Cooperative: open to WSU degree-seeking students.

CHE 5600 Biochemical Engineering (3 credits) Joint-listed with CHE 4600

Application of chemical engineering to biological systems including fermentation processes, biochemical reactor design, and biological separation processes. Additional projects/assignments required for graduate credit.

CHE 5820 Spent Nuclear Fuel Management and Disposition (3 credits) Cross-listed with NE 5820

The management of nuclear fuel after removal from a nuclear reactor; storage options, recycle and recovery of uranium and other radionuclides, geological repositories, and related topics. **Preregs:** Permission

CHE 5840 Process Safety (3 credits)

Joint-listed with CHE 4840

This course focuses on the fundamentals of chemical process safety. Topics will include process safety terminology, toxicology and chemical reactivity, industrial hygiene, chemical release and transport, dust, fire and explosions, mitigation and inherently safe design, and hazard identification and risk assessment. Additional work is required for graduate credit. Typically Offered: Fall. Prereqs or

Coreqs: CHE 3300, CHE 4230, and CHE 4440 Cooperative: open to WSU degree-seeking students

CHE 5990 (s) Non-thesis Master's Research (1-16 credits, max 99) Credit arranged

CHE 6000 Doctoral Research and Dissertation (1-45 credits, max 99) Credit arranged