

ECHM - Chemical Engineering

ECHM 100 Intro to Chemical Engr: 2 Credits (1 Lec, 1 Lab)

(F) An introduction to engineering measurements, computations, problem solving, and experimental design. Discussion of the breadth of opportunities in chemical and biological engineering. Cross-Listed with EBIO 100.

ECHM 201 Material and Energy Balances for Chemical & Biological Processes: 4 Credits (3 Lec, 1 Other)

PREREQUISITE: CHMY 141 or CHMY 151, M 171Q or M 181Q.
(F, Sp) Material and Energy balance calculations applied to industrial processes. Analysis of gas behavior and gas-liquid systems. Discussions of contemporary issues in engineering and the impact of engineering solutions in a global, economic, environmental and societal context. Cross-listed with ECHM 216

ECHM 205CS Energy and Sustainability: 3 Credits (3 Lec)

(F, Sp) Students from all academic backgrounds explore an array of renewable and non-renewable energy sources and energy conversion systems. Contemporary and contentious energy related issues are presented, and course participants will formulate strategies to address them.

ECHM 215 Elementary Principles of Chemical and Biological Engineering I: 3 Credits (3 Lec)

PREREQUISITE: CHMY 141 and M 171Q Material balance calculations applied to industrial processes. () On demand. Analysis of gas behavior and gas-liquid systems

ECHM 216 Elementary Principles of Chemical and Biological Engineering II: 3 Credits (3 Lec)

PREREQUISITE: ECHM 215, M 172, consent of instructor. () On demand. Energy balances and combined energy-material balances. Discussion of contemporary issues in engineering and the impact of engineering solutions in a global, economic, environmental and societal context

ECHM 290R Undergraduate Research: 1-6 Credits (1-6 Other)

PREREQUISITE: Consent of instructor. (F, Sp, Su) Directed undergraduate research/creative activity which may culminate in a written work or other creative project. May be repeated
Repeatable up to 99 credits.

ECHM 291 Special Topics: 1-4 Credits (1-4 Other)

PREREQUISITE: None required but some may be determined necessary by each offering department. Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number
Repeatable up to 12 credits.

ECHM 292 Independent Study: 1-3 Credits (1-3 Other)

PREREQUISITE: Consent of instructor and approval of the Associate Dean. (F, Sp, Su) Directed research and study on an individual basis
Repeatable up to 6 credits.

ECHM 307 Chem Engin Thermodynamics I: 3 Credits (3 Lec)

PREREQUISITE: ECHM 201, M 273. (F, Sp) Application of the laws of thermodynamics to power, refrigeration and gas liquefaction cycles. An introduction to vapor-liquid phase equilibrium for solutions at low pressure

ECHM 321 Chemical Engineering Fluid Mechanics Operations: 3 Credits (3 Lec)

PREREQUISITE: ECHM 201 and M 273
COREQUISITE: M 274. (F, Sp) Theory and equipment for fundamental chemical and biological engineering operations involving fluid mechanics. Equipment design and computations of operational rates

ECHM 322 Chemical Engineering Heat Transfer Operations: 3 Credits (3 Lec)

PREREQUISITE: ECHM 201, EGEN 102

COREQUISITE: ECHM 321. (F, Sp) Theory and equipment for fundamental chemical engineering operations involving heat transfer. Equipment design and computations of operational rates

ECHM 323 Chemical Engineering Mass Transfer Operations: 3 Credits (3 Lec)

PREREQUISITE: ECHM 307, ECHM 322. (F, Sp) Theory and equipment for fundamental chemical engineering operations involving mass transfer. Equipment design and computations of operational rates

ECHM 328 Chemical Engineering Reactor Design: 3 Credits (3 Lec)

PREREQUISITE: ECHM 201, M 274. (F, Sp) Application of the chemical kinetics of homogeneous and heterogeneous reactions to the design of chemical processing equipment

ECHM 405 Sustainable Energy: 3 Credits (3 Lec)

PREREQUISITE: EMAT 251 and either ECHM 307 or EMEC 320, or consent of instructor. (F) Review of energy sources, their extraction, conversion and end-use, focusing on modern technology and materials. Investigate the design, construction and operation of combustion-based energy conversion systems including boilers, engines and gas turbines, in addition to non-combustion-based energy conversion systems including solar-thermal, photovoltaics, wind turbines, fuel cells and batteries

ECHM 407 Chem Engin Thermodynamics II: 2 Credits (2 Lec)

PREREQUISITE: ECHM 307 and ECHM 323 and ECHM 328. (F, Sp) Application of laws of thermodynamics to vapor-liquid phase equilibrium, liquid-liquid phase equilibrium, and chemical reaction equilibrium

ECHM 411R Chemical Engineering Design I: 3 Credits (2 Lec, 1 Other)

PREREQUISITE: ECHM 321, ECHM 322, ECHM 323, ECHM 328
COREQUISITE: EGEN 310R. (F) Senior capstone course. Design and simulation of chemical engineering equipment, processes and plants

ECHM 412R Chemical Engineering Design II: 3 Credits (2 Lec, 1 Other)

PREREQUISITE: ECHM 323, ECHM 328. (Sp) Senior capstone course. Design and economic analysis of chemical engineering equipment, processes and plants. Students are required to meet with a faculty one hour a week for the additional credit hour of instruction

ECHM 424 Transport Analysis: 3 Credits (3 Lec)

PREREQUISITE: ECHM 323, M 273, M 274. (F, Sp) Deterministic modeling techniques are applied to processes for the transport of momentum, energy and mass. Analytical and numerical solution techniques for the differential equations commonly encountered in the transport processes

ECHM 428 Reaction Engineering and Reaction Modeling: 3 Credits (3 Lec)

PREREQUISITE: ECHM 323 and ECHM 328. (F, Sp) Advanced engineering aspects of chemical reactor design. Analysis of coupled mass and energy transport processes and chemical reaction in application to realistic design and scale-up of various types of chemical reactors. Optimization problems in reactor design and operation

ECHM 442 Chem Engin Laboratory I: 3 Credits (1 Lec, 2 Lab)

PREREQUISITE: ECHM 323, EGEN 350. (F, Sp) Experimental studies of unit operations and transport phenomena. Pilot plant studies. Design of Chemical processes and equipment from experimental studies. Cross-listed with EBIO 442

ECHM 443 Chem Engin Laboratory II: 3 Credits (1 Lec, 4 Lab)

PREREQUISITE: ECHM 442. (F, Sp) Experimental studies of unit operations and transport phenomena. Design of chemical processes and equipment from experimental studies

ECHM 451 Chemical Engineering Process Dynamics and Control: 3 Credits (3 Lec)

PREREQUISITE: ECHM 328 or EBIO 438 and M 274. (F, Sp) Transient response analysis of controllers and instruments. Design of chemical process control systems

ECHM 452 Advanced Engineering Materials: 3 Credits (3 Lec)

PREREQUISITE: EMEC 250 or EMAT 251, M 274. () On demand. Micro and macro properties of electronic materials and material processing

ECHM 490R Undergraduate Research: 1-8 Credits (1-8 Other)

PREREQUISITE: Senior Standing and consent of instructor. (F, Sp, Su) Directed undergraduate research/creative activity which may culminate in research paper, journal article, or undergraduate thesis. Course will address responsible conduct of research. May be repeated
Repeatable up to 12 credits.

ECHM 491 Special Topics: 1-3 Credits (1-3 Other)

PREREQUISITE: Course prerequisites as determined for each offering. Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number
Repeatable up to 12 credits.

ECHM 492 Independent Study: 1-3 Credits (1-3 Other)

PREREQUISITE: Junior standing, consent of instructor and approval of department head. (F, Sp, Su) Directed research and study on an individual basis
Repeatable up to 6 credits.

ECHM 498 Internship: 1-12 Credits (1-12 Lec)

PREREQUISITE: Junior standing, consent of instructor and approval of associate dean. (F, Sp, Su) An individualized assignment arranged with an agency, business or other organization to provide guided experience in the field
Repeatable up to 12 credits.

ECHM 503 Thermodynamics: 3 Credits (3 Lec)

PREREQUISITE: ECHM 307. (F) Chemical engineering application to phase equilibria and chemical reaction equilibrium. Liquid - liquid, vapor - liquid, and multiple reaction system

ECHM 510 Reaction Engineering/Modeling: 3 Credits (3 Lec)

PREREQUISITE: ECHM 328. (Sp) Theory and practice of industrial reactions, kinetics, synthesis, modeling of fixed and fluidized beds, process design problems

ECHM 533 Transport Phenomena: 3 Credits (3 Lec)

PREREQUISITE: ECHM 424. (Sp) Comprehensive treatment of mass, momentum, and energy transport. Cross listed with EMEC 533

ECHM 534 Mass Transfer: 3 Credits (3 Lec)

PREREQUISITE: ECHM 424. (F, Sp) Mass transfer theory, transport in liquids, porous solids, interfacial effects, related mathematical techniques and application

ECHM 535 Viscous Fluid Dynamics: 3 Credits (3 Lec)

(Sp) Advanced fluid dynamics of viscous materials. Historical and theoretical development. Newtonian, non-newtonian and turbulent flows. Multidimensional flow problems. Cross-listed with EMEC 534.

ECHM 575 Research or Prof Paper/Project: 1-4 Credits (1-4 Other)

PREREQUISITE: Graduate standing. (F, Sp, Su) A research or professional dealing with a topic in the field. The topic must have been mutually agreed upon by the student and his or her major advisor and graduate committee. Directed research and study on an individual basis
Repeatable up to 6 credits.

ECHM 590 Master's Thesis: 1-10 Credits (1-10 Other)

PREREQUISITE: Master's standing
Repeatable up to 10 credits.

ECHM 591 Special Topics: 1-3 Credits (1-3 Other)

PREREQUISITE: Upper division courses and others as determined for each offering. Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number
Repeatable up to 12 credits.

ECHM 592 Independent Study: 1-4 Credits (1-4 Other)

PREREQUISITE: Graduate standing, consent of instructor, approval of department head and Dean of Graduate Studies. (F, Sp, Su) Directed research and study on an individual basis
Repeatable up to 6 credits.

ECHM 594 Seminar: 1 Credits (1 Other)

PREREQUISITE: Graduate standing or seniors by petition. (F, Sp) Department of Chemical & Biological Engineering
Repeatable up to 4 credits.

ECHM 598 CHBE Grad Internship: 1-3 Credits (1-3 Other)

PREREQUISITE: Graduate standing, consent of advisor and approval of department head. (F, Sp, Su) An individualized assignment arranged with an agency, business, or other organization to provide guided experience in the field
Repeatable up to 6 credits.

ECHM 690 Doctoral Thesis: 1-10 Credits (1-10 Other)

PREREQUISITE: Doctoral standing
Repeatable up to 10 credits.