EACHM 100. Intro to Chemical Engr. 2 Credits. (1 Lec, 1 Lab) F
COREQUISITE: M 151Q or above. An introduction to engineering measurements, computations, problem solving, and experimental design. Discussion of the breadth of opportunities in chemical and biological engineering.

EACHM 201. Elementary Principles of Chemical and Biological Engineering. 3 Credits. (3 Lec) F,S

EACHM 205CS. Energy and Sustainability. 3 Credits. (3 Lec) F,S
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.

EACHM 216. Elementary Principles of Chemical and Biological Engineering II. 3 Credits. (3 Lec) S
3 cr. LEC 3 PREREQUISITE: ECHM 215, M 172Q. 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.

EACHM 290R. Undergraduate Research. 1-6 Credits. (1-6 Ind; max unlimited) F,S
Directed undergraduate research/creative activity which may culminate in a written work or other creative project. May be repeated.

EACHM 291. Special Topics. 1-4 Credits. (1-4 Lec; 12 cr max) On Demand
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.

EACHM 292. Independent Study. 1-3 Credits. (1-3 Ind; 6 cr max) On Demand
Maximum 6 cr. PREREQUISITE: Consent of instructor and approval of the Associate Dean. Directed research and study on an individual basis.

EACHM 307. Chem Eng Thermodynamics I. 3 Credits. (3 Lec) F

EACHM 321. Chemical Engineering Fluid Mechanics Operations. 3 Credits. (3 Lec) S
PREREQUISITE: ECHM 201 and M 172Q. Corequisite: M 274Q. Theory and equipment for fundamental chemical and biological engineering operations involving fluid mechanics. Equipment design and computations of operational rates.

EACHM 322. Chemical Engineering Heat Transfer Operations. 3 Credits. (3 Lec) F

EACHM 323. Chemical Engineering Mass Transfer Operations. 3 Credits. (3 Lec) S
PREREQUISITE: ECHM 307, ECHM 322. Theory and equipment for fundamental chemical engineering operations involving mass transfer. Equipment design and computations of operational rates.

EACHM 328. Chemical Engineering Reactor Design. 3 Credits. (3 Lec) S
3 cr. LEC 3 PREREQUISITE: ECHM 201, M 274. Application of the chemical kinetics of homogeneous and heterogeneous reactions to the design of chemical processing equipment.

EACHM 405. Sustainable Energy. 3 Credits. (3 Lec)
PREREQUISITE: EMAT 251 and either ECHM 307 or EMEC 320, or consent of instructor. 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.

EACHM 407. Chem Engin Thermodynamics II. 2 Credits. (2 Lec) F

EACHM 411R. Chemical Engineering Design I. 3 Credits. (2 Lec) F

EACHM 412R. Chemical Engineering Design II. 3 Credits. (2 Lec) S
PREREQUISITE: ECHM 411R. Senior capstone course. Design and economic analysis of chemical engineering equipment, processes and plants.

EACHM 424. Transport Analysis. 3 Credits. (3 Lec) F
PREREQUISITE: ECHM 323, M 273Q, M 274. 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.

EACHM 428. Reaction Engineering and Reaction Modeling. 3 Credits. (3 Lec) S
PREREQUISITE: ECHM 323 and ECHM 328. 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.

EACHM 442. Chem Engin Laboratory I. 3 Credits. (1 Lec, 2 Lab) F

EACHM 443. Chem Engin Laboratory II. 3 Credits. (1 Lec, 2 Lab) S
PREREQUISITE: ECHM 442. Experimental studies of unit operations and transport phenomena. Design of chemical processes and equipment from experimental studies.

EACHM 451. Chemical Engineering Process Dynamics and Control. 3 Credits. (3 Lec) S
PREREQUISITE: ECHM 328, ECHM 323, M 274. Transient response analysis of controllers and instruments. Design of chemical process control systems.

EACHM 452. Advanced Engineering Materials. 3 Credits. (3 Lec) On Demand
PREREQUISITE: EMEC 250 or EMAT 251, M 274. Micro and macro properties of electronic materials and material processing.

EACHM 490R. Undergraduate Research. 1-8 Credits. (1-8 Ind; 12 cr max) F,S,Su
PREREQUISITE: Senior Standing. 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.

EACHM 491. Special Topics. 1-3 Credits. (1-3 Lec; 12 cr max) On Demand
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.

EACHM 492. Independent Study. 1-3 Credits. (1-3 Ind; 6 cr max) On Demand
Maximum 6 cr. PREREQUISITE: Consent of instructor and approval of the Associate Dean. Directed research and study on an individual basis.

EACHM 498. Internship. 1-12 Credits. (1-12 Ind; 12 cr max) On Demand
PREREQUISITE: Junior standing, consent of instructor and approval of department head. Directed research and study on an individual basis.

EACHM 503. Thermodynamics. 3 Credits. (3 Lec) F

EACHM 510. Reaction Engineering/Modeling. 3 Credits. (3 Lec) S alternate years, to be offered odd years.

EACHM 533. Transport Phenomena. 3 Credits. (3 Lec) S

EACHM 534. Mass Transfer. 3 Credits. (3 Lec) On Demand
PREREQUISITE: ECHM 424. Mass transfer theory, transport in liquids, porous solids, interfacial effects, related mathematical techniques and application.
ECHM 535. Viscous Fluid Dynamics. 3 Credits. (3 Lec) On Demand

ECHM 575. Research or Prof Paper/Project. 1-4 Credits. (1-4 Ind; 6 cr max) On Demand
Maximum 6 cr. PREREQUISITE: Graduate standing. 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.

ECHM 590. Master's Thesis. 1-10 Credits. (1-10 Ind; 10 cr max) F,S,Su
PREREQUISITE: Master's standing.

ECHM 591. Special Topics. 1-3 Credits. (1-3 Lec; 12 cr max) On Demand
Maximum 12 cr. 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.

ECHM 592. Independent Study. 1-3 Credits. (1-3 Ind; 6 cr max) On Demand
Maximum 6 cr. PREREQUISITE: Graduate standing, consent of instructor, approval of department head and Dean of Graduate Studies. Directed research and study on an individual basis.

ECHM 594. Seminar. 1 Credit. (1 Sem; 4 cr max) F
Maximum 4 cr. PREREQUISITE: Graduate standing or seniors by petition. Course prerequisites as determined for each offering. Topics offered at the graduate level which are not covered in regular courses. Students participate in preparing and presenting discussion material.

ECHM 598. CHBE Grad Internship. 1-3 Credits. (1-3 Ind; 6 cr max) F,S,Su
Maximum 6 cr. PREREQUISITE: Graduate standing, consent of advisor and approval of department head. An individualized assignment arranged with an agency, business, or other organization to provide guided experience in the field.

ECHM 690. Doctoral Thesis. 1-10 Credits. (1-10 Ind; 10 cr max) F,S,Su
PREREQUISITE: Doctoral standing.