Undergraduate Program

Bachelor of Science in Chemical Engineering

Minimum credit hours required—136
In addition to the General Degree Requirements (page 54), the following courses are required:

- ChE 326 (3), 345L (1), 349 (3), 351 (3), 352 (3), 443 & 443L (3), 445L (1), 461 (3), 462 (3), 485 (1)
- CHEM 311 & 311L (4), 331 & 331L (4), 333 & 333L (4)
- ES 110 (2), 111 (3), 201 (3), 216 (3), 302 (3), 316 (3), 347(3), 350 (3), 405L (1)
- EE 211 (3) or ES 332 (3)
- MATH 231 (4), 335 (3)
- MATE 202 & 202L or 235 & 235L (4)
- Chemistry/Biology Elective (3) Any upper-division chemistry or biology course approved by the advisor
- Engineering/Technical Electives (6) Upper-division engineering or other approved courses. These electives should generally be Chemical Engineering or other engineering program courses at the 300-, 400- or 500-level. Advanced courses in chemistry, biology, mathematics, and computer science are encouraged. Chemical Engineering technical elective courses include ChE 463, 464, 470, 472, 473, 474, 475, and 489. Consult the semester schedule and your advisor for the availability of other technical electives of interest.

Chemical engineering majors must maintain a minimum GPA of 2.0 in required courses in order to graduate.

All engineering majors are required to take the Fundamentals in Engineering (FE) exam as a requirement for graduation.

Sample Curriculum for the Bachelor of Science in Chemical Engineering
To help plan your course of study, be sure to use the degree flowchart found in the Student Handbook at ***www.nmt.edu/~cheme***

Semester 1
2 ES 110 (intro to engineering)
3 ENGL 111 (college English)
4 MATH 131 (calculus I)
4 CHEM 121 & 121L (general)
3 Social Science
16 Total credit hours

Semester 2
3 ES 111 (computer programming)
4 MATH 132 (calculus II)
4 CHEM 122 & 122L (general)
5 PHYS 121 & 121L (general)
16 Total credit hours

Semester 3
3 ChE 326 (intro to chemical engineering)
4 MATH 231 (calculus III)
3 ES 201 (statics)
4 CHEM 311 & 311L (analytical)
3 ENGL 112 (college English II)
17 Total credit hours

Semester 4
3 ES 216 (fluid mechanics)
3 ES 347 (engineering thermodynamics)
3 MATH 335 (ordinary differential equations)
5 PHYS 122 & 122L (general)
3 Humanities
17 Total credit hours

Semester 5
3 ChE 349 (ChE thermodynamics)
3 EE 211 (circuits) or ES 332 (electrical engineering)
3 ES 350 (heat and mass transfer)
1 ES 405L (instrumentation)
4 CHEM 331 & 331L (physical)
3 Social Science
17 Total credit hours

Semester 6
1 ChE 345L (junior design)
3 ChE 351 (kinetics)
3 ChE 352 (separation processes)
3 ES 316 (engineering economics)
3 ENGL 341 (technical writing)
4 MATE 202 & 202L or 235 & 235L (materials engineering)
17 Total credit hours

Semester 7
1 ChE 445L (unit operations lab)
3 ChE 461 (plant design I)
1 ChE 485 (senior seminar)
3 ES 302 (strength of materials)
4 CHEM 333 & 333L (organic)
3 Engineering/Technical Elective
3 Humanities/Social Science
18 Total credit hours

Semester 8
2 ChE 443 (process control)
1 ChE 443L (process control lab)
3 ChE 462 (plant design II)
3 Chemistry/Biology Elective
3 Engineering/Technical Elective
3 Humanities
3 Social Science
18 Total credit hours

Minor in Polymer Science

Minimum credit hours required—19
The following courses are required:

- CHEM 334 (3), 446 (3)
- MATE 202 & 202L (4) or 235 & 235L (4)
- MATE 351 (3), 474 (3)
- ChE 473 (3)

Chemical Engineering Courses:

ChE 326, Principles of Chemical Engineering, 3 cr, 3 cl hrs
Prerequisite: ES 111; MATH 132
Offered spring and fall semesters
Introduction to stoichiometric computations. Calculations of energy and material balance. Elementary process analysis and reactor design. Single and multi-phase systems. (Same as METE 326)

ChE 345L, Chemical Engineering Design Lab, 1 cr, 3 lab hrs
Prerequisites: ES 216, 347, and 350
Offered spring semester
Team-oriented project design. Introduction to design fundamentals and creative problem-solving techniques. Written and oral presentations summarizing team progress.

ChE 349, Chemical Engineering Thermodynamics, 3 cr, 3 cl hrs
Prerequisites: MATH 231; ES 347 is recommended
Offered fall semester
The theory and engineering applications of the properties of mixtures, phase and chemical reaction equilibria. (Same as MATE 350)

ChE 351, Chemical Process Kinetics, 3 cr, 3 cl hrs
Prerequisites: ChE 326, 349
Offered spring semester
Fundamentals of chemical reaction kinetics and chemical reactor design. Development of rate equations for both homogeneous and heterogeneous reactions, catalysis, diffusion-controlled reactions, and transport processes. (Previously offered as ChE 451)

ChE 352, Separation Processes, 3 cr, 3 cl hrs
Prerequisites: ChE 349; ES 350
Offered spring semester
The process approach to solving problems that involve equilibrium in binary and multicomponent mixtures. Phase equilibrium, absorption, distillation (binary and multicomponent), liquid-liquid extraction, leaching. Design of staged operations for separating gas-liquid, liquid-liquid, solid-liquid, and gas-solid mixtures. (Previously offered as ChE 442)

ChE 443, Process Dynamics and Control, 2 cr, 2 cl hrs
Prerequisites: MATH 335 and (ES 350 or ES 314)
Process dynamics and control theory applied to chemical, mechanical, and other engineering processes. Design of control systems.

ChE 443L, Chemical Process Dynamics & Control Lab, 1 cr, 3 lab hrs
Corequisite: ChE 443
Computer modeling of system dynamics. Design, implementation, and tuning of process control systems for chemical processes.

ChE 445L, Unit Operations Lab, 1 cr, 3 lab hrs
Prerequisite: ChE 352
Offered fall semester
Laboratory exercises to illustrate heat exchange, fluid flow, and mass transport phenomena in common unit operations found in the chemical process industries.

ChE 461, Chemical Plant Design, Economics, and Management I, 3 cr, 1 cl hr, 6 lab hrs
Prerequisites: ES 316 or consent of instructor
Offered fall semester
A two-semester sequence of courses in which a design project is used to illustrate principles and processes of chemical plant design, economics, and management. Lecture topics include intellectual property, capital and operating cost estimation, energy conservation, design optimization and scaling of chemical processes. Use of commercially available process simulation software emphasized.

ChE 462, Chemical Plant Design, Economics, and Management II, 3 cr, 1 cl hr, 6 lab hrs
Prerequisite: ChE 461
Offered spring semester
Continuation of ChE 461.

Elective Courses

ChE 463, Design and Analysis of Experiments, 3 cr, 3 cl hrs
Prerequisite: Senior standing
Methods of statistics and modeling important to many problems in materials science and engineering. Examples are chosen from a number of actual experiences. Safety considerations and experiment design including analysis of risk, how risks may be integrated, and how formal procedures should be established. The use of information sources, such as materials safety data sheets (MSDS). (Same as MATE 430)

ChE 464, Natural Gas Engineering, 3 cr, 3 cl hrs
Prerequisite: PETR 245 or ChE 349
Offered fall semester
Composition and properties of natural gas. Gas separator design. Recovery of liquefiable products from gas. Conditioning, transmission, and compression, measurement of gas, gas pipeline design, and gas storage. (Same as PETR 464)

ChE 470, Fuel Cell Technology, 3 cr, 3 cl hrs
Prerequisite: Consent of instructor
The principles of fuel cell technology, including classification of fuel cells and operating mechanisms. Analysis of the underlying thermodynamics and physical factors which govern fuel cell performance and efficiency. Cell components and integrative cell design.

ChE 472, Advanced Transport Phenomena, 3 cr, 3 cl hrs
Prerequisites: ES 216 and 350 or consent of instructor
Highly recommended for students considering graduate school
Advanced principles of momentum, heat and mass transfer. Topics will include laminar Newtonian and non-Newtonian flow, elementary turbulent flow, heat conduction in composites, boundary layer theory, radiation, and binary diffusion with adsorption reaction.

ChE 473, Polymer Materials Engineering, 3 cr, 3 cl hrs
Prerequisite: MATE 202 or consent of instructor
Offered every fall semester
Introduction to classes and performance properties of polymeric materials. Methods of polymer synthesis and processing. Special emphasis on structure, viscoelasticity, and mechanical properties.

ChE 474, Polymer Processing and Characterization, 3 cr, 2 cl hrs, 3 lab hrs
Prerequisite: MATE 202 or consent of instructor
A practical and "hands-on" course covering the essentials of polymer processing and polymer materials characterization. A survey of polymer processing techniques with emphasis on the fundamentals of extrusion. Lab topics include: extruder operation, compounding, scanning calorimetry, rheometry, and mechanical testing. Field trips to manufacturing facilities. (Same as MATE 474)

ChE 475, Explosives Surety, 3 cr, 3 cl hrs
Prerequisite: Upper-class standing or consent of instructor
Offered spring semester
An introduction to explosives and other energetic materials. The basic chemical compositions, properties and environmental effects of commercial, military, and improvised (terrorist) explosives and some pyrotechnics will be compared. The basic physics of shock waves and detonation. Explosive effects, blast detection, tagging and environmental issues. Case studies or recent bombings will be used to describe a variety of terrorist approaches. Safety in handling of explosive materials and classifications for transportation and storage.

ChE 485, Senior Seminar, 1 cr, 3 lab hrs
Prerequisite: Senior standing or consent of instructor
Offered fall semester
Student and outside speaker presentations of topics of current interest. Peer and video review of each student's work. Career planning.

ChE 491, Independent Study, hrs and crs to be arranged
Prerequisite: Consent of instructor
Individual study of chemical engineering problems of special interest.

Faculty Research Interests

Bretz—Transport Phenomena, Phase Behavior, Natural Gas Processing
Marshall – Instrumentation and Data Acquisition
Tartis - Biomedical Engineering, Targeted Drug Delivery
Weinkauf—Polymer Engineering, Membrane Separations, Plasma Polymer Thin Films,Microsensors, Plasma Surface Modification