

CHEMICAL ENGINEERING

Associate Professor Martha C. Mitchell*, interim department head
Professor Richard L. Long*#, associate department head

Professors Long*#, Johnson, Munson-McGee, Patton (emeritus), Roubicek (emeritus); **Associate Professors** Andersen, Mitchell*, Rockstraw*; **Assistant Professors** Deng; **College Professor** Del Valle
 (505) 646-1214

*Registered Professional Engineer (NM)

#Registered Professional Engineer (State other than NM)

DEGREE: Bachelor of Science in Chemical Engineering

Chemical engineers combine their knowledge of science, mathematics, and physics with their expertise in engineering analysis to solve industry-level problems in both the private and public sectors. An undergraduate degree leads to an exciting career in fields such as computer chip manufacturing; environmental restoration and pollution prevention; biotechnology and bio-engineering; pharmaceutical manufacturing; food production; transportation (including automotive and aerospace); advanced materials; petrochemical and refining; chemical synthesis and production; power and energy production (including the nuclear industry); law, medicine or advanced studies at the graduate level.

In support of the mission of New Mexico State University, the Department of Chemical Engineering strives to prepare Chemical Engineering Bachelor of Science graduates to successfully and safely practice the chemical engineering profession, to engage in life-long personal and professional development, and to contribute to the betterment of their community and society.

To accomplish this mission, the department supports the objectives of the college and the university and expands the objectives to satisfy the needs of the Chemical Engineering constituent groups. The department strives to achieve the objectives of providing all graduating B.S. students with

1. a solid foundation in the fundamentals of chemical engineering science, design, and practice;
2. a sound base in chemistry, mathematics, and physics;
3. an opportunity to explore advanced disciplines pertinent to career choice;
4. an opportunity to participate on multidisciplinary teams;
5. the opportunity and training to develop the written and oral communication skills required of a practicing engineer;
6. The opportunity to develop and comprehend professional and ethical behavior, to develop an understanding of the humanities and social sciences, and to develop the skills to engage in lifelong learning.

These objectives are consistent with those of the College of Engineering and New Mexico State University in their commitment to developing student excellence in an intellectually stimulating environment, cultural diversity, and broad education programs, while encouraging individual expression, professional behavior, civic responsibility, leadership, and an appreciation for continuing education.

The NMSU curriculum meets ABET accreditation requirements.

Requirements (Total credits 135)

In addition to satisfying the requirements of the university and the College of Engineering, all majors must pass departmental classes with a grade of C or better.

Freshman Year (31 credits)

CH E 100, Introduction to Engineering.....	1
CH E 111, Introduction to Computers in Chemical Engineering.....	3
CHEM 115, 116, Principles of Chemistry I, II.....	8
COMM 265G, Principles of Human Communication.....	3
ENGL 111G, Rhetoric and Composition.....	4
MATH 191, 192, Calculus and Analytic Geometry I, II.....	6
PHYS 215, Engineering Physics I.....	3
Humanities or social science elective ¹	3

Sophomore Year (34 credits)

CH E 201, Chemical Process Calculations.....	5
CH E 301, Chemical Engineering Thermodynamics I.....	3

CH E 305, Transport Operations I: Fluid Flow.....	3
CH E 311, Engineering Data Analysis.....	3
CHEM 313, 314, 315, Organic Chemistry I, II, Lab.....	8
ENGL 218G, Technical and Scientific Communication.....	3
MATH 291, Calculus and Analytic Geometry III.....	3
MATH 392, Differential Equations.....	3
PHYS 216, Engineering Physics II.....	3

Junior Year (34 credits)

CH E 302, Chemical Engineering Thermodynamics II.....	3
CH E 306, Transport Operations II: Heat and Mass Transfer.....	3
CH E 307, Transport Operations III: Staged Operations.....	3
CH E 315L, Process Instrumentation Lab.....	2
CH E 361, Engineering Materials.....	3
CH E 407L, Transport Operations Lab.....	2
CH E 441, Chemical Kinetics and Reaction Engineering.....	3
CH E 451, Engineering Economy.....	3
CHEM 433, Physical Chemistry I.....	3
ECON 251G, Principles of Macroeconomics.....	3
Humanities or social science electives ¹	6

Senior Year (36 credits)

CH E 412, Process Control and Dynamics.....	3
CH E 422L, Unit Operations and Process Control Lab.....	2
CH E 452, Process Design, Analysis and Simulation.....	4
CH E 455, Advanced Plant Design.....	2
CH E 490, Senior Seminar.....	1
CH E upper-division elective.....	3
CHEM or natural science elective ^{2, 3}	3
CHEM elective ²	3
EE 201, Networks I.....	3
ME 236, Engineering Mechanics I.....	3
Engineering elective ⁴	3
Humanities or social sciences electives ¹	6

¹Humanities and social science electives must be selected to satisfy the university's general education requirements.

²Any upper-division chemistry class that would be acceptable for a B.S. in Chemistry that requires at least CHEM 112 as a prerequisite except for: CHEM 351, CHEM 441, CHEM 451, or CHEM 455.

³Other upper-division natural science class (such as toxicology or biology) with prior approval of your adviser.

⁴Upper-division engineering course selected with prior approval of adviser.

CIVIL ENGINEERING

Professor Kenneth R. White*, department head

Professor J. Phillip King*, associate department head

Professors Cadena-C* Hanson#, Idriss*, Jacques*, Khandan#, Samani*#, White*, Woodward*; **Assistant Professors** Bandini, Bawazir, Jauregui, McNamara, Newton, Zhang; **College Professor** Madrid*, Zellmer*#, **Adjunct Professor** Hernandez*##

(505) 646-3801

*Registered Professional Engineer (NM)

Registered Professional Engineer (State other than NM)

Registered Land Surveyor (State other than NM)

DEGREE: Bachelor of Science in Civil Engineering

- OPTION: General**
- OPTION: Structures**
- OPTION: Environmental**
- OPTION: Geotechnical**
- OPTION: Water Resources**

MINOR: Agricultural Engineering

DEGREE: Bachelor of Science in Civil Engineering

The curricula in civil engineering is designed to provide a broad background and is so arranged that students may specialize in one or more of the options listed above or work in one or more areas of civil engineering in the senior year. Students may wish to obtain more than one option in civil engineering.

Requirements

In addition to the university requirements for graduation, a student must have a 2.0 grade-point average in all departmental courses and pass the Fundamentals of Engineering Examination prior to graduation.

Civil Engineering Program Educational Objectives

Civil engineers design, test and evaluate public works projects that include structures, environmental systems, water resources, transportation and geotechnical applications. Civil engineers work as private consultants, for public agencies, industrial companies and research organizations and therefore the tools and methods of the civil engineer are both varied and broad. They use knowledge and skills in engineering, mathematics, and physical and social sciences along with the principles and methods of engineering analysis and design to evaluate and improve such systems. The undergraduate civil engineering degree program at New Mexico State University prepares students to join the work force or pursue graduate education while setting the foundation for life-long learning. Specifically, graduates of the program will be

- 1.) able to provide protection of the public health, safety and welfare;
- 2.) able to apply various civil engineering techniques in an integrated fashion to solve real-world problems through design, testing and evaluation;
- 3.) able to obtain meaningful employment or continue in a graduate program; and
- 4.) prepared for a long term successful career augmented with life-long learning experiences.

In addition, the Accreditation Board of Engineering and Technology Engineering, in conjunction with the American Society of Civil Engineers requires that baccalaureate degree graduates in civil engineering will be able to

- 1.) demonstrate proficiency in mathematics through differential equations, probability and statistics, calculus based physics and general chemistry;
- 2.) demonstrate proficiency in a minimum of four recognized major civil engineering areas;
- 3.) demonstrate the ability to conduct laboratory experiments and to critically analyze and interpret data in more than one of the recognized major civil engineering areas;
- 4.) demonstrate the ability to perform civil engineering design by means of design experience integrated throughout the professional component of the curriculum; and
- 5.) demonstrate an understanding of professional practice issues such as procurement of work; bidding versus quality-based selection processes; how the design professional and the construction professions interact to construct a project; the importance of professional licensure and continuing education; and/or other professional practice areas.

The Accreditation Board of Engineering and Technology Engineering Criteria 2000, in conjunction with the American Society of Civil Engineers requires that civil engineering curriculums include in-depth instruction allowing students to accomplish the integration of systems using appropriate analytical, computational and experimental practices. They also require that faculty teaching in civil engineering departments show evidence of understanding professional practice and maintain currency in their respective professional areas. Program faculty must have responsibility and sufficient authority to define, revise, implement, and achieve program objectives.

Freshman Year (33 credits)

C E 151, Introduction to Civil Engineering.....	3
C E 160, Geology for Engineers	4
ENGL 111G, Rhetoric and Composition.....	4
MATH 191, 192, Calculus and Analytic Geometry I, II.....	6
OEDG 109, Computer Drafting	3
PHYS 215, Engineering Physics I.....	3
PHYS 215L, Engineering Physics I Laboratory.....	1
SUR 222, Plane Surveying	3
Humanities or social science electives*.....	6

Sophomore Year (32 credits)

C E 231, Introduction to Fluid Mechanics.....	3
C E 233, Mechanics-Statics	3
C E 256, Environmental Science	3
C E 256L, Environmental Science Laboratory.....	1
C E 301, Mechanics of Materials.....	3
C E 331, Hydraulic Engineering	3
CHEM 111, General Chemistry I.....	4
ECON 251G, Principles of Macroeconomics, or ECON 252G, Principles of Microeconomics.....	3
ENGL 218G, Technical and Professional Communication	3
MATH 291, Calculus and Analytic Geometry III.....	3
M E 234, Mechanics-Dynamics.....	3

Junior Year (32 credits)

C E 311, Properties of Materials.....	3
C E 315, Determinate Structures.....	4
C E 356, Fundamentals of Environmental Engineering.....	3
C E 357, Soil Mechanics.....	3
C E 444, Steel Design, or C E 445, Concrete Design	3
COMM 265G, Principles of Human Communication	3
E E 201, Networks I, or M E 240, Thermodynamics	3
MATH 392, Differential Equations.....	3
STAT 371, Statistics for Engineers and Scientists I, or approved upper-division math elective.....	3
Science elective, PHYS 216 and PHYS 216L, Engineering Physics II and Lab, or CHEM 112, General Chemistry II	4

Senior Year (32 credits)

C E 450, Engineering Economy and Law.....	3
C E 497, Senior Seminar	2
Civil engineering options.....	18
Humanities or social science electives (upper-division)*	6
Humanities or social science elective*.....	3

*Humanities and social science electives must be selected to satisfy the college and university general education requirements.

Civil Engineering Options

Electives for Environmental Option (18 credits):

C E 382 Hydraulic systems Design; ENVE 455, Solid and Hazardous Waste Systems Design; and ENVE 456, Environmental Engineering Design....	9
A EN 459, Design of Water Wells/Pumping Systems; and C E 482, Hydraulic Structures.....	6
C E 444, Elements of Steel Design; G EN 452, Geohydrology; C E 471, Highway Engineering; C E 477, Construction Engineering (summer); A EN 478, Irrigation and Drainage Engineering; or C E 483, Surface Water Hydrology.....	3

Electives for Structural Option (18 credits):

C E 365, Intermediate Structural Mechanics; C E 444, Elements of Steel Design; or C E 445, Reinforced Concrete Design; C E 457, Foundation Design; and C E 469, Structural Systems	12
Select one of the two options below:	
Option 1: C E 443, Wood and Masonry Design and C E 468, Intermediate Mechanics of Materials	6
Option 2: C E 471, Highway Engineering; or C E 477, Construction Engineering (summer); and C E 443, Wood and Masonry Design or C E 468, Intermediate Mechanics of Materials.....	6

Electives for Water Resources Option (18 credits):

C E 482, Hydraulic Structures or G EN 485, Earthen Dam Design.....	3
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C E 382, Hydraulic Systems Design and C E 483, Surface Water Hydrology	6
A EN 459, Design of Water Wells/Pumping Systems or G EN 452, Geohydrology	3
A EN 475, Soil and Water Conservation; A EN 478, Irrigation and Drainage Engineering; A EN 479, Irrigation Systems Design and Management; or ENVE 456, Environmental Engineering Design	6

Electives for Geotechnical Option (18 credits):

G EN 452, Geohydrology; G EN 457, Foundation Design; G EN 459, Geomechanics and Rock Engineering; and G EN 485, Earthen Dam Design	12
G EN 453, G EN 498, C E 471, Highway Engineering or C E 482, Hydraulic Structures	6

Electives for General Civil Engineering Option (18 credits):

ENVE 456, Environmental Engineering Design; C E 469, Structural Systems, C E 482, Hydraulic Structures; or C E 485, Design of Earth Dams	3
C E 382, Hydraulic Systems Design; C E 444, Elements of Steel Design; C E 445, Reinforced Concrete Design; ENVE 455, Solid and Hazardous Waster Systems Design; or C E 457, Foundation Design	9
C E 471, Highway Engineering; C E 477, Construction Engineering; A EN 459, Design of Water Wells/Pumping Systems; G EN 452, Geohydrology; C E 483, Surface Water Hydrology; A EN 475, Soil and Water Conservation; A EN 478, Irrigation and Drainage Engineering; or A EN 479, Irrigation Systems Design and Management	6

MINOR: Agricultural Engineering

Minimum of 18 credits, designated as follows:

College of Agriculture and Home Economics

Soil Science Requirements, 3 credits from: SOIL 472, Soil morphology and Classification; SOIL 476, Soil Microbiology; SOIL 477, Soil Physics; SOIL 479, Environmental Soil Chemistry	3
Plant/Animal Science Requirement, 3 credits from: AGRO/HORT 365, Principles of Crop Production; ANSC 351G, Agricultural Animals of the World	3
Institutions/Economics Requirement, 3 credits from: AG E 315G, World Agriculture and Food Problems; AG E 337G, Natural Resources Economics; AG E 484, Water Resource Economics	3

College of Engineering

Irrigation Requirement, 3 credits from: AEN 478, Irrigation and Drainage Engineering; AEN 498, Special Topics	3
Engineering Specialty Requirement, 3 credits from: AEN 335, Engineering for Biological Systems; AEN 475, Soil and Water Conservation	3
Design Requirement, 3 credits from: AEN 440, Design Applications; AEN 459, Design of Water Wells/Pumping Systems	3

ENGINEERING PHYSICS

DEGREE: Bachelor of Science in Engineering Physics

The Engineering Physics program is offered jointly by the Physics Department and the College of Engineering. The faculty is drawn from the Departments of Physics, Electrical and Computer Engineering, and Mechanical Engineering.

A strong grasp of underlying physical principles behind the development of new technologies is necessary to keep up with new developments in a high-tech world. The BS in Engineering Physics program is designed to provide quality education of students for immediate employment with technical jobs in private industries (especially high-tech industries), research laboratories, and public sectors. The program trains students with a combination of engineering knowledge, physics principles, mathematical background, problem-solving strategies, and effective communicational skills. The BS in Engineering Physics also provides an excellent preparation for graduate studies in either physics or an engineering discipline.

The engineering physics program is offered jointly by the Department of Physics and College of Engineering. The BS in Engineering Physics confers an engineering credential. Students in the program complete an engineering core curriculum, either in Electrical and Computer Engineering or in Mechani-

cal Engineering, as well as a rigorous course of study in physics and mathematics. A strong laboratory component prepares students in experimental techniques and technology using state-of-the-art equipment.

The goals of the program are

- 1.) to give students a strong education in the fundamentals of physics, engineering, applied mathematics, and computation;
- 2.) to develop skill in real-world problem solving starting from fundamental physical principles;
- 3.) to improve communication skills; and
- 4.) to develop ability to work in a team.

The student must choose either the Electrical Engineering Option or the Mechanical Engineering Option. The requirements are listed below. Students must earn a C or better in all required courses.

Requirements for Electrical Option (128 or 129 credits)**Physics (40 or 41 credits)**

PHYS 213, Mechanics	3
PHYS 213L, Experimental Mechanics	1
PHYS 214, Electricity and Magnetism	3
PHYS 214L, Electricity and Magnetism Laboratory	1
PHYS 217, Heat, Light, and Sound	3
PHYS 217L, Experimental Heat, Light, and Sound	1
PHYS 315, Modern Physics	3
PHYS 315L, Experimental Modern Physics	2
PHYS 451, Intermediate Mechanics I	3
PHYS 454, Intermediate Modern Physics I	3
PHYS 455, Intermediate Modern Physics II	3
PHYS 475, Advanced Experimental Modern Physics 3, or PHYS 471, Modern Experimental Optics	2
PHYS 480, Thermodynamics	3
PHYS 495, Mathematical Methods of Physics I	3
Physics electives	6

Electrical Engineering (41 credits)

E E 111, Introduction to Electrical and Computer Engineering	4
E E 161, Computer-Aided Problem Solving	4
E E 211, AC Circuits	4
E E 221, Electronics I	4
E E 261, Digital Design I	4
E E 311, Signals and Systems	4
E E 315, Electromagnetics I	4
E E 341, Control Systems, or E E 332, Introduction to Electrical Power Engineering	4
E E 498, Capstone Design I	3
E E 499, Capstone Design II	3
Electrical engineering elective	3

Mathematics (15 credits)

MATH 191, Calculus and Analytic Geometry I	3
MATH 192, Calculus and Analytic Geometry II	3
MATH 291, Calculus and Analytic Geometry III	3
E E 301, Vector Principles	3
MATH 392, Ordinary Differential Equations	3

Natural Science (4 credits)

CHEM 111, General Chemistry I	4
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Additional General Education Requirements (28 credits)

ENGL 111G, Rhetoric and Composition	4
ENGL 218G, Technical and Scientific Communication	3
Critical thinking/analysis elective (noncomputer)	3
Historical perspective elective	3
Human thought elective	3
Social analysis elective	3
Literature/fine arts elective	3
Viewing a Wider World electives*	6

*Viewing a Wider World courses cannot be taken in engineering or physics.

Requirements for Mechanical Option (128 credits)**Physics (38 credits)**

PHYS 213, Mechanics	3
PHYS 213L, Experimental Mechanics	1