

# Dave C. Swalm School of Chemical Engineering

Director: Professor Jason Keith

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Chemical Engineering is a profession where a diverse group of individuals contribute to the invention, development, and deployment of an incredible range of processes and products in a variety of industries including chemical, petrochemical, environmental, pharmaceutical, environmental, and materials. Chemical engineering is the branch of engineering that deals with the chemical and physical processes used to develop and manufacture many different products of greater value from lesser valued chemicals and feedstocks. Without question, chemical engineers are making major contributions to the technological infrastructure of modern society.

The mission of the Swalm School of Chemical Engineering is to produce graduates who have the ability to apply the principles of the physical sciences, together with the principles of economics and human relations, to fields that pertain directly to processes and process equipment that treat material to effect a change in state, energy content, or composition.

Graduates will receive a broad education that will enable them to become leaders in industry, the profession, and the community. Those graduates who excel academically will be prepared for entry to graduate or professional school.

To achieve our mission, Program Educational Objectives have been established to help us assess the degree to which we have achieved these objectives.

## Program Educational Objectives

Mississippi State University Chemical Engineering graduates will:

1. Successfully enter the chemical engineering profession as design and process engineers (and related designations) with prominent companies in the chemical process industries, petroleum and petrochemical industries, pulp and paper industry, consulting or other, related chemical industries.
2. Demonstrate an ability to address unstructured problems specific to chemical engineering technical specialties by identifying and implementing solutions using the proper tools, practical approaches and flexible thinking.
3. Pursue post-baccalaureate degrees in chemical engineering and related fields, business and professional programs including medicine and law.
4. Demonstrate proficiency in chemical engineering practice and leadership development by advancing in their chosen fields to supervisory and management positions.

Students choosing to major in Chemical Engineering will select one of three concentration areas within the Chemical Engineering Program:

1. Chemical Engineering Practice Concentration;
2. Chemical Engineering Research/Development Concentration; or
3. Biomolecular Engineering Concentration.

**Chemical Engineering Practice Concentration.** This concentration area prepares the graduate to enter industry upon graduation well-prepared to function as a chemical engineer, in a variety of industries

as well as in a variety of job functions. Students pursuing this option are also well prepared for graduate studies in chemical engineering or professional school. A combination of 12 hours of technical electives, chemical engineering elective, and chemistry elective allows a student to emphasize an area of interest, including materials, environmental, energy (including alternative energy), or traditional chemical engineering.

**Chemical Engineering Research/Development Concentration.** This concentration area prepares the chemical engineering graduate for further educational endeavors at the graduate level and for opportunities in research and development by providing them with additional training in mathematics and chemical engineering topics. Focused selection of technical, chemistry, and basic engineering electives provides the opportunity to develop the depth required for post-graduate research activities in chemical engineering.

**Biomolecular Engineering Concentration.** This concentration area prepares the graduate for a career in the biotechnology industry. The concentration area also provides students the opportunity to fulfill prerequisites for medical, dental, or veterinary school upon completion of their chemical engineering degree. Focused selection of technical, chemistry, and basic engineering electives provides the opportunity to develop the depth required in biology, biochemistry, and microbiology for students interested in this concentration. While students regularly enter medical school via the Chemical Engineering Practice concentration, the biomolecular engineering concentration offers students not only a bachelor's degree in chemical engineering, but also highlights those topics encountered in biotechnology, medical school or in veterinary school.

The Chemical Engineering program is accredited by the Engineering Accreditation Commission of ABET, <http://www.abet.org>.

## General Education Requirements

### English Composition

EN 1103	English Composition I	3
or EN 1163	Accelerated Composition I	
EN 1113	English Composition II	3
or EN 1173	Accelerated Composition II	

### Mathematics

See Major Core

### Science

See Major Core

### Humanities

See General Education courses 6

### Fine Arts

See General Education courses 3

### Social/Behavioral Sciences

See General Education courses 6

### Major Core

**Math and Basic Science** 36

MA 1713	Calculus I	
MA 1723	Calculus II	
MA 2733	Calculus III	
MA 2743	Calculus IV	
MA 3253	Differential Equations I	
CH 1213	Chemistry I	

CH 1211	Investigations in Chemistry I
CH 1223	Chemistry II
CH 1221	Investigations in Chemistry II
CH 4511	Organic Chemistry Laboratory I
CH 4513	Organic Chemistry I
CH 4523	Organic Chemistry II
PH 2213	Physics I
PH 2223	Physics II

**Engineering Topics** 49

CHE 1101	CHE Freshman Seminar
CHE 2114	Mass and Energy Balances
CHE 2213	Chemical Engineering Analysis
CHE 3113	Chemical Engineering Thermodynamics I <sup>1</sup>
CHE 3123	Chemical Engineering Thermodynamics II
CHE 3203	Fluid Flow Operations <sup>1</sup>
CHE 3213	Heat Transfer Operations <sup>1</sup>
CHE 3222	Chemical Engineering Laboratory I
CHE 3223	Separation Processes
CHE 3232	Chemical Engineering Laboratory II
CHE 3413	Engineering Materials
CHE 4113	Chemical Reactor Design
CHE 4134	Process Design
CHE 4223	Process Instrumentation and Control
CHE 4233	Chemical Plant Design
CHE 4633	Chemical Process Safety
IE 3913	Engineering Economy I

**Oral Communication Requirement**

Fulfilled in CHE 3222, CHE 3232, CHE 4134 and CHE 4233

**Writing Requirement**

GE 3513	Technical Writing	3
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**Computer Literacy**

Fulfilled in CHE 2213 and CHE 4134

**Choose one of the following sets of courses to complete the degree:** 19**Chemical Engineering Practice Concentration (CHEP)**

EM 2413	Engineering Mechanics I
or ECE 3183	Electrical Engineering Systems
CHE 3331	Professional Development Seminar
CH 4413	Thermodynamics and Kinetics

Chemical Engineering Elective <sup>2</sup>Chemistry Elective <sup>3</sup>Technical Electives <sup>3</sup>

(It is strongly recommended that CHE 4313 Transport Phenomena be used as a technical elective)

**Chemical Engineering Research/Development Concentration (CERD)**

CHE 4313	Transport Phenomena
CHE 3331	Professional Development Seminar
MA 3113	Introduction to Linear Algebra
MA 3353	Differential Equations II

MA /ST 4543	Introduction to Mathematical Statistics I (MA/ST 4543 is a cross-listed course, but the student should choose MA 4543 if a minor in mathematics is desired.)
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or IE 4613	Engineering Statistics I
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CH 4413	Thermodynamics and Kinetics
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Chemistry Elective <sup>3</sup>**Biomolecular Engineering Concentration (BIOM)**

BIO 1134	Biology I
BIO 1144	Biology II
BIO 3304	General Microbiology
BCH 4603	General Biochemistry
CH 4521	Organic Chemistry Laboratory II

Choose one of the following:

PH 2233	Physics III (pre-medical students)
	Advanced biology course (pre-veterinary students)
	Biotechnology course from an engineering dept. (Biomolecular engineering practice)

Total Hours 128

- With consent of student's advisor, the following course substitutions are acceptable:
  - EM 3313 Fluid Mechanics for CHE 3203
  - ME 3513 Thermodynamics I for CHE 3113
  - ME 3313 Heat Transfer for CHE 3213
- CHE 4000 Directed Individual Study will generally be disallowed for the required chemical engineering elective but may be used as a technical elective.
- The Chemistry and Technical Electives are to be chosen from an approved list available online and from the student's advisor.