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Department of Chemical and
Biochemical Engineering
chemeng.mst.edu

B.S. Degree in Chemical Engineering with an Emphasis in Biochemical Engineering

Biochemical engineering is the branch of engineering which deals with changing the composition, energy content, and state of aggregation of biological materials. As a chemical engineering student, you will consider the fundamental properties and nature of matter (chemistry), the forces that act on matter (physics), the precise expressions of the relationships between them (mathematics) and the application to living systems (biology). Biochemical engineers take chemistry and microbiology out of the laboratory and into the world around us. They are creative problem solvers who apply scientific knowledge and technical expertise to make useful materials at a reasonable cost and in the safest manner possible. Computers are used extensively in solving engineering problems in the biotechnology field.

Biochemical engineers are involved in creating new wonder drugs and materials that improve life on earth. They develop processes to turn agricultural products into useful substances such as drugs, vitamins, proteins, and oils. They use biochemical and biological methods to improve the environment.

At Missouri S&T, biochemical engineering is an emphasis program in the department of chemical engineering. Your studies will give you a broad technical basis with an emphasis on material balances, energy balances, separation processes, rate processes, unit operations, process economics and design. In the biochemical engineering emphasis program you will gain experience in biochemistry, biotechnology, microbiology, molecular biology, the separation and purification of biological substances and biochemical reactor design.

In the biochemical emphasis program you will be prepared to work in the biotechnology industry and to pursue graduate degrees in biochemical engineering or medicine. Graduates have skills that make them attractive to industries such as pharmaceutical companies, manufacturers of specialty products from agricultural feedstock, biotechnology companies, and environmental consultants. Since the program is built upon the basis of a strong, traditional chemical engineering program, graduates of this emphasis program also often seek jobs in other chemical industries.

You will have laboratories which offer training in qualitative and quantitative analysis, organic and physical chemistry, physics, unit operations, protein separation and purification, biochemical reactor design, process control, instrumentation, and design.

Faculty

The chemical engineering department has 11 full-time faculty members and three adjunct faculty. Typical class size is 35-45 students.

Professional and Service Organizations

There is a very active student chapter of the American Institute of Chemical Engineers (AIChE). The AIChE Student Chapter brings practicing chemical engineers to their meetings to describe their responsibilities and opportunities at their company. Students in the department also participate in Omega Chi Epsilon, the national chemical engineering honor society; Tau Beta Pi, the engineering honor society; and Alpha Chi Sigma, a service society for students in chemistry-related fields.

Experiential Learning

Cooperative Education (Co-Op) is a structured educational strategy that alternates semesters of classroom studies with learning through productive work experiences at an industrial facility. It provides progressive experiences in integrating theory and practice. The Missouri S&T Career Opportunity and Employer Relation Guide (COER) has numerous contacts for students seeking a co-op along with many companies that come to campus to recruit co-op students.

There are numerous opportunities for undergraduate students to become involved in research. Many of the current research projects involve faculty members from multiple departments working on a team. This provides undergraduates an excellent opportunity to do research in a variety of areas while pursuing a degree in chemical engineering. The Missouri S&T's Opportunity for Undergraduate Research Experience (OURE) program provides a stipend to allow undergraduates to work with a professor for an academic year. Students can choose to fulfill one of their technical electives with ChemEng 4099 (UG Research) where they work on a project with a faculty member for credit. Students who participate in undergraduate research often present their results at the AIChE regional and national conferences and at a Missouri S&T sponsored conference that occurs each spring. The Missouri S&T AIChE student chapter is very active and helps to provide funds for students to present their results at these conferences.

Three of the Missouri S&T design teams are of interest to biochemical engineers: iGEM, Chem-E-Car and Chem-E-Cube. iGEM has students use genetic engineering to solve a real-world problem. Chem-E-Car requires students to build a shoe-box sized car that is powered by and stops using chemical reactions (and no brakes!). The students build batteries, research other power sources, and carefully calibrate their chemical reactions for these competitions. The Chem-E-Cube team builds a chemical plant that will fit inside a 1 ft³ space and meet the goals for that year's competition. These design teams work with the Student Design and Experiential Learning Center (SDELC) and the department to safely build and test their work.

B.S. in Chemical Engineering with Biochemical Emphasis

Freshman Year

First Semester	Credits	Second Semester	Credits
FR ENG 1100 Study & Careers in Engineering	1	MECH ENG 1720 Intro to Engineering Design	3
CHEM 1100 Lab Safety	1	COMP SCI 1500, 1972/1982, or 1570/1580	4
CHEM 1310 General Chemistry I Lecture	4	CHEM 1320 General Chemistry II Lecture	3
CHEM 1319 General Chemistry I Lab	1	MATH 1215 Calculus II	4
ENGLISH 1120 Exposition & Argumentation	3	PHYSICS 1135 Engineering Physics I	4
HIST 1200, 1300, 1310, or POL SCI 1200	3		
MATH 1214 or 1211 Calculus I or I-B	4		
	17		18

Sophomore Year

CHEM ENG 2100 Material & Energy Balances	4	CHEM ENG 2110 Thermodynamics I	3
CHEM 2210 Organic Chemistry I Lecture	4	ENGLISH 3560 Technical Writing (Comp II)	3
MATH 2222 Calculus III	4	MATH 3304 Differential Equations	3
PHYSICS 2135 Engineering Physics II	4	Science Elective (Lecture)	3
		Science Elective (Lab)	1
		STAT 3113 Applied Engineering Statistics	3
	16		16

Junior Year

CHEM ENG 3101 Transport	4	CHEM ENG 3131 Separations	3
CHEM ENG 3111 Numerical Computing	3	CHEM ENG 3141 Process Operations	3
CHEM ENG 3120 Thermodynamics II	3	CHEM ENG 3150 Reactor Design	3
SP&M S 1185 Principles of Speech	3	CHEM ENG 5250 Isolation & Purification (Spring)	3
Science Elective (Lecture)	3	Science Elective (Lecture)	3
Science Elective (Lab)	1	Science Elective (Lab)	1
	17		16

Senior Year

CHEM ENG 4091 Design I	3	CHEM ENG 4097 Design II	3
CHEM ENG 4201 Biochem Separations & Control Lab (Fall Only)	3	CHEM ENG 4110 ChE Process Dynamics & Control	3
CHEM ENG 4210 Biochem Reactors (Fall Only)	3	CHEM ENG 4220 Biochem Reactors Lab (Spring Only)	3
CHEM ENG 4241 Process Safety	3	CHEM ENG 4311 Ethics (CHEM ENG 2310)(Spring Only)	1
CHEM ENG 4301 Materials (CHEM ENG 2300)	1	ECON 1100 or 1200 Micro/Macro Economics	3
Upper Level Humanities or Social Science	3	Humanities or Social Science Elective	3
	16		16

Total 132

Science Elective Options: A minimum of 12 credit hours in Science Electives are required. Select three courses from CHEM 2220 CHEM 4610, CHEM 4620, BIO SCI 2213, BIO SCI 3313, and BIO SCI 4323; and a minimum of two laboratory courses from CHEM 2229 or CHEM 2219 CHEM 4619, BIO SCI 2219, BIO SCI 3319, and BIO SCI 4329.

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