

## Chemical Engineering

Accredited by the Engineering Accreditation Commission of ABET,  
 111 Market Place, Suite 1050, Baltimore, MD 21202-4012 - telephone (410) 347-7700.

### University Requirements (23)

Writing, Rhetoric and American Cultures (WRA)	4
Integrative Studies in Humanities (IAH)	8
Integrative Studies in Social Sciences (ISS)	8
Bioscience: BS 111 Cells and Molecules	3

### College Requirements (30)

CEM 151 General and Descriptive Chemistry	4
*EGR 100 Introduction to Engineering Design	2
*EGR 102 Introduction to Engineering Modeling	2
MTH 132 Calculus I	3
MTH 133 Calculus II	4
MTH 234 Multivariable Calculus	4
MTH 235 Differential Equations	3
PHY 183 Physics for Scientists & Engineers I	4
PHY 184 Physics for Scientists & Engineers II	4

### Major Requirements (61-63)

CEM 152 Principles of Chemistry	3
CEM 161 Chemistry Laboratory I	1
CEM 162 Chemistry Laboratory II	1
CEM 351 Organic Chemistry I	3
CEM 352 Organic Chemistry II	3
CEM 355 Organic Laboratory I	2
CHE 201 Material and Energy Balances	3
CHE 210 Modeling and Analysis of Transport Phenomena	3
CHE 301 Chemical Engineering as a Profession	1
CHE 311 Fluid Flow and Heat Transfer	3
CHE 312 Mass Transfer and Separations	4
CHE 316 Laboratory Practice and Statistical Analysis	4
CHE 321 Thermodynamics for Chemical Engineering	4
CHE 431 Chemical Reaction Engineering	4
CHE 432 Process Analysis and Control	3
CHE 433 Process Design and Optimization I	4
CHE 434 Process Design and Optimization II	2
CHE 473 Chem Engr Princ in Polymers & Mats Sys	3

### One of the following (4-6):

BMB 401 Basic Biochemistry	4
<b>OR</b>	
BMB 461 Biochemistry I	3
<b>AND</b>	
BMB 462 Biochemistry II	3

### Select one of the following courses:

CHE 472 Composite Materials Processing	3
CHE 481 Biochemical Engineering	3

### Select one of the following courses:

CEM 483 Quantum Chemistry	3
CEM 484 Molecular Thermodynamics	3

\*EGR 100 and EGR 102 are required for all students matriculating at MSU beginning Fall Semester, 2008. Students who matriculate before Fall 2008 must complete CSE 131 in place of EGR 102.

### Technical Electives (6)

Students must complete at least 6 credits of technically oriented subject-related courses approved by the student's adviser. Acceptable subjects include, but are not limited to, composites processing or biochemical engineering, electronic materials, environment, advanced mathematics, transport phenomena, advanced chemistry, foods, legal and regulatory issues, advanced materials, advanced biology, statistics, biomedical engineering, and polymers.

**Note:** At least one course in the technical elective area must include at least 3 credits of engineering topics, which includes courses taught in the College of Engineering as well as courses taught in advanced mathematics, advanced chemistry, advanced biology, advanced statistics, and advanced physics. If BMB 462 is taken to fulfill major requirements, it will count as technical elective credit in advanced biology.

### Concentrations in Chemical Engineering

In response to increasing interest in the application of chemical engineering principles to related fields, the Department of Chemical Engineering and Materials Science offers concentrations in biochemical engineering, biomedical engineering, environmental engineering, food science, and polymer science and engineering to students wishing an area of specialization in the degree. Concentrations are available to, but not required of, any student enrolled in the Bachelor of Science degree program in chemical engineering.

### Biochemical Engineering Concentration (17-19)

To earn a Bachelor of Science degree in Chemical Engineering with a biochemical engineering concentration, students must complete above requirements and the following (CHE 472 is not required):

#### Both of the following courses (6 credits):

CHE 481 Biochemical Engineering	3
MMG 301 Introductory Microbiology	3

#### Four courses from the following (11-13 credits):

BMB 401 Basic Biochemistry (and three of the following courses)	4
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#### OR

BMB 461 Biochemistry I	3
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#### AND

BMB 462 Biochemistry II (and two of the following courses)	3
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BMB 829 Methods Of Macromolecular Anlysis & Synthesis	2
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CHE 882 Advanced Biochemical Engineering	3
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CHE 883 Multidisciplinary Bioprocessing Laboratory	3
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MMG 409 Eukaryotic Cell Biology	3
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MMG 421 Prokaryotic Cell Physiology	3
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MMG 431 Microbial Genetics	3
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MMG 445 Basic Biotechnology	3
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### **Biomedical Engineering Concentration (15)**

To earn a Bachelor of Science degree in Chemical Engineering with a biomedical engineering concentration, students must complete above requirements and the following (CHE 472 and Technical Electives are not required):

#### **All of the following courses (9 credits):**

CHE 481	Biochemical Engineering	3
MMG 409	Eukaryotic Cell Biology	3
PSL 431	Human Physiology I	3

#### **Two of the following courses (6 credits):**

BMB 471	Biochemistry Laboratory (W)	3
CHE 883	Multidisciplinary Bioprocessing Laboratory	3
ME 494	Biofluid Mechanics and Heat Transfer	3
ZOL 341	Fundamental Genetics	4

### **Environmental Concentration (15)**

To earn a Bachelor of Science degree in Chemical Engineering with an environmental concentration, students must complete above requirements and the following (CHE 472 and Technical Electives are not required):

#### **Both of the following courses (6 credits):**

CE 280	Principles of Environmental Engr and Science	3
CHE 481	Biochemical Engineering	3

#### **Three of the following courses (9 credits):**

CE 481	Environmental Engineering Chemistry	3
CE 483	Unit Operations & Processes in Envrn Engr.	3
CE 485	Landfill Design	3
EEP 255	Ecological Economics	3
EEP 320	Environmental Economics	3
EEP 405	Corporate Environmental Management	3
NSC 448	Ecology, Law and Economics	3
ESA 200	Introduction to Environmental Studies	3
ESA 430	Law and Resources	3
ZOL 446	Environmental Issues and Public Policy	3

### **Food Science Concentration (12-13)**

To earn a Bachelor of Science degree in Chemical Engineering with a food science concentration, students must complete above requirements and the following (Technical Electives are not required):

#### **All of the following courses (9 credits):**

FSC 401	Food Chemistry	3
FSC 440	Food Microbiology	3
MMG 301	Introductory Microbiology	3

#### **One of the following courses (3-4 credits):**

BE 477	Food Engineering: Fluids	3
BE 478	Food Engineering: Solids	3
FSC 325	Food Processing: Unit Operations	4
FSC 421	Food Law and Regulations	3
FSC 455	Food Analysis	3
FSC 470	Integrated Approaches to Food Product Dev	3

### **Polymer Science and Engineering Concentration (16-17)**

To earn a Bachelor of Science degree in Chemical Engineering with a polymer science and engineering concentration, students must complete above requirements and the following (CHE 481 and Technical Electives are not required):

#### **All of the following courses (10 credits):**

CE 221	Statics	3
CHE 472	Composite Materials Processing	3
ME 222	Mechanics of Deformable Solids	4

#### **Two of the following courses (6-7 credits):**

CHE 871	Materials Surfaces and Interfaces	3
CHE 872	Polymers and Cmpsites: Mfg, Strc & Prfrmnce	3
MSE 370	Physical Processing of Materials	3
MSE 426	Introduction to Composite Materials	3
PKG 323	Packaging with Plastics	4

### **Other Electives (Variable)**

#### **Total Credits Required for Degree**

**128**

These requirements are effective for students admitted to the Chemical Engineering major beginning Fall 2008. The Department of Chemical Engineering and Materials Science constantly reviews program requirements and reserves the right to make changes as necessary. Consequently, each student is strongly encouraged to consult with his/her adviser to obtain assistance in planning an appropriate schedule of courses. Students who have questions about Chemical Engineering should contact the Chemical Engineering and Materials Science Department Advising Office, 1410 Engineering Building, phone (517) 355-6616 extension 1.

Some courses may have prerequisites, which are not otherwise required in the program. Students should check course descriptions to ensure they are aware of prerequisites.

## Chemical Engineering

### Sample Program

Freshman Year				Sophomore Year			
Fall	Credits	Spring	Credits	Fall	Credits	Spring	Credits
CEM 151	4	CEM 152	3	CEM 351	3	CEM 352	3
CEM 161	1	CEM 162	1	CHE 201	3	CEM 355	2
EGR 100	2	EGR 102	2	Elective	3	CHE 210	3
ISS 2XX	4	MTH 133	4	MTH 234	4	MTH 235	3
MTH 132	3	WRA 1XX	4	PHY 183	4	PHY 184	4
<b>Total</b>	<b>14</b>	<b>Total</b>	<b>14</b>	<b>Total</b>	<b>17</b>	<b>Total</b>	<b>15</b>

  

Junior Year				Senior Year			
Fall	Credits	Spring	Credits	Fall	Credits	Spring	Credits
CEM 483*	3	BMB 401	4	CHE 432	3	CHE 434	2
CHE 301	1	CHE 312	4	CHE 433	4	CHE 473	3
CHE 311	3	CHE 316	4	CHE 472/481	3	Elective	3
CHE 431	4	CHE 321	4	Elective	3	IAH XXX	4
IAH 20X	4			ISS 3XX	4	Technical Elective	3
						Technical Elective	3
<b>Total</b>	<b>15</b>	<b>Total</b>	<b>16</b>	<b>Total</b>	<b>17</b>	<b>Total</b>	<b>18</b>

\* Or CEM 484 Spring of Junior year.

### CHE Program Educational Objectives

The undergraduate program in chemical engineering builds a strong foundation for the professional development of its students and prepares them to meet the technological challenges of the future. With a bachelor's degree, the graduates are well equipped for a wide variety of positions as practicing chemical engineers or for graduate studies in engineering and scientific disciplines. The intensive program encourages continued learning and professional development by providing the proper knowledge and stimulation in a setting that promotes personal growth. The program emphasizes its historic, nationally recognized strength in chemical process design, yet draws on the scholarly accomplishments of its faculty to integrate traditional chemical engineering topics with specialized studies in the contemporary fields of materials, bioprocessing, environmental engineering, and food engineering.

The faculty of the chemical engineering program is committed to sharing the responsibility of learning with the students, providing a rigorous academic environment that encourages active learning, high quality student performance, and ethical conduct. While the faculty recognizes that the professional accomplishments of the program graduates stem from personal aspirations and individual initiative, the program faculty seeks to optimize their opportunities for success and their continued professional growth and development. Through the integration of knowledge and skills acquired in a demanding set of courses, extracurricular experiences, and faculty expertise and scholarship, the Chemical Engineering Program seeks to prepare its graduated:

- to become successful in their chosen career path, whether it be in the practice of chemical engineering, in advanced studies in engineering or science or in other complementary disciplines;
- to assume leadership roles in industry business and/or their communities;
- to contribute to the economic environment of their communities; and
- to maintain career skills through life-long learning.