

# Information for Students

## Department of Chemical Engineering

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### **Academic Advisors**

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#### **Transfer Students**

Ron Larsen and Max Deibert advise transfer students until you get “on track” with the MSU chemical engineering curriculum. (John Sears can also advise students if needed.)

Ron Larsen	306 Cobleigh Hall
Max Deibert	303 Cobleigh Hall

The evaluation of your credits transferred from your previous institution takes place in two parts:

1. The University evaluates general courses for MSU equivalencies. Courses which do not have precise MSU matches are evaluated as "E" or "EU" ("U" for upper level, i.e., 300 or 400 level courses). University transfer evaluations are performed by the Admissions Office.
2. The Department then evaluates your transfer credits in light of Departmental graduation requirements. Departmental transfer evaluations are performed by the transfer advisor, John Sears.

#### **Regular Students – Focus Area Advising**

Beginning Fall (2002) the Department assigns academic advisers by student focus-area. This will allow students who have selected particular focus areas to obtain scheduling advice from faculty members who have specialized in each focus area. The focus area advisors will be as follows:

<b><i>Focus Area</i></b>	<b><i>Lead Advisor(s)</i></b>		<b><i>Backup Advisor(s)</i></b>	
No Focus Area Determined (Freshmen and Sophomores, only)	Max Deibert	303 Cobleigh	Ron Larsen	310 Cobleigh
	Joe Seymour	316 Cobleigh	John Sears	327 Cobleigh
Environmental Focus	Jim Duffy	313 Cobleigh	Joe Seymour	316 Cobleigh
			Sue King	314 Cobleigh
Materials Focus	John Mandell	302 Cobleigh	Max Deibert	303 Cobleigh
Biochemical Eng. Focus	Phil Stewart	315 Cobleigh	Ron Larsen	310 Cobleigh
Classic Chemical Eng. Focus	Dan Shaffer	312 Cobleigh	Max Deibert	303 Cobleigh

The first two years of the chemical Engineering curriculum are the same for each Focus Area, so new students have two years to consider which area they want to focus on. You must choose a Focus Area by the end of your sophomore year, but you may make the selection earlier. Once you have informed the Department of your selection, you should see the focus area advisor(s) listed above for assistance in planning your courses.

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## ***Degree Requirements in Chemical Engineering***

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➤ **Credit Requirements**

The Department requires 128 credits for graduation, 43 of which must be in courses numbered 300 or higher.

➤ **Specific Course Requirements**

Specific course requirements are listed:

- in the 2002-2004 Catalog (paper)
- in the 2002-2004 Online Catalog at <http://www.montana.edu/level2/catalogs.html>
- in the Required Courses list in this document (next page)

They are also shown, with indicated prerequisites, on the attached curriculum flowsheet.

In addition to the specific course requirements, you must choose elective courses to meet the following requirements:

- **MSU CORE Requirements**
- **ABET Humanity and Social Science (H&SS) Requirements**
- **Focus Area Requirements**

# Bachelor of Science in Chemical Engineering

## Required Courses, 2002-04 Catalog

Course No.	Credits	Course Name	Semester Taken or Planned
CH E 100	1	Freshman Seminar	
CH E 213	3	Materials Science	
CH E 215	3	Elementary Principles I	
CH E 216	3	Elementary Principles II	
CH E 220	3	Computations in Ch E	
CH E 251 V	3	Societal Impacts of Ch E	
CH E 307	4	Ch E Thermodynamics	
CH E 322	4	Fluid Mech. & Heat Transfer	
CH E 323	3	Mass Transfer Operations	
CH E 328	4	Reaction Engineering	
CH E 400	1	Senior Seminar	
CH E 402	3	Chemical & Pet. Industries	
CH E 411 C	2	Design I	
CH E 412 C	3	Design II	
CH E 415	2	Design Case Studies <sup>1</sup>	
CH E 424	3	Transport Analysis	
CH E 441	4	Ch E Laboratory	
CH E 451	3	Process Control	
CHEM 131 N	4	General Chemistry I <sup>2</sup>	
CHEM 132 N	4	General Chemistry II <sup>3</sup>	
CHEM 215 N	5	Organic Chemistry <sup>4</sup>	
CHEM 324	3	Physical Chemistry II	
ENGL 121 W	3	College Writing I <sup>5</sup>	
MATH 181 M	4	Calculus & Anal. Geom. I	
MATH 182 M	4	Calculus & Anal. Geom. II	
MATH 224 M	4	Calculus	
MATH 225	4	Differential Equations	
PHYS 211 N	4	Physics I	
PHYS 212 N	4	Physics II	
CORE Electives	15	Use CORE and H&SS Worksheets	
Engineering and Science Electives	18	Use the Worksheet for your chosen Focus Area	
<b>TOTAL CREDITS</b>	<b>128</b>		

<sup>1</sup> or, substitute CH E 490: B.S. Thesis (2 credits)

<sup>2</sup> or, substitute CHEM 141N: Honors Chemistry I (4 credits)

<sup>3</sup> or, substitute CHEM 142N: Honors Chemistry II (4 credits)

<sup>4</sup> or, substitute CHEM 311 (4 credits) and CHEM 312 (4 credits). This 8-credit sequence of organic chemistry yields a net +3 credits [compared to CHEM 215 N (5 credits)]; the extra 3 credits can be used as a Science Elective.

<sup>5</sup> Students entering with high SAT Verbal ( $\geq 640$ ) or ACT English ( $\geq 27$ ) scores are not required to take ENGL 121W. However, you must still take a writing course (College of Engineering policy). The CHE Department has pre-approved these courses: ENGL 121W, 123H, or 221; BUS 201; UH 201VH and 202H (a full year of Texts and Critics must be taken). Another course might be acceptable, but get it approved by the Department before enrolling.

## CORE Requirements

Montana State University requires all MSU students to meet certain general education requirements, called the CORE requirements. For decades before the CORE was implemented, College of Engineering students were required to meet the Humanities and Social Science (H&SS) requirements of our accrediting agency, the Accreditation Board for Engineering and Technology (ABET). When MSU developed the CORE, these requirements did not substitute for, but were complimentary to the ABET H&SS requirements.

- By exercising care when selecting humanities courses, it is possible to satisfy both CORE and H&SS requirements with the same set of courses.

## CORE Requirements

Many of the CORE categories are met by courses required by the chemical engineering curriculum. The categories that chemical engineering students typically do not need to be concerned with include:

W	Written Communication (3cr)	met by ENGL 121W
V	Verbal Communication (3cr)	met by CHE 251V
M	Mathematics (3cr)	met by MATH 181M
N	Natural Sciences (9cr)	met by CHEM and PHYS courses

You must make sure you choose elective courses to meet the following CORE requirements:

H	Humanities (6cr)
F	Fine Arts (3cr)
S	Social Sciences (6cr)
G	Multicultural and/or Global Issues (6cr)

NOTE: A pound sign (#) has been used to designate Multicultural/Global courses for years, but starting Autumn 1999, a "G" is being used for this designation. It will take a while to update all of the documents on campus to reflect the new nomenclature.

A course with two CORE designations, such as MUS 212FG, may be used towards meeting two CORE requirements. For example, MUS 212FG may be used towards meeting both the "F" and "G" requirements.

### CORE Requirement Worksheet

#### Humanities (H)

Course	Credit	Grade

Total Credits:

Req'd Credits: 6

#### Fine Arts (F)

Course	Credit	Grade

Total Credits:

Req'd Credits: 3

#### Social Sciences (S)

Course	Credit	Grade

Total Credits:

Req'd Credits: 6

**Multicultural/Global (G or#) Requirement - 6 Credits, minimum.**

**Total G Credits: \_\_\_\_\_**

## **ABET H&SS Requirements**

ABET Humanity and Social Sciences requirements fall into three categories:

1. Total Required Credits (16 credits)
2. Distribution Requirements
  - a) Category A: courses selected to support communications, team work, and ethics.
  - b) Category B: courses selected to support global and societal issues, contemporary issues, and the influences of industrialization on society.

Note: The Distribution Requirements replace the “depth and breadth” requirements of prior catalogs. Students who entered the University before Fall 2002 may choose to fulfill either the “depth and breadth” requirements or the new distribution requirements.

### **1 – Credit Total**

16 credits of humanity, social science, and arts coursework.

Many students take the minimum, 15 credits of CORE "H", "F", and "S" classes. ABET requires 16 credits - the missing credit can be obtained from CHE 251V.

**Note to students transferring into CHE:** If you have transfer credit for COM 110V, you will still need to take CHE 251V. This is because CHE 251V is needed to meet specific accreditation requirements (e.g., discussion of the societal impacts of chemical engineering.)

### **2 – Distribution Requirements**

Students are required to take 9 credits from categories A and B (listed on next page), including:

- At least 3 credits from Category A
- At least 3 credits from Category B

#### ***H&SS Requirements Worksheet***

##### **Total Credit Requirement:**

- CHE 251V, and
- 15 or more credits "H", "F", and "S" courses.

##### **Credit Distribution Requirement:**

- 3 or more credits from Category A: \_\_\_\_\_
- 3 or more credits from Category B: \_\_\_\_\_
- 9 or more total credits from Categories A and B

# H&SS Electives by Category

Note: This list was correct at the time this document was prepared, but it changes periodically as additional courses are approved, or occasionally, when a department stops offering a course.

## Category A

Courses have been selected to support communications, team work, and ethics.

- ENGL 123H - Introduction to Literary Study
- ENGL 212H - Biblical and Classical Backgrounds to Literature
- ENGL 214H - Regional Literature
- ENGL 309HG - Mythologies
- ENGL 311HG - World Literature
- ENGL 314H - Literature of Place
- MLF 219HG - Intermediate French
- MLG 219HG - Intermediate German
- MLJ 315H - Introduction to Japanese Literature
- MLS 219HG - Intermediate Spanish
- NAS 320HG - American Indian Religions
- NAS 340HG - American Indian Literature
- PHIL 105HG - Problems of Good & Evil
- PHIL 120H - Reason & Reality
- PHIL 220HG - Philosophies of Asia
- PHIL 305H - History of Philosophy: Ancient & Medieval
- PHIL 306H - History of Philosophy: Modern
- PHIL 332H - Ethics
- PSY 100S - Introductory Psychology
- PSY 252S - Developmental Psychology
- PSY 305S - Applied Critical Thinking
- PSY 452S - Social Psychology
- RELS 105H - Introduction to the Study of Religion
- RELS 110HG – Religion, Conflict, and Politics
- RELS 202HG - Asian Religions: Hinduism & Buddhism
- RELS 203HG – Asian Religions: from Taoism to Zen
- RELS 220H – Interpretation of American Religion
- SOC 101S - Introduction to Sociology
- SOC 212S – Social Problems

## Category B

Courses have been selected to support global and societal issues, contemporary issues, and the influences of industrialization on society.

- AGE 210S – The Econ of Ag Business
- ANTH 101SG - Intro to Anthropology
- ANTH 204SG - Culture & Society
- ANTH 326SG - Language & Culture
- ANTH 433SG - Contemporary Pacific Societies
- ECON 101S - Economic Way of Thinking
- ECON 102SG - Principles of Macroeconomics and International Economics
- ECON 250SG - Honors Economics
- ECON 314SG - International Economics
- ECON 317SG - Economic Development
- ECON 332S - Economics of Natural Resources
- ECON 372S - Economic History of the US
- GEOG 105SG - World Regional Geography
- GEOG 201SG - Human Geography
- HIST 104HG - World History in the 20th Century
- HIST 107H - Western Civilization: French Revolution to Present
- HIST 109HG - Modern Asia
- HIST 110HG - Latin American History
- HIST 115HG - A History of Japan
- HIST 156H - America and the World After 1865
- HIST 426H - The Renaissance
- HIST 456H - American Thought and Culture
- HUM 205H - Nature and Culture
- MGMT 245SG - Cultural Dimensions of International Business
- MKTG 242SG - Introduction to Global Markets
- MLG 303H - Modern German Culture and Society
- NAS 100SG - Introduction to Native American Studies
- NAS 201SG - American Indians in Montana
- NAS 242SG - American Indians in Contemporary Society
- PHIL 250H – Morality & Society
- PHIL 325H – State, Community & Individual
- PHIL 362H – Philosophy & Race
- POLS 206S - The Government of the United States
- POLS 241SG - Introduction to International Relations
- POLS 324S - American Political Thought and Popular Culture
- POLS 402SG - International Law
- POLS 441SG - International Human Rights
- PSY 100S - Introductory Psychology
- PSY 252S - Developmental Psychology
- PSY 305S - Applied Critical Thinking
- PSY 452S - Social Psychology
- RELS 105H - Introduction to the Study of Religion
- RELS 110HG – Religion, Conflict, and Politics
- RELS 202HG - Asian Religions: Hinduism & Buddhism
- RELS 203HG – Asian Religions: from Taoism to Zen
- RELS 220H – Interpretation of American Religion
- SOC 101S - Introduction to Sociology
- SOC 212S – Social Problems
- SOC 225S - Sociology Through Film
- SOC 308S - Population Problems
- SOC 328S - Environmental Sociology

## Focus Area Worksheets

Each Focus Area requires 18 credits of Engineering and Science Electives. Use the worksheet for your selected Focus Area to be sure you meet graduation requirements for your Focus Area. Engineering Electives can be any engineering course on the list of Technical Electives. Similarly, Science Electives can be any science course on the list of Technical Electives. Other upper-level science and engineering courses may also be acceptable as electives, but you should get them approved by the Department before enrolling.

### **Classic Chemical Engineering Focus**

Requirement	Credits	Options (where applicable)
E E 206: Circuits I	4	
BCHM 340: Gen. Biochem.	5	
Chemistry Elective	3	<b>Choose One:</b> <input type="checkbox"/> CHEM 228: Fund. Analytical Chemistry Prerequisite: CHEM 132 or 142 <input type="checkbox"/> CHEM 426: Spectrochemical Meth. of Analysis Corequisite: CHEM 301 or 324 <input type="checkbox"/> CHEM 311&312 substitution for CHEM 215N <sup>1</sup>
Engineering Elective	3	
Eng. or Science Elective	3	
TOTAL CREDITS	18	

Note:

- 1 By taking CHEM 311 and CHEM 312 Organic Chemistry (total of 8 credits) instead of CHEM 215: Elements of Organic Chemistry (5 credits), you take 3 extra credits of organic chemistry. These credits may be used to satisfy the Chemistry Elective requirement for the Classic Focus Area. These credits may also be used as the Science Elective if you take CHEM 228 or CHEM 426 as your Chemistry Elective.

### **Biochemical Engineering Focus**

Requirement	Credits	Note
CH E 338: Bioproc in Eng	2	
CH E 438: Bioproc Eng.	2	
BCHM 340: Gen. Biochem.	5	
Engineering Elective	3	Must be outside of Chemical Engineering
Eng. or Science Electives	6	
TOTAL CREDITS	18	

## Environmental Engineering Focus

Requirement	Credits	Options (where applicable)
CHEM 228: Fund Ana Chem	3	
Env. Chem. Elective	3	<b>Choose One:</b> <input type="checkbox"/> LRES 355: Soil & Environmental Chemistry <sup>1</sup> Prerequisite: CHEM 215, LRES 201N <input type="checkbox"/> LRES 456: Pollution Science <sup>1</sup> Prerequisite: LRES 355 <input type="checkbox"/> CHEM 425: Electrochem. & Chromatography Prerequisite: CHEM 228 Corequisite: CHEM 301 or 324 <input type="checkbox"/> CHEM 426: Spectrochemical Meth. of Analysis Corequisite: CHEM 301 or 324 <input type="checkbox"/> BCHM 340: General Biochemistry (5 credits) Prerequisite: CHEM 215 or 312
Env. Eng. Electives	6	<b>Choose Two:</b> <input type="checkbox"/> CH E 444: Hazardous Waste Management Prerequisite: Junior standing, CHEM 215 or EM 335 <input type="checkbox"/> C E 340: Principles of Env. Engineering Corequisite: CHE 322 or EM 335 <input type="checkbox"/> C E 443: Air Pollution Control Prerequisite: CHE 307 Corequisite: CHE 322 <input type="checkbox"/> C E 445: Hazardous Waste Treatment Prerequisite: CE 340
Engineering Elective	3	
Eng. or Science Elective	3	
TOTAL CREDITS	18	

Note:

- 1 The instructors for these courses have indicated that upper-level CHE students may enroll in these courses without the prerequisites listed in the MSU Catalog.

## Materials Engineering Focus

Requirement	Credits	Options (where applicable)
M E 251: Matls Sci Lab	1	
E M 251: Stat & Part Dyn	3	
CHEM 325: P. Chem. Lab.	1	
CHEM 426: Spect Meth Ana	3	
Materials Eng. Elective <sup>2</sup>	6	<b>Choose Two:</b> <input type="checkbox"/> E M 253: Mechanics of Materials Prerequisite: EM 251 <input type="checkbox"/> CH E 452: Advanced Engineering Materials** Prerequisite: MATH 225 and ME 250 or CHE 213 <input type="checkbox"/> CH E 463: Composite Materials** Prerequisite: CHE 213 <input type="checkbox"/> CH E 467: Polymer Engineering** Prerequisite: CHE 213, CHE 215
Eng. or Science Elective <sup>2</sup>	4	
TOTAL CREDITS	18	

Note:

- 2 Your choice of Materials Engineering Electives, Engineering Electives, and Science Electives must include at least 1 credit of “advanced chemistry”. Upper level CHEM or BCHM courses count as “advanced chemistry”, and courses marked with (\*\*) in this list provide 1 credit of “advanced chemistry”. Other courses (mostly CHE elective courses) may also provide “advanced chemistry” credit. See the list of Technical Electives for more information.

# Chemical Engineering Technical Electives

Note: The Credits listed below are: Total Credits | AdChem Credits | EngSD Credits - (updated 6 / 2002)

Course #	Title	Offered	Credits	Notes
BCHM 340	General Biochemistry	[F, S, Su]	5   5   0	
CE 340	Environmental Engineering	[F, S]	3   0   3	
CE 434	Groundwater	[S]	3   0   3	
CE 443	Air Pollution Control	[F 2000]	3   0   3	
CE 444	Solid Waste Management	[F 2001]	3   0   3	
CE 445	Hazardous Waste Treatment	[S]	3   0   3	
CH E 338	Bioprocesses in Engineering	[S]	2   2   2	
CH E 402	Chemical Process Industries	[S]	3   1   3	
CH E 438	Bioprocess Engineering	[F]	2   1   2	
CH E 444	Hazardous Waste Management	[F]	3   0   3	
CH E 452	Advanced Engineering Materials	[S]	3   1   3	
CH E 463	Composite Materials	[F]	3   1   3	
CH E 467	Intro. to Polymer Engineering	[S 2001]	3   1   3	
CH E 415	Design Case Studies	[S]	2   0   2	Note 1
CH E 490	Undergraduate Thesis	[F,S,Su]	1 to 8   0   0	Note 1
CHEM 228	Analytical Chemistry	[S]	3   3   0	
CHEM 326	Physical Chemistry Laboratory II	[S]	2   2   1	
CHEM 334	Inorganic Chemistry	[S]	3   3   0	
CHEM 417	Synthetic Chemistry	[F]	3   3   0	
CHEM 425	Electrochemistry & Separations	[F]	3   3   0	
CHEM 426	Spectrochemical Analysis	[S]	3   3   0	
EE 206	Circuits & Electronics Fundamentals I	[F,Su]	4   0   4	
EE 207	Circuits & Electronics Fundamentals II	[F,S,Su]	4   0   4	
EE 216	Linear Electronics I	[F,S,Su]	4   0   4	
EM 251	Statics and Particle Dynamics	[F,S,Su]	3   0   3	
EM 252	Rigid Body Dynamics	[F,S]	3   0   3	
EM 253	Mechanics of Materials	[F,S,Su]	3   0   3	
I&ME 313	Work Analysis & Design	[S]	3   0   3	
I&ME 350	Applied Eng. Data Analysis	[F,S,Su]	2   0   0	
I&ME 354	Engineering Statistics I	[F]	3   0   0	
MB 301	General Microbiology I	[F]	4   4   0	
ME 255	Manufacturing Processes	[S]	3   0   3	
ME 355	Computer-Aided Manufacturing	[on demand]	3   0   3	
ME 450	Metallic Materials	[on demand]	3   1   3	
PHYS 213	General & Modern Physics III	[F,S]	4   4   0	
PHYS 231	Intro. to Theoretical Physics	[S]	3   3   0	
PHYS 425	Thermo. & Statistical Physics	[S 2001]	3   3   0	
PHYS 426	Modern Optics	[S 2002]	3   3   0	
PHYS 427	Laser Applications	[S 2001]	3   3   0	
PHYS 441	Solid State Physics	[F 2001]	3   3   0	

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## Notes

One of these courses (CHE 415, CHE 490) is required for graduation (student's choice). The other may be taken as a technical elective.