

CHEMICAL ENGINEERING

— ABET ACCREDITATION CRITERIA APPLY —

Chemical Engineering is a discipline that relates to numerous areas of technology. In broad terms, chemical engineers are responsible for the conception and design of processes for the purpose of production, transformation, and transport of chemicals, biochemicals, and materials. More recently, chemical engineers are increasingly involved in the design of new products that are enabled by emerging process technologies. These activities begin with experimentation in the laboratory and are followed by implementation of the technology to full-scale production. The mission of the Chemical Engineering department at Stanford is to provide professional training, development, and education for the next generation of leaders in chemical sciences and engineering.

The large number of industries that depend on the synthesis and processing of chemicals and materials place the chemical engineer in great demand. In addition to traditional examples such as the chemical, energy and oil industries, opportunities in biotechnology, pharmaceuticals, electronic materials and device fabrication, and environmental engineering are increasing. The unique training of the chemical engineer becomes essential in these areas whenever processes involve the chemical or physical transformation of matter. For example, chemical engineers working in the chemical industry investigate the creation of new polymeric materials with important electrical, optical, or mechanical properties. This requires attention not only to the synthesis of the polymer, but also to the flow and forming processes necessary to create a final product. In biotechnology, chemical engineers have responsibilities in the design of production processes and facilities to use microorganisms and enzymes to synthesize new drugs. Problems in environmental engineering that engage chemical engineers include the development of processes (for example, catalytic converters and effluent treatment facilities) to minimize the release of products harmful to the environment.

To carry out these activities, the chemical engineer requires a complete and quantitative understanding of both the scientific and engineering principles underlying these technological processes. This is reflected in the curriculum of the chemical engineering department, which includes the study of applied mathematics, material and energy balances, thermodynamics, fluid mechanics, energy and mass transfer, separations technologies, chemical reaction kinetics and

reactor design, biochemical engineering and process design. Courses are built on a foundation in the sciences of chemistry, physics, and biology.

The individual student's mathematics and science course preparation for the chemical engineering major depends on his or her previous background in these areas. Following are six sequences or 4-year plans. Each starts at a different point but all six plans conclude with the same in-the-major depth requirements.

Programs with the recommended engineering math (CME) courses:

- #1A Little preparation in math and chemistry: This plan starts with MATH 19, 20, 21, and CHEM 31A & 31B.
- #1B Little preparation in math; strong chemistry: This plan starts with MATH 19, 20, 21 and CHEM 31X.
- #2 No AP math credits, prepared to start with MATH 40 series, then move to CME math series. Strong chemistry preparation; start with CHEM 31X.
- #3 AP math credits, prepared to start with the CME math series, which is recommended instead of the MATH 50 series. Start with CHEM 31X.
- #4 Same preparation as 3, but with a degree goal of a B.S. with Honors in Chemical Engineering. Honors Program by application only; see departmental student services. This plan is for students interested in an in-depth research experience in addition to the normal coursework for the major.

Alternative programs with MATH 50 series courses:

- #5 No AP math credits, starting with MATH 40 series and continuing preparation with MATH 50 series.
- #6 AP math credits for MATH 40 series; start with MATH 50 series. Programs 5 & 6 require an additional 5 units of math.

Our departmental website is at <http://cheme.stanford.edu/> and that of our student chapter of the American Institute of Chemical Engineers is at <http://www.stanford.edu/group/aiche/>.

Our faculty, staff, and students would be glad to talk with you about majoring in Chemical Engineering. If you would like more information about this major, please contact our departmental student services staff in Keck Science Building, room 189.

Alternatively, you may phone (650-723-1302) or email Jeanne Cosby at cosby@stanford.edu.

OBJECTIVES AND OUTCOMES FOR CHEMICAL ENGINEERING

Objectives:

1. Principles and Skills: Provide a basic understanding of chemical engineering principles along with analytical problem-solving and communication skills necessary to succeed in diverse careers, including chemical engineering practice and academic research.
2. Preparation for Changing and Diverse Practice: Prepare students for successful practice in a field whose focus is constantly changing and growing with a long-term perspective that takes into account new tools, new means of dispersing and controlling information, new focus areas such as biotechnology and molecular engineering, and increasingly complex professional and societal expectations.
3. Preparation for Graduate Study: Prepare students for graduate study coupled with short-term and/or long-term career research in the chemical sciences and chemical engineering.
4. Preparation for Service: Prepare and develop students' skills, awareness, and background to become responsible citizens, employees, and leaders in our communities and in the field of chemical science.

Outcomes:

- (a) A proficiency in and ability to apply knowledge of engineering, mathematics through differential equations, probability and statistics, and science including physics, chemistry, and biology.
- (b) An ability to design and conduct experiments, as well as to analyze and interpret data
- (c) An ability to design a system, component, or process to meet desired needs
- (d) An ability to function on multi-disciplinary teams
- (e) An ability to identify, formulate, and solve engineering problems
- (f) An understanding of professional and ethical responsibility
- (g) An ability to communicate effectively
- (h) The broad education necessary to understand the impact of engineering solutions in a global and societal context
- (i) A recognition of the need for, and an ability to engage in life-long learning
- (j) A knowledge of contemporary issues
- (k) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.
- (l) Background for admission to engineering or other professional graduate programs

REQUIREMENTS: CHEMICAL ENGINEERING PROGRAM

Course	Title	Engr. Sci.	Engr. Dsgn.	Expr.	Total	Qtr.	Year
Mathematics and Science (47-53 Units)							
MATH 41	Single Variable Calculus	-	-	-	5	A	Fr
MATH 42	Single Variable Calculus	-	-	-	5	A,W	Fr
CME 100* <i>or</i> Math 51 AND 52	Vector Calculus for Engineers				5	A	Fr, So
CME 102* <i>or</i> Math 53	Ordinary Differential Eqs for Engineers	-	-	-	5	W, S	Fr, So
CME 104 <i>or</i> CME 106 (1 of 2 req'd)	Linear Algebra & Partial Differential Eqs for Engineers Intro to Probability and Statistics for Engineers				5 4	S W	So/Jr So/Jr
CHEM 31X	Chemical Principles (req'd) or 31 A & 31 B	-	-	-	4	A,W	Fr
CHEM 33	Structure and Reactivity (req'd)	-	-	-	4	W, S	Fr
CHEM 35	Organic Monofunctional Compounds (req'd)	-	-	-	4	A, S	Fr
CHEM 36	Organic Chemistry Laboratory I (req'd)	-	-	2	3	S	Fr
PHYS 41	Mechanics (req'd)	-	-	-	4	W	So
PHYS 43	Electricity & Magnetism (req'd)	-	-	-	4	S	So
<i>*CME 100 and 102 are the recommended math courses for ChemE majors</i>							
Technology in Society (3-5 units) (select one course from the approved list; see Figure 3-3)							
Engineering Fundamentals (3 courses minimum)							
ENGR 20	Introduction to Chemical Engineering	2	1	-	3	S	Fr/So
ENGR 25	Biotechnology	2	1	-	3	S	Fr/So
<i>Plus one or more additional course(s) (see Chapter 3, Figure 3-4 for list)</i>							
Engineering Depth (60 units; Note: Engr. Sci/Engr.Design units, that is, columns 1 & 2 from Fundamentals and Depth combined, must equal a minimum of 68 units in order to meet ABET graduation requirements)							
CHEMENG 10	The Chemical Engineering Profession	-	-	-	1	A	Sr
CHEMENG 100	Chem. Process Modeling, Dynamics	3	-	-	3	A	Jr
CHEMENG 110	Equilibrium Thermodynamics (03-04: Spr)	3	-	-	3	W	Jr
CHEMENG 120A	Fluid Mechanics	3	1	-	4	W	Jr
CHEMENG 120B	Energy & Mass Transport	3	1	-	4	S	Jr
CHEMENG 130	Separation Processes	2	1	-	3	S	Jr
CHEMENG 150	Biochemical Engineering	2	1	-	3	A	Sr
CHEMENG 140 <i>and/or</i> CHEMENG 160 <i>Or either</i>	Microelectronics Processing Technology Polymer Science & Engineering	2 2	1 1	- -	3 3	S W	Sr
CHEMENG 174 <i>or</i> CHEMENG 183 <i>2 of 3 options req'd</i>	Environmental Microbiology I Biochemistry II	2 3	1 -	- -	3 3	A S	Sr Jr
CHEMENG 170	Kinetics and Reactor Design	2	1	-	3	A	Sr
CHEMENG 180	Chemical Engineering Plant Design	-	3	-	3	S	Sr
CHEMENG 181	Biochemistry I	3	0	0	3	W	Jr
CHEMENG 185A	Chem Engr Lab A (<i>satisfies WIM</i>)	2	2	4	4	A	Sr
CHEMENG 185B	Chemical Engineering Lab B	2	2	4	4	W	Sr
CHEM 130	Organic Chemistry Laboratory II	4	-	4	4	A,W	So
CHEM 131	Organic Polyfunctional Compounds	2	-	1	3	A,W	So
CHEM 171	Physical Chemistry – Chemical Thermodynamics	3	-	-	3	A	Jr
CHEM 173	Physical Chemistry – Quantum Chemistry	3	-	-	3	W	Jr
CHEM 175	Physical Chemistry – Kinetic Theory & Statistical Mechanics	3	-	-	3	S	Jr

INSTRUCTIONS FOR FINDING OUT MORE ABOUT THE DEPARTMENT OF CHEMICAL ENGINEERING

1. Contact Chemical Engineering Student Services. To make an appointment, with the student services manager, send an email Jeanne Cosby, cosby@stanford.edu. Alternatively, drop-in visits are encouraged, especially between 2:00 and 4:00 p.m. in Keck Science Building, room 189. This will let the department know that you are considering the major and give you an opportunity to ask questions and get more information about chemical engineering, our advising program, etc.
2. Participate in the annual ChemE advising workshop the first week of classes, Autumn Quarter.
3. Attend quarterly departmental advising sessions.
4. Meet one-on-one with chemical engineering faculty and/or students.

Note: The online version of the UGHB is considered the definitive and final version of SoE requirements for each major. Since corrections or updates may have been made after this Handbook went to press in August 2008, download the online ChemE program sheet from ughb.stanford.edu to ensure you are using an accurate major plan.

Chemical Engineering

4-Year Plan #1A: CHEM 31A & CHEM 31B (instead of CHEM 31X) and MAT 19, 20, 21 series. Then CME 100, 102, and CME 104 or 106.

*** Note: Final Program MUST have 68 ABET units for Engineering Science and Engineering Design. ***

	Fall				Winter				Spring			
	Class	Math/ Sci.	Engr.	Other	Class	Math/ Sci.	Engr.	Other	Class	Math/ Sci.	Engr.	Other
<i>Freshman</i>	MATH 19	3	-	-	MATH 20	3	-	-	MATH 21	4	-	-
	IHUM	-	-	5	IHUM	-	-	5	IHUM	-	-	5
	GER	-	-	3	Writing	-	-	4	CHEM 33	4	-	-
	CHEM 31A*	4	-	-	CHEM 31B*	4	-	-	CHEM 36	3	-	-
	<i>Subtotals</i>	<i>7</i>	<i>0</i>	<i>8</i>	<i>Subtotals</i>	<i>7</i>	<i>0</i>	<i>9</i>	<i>Subtotals</i>	<i>11</i>	<i>0</i>	<i>5</i>
	Total			15	Total			16	Total			16
<i>Sophomore</i>	CME 100	5	-	-	CME 102	5	-	-	ENGR 20 **	-	3	-
	TIS (alt.) ***	-	-	-	Engr. Fund.	-	4	-	ENGR 25 **	-	3	-
	CHEM 35	4	-	-	PHYSICS 41	4	-	-	PHYSICS 43	4	-	-
	CHEM 130	4	-	-	Writing	-	-	4	ENGR math elec	5	-	-
	<i>Subtotals</i>	<i>13</i>	<i>0</i>	<i>0</i>	<i>Subtotals</i>	<i>9</i>	<i>4</i>	<i>4</i>	<i>Subtotals</i>	<i>9</i>	<i>6</i>	<i>0</i>
	Total			13	Total			17	Total			15
<i>Junior</i>	CHEMENG 100	-	3	-	CHEMENG 110	-	3	-	CHEMENG 130	-	3	-
	CHEM 131	-	3	-	CHEMENG 120A	-	4	-	CHEMENG 120B	-	4	-
	CHEM 171	-	3	-	CHEM 173	-	3	-	CHEM 175	-	3	-
	TIS *** (alt.)	-	-	-	CHEMENG 181	-	3	-	CHEMENG 183	-	3	-
	Language	-	-	5	Language	-	-	5	Language	-	-	5
					ENGR math elec							
<i>Subtotals</i>	<i>0</i>	<i>9</i>	<i>5</i>	<i>Subtotals</i>	<i>0</i>	<i>13</i>	<i>5</i>	<i>Subtotals</i>	<i>0</i>	<i>13</i>	<i>5</i>	
	Total			14	Total			18	Total			18
<i>Senior</i>	CHEMENG 150	-	3	-	CHEMENG 160	-	3	-	CHEMENG 140	-	-	-
	CHEMENG 170	-	3	-	GER	-	-	3	CHEMENG 180	-	3	-
	CHEMENG 185A	-	4	-	CHEMENG 185B	-	3	-	GER	-	-	5
	CHEMENG 10	-	1	-	GER	-	-	3	GER	-	-	3
	TIS course ***	-	-	4	TIS *** (alt.)	-	-	-				
	CHEMENG 174	-	-	-								
	<i>Subtotals</i>	<i>0</i>	<i>11</i>	<i>4</i>	<i>Subtotals</i>	<i>0</i>	<i>6</i>	<i>6</i>	<i>Subtotals</i>	<i>0</i>	<i>3</i>	<i>8</i>
	Total			15	Total			12	Total			11

Notes:

CHEMENG 181 (formerly 188) required (Win)

CHEMENG 150 (Aut) required

Both CHEMENG 185A and 185B required

* If prepared, take CHEM 31X (Aut), CHEM 33 (Win), and CHEM 35, 36 (Spr)

** ENGR/CHEMENG 20 "Introduction to Chemical Engineering" and ENGR/CHEMENG 25 "Biotechnology"

*** TIS course in 2nd, 3rd, or 4th year

- ENGR math elective, one of two: CME 104 (5 units) or CME 106 (4 units).

- ChE elective, two of three choices: CHEMENG 140 (Spr.) and/or 160 (Win.) and/or either 174 (Aut) or 183 (Win)

- Students' choices for Math elective, 3rd Engineering Fundamental, and CHEMENG electives affect choices, units, and scheduling of GER courses and other courses not required for the ChemE major.

AP Math Units: 0

UG Math & Science Units: 56

Total Engineering Units: 65

Total Other Units: 59

Total Units: 180

Chemical Engineering

Typical Sequence of Courses

4-Year Plan # 1-A

MATH 19, 20, 21 series, then CME 100, 102 and ENGR math elective

Plan A = CHEM 31A and CHEM 31B (instead of CHEM 31X)

<i>Freshman</i>	<i>Sophomore</i>	<i>Junior</i>	<i>Senior</i>
MATH 19 (A)	CME 100 (A)	Technology in Society	Technology in Society (alt.)
MATH 20 (W)	CME 102 (W)	CHEMENG 181 (W)	CHEMENG 10 (A)
MATH 21 (S)	*Math Elective/ CME 104 (S)	*Math Elective/ CME 106 (W)	CHEMENG 150 (A)
	ENGR 20 (S)	CHEMENG 100 (A)	CHEMENG 170 (A)
	ENGR 25 (S)	CHEMENG 110 (W)	CHEMENG 180 (S)
		CHEMENG 130 (S)	CHEMENG 185A (A)
	PHYS 41 (W)	CHEMENG 120A (W)	CHEMENG 185B (W)
	PHYS 43 (S)	CHEMENG 120B (S)	
CHEM 31A (A,Sum)	Engineering Fundamental	CHEM 171 (A)	Electives (take 2)
CHEM 31B (W)		CHEM 173 (W)	CHEMENG 140 (S)
CHEM 33 (W,S,Sum)	CHEM 35 (A)	CHEM 175 (S)	and/or CHEMENG 160 (W)
CHEM 36 (A,S,Sum)	CHEM 130 (A,W)	CHEM 131 (A,W)	or either CHEMENG 174 (A)
		CHEMENG 183 (S)	or CHEMENG 183 (S)

* Solid arrows represent direct prerequisites.

* Dashed lines represent co-requisites.

* Dashed-line boxes enclose alternatives. These may indicate years in which to take a given course or different courses that may fulfill a degree requirement

Chemical Engineering

4-Year Plan # 1-B: CHEM 31X (instead of CHEM 31A & CHEM 31B) and MATH 19, 20, 21 series. Then CME 100, 102, and 104 or 106

*** Note: Final Program MUST have 68 ABET units for Engineering Science and Engineering Design. ***

	<i>Fall</i>			<i>Winter</i>			<i>Spring</i>					
	Math/ Sci.	Engr.	Other	Math/ Sci.	Engr.	Other	Math/ Sci.	Engr.	Other			
<i>Freshman</i>	MATH 19	3	-	-	MATH 20	3	-	-	MATH 21	4	-	-
	IHUM	-	-	5	IHUM	-	-	5	IHUM	-	-	5
	GER	-	-	3	Writing	-	-	4	CHEM 35	4	-	-
	CHEM 31X	4	-	-	CHEM 33	4	-	-	CHEM 36	3	-	-
	<i>Subtotals</i>	<i>7</i>	<i>0</i>	<i>8</i>	<i>Subtotals</i>	<i>7</i>	<i>0</i>	<i>9</i>	<i>Subtotals</i>	<i>11</i>	<i>0</i>	<i>5</i>
Total	15			Total	16			Total	16			
<i>Sophomore</i>	CME 100	5	-	-	CME 102	5	-	-	ENGR 20 **	-	3	-
	TIS *** (alt.)	-	-	-	Engr. Fund.	-	4	-	ENGR 25 **	-	3	-
	CHEM 130	-	4	-	PHYSICS 41	4	-	-	PHYSICS 43	4	-	-
	Writing	-	-	4	GER	-	-	3	ENGR math elec	5	-	-
	<i>Subtotals</i>	<i>5</i>	<i>4</i>	<i>4</i>	<i>Subtotals</i>	<i>9</i>	<i>4</i>	<i>3</i>	<i>Subtotals</i>	<i>9</i>	<i>6</i>	<i>0</i>
Total	13			Total	16			Total	15			
<i>Junior</i>	CHEMENG 100	-	3	-	CHEMENG 110	-	3	-	CHEMENG 130	-	3	-
	CHEM 131	-	3	-	CHEMENG 120A	-	4	-	CHEMENG 120B	-	4	-
	CHEM 171	-	3	-	CHEM 173	-	3	-	CHEM 175	-	3	-
	TIS ** (alt)	-	-	-	CHEMENG 181	-	3	-	CHEMENG 183	-	3	-
	Language	-	-	5	Language	-	-	5	Language	-	-	5
		-	-	-	ENGR math elec	-	-	-	Elective	-	-	-
	<i>Subtotals</i>	<i>0</i>	<i>9</i>	<i>5</i>	<i>Subtotals</i>	<i>0</i>	<i>13</i>	<i>5</i>	<i>Subtotals</i>	<i>0</i>	<i>13</i>	<i>5</i>
Total	14			Total	18			Total	18			
<i>Senior</i>	CHEMENG 150	-	3	-	CHEMENG 160	-	3	-	CHEMENG 140	-	-	-
	CHEMENG 170	-	3	-	GER	-	-	3	CHEMENG 180	-	3	-
	CHEMENG 185A	-	4	-	CHEMENG 185B	-	4	-	GER	-	-	5
	CHEMENG 10	-	1	-	GER	-	-	3	Elective	-	-	3
	TIS course ***	-	-	4	TIS *** (alt)	-	-	-				
	CHEMENG 174	-	-	-								
	<i>Subtotals</i>	<i>0</i>	<i>11</i>	<i>4</i>	<i>Subtotals</i>	<i>0</i>	<i>7</i>	<i>6</i>	<i>Subtotals</i>	<i>0</i>	<i>3</i>	<i>8</i>
Total	15			Total	13			Total	11			

Notes:

CHEMENG 181 (formerly 188) required (Win)

CHEMENG 150 (Aut) required

Both CHEMENG 185A and 185B required

** ENGR/CHEMENG 20 "Introduction to Chemical Engineering" and ENGR/CHEMENG 25 "Biotechnology"

*** TIS course in 2nd, 3rd, or 4th year

- ENGR math elective, one of two: CME 104 (5 units) or CME 106 (4 units).

- ChE elective, two of three choices: CHEMENG 140 (Spr.) and/or 160 (Win.) and/or either 174 (Aut) or 183 (Win)

Students' choices for Math elective, 3rd Engineering Fundamental, and CHEMENG electives affect choices, units, and scheduling of GER courses and other courses not required for the ChemE major.

AP Math Units:	0
UG Math & Science Units:	48
Total Engineering Units:	70
Total Other Units:	62
Total Units:	180

Chemical Engineering

Typical Sequence of Courses

4-Year Plan # 1-B

MATH 19, 20, 21 series, then CME 100, 102 and ENGR math elective

Plan B = CHEM 31X (instead of CHEM 31A and CHEM 31B)

<i>Freshman</i>	<i>Sophomore</i>	<i>Junior</i>	<i>Senior</i>
MATH 19 (A)	CME 100 (A)	Technology in Society	Technology in Society (alt.)
MATH 20 (W)	CME 102 (W)	CHEMENG 181 (W)	CHEMENG 10 (A)
MATH 21 (S)	*Math Elective/ CME 104 (S)	1 of 2 *Math Elective/ CME 106 (W)	CHEMENG 150 (A)
	ENGR 20 (S)	CHEMENG 100 (A)	CHEMENG 170 (A)
	ENGR 25 (S)	CHEMENG 110 (W)	CHEMENG 180 (S)
		CHEMENG 130 (S)	CHEMENG 185A (A)
	PHYS 41 (W)	CHEMENG 120A (W)	CHEMENG 185B (W)
	PHYS 43 (S)	CHEMENG 120B (S)	
CHEM 31X (A,Sum)	Engineering Fundamental	CHEM 171 (A)	Electives (take 2)
CHEM 33 (W,S,Sum)		CHEM 173 (W)	CHEMENG 140 (S)
CHEM 35 (A,S,Sum)	CHEM 35 (A)	CHEM 175 (S)	and/or CHEMENG 160 (W)
CHEM 36 (A,S,Sum)	CHEM 130 (A,W)	CHEM 131 (A,W)	or either CHEMENG 174 (A)
		CHEMENG 183 (S)	or CHEMENG 183 (S)

* Solid arrows represent direct prerequisites.

* Dashed lines represent co-requisites.

* Dashed-line boxes enclose alternatives. These may indicate years in which to take a given course or different courses that may fulfill a degree requirement

Chemical Engineering

4-Year Plan #2 — A RECOMMENDED PLAN — MATH 40 series; then CME 100 and 102. Then CME 104 or 106

*** Note: Final Program MUST have 68 ABET units for Engineering Science and Engineering Design. ***

	Fall			Winter			Spring					
	Math/ Sci.	Engr.	Other	Class	Math/ Sci.	Engr.	Other	Class	Math/ Sci.	Engr.	Other	
<i>Freshman</i>	MATH 41	5	-	-	MATH 42	5	-	-	ENGR 20 **	-	3	-
	IHUM	-	-	5	IHUM	-	-	5	ENGR 25 **	-	-	-
	CHEM 31X	4			CHEM 33	4	-	-	IHUM	-	-	5
					Writing	-	-	4	CHEM 35	4		
	<i>Subtotals</i>	<i>9</i>	<i>0</i>	<i>5</i>	<i>Subtotals</i>	<i>9</i>	<i>0</i>	<i>9</i>	<i>Subtotals</i>	<i>7</i>	<i>3</i>	<i>5</i>
Total	14			Total	18			Total	15			
<i>Sophomore</i>	CME 100	5	-	-	CME 102	5	-	-	ENGR 20 **	-	-	-
	CHEM 130	-	4	-	Engr. Fund.		4	-	ENGR 25 **	-	3	-
	Writing	-	-	4	PHYSICS 41	4	-	-	PHYSICS 43	4	-	-
	GER	-	-	3	GER	-	-	3	ENGR math elec	5	-	-
	TIS *** (alt.)								GER	-	-	3
<i>Subtotals</i>	<i>5</i>	<i>4</i>	<i>7</i>	<i>Subtotals</i>	<i>9</i>	<i>4</i>	<i>3</i>	<i>Subtotals</i>	<i>9</i>	<i>3</i>	<i>3</i>	
Total	16			Total	16			Total	15			
<i>Junior</i>	CHEMENG 100	-	3	-	CHEMENG 110	-	3	-	CHEMENG 130	-	3	-
	CHEM 131	-	3	-	CHEMENG 120A	-	4	-	CHEMENG 120B	-	4	-
	CHEM 171	-	3	-	CHEM 173	-	3	-	CHEM 175	-	3	-
	TIS ***	-	-	3	CHEMENG 181	-	3	-	CHEMENG 183	-	3	-
					ENGR math elec	-	-	-	GER	-	-	3
<i>Subtotals</i>	<i>0</i>	<i>9</i>	<i>3</i>	<i>Subtotals</i>	<i>0</i>	<i>13</i>	<i>0</i>	<i>Subtotals</i>	<i>0</i>	<i>13</i>	<i>3</i>	
Total	12			Total	13			Total	16			
<i>Senior</i>	CHEMENG 150	-	3	-	CHEMENG 160	-	3	-	CHEMENG 140	-	-	-
	CHEMENG 170	-	3	-	GER	-	-	5	CHEMENG 180	-	3	-
	CHEMENG 185A	-	4	-	CHEMENG 185B	-	4	-	Elective	-	-	-
	CHEMENG 10	-	1	-	TIS *** (alt.)	-	-	-	Elective	-	-	4
	Language	-	-	5	Language	-	-	5	Language	-	-	5
	CHEMENG 174	-	-	-								
<i>Subtotals</i>	<i>0</i>	<i>11</i>	<i>5</i>	<i>Subtotals</i>	<i>0</i>	<i>7</i>	<i>10</i>	<i>Subtotals</i>	<i>0</i>	<i>3</i>	<i>9</i>	
Total	16			Total	17			Total	12			

Notes:

CHEMENG 181 (formerly 188) required (Win)

CHEMENG 150 (Aut) required

Both CHEMENG 185A and 185B required

** ENGR/CHEMENG 20 "Intro to ChemE" and ENGR/CHEMENG 25 "Biotechnology"

*** TIS course in 2nd, 3rd, or 4th year

- ENGR math elective, one of two: CME 104 (5 units) or CME 106 (4 units).

- ChE elective, 2 of 3 choices: CHEMENG 140 (Spr.) and/ or 160 (Win.) and/or (either 174 (Aut) or 183 (Spr))

- Students' choices for Math elective, 3rd Engineering Fundamental, and CHEMENG electives affect choices, units, and scheduling of GER courses and other courses not required for the ChemE major.

AP Math Units:	0
UG Math & Science Units:	48
Total Engineering Units:	70
Total Other Units:	<u>62</u>
	180

Chemical Engineering

Typical Sequence of Courses

4-Year Plan # 2 — RECOMMENDED

MATH 40 series, then CME 100, 102 then CME 104 or 106

<i>Freshman</i>	<i>Sophomore</i>	<i>Junior</i>	<i>Senior</i>
MATH 41 (A)	CME 100 (A)	Technology in Society	Technology in Society (alt.)
MATH 42 (A,W)	CME 102 (W)	CHEMENG 181 (W)	CHEMENG 10 (A)
	*Math Elective/ CME 104 (S)	Take 1 of 2	*Math Elective/ CME 106 (W)
ENGR 20 (S)	ENGR 20 (S) (alternative)	CHEMENG 100 (A)	CHEMENG 170 (A)
ENGR 25 (S) (alt.)	ENGR 25 (S)	CHEMENG 110 (W)	CHEMENG 180 (S)
		CHEMENG 130 (S)	CHEMENG 185A (A)
	PHYS 41 (W)	CHEMENG 120A (W)	CHEMENG 185B (W)
	PHYS 43 (S)	CHEMENG 120B (S)	
		CHEM 171 (A)	Electives (take 2)
CHEM 31X (A,Sum)	Engineering Fundamental	CHEM 173 (W)	CHEMENG 140 (S)
CHEM 33 (W,S,Sum)		CHEM 175 (S)	and/or CHEMENG 160 (W)
CHEM 35 (A,S,Sum)		CHEM 131 (A,W)	or either CHEMENG 174 (A)
CHEM 36 (A,S,Sum)	CHEM 130 (A,W)	CHEMENG 183 (S)	or CHEMENG 183 (S)

* Solid arrows represent direct prerequisites.

* Dashed lines represent co-requisites.

* Dashed-line boxes enclose alternatives. These may indicate years in which to take a given course or different courses that may fulfill a degree requirement

Chemical Engineering

4-Year Plan # 3 — A RECOMMENDED PLAN — CME 100 and 102, then CME 104 or 106
(AP credit for MATH 40 series; start with CME 100, 102 instead of MATH 51 series)

*** Note: Final Program MUST have 68 ABET units for Engineering Science and Engineering Design>

	<i>Fall</i>			<i>Winter</i>			<i>Spring</i>					
	Math/ Sci.	Engr.	Other	Math/ Sci.	Engr.	Other	Math/ Sci.	Engr.	Other			
<i>Freshman</i>	CME 100	5	-	-	CME 102	5	-	-	ENGR 20 **	-	3	-
	IHUM	-	-	5	IHUM	-	-	5	ENGR 25 **	-	-	-
	CHEM 31X	4	-	-	CHEM 33	4	-	-	IHUM	-	-	5
					Writing	-	-	4	CHEM 35	4	-	-
	<i>Subtotals</i>	<i>9</i>	<i>0</i>	<i>5</i>	<i>Subtotals</i>	<i>9</i>	<i>0</i>	<i>9</i>	<i>Subtotals</i>	<i>7</i>	<i>3</i>	<i>5</i>
Total	14			Total	18			Total	15			
<i>Sophomore</i>	CHEM 130	-	4	-	CME math elec	4	-	-	CME math elec	-	-	-
	TIS *** (alt.)	-	-	-	PHYSICS 41	4	-	-	PHYSICS 43	4	-	-
	Writing	-	-	4	Engr. Fund	-	4	-	ENGR 20 **	-	-	-
	GER	-	-	3	CME math elec	-	-	-	ENGR 25 **	-	3	-
	Language	-	-	5	Language	-	-	5	Language	-	-	5
<i>Subtotals</i>	<i>0</i>	<i>4</i>	<i>12</i>	<i>Subtotals</i>	<i>8</i>	<i>4</i>	<i>5</i>	<i>Subtotals</i>	<i>4</i>	<i>3</i>	<i>5</i>	
Total	16			Total	17			Total	12			
<i>Junior</i>	CHEMENG 100	-	3	-	CHEMENG 110	-	3	-	CHEMENG 130	-	3	-
	CHEM 131	-	3	-	CHEMENG 120A	-	4	-	CHEMENG 120B	-	4	-
	CHEM 171	-	3	-	CHEM 173	-	3	-	CHEM 175	-	3	-
	GER	-	-	3	CHEMENG 181	-	3	-	CHEMENG 183	-	3	-
	<i>Subtotals</i>	<i>0</i>	<i>9</i>	<i>3</i>	<i>Subtotals</i>	<i>0</i>	<i>13</i>	<i>0</i>	<i>Subtotals</i>	<i>0</i>	<i>13</i>	<i>0</i>
Total	12			Total	13			Total	13			
<i>Senior</i>	CHEMENG150	-	3	-	CHEMENG 160	-	-	-	CHEMENG 140	-	3	-
	CHEMENG 170	-	3	-	GER	-	-	5	CHEMENG 180	-	3	-
	CHEMENG 185A	-	4	-	CHEMENG 185B	-	4	-	Elective	-	-	3
	CHEMENG 10	-	1	-	GER	-	-	4	GER	-	-	3
	TIS course ***	-	-	4	Elective	-	-	-	TIS ***(alt.)	-	-	-
	CHEMENG 174	-	-	-								
	<i>Subtotals</i>	<i>0</i>	<i>11</i>	<i>4</i>	<i>Subtotals</i>	<i>0</i>	<i>4</i>	<i>9</i>	<i>Subtotals</i>	<i>0</i>	<i>6</i>	<i>6</i>
Total	15			Total	13			Total	12			

Notes:

CHEMENG 181 (formerly 188) required (Win)

CHEMENG 150 (Aut) required

Both CHEMENG 185A and 185B required

** ENGR/CHEMENG 20 "introduction to Chemical Engineering" and ENGR/CHEMENG 25 "Biotechnology"

*** TIS course in 2nd, 3rd, or 4th year

- ENGR math elective, one of two: CME 104 (5 units) or CME 106 (4 units).

- ChE elective, two of three choices: CHEMENG 140 (Spr.) and/or 160 (Win.) and/or (either 174 (Aut) or 183 (Spr)).

- Students' choices for Math elective, 3rd Engineering Fundamental, and CHEMENG electives affect choices, units, and scheduling of GER courses and other courses not required for the ChemE major.

AP Math Units:	10
UG Math & Science Units:	37
Total Engineering Units:	70
Total Other Units:	63
Total Units:	180

Chemical Engineering

Typical Sequence of Courses

4-Year Plan # 3 — RECOMMENDED

AP credit for MATH 40 series; start with CME 100, 102 (instead of MATH 51 series); then CME 104 or 106

<i>Freshman</i>	<i>Sophomore</i>	<i>Junior</i>	<i>Senior</i>
CME 100 (A)	Math Elective 1 of 2	Technology in Society	Technology in Society (alt.)
CME 102 (W)	CME 104 (S)	CHEMENG 181 (W)	CHEMENG 10 (A)
	CME 106 (W)		CHEMENG 150 (A)
		CHEMENG 100 (A)	CHEMENG 170 (A)
ENGR 20 (S)	ENGR 20 (S) (alt.)	CHEMENG 110 (W)	CHEMENG 180 (S)
ENGR 25 (S) (alt.)	ENGR 25 (S)	CHEMENG 130 (S)	CHEMENG 185A (A)
	PHYS 41 (W)	CHEMENG 120A (W)	CHEMENG 185B (W)
	PHYS 43 (S)	CHEMENG 120B (S)	
		CHEM 171 (A)	Electives (take 2)
CHEM 31X (A,Sum)	Engineering Fundamental	CHEM 173 (W)	CHEMENG 140 (S)
CHEM 33 (W,S,Sum)		CHEM 175 (S)	and/or CHEMENG 160 (W)
CHEM 35 (A,S,Sum)		CHEM 131 (A,W)	or either CHEMENG 174 (A)
CHEM 36 (A,S,Sum)	CHEM 130 (A,W)	CHEMENG 183 (S)	or CHEMENG 183 (S)

* Solid arrows represent direct prerequisites.

* Dashed lines represent co-requisites.

* Dashed-line boxes enclose alternatives. These may indicate years in which to take a given course or different courses that may fulfill a degree requirement

Chemical Engineering WITH HONORS

By separate deptl. application with research proposal; min. 3.5 GPA; min. of 9 units of 190H during min. of 3 qtrs.

4-Year Plan # 4 — A RECOMMENDED PLAN — CME 100, 102, then CME 104 or 106. (AP credit for MATH 40 series. CME instead of MATH 51 series)

*** Note: Final Program MUST have 68 ABET units for Engineering Science and Engineering Design. ***

	Fall			Winter			Spring					
	Math/			Math/			Math/					
	Class	Sci.	Engr.	Other	Class	Sci.	Engr.	Other	Class	Sci.	Engr.	Other
<i>Freshman</i>	CME 100	5	-	-	CME 102	5	-	-	ENGR 20 **	-	3	-
	IHUM	-	-	5	IHUM	-	-	5	ENGR 25 **	-	-	-
	CHEM 31X	4	-	-	CHEM 33	4	-	-	IHUM	-	-	5
					Writing	-	-	4	CHEM 35	4	-	-
	<i>Subtotals</i>	<i>9</i>	<i>0</i>	<i>5</i>	<i>Subtotals</i>	<i>9</i>	<i>0</i>	<i>9</i>	<i>Subtotals</i>	<i>7</i>	<i>3</i>	<i>5</i>
	Total	14		Total	18		Total	15				
<i>Sophomore</i>	CHEM 130	-	4	-	CME math elec	-	-	-	CME math elec	5	-	-
	TIS *** (alt.)	-	-	-	PHYSICS 41	4	-	-	PHYSICS 43	4	-	-
	Writing	-	-	4	Engr. Fund	-	4	-	ENGR 20 **	-	-	-
	GER	-	-	4	GER	-	-	-	ENGR 25 **	-	3	-
	Language	-	-	5	Language	-	-	5	Language	-	-	5
<i>Subtotals</i>	<i>0</i>	<i>4</i>	<i>13</i>	<i>Subtotals</i>	<i>4</i>	<i>4</i>	<i>5</i>	<i>Subtotals</i>	<i>9</i>	<i>3</i>	<i>5</i>	
	Total	17		Total	13		Total	17				
<i>Junior</i>	CHEMENG 100	-	3	-	CHEMENG 110	-	3	-	CHEMENG 130	-	3	-
	CHEM 131	-	3	-	CHEMENG 120A	-	4	-	CHEMENG 120B	-	4	-
	CHEM 171	-	3	-	CHEM 173	-	3	-	CHEM 175	-	3	-
	GER	-	3	-	CHEMENG 181	-	3	-	CHEMENG 183	-	3	-
	TIS ** (alt.)	-	-	-	GER	-	-	3	CHEMENG 190H	-	3	-
<i>Subtotals</i>	<i>0</i>	<i>12</i>	<i>0</i>	<i>Subtotals</i>	<i>0</i>	<i>13</i>	<i>3</i>	<i>Subtotals</i>	<i>0</i>	<i>16</i>	<i>0</i>	
	Total	12		Total	16		Total	16				
<i>Senior</i>	CHEMENG150	-	3	-	CHEMENG 160	-	-	-	CHEMENG 140	-	3	-
	CHEMENG 170	-	3	-	TIS	-	-	4	CHEMENG 180	-	3	-
	CHEMENG 185A	-	4	-	CHEMENG 185B	-	3	-	GER	-	-	4
	CHEMENG 10	-	1	-	TIS course **	-	-	4	Elective	-	-	3
	CHEMENG 190H	-	3	-	CHEMENG 190H	-	3	-	TIS** (alt.)	-	-	-
<i>Subtotals</i>	<i>0</i>	<i>14</i>	<i>0</i>	<i>Subtotals</i>	<i>0</i>	<i>6</i>	<i>8</i>	<i>Subtotals</i>	<i>0</i>	<i>6</i>	<i>7</i>	
	Total	14		Total	14		Total	13				

Notes:

CHEMENG 181 (formerly 188) required (Win)

CHEMENG 150 (Aut) required

Both CHEMENG 185A and 185B required

** ENGR/CHEMENG 20 "Introduction to Chemical Engineering" and ENGR/CHEMENG 25 "Biotechnology"

*** TIS course in 2nd, 3rd, or 4th year

- ENGR math elective, one of two: CME 104 (5 units) or CME 106 (4 units).

- ChE elective, two of three choices: CHEMENG 140 (Spr.) and/or, 160 (Win.) and/or (either 174 (Aut) or 183 (Spr))

- Students' choices for Math elective, 3rd Engineering Fundamental, and CHEMENG electives affect choices, units, and scheduling of GER courses and other courses not required for the ChemE major.

AP Math Units:	10
UG Math & Science Units:	38
Total Engineering Units:	81
Total Other Units:	<u>60</u>
Total Units:	189

Chemical Engineering with Honors Research

Typical Sequence of Lecture Courses; start CHEMENG 190H research by junior year.

4-Year Plan # 4 — RECOMMENDED

AP credit for MATH 40 series; start with CME 100, 102, instead of MATH 51 series

<i>Freshman</i>	<i>Sophomore</i>	<i>Junior</i>	<i>Senior</i>
CME 100 (A)	Math Elective 1 of 2	Technology in Society	Technology in Society (alt.)
CME 102 (W)	CME 104 (S)	CHEMENG 181 (W)	CHEMENG 10 (A)
	CME 106 (W)		CHEMENG 150 (A)
		CHEMENG 100 (A)	CHEMENG 170 (A)
ENGR 20 (S)	ENGR 20 (S) (alt.)	CHEMENG 110 (W)	CHEMENG 180 (S)
ENGR 25 (S) (alt.)	ENGR 25 (S)	CHEMENG 130 (S)	CHEMENG 185A (A)
	PHYS 41 (W)	CHEMENG 120A (W)	CHEMENG 185B (W)
	PHYS 43 (S)	CHEMENG 120B (S)	
		CHEM 171 (A)	Electives (take 2)
CHEM 31X (A,Sum)	Engineering Fundamental	CHEM 173 (W)	CHEMENG 140 (S)
CHEM 33 (W,S,Sum)		CHEM 175 (S)	and/or CHEMENG 160 (W)
CHEM 35 (A,S,Sum)		CHEM 131 (A,W)	or either CHEMENG 174 (A)
CHEM 36 (A,S,Sum)	CHEM 130 (A,W)	CHEMENG 183 (S)	or CHEMENG 183 (S)
		CHEMENG 190H (A,W,S,Smr)	CHEMENG 190H (A,W)

* Solid arrows represent direct prerequisites.

* Dashed lines represent co-requisites.

* Dashed-line boxes enclose alternatives. These may indicate years in which to take a given course or different courses that may fulfill a degree requirement

Chemical Engineering

4-Year Plan # 5 — A PLAN that starts with MATH 41 & 42, then the MATH 51series, followed by CME 104 or 106.

*** Note: Final Program MUST have 68 ABET units for Engineering Science and Engineering Design. ***

	Fall			Winter			Spring					
	Math/ Sci.	Engr.	Other	Math/ Sci.	Engr.	Other	Math/ Sci.	Engr.	Other			
<i>Freshman</i>	MATH 41	5	-	-	MATH 42	5	-	-	MATH 51	5	-	-
	IHUM	-	-	5	IHUM	-	-	5	IHUM	-	-	5
	CHEM 31X	4	-	-	CHEM 33	4	-	-	CHEM 35	4	-	-
	GER	-	-	3	Writing	-	-	4	CHEM 36	3	-	-
	<i>Subtotals</i>	<i>9</i>	<i>0</i>	<i>8</i>	<i>Subtotals</i>	<i>9</i>	<i>0</i>	<i>9</i>	<i>Subtotals</i>	<i>12</i>	<i>0</i>	<i>5</i>
Total	17			Total	18			Total	17			
<i>Sophomore</i>	MATH 52	5	-	-	MATH 53	5	-	-	ENGR math elec	5	-	-
	CHEM 130	-	4	-	PHYSICS 41	4	-	-	PHYSICS 43	4	-	-
	Writing	-	-	4	Engr. Fund	-	4	-	ENGR 20 **	-	3	-
	GER	-	-	3	GER	-	-	3	ENGR 25 **	-	3	-
	TIS *** (alt.)	-	-	-	<i>Subtotals</i>	<i>9</i>	<i>4</i>	<i>3</i>	<i>Subtotals</i>	<i>9</i>	<i>6</i>	<i>0</i>
Total	16			Total	16			Total	15			
<i>Junior</i>	CHEMENG 100	-	3	-	CHEMENG 110	-	3	-	CHEMENG 130	-	3	-
	CHEM 131	-	3	-	CHEMENG 120A	-	4	-	CHEMENG 120B	-	4	-
	CHEM 171	-	3	-	CHEM 173	-	3	-	CHEM 175	-	3	-
	TIS *** (alt.)	-	-	-	CHEMENG 181	-	3	-	CHEMENG 183	-	-	-
	Language	-	-	5	Language	-	-	5	Language	-	-	5
<i>Subtotals</i>	<i>0</i>	<i>9</i>	<i>5</i>	<i>Subtotals</i>	<i>0</i>	<i>13</i>	<i>5</i>	<i>Subtotals</i>	<i>0</i>	<i>10</i>	<i>5</i>	
Total	14			Total	18			Total	15			
<i>Senior</i>	CHEMENG 150	-	3	-	CHEMENG 160	-	3	-	CHEMENG 140	-	-	-
	CHEMENG 170	-	3	-	GER	-	-	3	CHEMENG 180	-	3	-
	CHEMENG 185A	-	4	-	CHEMENG 185B	-	4	-	Elective	-	-	3
	CHEMENG 10	-	1	-	TIS course ***	-	4	-	Elective	-	-	5
	CHEMENG 174	-	-	-	<i>Subtotals</i>	<i>0</i>	<i>11</i>	<i>3</i>	<i>Subtotals</i>	<i>0</i>	<i>3</i>	<i>8</i>
GER	-	-	3	Total	14			Total	11			

Notes:

CHEMENG 181 (formerly 188) required (Win)

CHEMENG 150 (Aut) required

Both CHEMENG 185A and 185B required

** ENGR/CHEMENG 20 "Introduction to Chemical Engineering" and ENGR/CHEMENG 25 "Biotechnology"

*** TIS course in 2nd, 3rd, or 4th year

- ENGR math elective, one of two: CME 104 (5 units) or CME 106 (4 units).

- ChE elective, two of three choices: CHEMENG 140 (Spr.) and/or 160 (Win.) and/or (either 174 (Aut) or 183 (07-08: Win,

- Students' choices for Math elective, 3rd Engineering Fundamental, and CHEMENG electives affect choices, units, and scheduling of GER courses and other courses not required for the ChemE major.

AP Math Units:	0
UG Math & Science Units:	53
Total Engineering Units:	71
Total Other Units:	61
Total Units:	185

Chemical Engineering

Typical Sequence of Courses

4-Year Plan # 5

MATH 40 series; then MATH 50 series; then CME 104 or 106

<i>Freshman</i>	<i>Sophomore</i>	<i>Junior</i>	<i>Senior</i>
MATH 41 (A)	MATH 52 (A, W, S)	Technology in Society	Technology in Society (alt.)
MATH 42 (A, W)	MATH 53 (A, W, S)	CHEMENG 181 (W)	CHEMENG 10 (A)
MATH 51 (A, W, S)	*Math Elective/ CME 104 (S)	*Math Elective/ CME 106 (W)	CHEMENG 150 (A)
	ENGR 20 (S)	CHEMENG 100 (A)	CHEMENG 170 (A)
	ENGR 25 (S)	CHEMENG 110 (W)	CHEMENG 180 (S)
		CHEMENG 130 (S)	CHEMENG 185A (A)
	PHYS 41 (W)	CHEMENG 120A (W)	CHEMENG 185B (W)
	PHYS 43 (S)	CHEMENG 120B (S)	
CHEM 31X (A,Sum)	Engineering Fundamental	CHEM 171 (A)	Electives (take 2)
CHEM 33 (W,S,Sum)		CHEM 173 (W)	CHEMENG 140 (S)
CHEM 35 (A,S,Sum)	CHEM 35 (A)	CHEM 175 (S)	and/or CHEMENG 160 (W)
CHEM 36 (A,S,Sum)	CHEM 130 (A,W)	CHEM 131 (A,W)	or either CHEMENG 174 (A)
		CHEMENG 183 (S)	or CHEMENG 183 (S)

* Solid arrows represent direct prerequisites.

* Dashed lines represent co-requisites.

* Dashed-line boxes enclose alternatives. These may indicate years in which to take a given course or different courses that may fulfill a degree requirement

Chemical Engineering

4-Year Plan # 6 — A PLAN with AP credit for the MATH 41 series, then the MATH 51 series, followed by CME 104 or 106

*** Note: Final Program MUST have 68 ABET units for Engineering Science and Engineering Design. ***

	Fall			Winter			Spring					
	Math/ Sci.	Engr.	Other	Class	Math/ Sci.	Engr.	Other	Class	Math/ Sci.	Engr.	Other	
<i>Freshman</i>	MATH 51	5	-	-	MATH 52	5	-	-	MATH 53	5	-	-
	IHUM	-	-	5	IHUM	-	-	5	IHUM	-	-	5
	CHEM 31X	4	-	-	CHEM 33	4	-	-	CHEM 35	4	-	-
	GER	-	-	-	Writing	-	-	4	CHEM 36	3	-	-
	<i>Subtotals</i>	<i>9</i>	<i>0</i>	<i>5</i>	<i>Subtotals</i>	<i>9</i>	<i>0</i>	<i>9</i>	<i>Subtotals</i>	<i>12</i>	<i>0</i>	<i>5</i>
Total	14			Total	18			Total	17			
<i>Sophomore</i>	CHEM 130	-	4	-	CME 104	5	-	-	ENGR math elec	5	-	-
	TIS course ***	-	-	4	PHYSICS 41	4	-	-	PHYSICS 43	4	-	-
	Writing	-	-	4	Engr. Fundamenta	-	4	-	ENGR 20 **	-	3	-
	GER	-	-	4	ENGR math elec	-	-	-	ENGR 25 **	-	3	-
	<i>Subtotals</i>	<i>0</i>	<i>4</i>	<i>12</i>	<i>Subtotals</i>	<i>9</i>	<i>4</i>	<i>0</i>	<i>Subtotals</i>	<i>9</i>	<i>6</i>	<i>0</i>
Total	16			Total	13			Total	15			
<i>Junior</i>	CHEMENG 100	-	3	-	CHEMENG 110	-	3	-	CHEMENG 130	-	3	-
	CHEM 131	-	3	-	CHEMENG 120A	-	4	-	CHEMENG 120B	-	4	-
	CHEM 171	-	3	-	CHEM 173	-	3	-	CHEM 175	-	3	-
	TIS *** (alt.)	-	-	-	CHEMENG 181	-	3	-	CHEMENG 183	-	3	-
	Language	-	-	5	Language	-	-	5	Language	-	-	5
<i>Subtotals</i>	<i>0</i>	<i>9</i>	<i>5</i>	<i>Subtotals</i>	<i>0</i>	<i>13</i>	<i>5</i>	<i>Subtotals</i>	<i>0</i>	<i>13</i>	<i>5</i>	
Total	14			Total	18			Total	18			
<i>Senior</i>	CHEMENG 150	-	3	-	CHEMENG 160	-	3	-	CHEMENG 140	-	3	-
	CHEMENG 170	-	3	-	GER	-	-	4	CHEMENG 180	-	3	-
	CHEMENG 185A	-	4	-	CHEMENG 185B	-	4	-	GER	-	-	3
	CHEMENG 10	-	1	-	Elective	-	-	3	Elective	-	-	-
	CHEMENG 174	-	-	-					TIS *** (alt.)	-	-	-
GER	-	-	3									
<i>Subtotals</i>	<i>0</i>	<i>11</i>	<i>3</i>	<i>Subtotals</i>	<i>0</i>	<i>7</i>	<i>7</i>	<i>Subtotals</i>	<i>0</i>	<i>6</i>	<i>3</i>	
Total	14			Total	14			Total	9			

Notes:

CHEMENG 181 (formerly 188) required (08-09: Win)

CHEMENG 150 (Aut) required

Both CHEMENG 185A and 185B required

** ENGR/CHEMENG 20 "Introduction to Chemical Engineering" and ENGR/CHEMENG 25 "Biotechnology"

*** TIS course in 2nd, 3rd, or 4th year

- ENGR math elective, one of two: CME 104 (5 units) or CME 106 (4 units).

- ChE elective, two of three choices: CHEMENG 140 (Spr.) and/or 160 (Win.) and/or (either 174 (Aut) or 183 (Spr))

- Students' choices for Math elective, 3rd Engineering Fundamental, and CHEMENG electives affect choices, units, and scheduling of GER courses and other courses not required for the ChemE major.

AP Math Units:	10
UG Math & Science Units:	48
Total Engineering Units:	73
Total Other Units:	59
Total Units:	190

Chemical Engineering

Typical Sequence of Courses

4-Year Plan # 6

AP credit for MATH 40 series; MATH 50 series; then CME 104 or 106

<i>Freshman</i>	<i>Sophomore</i>	<i>Junior</i>	<i>Senior</i>
MATH 51 (A, W, S)	Math Elective 1 of 2	Technology in Society	Technology in Society (alt.)
MATH 52 (A, W, S)	CME 104 (S)		CHEMENG 10 (A)
MATH 53 (A, W, S)	CME 106 (W)	CHEMENG 181 (W)	CHEMENG 150 (A)
		CHEMENG 100 (A)	CHEMENG 170 (A)
	ENGR 20 (S)	CHEMENG 110 (W)	CHEMENG 180 (S)
	ENGR 25 (S)	CHEMENG 130 (S)	CHEMENG 185A (A)
	PHYS 41 (W)	CHEMENG 120A (W)	CHEMENG 185B (W)
	PHYS 43 (S)	CHEMENG 120B (S)	
CHEM 31X (A,Sum)	Engineering Fundamental	CHEM 171 (A)	Electives (take 2)
CHEM 33 (W,S,Sum)		CHEM 173 (W)	CHEMENG 140 (S)
CHEM 35 (A,S,Sum)	CHEM 35 (A)	CHEM 175 (S)	and/or CHEMENG 160 (W)
CHEM 36 (A,S,Sum)	CHEM 130 (A,W)	CHEM 131 (A,W)	or either CHEMENG 174 (A)
		CHEMENG 183 (S)	or CHEMENG 183 (S)

* Solid arrows represent direct prerequisites.

* Dashed lines represent co-requisites.

* Dashed-line boxes enclose alternatives. These may indicate years in which to take a given course or different courses that may fulfill a degree requirement

INSTRUCTIONS FOR DECLARING A MAJOR IN CHEMICAL ENGINEERING (BS: CHEMENG)

1. Log on to Axess and request to major in Chemical Engineering.
2. Print your unofficial Stanford transcript from Axess.
3. Download a Chemical Engineering Program Sheet from the School of Engineering web site: <http://ughb.stanford.edu> and complete it electronically. Enter “AP” instead of a course grade for any course waived due to AP credit.
4. Save the electronic file for your records. Print your Program Sheet.
5. Take your unofficial transcript and completed Program Sheet to Jeanne Cosby, Student Services Manager, in Keck Science Building, room 189. She is most available during daily drop-in hours: 2 to 3:45pm.

Note: The online version of the UGHB is considered the definitive and final version of SoE requirements for each major. Since corrections or updates may have been made after this Handbook went to press in August 2008, download the online CHEMENG program sheet from ughb.stanford.edu to ensure you are using an accurate major plan.

Stanford University's School of Engineering

Chemical Engineering

2008–2009 Program Sheet

— ABET Accreditation Criteria Apply —

Follow all requirements as stated for the year of the Program Sheet used.

Name: _____
 Email: _____
 Date: _____

SU ID: _____
 Local Phone: _____
 Date B.S. expected: _____

Mathematics and Science Requirement (45 units minimum)

Dept	Course	Title	Transfer/AP Approval			Unit Total	Grade	ABET Units		
			✓ if Transfer	Initials	Date			Engr Sci	Engr Des	Experiment
Mathematics										
MATH	41	Calculus (req'd)				5				
MATH	42	Calculus (req'd)				5				
CME	100	Vector Calculus for Engineers (req'd; note 1)				5				
CME	102	ODE for Engineers (req'd; note 1)				5				
CME 104 or CME 106 (Req'd)		Linear Algebra & Partial Differential Equations				5				
		Intro. to Probability & Statistics for Engrs				4				
Mathematics Unit Total										
Science										
PHYSICS	41	Mechanics (req'd)				4				0
PHYSICS	43	Electricity & Magnetism (req'd)				4				0
CHEM	31X	Chemical Principles (req'd) <i>or</i> CHEM 31A,B				4				0
CHEM	33	Structure and Reactivity (req'd)				4				0
CHEM	35	Organic Mono Compounds (req'd)				4				0
CHEM	36	Organic Chemistry Laboratory I (req'd)				3				2
Science Unit Total										
Math & Science Unit Total (45 units minimum)										

Technology in Society Requirement (1 course required; see UGHB Fig. 3-3 for SoE approved list)

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NOTES

- * Engineering Science, Engineering Design, and Experimentation units do not apply to shaded areas.
 - * Read all emails from the Office of Student Affairs; this is the SoE's only method of conveying key information to Eng majors.
 - * This form is available as an Excel file at <http://ughb.stanford.edu/>. The printed form must be signed by the advisor and, if required, by the departmental representative. Changes must be initialed in ink. Delete courses not taken.
 - * All courses listed on this form must be taken for a letter grade if offered by the instructor.
 - * Minimum Combined Grade Point Average for all courses in Engineering Topics (Engineering Science and Engineering Design courses) is 2.0.
 - * Transfer and AP credits in Math, Science, Funds., & TIS must be approved by the SoE Dean's Office. Transfer credits in Engineering Depth must be approved by the Advisor. Transfer credit information and petitions are available at <http://ughb.stanford.edu/transfer.html>.
 - * All courses listed on this form must only be included under one category; no double-counting. Delete courses not taken.
- (1) CME 100, 102 strongly recommended; however MATH 51 and 52 may be substituted for CME 100; MATH 53 may be substituted for CME 102.

program sheet continues on page 2

Chemical Engineering Program Sheet (continued)

Engineering Topics (Engr Science + Engr Design combined) must equal 68 units; see note 2

Dept	Course	Title	Transfer/AP Approval			Unit Total	Grade	ABET Units		
			✓ if Transfer	Initials	Date			Engr Sci	Engr Des	Experiment
Engineering Fundamentals (3 courses required)										
ENGR	25	Introduction to Biotechnology				3		2	1	0
ENGR	20	Introduction to Chemical Engineering				3		2	1	0
ENGR		<i>Fundamentals Elective (see Note 2)</i>								
<i>Engineering Fundamentals Unit Total</i>										

Engineering Depth (Delete courses not taken)

CHEMENG	10	The Chemical Engineering Profession				1		0	0	0
CHEMENG	100	Chem. Proc. Modeling, Dyn. & Control				3		3	0	0
CHEMENG	110	Equilibrium Thermodynamics				3		3	0	0
CHEMENG	120A	Fluid Mechanics				4		3	1	0
CHEMENG	120B	Energy and Mass Transport				4		3	1	0
CHEMENG	130	Separation Processes				3		2	1	0
CHEMENG	140	Microelectronics Process Tech (see note 3)				3		2	1	0
CHEMENG	150	Biochemical Engineering (see note 3)				3		2	1	0
CHEMENG	160	Polymer Science & Engineering (see note 3)				3		2	1	0
CHEMENG	170	Kinetics and Reactor Design				3		2	1	0
CHEMENG	174	Environmental Microbiology (see Note 3)				3		2	1	0
CHEMENG	180	Chemical Engineering Plant Design				3		0	3	0
CHEMENG	181	Biochemistry I (formerly 188)(see Note 3)				3		3	0	0
CHEMENG	183	Biochemistry II (formerly 189) (see note 3)				3		3	0	0
CHEMENG	185A	Chemical Engineering Lab A (WIM)				4		2	2	4
CHEMENG	185B	Chemical Engineering Lab B				4		2	2	4
CHEM	130	Organic Chemistry Laboratory II				4		4	1	4
CHEM	131	Organic Polyfunctional Compounds				3		2	0	1
CHEM	171	Physical Chemistry - Chem. Thermo.				3		3	0	0
CHEM	173	Physical Chemistry - Quantum Chem.				3		3	0	0
CHEM	175	Physical Chem - Kin. Th. & Stat. Mech.				3		3	0	0
<i>Depth/Engr Science/Engr Design/Experiment Unit Totals</i>										

Program Totals (ABET Requirements)

Mathematics and Science (45 units minimum)
Engineering Topics (Engr Science + Engr Design) (68 units minimum)
Experimentation (8 units minimum)

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Program Approvals

Advisor

Printed Name: _____
 Signature: _____

Date: _____

Student Services/Departmental

Printed Name: _____
 Signature: _____

Date: _____

School of Engineering (signature not required prior to graduation)

Printed Name: _____
 Signature: _____

Date: _____

NOTES (continued from page 1)

- (2) Third ENGR Fund course required. In order to satisfy ABET requirements for graduation, the ChemE major must take enough courses so that the combined Engineering Science and Design units from Fundamentals and Depth courses add up to a minimum of 68 units.
- (3) CHEMENG 150 and CHEMENG 181 required, plus two of the following: 140, 160 or (either 174 or 183)