Chemical Engineering Advising Handbook

New Curriculum

This Handbook summarizes the academic requirements of the "New" Chemical Engineering Curriculum and applies to students who were admitted to Penn State in Summer 2015 or later. Students who were admitted before summer 2015 should follow the "Old" curriculum.

Designed to meet the needs of our students and faculty for decades to come, the new Chemical Engineering and Biomedical Engineering Building will be located on the site of the existing Fenske Laboratory, with construction to run from fall 2016 through January 2019.

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Academic Requirements (All Options)

The New curriculum requires 133 credits for graduation. Of these, 115 are common to all options and 18 are specific to each option. The common requirements of the program are summarized below:

COMMON REQUIREMENTS FOR ALL OPTIONS (115 credits)

GENERAL EDUCATION & OTHER GENERAL REQUIREMENTS (34 credits)
- EDSGN 100 Introduction to Engineering Design (3)
- ENGL 015 Rhetoric and Composition (3)
- ENGL 202C Effective Writing: Technical Writing (3)
- CAS 100A or B Effective Speech (3)
- GHA elective (3, see here for a list of acceptable courses)
- First-Year Seminar Seminar (1 cr, see here for a list of available seminars)
- GA/GH/GS electives (18 credits of electives)

MATH (16 credits)
- MATH 140 Calculus With Analytic Geometry I (4)
- MATH 141 Calculus with Analytic Geometry II (4)
- MATH 231 Calculus of Several Variables (2)
- MATH 251 Ordinary and Partial Differential Equations (4)

PHYSICS (8 credits)
- PHYS 211 General Physics: Mechanics (4)
- PHYS 212 (4cr) General Physics: Electricity and Magnetism (4)

CHEMICAL AND LIFE SCIENCES (24 credits)
- CHEM 110 Chemical Principles I (3)
- CHEM 111 Experimental Chemistry I (1)
- CHEM 112 Chemical Principles II (3)
- CHEM 113 Experimental Chemistry II (1)
- CHEM 210 Organic Chemistry I (3)
- CHEM 212 Organic Chemistry II (3)
- CHEM 213 Laboratory in Organic Chemistry (2)
- CHEM 457 Experimental Physical Chemistry (2)
- B M B 251 Molecular and Cell Biology I (3)

Take 3 credits of physical chemistry from the list below:
- CHEM 408 Computational Chemistry (3)
- CHEM 448 Surface Chemistry (3)
- CHEM 452 Physical Chemistry - Quantum Chemistry (3)
- CHEM 464 Chemical Kinetics and Dynamics (3)

REQUIRED CHEMICAL ENGINEERING COURSES (35 credits)
- CH E 210 Introduction to Material Balances (3)
- CH E 220 Introduction to Chemical Engineering Thermodynamics (3)

CH E 230 Computational Tools for Chemical Engineering (3)
CH E 300 Professional Development Seminar (3)
CH E 320 Phase and Chemical Equilibria (3)
CH E 330 Process Fluid Mechanics (3)
CH E 340 Introduction to Biomolecular Engineering (3)
CH E 350 Process Heat Transfer (3)
CH E 410 Mass Transfer Operations (3)
CH E 430 Chemical Reaction Engineering (3)
CH E 452 Chemical Process Safety (3)
CH E 470 Design of Chemical Plants (3)
CH E 480W Chemical Engineering Laboratory (3)

C Requirement

The following courses require C for graduation in chemical engineering:

CH E 210, 220, 320, 330, 350, 410, 430

CH E 210 and 220 are special courses and require a minimum grade of C before you can take any CH E course that have 210/220 as prerequisites. Notice that CH E 210 is a prerequisite for all 300-level courses (except CH E 300); this means that a D in 210 will require you to retake 210 before you can start taking 300-level courses.

General Scheduling Tips

- Most students will be taking CH E 210 and 220 in the fourth semester. The prerequisites for these two classes are Math 251 and Math 230, respectively. You should be done with these Math courses before you take CH E 210 and 220.
- During the semester you take CH E 210 and 220, plan on a lighter credit load (~15-16 credits), especially if are transferring from a branch Campus. It takes some effort to get used to the format and study style of chemical engineering classes and since both CH E 210 and 220 require a minimum grade of C, you should make sure you have the time to devote the required effort.
- The 300-level course can be taken almost in any sequence. We recommend that you take CH E 320, 330in the fall of the junior year, then CH E 300, 350 and 340 in the spring.
- CH E 410 and 430 are prerequisites for CH E 470. Plan to take 410 and 430 in the fall of the senior year, and 470 in the spring.
- The chemical engineering lab, CH E 480W, can be taken concurrently with CH E 410/430, therefore you can take it either in the fall or spring of the senior year.
- All required CH E courses are offered both fall and spring, with the exception of CH E 300. In addition, the following summer courses are offered over the web: CH E 210, 220, 320, 350.
- The recommended course schedule is shown on the next page. Variations re possible but you should talk to your adviser first.

Sample Schedule (All Options)

Semester 1		Semester 2	
CHEM 110	3	CHEM 112	3
CHEM 111	1	CHEM 113	1
MATH 140	4	MATH 141	4
EDSGN 100	3	PHYS 211	4
First Year Seminar	1	ENGL 15 or ENGL 30	3
ECON 102 or 104 (GS Elective)	3		
	15		16.5

Semester 3		Semester 4	
CHEM 210	3	CH E 210	3
MATH 231	2	CH E 220	3
MATH 251	4	CH E 230	1
PHYS 212	4	CHEM 212	3
GA/GS/GA Elective 2	3	CHEM 213	2
		GA/GS/GA Elective 3	3
		Health & Physical Activity (GHA)	1.5
	16		16.5

Semester 5		Semester 6	
CH E 320	3	CH E 300	1
CH E 330	3	CH E 340	3
ENGL 202C	3	CH E 350	3
B M B 251	3	CHEM 457	2
Option course 1	3	Physical chemistry elective	3
GA/GH/GS Elective 4	3	CAS 100A/B	3
		Health & Physical Activity (GHA)	1.5
	18		16.5

Semester 7		Semester 8	
CH E 410	3	CH E 452	3
CH E 430	3	CH E 470	3
CHE 480W (Chem. Eng. Lab)	3	Option course 4	3
Option course 2	3	Option course 5	3
Option course 3	3	Option course 6	3
GA/GH/GS Elective 5	3	GA/GH/GS Elective 6	3
	18		18

Requirements for the Options

The chemical engineering program offers five options:

General
Bioprocess & Biomolecular Engineering
Energy Engineering
Polymer Engineering
Research Engineering

You must declare an option once you have been admitted into the major. If you do not declare an option, you will be placed into the General option. You may switch between options any time, but to graduate you must satisfy all the requirements of the the option that is your final choice.

NOTE

The chemical engineering program is planning to phase out the at which point the curriculum will revert to the requirements of the general option.

The effective date for this change will be announced when these changes are formally approved. Until then, students will be able to pursue any of the above five options.

General Option (18 credits)

The general option offers the maximum flexibility among all options with respect to the choice of electives. The electives of the option are as follows:

Chemical Engineering Electives (6 credits)

Take 6 credits in 400-level engineering electives from he following list:

CH E 432 (F SC 432) Petroleum Processing
CH E 438 Bioprocess Engineering
CH E 442 (MATSE 448) Polymer Processing Technology
CH E 443 Introduction to Polymer Science
CH E 446 Transport Phenomena
CH E 449 Bioseparations
CH E 450 Process Dynamics and Control

CH E 494 Research Projects in Chemical Engineering (see Note below)
CH E 496 Independent Studies
CH E 497 Special Topics in Chemical Engineering (see Note below)
Note on CH E 494: Students may use up to 6 credits of CH E 494 towards graduation requirements in chemical engineering. Three credits may be used as a CH E 4XX electives and another 3 credits may be used as professional elective (the professional electives, below).

Note on CH E 497: This is a generic course number for special topics that do not have a permanent course number. When multiple courses are offered on special topics, they will appear with numbers such as 497A, 497B etc.

Materials Elective (3 credits)

Select 3 credits from the list:

MATSE 201 Introduction to Materials Science
MATSE 202 Introduction to Polymer Materials
EGEE 455 Materials for Energy Applications
BME 444 (MATSE 404) Surfaces and the Biological Response to Materials

Engineering Elective (3 credits)

Select 3 credits from approved list of engineering courses. This list is rather long and can be found at the end of this handbook.

Professional Elective (6 credits)

Professional electives is a broad category of electives that give you the opportunity to enhance your portfolio of professional skills, to pursue minors, or to pursue topics of personal interest that are not covered by other elective categories. Acceptable courses must be at the 200-level or above.

Bioprocess & Biomolecular Option

Required credits (9 cr):

B M B 442(3), CH E 438(3), CH E 449(3)

Choose 3 credits from the list below:

BME 443/MATSE403(3) or BME 444/MATSE 404 IL(3)

Select 3-6 credits from the list:

B E 464 Bioenergy Systems Engineering (3)
B E 468 Microbiological Engineering (3)
BME 419 Artificial Organs and Prosthetic Devices (3)
BME 433 Drug Delivery (3)
BME 435 Micro/Nano-Scale Systems for Biomedical Engineering (3)

BME 445 Tissue Engineering: Concepts, Calculations and Applications (3)
BME 446 Polymers in Biomedical Engineering (3)
E SC 456 (EGEE 456, E E 456) Introduction to Neural Networks (3)
E SC 484 Biologically Inspired Nanomaterials (3)
M E 491 Bioengineering Applications of Mechanical Engineering (3)
By petition students may use CH E 294/494 or co-op/internship credits to count towards this requirement if the research / work is appropriate for the option

Select 3 credits from the list:

BIOL 472 Mammalian Physiology (3)
B M B 252 (MICRB 252) Molecular and Cell Biology II (3)
B M B 401 General Biochemistry (3)
B M B 428 Physical Chemistry with Biological Applications (3)
B M B 432 (MICRB 432, VB SC 432) Advanced Immunology: Signaling in the Immune System (3)
B M B 433 (VB SC 433) Molecular and Cellular Toxicology (3)
B M B 435 (MICRB 435, VB SC 435) Viral Pathogensis (2)
B M B 450 (MICRB 450) Microbial/Molecular Genetics (2)
B M B 464 Molecular Medicine (3)
B M B 465 Protein Structure and Function (3)
B M B 474 Analytical Biochemistry (3)
MICRB 201 Introductory Microbiology (3)

Energy and Fuels Engineering Option (18 credits)

Required courses (6 credits)

EGEE 411W(3), EGEE 455(3)

Choose 3 credits from the list:

F SC 401(3) or ENVSE 400(3)

Choose 9 credits from the list:

CH E 423 Chemical Energy Technology (3)
EGEE 420 Hydrogen and Fuel Cells (3)
EGEE 430 (M E 430) Introduction to Combustion (3)
F SC 431 The Chemistry of Fuels (3)
F SC 432 (CH E 432) Petroleum Processing (3)
ENVSE 420 Fire Safety Engineering (3)
ENVSE 427 Pollution Control in the Process Industries (3)
ENVSE 457 Industrial Hygiene Measurements (4)
ENVSE 470 Systems Safety and Risk Engineering (3)
ENVSE 480 Environmental Systems Engineering Process Design (3)
P N G 410 Applied Reservoir Engineering (3)
P N G 480 Production Process Engineering (3)

Polymer Engineering Option (18 credits)

Required courses (12 credits)

MATSE 202(3), MATSE 441(3), MATSE 446(3), MATSE 447(3)

Select 6 credits from:

CH E 443(3), MATSE 403/BME 443(3), MATSE 404/BME 444 IL(3), MATSE 445(3), M E 403(3)

Research Intensive Option (18 credits)

Required courses (6 credits)

CH E 494(6)

Select 3 credits from:

CH E 446(3) or CH E 544(3)

Select 3 credits from:

MATSE 201(3), MATSE 202(3), EGEE 455(3), MATSE 404/BME 444 IL(3), CH E 510(3)

Select 6 credits from research electives. Research electives are 400-level courses that support the student's research project. They are selected in consultation with of the research advisor and with the advisor's approval.