

Chemical Engineering Advising Handbook

New Curriculum

This Handbook summarizes the academic requirements of the “New” Chemical Engineering Curriculum and applies to students who *started at Penn State in Summer 2015 or later*. Students who started 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 Lab, with construction to run from fall 2016 through January 2019.

Table of Contents

Transition to the New Building	4
ChE Faculty	4
Academic Requirements (All Options)	5
C Requirement	6
General Scheduling Tips	6
Requirements for the Options	7
General Option (18 credits)	8
Chemical Engineering Electives (6 credits)	8
Materials Elective (3 credits)	8
Engineering Elective (3 credits)	8
Professional Elective (6 credits)	8
Bioprocess & Biomolecular Option	9
Energy and Fuels Engineering Option (18 credits)	9
Polymer Engineering Option (18 credits)	10
Research Intensive Option (18 credits)	10
General Requirements	10
First Year Seminar	12
Arts/Humanities/Social Science Electives (AHS requirement)	12
US and International Cultures (US/IL requirement)	12
Other course substitutions	13
Language substitution	13
AP credits	13
Nutrition & Physical Activity (GHA)	13
LIST OF ENGINEERING ELECTIVES (GENERAL OPTION)	15
Biological Engineering	15
Biomedical Engineering	15
Civil Engineering	15
Computer Science	15

Engineering Mechanics	16
Engineering Science	16
Energy And Geo-Environmental Engineering	16
Energy, Business & Finance	16
Fuel Science	16
Materials Science And Engineering	17
Mechanical Engineering/ Nuclear Engineering	17
Petroleum And Natural Gas Engineering	17
Statistics	17
CHECKSHEET	19

Transition to the New Building

The new chemical engineering and biomedical engineering building will open in 2019 and will be located where Fenske Building used to be. Fenske is scheduled for demolition during Fall 2016. Until the new building is ready, the chemical engineering department will be moving to temporary locations around campus. The moves started in summer 2016 and will continue through the fall. The directory below will be updated as the move to the temporary location is completed.

Undergraduate Office:	Rachel Smith, Jennie Gibson, 7 Thomas, 814-865-2574
CH E 470W Lab:	18 Thomas
CH E Computer Labs:	9, 16 and 17 Thomas
IT Support:	Steven Black, 8D Thomas, 814-863-9634
AIChE Office:	5 Thomas

ChE Faculty

Monty Alger, 101 Hosler Building, mx50@psu.edu, 814-865-0269
Antonios Armaou, 8C Thomas Building, armaou@enr.psu.edu, 814-865-5316
Ali Borhan, 8A Thomas Building, borhan@psu.edu, 814-865-7847
Wayne Curtis, 45 Greenberg, wrc2@psu.edu, 814-863-4805
Ronald Danner, 47 Greenberg, pd@psu.edu, 814-863-4814
Kristen Fichthorn, 37 Greenberg, fichthorn@psu.edu, 814-863-4807
Esther Gomez, 44 Greenberg, ewg10@psu.edu, 814-867-4732
Enrique Gomez, 404 Steidle Building, edg12@psu.edu, 814-867-3428
Mechteld Hillsley, 8F Thomas Building, mmv100@psu.edu, 814-863-9356
Michael Janik, 51 Greenberg, mjj13@psu.edu, 814-863-9366
Seong Kim, N323 Millennium Science Complex, shkim@enr.psu.edu, 814-863-4809
Manish Kumar, 43 Greenberg, mxk64@psu.edu, 814-865-7519
Angela Lueking, 0120 Hosler Building, adl11@psu.edu, 814-863-6256
Janna Maranas, 48 Greenberg, jmaranas@psu.edu, 814-863-6228
Costas Maranas, 126 Land & Water, costas@psu.edu, 814-863-9958
Themis Matsoukas, 8H Thomas Building, matsoukas@psu.edu, 814-863-2002
Dawn McFadden, 8E Thomas Building, dmm120@psu.edu
Scott Milner, 38 Greenberg, stm9@psu.edu, 814-863-9355
Robert Rioux, 207 – COE –3058 Research Dr., rioux@enr.psu.edu, 814-867-2503
Howard Salis, 210 Agricultural Engineering Building, hms17@psu.edu, 814-865-1931
Phil Savage, Department Head, 119B Greenberg, pes15@psu.edu, 814-867-5876
Darrell Velegol, 8G Thomas Building, velegol@psu.edu, 814-865-8739
Thomas Wood, 42 Greenberg, tuw14@psu.edu, 814-863-4811
Xueyi Zhang, 49 Greenberg, xuz32@psu.edu, 814-865-9746

Andrew Zydney, 41 Greenberg, alz3@psu.edu, 814-863-7113

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 credit, see [here](#) for a list of available seminars)
- GA/GH/GS electives (18 credits; must include ECON 102 or 104; must include 3 credits of US and 3 credits of IL)

MATH (14 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 General Physics: Electricity and Magnetism (4)

CHEMISTRY 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/MICRB 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)
- CHEM 466 Molecular Thermodynamics (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 (1)
- CH E 300 Professional Development Seminar (1)
- 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 has these courses 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.

The Chemical Engineering faculty has decided to remove CH E 410 and 430 from the list of courses that require C for graduation. This curriculum change has not been formalized as yet, students, however may petition a waiver.

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 231, 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 and 330 in 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.

A sample course plan is shown on page 11. It does not show the specific courses of each option, it is your responsibility to place these courses on the schedule, ensure that the courses you want to take are available in the semester you plan to take them, and that all prerequisites are satisfied. Before making modifications to this plan see your advisor to make sure that everything will work as planned.

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 will be phasing out all specialized options, 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 the following list:

- CH E 423 Chemical Energy Technology
- 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 (3)
- MATSE 202 Introduction to Polymer Materials (3)
- EGEE 455 Materials for Energy Applications (3)
- BME 444 (MATSE 404) Surfaces and the Biological Response to Materials (3)

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 credits):

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 Pathogenesis (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.

General Requirements

These are various requirements that are set by the College of Engineering and the University. With few exceptions, these are common to all engineering majors (but students who are considering a change of major should discuss these with an advisor in your intended major).

Course Schedule — All Options			
Semester 1	credits	Semester 2	credits
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	3		
	15		15
Semester 3	credits	Semester 4	credits
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	1.5
	16		16.5
Semester 5	credits	Semester 6	credits
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/MICRB 251	3	CHEM 457	2
Option course 1	3	Physical chemistry	3
GA/GH/GS Elective 4	3	CAS 100A/B	3
		Health & Physical	1.5
	18		16.5
Semester 7	credits	Semester 8	credits
CH E 410	3	CH E 452	3
CH E 430	3	CH E 470	3
CHE 480W (Chem.	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
Total number of credits: 133			

First Year Seminar

Students must select a 1-credit freshman seminar during their first year. Students are not required to take the seminar offered by their major – any freshman seminar will satisfy the requirement. This requirement must be completed during the first year.

In some cases the FYS requirement is incorporated in certain 3-credit courses. In such case you must still provide an additional credit to satisfy the the total credit requirement in CH E (133 credits). See your advisor for further information.

Arts/Humanities/Social Science Electives (AHS requirement)

You must take 18 credits of courses from the areas of Arts (GA), Humanities (GH) and Social & Behavioral Sciences (GS). The GA/GH/GS credits must be split among the three areas in one of two ways:

6-6-6 This is the default split with 6 credits in each area

9-6-3 This split allows you to explore one area more at the expense of another (it does not matter which area has the 9 credits and which has the 6). This split requires a petition, which however is automatically approved.

No other split is allowed. If your GA/GH/GS do not satisfy one of these splits, you will be required to take extra courses and may delay graduation.

The required Economics course (Econ 102 or 104) qualifies as a Social Sciences elective (GS).

Courses that can satisfy the Arts/Humanities/Social Science requirement carry the designation GA, GH or GS. Courses that do not carry this designation cannot be used.

Listings can be found on online:

Arts Courses (GA): <http://bulletins.psu.edu/undergrad/generaleducation/knowledge3>.

Humanities Courses (GH): <http://bulletins.psu.edu/undergrad/generaleducation/knowledge4>.

Social & Behavioral Sciences (GS): <http://bulletins.psu.edu/undergrad/generaleducation/knowledge5>.

US and International Cultures (US/IL requirement)

Students are required to complete 3 credits with the designation US and 3 credits with the designation IL. The designation US refers to courses that deal with issues in contemporary US society; the designation IL refers to courses that deal with international societies. This requirement is most easily satisfied through the Arts/Humanities/Social Science electives as many courses in these categories carry the designations US or IL. Therefore, if you plan

carefully, you will not have to take extra courses to satisfy this requirement. It is your responsibility to ensure that this requirement is met.

Some courses carry the dual designation "US;IL". Such courses can be used to satisfy either the US or the IL requirement –but not both simultaneously. This means that the US and IL requirements must be met by two different courses.

A listing of courses that satisfy this requirement can be found in the online Blue Book: **US/IL Courses:** <http://bulletins.psu.edu/undergrad/generaleducation/requirements1>

Other course substitutions

Any course not designated as General Education, but which truly meets the spirit of the GA, GH, GS, or GI requirements, whether taken at Penn State or elsewhere, may be petitioned to count in the appropriate area. Key to the success of this type of petition is detailed documentation on what the course covered and, if possible, a written statement by the instructor of the course on the appropriateness of this course as a GA, GH, GS. Students should seek the assistance of their academic advisers for the preparation and submission of this type of petition.

Note: The GA/GH/GS and US/IL requirements are the most common sources of mistakes and can lead to delayed graduation, if you have the wrong distribution of credits. Think carefully before you take these electives and talk to an Adviser, if you are unsure about these requirements.

Language substitution

A language course at the 12th credit level or higher can be substituted for 3 credits of Arts, Humanities, or Social Science requirements. If this substitution is made, it cannot be the 3 credits in a 3-6-9 distribution. Beginning language courses at Penn State are 4 credits each, so the 12th credit level would be a level III course (Span 003, Italian 003, French 003, etc.). If you intend to take a language course elsewhere, consult with an adviser first, as the 12th credit level may be defined differently at other institutions.

AP credits

Some credit gained through Advanced Placement tests in high school may be petitioned to count for Arts, Humanities, or Social Science courses. Students should seek the assistance of their academic advisers for the preparation and submission of such petitions.

Nutrition & Physical Activity (GHA)

You need 3 credits in the Nutrition and Physical Activity category. These courses are designated as GHA and include courses in nutrition as well as various sports activities. You may choose any mix of these courses as long as you have a total of 3 credits. A list can be

found in the online Blue Book (and notice that some of these courses also come with US/IL designations):

List of GHA courses: <http://bulletins.psu.edu/undergrad/generaleducation/knowledge1>

LIST OF ENGINEERING ELECTIVES (GENERAL OPTION)

The course descriptions shown below are based on the Blue Book as of August 2012. Please refer to the Blue Book for current information.

Courses outside this list with sufficient technical content can be petitioned. Such courses are expected to be at the 300-400 level and have prerequisites in Math, Physics or Chemistry as appropriate for the subject.

Co-Op credits may be petitioned as Engineering Electives. Approval is subject to review of the final Co-Op report, which is expected to demonstrate sufficient depth in the application of chemical engineering principles. Since approval is not automatic, consult with your advisor before submitting such petition.

Many of the courses in the list below require prerequisites that are outside the courses normally taken by chemical engineering students. It is the student's responsibility to ensure that he or she has the proper prerequisites for the course of their choice. Questions about prerequisites should be directed to the program that offers the course of interest.

Biological Engineering

- B E 302 TRANSPORT PROCESSES FOR BIOLOGICAL SYSTEMS (3)
- B E 304 ENGINEERING PROPERTIES OF FOOD AND BIOLOGICAL MATERIALS (3)
- B E 308 ENGINEERING ELEMENTS OF BIOCHEMISTRY AND MICROBIOLOGY (3)
- B E 465 FOOD AND BIOLOGICAL PROCESS ENGINEERING (3)
- B E 468 MICROBIOLOGICAL ENGINEERING (3)

Biomedical Engineering

- BME 409 BIOFLUID MECHANICS (3)
- BME 410 BIOMEDICAL APPLICATIONS OF MICROFLUIDICS (3)
- BME 419 ARTIFICIAL ORGANS AND PROSTHETIC DEVICES (3)
- BME 423 REACTION KINETICS OF BIOLOGICAL SYSTEMS (3)

Civil Engineering

- C E 370 INTRODUCTION TO ENVIRONMENTAL ENGINEERING (3)
- C E 371 WATER AND WASTEWATER TREATMENT (3)

Computer Science

- CMPS 200 (GQ) PROGRAMMING FOR ENGINEERS WITH MATLAB (3)
- CMPS 201 (GQ) PROGRAMMING FOR ENGINEERS WITH C++ (3)
- CMPS 202 (GQ) PROGRAMMING FOR ENGINEERS WITH FORTRAN (3)

Engineering Mechanics

- E MCH 211 STATICS (3)
- E MCH 212/212H DYNAMICS (3)
- E MCH 212/212H DYNAMICS (3)

Engineering Science

- E SC 312 ENGINEERING APPLICATIONS OF WAVE, PARTICLE, AND ENSEMBLE CONCEPTS (3)
- E SC 313 INTRODUCTION TO PRINCIPLES, FABRICATION METHODS (3) AND APPLICATIONS OF NANOTECHNOLOGY (3)
- E SC 314 ENGINEERING APPLICATIONS OF MATERIALS (3)

Energy And Geo-Environmental Engineering

- EGEE 302 PRINCIPLES OF ENERGY ENGINEERING (3)
- EGEE 401 ENERGY IN A CHANGING WORLD (3)
- EGEE 411 ENERGY SCIENCE AND ENGINEERING LAB (3)
- EGEE 412 GREEN ENGINEERING & ENVIRONMENTAL COMPLIANCE (3)
- EGEE 420 HYDROGEN AND FUEL CELLS (3)
- EGEE 430 (M E) INTRODUCTION TO COMBUSTION (3)
- EGEE 436 MODERN THERMODYNAMICS FOR ENERGY SYSTEMS (3)
- EGEE 437 FUNDAMENTALS OF RENEWABLE ENERGY (3)
- EGEE 441 ELECTROCHEMICAL ENERGY CONVERSION (3)
- EGEE 451 ENERGY CONVERSION PROCESSES (3)
- EGEE 455 MATERIALS FOR ENERGY APPLICATIONS (3)
- EGEE 456 (E E;E SC) INTRODUCTION TO NEURAL NETWORKS (3)
- EGEE 464W ENGINEERING DESIGN PROJECT (3)

Energy, Business & Finance

- E B F 473 RISK MANAGEMENT IN ENERGY INDUSTRIES (3)
- E B F 484 ENERGY ECONOMICS (3)
- Environmental Systems Engineering (ENVSE)
- ENVSE 400 ENVIRONMENTAL SYSTEMS ENGINEERING (3), formally IHS 400.
- ENVSE 420 FIRE SAFETY ENGINEERING (3), formally IHS 420.
- ENVSE 450 ENVIRONMENTAL HEALTH AND SAFETY (3), formerly IHS 450.
- ENVSE 457 INDUSTRIAL HYGIENE MEASUREMENTS (4), formerly IHS 447.
- ENVSE 470 SYSTEMS SAFETY AND RISK ENGINEERING (3), formerly IHS 470.

Fuel Science

- F SC 401 INTRODUCTION TO FUEL TECHNOLOGY (3)

F SC 431 THE CHEMISTRY OF FUELS (3)

Materials Science And Engineering

MATSE 400 CRYSTAL CHEMISTRY (3)

MATSE 401 THERMODYNAMICS OF MATERIALS (3)

MATSE 402 MATERIALS PROCESS KINETICS (3)

MATSE 403 (BIOE 443) BIOMEDICAL MATERIALS (3)

MATSE 404 (IL) (BIOE 444) SURFACES AND THE BIOLOGICAL RESPONSE TO MATERIALS (3)

MATSE 409 (NUC E) NUCLEAR MATERIALS (3)ALS I (3)

MATSE 442 POLYMER SYNTHESIS (3)

MATSE 443 INTRODUCTION TO THE MATERIALS SCIENCE OF POLYMERS (3)

MATSE 444 SOLID STATE PROPERTIES OF POLYMERIC MATERIALS (3)

MATSE445 THERMODYNAMICS, MICROSTRUCTURE, AND CHARACTERIZATION OF POLYMERS (3)

MATSE 446 MECHANICAL AND ELECTRICAL PROPERTIES OF POLYMERS AND COMPOSITES (3)

MATSE 447 RHEOLOGY AND PROCESSING OF POLYMERS (3)

Mechanical Engineering/ Nuclear Engineering

M E 401 REFRIGERATION AND AIR CONDITIONING (3)

402 POWER PLANTS (3)

M E 403 POLYMER ELECTROLYTE FUEL CELL ENGINES (3)

M E 405 INDOOR AIR QUALITY ENGINEERING (3)

M E 406 (NUC E) INTRODUCTION TO STATISTICAL THERMODYNAMICS (3)

M E 433 FUNDAMENTALS OF AIR POLLUTION (3)

Petroleum And Natural Gas Engineering

P N G 405 ROCK AND FLUID PROPERTIES (3)

P N G 410 APPLIED RESERVOIR ENGINEERING (3)

P N G 480 PRODUCTION PROCESS ENGINEERING (3)

Statistics

STAT 401 EXPERIMENTAL METHODS (3)

New Curriculum – Students who started at Penn State in Summer 2015 or later

Chemical Engineering (35 credits)	CR	Grade
CH E 210 (C) - Material Balances	3	
CH E 220 (C) - Thermodynamics I	3	
CH E 230 (C) - Comp. Tools	1	
CH E 300 - Professional Seminar	1	
CH E 320 (C)- Thermodynamics II	3	
CH E 330 (C) - Fluids	3	
CH E 340 - Bioprocessing	3	
CH E 350 (C) - Heat Transfer	3	
CH E 410 (C) - Mass Transfer	3	
CH E 430 (C) - Reactor Design	3	
CH E 452 - Safety & Control	3	
CH E 470 - Capstone Design	3	
CH E 480W - ChE Lab	3	

Physics (8 credits)	CR	Grade
PHYS 211 - Mechanics	4	
PHYS 212 - Electricity	4	

Chemical & Life Sciences (24 credits)	CR	Grade
CHEM 110 - General Chemistry I	3	
CHEM 111 - Chem Lab I	1	
CHEM 112 - General Chemistry II	3	
CHEM 113 - Chem Lab II	1	
CHEM 210 - Organic I	3	
CHEM 212 - Organic II	3	
CHEM 213 - Organic Lab	2	
CHEM 466 - P-Chem	3	
CHEM 457- P-Chem Lab	2	
BMB/MICRB 251- Mol. Biology	3	
24		

MATH (14 credits)	CR	Grade
MATH 140 - Calculus I	4	
MATH 141 - Calculus II	4	
MATH 231 - Multivariate Calculus	2	
MATH 251 - Differential Equations	4	

Arts/Humanities/Social Studies (18 credits)	CR	Grade
ECON	GS	3
		3
		3
		3
		3
		3

Other Reuirements	CR	Grade
First Year Seminar	1	
ENGL 15/30 - Rhetoric	3	
CAS 100 A/B - Speech Comm	3	
ENGL 202C - Technical Wrting	3	
EDSGN 100 -Intro Design	3	
GAH	1	
GAH	1	
GAH	1	

GEN Option (18 credits)	CR	Grade
CH E 4_____ - CH E Elective I	3	
CH E 4_____ - CH E Elective II	3	
PROF Elective 1	3	
PROF Elective 2	3	
ENG Elective 1	3	
ENG Elective 2 – Select 3 cr from list		
MATSE 201	3	
MATSE 202	3	
EGEE 455	3	
BME 444	3	

ENERGY & FUELS ENG Option (18 credits)	CR	Grade
EGEE 411	3	
EGEE 455	3	
Select 3 credits from list		
F SC 401	3	
ENVSE 400	3	
Select 9 credits from list		
CH E 423	3	
EGEE 420	3	
EGEE 430 (M E 430)	3	
F SC 431	3	
F SC 432 (CH E 432)	3	
ENVSE 420	3	
ENVSE 427	3	
ENVSE 457	4	
ENVSE 470	3	
ENVSE 480	3	
P N G 410	3	
P N G 480	3	

PLMRE Option (18 credits)	CR	Grade
MATSE 441	3	
MATSE 443	3	
MATSE 446	3	
MATSE 447	3	
MATSE 448	3	
Select 3 cr		
MATSE 444	3	
MATSE 445	3	

Research Intensive Option (18 credits)	CR	Grade
CH E 494	6	
Select 3 cr from list		
CH E 466	3	
CH E 544	3	
Select 3 cr from CH E 5XX		
CH E 5_____	3	
Select 6 cr of appropriate electives		
Tech/Prof Elective 1 -	3	
Tech/Prof Elective 2 -	3	

BPBME Option (18 credits)	CR	Grade
B M B 442	3	
CH E 438	3	
CH E 449	3	
Select 3 cr from list		
BME 443/MATSE403(3)	3	
BME 444/MATSE 404	3	

Select 3-6 credits from list below	CR	Grade
B E 464	3	
B E 468	3	
BME 419	3	
BME 433	3	
BME 435	3	
BME 445	3	
BME 446	3	
E SC 456 (EGEE 456, E E 456)	3	
E SC 484	3	
M E 491	3	

Select 0-3 credits from list below	CR	Grade
BIOL 472	3	
B M B 252	3	
B M B 401	3	
B M B 428	3	
B M B 432 (MICRB 432, VB SC 432)	3	
B M B 433 (VB SC 433)	3	
B M B 435 (MICRB 435, VB SC 435)	2	
B M B 450 (MICRB 450)	2	
B M B 464	3	
B M B 465	3	
B M B 474	3	
MICRB 201	3	

CHECKSHEET
