Academic Advising Guide

Chemical Engineering

Dept. 3295, 1000 E. University Ave. Laramie, WY 82071 Phone: (307) 766-2500 http://www.uwyo.edu/chemical

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Contact Us

Heather Warren Office Associate Senior Email: hwarren@uwyo.edu

David Bell Undergraduate Program Director Email: davebell@uwyo.edu

Vladimir Alvarado Department Head Email: valvarad@uwyo.edu

"A goal without a plan is just a wish." — Antoine de Saint-Exupéry

"Before anything else, preparation is the key to success." – Alexander Graham Bell

Introduction

<u>The Guide</u>

This guide was created with one important thing in mind: **We want you to be successful!** This guide describes the curriculum, course descriptions, prerequisites, and the general requirements for graduation. It also contains information about technical requirements, which give you the opportunity to shape your program further. With this Academic Advising Guide, you will be aware of the program policy, familiar with the procedures, and able to plan ahead your study.

You need this guide if you want to:

- meet with your advisor for advising
- plan ahead your study
- consider technical requirements
- check some requirements
- check course description and prerequisites
- take undergraduate research or internship
- take an MS Quick Start Program
- request exceptions
- find forms and petitions
- transfer a course from another university
- find other important information

Since the contents of this Advising Guide always change with time, check the advising website regularly to obtain the latest updates. We will update the Advising Guide once every semester before the advising week. It is the responsibility of the student to know the latest updates on the program policies and curriculum.



Help Corner

- 1. Where can I find the information if I cannot find it on this guide?
 - a. Check our website first at:
 - If you still cannot find the answer, please contact us.
- 2. Where can I obtain this guide (word file)?

Download it at:

http://www.uwyo.edu/chemical

Curriculum

The curriculum below is the suggested course arrangement. Each student may have a different course arrangement depending on a lot of factors. When you plan your study:

Always check the prerequisites of courses & always check the semester in which courses are usually offered. •

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		EALL (TO	r students entering Grade	g UW Fall 2017	SPRING		Grado
		FALL	ERESHN		SERING		Graue
		1101 First Year Seminar (EVS)	3	MATH	2205 Calculus II	4	
		has				-	
	ΜΔΤΗ	2200 Calculus I (O)	4	CHEM	1060 Adv Gen Chemistry II	4	
	M/ATTT	C Math 1405 or 1450 MDE 5 ACT 27 SAT 500		OTIEN	CHEM 1050 /or CHEM 1020)		
	CHEM	1050 Adv Gen Chemistry I (PN)	4	PHYS	1210 Engr Physics I* (PN)	4	
		Concurrent MATH 2200			C in MATH 2200 Concurrent MATH 2205		
	LIFE	1010 General Biology I	4	ENGL	1010 Coll Comp & Rhet (COM1)	3	
		C In MATH 0921 or MPE 2 ACT 21 SAT 600	· · · · · · · · · · · · · · · · · · ·		None	-	
				CHE	1005 Intro to Chemical Eng.	1	
					Concurrent with MATH 2200		
			15			16	
			SOPHOM	ORE YEAR			
	MATH	2210 Calculus III	4	MATH	2310 Applied Differential Eqns I	3	
		C In MATH 2205			C In MATH 2205		
	CHEM	2420 Organic Chemistry I	4	CHEM	2440 Organic Chemistry II	4	
		CHEM 1060 (or CHEM 1030)			CHEM 2420		
	CHE	2005 Chem Process Analysis	3	CHE	2060 Intro to CHE Computing	3	
		C In MATH 2205, C- In CHEM 1050 (or CHEM 1020)			C- In CHE 1005 & Concurrent MATH 2310		
	PHYS	1220 Engr Physics II	4	CHE	2070 Chemical Thermo I	3	
		C In MATH 2200, 2205, Concurrent In MATH 2210			C- In CHE 2005, PHYS 1210 & C In Math 2210		
	COM 2		3	CHE	2080 Che. Eng. Fluid Mechanics	3	
		(O,WB)		C-1	n CHE 2005 & PHYS 1210, C in MATH 2210 & Concurren	t MATH	2310
			18			16	
	CUE	2015 Chamical Thorma II	JUNIO		2020 Mass Transfer	2	
	CHE	3015 Chemical Thermon	3	CHE	3026 Mass fransier	3	
	CHE	2026 Host Transfor	2	CHE	2070 Process Simul & Econ	2	
	CHE			CHE	SUPURPOCESS SITTULA ECON	3	
	CHEM	4507 Physical Chemistry I	3	CHE	4060 Reaction Engineering	3	
	OTIEM	MATH 2010 DHVP 1020 CHEM 1050 or 1020		ONE	C In CHE 2015 & CHE 2025 and appaurant CHE 2028		
		MATH 2210, PHYS 1220, CHEM 1000 01 1030			Human Culture (H)	3	
		Technical Requirement**	3		None	Ŭ	
		Technical Requirement**	3		Technical Requirement**	3	
		. connour roqui onioni			-		
			15			15	
			SENIO	R YEAR			
	CHE	3040 Unit Ops Lab I	3	CHE	4050 Unit Ops Lab II	3	
		C- In CHE 3026, CHE 3028 & CHE 4060			C- In CHE 3040		
	CHE	4070 Process Design I	4	CHE	4080 Process Design II (COM3)	4	
		C- In CHE 3028, CHE 3070 & CHE 4060			C- In CHE 4070 & COM 2		
	CHE	4090 Process Dyn & Control	3		US & Wyo Const (V)	3	
		C- In CHE 3028 and CHE 4060			None		
		Human Culture (H)	3		Technical Requirement**	3	
		Technical Requirement**	3		Technical Requirement**	- 3	
	Tetel		16			16	
	i otal H	ours. 127					
* Т!	ha ES 24	10/2120 equence can be substituted for	- DHVS 1210				
**(ne ES 21 Chemical	Engineering Curriculum allows for the fo	lowing Elective	Concentration	e.		
		Petroleum Engineering	LICENTY LICENTE	o on oon a duon			
		Biological Engineering					
		Environmental Engineering					

· Graduate School Preparation

18 credits of Technical Requirements required (ten credits must be 3000+) Self directed requires 9 credits of CHE technical courses and 9 credits of approved technical courses

Approved minors require a minimum of 6 credits of CHE Technical Courses

Approved concentrations:

Students must follow the required number of CHE Technical Courses for their approved concentration Elective courses can also be used to obtain a concurrent Chemistry major (Plan 1 BS or BA) or a minor (Math, Business, Management, Agricultural Business, etc.), or to satisfy pre-med recommended courses. Students are referred to the respective departments for further information. The Chemical Engineering Program only requires that the number of credits of upper-division courses be satisfied (i.e., ten credits of electives must be 3000+). Updated 4/20/17

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Course Descriptions

For other course descriptions, see: <u>http://www.uwyo.edu/registrar/university_catalog/</u>

1005. Introduction to Chemical Engineering. 1. Provides an overview of chemical engineering and its role in the current technological importance: energy, biotechnology, production of chemicals, and materials processing. Introduces strategies for solving engineering problems, including ethical considerations, discusses process variables, units, mass balance, and data analysis, and incorporates active learning exercises using spreadsheet to solve chemical engineering problems. Prerequisite: either CHEM 1050 or CHEM 1020 and concurrent enrollment in PHYS 1210. (Normally offered spring semester)

2005. Chemical Process Analysis. **3.** Introduces analysis of chemical processes using stoichiometry, material and energy balances, thermodynamics and economics. Prerequisite: C or better in MATH 2205 and either CHEM 1050 or CHEM 1020. (Normally offered fall semester)

2060. Introduction to Chemical Engineering Computing. **3.** Introduces chemical engineering problems, develops computational skills needed to solve them, and reinforces a computational tool that will be useful for other CHE classes. Prerequisites: Grade of C or better in CHE 1005 and concurrent enrollment in MATH 2310. (Normally offered spring semester)

2070. Chemical Thermodynamics I. **3.** Discusses first and second laws of thermodynamics applied to chemical processes, production of power from heat, refrigeration, and liquefaction processes, develops thermodynamic relations for calculating thermodynamic properties of fluids, including the use of equations of state, and introduces heat effects, Gibbs-energy change of reaction, and chemical-reaction equilibria. Prerequisites: PHYS 1210, MATH 2210, and grade of C or better in CHE 2005. (Normally offered spring semester)

2080. Chemical Engineering Fluid Mechanics. **3.** Introduces the fundamental aspects of macroscopic fluid mechanics, including physical properties, fluid statics, mass, energy, and momentum balances, momentum transport, and flow through pumps, pipes, and other chemical engineering equipment for both incompressible and compressible fluids, and of microscopic fluid mechanics, including differential mass and momentum balances. Prerequisites: PHYS 1210, MATH 2210, concurrent enrollment in MATH 2310, and grade of C or better in CHE 2005. (Normally offered spring semester)

3015. Chemical Thermodynamics II. **3.** Introduces mixture properties, such as chemical potentials, excess properties, partial molar properties, heats of mixing, fugacities, and practical tools for estimating them from solution theories and equations of state. These tools and concepts are applied to phase and chemical equilibria. Cross listed with PETE 3015. Prerequisite: CHE 2060, CHE 2070 or ES 2310. (Normally offered fall semester)

3026. Heat Transfer. **3.** Introduces the theory and application of energy transport (e.g. conduction, convection, radiation), discusses in depth fundamentals of microscopic energy transport, and applies the knowledge to macroscopic chemical engineering processes and systems. Prerequisites: CHE 2080 or ES 2330. (Normally offered fall semester)

3028. Mass Transfer. **3.** Introduces mass transfer concepts, including molecular diffusion, convective mass transfer, and mass transfer between phases, and the development of mathematical models of these physical phenomena, applicable to the analysis and design of chemical processes. Prerequisites: CHE 2080 or ES 2330. (Normally offered fall semester)

3035. Separation Processes. 3. Applies transport and equilibrium concepts and models to the analysis and design of separation processes, such as distillation, absorption, extraction, leaching, adsorption, crystallization, and membrane separation processes. Prerequisites: CHE 3015 and 3028. (Normally offered spring semester)

3040. Unit Operations Laboratory I. 3. Illustrates fluid-flow and heat-transfer principles with experiments, for example, on pipe flow, fluid viscosity, and convective heat transfer. Emphasizes experimental-error analysis and technical communication, both written and oral. Prerequisite: CHE 3026. (Normally offered fall semester)

3070. Process Simulation and Economics. **3.** Introduces the process simulation software used in the chemical industry and its applications, including examples of heat and material balances, physical properties, phase and chemical equilibria, equilibrium-stage separations and costs and profitability analysis. Prerequisites: CHE 3015 and concurrent enrollment in CHE 3035.

3900. Undergraduate Research. 1-6 (Max. 6). Students carry out research appropriate to undergraduates, under faculty supervision. May be taken more than once. Prerequisite: Junior standing in chemical engineering and approval from a faculty sponsor. (Normally offered each semester)

4050. Unit Operations Laboratory II. 3. Illustrates mass-transfer principles with experiments, for example, on extraction, gas absorption, and distillation. Emphasizes experiment planning and technical communication, both written and oral. Prerequisite: CHE 3035. (Normally offered spring semester)

4060. Reaction Engineering. 3. Introduces chemical process kinetics, catalysis and reactor design. Includes homogeneous and heterogeneous reaction kinetics; design of batch, stirred-tank and tubular reactors; and non-isothermal operation. Prerequisites: CHE 3015, 3026, and 3028. (Normally offered spring semester)

4070. Process Design I. 4. Encompasses engineering design of chemical processes. Introduces engineering economics, process safety management and environmental management. Prerequisites: CHE 3035, 3070, and 4060. (Normally offered fall semester)

4080. Process Design II. 4. Intended for the last semester of the senior year. Applies all previous courses to the design of safe, economical and environmentally benign chemical processes. Prerequisite: COJO 2010 and CHE 4070. (Normally offered spring semester)

4090. Process Dynamics and Control. 3. Encompasses analysis and design control systems for the chemical process industry including steady-state approximation, types of controllers, simple unsteady-state analysis, use of mathematical models and process dynamics under control. Prerequisites: CHE 3035 and 4060.

4100. Biochemical Engineering. 3. Applies chemical engineering principles to the analysis and design of biological processes widely used in the pharmaceutical, food and environmental remediation industries. Topics include kinetics of enzyme-catalyzed reactions, cellular growth and metabolism, bioreactor design and mass transfer considerations. Dual listed with CHE 5100. Prerequisites: MOLB 2021 or concurrent enrollment and CHE 4060 or concurrent enrollment.

4110. Air Pollution for Chemical Engineers. 3. Focuses on strategies and technologies for complying with air pollution control regulations. Introduces atmospheric mixing and dispersion modeling to describe impact of process air emissions on the environment. Examines chemistries of pollutant production and atmospheric fate of air pollutants. Prerequisites: CHE 2005.

4160. Biomedical Engineering-Transport Processes. 3. Focus on chemical and physical transport processes with applications toward the development of drug delivery systems, artificial organs, bioartificial organs and tissue

engineering. This will involve topics covering body fluids, capillary solute transport, pharmacokinetic models and cell physiology. Prerequisites: consent of instructor and grade of C or better in 3 courses counting no more than two from CHEM 1020, CHEM 1030, CHEM 1050, LIFE 1010, LIFE 1020 and at least one from LIFE 2022, MATH 2200, KIN 2040, MOLB 2021, MOLB 2240, CHE 3000, ES 2310.

4165. Biomaterials. Material science and engineering of the various materials used for biomedical applications, indepth discussion of the molecular and cellular interactions to implanted materials, as well as a survey of practical applications. Materials covered will include polymers, ceramics, metals, composites, silicones, and natural materials, such as collagen, elastin, and silk. Prerequisites: LIFE 1010 and CHEM 1020 or CHEM 1050, or permission of instructor.

4170. Polymeric Materials Synthesis. 3. An introduction to the polymer technology, with emphasis on the synthesis of polymeric materials and polymerization processes. Applications cover commodity polymers, such as polyolefins and advanced materials, such as nanomaterials, aerospace materials and biomaterials and biomaterials for drug delivery, artificial tissues and organs. Prerequisites: CHEM 2340 or 2440.

4190. Polymeric Materials: Characterization and Properties. 3. Intended for science and engineering students, an introduction to the characterization and properties of polymeric materials. Introduces synthesis, architecture, molecular microstructure analysis, molecular weight determination, solution properties, thermal properties and mechanical properties of polymeric materials. Dual listed with CHE 5190. Prerequisite: CHEM 4507.

4200. Industrial Chemical Production. **3.** Integration of chemical engineering and chemistry as practiced in modern industry. Engineering of chemical reactions and processes for commodity chemicals, petroleum-based fuels, petrochemicals, intermediates, specialty chemicals, pharmaceuticals, and engineered materials. Environmental strategies for waste minimization and pollution prevention. Prerequisites: CHEM 2420 and CHE 3015 (may be taken concurrently).

4210. Natural Gas Processes and Modeling. **3.** After a quick introduction to the Hysys simulation program, the main chemical processes used to convert well-head gas to products will be reviewed and modeled (fractionation train, sulfur recovery, tail gas clean-up, dehydration, refrigeration, nitrogen rejection) in high detail, including appropriate property models to use. Prerequisite: CHE 3070.

4270. Advanced Process Simulation. **3.** Advanced topics for a commercial process simulation software that is routinely used in industry will be covered. Topics will include: electrolyte systems, physical property methods and regression of parameters, petroleum industry component selection and distillation, solids handling capabilities including coal processing, advanced recycle stream convergence techniques, and equation-oriented solution methods. Prerequisite: CHE 3070.

4340. Numerical Analysis. **3.** Considers computer methods and their accuracy for applied mathematics. Topics include machine arithmetic, analysis of rounding error, solution methods for linear systems and nonlinear equations, interpolations, numerical differentiation and numerical solution of differential equations. Includes some programming. Prerequisites: grade of C or better in COSC 1010, MATH 2310, and either MATH 2250 or 3310.

4970. Internship in Chemical Engineering. 1-6 (Max. 6). Enables credit for students in appropriate engineering activities while serving as interns in an industrial, government, or other setting. Prerequisite: approval from a faculty sponsor and involvement in a chemical engineering co-op/internship experience.

4990. Topics in Chemical Engineering. 1-6 (Max. 6). Features topics not included in regularly offered classes. Section I is individual study. Other sections are group study by seminar or in class format. Prerequisite: CHE 3000 or concurrent enrollment.

Prerequisites

Prerequisites must be satisfied before you can take any courses. If you do not have the prerequisites for a certain course but you still want to take the class, you must submit a petition to waive the prerequisites. If your request to waive the prerequisite is granted, you can take the course. You could find the prerequisites highlighted in blue of all courses in the Course curriculum sheet on page 3 of this document.

Requirements and Policies

General Requirements

- 1. In order to receive a degree from the College, minimum GPA requirements must be met. First, the student must have at least a 2.0 cumulative GPA on all courses completed at UW. Secondly, the student must also have at least a 2.0 cumulative GPA on all engineering courses completed at UW. Note that transfer work and AP credit do not enter into the computation of a UW grade point average.
- 2. The required minimum number of credits for upper division is 48 credits.
- 3. To graduate from UW, a minimum of 30 credits of upper division must be taken from UW.
- 4. A grade of C- or better in the following prerequisite courses is required:
 - MATH courses
 - All Chemical Engineering course prerequisites.

University Studies Program (USP) Policies

- Students must complete all required USP 2015 courses: Communication (COM1, COM2, and COM3), Human Culture (H), Physical & Natural World (PN), Quantitative Reasoning (Q), and US & Wyoming Constitutions (V) courses.
- 2. All three components of the freshmen USP (FYS, Q, and COM1) should be completed the first year, except if remedial math is required, but the other two components should not be delayed.
- 3. ENGL 1010, ESL 1210, and HP 1020 will count for the WA requirement under USP 2003 and the COM 1 requirement under USP 2015.
- 4. Students must earn a grade of C or better in the First-Year Seminar and Communication 1, 2, and 3 courses.
- 5. Students who have earned more than 30 post-high school credit hours are exempt from taking a FYS by submitting a University Studies petition form. Exemptions may also be granted by sending an email to the Registrar requesting this exception. Please send it to: registrar@uwyo.edu.

Second Bachelor's/Dual degree

For students seeking a second bachelor's degree who obtained the first degree at an accredited institution, the following guidelines must be followed:

- 1. Students have to complete a minimum of 30 additional credits at UW, 12 of which must be upper division.
- 2. Students have to meet the program requirement.
- 3. Students do not have to meet the USP requirements (except the U.S./Wyoming Constitution course and Communication 3).
- 4. Students may meet the V requirement in one of three ways:
 - Completion of a UW V course;
 - Completion of a course that has been articulated with UW; or

• Completion of a U.S. Constitution course and a passing grade on the WY Challenge exam administered by the Political Science department (<u>http://www.uwyo.edu/pols/challenge-exam/</u>).

Transfer students

- 1. Community college students who earn an AA, AS, or AB degree during the spring of 2015 or after will receive a waiver for all USP 2015 requirements except the U.S./Wyoming Constitution course and Communication 3.
- 2. Community college students who have not earned an AA, AS, or AB degree will have to fulfill all USP 2015 requirements.
- 3. Students who have earned more than 30 post-high school credit hours are exempt from taking a FYS by submitting a University Studies petition form. Exemptions may also be granted by petition for students who have spent a successful year in residence at another college or university even if they have not quite earned 30 credits. Download the petition form at

http://www.uwyo.edu/registrar/students/forms_and_petitions.html.

- 4. Transfer students may meet the V requirement in one of three ways:
 - Completion of a UW V course;
 - Completion of a course that has been articulated with UW; or
 - Completion of a U.S. Constitution course and a passing grade on the WY Challenge exam administered by the Political Science department (<u>http://www.uwyo.edu/pols/challenge-exam/</u>).
- 5. Transfer students can meet the COM 2 requirement in several ways:
 - Completion of a UW COM 2 course;
 - Completion of a COM 2 course that has been articulated with UW;
 - Completion of a COM 2-type course that has been nominated for USP inclusion by a community college (articulation paperwork will be necessary);
 - Completion of an intermediate composition course and a public speaking course;
 - Completion of either an intermediate composition course and a passing score on the public speaking exam administered by the Communication & Journalism Department or completion of a public speaking course and successful petition for advanced writing status at UW.

Other Policies

- Students may not take a course for S/U credit to satisfy any requirement for a degree from the College of Engineering and Applied Science, unless the course is offered for S/U credit only.
- All Wyoming Community College equivalent courses will be evaluated for acceptance into the CHE program.
- For upper-division coursework, no more than two CHE 3000+ courses can be transferred and applied to the CHE degree, however, CHE 4070 Process Design I and CHE 4080 Process Design II cannot be transferred to UW.
- All CHE transfer courses must be C minus or better.
- The upper-division rules may be waived for classes taken during Study Abroad and National Student Exchange Programs with pre-approval.

Technical Requirements

The technical requirements in the Chemical Engineering curriculum can be used toward an area of emphasis or a minor. The number of credits of upper-division courses must be satisfied, and thus 10 credits of electives must be 3000+.

Chemical Engineering Areas of Emphasis:

Biological Engineering (18 credits)

12 credits of Chemical Engineering Coursework required

Required Courses (12 credits):

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- CHE 4100 Biochemical Engineering
- CHE 4160 Biomedical Engineering Transport Processes
- CHE 4165 Biomaterials

Choose Remaining Courses From (6 credits):

CHE 3900	Undergraduate Research
LIFE 3050	Genetics
LIFE 3600	Cell Biology
MOLB 2010	Microbiology
MOLB 2240	Medical Microbiology
MOLB 4100	Clinical Biochemistry
MOLB 4400	Immunology
MOLB 4495	Bioinformatics
ZOO 2040	Human Anatomy
ZOO 3115	Human Systems Physiology
ZOO 4125	Integrative Physiology
Other approved electi	ive(s).

Pre-Medicine Students may replace CHE 3100 with the following courses:

- MOLB 2010 General Microbiology
- MOLB 3610 Principles of Biochemistry I

And should also take the following courses:

- LIFE 3050 Genetics
- LIFE 3600 Cell Biology
- ZOO 2040 Human Anatomy

<u>Chemical Process Industry</u> (18 credits of technical electives):

9 credits of Chemical Engineering Electives required

Suggested Coursework:

CHE 4000	Environment, Technology, and Society
CHE 4100	Biochemical Engineering
CHE 4200	Industrial Chemical Production
CHE 4210	Natural Gas Processes and Modeling
CHE 4270	Advanced Process Simulation
CHE 4970	Internship in Chemical Engineering
EE 4620	Automatic Control Systems
EE 5885	Topics: Process Control
MGT 3110	Business Ethics
MGT 3210	Management and Organization
STAT 4220	Basic Engineering Statistics
ES 4910	Survey of Engineering Management

Environmental Engineering:

(18 credits of technical requirements):

6 credits of Chemical Engineering Courses required

Required Courses (9 credits):

ATSC 2100	Global Warming: The Science of Humankind's Energy Consumption Impacting Climate
CE 3400	Introduction to Environmental Engineering
CHE 4000	Environment, Technology and Society

Choose At Least One Course From (at least 3 credits):

- CHE 3100 Fundamentals of Bioengineering
- CHE 4100 Biochemical Engineering

Choose Remaining Courses From (3-6 credits):

MICR 2021	General Microbiology
CE 4400	Design of Water Treatment Facilities
CE 4410	Design of Wastewater Treatment Facilities
CE 4430	Environmental Engineering Chemistry
CE 4440	Solid Waste Engineering
CHE 3900	Undergraduate Research (on appropriate topic)

Graduate School Preparation (18 credits of technical electives):

9 credits of Chemical Engineering Electives required including 3 credits of Undergraduate Research

Suggested Coursework:

CHE 3900	Undergraduate Research (up to 6 credits)
MATH 2250	Elementary Linear Algebra
MATH 3310	Applied Differential Equations
MATH 4440	Introduction to Partial Differential Eq I
STAT 4220	Basic Engineering Statistics
CHE 5000+	Any CHE course at the 5000 level and above
Other approv	red electives

Materials Science and Engineering (18 credits of technical electives):

9 credits of Chemical Engineering Electives required

Suggested Coursework:

CHE 4165	Biomaterials
CHE 4990	Polymer Chemistry and Engineering
CHE 4170	Polymeric Materials Synthesis
CHE 4190	Polymeric Materials: Characterization and Properties
CHE 3900	Undergraduate Research
ME 3450	Properties of Materials
ES 2410	Mechanics of Materials
EE (PHYS) 4340	Semiconductor Materials and Devices
CHEM 4050	Solar Energy Conversion
Other approved elect	ives

Petroleum Engineering: (18 credits of technical electives):

9 credits of Chemical Engineering Electives required

Suggested Coursework:

PETE 2050	Fundamentals of Petroleum Engineering
PETE 3200	Reservoir Engineering
PETE 3255	Basic Drilling Engineering
PETE 3715	Production Engineering
PETE 4225	Well Testing
PETE 4320	Well Log Interpretation
Other approved elect	ives

Note: An area of emphasis is not a minor and will not be stated on your diploma.

Self-Directed Emphasis

If you elect not to choose an area of emphasis or a minor, the technical requirements must be approved by your advisor and must contain at least 3 CHE technical requirements and 3 approved technical requirements. This is referred to as the Self-Directed Emphasis.

The following electives policy must be followed for students who choose a Self-Directed Emphasis:

- Electives must be upper level (3000+ level) science, technology, engineering, or mathematics (STEM) courses, or courses in the College of Business or College of Law (with a technical component). Lower division courses (1000/2000 level) may be allowed, particularly if they are prerequisites for higher level courses in an area in which the student has an appropriate educational objective. For a lower level course to be accepted, the student must have a clearly articulated argument for the course. Also remember that students must complete 48 upper-division hours.
- The following is a list (in alphabetical order) of disciplines in which appropriate courses may be found: Agriculture (all except Agriculture Economics and Family and Consumer Science), Agroecology/Entomology/ Soil Science, Anthropology, Astronomy, Atmospheric Science, Biology/Life Science, Botany, Business (dealing with decision science), Chemistry, Computer Science, Earth Systems Science, Energy Resources, Engineering (all disciplines), Environment and Natural Resources, Geography, Geology and Geophysics, Law (dealing with technical issues), Mathematics, Molecular Biology, Physics, Statistics, and Zoology.
- Courses in the arts, culture, humanities, social sciences, government and the like (in general, those areas which are addressed in the University of Wyoming University Studies Program) will not be accepted as electives.

The approved courses in the College of Business and College of Law for the Self-Directed concentration:

IMGT 2400 Introduction to Information Management (3). This course is the prerequisite of IMGT 3400.

IMGT 3400 Database Management Systems (3)

IMGT 4020 Information Security (3). Cross listed with ACCT 4020.

IMGT 4455 Systems Analysis and Design (3). Cross listed with MGT 4455.

ECON 4320 Mathematical Economics (3) ECON 4350 Game Theory (3) ECON 4400 Environmental Economics (3) ECON 4410 Natural Resource Economics (3) ECON 4430 Energy Economics (3)

FIN 3250 Corporate Finance (3)

- FIN 3310 Investment Management (3)
- FIN 3520 Financial Markets and Institutions (3)
- FIN 4250 Advanced Corporate Finance (3)

FIN 4400 Empirical Finance (3)

FIN 4710 Risk Management (3)

DSCI 4240 Computer Applications in Decision Sciences (3)

LAW 6660 Environmental Law (3) LAW 6725 Intellectual Property (3) LAW 6780 Mining Law (2) LAW 6790 Oil and Gas (3) LAW 6800 Public Lands (3) LAW 6860 Water Rights (3) LAW 6865 Natural Resources Law (3) LAW 6870 Water Pollution (3) LAW 6875 Hazardous Waste and Water Pollution Law (3)

Note that if an approved course (one of the courses in the above list) requires a prerequisite course that is not an approved course, the prerequisite course, of course, needs to be taken first, but it will not be counted toward your degree.

Minors:

Elective courses can also be used to obtain a minor (Math, Geology, Economics, Management, and Business). If you want to obtain a minor, you have to officially declare the minor. Students are referred to the respective departments for further information. The minor requirements are checked by the respective department, not Petroleum Engineering Department! The Petroleum Engineering Program only requires that the number of credits of upper-division courses be satisfied (i.e., thirteen credits of electives must be 3000+). If you change your mind and drop your minor, the requirements of Self-Directed concentration apply.

At the moment, we allow students to use the elective courses to obtain the following minors:

Math Minor

MATH 2250 Elementary Linear Algebra (3 credits) MATH 2800 Mathematics Major Seminar (2 credits) MATH 3205/3500/3340 (3 credits) MATH 3000+ (6 credits) Approved elective (3000+) (4 credits)

Geology Minor

GEOL 2000 Geochemical Cycles and the Earth System (4 credits) GEOL 3400 Geological Hazards OR GEOL 3500 Global Change OR GEOL 3600 Earth and Mineral Resources (4 credits) GEOL 3000+ (5 credits) Approved elective (3000+) (5 credits)

Economics Minor

ECON 1010 Principles of Macroeconomics (3 credits) ECON 1020 Principles of Microeconomics (3 credits) ECON 3010 Intermediate Macroeconomics (3 credits) ECON 3020 Intermediate Microeconomics (3 credits) ECON 3000+ (3 credits) ECON 4000+ (6 credits)

Management Minor

MGT 3210 Management & Organization (3 credits) MGT 3410 Human Resource Management (3 credits) Choose five courses from the following: (15 hours) MGT 3420 Org Behavior & Leadership (3 credits) MGT 4425 Supervision (3 credits) MGT 4430 Organization Design and Change (3 credits) MGT 4440 Managerial Problem Solving (3 credits) MGT 4445 Managing Risk & Knowledge (3 credits) MGT 4455 Systems Analysis & Design (3 credits) MGT 4465 Managerial Tools (3 credits) MGT 4470 Management Negotiation & Conflict Resolution (3 credits) DSCI 4250 Revenue Management (3 credits) DSCI 4260 Project Management (3 credits)

Business Minor

ACCT 1010 Principles of Accounting I (3 credits) ACCT 1020 Principles of Accounting II (3 credits) FIN 3250 Corporate Finance (3 credits) MGT 1040 Legal Environment of Business (3 credits) MGT 3110 Business Ethics (3 credits) MGT 3210 Management and Organization (3 credits) MKT 3210 Introduction to Marketing (3 credits) STAT 2010, 2050, or 2070 Statistics (4 credits) Choose one Upper Division Business Course (3 hours)

Chemistry Minor

Note: A grade of C or better is required in all courses Required courses:

1020 or 1050 General Chemistry I (4 credits)
1030 or 1060 General Chemistry II (4 credits)
2230 Quantitative Analysis (4 credits)
2420 Organic Chemistry I &
2440 Organic Chemistry II (6-8 credits)
Elective courses: Choose one of the following (3-4 credits)
3020 Environmental Chemistry (3 credits)
3550 Physical Chemistry for Life Sciences (3 credits)
3610 Principles of Biochemistry (cross-listed with MOLB 3610) (4 credits)
4110 Introductory Inorganic Chemistry (3 credits)
4230 Instrumental Methods of Chemical Analysis (4 credits)
4505 or 4507 Physical Chemistry I (3 credits)
MOLB4600 General Biochemistry (3 credits)
Student will be assigned an advisor in the Chemistry department to consult regarding their minor.

Appropriate substitutes for the elected course may be approved by a student's Chemistry advisor, and the head of the Department of Chemistry

Degree Check

A Degree Check must be done before you graduate. You need to complete it 2-3 semesters out from graduation. This check is done by you, your advisor, department head, and college and university designees. We want to make sure that all of your degree requirements will be met.

- To initiate this, you have to submit the advisor-approved degree check sheet enlisting your grades of all courses to the department one year before your graduation date. This will provide you enough time for any corrective actions needed. Please be sure to type the degree check sheet, get your advisor's signature and then submit it to Heather in Engineering 4055. She will take care of the remaining signatures.
- 2. On the degree check sheet, you also need to indicate when the courses left should be taken and what elective or human culture courses to take if you still have any. Please insert the semester and year you plan on taking them.
- 3. The degree check sheet is not a binding contract, you still can change the elective/human culture courses you eventually want to take, but you have to inform your advisor about the changes and your advisor will inform the college.
- 4. You will be informed if there is any corrective action needed.

The Degree Check Sheet is also needed for other purposes. You are required to update your degree check sheet before you meet with your advisor or before you submit a petition. The consideration of certain petitions will not be performed without the advisor-approved degree check sheet.

Download the Degree Check sheet at: <u>http://www.uwyo.edu/chemical/undergraduate/chindex.html</u>



CHEMICAL ENGINEERING DEGREE CHECK (2017-2018)

STUDE	NT						W#	
STUDE	NT e-mai	l:						
ADVISC	N R						TRANSFER WORK: GRAD DATE:	
GENER	ΔΙ			Hre	Credit	Grade	Proroquisitos	Comments
FYS		1101		3	orean	Grade	Frerequisites	Comments
COM1	ENGL	1010	College Composition and Rhetoric	3			C in ENGL 1010 (or ESL 1210 or HP 1020)	
COM2				3				
			Minimum Required	[9]	0			
MATH							Prerequisites	
Q	MATH	2200	Calculus I	4 _			C in MATH 1405 or 1450, or MPE 5, or ACT 27, or SAT 600	
	MATH	2205	Calculus II	4 -			C in MATH 2200	
		2210	Applied Differential Equations I	4 -			C in MATH 2205	
	IVI/ATTT	2310	Minimum Required	[15]	0		C III MIATH 2205	
SCIENC	E		initiation required	[10]	0		Prerequisites	
PN	CHEM	1050	Advanced General Chemistry I	4			Concurrent enrollment in MATH 2200	
	CHEM	1060	Advanced General Chemistry II	4 -			CHEM 1050 (or CHEM 1020)	
	CHEM	2420	Organic Chemistry I	4			CHEM 1060 (or CHEM 1030)	
	CHEM	2440	Organic Chemistry II	4		-	CHEM 2420	
	CHEM	4507	Physical Chemistry I	3			MATH 2210, PHYS 1220, CHEM 1060 (or CHEM 1030)	
PN	PHYS	1210	Engineering Physics I	4			C in MATH 2200, Concurrent in MATH 2205	
	PHYS	1220	Engineering Physics II	4 -			C in MATH 2205, Concurrent in MATH 2210	
	LIFE	1010	General Biology I	4	0		C in MATH 0921, or MPE 2, or ACT 21, or SAT 600	
116.8.14	V Consti	tution	and Human Culture	[31]	0			
V	Consu	uuuun		з				
Ĥ.				3 -				
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·			Minimum Required	[9]	0			
CHEMIC	CAL ENG	INEER	RING				Prerequisites	
	CHE	1005	Intro to Chemical Engineering	1			Concurrent with MATH 2200	
	CHE	2005	Chemical Process Analysis	3			C in MATH 2205, C- in CHEM 1050 (or CHEM 1020)	
	CHE	2060	Intro to Chem Engr Computing	3_			C- in CHE 1005 & Concurrent MATH 2310	
	CHE	2070	Chemical Thermodynamics I Chemical Eng Eluid Machanica	3			C- in CHE 2005, PHYS 1210 & C in MATH 2210	
		2000	Chemical Eng Fluid Mechanics	ు సా			C- In CHE 2005 & PHYS 1210, C In MATH 2210 & Concurrent MATH 2310	
	CHE	3015	Heat Transfer	3			C in CHE 2060 & CHE 2070 or ES 2310	
	CHE	3020	Mass Transfer	3 -			C- in CHE 2060 & CHE 2080 or ES 2330	
	CHE	3040	Unit Operations Lab L	3 -			C- in CHE 3026 CHE 3028 & CHE 4060	
	CHE	3070	Process Simulation & Economics	3			C- in CHE 3015 & CHE 3026 & Concurrent CHE 3028	
	CHE	4050	Unit Operations Lab II	3			C- in CHE 3040	
	CHE	4060	Reaction Engineering	3			C- in CHE 3015 & CHE 3026 & Concurrent CHE 3028	
	CHE	4070	Process Design I	4			C- in CHE 3028, CHE 3070 & CHE 4060	
COM3	CHE	4080	Process Design II	4			C- in CHE 4070 & COM 2	
	CHE	4090	Process Dynamics and Control	3			C- in CHE 3028 & CHE 4060	
			Minimum Required	[45]	0			
APPRO	VED ELE	CIIVE	.5	2			At least 10 hrs must be 3000-level or higher	
				3-				
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				3 -				
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			Minimum Required	[18]	0			•
			Total Hours	[127]	0			
			τοτα	L HOUR	S REMA	INING =	127	
Stu	dent Signa	iture	Date				Advisor approval Date	9

Department approval

Date

College approval

Date

BS/MS Quick Start Program

The BS/MS Quick Start program in Chemical Engineering is designed to present highly qualified UW students with the opportunity to begin graduate study while they complete their Bachelor of Science (BS) degree in Chemical Engineering. This program allows for early planning of the graduate portion of a student's education and provides more flexibility in the number of required courses and the order in which they are taken. The more efficient and better-planned use of time should result in reduction of the time required for obtaining the Master of Science in Chemical Engineering.

The Quick Start program contains two essential elements:

- 1. Qualified students may receive provisional admission to the Petroleum Engineering graduate program prior to completing the normal application process. This provisional admission will permit students to make their long-term educational plans earlier in their studies, thus providing enhanced opportunities for course selection and involvement in research. To apply go to: http://www.uwyo.edu/chemical/undergraduate/quickstart.html
- 2. Students in the program may apply up to six credit hours of 5000-level courses toward both the BS and MS degree programs. By completing successfully up to six credit hours of graduate classes during their senior year, these students will have demonstrated their ability to do graduate-level course work as undergraduates, easing their transition to the graduate program.

Admission

Application for admission to the Quick Start program may be made when the student enters the second semester of their junior year. Minimum requirements for admission to the joint program are:

- 1. A minimum cumulative GPA of 3.4
- 2. A minimum GPA of 3.4 in CPE courses
- 3. Three letters of recommendation (at least two must be from Petroleum Engineering faculty at UW)

Retention requirements

Prior to completion of all requirements for the BS degree, students in the Quick Start program must complete all requirements for admission to the Petroleum Engineering graduate program. However, the Graduate Records Examination (GRE) requirement may be waived. Failure to complete admission requirements will result in suspension from the program. A student in the Quick Start program must maintain a cumulative GPA of at least 3.4 in their undergraduate courses, 3.4 in their departmental courses and at least 3.0 in 5000-level courses in order to remain in good standing in the program. Failure to meet the GPA requirement places a student on probation for one semester. If the GPA requirement is not met after that semester, the student will be suspended from the program.

Plan of study

Students in the BS/MS Quick Start program must complete a Plan A or Plan B master program of study in consultation with a faculty advisor. The program of study must include all the courses to be taken from the senior year through the end of the MS program. This plan must be filed with the Petroleum Engineering Graduate Coordinator by the end of the first semester in which the student has been admitted into the program. For the Program of Study, go to: http://www.uwyo.edu/chemical/undergraduate/quickstart.html

	Q	UICKSTAR	CI PRC	JGRAM	OF STUD	Y
PLE	ASE PRINI	AND READ INS	TRUCTIO	NS BEFOR	E COMPLETIN	G THIS FORM.
	THIS	FORM MUST BE	E TYPED A	ND IRANS	CRIPIS ATTAC	HED
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hone Number			Academic	Department		
ailing Address	Street		City		State	Zip Code
mail		MS Degree (master	s, ed specialist	. Majo	r or Certificate Program	n and Option (if applicable)
ASTER'S STUD		doctoral) Plan A (Thesis Option)	Plan B (No	n-thesis Option)	-	
REVIOUS DEGRE	ES RECEIVED:					
egree	Date	Maj	or		Institution	
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. Transfer work	from other instit	tutions - Up to 9 hours o	PROPOSED f graduate cour	PROGRAM: sework can be tr	ansferred toward a mas	ster's program. Official trans
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Frequently Asked Questions

• How many credits should I take?

You should take the number of credits you are comfortable taking. Be mindful of your other responsibilities, coupled with a sound academic plan. The number of credits you take may vary from semester to semester.

• How do I view my Degree Works?

To access your Degree Evaluation, log on to WyoRecords and find the tab for Registration. A link for Degree Evaluation will be listed under the Registration options. This link will direct you to the audit of your requirements within Degree Works.

• All of my grades are not visible on my degree works. How can I change this?

There is a possibility that all of your grades may not be updated in the system. You can visit the Office of the Registrar and inform them of missing grades of your degree works or communicate this to the Coordinator, Student Advising.

• I am about to graduate soon, what preparations are necessary?

It is important that your degree check sheet has been approved and you have taken the Fundamentals of Engineering (FE) exam. When your degree check sheet has been approved, you will receive an email from the college's Center for Student Advising stating that it has been approved, the anticipated graduation date form which you would need to complete and information on the FE exam.

• Where can I find the degree check sheet?

You can find the department's degree check sheet on the Chemical Engineering webpage.

<u>http://www.uwyo.edu/chemical/undergraduate/chindex.html</u> You are encouraged to download and save this sheet on your personal computer and update it each semester.

• When do I hand in my degree check sheet?

Your Degree Check Sheet should be handed in 2-3 semesters before the anticipated graduation date.

• How do I complete my degree check sheet?

Students are encouraged to complete their degree check sheet with their advisor. The degree check sheet is an excel document that automatically populates the Credit column when the grade for each course is entered in the Grade column. If a course grade was transferred, indicate this by putting a T in front of the letter grade. For instance TB, which stands for transfer grade B. After filling in the degree check sheet (be sure it's typed and not hand-written) print, sign and hand it in to Heather Warren in Engineering 4055.

• I took a course at a previous institution that I think may be the same as a course here at UW but it is not in the transfer catalog. How can I determine if this course can be transferred?

In a case like this, students are encouraged to get the complete syllabus for the course. If the course is an engineering course, students need to fill out the college's transfer evaluation form. This form along with the syllabus should be taken to the office of the Coordinator, Student Advising. It will then be given to the appropriate faculty member for evaluation. If the course is a subject outside of the engineering college, for instance the Chemistry department, students are encouraged to take the syllabus to the respective department for an evaluation.

• What happens if my cumulative GPA goes below 2.0?

If your cumulative GPA falls below 2.0, you will be placed on academic probation at the end of the semester. You will be notified of this and encouraged to visit with your advisor to develop a plan to help you to improve in the following semester. If your semester GPA falls below a 2.0 while on academic probation you will be suspended from the university.

• How do I get reinstated if I was placed on academic suspension?

A student placed on academic suspension can petition for reinstatement after sitting out for one full semester. He/she will need to visit the Office of the Registrar's page, print the Petition for Academic Reinstatement form and complete it.

• How do I go about changing my major?

You will need to visit the office of the Coordinator, Student Advising for the department and complete the change of major form. After it is signed by the Department Head you will need to collect your folder from the office of the Coordinator, Student Advising and take both folder and form to your new department.

• How do I find my advisor?

The name of your advisor can be found in the Student Resources tab in your WyoWeb account. It will be listed in the Academic Profile box.

• Is advising restricted to advising week?

Advising is not restricted to advising week only. It is important that you get to know your advisor and feel comfortable checking in with him/her throughout the semester.

How do I prepare for advising week?

It is very important that students are prepared for advising week to maximize the benefits.

- 1. Be aware of when advising week will take place
- 2. Know your advisor. Some students may have a different advisor than they did in the previous semester. It is important that each student knows the name of his/her advisor and where to find him/her
- 3. Check your email daily and read carefully any emails sent out by staff and/or advisor regarding advising week
- 4. Ensure that you schedule a specific day and time to meet with your advisor. Each advisor will indicate how and when they would like their advisees to schedule an advising appointment
- 5. Ensure that you collect a Course Request Form from the main office or the office of the Coordinator, Student Advising before advising week begins
- 6. Be mindful of the courses you are hoping to take in the upcoming semester and ensure that you have all the necessary prerequisites for each course
- 7. Come prepared with any questions or concerns that you may have. This week is a great opportunity to talk with your advisor about a possible minor, class options, internships etc.
- 8. If you have any questions about advising week, ask! The Coordinator, Student advising or your advisor
- I have an associate's degree. Will I be exempt from any courses?

Yes. Students with an Associate of Arts degree (AA) or an Associate of Science degree (AS) will be exempt from all USP courses except the US & Wyoming Constitutions course. Students with an Associate of Applied Science (AAS) degree will not be exempt from the P requirement (PEAC 1001) on the 2003 catalog or the US & Wyoming Constitutions course.

• I have a previous bachelor's degree and I am currently a second bachelor's degree seeking student. Will I be able to be exempt from any courses?

Yes. Just like a student who has completed their Associate's degree, students with a previous bachelor's degree will be exempt from all USP courses except the US & Wyoming Constitutions course.



Forms and Petitions

All forms in the Forms and Petitions section can be downloaded or printed out by double-clicking the form. You need to submit a form or petition when:

- 1. You want to take an **undergraduate research or internship**. You must submit the form on Page 22 <u>before</u> taking undergraduate research or internship. No credits will be given when the undergraduate research or internship is done first without submitting the form.
- 2. You want to adjust your curriculum because
 - a. you have taken a course/similar course at another institution, which might be a good substitute for an existing course in the Petroleum Engineering Curriculum at UW, or
 - b. you have taken a similar course at other programs at UW, which might be a good substitute for an existing course in the Petroleum Engineering Curriculum at UW, or
 - c. you plan on taking a similar course at other programs at UW, but you are not certain if that particular course can be a substitute for your targeted course in the Petroleum Engineering Curriculum at UW.
 Submit a petition using the form on Page 22.
- 3. You want to **transfer a course** that you have taken at another institution, or you plan to take a course at another institution but you are not certain if that particular course is transferrable back to UW. Submit the Transfer Evaluation Form on Page 22. By doing this, if the transfer course is considered equivalent to an existing course at UW, the equivalency will be kept on the database. For future students from the same institution, the transfer of the same course will then be automatic.
- 4. You want to **change/add major or minor**. Submit the form on Page 22.
- 5. You want to **request an exception**, such as adding/dropping a course or withdraw from a course after the deadline. Submit the form on Page 22.
- 6. You want to **take courses more than the maximum credit hour load** in one semester. Submit the petition form on Page 22.
- 7. You want to **request a prerequisite waiver**. You have to provide compelling reasons. Loss of financial aid or increased time to graduation are not valid reasons to waive the prerequisites. Submit the form on Page 22.

Undergraduate Research and Internship Form. Found at:

http://www.uwyo.edu/chemical/undergraduate/chindex.html

Curriculum Adjustment Petition. Found at: <u>http://www.uwyo.edu/chemical/undergraduate/chindex.html</u>

Transfer Evaluation Form. Found at: http://www.uwyo.edu/registrar/students/forms_and_petitions.html

Change/Add Major or Minor. Found at: <u>http://www.uwyo.edu/registrar/students/forms_and_petitions.html</u>

Exception Request Form. Found at: <u>http://www.uwyo.edu/registrar/students/forms_and_petitions.html</u>

Overload Petition. Found at: <u>http://www.uwyo.edu/registrar/students/forms_and_petitions.html</u>

Prerequisite Waiver Form. Found at: <u>http://www.uwyo.edu/chemical/undergraduate/chindex.html</u>