

CHEMICAL ENGINEERING

Although Chemical Engineering has existed for only 100 years, its name is no longer completely descriptive of this dynamic profession. The work of the chemical engineer is not restricted to the chemical industry, chemical changes, or chemistry. Instead, modern chemical engineers are concerned with all the physical, chemical, and biological changes of matter that can produce an economic product or result that is useful to humankind.

About this Program

- **College:** Herbert Wertheim College of Engineering (<http://catalog.ufl.edu/UGRD/colleges-schools/UGENG/>)
- **Degree:** Bachelor of Science in Chemical Engineering
- **Credits for Degree:** 128

To graduate with this major, students must complete all university, college, and major requirements.

Department Information

As Chemical Engineers, the career options for students will be diverse and exciting. Students will develop the skills needed to design processes to produce anything made by chemical or biological means, including consumer products, food and beverages, pharmaceuticals, specialty chemicals, semiconductors, biomaterials, pulp and paper, polymers, and more. Chemical Engineers use their knowledge of all branches of science and mathematics (not just chemistry) to solve problems at a variety of scales—from developing materials with features at the nanoscale all the way to designing a 250-foot-tall distillation tower and everything in between.

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Map (<http://campusmap.ufl.edu/#/index/0958>)

Curriculum

- Biomolecular Engineering Minor
- Chemical Engineering
- Combination Degrees

The education of the chemical engineer is based on the fundamental sciences of physics, chemistry and biology, on mathematical and computer techniques, and on basic engineering principles. This background makes the chemical engineer extremely versatile and capable of working in a variety of industries: chemical, biochemical, petroleum, materials, microelectronics, environmental, food processing, consumer products, consulting and project management. It is also good preparation for law and medical schools.

Department Requirements

Successful applicants must have earned a minimum 2.5 grade point average in the better of two attempts of the eight preprofessional courses and a minimum 2.5 grade point average in the better of two attempts of the preprofessional calculus course sequence.

For the purposes of determining admission to or retention in the department, grade point averages will be based on no more than two attempts for each course. Students must maintain satisfactory progress (minimum GPA of 2.0) in chemical engineering courses and in their overall record.

Minimum grades of C are required in the courses listed below. These must be achieved within two enrollments (including drops and/or withdrawals) for each course, with the exception of ECH 4714, for which the number of attempts allowed to earn a C is not limited.

Code	Title	Credits
ECH 3023	Material and Energy Balances	4
ECH 3101	Process Thermodynamics	4
ECH 3203	Fluid and Solid Operations	3
ECH 3223	Energy Transfer Operations	3
ECH 3264	Elementary Transport Phenomena	2
COT 3502	Computer Model Formulation	3
ECH 4714	Chemical Process Safety	3

Any course taken to satisfy a degree requirement (General Education, required course, or technical elective) cannot be taken S/U, with the exception of the following:

Code	Title	Credits
EGN 4912	Engineering Directed Independent Research	0-3
ECH 4948	Internship Work Experience	0-3
ECH 4949	Co-op Work Experience	0-3

Educational Objectives

Within a few years of obtaining a bachelor's degree in chemical engineering from the University of Florida, the recent graduates will achieve one or more of the following:

- Graduates will demonstrate professional engineering competence via promotions and/or positions of increasing responsibility.
- Graduates will be successful in pursuing advanced degrees in chemical engineering or in other disciplines.
- Graduates will be able to work in diverse professional environments as demonstrated in their pursuit of continuing education, professional certification/registration and/or career path into business, government, education, etc.

Chemical engineers apply math, chemistry, physics, biology, thermodynamics (classical and molecular), transport phenomena, and reaction kinetics to design products and to design, operate, control, optimize, and scale up manufacturing processes that rely on physical and bio/molecular transformations. Graduates of the Chemical Engineering undergraduate program contribute to the production of energy, including green energy, fertilizers, food and beverages, pharmaceuticals including antibiotics and vaccines, semiconductors and other components of cell phones and computers, fuel cells, batteries, consumer products, plastics, paint, paper, and a myriad of other products that benefit humankind.

Goal

To prepare students for lifelong careers in chemical engineering.

Mission

To offer high-quality undergraduate and graduate degree programs in chemical engineering and to conduct research that helps educate graduate students and serves the needs of Florida and the nation.

Critical Tracking

Critical Tracking records each student's progress in courses that are required for progress toward each major. Please note the critical-tracking requirements below on a per-semester basis.

Equivalent critical-tracking courses as determined by the State of Florida Common Course Prerequisites (<https://cpm.flvc.org/advance-search/>) may be used for transfer students.

Semester 1

- 2.5 GPA in MAC 2311, MAC 2312 and MAC 2313 sequence based on the best of two attempts
- Complete 2 of 8 critical-tracking courses with a minimum grade of C within two attempts: CHM 2045 or CHM 2095, CHM 2046 or CHM 2096, COP 2273, MAC 2311, MAC 2312, MAC 2313, MAP 2302, PHY 2048
- 2.5 GPA required for all critical-tracking courses based on the best of two attempts
- 2.0 UF GPA required

Semester 2

- Complete 3 additional critical-tracking courses with a minimum grade of C within two attempts
- 2.5 GPA required for all critical-tracking courses based on the best of two attempts
- 2.5 GPA in MAC 2311, MAC 2312 and MAC 2313 sequence based on the best of two attempts
- 2.0 UF GPA required

Semester 3

- Complete the remaining critical-tracking courses with minimum grades of C within two attempts
- 2.5 GPA required for all critical-tracking courses based on the best of two attempts
- 2.5 GPA in MAC 2311, MAC 2312 and MAC 2313 sequence based on the best of two attempts
- Complete ECH 2934
- Complete ECH 3023
- 2.0 UF GPA required

Semester 4

- Complete at least 4 additional upper division critical-tracking courses (reference Model Semester Plan)
- 2.0 CHE GPA required
- 2.0 UF GPA required

Semester 5

- Complete at least 4 additional upper division critical-tracking courses
- 2.0 CHE GPA required
- 2.0 UF GPA required

Semester 6

- Complete at least 5 additional upper division critical-tracking courses
- 2.0 CHE GPA required
- 2.0 UF GPA required

Semester 7

- Complete at least 4 additional upper division critical-tracking courses
- 2.0 CHE GPA required
- 2.0 UF GPA required

Semester 8

- Complete all remaining upper division critical-tracking courses
- 2.0 CHE GPA required
- 2.0 UF GPA required

Model Semester Plan

To remain on track, students must complete the appropriate critical-tracking courses, which appear in bold. These courses must be completed by the terms as listed above in the Critical Tracking criteria.

This semester plan represents an example progression through the major. Actual courses and course order may be different depending on the student's academic record and scheduling availability of courses. Prerequisites still apply.

Course	Title	Credits
Semester One		
Quest 1 (Gen Ed Humanities) ^{1,2}		3
Select one:		4
CHM 2045 & 2045L	General Chemistry 1 and General Chemistry Laboratory (Critical Tracking ; State Core Gen Ed Physical Sciences)	
CHM 2095 & 2095L	Chemistry For Engineers 1 and Applied General Chemistry 1 Lab (Critical Tracking ; State Core Gen Ed Physical Sciences)	
MAC 2311	Analytic Geometry and Calculus 1 (Critical Tracking ; State Core Gen Ed Mathematics)	4
State Core Gen Ed Humanities (http://catalog.ufl.edu/UGRD/academic-programs/general-education/#genedcoursestext) ^{1,2}		3
State Core Gen Ed Social and Behavioral Sciences (http://catalog.ufl.edu/UGRD/academic-programs/general-education/#genedcoursestext) ^{1,2}		3
Credits		17
Semester Two		
BME 2402	Introduction to Biomolecular Engineering ³	3
Select one:		4
CHM 2046 & 2046L	General Chemistry 2 and General Chemistry 2 Laboratory (Critical Tracking ; State Core Gen Ed Biological and Physical Sciences)	
CHM 2096 & 2096L	Applied General Chemistry 2 and Applied General Chemistry 2 Lab (Critical Tracking ; State Core Gen Ed Biological and Physical Sciences)	
ENC 1101	Expository and Argumentative Writing (State Core Gen Ed Composition (http://catalog.ufl.edu/UGRD/academic-programs/general-education/#genedcoursestext))	3

MAC 2312	Analytic Geometry and Calculus 2 (Critical Tracking ; Gen Ed Mathematics)	4
PHY 2048 & 2048L	Physics with Calculus 1 and Laboratory for PHY 2048 (Critical Tracking ; Gen Ed Physical Sciences)	4
Credits		18
Semester Three		
COP 2273	Python Programming for Engineers (Critical Tracking)	3
ECH 2934	Professional Development of Chemical Engineers (Critical Tracking ; upper-division)	1
ECH 3023	Material and Energy Balances (Critical Tracking ; upper-division) ^{2,4}	4
MAC 2313	Analytic Geometry and Calculus 3 (Critical Tracking)	4
MAP 2302	Elementary Differential Equations (Critical Tracking)	3
Credits		15
Semester Four		
COT 3502	Computer Model Formulation (Critical Tracking ; upper-division) ^{2,4}	3
ECH 3101	Process Thermodynamics (Critical Tracking ; upper-division) ^{2,4}	4
ECH 3264	Elementary Transport Phenomena (Critical Tracking ; upper-division) ^{2,4}	2
PHY 2049 & 2049L	Physics with Calculus 2 and Laboratory for PHY 2049 (Gen Ed Physical Sciences)	4
STA 3032 or STA 2023	Engineering Statistics (Critical Tracking ; upper-division) or Introduction to Statistics 1	3
Credits		16
Semester Five		
CHM 2210	Organic Chemistry 1	3
ECH 3203	Fluid and Solid Operations (Critical Tracking ; upper-division) ^{2,4}	3
ECH 3223	Energy Transfer Operations (Critical Tracking ; upper-division) ^{2,4}	3
ECH 4123	Phase and Chemical Equilibria (Critical Tracking ; upper-division) ⁴	3
ENC 2256	Writing in the Disciplines (Critical Tracking ; upper-division; Gen Ed Composition)	3
Credits		15
Semester Six		
CHM 2211	Organic Chemistry 2	3
ECH 4224L	Fluid and Energy Transfer Operations Laboratory (Critical Tracking ; upper-division) ⁵	2
ECH 4403	Separation and Mass Transfer Operations (Critical Tracking ; upper-division) ⁴	3
ECH 4714	Chemical Process Safety (Critical Tracking ; upper-division)	3
Technical electives ³		4
Credits		15
Semester Seven		
CGN 3710 or EEL 3003	Experimentation and Instrumentation in Civil Engineering or Elements of Electrical Engineering	3
ECH 4404L	Separation and Mass Transfer Operations Laboratory	2
ECH 4504	Chemical Kinetics and Reactor Design (Critical Tracking ; upper-division) ⁴	4
ECH 4604	Process Economics and Optimization (Critical Tracking ; upper-division) ⁴	3
ECH 4824	Materials of Chemical Engineering (Critical Tracking ; upper-division) ⁴	2
Technical elective ³		3
Credits		17
Semester Eight		
Quest 2 (Gen Ed Social and Behavioral Sciences) ²		3
CHM 2211L	Organic Chemistry Laboratory	2
ECH 4323 & 4323L	Process Control Theory and Process Control Laboratory	4
ECH 4644	Process Design ^{4,6}	3
Chemical engineering technical elective		3
Credits		15
Total Credits		128

¹ To complete General Education requirements, a student must select a General Education course in the Humanities that features the UF Quest 1 subject area for 3 credits, a General Education course in the Social and Behavioral Science or Natural Science that features the UF Quest 2 subject area for 3 credits, and a General Education course that features the International subject area for 3 credits.

² Minimum grade of C required.

³ Students may replace BME 2402 and a 3-credit technical elective by BSC 2010 and BSC 2011 (pre-health students are required to take BSC 2010 and BSC 2011). Pre-health students are recommended to take BSC 2010 instead of BME 2402 in Semester Two and use 7 technical elective credits for some of the courses required by the pre-health program, BSC 2010L, BSC 2011, BSC 2011L, and BCH 4024 or CHM 3218.

⁴ Major Critical Path courses must be taken and completed in sequence.

⁵ Register for ECH 4224L immediately following completion of ECH 3101, ECH 3203, and ECH 3223.

Technical Electives

Technical electives are defined as department-approved, upper-division courses with significant technical science, engineering, and/or math content. Provision is made to receive up to five credits of approved co-op, internship and/or research experience with no more than three credits coming from industry work and no more than three coming from academic research. Military courses cannot be used for technical electives.

Academic Learning Compact

The Chemical Engineering program enables students to apply knowledge of mathematics, science, and engineering principles to chemical engineering problems; to design and conduct chemical engineering experiments and to analyze and interpret the data; to design a chemical engineering system, component or process to meet desired needs within realistic economic, environmental, social, political, ethical, health and safety, manufacturability and sustainability constraints; and to communicate technical data and design information effectively in speech and in writing to other chemical engineers.

The Chemical Engineering BS Program is accredited by the Engineering Accreditation Commission of ABET, <https://www.abet.org> (<https://nam10.safelinks.protection.outlook.com/?url=https%3A%2F%2Fwww.abet.org%2F&data=05%7C01%7CDMAYH%40eng.ufl.edu%7C71f1da0d2bb2405acf0908db1519ea82%7C0d4da0f84a314d76ace60a62331e1b84%7C0%7C0%7C638126973271573797%7CUnknown%7CTWFpbGZsb3d8eyJWljiMC4wLjAwMDAiLCJQIjoiV2luMzliLCJBTiI6IjEhaWwiLCJXVCi6Mn0%3D%7C3000%7C%7C&sdata=Dc6bpEcUU8fM3vMsOTj6pGPQgyLzoSeoS8v2s%2BFVnBE%3D&reserved=0>), under the General Criteria and the Program Criteria for Chemical, Biochemical, Biomolecular and Similarly Named Engineering Programs.

Before Graduating Students Must

- Pass an assessment by two or more faculty and/or industry practitioners of performance on a major design experience.
- Pass assessment in two courses of individual assignments targeted to each learning outcome. Assessment will be provided by the instructor of the course according to department standards.
- Complete an exit interview in your final semester.
- Complete requirements for the baccalaureate degree, as determined by faculty.

Students in the Major Will Learn to

Student Learning Outcomes | SLOs

Content

1. Apply knowledge of mathematics, science and engineering principles to chemical engineering problems.
2. Design and conduct chemical engineering experiments and analyze and interpret the data.

Critical Thinking

3. Design a chemical engineering system, component or process to meet desired needs within realistic economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability constraints.

Communication

4. Communicate technical data and design information effectively in writing and in speech to other chemical engineers.

Curriculum Map

I = Introduced; R = Reinforced; A = Assessed

Courses	SLO 1	SLO 2	SLO 3	SLO 4
ECH 2934				I
ECH 3023	I			
ECH 3101	R			
ECH 3203			I	
ECH 3264	R			
ECH 4224L		I, A		R
ECH 4323	A			
ECH 4403			R	

ECH 4404L		A		A
ECH 4504	A			
ECH 4604			A	
ECH 4644			A	A

Assessment Types

- Exams
 - Oral and written reports
 - Group presentations
 - Co-op and internship employer evaluations
 - Additional assessments include the student survey and exit interview
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