

# 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 mankind.

## 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:** 131

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

## Department Information

The work of the Department of Chemical Engineering 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 mankind.

Website (<https://www.che.ufl.edu/>)

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CHEMICAL ENGINEERING STUDENT CENTER (CESC)

GAINESVILLE FL 32611-2030

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 have earned a minimum grade point average in the better of two attempts of 2.5 in 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.

To proceed to succeeding courses, minimum grades of C are required in the following within two enrollments (including drops and/or withdrawals) for each course:

Code	Title	Credits
ECH 3023	Material and Energy Balances	4
ECH 3101	Process Thermodynamics	3
ECH 3203	Fluid and Solid Operations	3
ECH 3223	Energy Transfer Operations	3
ECH 3264	Elementary Transport Phenomena	3
COT 3502	Computer Model Formulation	4
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
ECH 4912	Integrated Product and Process Design 1	3
ECH 4948	Internship Work Experience	1
ECH 4949	Co-op Work Experience	1

## Educational Objectives

Within a few years of obtaining a bachelor's degree in chemical engineering from the University of Florida, the recent graduate 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.

The chemical industry alone provides an opportunity for the chemical engineer to participate in the research, development, design or operation of plants for the production of new synthetic fibers, plastics, chemical fertilizers, vitamins, antibiotics, rocket fuels, nuclear fuels, paper pulp, photographic products, paints, fuel cells, semiconductors and the thousands of chemicals that are used as intermediates in the manufacture of these products.

## 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 (<http://www.flvc.org/cpp/displayRecord.jsp?cip=140701&track=01>) 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, MAC 2311, MAC 2312, MAC 2313, MAP 2302, PHY 2048, PHY 2049
- 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 3023
- Complete ECH 4934
- 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
<b>Semester One</b>		
Quest 1 (Gen Ed Humanities)		3
ABE 2062 or BSC 2010	Biology for Engineers or Integrated Principles of Biology 1	3
Select one:		4
CHM 2045 & 2045L	General Chemistry 1 and General Chemistry 1 Laboratory ( <b>Critical Tracking</b> ; State Core Gen Ed Physical Sciences)	
CHM 2095 & 2095L	Chemistry for Engineers 1 and Chemistry Lab 1 for Engineers ( <b>Critical Tracking</b> ; State Core Gen Ed Physical Sciences)	
MAC 2311	Analytic Geometry and Calculus 1 ( <b>Critical Tracking</b> ; State Core Gen Ed Mathematics)	4
State Core Gen Ed Humanities ( <a href="http://catalog.ufl.edu/UGRD/academic-programs/general-education/#genedcoursestext">http://catalog.ufl.edu/UGRD/academic-programs/general-education/#genedcoursestext</a> ) <sup>2</sup>		3
		<b>Credits</b>
		<b>17</b>
<b>Semester Two</b>		
Select one:		4
CHM 2046 & 2046L	General Chemistry 2 and General Chemistry 2 Laboratory ( <b>Critical Tracking</b> ; State Core Gen Ed Biological and Physical Sciences)	
CHM 2096 & 2096L	Chemistry for Engineers 2 and Chemistry Lab 2 for Engineers ( <b>Critical Tracking</b> ; State Core Gen Ed Biological and Physical Sciences)	
ENC 1101	Expository and Argumentative Writing (State Core Gen Ed Composition ( <a href="http://catalog.ufl.edu/UGRD/academic-programs/general-education/#genedcoursestext">http://catalog.ufl.edu/UGRD/academic-programs/general-education/#genedcoursestext</a> ))	3
MAC 2312	Analytic Geometry and Calculus 2 ( <b>Critical Tracking</b> ; Gen Ed Mathematics)	4
PHY 2048 & 2048L	Physics with Calculus 1 and Laboratory for Physics with Calculus 1 ( <b>Critical Tracking</b> ; Gen Ed Physical Sciences)	4
State Core Gen Ed Social and Behavioral Sciences ( <a href="http://catalog.ufl.edu/UGRD/academic-programs/general-education/#genedcoursestext">http://catalog.ufl.edu/UGRD/academic-programs/general-education/#genedcoursestext</a> ) <sup>2</sup>		3
		<b>Credits</b>
		<b>18</b>
<b>Semester Three</b>		
ECH 3023	Material and Energy Balances ( <b>Critical Tracking</b> ; upper-division) <sup>2,3</sup>	4

ECH 4934	Professional Seminar ( <b>Critical Tracking</b> ; upper-division)	1
MAC 2313	Analytic Geometry and Calculus 3 ( <b>Critical Tracking</b> )	4
MAP 2302	Elementary Differential Equations ( <b>Critical Tracking</b> )	3
PHY 2049 & 2049L	Physics with Calculus 2 and Laboratory for Physics with Calculus 2 ( <b>Critical Tracking</b> ; Gen Ed Physical Sciences)	4
<b>Credits</b>		<b>16</b>
<b>Semester Four</b>		
CHM 4411 or PHY 3513	Physical Chemistry: Thermodynamics and Kinetics ( <b>Critical Tracking</b> ; upper-division) <sup>4</sup> or Thermal Physics 1	3-4
COT 3502	Computer Model Formulation ( <b>Critical Tracking</b> ; upper-division) <sup>2,3</sup>	4
ECH 3264	Elementary Transport Phenomena ( <b>Critical Tracking</b> ; upper-division) <sup>1</sup>	3
STA 3032 or STA 2023	Engineering Statistics ( <b>Critical Tracking</b> ; upper-division) or Introduction to Statistics 1	3
Technical elective		3
<b>Credits</b>		<b>16-17</b>
<b>Semester Five</b>		
CHM 2210	Organic Chemistry 1	3
ECH 3101	Process Thermodynamics ( <b>Critical Tracking</b> ; upper-division) <sup>2,3</sup>	3
ECH 3203	Fluid and Solid Operations ( <b>Critical Tracking</b> ; upper-division) <sup>2,3</sup>	3
ECH 3223	Energy Transfer Operations ( <b>Critical Tracking</b> ; upper-division) <sup>2,3</sup>	3
ENC 3246	Professional Communication for Engineers ( <b>Critical Tracking</b> ; upper-division; Gen Ed Composition)	3
<b>Credits</b>		<b>15</b>
<b>Semester Six</b>		
CHM 2211 & 2211L	Organic Chemistry 2 and Organic Chemistry Laboratory ( <b>Critical Tracking</b> ; upper-division)	5
ECH 4123	Phase and Chemical Equilibria ( <b>Critical Tracking</b> ; upper-division) <sup>3</sup>	3
ECH 4224L	Fluid and Energy Transfer Operations Laboratory ( <b>Critical Tracking</b> ; upper-division) <sup>5</sup>	2
ECH 4403	Separation and Mass Transfer Operations ( <b>Critical Tracking</b> ; upper-division) <sup>3</sup>	3
ECH 4714	Chemical Process Safety ( <b>Critical Tracking</b> )	3
<b>Credits</b>		<b>16</b>
<b>Semester Seven</b>		
CGN 3710 or EEL 3003	Experimentation and Instrumentation in Civil Engineering ( <b>Critical Tracking</b> ; upper-division) or Elements of Electrical Engineering	3
ECH 4404L	Separation and Mass Transfer Operations Laboratory	2
ECH 4504	Chemical Kinetics and Reactor Design ( <b>Critical Tracking</b> ; upper-division) <sup>3</sup>	4
ECH 4604	Process Economics and Optimization ( <b>Critical Tracking</b> ; upper-division) <sup>3</sup>	3
ECH 4824	Materials of Chemical Engineering ( <b>Critical Tracking</b> ; upper-division) <sup>3</sup>	2

Technical elective		3
<b>Credits</b>		<b>17</b>
<b>Semester Eight</b>		
Quest 2 (Gen Ed Social and Behavioral Sciences) <sup>2</sup>		3
ECH 4323 & 4323L	Process Control Theory and Chemical Engineering Laboratory 5	4
ECH 4644	Process Design <sup>4,3,6</sup>	3
Chemical engineering technical elective		3
Technical elective		3
<b>Credits</b>		<b>16</b>
<b>Total Credits</b>		<b>131-132</b>

- Students are also expected to complete the General Education International and Diversity requirements. This is often done concurrently with another General Education requirement (typically Gen Ed Composition, Gen Ed Humanities, or Gen Ed Social and Behavioral Sciences).
- Minimum grade of C required.
- Major Critical Path courses must be taken and completed in sequence.  
More Info (<http://www.che.ufl.edu/>)
- If the Physical Chemistry Topics 3 credit requirement is satisfied by a 4 credit course, the additional credit satisfies 1 credit of the Technical elective requirement.
- Register for ECH 4224L immediately following completion of ECH 3101, ECH 3203, and ECH 3223.
- The Integrated Product and Process Design program (EGN 4951 and ECH 4952) requires six credits of coursework and is offered as a sequence of two three-credit courses during fall and spring of the senior year. These two courses are pre-approved substitutes for three credits of technical electives and for ECH 4644.

## 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.

Accredited by the Engineering Accreditation Commission of ABET, <http://www.abet.org> ([https://urldefense.proofpoint.com/v2/url?u=http-3A\\_\\_www.abet.org&d=DwMGaQ&c=pZJPUDQ3SB9JpIYbifm4nt2IEVG5pWx2HBF73BYn6kEY-D7Qfs6kPA&m=-KF2G1JwsXcME70kGBMIRYTy2i4YuqEwzRran98WV1M&s=73PhSd8hcuNu3AXlyLst](https://urldefense.proofpoint.com/v2/url?u=http-3A__www.abet.org&d=DwMGaQ&c=pZJPUDQ3SB9JpIYbifm4nt2IEVG5pWx2HBF73BYn6kEY-D7Qfs6kPA&m=-KF2G1JwsXcME70kGBMIRYTy2i4YuqEwzRran98WV1M&s=73PhSd8hcuNu3AXlyLst))

ABET EAC Program Educational Objectives, Student Outcomes, and Enrollment and Graduation Numbers can be found on the college website (<https://www.eng.ufl.edu/academics/degree-programs/accreditation/>).

## 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 3101	A			
ECH 3223	A		I	
ECH 4224L		I		
ECH 4404L		I		
ECH 4644			A	A
ECH 4934				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
-