# CHEMICAL ENGINEERING

Not all courses are offered every semester. Refer to the schedule of courses for each term's specific offerings.
More Info (https://one.uf.edu/soc/)

*Unless otherwise indicated in the course description, all courses at the University of Florida are taught in English, with the exception of specific foreign language courses.*

## Department Information

The Department of Chemical Engineering  has over 100 years of history and tradition in excellence in chemical engineering education. The department's faculty possess a broad range of expertise spanning such fields as biomolecular engineering, advanced materials and devices, sustainability, and energy, among other areas. The undergraduate chemical engineering program combines rigorous coursework with hands-on laboratory experience to prepare students for successful careers in various industries.
**Website (https://www.che.ufl.edu/)**

### CONTACT

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### Curriculum

- Biomolecular Engineering Minor
- Chemical Engineering
- Combination Degrees

## Courses

**BME 2402 Introduction to Biomolecular Engineering 3 Credits**
**Grading Scheme:** Letter Grade
Introduces bio-related careers in chemical engineering, providing foundational knowledge in molecular cell biology and biochemistry for early undergraduate students. Highlights the connections between biology and chemical engineering, helping students understand interdisciplinary concepts that are essential for biomolecular engineering
**Prerequisite:** (Sophomore Standing or Chemical Engineering Major) & (CHM 2045 or CHM 2095 or CHM 2050).
**Corequisite:** CHM 2046 or CHM 2096 or CHM 2051.

**BME 4220 Biomolecular Cell Mechanics 3 Credits**
**Grading Scheme:** Letter Grade
Covers the biomolecular basis of cell mechanics and cell motility, emphasizing quantitative models and systems-biology approaches.
**Prerequisite:** PHY 2048.

**BME 4321 Dynamics of Cellular Processes 3 Credits**
**Grading Scheme:** Letter Grade
Confocal florescence microscopy, techniques for imaging macromolecular dynamics and interactions inside living cells, models of intracellular diffusion, models of ligand-receptor binding, interplay between binding and transport, modeling and analysis of experiments. Examples from literature include mRNA transport, nuclear pore dynamics, cytoskeletal dynamics, imaging motor proteins and transcription factor dynamics.
**Prerequisite:** a course on kinetics and/or transport, or instructor permission.

**COT 3502 Computational Methods for Chemical Engineers 3 Credits**
**Grading Scheme:** Letter Grade
Solutions of scientific and engineering problems using digital computers. Formulation of models for describing physical processes, numerical analysis, and computer programming.
**Prerequisite:** COP 2273 with a grade of C or better and MAP 2302 and MAC 2313.

**ECH 2934 Professional Development of Chemical Engineers 1 Credit**
**Grading Scheme:** Letter Grade
Introduces the Chemical Engineering profession and a wide range of careers, including chemical, energy, pharmaceutical, semiconductor, and food industries, as well as graduate and professional school pathways. Provides resources to build successful professional careers, including best practices for interviewing, oral presentations, and teamwork. Also discusses professional codes of conduct and ethical decision-making.

**ECH 3023 Material and Energy Balances 4 Credits**
**Grading Scheme:** Letter Grade
Formulation and solution of material and energy balances utilizing physical/chemical properties of matter as applied to analyzing unit operations systems.
**Prerequisite:** (CHM 2045 or CHM 2095 or CHM 2050) & MAC 2312 & PHY 2048;
**Corequisite:** (CHM 2046 or CHM 2096 or CHM 2051) & MAC 2313 & MAP 2302 & ECH 2934

**ECH 3101 Process Thermodynamics 4 Credits**
**Grading Scheme:** Letter Grade
Introduces fundamental principles of classical and statistical thermodynamics. Application of the first and second laws of thermodynamics to the modeling and analysis of physical and chemical processes undergoing change, such as liquefaction, refrigeration, and power generation.
**Prerequisite:** COP 2273 and ECH 3023.
**Corequisite:** COT 3502.

**ECH 3203 Fluid and Solid Operations 3 Credits**
**Grading Scheme:** Letter Grade
Characteristics of laminar and turbulent flow, mechanical energy balance, flow through packed beds and fluidization of solids, design of pumping systems and piping networks and metering of fluids.
**Prerequisite:** COT 3502 and ECH 3264.

**ECH 3223 Energy Transfer Operations 3 Credits**
**Grading Scheme:** Letter Grade
Steady state conduction in solids and heterogeneous materials, transient conduction, convection heat transfer, heat transfer during boiling and condensation, radiation heat transfer, design of heat-transfer equipment and heat exchange networks.
**Prerequisite:** COT 3502 and ECH 3264.

**ECH 3264 Elementary Transport Phenomena 2 Credits**
**Grading Scheme:** Letter Grade
Flux law and conservation equations of mass, energy, and momentum; solution of transport problems associated with physical and chemical processing; macroscopic and microscopic analysis.
**Prerequisite:** ECH 3023 and MAP 2302 and MAC 2313.

**ECH 4123 Phase and Chemical Equilibria 3 Credits**
**Grading Scheme:** Letter Grade
Application of thermodynamic principles to systems of variable composition, including the study of phase and chemical equilibria.
**Prerequisite:** ECH 3101.

**ECH 4224L Fluid and Energy Transfer Operations Laboratory 2 Credits**
**Grading Scheme:** Letter Grade
Laboratory work in unit operations involving heat and momentum transfer.
**Prerequisite:** ECH 3101 and ECH 3203 and ECH 3223 and STA 3032 or STA 2023;
**Corequisite:** ECH 4714 and ENC 2256.
**Attributes:** Satisfies 6000 Words of Writing Requirement

**ECH 4323 Process Control Theory 3 Credits**
**Grading Scheme:** Letter Grade
Analysis and automatic control of process systems in chemical engineering.
**Prerequisite:** COT 3502.
**Corequisite:** ECH 4323L.

**ECH 4323L Process Control Laboratory 1 Credit**
**Grading Scheme:** Letter Grade
Laboratory work associated with ECH 4323.
**Prerequisite:** COT 3502.
**Corequisite:** ECH 4323.

**ECH 4403 Separation and Mass Transfer Operations 3 Credits**
**Grading Scheme:** Letter Grade
Theory, design, and evaluation of diffusional and staged mass transfer processes including distillation, absorption and extraction, leaching, and membrane separations. Computer-aided design methods.
**Prerequisite:** ECH 3101 and ECH 3203 and ECH 3223.

**ECH 4404L Separation and Mass Transfer Operations Laboratory 2 Credits**
**Grading Scheme:** Letter Grade
Laboratory work in unit operations involving mass transfer. (WR)
**Prerequisite:** ECH 4403 and ECH 4224L and ECH 4714.
**Attributes:** Satisfies 6000 Words of Writing Requirement

**ECH 4504 Chemical Kinetics and Reactor Design 4 Credits**
**Grading Scheme:** Letter Grade
Homogeneous and heterogeneous reaction kinetic modeling and data analysis. Analysis and design of ideal batch, mixed, plug and recycle reactors. Heterogeneous catalysis and reactor design.
**Prerequisite:** ECH 3264 and ECH 4123.

**ECH 4524 Heterogeneous Chemical Kinetics Reactor Design 2 Credits**
**Grading Scheme:** Letter Grade
Theories of catalytic reactions of adsorbed species at solid surfaces, development or rate expressions with heat and mass transport properties through porous catalyst materials for design of heterogeneous chemical reactors.
**Prerequisite:** ECH 4504.

**ECH 4604 Process Economics and Optimization 3 Credits**
**Grading Scheme:** Letter Grade
Introduces the principles of process economics including specifications and costing of equipment, operations costing and economic evaluation of processes.
**Prerequisite:** ECH 3203 and ECH 3223;
**Corequisite:** ECH 4403.

**ECH 4644 Process Design 3 Credits**
**Grading Scheme:** Letter Grade
Preliminary design of convention chemical processes including process specifications, sitting and layout, equipment sizing, utility and manpower needs, safety and hazard analysis, environmental considerations and economic evaluation. Planning techniques for detailed engineering, construction and startup.
**Prerequisite:** ECH 4403 and ECH 4504 and ECH 4604 and ECH 4824.

**ECH 4714 Chemical Process Safety 3 Credits**
**Grading Scheme:** Letter Grade
Laboratory and process safety analysis which emphasizes prevention and mitigation. Application of chemical engineering principles to assessing hazards and risk.
**Prerequisite:** ECH 3101, ECH 3203 and ECH 3223.

**ECH 4742 Bioprocess Engineering and Bioseparations 3 Credits**
**Grading Scheme:** Letter Grade
Key concepts of bioprocess engineering and bioseparations needed for chemical engineers to succeed in the pharmaceutical industry, the food/beverage industry, and bio-based processes for energy production. Topics include enzymes and enzyme kinetics, growth rates, fermentation, batch processing and batch reactors, and bioactive molecule separation (filtration, gel electrophoresis, chromatography, and other forms of bioseparations for cell, protein, gene, antibody, and viral therapies).
**Prerequisite:** (ECH3023 or BME3060) & BME 2402.

**ECH 4744 Pharmaceutical Bioengineering 3 Credits**
**Grading Scheme:** Letter Grade
Introduces concepts, challenges, and technologies in the modern pharmaceutical industry and laboratory, focused on biologics (drugs derived from living organisms).
**Prerequisite:** (BME 2402 or BSC 2010) & (CHM 2046 or CHM 2096 or CHM 2051).

**ECH 4824 Materials of Chemical Engineering 2 Credits**
**Grading Scheme:** Letter Grade
Relations between microscopic structure and macroscopic mechanical, thermal and electrical properties of organic and inorganic solids. Engineering applications, including corrosion.
**Prerequisite:** ECH 3264

**ECH 4827 Processing of Complex Fluids 3 Credits**
**Grading Scheme:** Letter Grade
Principles involved in quantitative adoption of chemical engineering unit operations and unit processes for the analysis and design of systems involving complex fluids.
**Prerequisite:** (ECH 3203 and ECH 3223 and ECH 4123 and ECH 4824) or instructor permission.

**ECH 4905 Special Problems in Chemical Engineering 1-6 Credits**
**Grading Scheme:** Letter Grade
Study of chemical engineering problems as identified by the student and instructor.
**Prerequisite:** Engineering major.

**ECH 4912 Integrated Product and Process Design 1 3 Credits**
**Grading Scheme:** Letter Grade
The first part of a two-course sequence in which multidisciplinary teams of engineering and business students partner with industry sponsors to design and build authentic product and processes, on time and within budget. Working closely with industry liaison engineers and a faculty coach, students gain practical experience in teamwork and communication, problem solving and engineering design, and develop leadership, management and people skills.
**Prerequisite:** senior standing.

**ECH 4913 Integrated Product and Process Design 2 3 Credits**
**Grading Scheme:** Letter Grade
The second part of a two-course sequence in which multidisciplinary teams of engineering and business students partner with industry sponsors to design and build authentic product and processes, on time and within budget. Working closely with industry liaison engineers and a faculty coach, students gain practical experience in teamwork and communication, problem solving and engineering design, and develop leadership, management and people skills.
**Prerequisite:** senior standing.

**ECH 4944 Practical Work in Chemical Engineering 1-5 Credits**
**Grading Scheme:** Letter Grade
One term industrial employment, including extra work according a pre-approved outline. Practical engineering work under industrial supervision as set forth in college regulations.
**Prerequisite:** Engineering major.

**ECH 4948 Internship Work Experience 0-3 Credits**
**Grading Scheme:** S/U
Practical internship work experience under approved industrial supervision, as set forth in college regulations. A maximum of 3 credits from ECH 4948 and ECH 4949 can count towards the Chemical Engineering degree. For example, a student who has earned 1 credit of ECH 4949, can only have 2 credits of ECH 4948 count towards the degree.
**Prerequisite:** Engineering major.

**ECH 4949 Co-op Work Experience 0-3 Credits**
**Grading Scheme:** S/U
Practical co-op work experience under approved industrial supervision, as set forth in college regulations. A maximum of 3 credits from ECH 4949 and ECH 4948 can count towards the Chemical Engineering degree. For example, a student who has earned 1 credit of ECH 4948, can only have 2 credits of ECH 4949 count towards the degree.
**Prerequisite:** Engineering major.

**EGN 1935 Special Topics in Freshman Engineering 1-3 Credits**
**Grading Scheme:** Letter Grade
Laboratory, lectures or conferences cover selected topics in engineering.

**EGN 4912 Engineering Directed Independent Research 0-3 Credits**
**Grading Scheme:** S/U
Provides firsthand, supervised research with a faculty advisor or postdoctoral or graduate student mentor. Projects may involve inquiry, design, investigation, scholarship, discovery, or application.
**Prerequisite:** Department permission.