CHEMICAL AND BIOMOLECULAR ENGINEERING

Department Information

(251) 460-6160

Department of Chemical and Biomolecular Engineering website
https://www.southalabama.edu/colleges/engineering/chbe/index.html (https://www.southalabama.edu/colleges/engineering/chbe/)

Department of Chemical and Biomolecular Engineering Staff

Title	Name
Interim Chair	Silas Leavesley
Professors	Glover, Leavesley, West
Associate Professors	Rabideau, Wheeler
Assistant Professors	Dennis, Walker

Chemical Engineering is a profession in which knowledge of mathematics, chemistry, biology and other natural sciences gained by study, experience, and practice is applied with judgment to develop economical ways of using material and energy for the benefit of mankind. The program required for the degree of Bachelor of Science in Chemical Engineering provides fundamental instruction in mathematics, chemistry, biology, physics, and engineering. This education prepares the graduate to seek employment in petrochemical, pharmaceutical, healthcare, microelectronics, polymers, energy and environmental industries. In addition, the graduate is well-prepared to pursue graduate school.

All electives must be approved by the student's advisor. Degree requirements include a minimum of 18 semester hours of approved electives in the Humanities and Social Sciences.

Satisfactory completion of the 126 hour program outlined below leads to the degree of Bachelor of Science in Chemical Engineering. Students must also comply with the College of Engineering Requirements for a Degree, which are covered in the Bulletin under the College of Engineering.

BSChE Program Educational Objectives

The educational objectives of the Department of Chemical & Biomolecular Engineering's undergraduate program are that, within a few years of program completion, graduates will have used the knowledge and skills gained through academic preparation and post-graduation experience so they have:

1. Advanced in the chemical engineering profession and applied engineering knowledge and problem-solving skills to multi-disciplinary projects.
2. Incorporated economic environmental, social, regulatory, constructability, safety, and sustainability considerations into the practice of chemical engineering.
3. Exhibited effective communication skills, teamwork, leadership, initiative, project management, and professional and ethical behavior.
4. Continued their technical and professional development, which may include graduate level education, continuing education, and participation in professional organizations.

BSChE Student Outcomes

By the time of graduation from the BSChE program, a student will have demonstrated attainment of the following outcomes:

1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.
3. an ability to communicate effectively with a range of audiences
4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgements, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.
5. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.
6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgement to draw conclusions.
7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

The BSChE curriculum is designed to ensure the attainment of the student outcomes.

The Bachelor of Science degree program in Chemical Engineering at the University of South Alabama is accredited by the Engineering Accreditation Commission of ABET, https://www.abet.org, under the General Criteria and the Program Criteria for Chemical, Biochemical, Biomolecular and similarly named Engineering programs.

BSChE Accelerated Bachelor's to Master's (ABM) Degree Option

The USA Accelerated Bachelor's to Master's (ABM) in Chemical and Biomolecular Engineering provides exceptional undergraduate students the opportunity to earn a bachelor's and a master's degree at an accelerated pace. ABM students may count up to 12 credit hours of graduate coursework towards either the undergraduate or graduate degrees in Chemical and Biomolecular Engineering. ABM students typically complete the master's degree within one academic year after completing the undergraduate degree. See a departmental advisor for specific details.

BSChE Departmental Honors Designation

To receive a designation of "Departmental Honors," students must:

1. successfully complete 4 to 6 credit hours of Honors Senior Project in Chemical Engineering (CHE 499).
2. have at least a 3.50 GPA overall at the time of graduation.
3. have both submitted a written report and made an oral presentation of the Honors Senior Project in keeping with the expectations of the Honors College (https://www.southalabama.edu/colleges/honors/seniorproject.html).

See a departmental advisor for specific details.

Degrees, Programs, or Concentrations

- Chemical Engineering (BS) (http://bulletin.southalabama.edu/programs-az/engineering/chemical-biomolecular-engineering/chemical-engineering-bs/)
- Chemical Engineering (MS) (http://bulletin.southalabama.edu/programs-az/engineering/chemical-biomolecular-engineering/chemical-engineering-ms/)

Courses

CHE 190 Special Topics - 1-5 cr
Topics of current Chemical Engineering interest. Requires permission of department chair.

CHE 201 CHE Fundamentals I 3 cr
Formulation of material balances and relations involving real gases, vapors, liquids, and solids. Prerequisites: CH 132. Corequisite: MA 126.
Prerequisite: (CH 116 Minimum Grade of D or CH 132 Minimum Grade of D) and (MA 126 (may be taken concurrently) Minimum Grade of D or MA 233 Minimum Grade of D)

CHE 202 CHE Fundamentals II 3 cr
Formulation of energy balance and combined material and energy balances for steady-state processes. Prerequisites: CHE 201. Corequisites: BLY 121. Fee
Prerequisite: CHE 201 Minimum Grade of D and (BLY 121 (may be taken concurrently) Minimum Grade of D or BLY 141 Minimum Grade of D)

CHE 203 Material and Energy Balances 4 cr
Application of multicomponent material and energy balances to chemical processes involving phase changes and chemical reactions. Minimum grade of 'C' is required and only 2 attempts are permitted. Fee
Prerequisite: CH 132 Minimum Grade of C and CH 132L Minimum Grade of C and MA 126 Minimum Grade of C and (EH 101 Minimum Grade of C or EH 105 Minimum Grade of C or ACT English 27 or SAT Critical Reading 610 or READING TEST SCORE 33 or University - EH101 Exempt P)

CHE 232 Chemical Engr Thermodynamics I 3 cr
Applications of the First and Second Law. Estimation of fluid properties and heat effects. Thermodynamic analysis of meters, throttles, nozzles, and compressors.
Prerequisite: (PH 201 Minimum Grade of D or PH 216 Minimum Grade of D) and (MA 227 Minimum Grade of D or MA 234 Minimum Grade of D) and (CHE 201 Minimum Grade of D)

CHE 290 Special Topics - 1-5 cr
Topics of current chemical engineering interest. Requires consent of department chair.

CHE 301 CHE Calculations III - C 3 cr
Material and energy balance process calculations emphasizing applied statistics utilizing computer programming concepts, spreadsheets, and modern mathematical computer tools.
Prerequisite: CHE 202 Minimum Grade of D

CHE 311 CHE Separations I 3 cr
Applications of material balances and equilibrium relations to equilibrium stage design. Design of single stages and cascades for absorption, stripping, distillation, liquid-liquid extraction, and bioseparations.
Prerequisite: CHE 203 Minimum Grade of C
Corequisite: CHE 331

CHE 321 Transport Phenomena I 3 cr
Fundamentals of momentum transfer with applications in fluid flow through pipes and process equipment.
Prerequisite: MA 238 Minimum Grade of C and CHE 203 Minimum Grade of C and PH 201 Minimum Grade of C

CHE 322 Transport Phenomena II 3 cr
Fundamentals of conductive, convective, and radiative modes of heat transfer with applications in the design of heat exchanges.
Prerequisite: CHE 321 Minimum Grade of C

CHE 331 CHE Thermodynamics I 3 cr
This course introduces the fundamentals of thermophysical property estimation and modeling of non-ideal pure and multicomponent fluid systems, including an introduction to multicomponent vapor/liquid equilibria.
Prerequisite: CH 201 Minimum Grade of C and CHE 203 Minimum Grade of C and MA 238 Minimum Grade of C and CH 201L Minimum Grade of C and PH 201 Minimum Grade of C
Corequisite: CHE 351

CHE 332 CHE Thermodynamics II 3 cr
This class is an advanced thermodynamics course that uses a molecular level viewpoint to introduce students to applications of thermodynamics principles to complex chemical engineering problems including multicomponent, non-ideal fluid phase equilibria (VLE, VLLE, SLE), and chemical reaction equilibria. The concepts of chemical potential, fugacity, partial molar and excess properties as well as complex activity coefficient models are introduced to solve these problems.
Prerequisite: CHE 331 Minimum Grade of C
Corequisite: CHE 352

CHE 342 Engineering Communication - W 3 cr
Formal and informal reports, oral presentations, and visual aids.
Prerequisite: EH 102 Minimum Grade of C or EH 105 Minimum Grade of C
Corequisite: CHE 352

CHE 351 Modeling Lab 1 cr
Computational tools and numerical methods for solving chemical engineering problems.
Corequisite: CHE 311, CHE 331

CHE 352 Measurement Lab 1 cr
Laboratory practices for measurement of reaction and phase change parameters. Statistical tools for assessing experimental data.
Prerequisite: CHE 351 Minimum Grade of C
Corequisite: CHE 332, CHE 372

CHE 363 Simulation of Chemical Process 3 cr
In this course, students utilize modern software tools, such as Aspen Plus, to model steady rate chemical processes. Simulation topics include physical property selection, flowsheet generation, separations, and reactors.
Prerequisite: CHE 311 Minimum Grade of C
Corequisite: CHE 332, CHE 372

CHE 372 Chemical Reactor Design 3 cr
Fundamentals of systems involving chemical reactions, including batch and flow systems. Design of thermal and catalytic systems with single and multiple reactions. Analysis of kinetic data and mechanisms.
Prerequisite: CHE 331 Minimum Grade of C
Corequisite: CHE 322, CHE 332

CHE 390 Special Topics - 1-5 cr
Topics of current chemical engineering interest. Requires consent of department chair.

CHE 421 CHE Separations II 3 cr
Fundamentals of mass transfer. Mass, energy, and momentum transfer analogies. Design of mass transfer equipment.
Prerequisite: CHE 311 Minimum Grade of C and CHE 322 Minimum Grade of C

CHE 441 Chem Engr Ops Lab I-W 2 cr
Laboratory Studies of the unit operations of chemical engineering with emphasis on momentum and heat transfer.
Prerequisite: CHE 322 Minimum Grade of C and CHE 351 Minimum Grade of C and CHE 352 Minimum Grade of C and (CHE 342 Minimum Grade of C or CHE 363 Minimum Grade of C)

CHE 442 Chem Engr Ops Lab II - W 2 cr
Laboratory studies of the unit operations of chemical engineering with emphasis on stage-wise and differential contactors.
Prerequisite: CHE 441 (may be taken concurrently) Minimum Grade of C and CHE 311 Minimum Grade of C and CHE 421 Minimum Grade of C

CHE 451 Process Models 3 cr
Mathematical modeling, simulation, and dynamics of chemical process systems for design and analysis.
Prerequisite: CHE 322 Minimum Grade of C

CHE 452 Process Dynamics and Control 3 cr
Mathematical modeling, simulation and dynamics of chemical process systems. Feedback and Feed-forward control of chemical processes. Specification of control loops. Selection and tuning of controller modes.
Prerequisite: CHE 372 Minimum Grade of C

CHE 461 Process Design I 3 cr
Engineering economics and elements of process design, including energy and material balances, manufacturing and product cost. Unit operation equipment sizing, and cost. This course is considered a "Senior Capstone Design" course.
Prerequisite: EG 231 Minimum Grade of C and CHE 332 Minimum Grade of C and CHE 372 Minimum Grade of C and (CHE 342 Minimum Grade of C or CHE 363 Minimum Grade of C)

CHE 462 Process Design II 3 cr
Selection, design and specification of principal chemical processes. This course is considered a "Senior Capstone Design" course.
Prerequisite: CHE 461 Minimum Grade of C

CHE 490 Special Topics 1-3 cr
Topics of current chemical engineering interest. Requires consent of department chair or departmental approval.

CHE 494 Directed Studies 1-3 cr
Directed study, under the guidance of a faculty advisor, of a topic from the field of chemical engineering, not offered in a regularly scheduled course. A written report is required. May be repeated for a maximum of 6 credit hours. Requires consent of the department chair and minimum GPA of 3.00 for admission or departmental approval.

CHE 499 Honors Senior Project 1-6 cr
Under the advice and guidance of a faculty mentor, honors students will identify and carry out a research project, relevant to the field of chemical engineering. The senior project will be judged and graded by three faculty chaired by the honors mentor. This course is required for Honors recognition. A minimum of 4 credit hours is required, but students may enroll for a maximum of 6 credit hours over two semesters. Requires completion of an approved project prospectus.
Prerequisite: CHE 322 Minimum Grade of C and CHE 332 Minimum Grade of C

CHE 501 Chemical Engineering Seminar 1 cr
A weekly research seminar for Chemical Engineering graduate students. Students will attend research presentations by faculty, invited speakers and other students rehearsing for their proposal presentations, thesis defenses or conference presentations. Topics will include research, research methods, safety and responsible conduct of research.

CHE 510 Adv Chemical Thermodynamics 3 cr
Advanced classical and molecular thermodynamics as applied to non-ideal multicomponent phase and reaction equilibria for chemical engineering applications. An introduction to statistical thermodynamics will also be given.

CHE 520 Adv Transport Phenomena I 3 cr
An advanced treatment of the principles and methods of transport phenomena. Detailed coverage of several key aspects of energy and momentum transfer including creeping flows, boundary layers and lubrication theory.

CHE 521 Adv Transport Phenomena II 3 cr
An advanced treatment of the principles and methods of mass transfer, diffusion and adsorption phenomena. Coverage of conservation equations, mass transfer at interfaces and boundary conditions. Includes coverage of adsorption and diffusion on surfaces, porous structures and membranes.

CHE 525 Chemical Reactor Analysis 3 cr
Design, modeling and analysis of non-ideal chemical reactor systems. Includes effects of mass transfer in heterogeneous catalytic reactors, non-steady-state heat transfer and residence time distributions.

CHE 530 Synthetic Fuels 3 cr
Fundamentals of gasification and liquefaction concepts applied to fossil fuels and biomass conversion.

CHE 540 Distillation 3 cr
Analysis and design of separation units for multicomponent nonideal systems.

CHE 550 Chemical Process Control 3 cr
Sampled-data algorithms, feedback, feedforward, deadtime compensation, advanced control schemes applied to chemical engineering processes.

CHE 551 Adv Chem Engineering Modeling 3 cr
Advanced mathematical modeling of chemical process systems for design and analysis.

CHE 560 Mixing and Agitation 3 cr
Analysis and design of single-phase and multiple-phase mixing units.

CHE 563 Simulation of Chem Processes 3 cr
In this course, students utilize modern software, tools, such as Aspen Plus, to model steady state chemical processes. Simulation topics include physical property selection, flowsheet generation, separations and reactors.
Cross-Listed: CHE 463

CHE 570 Separation Processes 3 cr
Analysis and design of separation processes. Topics include molecular diffusion and convective mass transfer with applications in the chemical, petroleum and pharmaceutical industries.

CHE 575 Chem Proc Synth Optimization 3 cr
Use of analysis, synthesis, and optimization in process development.

CHE 580 Chem Process Safety and Design 3 cr
Fundamental principles of chemical process safety, fires and explosions and design for the mitigation of associated hazards.

CHE 590 Special Topics - 3 cr
Topics of current chemical engineering interest. Requires consent of the department chair or departmental approval.

CHE 592 Directed Independent Study 1-6 cr
Directed study, under the guidance of a faculty advisor, of a topic from the field of chemical engineering, not offered in a regularly scheduled course. A written report is required. Requires consent of the department chair and overall minimum GPA of 2.5 for admission or departmental approval.

CHE 594 Project in Chem Engineering 3 cr
Approved investigation of original problems under direction of a faculty member. Requires approved prospectus.

CHE 599 Thesis 1-6 cr
May be taken more than once. Only 6 hours may be applied for credit toward a degree. Requires approved prospectus.

Faculty

Faculty Name	Faculty Department	Faculty Position	Degrees Held
DENNIS, GRAYSON P (gpdennis@southalabama.edu)	Chemical-Biomolecular Eng	Assistant Professor	BS, University of Alabama MS, University of Alabama PHD, University of Alabama
GLOVER, THOMAS G. (glover@southalabama.edu)	Chemical-Biomolecular Eng	Professor	BS, Georgia Inst of Tech - Main PHD, Vanderbilt University
LEAVESLEY, SILAS J. (leavesley@southalabama.edu)	Chemical-Biomolecular Eng	Professor	BS, Florida State University PHD, Purdue University-Main Campus
RABIDEAU, BROOKS D. (brabideau@southalabama.edu)	Chemical-Biomolecular Eng	Associate Professor	BS, Northwestern University PHD, University of Texas- Austin
USHER, JOHN MARK (usher@southalabama.edu)	Chemical-Biomolecular Eng	Professor	BS, University of Florida MS, Louisiana State University MS, Louisiana State University PHD, Louisiana State University
WALKER, SEAN (seanwalker@southalabama.edu)	Chemical-Biomolecular Eng	Assistant Professor	MAS, Univ of Waterloo BAS, Univ of Waterloo PHD, Univ of Waterloo
WEST, CHRISTY WHEELER (cwwest@southalabama.edu)	Chemical-Biomolecular Eng	Associate Professor	BS, University of Alabama PHD, Georgia Inst of Tech - Main
WEST, KEVIN NEAL (kevinwest@southalabama.edu)	Chemical-Biomolecular Eng	Professor	BS, University of Virginia PHD, Georgia Inst of Tech - Main