CHEMICAL ENGINEERING, BSCHE

Chemical engineering students have strong interests in math, chemistry, physics, and biology. These subjects are often combined and encountered throughout our curriculum. Overall, chemical engineering students are curious about how and why things work, and they have a desire to invent new ways to improve existing technology.

The BSChE degree is a professional degree that prepares graduates for employment and graduate study in chemical engineering and related fields, as well as entry into professional programs such as medicine, dentistry, law, and business.

Chemical engineers apply economics, chemistry, biology, physics, and mathematics to the design and operation of processes and to the research and development of new materials, processes, and systems. The many and varied issues associated with going from concept to demonstration to operation of processes and equipment all fall within the province of chemical engineering. Chemical engineers are as comfortable with plant operations, research and development projects, synthesis of alternative fuels, energy conservation and conversion, process design, optimization and control, environmental conservation and pollution prevention, as they are with the exciting fundamental studies associated with biotechnology, nanotechnology, electrochemical technology, and other areas yet to be discovered.

The BSChE degree and curriculum place strong emphasis on the basic sciences, but a vital feature remains the high degree of confidence and practical ability gained from laboratory and design courses. Laboratories include equipment needed to study and demonstrate heat, mass, and momentum transfer; material and energy balances; process dynamics and control; chemical reaction systems, and thermodynamics. The laboratory courses cover fundamental principles to reinforce the basic courses within the chemical engineering curriculum, while also containing pilot scale process units and other pieces of equipment that allow students to build, operate, and analyze results collected during their operation. The Chemical and Biological Engineering High Bay Facility provides state-of-the-art visualization equipment for research and instruction in continuous and batch distillation and reaction engineering. Individual faculty member research laboratories give students the opportunity to work one-on-one with faculty in special problems courses.

The Chemical and Biological Engineering Design component of this curriculum includes development of student creativity, use of open-ended problems, development and use of modern design theory and methodology, formulation of design problem statements and specifications, consideration of alternative solutions, feasibility analyses, concurrent engineering design, technical research, and detailed system descriptions. The introduction of realistic constraints, such as economic factors, safety, reliability, aesthetics, ethics and environmental and social impacts, are used to fully develop each design experience.

Accreditation

Information can be found on Department website.

Special Features

While the baccalaureate degree curriculum contains many courses designed to sequentially introduce students to methodologies for understanding, defining, and solving a broad array of increasingly complex problems, there are elements in the program that also allow students to investigate exciting and challenging issues that often exist at the intersections where engineering and the sciences meet. Some of the elective and special program options are described below.

Students earning the Bachelor of Science in Chemical Engineering (BS) degree must complete all University, College and departmental degree requirements for a total of 128 credit hours. These include General Education requirements and the following major requirements and ancillary requirements. Additional information, including a semester-by-semester flowchart of degree requirements, can be found on the departmental website. Students completing the Bachelor of Science in Chemical Engineering (BS) degree must comply with all College of Engineering academic policies and requirements.

Major and Ancillary Requirements		Hours
Major Courses		
ENGR 101	The World of Engineering	1
ENGR 104	Fundamentals of Engineering	3
CHE 254	CHE Calculations	4
CHE 255	CHE Thermodynamics	4
CHE 304	Fluid Flow Operations	3
CHE 305	Separation Processes	3
CHE 306	Heat Transfer Operations	3
CHE 321 & CHE 322 or CHE 323	Basic CHE Lab and Unit Operations Laboratory Operations Laboratory	4
CHE 324	Transport Phenomena	3
CHE 354	Chemical Reactor Design	3
CHE 414	Computer Methods in ChemE	3
CHE 440 or CHE 441 or CHE 540	Health & Safety Honors Health and Safety Health Safety Chem Process Ind	3
CHE 481	Chemical Process Design I	3
CHE 482	Chemical Process Design II	3
CHE 493	Process Dynamics & Control	3
Advanced Science Elective		3
Advanced Science Elective options include courses in the below subjects from course numbers 300 to 499, except 397. Students must meet prerequisites required by the selected course.		
BSC, CE, CH, CHE, GEO, MS, PH		
Chemical Engineering Elective		3
Any CHE 400 to 499 course not completing other Major and Ancillary requirements. Special approval by the department is required for CHE 491, CHE 492, CHE 498, CHE 499.		
Biochemistry Elective		3
CHE 445 or CHE 446 or CHE 545 or BSC 450 or CH 461	Intro to Biochemical Engr Honors Intro to Biochem Eng Intro to Biochemical Engr Fundamentals of Biochemistry Biochemistry I	
Engineering Systems Elective		3

MTE 271	Engr Matls: Struc Prop	
or		
AEM 201	Statics	
or		
ECE 320	Fundmtl Electrical Engr	
	Credit Hours Subtotal:	58

Ancillary Courses

BSC 114 or	Principles Of Biology I	3
BSC 118	Honors General Biology I	
CH 101 or	General Chemistry	4
CH 117	Honors General Chemistry	
CH 102 or	General Chemistry	4
CH 118	Honors General Chemistry	
CH 231	Elem Organic Chemistry I	3
CH 232	Elem Organic Chem II	3
CH 237	Elem Organic Chem Lab	2
MATH 125 or	Calculus I	4
MATH 145	Honors Calculus I	
MATH 126 or	Calculus II	4
MATH 146	Honors Calculus II	
MATH 227 or	Calculus III	4
MATH 247	Honors Calculus III	
MATH 238	Appld Diff Equations I	3
PH 105 or	General Physics W/Calc I	4
PH 125	Honors Gen Ph W/Calculus	
PH 106 or	General Physics W/Calc II	4
PH 126	Honors Gen Ph W/Calculus II	
Career Elective		6

Career Elective options include courses in the below subjects, except 197/397 and courses completing other degree requirements. Students must meet prerequisites required by the selected course.

AEM 200-499; CHE 325, 400-499 except 440, 441, 414, 415, 445, 446, 481, 482, 493; CE 200-499, CS 100-499; ECE 200-499; GES 300-499; ME 200-499; MTE 200-499; BSC 115-499; CH 200-499; GEO 100-499; MATH 237-499; PH 200-499; AC 210; COM 100-499; CSM 300-499; EC 100-499; EN 300-499; FI 300-499; GBA 171, 172, 271, 272, 371, 372; LGS 200-499; MGT 300-499; MKT 300-499; PHL 200-499; RRS 100-499; MIL 310, 311, 320, 321; All foreign languages

Credit Hours Subtotal: 48

General Education Courses

The specific courses each student completes in order to fulfill the University of Alabama's general education requirements will depend upon the particular degree program in which the student is enrolled. To determine how these general education requirements are integrated into your program of study, review your semester-by-semester flowchart and discuss with your academic advisor.

Dual Chemical Engineering/Chemistry Major

UA's Department of Chemical and Biological Engineering and Department of Chemistry offer a dual major program allowing undergraduate students to obtain a single B.S. degree in chemical engineering with both chemistry and chemical engineering listed as majors. The dual major combines core coursework for both chemical engineering and chemistry majors. Career and advanced science elective slots in the chemical engineering curriculum are satisfied by courses in Chemical Equilibria and Analyses, covering classical methods of quantitative and analysis including a laboratory introduction to spectroscopic and chromatographic methods, and Physical Chemistry with Elementary Physical Chemistry Laboratory, while the biology elective slot is fulfilled with Biochemistry I. In addition, Organic Chemistry Laboratory II and a 400-level chemistry elective course are required for a total of four additional hours beyond the chemical engineering degree requirement. Alternatively, students can pursue concurrent degrees in Chemical Engineering and Chemistry. Students must meet University requirements for second or concurrent degrees.

Major and Ancillary Requirements		Hours
Chemical Engineering Major Courses		
ENGR 101	The World of Engineering	1
ENGR 104	Fundamentals of Engineering	3
CHE 254	CHE Calculations	4
CHE 255	CHE Thermodynamics	4
CHE 304	Fluid Flow Operations	3
CHE 305	Separation Processes	3
CHE 306	Heat Transfer Operations	3
CHE 321 & CHE 322 or	Basic CHE Lab and Unit Operations Laboratory	4
CHE 323	Operations Laboratory	
CHE 324	Transport Phenomena	3
CHE 354	Chemical Reactor Design	3
CHE 414 or	Computer Methods in ChemE	3
CHE 415	Computer Methods in ChemE Hons	
CHE 440 or	Health & Safety	3
CHE 441 or	Honors Health and Safety	
CHE 540	Health Safety Chem Process Ind	
CHE 481	Chemical Process Design I	3
CHE 482	Chemical Process Design II	3
CHE 493	Process Dynamics & Control	3
Chemical Engineering Elective		3
Any CHE 400 to 499 course not completing other Major and Ancillary requirements. Special approval by the department is required for CHE 491, CHE 492, CHE 498, CHE 499.		
Engineering Systems Elective		3
MTE 271	Engr Matls: Struc Prop	
or		
AEM 201	Statics	
or		
ECE 320	Fundmtl Electrical Engr	
	Credit Hours Subtotal:	52
Chemistry Major Courses		
CH 101 or	General Chemistry	4
CH 117	Honors General Chemistry	
CH 102 or	General Chemistry	4
CH 118	Honors General Chemistry	
CH 223	Quantitative Analysis	4
CH 231	Elem Organic Chemistry I	3
CH 232	Elem Organic Chem II	3

CH 237	Elem Organic Chem Lab	2
CH 338	Elem Organic Chem Lab II	2
CH 343	Elem Phy Chem Lab	1
CH 441	Physical Chemistry I	3
CH 461	Biochemistry I	3
Chemistry Elective (any CH 400 to 499 course)		3
	Credit Hours Subtotal:	32

Ancillary Courses

BSC 114 or	Principles Of Biology I	3
BSC 118	Honors General Biology I	
MATH 125 or	Calculus I	4
MATH 146	Honors Calculus II	
MATH 126 or	Calculus II	4
MATH 146	Honors Calculus II	
MATH 227 or	Calculus III	4
MATH 247	Honors Calculus III	
MATH 238	Appld Diff Equations I	3
PH 105 or	General Physics W/Calc I	4
PH 125	Honors Gen Ph W/Calculus	
PH 106 or	General Physics W/Calc II	4
PH 126	Honors Gen Ph W/Calculus II	
	Credit Hours Subtotal:	26

General Education Courses

The specific courses each student completes in order to fulfill the University of Alabama's general education requirements will depend upon the particular degree program in which the student is enrolled. To determine how these general education requirements are integrated into your program of study, review your semester-by-semester flowchart and discuss with your academic advisor.

Departmental Honors Program

The Department of Chemical and Biological Engineering (ChBE) offers an undergraduate Honors Program for students who seek to be challenged by advanced subjects and receive additional distinction with their undergraduate degrees. This individually tailored program culminates with the awarding of an Honors Certificate, awarded for Fall, Spring and Summer graduates in the student's senior year. Students enrolled in the Department of Chemical and Biological Engineering Honors Program are encouraged to participate in the honors programs offered through the Honors College.

Opportunities for ChBE Honors Students

- Discover career opportunities
- Explore engineering issues from multiple perspectives in forum setting
- Enhance your degree status
- Honors co-op and internship program (need pre-approval by ChBE Honors Chair)
- Study challenging problems
- Options to work or study abroad

Honors by Contract

Students may earn up to 6 hours of honors credit in appropriate regularly scheduled JUNIOR and SENIOR level courses through satisfactory completion of the terms of an Honors By Contract. Though uncommon in CHE courses, this is coordinated by UA's Honors College.

Requirements

- No application required (recognition is at graduation).
- Incoming freshmen must have minimum high school GPA of 3.3 and ACT score of at least 28 or SAT score of 1240.
- Transfer Students must have minimum cumulative college GPA of 3.3 and ACT score of at least 28 or SAT score of 1240.
- Current UA students must have minimum cumulative UA GPA of 3.3.
- Students must complete 18 hours of honors credit (as outlined below) and maintain a UA GPA of 3.3 to graduate with honors in chemical engineering.

Departmental Honors Requirements		Hours
Required Courses		
CHE 325	ChE Honors Forum	1
ChBE Honors Credit (6 hours minimum)		6
CHE 413	Honors Polymer Materials Eng	
CHE 415	Computer Methods in ChemE Hons	
CHE 417	Hnrs Stem Cell Bioengineering	
CHE 419	Honors Tissue Engineering	
CHE 441	Honors Health and Safety	
CHE 446	Honors Intro to Biochem Eng	
CHE 497	Honors Co-op/Internship	
CHE 498	Honors Special Problems	
CHE 499	Honors Special Problems [1]	
ChBE Curriculum Honors Courses (5 hours minimum) [2]		5
University Honors College Courses (6 hours minimum)		6
Total Hours		**18**

Footnotes

1. At least 3 hours of the above must be an experiential class (research, internship, co-op) - CHE 497, CHE 498 or CHE 499
2. May include courses part of the curriculum: Chemistry (CH), Physics (PH), Biology (BSC), Mathematics (MATH), General Engineering Studies (GES), additional CHE courses.

Biological Engineering Concentration

The Biological Engineering Concentration is designed to allow chemical engineering majors to focus their elective courses on biochemical and biological engineering-related topics. The Concentration is designed to fit into the main Chemical Engineering curriculum by using elective courses and does not add additional course requirements for graduation.

To complete the Biological Engineering Concentration, students must complete a minimum of 15 credit hours (3 biochemistry credit hours plus 12 elective credit hours) from the approved course list below.

1. Students must complete a minimum of 15 credit hours from the approved courses list (see below)
2. Students must be Chemical Engineering majors to receive credit for the concentration

Required course - must complete one of the following. If a student selects CH 461 or BSC 450 for the biochemistry requirement, they cannot count the other course, but may count CHE 445/CHE 446 as an elective course.

Code and Title		Hours
CHE 445 or	Intro to Biochemical Engr	3
CHE 446	Honors Intro to Biochem Eng	
CH 461	Biochemistry I	3
BSC 450	Fundamentals of Biochemistry	3

Electives - must complete 12 hours from the list below.

Code and Title		Hours
CHE 416 or	Stem Cell Bioengineering	3
CHE 417	Hnrs Stem Cell Bioengineering	
CHE 418 or	Tissue Engineering	3
CHE 419	Honors Tissue Engineering	
CHE 492	Special Topics (e.g., Bioseparations, Microbial Engineering, Cancer Bioengineering)	3
BSC 300	Cell Biology	3
BSC 310	Microbiology	3
BSC 312	Microbiology Lab	2
BSC 315	Genetics	3
BSC 380	Intro Stats Biology	3
BSC 385	Ecology and Evolution	3
BSC 424	Human Physiology	3
BSC 425	Human Physiology Lab	2
BSC 435	Immunology	4
BSC 441	Developmental Biology	3
BSC 442	Integrated Genomics	4
BSC 444	General Virology	3
BSC 449	Endocrinology	3
BSC 451	Molecular Biology	3
BSC 465	Prin Of Toxicology	3
BSC 481	Adv Biostatistics with R	3
PH 411	Biophysics	3

Students find careers in the following industries: petroleum, plastics, pulp and paper, food, consumer products, biotechnology, fine chemicals, pharmaceuticals, medical, environmental

Types of Jobs Accepted

Our chemical engineering students are in high demand and find jobs with local industries within the state, as well as with Fortune 500 companies around the globe. Common employers are power companies, engineering design firms, large chemical manufacturers, and petroleum refiners.

Jobs of Experienced Alumni

Our experienced alumni have become leaders in major industries, consulting firms, the medical field, and academic institutions. We have had alumni obtain positions as faculty at MIT and as CEOs at Fortune 500 companies, and become prominent judges. Many of our alumni stay connected with our department, including service on our Advisory Board.

Learn more about opportunities in this field at the Career Center