CHEMICAL ENGINEERING, BS

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The mission of the Department of Biomedical and Chemical Engineering is to provide our students with mentoring, curricular experience and extracurricular opportunities consistent with their individual career objectives in order to:

- Prepare them to apply science, mathematics and engineering knowledge to serve the needs of society;
- Instill in them a deep sense of respect for others and a strong foundation in professional and social ethics;
- Develop in them the understanding that continued education will further their professional and leadership skills.

The program educational objectives of the Bachelor of Science in Chemical Engineering in the Department of Biomedical and Chemical Engineering at Syracuse University describe what graduates of the program are expected to attain within a few years of graduation:

- Graduates of the program will apply chemical engineering fundamental knowledge and skills to develop and promote solutions to a wide variety of techinical and societal problems.
- Graduates will effectively use technical, critical, thinking and leadership skill sets to advance their careers in industry, academia, or other career paths.
- Graduates will continue to seek and acquire new knowledge, skills and experiences related to their professional goals.
- Graduates will consider and account for the social, environmental, and ethical impact of their professional activites and decisions, including considerations of saftey, sustainabiity, equity, diversity, and inclusion.

Chemical engineering has a rich past; chemical engineers are the large scale manufacture of numerous products including chemicals, fibers, foods, fuels, pharmaceuticals, plastics, pulp and paper, and rubber. Because chemical engineering is the most versatile of the engineering disciplines, chemical engineers in the future will contribute to diverse new and emerging technologies. They will seek new ways to process our energy and natural resources; they will play key roles in the areas of environmental cleanup and protection, management of hazardous wastes, and process and product safety. They will be involved in new technologies such as biotechnology and biomedicine, and in the development and production of new materials such as polymers, ceramics, and advanced composites.

The chemical engineering curriculum prepares students to apply the fundamentals of chemistry, physics, and engineering to problems related to the efficient and safe production of chemical and related products. The program focuses on developing a solid background in the principles of chemical engineering and their applications to the challenges facing industry and society. If a student wishes to specialize in biochemical, environmental, or polymer materials engineering, he or she can select appropriate science and engineering courses to supplement the general curriculum. Engineering design concepts are integrated throughout all four years of the chemical engineering program.

Beginning with ECS 101 Introduction to Engineering and Computer Science in the fall of the first year, students are introduced to the engineering method for problem solving, and concepts of engineering design. In this way students see how mathematics, basic sciences, and engineering science provide the necessary tools for design and how to go about the design process.

During the sophomore, junior, and senior years, problems of increasing complexity and open-endedness are presented to students in the chemical engineering courses, continually challenging their technical expertise, creativity, and knowledge.

Finally, in their senior year courses, students are required to complete major design projects in their courses and laboratory. These projects are open-ended and designed to build upon the students' understanding and mastery of the fundamentals of mathematics, sciences, and engineering topics. They also consider broader social issues in addition to technical issues such as environmental impact and safety.

Many students take advantage of the low student/faculty ratio by participating in research or independent study projects. There are part-time, summer, co-op, and internship opportunities available for students seeking work experience. International study opportunities are also available.

This program is accredited by the Engineering Accreditation Commission of ABET, http://www.abet.org

Student Learning 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 judgments, 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 judgment to draw conclusions
7. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies
8. An ability to recognize and address chemical process safety needs in contemporary chemical engineering practice

Chemical Engineering Course Requirements

Year 1		
Fall		**Credits**
ECS 101	Introduction to Engineering and Computer Science	3
CHE 106	General Chemistry Lecture I	3
CHE 107	General Chemistry Laboratory I	1
MAT 295	Calculus I	4
WRT 105	Studio 1: Practices of Academic Writing	3
FYS 101	First Year Seminar	1
Social Science/Humanities elective		3
	Credits	**18**
Spring		
ECS 104	Engineering Computational Tools	3
CHE 116	General Chemistry Lecture II	3
CHE 117	General Chemistry Laboratory II	1
MAT 296	Calculus II	2-4
PHY 211	General Physics I	3
PHY 221	General Physics Laboratory I	1
	Credits	**13-15**
Year 2		
Fall		
CEN 231	Mass and Energy Balances	3
CHE 275	Organic Chemistry I	3
CHE 276	Organic Chemistry I Laboratory	2
MAT 397	Calculus III	4
PHY 212	General Physics II	3
PHY 222	General Physics Laboratory II	1
	Credits	**16**
Spring		
CEN 212	Experimental Methods in Chemical Engineering and Bioengineering	3
CEN 252	Chemical Engineering Thermodynamics I	3
MAT 485	Differential Equations and Matrix Algebra for Engineers	3
WRT 205	Studio 2: Critical Research and Writing	3
Social Science/Humanities elective		6
	Credits	**18**
Year 3		
Fall		
ECS 326	Engineering Materials, Properties, and Processing	3
CEN 333	Fluid Transport	3
CEN 353	Chemical Engineering Thermodynamics II	3
CHE 346	Physical Chemistry I	3
CHE 347	Physical-Analytical Chem Lab	2
Social Science/Humanities elective		3
	Credits	**17**
Spring		
CEN 311	Chemical Engineering Laboratory I	2
CEN 313	Chemical Process Safety	3
CEN 341	Fundamentals of Heat and Mass Transfer	3
CEN 575	Process Control	3
Select one of the following Restrictive Electives:		3
CHE 356	Physical Chemistry II	
CEN 451	Molecular and Statistical Thermodynamics	
CEN/BEN 421	Biochemical Engineering	
Technical Elective: At least 1 technical elective must be in CEN		3
	Credits	**17**
Year 4		
Fall		
CEN 412	Chemical Engineering Laboratory II	2
CEN 442	Heat and Mass Transfer Operations	3
CEN 587	Chemical Reaction Engineering	4
Technical elective		3
Social Science/Humanities elective		3
	Credits	**15**
Spring		
CEN 474	Process Design	4
Social Science/Humanities elective		3
Technical electives		6
	Credits	**13**
	Total Credits	**127-129**