Biochemical Engineering

Course Replacements in Program Specialization				
Tech Elective I(3)	3	Replaced by…	CHEN 5800 Biochemical Engineering (3)	3
Tech Elective II(3) Tech Elective III(3) or ROTC Tech Elective IV(3) or ROTC	9	Replaced by…	**Biochemical Eng. Tech Electives (9)**	**9**

Approved Biochemical Engineering Tech Electives	
BCHE 5180 Biochemistry (3) *	BIOL 1030 & 1031 Organismal Biology (4)
BCHE 5190 Biochemistry II (3)	BIOL 3000 Genetics (4)
CHEN 4900 Independent Study (1)	BIOL 3200 General Microbiology (4) *
CHEN 4980 Undergraduate Research (1-3)	BIOL 3060 Ecology (4)
CHEN 4997 Honors Thesis (1-3)	BIOL 4100 Cell Biology (3)
CHEN 5810 Biomedical Engineering (3)	BIOL 4220 Intro Molecular Genetics (3)
CHEN 5820 Environmental Biotechnology (3)	
CHEN 5660 Macroscale Assembly & Applications of Nanomaterials	

* Students in this program specialization are strongly urged to take BCHE 5180 and BIOL 3200

Biomedical Engineering

Course Replacements in Program Specialization				
Tech Elective I(3)	3	Replaced by…	CHEN 5810 Biomedical Engineering (3) or CHEN 5970 Cell & Tissue Engineering (3)	3
Tech Elective II(3) Tech Elective III(3) or ROTC Tech Elective IV(3) or ROTC	9	Replaced by…	**Biomedical Eng. Tech Electives (9)**	9
PHIL 1040 Business Ethics	3	Replaced by…	PHIL 1030 Ethics and Health Science (3)	3

Approved Biomedical Engineering Tech Electives	
BCHE 5180 Biochemistry (3) *	BIOL 5600 Mammalian Physiology (6)
BCHE Biochemistry I Lab (1)	CHEN 4997 Honors Thesis (1-3)
BIOL 2500 Human Anatomy & Physiology I (4)	CHEN 5810 Biomedical Engineering (3)
BIOL 2510 Human Anatomy & Physiology II (4)	CHEN 5970 Cell & Tissue Engineering (3)
BIOL 3000 Genetics (4)	CHEN 5660 Macroscale Assembly & Applications of Nanomaterials
BIOL 3200 General Microbiology (4)	
BIOL 4100 Cell Biology (3)	
BIOL 4101 Cell Biology Lab (2)	

* Students in this program specialization are strongly urged to take BCHE 5180

Computer-Aided Chemical Engineering

Course Replacements in Program Specialization				
Tech Elective I(3) Tech Elective II(3) Tech Elective III(3) or ROTC Tech Elective IV(3) or ROTC	12	Replaced by…	**Computer-Aided Chem. Eng. Tech Electives (12)**	12

Approved Computer-Aided Chemical Engineering Tech Electives	
BCHE 5180 Biochemistry (3)	COMP 3000 Object Oriented Program for Engineering (3)
CHEM 4130 Instrumental Analysis (3)	COMP 4000 Windows NT Net and Syst Administration (3)
CHEM 4131 Inst Analysis Lab (1)	ELEC 2110 Electric Circuit Analysis (3)
CHEN 4160 Process Dynamics (3)	ELEC 2120 Linear Signals and Systems Analysis (3)
CHEN 4180 Adv Process Control (3)	ELEC 2200 Digital Circuits for Computer Science (3)
CHEN 4900 Independent Study (1)	ELEC 2210 Digital Electronics (3)
CHEN 4980 Undergraduate Research (1-3)	ELEC 2220 Computer Systems (3)
CHEN 4997 Honors Thesis (1-3)	ELEC 3500 Control Systems (3)
CHEN 5410 Macromolecular Science and Engineering (3)	ELEC 3810 Fund Electrical Engineering (3)
CHEN 5660 Macroscale Assembly & Applications of Nanomaterials	ELEC 3820 Electrical Instrumentation (3)
COMP 2000 Network Program w HTML and JAVA (3)	MATH 2660 Linear Algebra (3)

Environmental Chemical Engineering

Course Replacements in Program Specialization				
Tech Elective I(3) Tech Elective II(3) Tech Elective III(3) or ROTC Tech Elective IV(3) or ROTC	12	Replaced by…	**Environmental Chem. Eng. Tech Electives (12)**	**12**

Approved Environmental Chemical Engineering Tech Electives	
BCHE 5180 Biochemistry (3) CHEM 4130 Instrumental Analysis (3) CHEM 4131 Inst Analysis Lab (1) CHEN 3090 Introductory Pulp and Paper Technology (3) CHEN 4160 Process Dynamics (3) CHEN 4900 Independent Study (1) CHEN 4980 Undergraduate Research (1-3) CHEN 4997 Honors Thesis (1-3) CHEN 5120 Surface and Colloid Science (3)	CHEN 5700 Advanced Separation Processes (3) CHEN 5800 Biochemical Engineering (3) CHEN 5660 Macroscale Assembly & Applications of Nanomaterials CIVL 3220 Water & Waste Treatment (4) CIVL 3230 Intro Environmental Eng (4) CIVL 4230 Urban Hydraulic System Design (3) CIVL 5240 Air Pollution (3) STAT 3010 Statistics of Engineering (3)

Pre-Medicine Specialization

Course Replacements in Program Specialization				
Tech Elective I(3)	3	Replaced by…	CHEN 5810 Biomedical Engineering (3) or CHEN 5970 Cell & Tissue Engineering (3)	3
Tech Elective II(3) Tech Elective III(3) or ROTC Tech Elective IV(3) or ROTC	9	Replaced by…	BCHE 5180 Biochemistry (3) CHEM 2081 Organic Chemistry II Lab (1) **Pre-Medicine Tech Elective (5)**	9
PHIL 1040 Business Ethics	3	Replaced by…	PHIL 1030 Ethics and Health Science (3)	3

Approved Pre-Medicine Tech Electives	
BCHE Biochemistry I Lab (1) BIOL 2500 Human Anatomy & Physiology I (4) BIOL 2510 Human Anatomy & Physiology II (4) BIOL 3000 Genetics (4) BIOL 4100 Cell Biology (3) BIOL 4101 Cell Biology Lab (2)	BIOL 5600 Mammalian Physiology (6) CHEN 4997 Honors Thesis (1-3) CHEN 5810 Biomedical Engineering CHEN 5970 Cell & Tissue Engineering CHEN 5970 Special Topics in PreMed Chem. Eng. (1-3)

Pulp, Paper and Bioresource Engineering

Course Replacements in Program Specialization				
Tech Elective I(3)	3	Replaced by…	CHEN 4100 P&P Proc Lab (2) CHEM 2081 Organic Chemistry II Lab (1)	3
Tech Elective II(3)	3	Replaced by…	CHEN 3090 Intro Pulp & Paper Technology (3)	3
Tech Elective III(3) or ROTC	3	Replaced by…	CHEN 5110 P&P Engineering (3)	3
Tech Elective IV(3) or ROTC	3	Replaced by…	CHEN 5800 Biochemical Engineering (3)	3

Approved Pulp, Paper and Bio-Resource Engineering Tech Electives	
None	

Description of Chemical Engineering Program Specializations

Because of the breadth of chemical engineering opportunities, the department offers a number of specially designed program specializations that provide unique training and course selection to those students who wish to concentrate in a particular area or technology. The current program specializations are Biochemical Engineering, Biomedical Engineering, Computer-Aided Chemical Engineering, Environmental Chemical Engineering, Pre-Medicine Specialization and Pulp, Paper and Bio-Resource Engineering.

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Biochemical Engineering Specialization

Chemical engineers trained in biochemical engineering and biotechnology are the key to successful commercialization of new biologically based processes ranging from high value pharmaceuticals to new food processes. This program specialization provides a strong biology and chemistry fundamental background for graduate work in biochemical engineering and a plan of study to meet these objectives.
Students in this specialization take CHEN 5800, and Biochemical Engineering Technical Electives* (9 hours). These courses replace Technical Electives I-IV.

Biomedical Engineering Specialization

This specialization provides the necessary preparation for students wanting to do graduate work in biomedical engineering or work in a career with an emphasis of medical applications of chemical engineering.
Students in this specialization take PHIL 1030, CHEM 2081, CHEN 5810 or CHEN 5970 Cell & Tissue Engineering, and Biomedical Engineering Technical Electives* (8 hour). These courses replace Technical Electives I-IV.

Computer-Aided Chemical Engineering Specialization

Chemical engineers with expertise in the application of advanced computer-aided tools in areas like process systems engineering, process control, and advanced process technology are highly sought after by all process industries. The program specialization provides appropriate courses for an individual with interests in advanced use of computers for solving chemical and biological engineering problems.
Students in this specialization take Computer-Aided Chemical Engineering Technical Electives* (12 hours). These courses replace Technical Electives I-IV.

Environmental Chemical Engineering Specialization

The environmental specialization in chemical engineering prepares students for careers in the expanding environmental arena. Students specializing in this area learn about the chemical processes and reactions that affect the environment, pollution prevention, the latest standards for air, water and land quality, as well as, hazardous materials management. This specialization prepares students for environmental positions in a broad range of manufacturing and service industries all of which must comply with increasingly complex environmental standards, and in various state and federal agencies.

Students in this specialization take Environmental Chemical Engineering Technical Electives* (12 hours). These courses replace Technical Electives I-IV.

Pre-Medicine Specialization

This specialization provides the necessary preparation for students wanting to go to medical school. A Pre-Med series of courses, when completed, provides a chemical engineering degree while simultaneously meeting medical school requirements.
Students in this specialization take PHIL 1030, CHEM 2081, BCHE 5180, CHEN 5810 or CHEN 5970 Cell & Tissue Engineering, and Pre-Medicine Technical Electives* (8 hour). These courses replace Technical Electives I-IV and PHIL 1040.
Students in this program specialization who are interested in medical school must also work with the director for Pre-Health Professions in the College of Science and Mathematics.

Pulp, Paper and Bioresource Engineering Specialization

This specialization prepares students for challenging and rewarding careers in the pulp, paper and bioresource industries. These industries are unique in being capable of sustainable development with a renewable raw material base, recyclable products, and processing technology able to achieve energy self-sufficiency and environmental compatibility. This specialization prepares students for a broad range of career paths in process engineering, product development, biotechnology and sustainable engineering.
Students in this specialization take CHEM 2081, CHEN 3090, CHEN 4100, CHEN 5110 and CHEN 5800. These courses replace Technical Electives I-IV.

** A list of approved technical electives for this specialization is available from the department undergraduate advisor.*