TECHNICAL ELECTIVE OPTIONS FOR CHEMICAL ENGINEERING UNDERGRADUATE PROGRAMS

Technical electives must be upper level courses taken in the junior or senior year. Students should obtain adviser approval before enrolling in any course NOT on this list for technical elective credit. Courses on this list are pre-approved by faculty.

3 Electives REQUIRED: Of the three, one Technical Elective or Advanced Chemistry Elective must be a CHE course.

Standard Option Technical Elective List (Choose 2)

ENGINEERING Technical Electives

Chemical, Biological & Materials Engr

All CH E 4000-6000 level non-required

CH E 3960 Honors Reading
CH E 3983/4983 Honors Research I & !!
CH E 3953/4953 Undergrad Research I & II
CH E 4203 Bioengineering Principles
CH E 5163 Catalysis (grad students)
CH E 5183 Grad Transport Phenomena
CH E 5203 Bioengr Principles(alt even fall)
CH E 5213 Experimental Methods in Materials Research
CH E 5143 Multi-Scale Modeling Matter
CH E 5243 Biochemical Engineering
CH E 5293 Transport in Biological Systems
CHE 5373 Tissue Engineering (BME 5373)
CH E 5453 Polymer Science
CH E 5463 Polymer Processing
CH E 5480 Industrial & Environmental Transport Process
CH E 5480 Seminar in Selected Topics
CHE 5513 Surface Characterization
CH E 5523 Advanced Mathematical Methods
CHE 5533 Material Design for Energy Application (Dr. Wang)
CH E 5643 Natural Gas Utilization
CH E 5673 Colloids and Surface Science
CH E 5693 Cellular Aspects in Tissue Regeneration
CHE 5823 Adv Numerical Methods/Harwell
CH E 5843 Adv CHE Thermodynamics
CH E 6723 Adv Kinetics and Reaction Engr

Aerospace and Mechanical Engineering

AME 3363 Design of Thermal Fluid Systems
AME 5203 Bioengineering Principles
AME 5213 Biomechanics I (Biosolids)
AME 5223 Biomechanics II
AME 5233 Biomaterials
AME 5253 Implantable Devices
AME 5293 Transport in Biological Systems
AME 5710 Topics in Solid Mechanics-Neural Engr
AME 5720 Topics in Fluid Mechanics
AME 5973 Comp Heat & Fluid Flow
AME 5953 Turbulence I
AME 5983 Computational Fluid Dynamics

Biomedical Engineering

BME 5243 Biochemical Engineering
BME3153 Molecular,Cellular & Tissue Engr
BME 3163 Biomedical Micro/Nano Tech
BME 5990 Independent study

Civil Engineering & Environ. Science

CEES 3213 Water Resources Engineering
CEES 3243 Water and Wastewater Treatment Design
CEES 4943 Intro to Air Quality
CEES 4114 Aquatic Chemistry
CEES 4263 Hazardous and Solid Waste Management
CEES 4943 Intro to Air Quality
CEES 5244 Water and Waste Treatment

Electrical and Computer Engineering

ECE 3323 Intro-Solid State Elec Devices
ECE 3813 Introductory Electronics
ECE 4973 Engr Principles of the Body
ECE 4813 Electronics
ECE 4823 Engineering Principles of the Human Body
ECE 4990 Res. & Design Exp in Bioengr
ECE 5843 Medical Imaging Systems
ECE 5863 Bioinstrumentation
ECE 5973 Special Topics: Comp Bioengr
ECE 6813 AdvTopics in Biomedical Engr

Industrial and Systems Engineering

ISE 3293 Applied Engineering Statistics

Petroleum and Geological Engineering

PE 5603 Intro Natural Gas Engr.& Mgmt
PE 5613 Natural Gas Engineering
PE 5623 Natural Gas Processing

ENGR 4013 Leadership & Management

NON-ENGINEERING Technical Electives

Mathematics

MATH 3333 Linear Algebra I
MATH 4753 Applied Statistical Methods
MATH 4733 Theory of Probability
MATH 3423 Physical Math II
MATH 4163 Intro Partial Diff. Equations

Meteorology

METR 5103 Boundary Layer Meteorology
METR 5344 Comp Fluid Dynamics I

Biology

BIOL 3101 Princ of Physiology Lab (take w/ 3103-Princ of Physiology lecture)
BIOL 3103 Princ of Physiology
BIOL 3113 Cell Biology
BIOL 3201 Animal Development Lab
BIOL 3203 Animal Development
BIOL 3333 Genetics
BIOL 4244 Animal Histology
BIOL 4843 Intro. to Molecular Biology
BIOL 4853 Neurobiology of Memory
BIOL 4913 Quantitative Biology
BIOL 5153 Endocrine Physiology
BIOL 5293 Cytology Ultrastructure
BIOL 5343 Developmental Genetics
BIOL 5364 Trans Electron Microscopy
BIOL 5374 Scanning Electron Microscopy

Chemistry and Biochemistry

CHEM 3523 Physical Chemistry II
CHEM 3653 Intro to Biochemistry
CHEM 3753 Intro to Biochemical Methods
CHEM 4023 Instrumental Methods in Chemical Analysis
CHEM 4333 Advanced Inorganic Chemistry
CHEM 5453 Polymer Science
CHEM 5753 Principles of Biochem I
CHEM 5853 Principles of Biochem II
CHEM 6813 Intro to Biochemical Methods
CHEM 6823 Protein, Nucleic Acids, & Gene Expression
CHEM 6833 Structure & Function of Membranes & Hormones
CHEM 6843 Enzyme Mechanisms & Metabolic Regulation
CHEM 6853 Protein Structure & Function

Microbiology

MBIO 3113 Cell Biology
MBIO 3813 Fundamentals of MBIO
MBIO 3812 Fundamentals of MBIO Lab
MBIO 4833 Basic Immunology
MBIO 4843 Intro of Molecular Biology
MBIO 5620 Investigations in Microbiology
MBIO 5833 Industrial & Applied MBIO
MBIO 5843 Intro to Molecular Biology

Physics

PHYS 3223 Modern Physics for Engineers

Advanced Chemistry Elective List *(for STANDARD option)*

CHEM 3523 Physical Chemistry II
CHEM 3653 Intro to Biochemistry
CHEM 4333 Adv Inorganic-Periodic System (fall)
CHEM 4444 Adv Synthesis/Spectral Character (fall)
CH E 4163 and 5163 Heterogeneous Catalysis (irreg.)
CH E 5243 Biochemical Engineering (spring)
CH E 5273 Biomedical Engineering (irreg.)
CH E 5453 Polymer Science (irreg. Spring)
CH E 5673 Colloids and Surface Science (irreg. spring)
CH E 5533 Mat. Design for Energy Application (irreg.)

Pre-Medical and Biomedical Technical Elective List Students must choose one of the Technical Elective options below to follow.	
Pre-Medical Option	Biomedical Option
Take CHEM3653 Intro to Biochemistry	***Take*** CHEM3653 Intro to Biochemistry
Take one of the following: BIOL3113 Cell Biology OR BIOL3333 Genetics OR BIOL4843 Molecular Biology	***Take CH E 5203 Bioengineering Principles (alt. even fall)***
Take one of the following CH E Pre-Medical Option Technical Elective II <u>Bioengineering Content Options:</u> ***CH E 5203 Bioengineering Principles (alt. even fall)*** CH E 5243 Biochemical Engineering CH E 5293 Transport in Biological Systems CH E 5373 Tissue Engineering (BME 5373) **Aerospace and Mechanical Engineering** AME 5203 Bioengineering Principles AME 5213 Biomechanics I AME 5223 Biomechanics II AME 5233 Biomaterials AME 5293 Transport in Biological Systems AME 5710 Neural Engineering **Electrical and Computer Engineering** ECE 4823 Engineering Principles of the Human Body ECE 4990 Special Studies: Research & Design Experience in Bioengineering ECE 5843 Medical Imaging Systems ECE 5973 Computational Bioeng. ECE 6813 Advanced Topics in Biomedical Engineering **Biomedical Engineering** BME 5243 Biochemical Engineering BME 3153 Molecular, Cellular & Tissue Engineering BME 3163 Biomedical Micro/Nano Technology BME 5990 Independent study	***Take one of the following CH E Biomedical Option Technical Elective II*** <u>Biological Content Options:</u> BIOL 3113 Cell Biology BIOL 3333 Genetics BIOL 4843 Intro. to Molecular Biology <u>Chemical Engineering</u> CH E 5243 Biochemical Engineering CH E 5293 Transport in Biological Systems CH E 5373 Tissue Engineering (BME 5373) **Aerospace and Mechanical Engineering** AME 5203 Bioengineering Principles AME 5213 Biomechanics I AME 5223 Biomechanics II AME 5233 Biomaterials AME 5293 Transport in Biological Systems AME 5710 Neural Engineering **Electrical and Computer Engineering** ECE 4823 Engineering Principles of the Human Body ECE 4990 Special Studies: Research & Design Experience in Bioengineering ECE 5843 Medical Imaging Systems ECE 5973 Computational Bioeng. ECE 6813 Advanced Topics in Biomedical Engineering **Biomedical Engineering** BME 5243 Biochemical Engineering BME 3153 Molecular, Cellular & Tissue Engineering BME 3163 Biomedical Micro/Nano Technology BME 5990 Independent study