

## Technical Electives

Bachelor of Science in Chemical Engineering (B.S.Ch.E.)  
2015-2016 Catalog Year

Each concentration for the B.S.Ch.E. requires 6 credit hours total of technical electives. Together, you and your faculty advisor will select the most appropriate technical electives from this document to support your individual academic and career goals. The two courses you choose for your 6 hours of required technical electives will include:

- 1) **Engineering Technical Elective** (3 hrs) - Must be a course that is offered by the School of Engineering
- 2) **Technical Elective** (3 hrs) - May be a course offered by either the School of Engineering or College of Arts & Sciences

**NOTE:** The chairperson may allow up to 6 credit hours of technical electives for students taking required ROTC courses in aerospace or naval science. One technical elective can be replaced by a research project done under the supervision of a CBE faculty member and requires advance approval by the Director of Undergraduate Programs. Students are encouraged to sign up for independent study, CBE 491/492 which provides academic credit for doing research under the supervision of a CBE faculty member. In order to be used as a technical elective CBE 491/492 must be taken for 3 credit hours. Only 3 credit hours of CBE 491/492 may be applied toward the technical elective requirement.

All courses below are 3 credit hours unless noted otherwise. AOA = Also Offered As

### Courses Offered by the School of Engineering

#### Biomedical Engineering

- BME 556** - Protein and Nucleic Acid Engineering  
(cross-listed with CBE 499, 515)
- BME 544** - Thermodynamics of Biological Systems  
(cross-listed with CBE 499, 515, 542)

#### Chemical & Biological Engineering

- CBE 213** - Laboratory Electronics for Nuclear, Chemical and Biological Engineers (AOA NE 213)
- CBE 412/512** - Characterization Methods for Nanostructures (AOA CHEM 469/569, NSMS 412/512)
- CBE 417/517** - Applied Biology for Biomedical Engineers (AOA BME 517)
- CBE 447/547** - Biomedical Engineering Research Practices (AOA BME 547)
- CBE 472/572** - Biomaterials Engineering (AOA BME 572)
- CBE 477/577** - Electrochemical Engineering
- CBE 479/579** - Tissue Engineering (AOA BME 579, NSMS 574)
- CBE 491-492** - Undergraduate Problems\*
- CBE 499** - Protein and Nucleic Acid Engineering  
(cross-listed with CBE 515, BME 556)
- CBE 499** - Selected Topics

#### Civil Engineering

- CE 302** - Mechanics of Materials
- CE 335** - Environmental and Water Resources Engineering
- CE 350** - Engineering Economy
- CE 431/531** - Physical-Chemical Water and Wastewater Treatment
- CE 433/533** - Environmental Microbiology
- CE 436/536** - Biological Wastewater Treatment

#### Civil Engineering - cont'd

- CE 438/538** - Sustainable Engineering
- CE 440/540** - Design of Hydraulic Systems
- CE 441/541** - Hydrogeology (AOA EPS 462)
- CE 442** - Hydraulic Engineering and Hydrology

#### Computer Science

- CS 375** - Introduction to Numerical Computing (AOA MATH 375)
- CS 412** - Introduction to Computer Graphics: Scanline Algorithms (AOA ECE 412)
- CS 427/527** - Principles of Artificially Intelligent Machines

#### Electrical Engineering

- ECE 371** - Materials and Devices
- ECE 412** - Introduction to Computer Graphics: Scanline Algorithms (AOA CS 412)

#### Mechanical Engineering

- ME 365** - Heating, Ventilating and Air Conditioning Systems
- ME 405/505** - High Performance Engines
- ME 419/519** - Theory, Fabrication, and Characterization of Nano and Microelectromechanical Systems (NEMS/MEMS) (4 hrs)

#### Nuclear Engineering

- NE 213** - Laboratory Electronics for Nuclear, Chemical and Biological Engineers (AOA CBE 213)
- NE 230** - Principles of Radiation Protection
- NE 231** - Principles of Nuclear Engineering
- NE 323L** - Radiation Detection and Measurement
- NE 439** - Radioactive Waste Management (AOA CE 539)

\* - CBE 491/492 must be taken as a 3 hr course and must be approved by Director of UG Programs

## Courses Offered by the College of Arts & Sciences

### Biochemistry

**BIOC 423** - Introductory Biochemistry

### Biology

**BIOL 202L** - Genetics (4 hrs)

**BIOL 237** - Human A&P I for the Health Sciences

**BIOL 238** - Human A&P II for the Health Sciences

**BIOL 239L** - Microbiology for Health Sciences and Non-Majors (4 hrs)

**BIOL 247L** - Human Anatomy and Physiology Lab I (1 hr)

**BIOL 248L** - Human Anatomy and Physiology Lab II (1 hr)

**BIOL 425** - Molecular Genetics

**BIOL 429** - Molecular Cell Biology I

**BIOL 446/546** - Laboratory Methods in Molecular Biology (4 hrs)

### Chemistry

**CHEM 253L** - Quantitative Analysis (4 hrs)

**CHEM 411L** - Laboratory Methods in Physical Chemistry

**CHEM 412** - Advanced Physical Chemistry

**CHEM 421** - Biological Chemistry

**CHEM 425** - Organic Chemistry of Biological Pathways

**CHEM 431** - Advanced Inorganic Chemistry

**CHEM 432L** - Advanced Synthetic Chemistry Laboratory

**CHEM 453L** - Analytical Instrumentation: Theory and Application (4 hrs)

**CHEM 457** - Environmental Chemistry

**CHEM 469/569** - Characterization Methods for Nanostructures (AOA CBE/NSMS 412/512)

### Earth & Planetary Sciences

**EPS 301** - Mineralogy/Earth and Planetary Materials

**EPS 302L** - Mineralogy Laboratory (2 hrs)

**EPS 303L** - Igneous and Metamorphic Petrology (4 hrs)

**EPS 304L** - Sedimentology and Stratigraphy (4 hrs)

**EPS 307L** - Structural Geology (4 hrs)

**EPS 333** - Environmental Geology

**EPS 352** - Global Climate Change (AOA GEOG 352)

**EPS 365** - Exploring the Solar System

**EPS 400** - Topics in Earth and Planetary Sciences

**EPS 405L/505L** - Stable Isotope Geochemistry

**EPS 410/510** - Fundamentals of Geochemistry

**EPS 411L** - Invertebrate Paleontology (4 hrs)

**EPS 415/515** - Geochemistry of Natural Waters

**EPS 420L/520L** - Topics in Advanced Field Geology

**EPS 427/527** - Geophysics (AOA PHYC 327)

**EPS 428/528** - Applied Math for Earth & Environmental Sci

**EPS 433** - Statistics and Data Analysis in Earth Science

**EPS 439** - Paleoclimatology

**EPS 443/543** - Aquifers and Reservoirs

**EPS 450L/550L** - Volcanology (4 hrs)

**EPS 455L/555L** - Computational and GIS Applications in Geomorphology

### Earth & Planetary Sciences - cont'd

**EPS 465/565** - Mars Evolution

**EPS 476/576** - Physical Hydrogeology

**EPS 481L/581L** - Geomorphology and Surficial Geology (4 hrs)

**EPS 482L/582L** - Geoarchaeology (AOA ANTH 482L/582L)

**EPS 485L/585L** - Soil Stratigraphy and Morphology

### Mathematics & Statistics

**MATH 311** - Vector Analysis

**MATH 312** - Partial Differential Equations for Engineering

**MATH 313** - Complex Variables

**MATH 314** - Linear Algebra with Applications

**MATH 317** - Elementary Combinatorics

**MATH 318** - Graph Theory

**MATH 319** - Theory of Numbers

**MATH 321** - Linear Algebra

**MATH 322** - Modern Algebra I

**MATH 327** - Introduction to Mathematical Thinking and Discrete Structures

**MATH 356** - Symbolic Logic (AOA PHIL 356)

**MATH 375** - Introduction to Numerical Computing (AOA CS 375)

**MATH 401** - Advanced Calculus I (4 hrs)

**MATH 402** - Advanced Calculus II

**MATH 415** - History and Philosophy of Mathematics (AOA PHIL 415)

**MATH 421** - Modern Algebra II

**MATH 422** - Modern Algebra for Engineers

**MATH 431/535** - Introduction to Topology

**MATH 441** - Probability (AOA STAT 461/561)

**MATH 462/512** - Introduction to Ordinary Differential Equations

**MATH 463/513** - Introduction to Partial Differential Equations

**MATH 464/514** - Applied Matrix Theory

**MATH 466** - Mathematical Methods in Science and

**MATH 471** - Introduction to Scientific Computing

**MATH 472/572** - Fourier Analysis and Wavelets

**STAT 345** - Elements of Mathematical Statistics and Probability Theory

**STAT 434/534** - Introduction to Differential Geometry

**STAT 461/561** - Probability (AOA MATH 441)

### Physics & Astronomy

**PHYC 302** - Introduction to Photonics

**PHYC 303** - Analytical Mechanics I

**PHYC 304** - Analytical Mechanics II

**PHYC 330** - Introduction to Modern Physics

**PHYC 405** - Electricity and Magnetism I

**PHYC 406** - Electricity and Magnetism II

**PHYC 430** - Introduction to Solid State Physics

**PHYC 491** - Intermediate Quantum Mechanics I

**PHYC 492** - Intermediate Quantum Mechanics II

**PHYC 493L** - Contemporary Physics Laboratory

**PHYC 495** - Theory of Special Relativity