

Chemical Engineering Technical Electives

Technical Electives: Students must complete at least six credits of technically oriented **subject-related courses** approved by his or her advisor. Acceptable subjects include, but are not limited to: composites processing or biochemical engineering, electronic materials, environment, advanced mathematics, transport phenomena, advanced chemistry, food, legal and regulatory issues, advanced materials, advanced biology, statistics, biomedical engineering, and polymers.

You may select two courses from one of the groups listed below or request approval from your advisor for an alternate set of courses. At least one course in the technical elective area must include 3 credits of engineering topics. Engineering topics courses include courses taught in the College of Engineering as well as some courses taught in advanced math, advanced chemistry, advanced biology, advanced statistics, and advanced physics. **Engineering topics courses are denoted by superscript “e” in front of the course listing.**

NOTE: If BMB 462 is taken to fulfill major requirements, it will count as technical elective credit in biological sciences and engineering.

Biological Sciences and Engineering

ANTR 350, Human Anatomy (p: BS 111)

^e*CHE 481, Biochemical Engineering (CHE 431; BMB 401)

^e CHE 883, Multidisciplinary Bioprocessing Lab (p: CHE 481)

CSS 350, Introduction to Plant Genetics (p: BS 111)

^e ME 495, Tissue Mechanics (p: ME 222)

^e ME 497, Biomechanical Design (p: jr/sr)

MMG 301, Introductory Microbiology (p: BS 111; CEM 251 or cc or 351 or cc)

^e MMG 409, Eukaryotic Cell Biology (p: BS 111; BMB 401 or cc or BMB 462 or cc)

^e MMG 425, Microbial Microbiology (RB: MMG 301)

^e MMG/FSC 440, Food Microbiology (p: MMG 201 or MMG 301; WRA)

^e MMG 445, Basic Biotechnology (p: MMG 301 or cc)

^e MMG 451, Immunology (p: BS 111; BMB 401 or cc or BMB 461 or cc)

^e MSE 425, Biomaterials and Biocompatibility (p: MSE 250; PSL 250 or cc or PSL 431)

PHM 350, Introductory Human Pharmacology (p: PSL 250 or PSL 431 and 432)

PSL 250, Introductory Physiology (p: none)

^e PSL 420, Membrane Biophysics: Introduction (p: one year PHY or CEM; one year MTH)

^e PSL 425, Physiological Biophysics (p: PSL 250 or 431)

PSL 431, Human Physiology I (p: BS 111; CEM 351 or 352; PHY 184 or cc)

PSL 432, Human Physiology II (p: PSL 431)

ZOL341, Fundamental Genetics (BS 111)ⁿ

***Note: Completion of CHE 472 or CHE 481 is a program requirement. Therefore, CHE 472 or CHE 481 cannot count as both a technical elective and a program requirement.**

Chemical Engineering

- ° *CHE 472, Composite Materials Processing (p: CHE 311)
 - ° *CHE 481, Biochemical Engineering (CHE 431; BMB 401 starting FS06)
 - ° CHE 490, Independent Study
 - ° CHE 883, Multidisciplinary Bioprocessing Lab (p: CHE 481)
 - ° CHE 491, Engineering Entrepreneurship (sr. standing)
 - ° CHE 491, Distilled Beverage Technology (sr. standing)
 - ° CHE 491, Engineering Entrepreneurship (sr. standing)
 - ° CHE 891, Green and Sustainable Energy (jr. or sr. standing)
- *Note: Completion of CHE 472 or CHE 481 is a program requirement. Therefore, CHE 472 or CHE 481 cannot count as both a technical elective and a program requirement.**

Advanced Chemistry and Physics

- ° CEM 411, Inorganic Chemistry (p: CEM 484)
 - ° CEM 444, Chemical Safety (p: CEM 142; CEM 252; override needed)
 - °*CEM 483, Quantum Chemistry (p: MTH 234)
 - °*CEM 484, Molecular Thermodynamics (p:
° CEM 485, Modern Nuclear Chemistry (p: CEM 141 or 152; PHY 184)
PHY 215, Thermodynamics and Modern Physics (p: PHY 184 or cc; MTH 234 or cc)
PHY 321, Classical Mechanics I (p: PHY 184, MTH 234 or cc)
PHY 351B, Computational Physics (p: PHY 215)
PHY 357B, Topics in Contemporary Physics (p; PHY 215)
° PHY 422, Classical Mechanics II (p: PHY 321)
° PHY 480, Computational Physics (RB: CSE 131 or 231)
- *Note: Completion of CEM 483 or CEM 484 is a program requirement. Therefore, CEM 483 or CEM 484 taken alone cannot count as both a technical elective and a program requirement.**

Electrical Engineering

- ° ECE 201, Circuits and Systems I (p: CSE 131 or cc or CSE 231 or cc or EGR 102 or cc; MTH 234 or cc)
- ° ECE 202, Circuits and Systems II (p: ECE 201; MTH 235 or cc)
- ° ECE 230, Digital Logic Fundamentals (p: CSE 131 or 231 or EGR 102)
- ° ECE 280, Electrical Engineering Analysis (p: MTH 234; ECE 201 or cc)
- ° ECE 345, Electronic Instrumentation Systems
CSE 231, Programming I (Python) (p: MTH 132 or cc)
CSE 232, Programming II (Python) (p: CSE 231; MTH 132)
CSE 260, Discrete Structures in Computer Science (p: MTH 133)

Environmental Engineering and Policy

- ° CE 280, Principles of Environmental Engineering and Science (p: CEM 141 or 151; MTH 132 or cc)
- ° CE 481, Environmental Engineering Chemistry (p: CEM 151 and 152; CEM 252 or 352)
- ° CE 483, Unit Operations and Processes in Environmental Engineering (p: CE 280; CE 321 or cc; override needed)
- ° CE 487, Microbiology for Environmental Health Engineering (p: CHE 201)
- ° CHE 891, Green and Sustainable Energy (jr. or sr. standing)
- CSS 210, Fundamentals of Soil and Landscape Science (p: CEM 141; override needed)
- ° CSS 355, Environmental Soil Chemistry (p: CEM 143; CSS 210; override needed)
- EEP 255, Ecological Economics
- ° EEP 320, Environmental Economics (p: EEP 255)
- ° EEP 405, Corporate Environmental Management (p: EEP 255)
- EEP 430, Law and Resources (p: jr/sr)
- ° ENE 427, Environmental Toxicology and Society (p: BS 111)
- ENT 319, Introduction to Earth System Science
- ° ENT 419, Advanced Earth System Science (p: ENT 319)
- NSC 448, Ecology, Law and Economics (p: EC 201)
- ESA 201, Environmental and Natural Resources (p: none)
- ESA 300, Environmental Conflict Management (p: WRA)
- ESA 430, Environmental and Natural Resource Law (jr/sr)
- ° ESA 446, Environmental Issues and Public Policy (jr/sr)

Food Processing

- ° CHE 491, Distilled Beverage Technology (sr. standing)
- ° FSC 342, Food Safety and Hazard Analysis Critical Control Point Program (p: one course in MMG or CEM or BS) Override necessary
- ° FSC 401, Food Chemistry (p: CEM 352 or BMB 401 or cc)
- ° FSC 421, Food Laws and Regulations (p: HNF 150 or FSC 211)
- ° FSC 430, Food Processing: Fruits and Vegetables (p: FSC 211)
- ° FSC 431, Food Processing: Cereals (p: FSC 211)
- ° FSC 432, Food Processing: Dairy Foods (p: FSC 211)
- ° FSC 433, Food Processing: Muscle Foods (p: FSC 211)
- ° FSC 440, Food Microbiology (p: MMG 201 or MMG 301)
- ° FSC 455, Food Analysis (p: BMB 401 or cc; WRA)
- ° FSC/BE 477, Food Engineering: Fluids (p: CHE 311)

Materials Engineering

- °*CHE 472, Composite Materials Processing (p: CHE 311)
 - ° CE 221, Statics (p: Phy 183; MTH 234 or cc)
 - ° ME 222, Deformable Solids (p: CE 221; MTH 234)
 - ° ME 361, Dynamics (p: CE/ME 221; MTH 235)
 - ° ME 495, Tissue Mechanics (p: ME 222)
 - ° MSE 250, Introduction to Materials Science (p: CEM 141 or 151)
 - ° MSE 350, Electronic Structure and Properties of Materials (PHY 184 or cc; CEM 141 or 151)
 - ° MSE 370, Physical Processing of Materials (p: MSE 310 or CHE 321; override necessary)
 - ° MSE 425, Biomaterials and Biocompatibility (p: MSE 250; PSL 250 or cc or PSL 431)
 - PKG 221, Packaging with Glass and Metal (p: CEM 141 or 151; PHY 183; PKG 101 or cc)
 - ° PKG 323, Packaging with Plastics (p: PKG 101; PKG 221 or cc; CEM 351; STT 351; MTH 132) override necessary
- *Note: Completion of CHE 472 or CHE 481 is a program requirement. Therefore, CHE 472 or CHE 481 cannot count as both a technical elective and a program requirement.**

Mathematics, Statistics and Computing

- MTH 309, Linear Algebra I (p: MTH 234; WRA)
- MTH 314, Matrix Algebra with Applications (p: MTH 234)
- MTH 320, Analysis I (p: MTH 234; MTH 309)
- MTH 414, Linear Algebra II (p: MTH 309 or MTH 314)
- ° MTH 415, Applied Linear Algebra (p: MTH 235; MTH 309 or MTH 314)
- ° MTH 421, Analysis II (p: MTH 320)
- ° MTH 443, Boundary Value Problems for Engineers (p: MTH 235)
- ° MTH 451, Numerical Analysis (p: CSE 131 or CSE 231; MTH 309 or 314 or 415; MTH 235)
- ° STT 351, Probability and Statistics for Engineers (p: MTH 234)
- CSE 231, Programming I (Python) (p: MTH 132 or cc)
- CSE 232, Programming II (Python) (p: CSE 231; MTH 132)
- CSE 260, Discrete Structures in Computer Science (p: MTH 133)