

## Approved Technical Elective Classes for Chemical Engineering Students

- Selection of technical electives is an important decision affecting minors and preparation for jobs and graduate school. Students are strongly advised to consult with a CME academic advisor to discuss the options and constraints that apply to their situation.
- Chemical Engineering courses, Engineering courses, Math and Science courses can be used as technical electives.
- The Engineering/Science classes can be used to complete a minor.
- Engineering Technology classes cannot be accepted as engineering/science requirement.
- Honors Thesis (CME 493 or CME 494) can be used as technical elective. Engineering Systems Design Seminar (EGR 320) cannot be used for an engineering/science requirement.
- **PHY 250** - Descriptive Astronomy does not count as a technical elective.
- Most common classes taken by Chemical Engineering students are in bold letters. Pre-requisites to courses are in parentheses.

### Chemical Engineering Electives

<b>CME 409</b>	<b>Introduction to Polymer Science – Thermoplastics (CME 311, CHM 314)</b>
<b>CME 410</b>	<b>High Performance Thermoset Polymers (Organic Chemistry), permission of instructor</b>
CME 412	Advanced Composites (CME 409 or CME 509 or MAT 501 or consent of instructor)
<b>CME 432</b>	<b>Chemical Product Design</b>
<b>CME 486</b>	<b>Introduction to Petroleum Engineering</b>
<b>CME 489</b>	<b>Principles of Biology for Bioengineers</b>
<b>CME 490</b>	<b>Introduction to Bioengineering (CME 324, CME 306 co-req.)</b>
<b>CME 491</b>	<b>Biomedical Engineering</b>
CME 492	Chemical Sensors & Biosensors
CME 499	Special Problems
CME 507	Advanced Thermodynamics
<b>CME 509</b>	<b>Introduction to Polymer Science - Thermoplastics (College Chemistry; physics and differential equations)</b>
<b>CME 510</b>	<b>High Performance Thermoset Polymers (Background in differential equations, organic or physical chemistry, or CME 509)</b>
<b>CME 511</b>	<b>Principles of Corrosion (MAT 501)</b>
<b>CME 512</b>	<b>Advanced Composites (MAT 501, MAT 509 or perm of instructor)</b>
CME 515	Statistical Thermodynamics (CME 311, MTH 219)
CME 521	Advanced Transport Phenomena

CME 523	Transport Phenomena in Biological Systems (BIE 503 or BIO 505; BIO 151, BIO 152; MTH218 or permission of instructor)
CME 524	Electrochemical Power
CME 526	Polymer Engineering (CME 510 or consent of instructor)
CME 527	Methods of Polymer Analysis (CME 509, 510 or consent of instructor)
CME 528	Chemical Behavior of Materials (CHM 123 or permission of instructor)
CME 529	Computational Chemistry and Molecular Simulations
<b>CME 530</b>	<b>Biomaterials</b>
<b>CME 532</b>	<b>Chemical Product Design (CME 311, 324 or consent of instructor)</b>
CME 533	Biofuel Production Processes (EGR 202; CHM 123 or consent of instructor)
CME 541	Process Dynamics
CME 542	Chemical Engineering Kinetics (CME 306 and CME 381 or equivalent)
CME 543	Chemical Reactor Analysis and Design (CME 306 & CME 381 or equivalent)
CME 550	Agitation (CME 412 or consent of instructor)
CME 560	Biological Processes in Wastewater Engineering
CME 562	Physical and Chemical Wastewater Treatment Processes (CHM 123 and CME 411 or consent of instructor)
CME 563	Hazardous Waste Engineering (CHM 123 and CME 411 or consent of instructor)
CME 564	Solid Waste Engineering (CHM 123 and CME 411 or consent of instructor)
CME 565	Fundamentals of Combustion (CME 311, CME 306 or consent of instructor)
CME 566	Advanced Separations (CME 365 or equivalent or consent of instructor)
CME 574	Fundamentals of Air Pollution Engineering I (CME 311, CME 324 or consent of instructor)
CME 575	Fundamentals of Air Pollution Engineering II (CME 574 or consent of instructor)
CME 576	Environmental Engineering Separation Processes
CME 579	Materials for Advanced Energy Application
CME 581	Advanced Chemical Engineering Calculations I (MTH 219 or permission of instructor)
CME 582	Advanced Chemical Engineering Calculations II
CME 583	Process Modeling (CME 582 or equivalent)
CME 586	Introduction to Petroleum Engineering
CME 590	Introduction to Bioengineering
CME 591	Biomedical Engineering
CME 592	Chemical Sensors and Biosensors
CME 595	Special Problems in Chemical Engineering

### **Bioengineering Electives**

BIE 503	Principles of Biology for Bioengineers (BIO 151, BIO 152 or consent of instructor)
BIE 511	Biomaterials
BIE 521	Biomechanical Engineering (EGM202, EGR 201 or consent of instructor)
BIE 529	Computational Chemistry and Molecular Simulations (CHM 124 or consent of instructor)
BIE 530	Biomaterials
BIE 533	Biofuel Production Processes (EGR 202; CHM 123 or consent of instructor)
BIE 537	
BIE 560	Biological Processes in Wastewater Engineering (CHM 124)
BIE 561	Biomedical Engineering I (BIO 151 and CME 324) or BIE 501 or permission of instructor

## **Biology Electives**

<b>BIO 151</b>	<b>Concepts of Biology I: Cell and Molecular Biology</b>
BIO 152	Concepts of Biology II: Evolution and Ecology (BIO 151 suggested)
BIO 312	General Genetics (BIO 152)
BIO 350	Applied Microbiology (BIO 152, CHM 314)
BIO 403	Physiology I (BIO 152, CHM 314)
BIO 404	Physiology II (BIO 403)
BIO 411	General Microbiology (BIO 152, CHM 313)
BIO 415	Neurobiology (BIO 152, CHM 124)
BIO 440	Cell Biology (BIO 152, CHM 314)
BIO 462	Molecular Biology (BIO 312, CHM 314)

## **Chemistry Electives**

Any course that has CHM 124 as a prerequisite.

<b>CHM 201</b>	<b>Quantitative Analysis (CHM 124, 124L; Concurrent with CHM 201L)</b>
<b>CHM 201L</b>	<b>Quantitative Analysis Lab</b>
CHM 234	Energy Resources Prerequisite(s): CHM 123, CHM 124
CHM 303	Physical Chemistry (CHM 201 or equivalent; co-requisite MTH 218; Concurrent with 303L)
CHM 303L	Physical Chemistry Lab
CHM 304	Physical Chemistry
CHM 304L	Physical Chemistry Lab (MTH 218 co-requisite)
CHM 341	Environmental Chemistry (CHM 314 or permission of instructor)
CHM 341L	Environmental Chemistry Lab (Co-requisite CHM 341)
CHM 415	Analytical Chemistry (CHM 201, 201L, 302 or 304; Concurrent with 415L)
CHM 415L	Analytical Chemistry Lab (CHM 201L, CHM 302 or equivalent)
CHM 417	Inorganic Chemistry (CHM 124, 314; co-requisite CHM 302 or 304)
CHM 418L	Inorganic Chemistry Laboratory (CHM 201L, 314L; co-requisite CHM 417)
<b>CHM 420</b>	<b>Biochemistry (CHM 314)</b>
CHM 427	Medicinal Chemistry (CHM 314 and CHM 420 or CHM 451)
CHM 451	General Biochemistry I (CHM 201, 314)
CHM 452	General Biochemistry II (CHM 451)
CHM 462L	Biochemistry Laboratory (CHM 420 or 451)
CME 528	Chemical Behavior of Materials

## **Civil & Environmental Engineering Electives**

CEE 213	Surveying
CEE 214	Highway Geometrics
CEE 215L	Surveying Field Practice
CEE 311L	Civil Engineering Materials Laboratory
CEE 312	Geotechnical Engineering
CEE 312L	Geotechnical Engineering Laboratory
CEE 313	Hydraulics
CEE 313L	Hydraulics Laboratory

CEE 316	Analysis of Structures I
CEE 333	Water Resources Engineering
CEE 403	Transportation Engineering
CEE 411	Design of Steel Structures
CEE 412	Design of Concrete Structures
CEE 421	Construction Engineering
CEE 422	Design and Construction Project Management
CEE 434	Water and Wastewater Engineering
CEE 434L	Water & Wastewater Engineering Laboratory
CEE 450	Civil Engineering Design
CEE 463	Hazardous Waste Engineering
CEE 546	Finite Element Analysis
CEE 560	Industrial/Domestic Waste Treatment
CEE 562*	Physical and Chemical Wastewater Treatment Processes
CEE 563	Hazardous Waste Treatment
CEE 564*	Solid Waste Engineering
CEE 580	Hydrology and Seepage (CIE 312, 313)
CEE 582	Advanced Hydraulics (CIE 313)

### **Computer Science Electives**

CPS 132	Computer Programming for Engineering and Science (Co-requisite MTH 168)
<b>CPS 150</b>	<b>Algorithm &amp; Programming I (4 credit hour)</b>
CPS 151	Algorithm & Programming II (4 credit hour, CPS 150)
CPS 250	Introduction to Computer Organization (CPS 151)
CPS 346	Operating Systems I (CPS 250, 350)
CPS 350	Data Structures & Algorithms (CPS 151)
<b>CPS 353</b>	<b>Numerical Methods I (MTH 169, CPS 132 or 150)</b>

### **Electrical and Computer Engineering Electives**

ECE 201	Circuit Analysis (MTH 138 or 168, Concurrent with ECE 201L)
<b>ECE 204</b>	<b>Electronic Devices (EGR 203; Co-Req ECE 204L)</b>
ECE 215	Introduction to Digital Systems (EGR 203; Co-Req ECE 215L)
ECE 303	Signals and Systems (ECE 204; MTH 218; Co-Req ECE 303L)
ECE 304	Electronic Systems (ECE 303; Co-req ECE 304L)
ECE 314	Fundamentals of Computer Architecture (CPS 150; ECE 215; Co-Req ECE 314L)
ECE 401	Communication Systems (ECE 304; 340; Co-req ECE 401L)
ECE 401L	Communication Systems Lab (ECE 304; Co-Req ECE 401)
ECE 414	Electro-Mechanical Devices (ECE 303, ECE 332)

### **Engineering Mechanics Electives**

EGM 202	Dynamics (EGR 201)
<b>EGM 303</b>	<b>Strength of Materials (EGR 201)</b>

### **Engineering Management and Systems**

ENM 500	Probability and Statistics for Engineers (MTH 218)
ENM 541	Production Engineering (MSC 521 or permission of instructor)
ENM 560	Quality Assurance (ENM 500 or equivalent)
ENM 561	Design and Analysis of Experiments (ENM 500 or equivalent)

### **Geology Electives**

GEO 115	Physical Geology
GEO 208	Environmental Geology (GEO 109 or 115, permission of instructor)
<b>GEO 218</b>	<b>Engineering Geology</b>
GEO 309	Surface and Groundwater Hydrology (GEO 109 or GEO 218 or permission of instructor)
GEO 412	Introductory Geochemistry (GEO 201, or permission of instructor)

### **Industrial and Systems Engineering Electives**

<b>ISE 300</b>	<b>Probability and Statistics for Engineers (MTH 218)</b>
ISE 411	Problem Solving and Decision Making
ISE 430	Engineering Economy (MTH 218 not recommended; covered in Design I)
ISE 441	Production Engineering (CPS 132; ISE 300 or MTH 167)
ISE 455	Systems Dynamics (MTH 368 or ISE 369; CPS 132)
ISE 460	Quality Assurance (ISE 300 or MTH 367; CPS 132)
ISE 461	Design and Analysis of Experiments (CPS 132, ISE 300, MTH 367)
ISE 465	Reliability and Maintainability (MTH 367 or ISE 300; CPS 132)

### **Materials Engineering**

<b>MAT 501</b>	<b>Principles of Materials I (MTH 219, college chemistry and physics)</b>
<b>MAT 502</b>	<b>Principles of Materials II (MAT 501 or equivalent)</b>
MAT 504	Techniques of Material Analysis (MAT 501 or permission of instructor)
MAT 506	Mechanical Behavior of Materials (EGM 303 or permission of instructor)
MAT 507	Introduction to Ceramic Materials (MAT 501)
MAT 508	Principles of Material Selection (MAT 501 or permission of instructor)
MAT 509	Introduction to Polymer Science-Thermoplastics (Organic Chemistry, College Physics, and Differential Equations)
MAT 521	Nondestructive Evaluation (Permission of Instructor)
MAT 527	Methods of Polymer Analysis (MAT 509, MAT 510)
MAT 528	Chemical Behavior of Materials (College Chemistry or permission of instructor)
MAT 529	Computational Chemistry and Molecular Simulations
MAT 535	High-Temperature Materials (MAT 501 or equivalent)
MAT 540	Composite Design (EGM 303 or EGM 330)
MAT 541	Experimental Mechanics of Composite Materials (EGM 303 or EGM 330)
<b>MAT 542</b>	<b>Advanced Composites (MAT 501, MAT 509, permission of instructor)</b>
MAT 543	Analytical Mechanics of Composite Materials (EGM 303 or EGM 330)
MAT 544	Mechanics of Composite Structures
MAT 570	Fracture Mechanics (MAT 506 or permission of instructor)
MAT 575	Fracture and Fatigue of Metals and Alloys I (MAT 501, MAT 506, or permission of instructor)

MAT 579	Materials for Advanced Energy Applications (consent of instructor)
MAT 580	Polymer Durability
MAT 601	Surface Chemistry of Solids (MAT 501 or permission of instructor)
MAT 603	Materials Science of Thin Films (College Physics, fundamental physical and chemical properties of materials)
MAT 604	Nanostructured Materials (College Physics fundamental physical and chemical properties of materials)
MAT 605	Introduction to Carbon Nanotechnology

### **Mathematics Electives**

MTH 310	Linear Algebra and Matrices (MTH 308, MTH 218 or perm of instructor)
<b>MTH 367</b>	<b>Statistical Methods I (MTH 149, or 169)</b>
MTH 368	Statistical Methods II (MTH 367)
MTH 403	Boundary Value Problems (MTH 219)
MTH 411	Probability and Statistics I (MTH 218, MTH 308)
MTH 412	Probability and Statistics II (MTH 411)
MTH 440	Introduction to Mathematical Modeling (MTH 219, 310 or permission of instructor)

### **Mechanical Engineering Electives**

Strength and Materials is a prerequisite for many of the classes

MEE 312	Engineering Materials I (PHY 208, EGM 303, MEE 301 or permission)
<b>MEE 313</b>	<b>Engineering Materials II (MEE 312 or permission of instructor)</b>
MEE 401	Aerodynamics (MEE 308)
MEE 413	Propulsion
MEE 417	Internal Combustion Engines (MEE 301 or permission)
MEE 420	Energy Efficient Buildings
MEE 471	Design of Thermal Systems
MEE 473	Renewable Energy Systems
MEE 478	Energy Efficient Manufacturing
MEE 530	Biomechanical Engineering
MEE 567	Solar Heating Analysis

### **Physics Electives**

Any course that has PHY 206 as a prerequisite.

PHY 208	General Physics III - Mechanics of Waves
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