

# Engineering/Science, Chemical Engineering, Chemistry, and Ethics Requirements

Revised 8/13

- \* 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, 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 are in bold letters. Pre-requisites to courses are in parentheses.

## Chemical Engineering

Any course that is not a required class can be taken.

<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>
<b>CME 412</b>	<b>Advanced Composites (CME 409 or CME 509 or MAT 501 or consent of instructor)</b>
<b>CME 429</b>	<b>Computational Chemistry and Molecular Simulations</b>
<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>
<b>CME 492</b>	<b>Chemical Sensors &amp; Biosensors</b>
CME 499	Special Problems
CME 507	Advanced Thermodynamics

<b>CME 509</b>	<b>Introduction to Polymer Science - Thermoplastics</b> <b>(College Chemistry; physics and differential equations)</b>
CME 510	High Performance Thermoset Polymers (Background in differential equations, organic or physical chemistry, or CME 509)
<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 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 532</b>	<b>Chemical Product Design (CME 311, 324 or consent of instructor)</b>
<b>CME 530</b>	<b>Biomaterials</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 of instructor)
CME 576	Environmental Engineering Separation Processes
CME 579	Materials for Advanced Energy Application
CME 580	Polymer Decomposition, Degradation, and Durability
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**

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	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**

<b>BIO</b>	<b>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**

Any course that has CHM 124 as a prerequisite.

<b>CHM</b>	<b>201</b>	<b>Quantitative Analysis (CHM 124, 124L; Concurrent with CHM 201L)</b>
<b>CHM</b>	<b>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</b>	<b>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**

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

### **Computer Science**

CPS	132	Computer Programming for Engineering and Science (Co-requisite MTH 168)
<b>CPS</b>	<b>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</b>	<b>353</b>	<b>Numerical Methods I (MTH 169, CPS 132 or 150)</b>

### **Electrical and Computer Engineering**

Any course that is not a required class can be taken.

ECE	201	Circuit Analysis (MTH 138 or 168, Concurrent with ECE 201L)
<b>ECE</b>	<b>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

- EGM 202 Dynamics (EGR 201)  
**EGM 303 Strength of Materials (EGR 201)**  
 EGM 445 Finite Element Applications (EGM 303, MTH 219)

### Geology

- GEO 115 Physical Geology  
 GEO 208 Environmental Geology (GEO 109 or 115, permission of instructor)  
**GEO 218 Engineering Geology**  
 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

- ISE 300 Probability and Statistics for Engineers (MTH 218)**  
 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)

### Mathematics

- MTH 310 Linear Algebra and Matrices (MTH 308, MTH 218 or perm of instructor)  
**MTH 367 Statistical Methods I (MTH 149, or 169)**  
 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

Any course can be taken.

Strength and Materials is a prerequisite for many of the classes so it is listed here.

- EGM 303 Strength and Materials (EGM 201)**  
 MEE 312 Engineering Materials I (PHY 208, EGM 303, MEE 301 or permission)  
**MEE 313 Engineering Materials II (MEE 312 or permission of instructor)**  
 MEE 401 Aerodynamics (MEE 308)

MEE 402	Energy Conversion Systems (MEE 302 or CME 311 or MCT 232)
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

### **Physics**

Any course that has PHY 206 as a prerequisite.

PHY 208      General Physics III - Mechanics of Waves

## Graduate Classes

The following are acceptable graduate classes:

BIE	511	Biomaterials
BIE	529	Computational Chemistry and Molecular Simulations (CHM 124 or consent of instructor)
BIE	533	Biofuel Production Processes (EGR 202; CHM 123 or consent of instructor)
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
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)
CME	507	Advanced Thermodynamics
<b>CME</b>	<b>509</b>	<b>Introduction to Polymer Science – Thermoplastics (College Chemistry and Calculus)</b>
<b>CME</b>	<b>510</b>	<b>High Performance Thermoset Polymers (Background in differential equations, organic or physical chemistry, or CME 509)</b>
<b>CME</b>	<b>511</b>	<b>Principles of Corrosion (MAT 501)</b>
<b>CME</b>	<b>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 324 or 381 or equivalent)
CME	524	Fundamentals and Applications of Fuel Cells
CME	525	Design of Macromolecular Systems (CHM 314; CME 510 or consent of instructor)
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
CME	530	Biomaterials
<b>CME</b>	<b>532</b>	<b>Chemical Product Design</b>
CME	533	Biofuel Production Processes
CME	541	Process Dynamics
<b>CME</b>	<b>542</b>	<b>Chemical Engineering Kinetics (CME 306 and CME 381 or equivalent)</b>
CME	543	Chemical Reactor Analysis and Design (CME 306 and 381 or equivalent)
CME	550	Agitation
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 ( CME 411 or kputwexqt"consent)

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	Air Pollution Engineering I (CME 311 or MEE 301, 302; CME 324 or MEE 410; or permission of instructor)
CME	575	Air Pollution Engineering II (CME 574 or permission of instructor)
CME	576	Environmental Engineering Separation Processes (Consent of instructor)
CME	579	Materials for Advanced Energy Application
CME	580	Polymer Durability
<b>CME</b>	<b>582</b>	<b>Advanced Chemical Engineering Calculations II</b>
CME	583	Process Modeling (CME 582 or equivalent)
CME	586	Introduction to Petroleum Engineering
CME	590	Introduction to Bioengineering (CME 324, CME 306)
CME	591	Introduction to Biomedical Engineering
CME	592	Chemical Sensors & Biosensors
CME	595	Special Problems in Chemical Engineering
ENM	541	Production Engineering (ENM 521 or permission of instructor)
<b>ENM</b>	<b>560</b>	<b>Quality Assurance (MSC 501 or equivalent)</b>
ENM	561	Design and Analysis of Experiments (MSC 501 or equivalent)
<b>ENM</b>	<b>575</b>	<b>Introduction to Artificial Intelligence</b>
ENM	577	Introduction to Expert Systems
<b>MAT</b>	<b>501</b>	<b>Principles of Materials I (MTH 219, college chemistry and physics)</b>
<b>MAT</b>	<b>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	521	Nondestructive Evaluation (Permission of Instructor)
MAT	526	Polymer Engineering (MEE 308, MEE 410, MAT 510)
MAT	527	Methods of Polymer Analysis (MAT 509, MAT 510)
MAT	529	Computational Chemistry and Molecular Simulations
MAT	530	Biomaterials
MAT	535	High-Temperature Materials (MAT 501 or equivalent)
<b>MAT</b>	<b>542</b>	<b>Advanced Composites (MAT 501, MAT 509, permission of instructor)</b>
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	576	Fracture and Fatigue of Metals and Alloys II (MAT 575 or equivalent)
MAT	577	Light Structural Metals
MAT	579	Materials for Adv Energy Applications (consent of instructor)
MAT	580	Polymer Durability



MAT	601	Surface Chemistry of Solids (MAT 501 or permission of instructor)
MEE	530	Biomechanical Engineering
MEE	567	Solar Heating Analysis
MTH	547	Statistics for Experimenters (MTH 367 or equivalent)

**\* may be dropped or changed in the future**