

**CHEMICAL ENGINEERING PROGRAM
TECHNICAL ELECTIVE REQUIREMENT
March 2007**

TECHNICAL ELECTIVE RULES

The ChE curriculum requires 6 credits of technical electives, to include:

A minimum of 2 credits of engineering elective, with the other 4 credits coming from engineering electives, advanced math electives, or advanced science electives.

In addition, at least one course must be outside of Chemical Engineering, and research credits cannot be used to fulfill all 6 credits of the requirement.

ENGINEERING ELECTIVES

Engineering courses must be at the 200 level or higher and with sufficient rigor, e.g. seminar courses and 1 credit programming courses don't count. Courses in AOSS are not considered engineering courses for this purpose.

Here is a **sampling** of popular engineering electives. Note that most Engineering courses fulfill the requirement

BME 401	4	Human body: Its Structure & Function	Envir 310	3	Toxicology
BME 410	4	Design & Applications of Biomaterials	IOE 201	2	Economic Decision Making
BME 419	4	Bioengineering Physiology	IOE 202	2	Operations Modeling
ChE 444	3	Applied Chemical Kinetics	IOE 265	4	Probability & Statistics for Engineers
ChE 472	4	Polymer Science and Engineering	IOE 366	2	Linear Statistical Models
ChE 490	1-6	Directed study, Res., Special probs	IOE 422	3	Entrepreneurship
ChE 517	3	Biochemical Engineering	IOE 425	2	Manufacturing Strategies
ChE 519	3	Pharmaceutical Engineering	MSE 242	4	Physics of Materials
ChE 530	3	Bioinformatics and Gene Expression	MSE 350	4	Fundamentals of Materials Sci & Engin
CEE 260	4	Environmental Principles	MSE 412	3	Polymeric Materials
CEE 581	3	Aquatic Chemistry	MSE 414	3	Applied Polymer Processing
CEE 582	3	Environmental Microbiology	ME 211	4	Introduction to Solid Mechanics
CEE 586	3-4	Industrial Ecology	ME 240	4	Intro. to Dynamics & Vibrations
CEE 686	2-3	Case studies in Environ. Sustainability	ME 250	4	Design and Manufacturing I (CAD)
EECS 280	4	Programming & Intro. Data Structures	ME 589	3	Eco. Sustainability in Design & Manuf
Engin 350	3	International Lab Experience for Eng.	NERS 211	4	Intro to Nuclear Engin. & Radiol Sci.
Engin 477	4	Principles of Virtual Reality			

ADVANCED MATH ELECTIVES

The non-engineering courses listed below have previously been approved as Advanced Math electives. If you are interested in taking a course that's not on the list, contact Dr. Montgomery for approval.

Math 354	3	Fourier Analysis and its Applications.
Math 371/Engr 371	3	Numerical Methods for Engineers and Scientists.
Math 417	3	Matrix Algebra I.
Math 419	3	Linear Spaces and Matrix Theory
Math 425/Stats 425	3	Introduction to Probability.
Math 450	4	Advanced Mathematics for Engineers I.
Math 454	3	Boundary Value Problems for PDEs
Math 462	3	Mathematical Models.
Math 463	3	Mathematical Modeling in Biology.
Math 471	3	Introduction to Numerical Methods.
Stats 405/ECON 405	4	Applied Statistical Methods II
Stats 412	3	Introduction to Probability and Statistics

The following Engineering courses might also be of interest to those interested in a mathematics emphasis:

ChE 507	3	Mathematical Modeling in Chemical Engineering
ChE 508	3	Applied Numerical Methods I
Engin 303	4	Computational Methods for Engineers and Scientists
IOE 366	2	Linear Statistical Models (ChE 360 fulfills prereqs)
IOE 465	3	Design and Analysis of Experiments

ADVANCED SCIENCE ELECTIVES

The courses listed below have previously been approved as Advanced Science electives. If you are interested in taking a course that's not on the list, contact Dr. Montgomery for approval.

AOSS - Atmospheric, Oceanic and Space Sciences

AOSS 300	3	Global Environmental Impact of Technological Change
AOSS 320/ GS 320	4	Earth System Evolution
AOSS 321/ GS 321	4	Earth System Dynamics
AOSS 463	3	Air Pollution Meteorology
AOSS 464	4	Intro. to Space & Spacecraft Environment
AOSS 467	3	Biochemical Cycles
AOSS 475	4	Earth-Ocean-Atmosph. Interactns
AOSS 479	4	Atmospheric Chemistry
AOSS 605	1-4	Atmospheric Reaction Modeling

BIO – Biology

BIOL 207	4	Introductory Microbiology
BIOL 208	3	Embryology
BIOL 305	4	Genetics
BIOL 310	4	Intro. Biochemistry
BIOL 311	4	Intro. Biochemistry, Self-Paced
BIOL 390	4	Evolution
BIOL 482	5	Limnology: Freshwater Ecology

BC - Biological Chemistry - Medical School

BC 415	3	Intro. Biochemistry
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CHEM – Chemistry

CHEM 451	4	Intro. Biochemistry I
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CHEM 461	3	Physical Chemistry I
CHEM 463	3	Physical Chemistry II
CHEM 511	3	Materials Chemistry

EHS – Environmental Health Science (Public Health)

EHS 547	3	Food Science
EHS 550	3	Intro to Occupational & Environmental Health
EHS 585	3	Food Safety Management

GS - Geological Sciences – see also AOSS

GS 425	3	Environmental Geochemistry
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MCDB – Molecular Cellular and Dev. Biology

MCDB 307-8	3	Developmental Biol. & Lab
MCDB 428	4	Cell Biology

NRE – Natural Resources and the Environment

NRE 574	3	Sustainable Energy Systems
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PHYS – Physics

PHYS 340/1	3,2	Waves, Heat, and Light; Lab
PHYS 390	3	Introduction to Modern Physics

PHARM – Pharmaceutical Sciences

PHARM 462	3	Pharmaceutical Sciences I
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The following Engineering courses might also be of interest to those interested in a science emphasis:

BME - Biomedical Engineering

BME 410	4	Design & Applications of Biomaterials
BME 418	4	Quantitative Cell Biology

CHE – Chemical Engineering

CHE 444	3	Applied Chemical Kinetics
CHE 470	3	Colloids and Interfaces
CHE 472	4	Polymer Science and Engin.
CHE 519	3	Pharmaceutical Engineering
CHE 538	3	Statistical & Irreversible Thermo.

CEE - Civil and Environmental Engineering

CEE 581	3	Aquatic Chemistry
CEE 582	3	Environmental Microbiology
CEE 586 /NRE 557	3,4	Industrial Ecology

MSE - Materials Science and Engineering

MSE 410 (BME 410)	4	Biomedical Materials
MSE 412 (ChE 412, MacroSE 412)	3	Polymeric Materials

OTHER TECHNICAL ELECTIVES

FIN 300	3	Financial Management
OMS 311	3	Operations Management

Check web for updates at <http://www.engin.umich.edu/dept/cheme/ugoffice/ugprog.html>