

## Technical Electives 2011-2012 Academic Year

Technical electives allow chemical engineering majors to tailor their degree. These classes, which include upper division science, applied science, and engineering subjects, cover a wide range of topics and give you a chance to follow your individual. In addition, you can often earn a minor by double counting some of the minor requirements with the technical electives.

To fulfill your departmental requirements, you must take 10 credits of approved technical electives. Technical electives are any course listed here as approved chemical engineering, engineering, or technical electives. With these 10 credits, you must take:

1. Three credits of chemical engineering elective, and
2. Three credits of engineering elective

Note that many of the courses listed below are not offered every semester and most have prerequisites. A “\*” indicates courses that do not require additional prerequisites other than classes CM majors must already take. It is best to plan out your technical electives ahead of time.

### Chemical Engineering Electives (3 credits required)

CM 2200	Intro Minerals and Materials*	3	CM/CH 4631	Polymer Science Laboratory	2
CM 3450	Computer-Aided Problem Solving*	3	CM 4650	Polymer Rheology*	3
CM 3820	Sampling Statistics and Instrumentation*	3	CM 4655	Polymer Rheology Laboratory	1
CM/ENT 3974	Fuel Cell Fundamentals*	1	CM 4710	Biochemical Processes*	3
CM/ENT 3977	Fund of Hydrogen as an Energy Carrier*	1	CM/MY 4740	Hydrometallurgy/Pyrometallurgy*	4
CM/ENT 3978	Hydrogen Measurements Lab*	1	CM 4740	Analytical Microdevice Technology*	3
CM 4000	Chemical Engineering Research* <sup>1</sup>	va	CM 5100	Applied Mathematics for Chem Eng* <sup>2</sup>	3
CM 4125	Bioprocess Engineering Laboratory	1	CM 5200	Advanced CM Thermodynamics* <sup>2</sup>	3
CM 4450	Computational Methods in Chem Eng*	2	CM 5300	Advanced Transport Phenomena* <sup>2</sup>	3
CM 4500	Particle Technology*	4	CM 5400	Advanced Reactive Systems Analysis* <sup>2</sup>	3
CM 4550	Industrial Chemical Production*	3	CMU 8950U	CM Technical Elective	va
CM/CH 4610	Introduction to Polymer Science*	3			

### Engineering Electives (3 credits required)

Approved engineering electives include any course listed under chemical engineering electives, plus the courses listed below.

BE 2600	Introduction to Biomed Eng*	3	ENT 4950	Enterprise Project Work V <sup>2</sup>	2
BE 3500	Biomedical Materials	3	ENT 4960	Enterprise Project Work VI <sup>2</sup>	2
BE 4100	Cell and Tissue Mechanics	3	ENT 4961	Enterprise Project Work VII	1
BE 4300	Adv Polymeric Biomaterials	3	ENVE 3503	Environmental Engineering*	3
CS 1121	Intro to Computer Science I*	3	ENVE 4501	Envir Eng Chemical Processes	4
CS 1131	Computer Science I* <sup>2</sup>	4	MEEM 2110	Statics*	3
EE 2110	Electric Circuits	3	MEEM 2150	Mechanics of Materials	3
EE 2150	Introduction to Signal Processing	3	MEEM 2700	Dynamics	3
EE 2173	Digital Logic	3	MEEM 4170	Failure of Material in Mechanics	3
EE 2190	Introduction to Photonics*	3	MEEM 4403	Computer-Aided Design Methods* <sup>2</sup>	4
EE 3010	Circuits and Instrumentation*	3	MEEM 4405	Intro to the Finite Element Method	3
EE 3120	Electric Energy Systems	3	MEEM 4635	Design with Plastics	3
EE 3130	Electronics	3	MEEM 4650	Quality Engineering	3
EE 3140	Electromagnetics	3	MEEM 5170	Finite Elem and Var Meth in Eng* <sup>2</sup>	3
ENG 2120	Statics-Strength of Materials*	4	MEEM 5240	Comp Fluid Dynamics for Eng*	3
ENT 2950	Enterprise Project Work I*	1	MY 3100	Materials Processing I	4
ENT 2960	Enterprise Project Work II*	1	MY 3200	Materials Characterization I	4
ENT 3950	Enterprise Project Work III*	1	MY 3400	Mechanical Prop of Materials	3
ENT 3960	Enterprise Project Work IV*	1	MY 4130	Principles of Metal Casting	3
ENT 3966	Design for Manufacturing*	1	MY 4150	Composite Materials	2
ENT 3975	Intro to Vehicle Des and System Mod*	1	UN 3002	Undergrad Cooperative Ed Lab* <sup>3</sup>	2

## Technical Electives

Approved technical electives include any course listed under chemical engineering electives and engineering electives, plus the courses listed below.

BA 3600	Quality Management	3	CH 4720	Biomolecular Chemistry II	3
BA 4620	Supply Chain Management	3	CM/CH 4620	Polymer Chemistry*	3
BE 2110	Statistical Methods for Biomed Eng*	3	CS 1121	Intro to Computer Science I*	3
BE/BL 2400	Biology for Engineers I*	3	CS 1131	Computer Science I* <sup>2</sup>	4
BL 1040	Principles of Biology*	4	ENG/SS 4510	Sustainable Futures I*	3
BL 2100	Principles of Biochemistry	3	ENT 3954	Enterprise Market Principles*	1
BL 4010	Biochemistry I	3	ENT 3958	Ethics in Eng Des and Impl*	1
BL 4020	Biochemistry II	3	ENT 3963	Technology Commercialization	1
BL 2010	Anatomy/Physiology I*	3	ENT 3964	Project Management*	1
BL 2011	Anatomy/Physiology I Lab	1	ENT 3967	Product/Process Development II*	1
BL 2020	Anatomy/Physiology II	3	ENT 3971	Seven Habits of Highly Effective Peop*	1
BL 2021	Anatomy/Physiology II Lab	1	ENT 4951	Business Plans and Budging in the Ent*	1
BL 2200	Genetics	3	FW 1035	Wood Anatomy and Properties*	4
BL 3210	General Microbiology	4	FW 3098	Wood Processing and Manufacturing	2
BL 3640	General Immunology <sup>2</sup>	3	GE 2020	Intro to Mining Eng and Mining Meth*	4
BL 4030	Molecular Biology	3	GE 2300	Earth Materials I: Mineralogy	3
BL 4220	Applied and Industrial Microbiology	3	GE 2310	Earth Materials II: Rocks and Min Res	3
BL 4320	Histology	4	GE 2350	Structural Geology I*	2
BL 4380	Cardiopulmonary Physiology	3	GE 2640	Atmos Observations and Meteorology*	3
BL 4470	Analysis of Biological Data*	4	MA 2710	Introduction to Statistical Analysis*	3
BL 4820	Biochem Lab Techniques I	2	MA 2720	Statistical Methods*	4
BL 4830	Advanced Bichemical Techniques	2	MA 3210	Introduction to Combinatorics*	3
BL 4840	Molecular Biology Techniques	3	MA 3310	Introduction to Abstract Algebra*	3
ENVE 3502	Envir Monitoring and Meas Analysis*	3	MA 3450	Introduction to Real Analysis*	3
CH 2212	Quantitative Analysis* <sup>4</sup>	5	MA 3710	Engineering Statistics*	3
CH 2421	Organic Chemistry Lab II	2	MA 3924	College Geometry with Tech*	3
CH 3520	Physical Chemistry II – Mol Structure*	3	MA 4330	Linear Algebra*	3
CH 3521	Physical Chemistry Lab II	2	MA 4515	Intro to Partial Differential Eqns*	3
CH 4110	Pharm Chem I - Drug Action	3	MA 4525	App Vector and Tensor Math*	3
CH 4120	Pharm Chem II - Drug Design	3	MA 4630	Numerical Methods	3
CH 4212	Instrumental Analysis	5	MA 4760	Mathematical Statistics I	3
CH 4310	Inorganic Chemistry I	3	MA 4908	Theory of Numbers with Tech	3
CH 4311	Inorganic Chemistry Lab	2	MY 2100	Intro to Materials Sci and Eng*	3
CH 4320	Inorganic Chemistry II	3	MY 4600	Introduction to Polymer Eng	3
CH 4412	Spectroscopy of Organic Chem.	3	PH 2230	Electronics for Scientists*	4
CH 4430	Intermediate Organic Chemistry	3	PH 2300	Univ Physics III – Fluids and Thermo*	2
CH 4510	Intermediate Physical Chemistry	3	PH 2400	Univ Physics IV – Waves and Mod Phy* <sup>3</sup>	3
CH 4710	Biomolecular Chemistry I	3	UN 2600	Fund of Nanoscale Sci and Eng*	2

Additional higher-level engineering, mathematics, science or applied business course may be approved by the CM advisor or CM department chair on a case-by-case basis. Courses that are on the general education list are not approved for technical electives. Courses used as a chemical engineering or engineering elective must be an ABET engineering course.

<sup>1</sup> A maximum of 6 credits may be counted as chemical engineering, engineering, or technical electives.

<sup>2</sup> Registration is restricted. Will need special permission to take. See Banweb for more information.

<sup>3</sup> A maximum of two semesters of co-op may be counted as technical elective credit.

<sup>4</sup> Difficult to fit into the standard CM schedule at this time.