B.S. in Chemical Engineering

2015-2016 Academic Year





This suggested schedule includes a second semester of organic chemistry. Two semesters of organic chemistry are recommended to all chemical engineering students and is especially encouraged to those planning to minor *Polymer Science and Engineering*, *Bioprocess Engineering*, or *Mineral Processing*.

Freshman Year

Fall Semester					
Course	Title	Cr			
CH 1150	University Chemistry I	3			
CH 1151	University Chemistry Lab I	1			
CH 1153	University Chemistry Rec I	1			
CM 1000	Introduction to Chemical Engg	1			
ENG 1101	Engg Analysis and Prob Solv	3			
MA 1160	Calculus with Technology I	4			
PH 1100	Physics by Inquiry I	1			
UN 1015	Compositions	3			
	Co-Curricular (1 cr)* Total	18			

Spring Semester					
Course	Title		Cr		
CH 1160	University Chemistry II		3		
CH 1161	University Chemistry La	b II	1		
ENG 1102	Engg Modeling and Desi	ign	3		
MA 2160	Calculus with Technolog	gy II	4		
PH 2100	University Physics I		3		
UN 1025	Global Issues**		3		
	Co-Curricular (1 cr)*	Total	18		

Sophomore Year

Fall Semester

Course	Title	<u>Cr</u>
CH 2410	Organic Chemistry I	3
CH 2411	Organic Chemistry Lab I	1
CM 2110	Fundamentals of ChE I	3
MA 3160	Multivariable Calc with Techn	4
PH 1200	Physics by Inquiry II	1
	Critical & Creat Think Course*	3
	Co-Curricular (1 cr)* Total	16

Spring Semester

Cour	se	Title	Cr
CH 2	420	Organic Chemistry II*	3
CM 2	2120	Fundamentals of ChE II	3
MA 2	2321	Elementary Linear Algebra	2
MA 3	3521	Elem Differential Equations	2
PH 2	200	University Physics II	3
		Social Resp & Eth Reas Course*	3
		Total	16

except for CM2110, CM2120, which are offered in the summer, along with

CM3410.

Can often be

transferred in from another institution,

Junior Year

Fall Semester

Course	Title	Cr
CH 3510	Physical Chemistry I	3
CH 3511	Physical Chemistry Lab I	2
CM 3110	Transport/Unit Operations I	3
CM 3215	Transport Laboratory	2
CM 3410	Tech Comm for ChE	3
	HASS Course*	3
	Total	16

Spring Semester

Course	Title	Cr
CM 3120	Transport/Unit Operations II	3
CM 3230	Thermodynamics for ChE	4
CM 3310	Process Control	3
CM 3510	Chemical Reaction Engg	3
	HASS Course*	3
	Total	16

Senior Year

Fall Semester

Course	Title	<u>Cr</u>
CM 4110	Unit Operations Lab	3
CM 4310	Chemical Process Safety/Env	3
CM 4855	ChE Proc Analysis & Design I	3
	Technical Elective*	3
	Technical Elective*	3
	HASS Course* (3000+ lev)	3
	Total	18

Spring Semester

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Course	Title	Cr
CM 4120	Chemical Plant Operations Lab	3
CM 4860	ChE Proc Analysis & Design II	2
CM 4861	ChE Design Laboratory II	1
	Core Engineering Elective*	4
	HASS Course* (3000+ lev)	3
	Free Elective*	3
	Total -	16

^{*} See back for description.

Updated 4/17/2015

^{**} A 3000-level or higher modern language course may be used in place of UN 1025 Global Issues.

6 credits of HASS must be at 3000 level and there are pre-regs to these classes

Elective Worksheet - 4 year plan

BL2100 (fa, 3cr) and CM4740 (sp, 4cr) Major Requirements - Technical Electives (13 credits total) substitute for CH2420 (sp., su, 3cr) 3-4 credits of Organic Chemistry II or sub 4-6 credits of Core Engineering Elective Elective courses must total to at least 13 credits. Credits above 13 may be used towards free electives. 3-6 credits of additional Technical Electives The list of approved elective courses is available on the department's advising webpage: www.mtu.edu/chemical/undergraduate/advising General Education Requirements (24 credits total) Core Courses (12 credits) HASS Courses (12 credits) Easy to Compositions Communication/Composition List schedule 1st year; UN 1015 3 cr increasingly **Global Issues Humanities/Fine Arts List** hard to UN 1025 or 3000+ level language__ enroll as **Critical and Creative Thinking List** class Social and Behavioral Science List standing rises. Social Resp. & Ethical Reasoning List Any List above or HASS Restricted List Upper Division Check: Recommended HASS course: EC 3400 Economic At least 6 credits of HASS must be at the upper Decision Analysis, taken prior or during fall senior division 3000-4000 level. UN 1025 (or 3000+ level year classes. This course is on the Social and language course) and UN 1015 are prerequisites for all Behavioral Science List and is an upper-division upper division HASS courses. course. _3 cr Take one per Co-Curricular Activities (3 credits total) Co-curricular courses count for financial aid and fullsemester; can time student status; however they are not included in GPA calculations or in the 131 credits total required for transferred in graduation. if needed; intramurals Co-curricular courses can only be used once for this can count requirement, except PE 0210 Special Topics and PE 0425 Intramurals, which may be used twice. (PE0425) Free Elective Requirement (3 credits total) Free electives are any class, 1000-level or higher that are not co-curricular courses. They may be taken pass/fail, unless the course is being used for a minor. OPTIONAL - Minor (6 credits not double counting) Each minor must include at least 6 credits of 3000level or higher courses that are not counting elsewhere (3000+ lev)_____ for your degree (required courses, technical electives, HASS courses, etc.), EXCEPT these credits can count (3000+ lev)_____ toward your free elective requirement.



Technical Elective Courses B.S. in Chemical Engineering

2015-16 Academic Year

Technical electives must total to 13 credits. Additional credits may be used towards free electives.

Note that many of the courses listed below are not offered every semester or every year and most have prerequisites. It is best to plan out your technical electives ahead of time.

3-4 credits of Organic Chemistry II or substitute

CH 2420	Organic Chemistry II	3
BL 2100	Principles of Biochemistry	3
CM 4740	Hydrometallurgy/Pyrometallurgy	4

4-6 credits of Core Engineering Electives

CM 2200	Intro Minerals and Materials	3	CM 5200	Advanced CM Thermodynamics	3
CM 3450	Computer-Aided Problem Solving	3	CM 5300	Advanced Transport Phenomena	3
CM 3820	Sampling Stats and Instrumentation	3	CM 5400	Advanced Reactive Systems Analysis	3
CM/ENT 3974	Fuel Cell Fundamentals	1	EE 3010	Circuits and Instrumentation	3
CM 4125	Bioprocess Engineering Laboratory	1	ENG 2120	Statics-Strength of Materials	4
CM 4500	Particle Technology	4	GE 4610	Formation Eval and Petroleum Engg	3
CM 4550	Industrial Chemical Production	3	MEEM 2110	Statics	3
CM 4650	Polymer Rheology	3			
CM 4655	Polymer Rheology Laboratory	1	Undergradua	te Research Courses (repeatable)	
CM 4710	Biochemical Processes	3	No more than	6 credits from the following:	
CM/MY 4740	Hydrometallurgy/Pyrometallurgy	4	CM 4000	Chemical Engineering Research	1-3
CM 4770	Analytical Microdevice Technologies	3	CM 4020	UG Research in Mineral Proc Engg	1-3
CM 4780	Biomanufacturing and Biosafety	3	CM 4040	UG Research in Biological Engg	1-3
CM 5100	Applied Mathematics for CM	3	CM 4060	UG Research in Polymer Engg	1-3

3-6 credits of additional Technical Electives

BE 2110	Statistical Methods for Biomed Eng	3	CH 4120	Pharm Chem: Drug Design	3
BE 2400	Cellular and Molecular Biology	3	CH 4212	Instrumental Analysis	5
BE 4300	Polymeric Biomaterials	3	CH 4222	Bioanalytical Chemistry	5
BL 1040	Principles of Biology	4	CH 4310	Inorganic Chemistry I	3
BL 2010	Anatomy & Physiology I	3	CH 4311	Inorganic Chemistry Lab	2
BL 2011	Anatomy & Physiology I Lab	1	CH 4320	Inorganic Chemistry II	3
BL 2020	Anatomy & Physiology II	3	CH 4412	Spectroscopy of Organic Chem.	3
BL 2021	Anatomy & Physiology II Lab	1	CH 4430	Intermediate Organic Chemistry	3
BL 2100	Principles of Biochemistry	3	CH 4510	Intermediate Physical Chemistry	3
BL 2200	Genetics	3	CH 4710	Biomolecular Chemistry I	3
BL 2210	Genetics Laboratory	1	CH 4720	Biomolecular Chemistry II	3
BL 3210	General Microbiology	4	CM 2200	Intro Minerals and Materials	3
BL 3310	Environmental Microbiology	3	CM 3450	Computer-Aided Problem Solving	3
BL 3640	General Immunology	3	CM 3820	Sampling Stats and Instrumentation	3
BL 4010	Biochemistry I	3	CM/ENT 3974	Fuel Cell Fundamentals	1
BL 4020	Biochemistry II	3	CM 4125	Bioprocess Engineering Laboratory	1
BL 4030	Molecular Biology	3	CM 4500	Particle Technology	4
BL 4220	Applied and Industrial Microbiology	3	CM 4550	Industrial Chemical Production	3
BL 4380	Cardiopulmonary Physiology	3	CM/CH 4610	Introduction to Polymer Science	3
BL 4820	Biochem Lab Techniques I	2	CM/CH 4620	Polymer Chemistry	3
BL 4840	Molecular Biology Techniques	3	CM/CH 4631	Polymer Science Laboratory	2
CH 2212	Quantitative Analysis	5	CM 4650	Polymer Rheology	3
CH 2420	Organic Chemistry II	3	CM 4655	Polymer Rheology Laboratory	1
CH 2421	Organic Chemistry Lab II	2	CM 4710	Biochemical Processes	3
CH 3520	Physical Chemistry II – Mol Structure	3	CM/MY 4740	Hydrometallurgy/Pyrometallurgy	4
CH 3521	Physical Chemistry Lab II	2	CM 4770	Analytical Microdevice Technologies	3
CH 4110	Pharm Chem: Drug Action	3	CM 4780	Biomanufacturing and Biosafety	3

MA 4620

Numerical Methods for PDEs

CM 5100	Applied Mathematics for CM	3	MA 4760	Mathematical Statistics I	3
CM 5200	Advanced CM Thermodynamics	3	MA 4770	Mathematical Statistics II	3
CM 5300	Advanced Transport Phenomena	3	MA 4908	Theory of Numbers with Technology	3
CM 5400	Advanced Reactive Systems Analysis	3	MEEM 2110	Statics	3
CMU 8950U	CM Technical Elective	var	MEEM 2150	Mechanics of Materials	3
CS 1111	Intro to Programming in C/C++	3	MEEM 2700	Dynamics	3
CS 1121	Intro to Programming I	3	MEEM 4170	Failure of Materials in Mechanics	3
CS 1131	Accelerated Intro to Programming	5	MEEM 4200	Principles of Energy Conversion	3
EE 3010	Circuits and Instrumentation	3	MEEM 4220	Internal Combustion Engines I	3
EE 3120	Electric Energy Systems	3	MEEM 4240	Combustion and Air Pollution	3
EE 3140	Electromagnetics	3	MEEM 4260	Fuel Cell Technology	3
EET 3373	Intro to Programmable Controllers	3	MEEM 4403	Computer-Aided Design Methods	4
ENG 2120	Statics-Strength of Materials	4	MEEM 4405	Intro to the Finite Element Method	3
ENG 4510	Sustainable Futures I	3	MEEM 4635	Design with Plastics	3
ENG 5520	Sustainable Futures II	3	MEEM 4650	Quality Engineering	3
ENT 2950	Enterprise Project Work I	1	MEEM 5170	Finite Elem and Var Meth in Engg	3
ENT 2960	Enterprise Project Work II	1	MEEM 5240	Comp Fluid Dynamics for Engg	3
ENT 3950	Enterprise Project Work III	1	MY 2100	Intro to Materials Sci and Eng	3
ENT 3960	Enterprise Project Work IV	1	MY 2110	Intro to Materials Sci and Eng II	3
ENT 3980	Pre-Capstone Enterprise Project Work	1	MY 3100	Materials Processing I	4
ENT 4950	Enterprise Project Work V Capstone	2	MY 3200	Materials Characterization I	4
ENT 4960	Enterprise Project Work VI Capstone	2	MY 4130	Principles of Metal Casting	3
ENT 4961	Enterprise Project Work VII	1	MY 4155	Composite Materials	3
ENVE 3502	Envir Monitoring and Meas Analysis	3	MY 4600	Introduction to Polymer Eng	3
ENVE 3503	Environmental Engineering	3	OSM 4650	Six Sigma Fundamentals	3
ENVE 4501	Envir Eng Chemical Processes	4	PH 2230	Electronics for Scientists	4
FW 1035	Wood Anatomy and Properties	4	PH 2300	Univ Physics III – Fluids and Thermo	2
FW 3098	Wood Processing and Manufacture	2	PH 2400	Univ Physics IV – Waves and Mod Phy	3
GE 2020	Intro to Mining Eng and Mining Meth	4	UN 2600	Fund of Nanoscale Sci and Eng	2
GE 2300	Mineral Science	3	UN 3002	Undergrad Cooperative Ed I	1-2
GE 2310	Introduction to Petrology	3		x of 4 credits may be used as a tech elect	
GE 2640	Atmos Observations and Meteorology	3	(repeatable, inc	in or research may be about up a toom erect,	,
GE 3400	Drilling and Blasting	3	Enterprise Mo	dule Courses	
GE 4360	Material Handling	3		credits from the following:	
GE 4610	Formation Eval and Petroleum Engr	3	ENT 3954	Enterprise Market Principles	1
MA 2600	Scientific Computing	3	ENT 3958	Ethics in Eng Des and Impl	1
MA 2710	Introduction to Statistical Analysis	3	ENT 3959	Fundamentals of Six Sigma I	1
	•	4			1
MA 2720	Statistical Methods		ENT 3961	Enterprise Strategic Leadership	1
MA 3210	Introduction to Combinatorics	3	ENT 3962	Communication Strategies	1
MA 3310	Introduction to Abstract Algebra	3	ENT 3963	Technology Commercialization	1
MA 3450	Introduction to Real Analysis	3	ENT 3964	Project Management	1
MA 3710	Engineering Statistics	3	ENT 3966	Design for Manufacturing	1
MA 3740	Statistical Programming & Analysis	3	ENT 3967	Six Sigma II	1
MA 3924	College Geometry with Technology	3	ENT 3971	Seven Habits of Highly Effective Peop	1
MA 4330	Linear Algebra	3	ENT 3976	Personal Brand Management	1
MA 4515	Intro to Partial Differential Eqns	3	ENT 4951	Business Plans and Budging in the Ent	1
MA 4525	Applied Vector and Tensor Math	3	ENT 4954	Global Competition	1
14.4.600	NI 1 M. d d. C DDE.	2			

Additional higher-level engineering, mathematics, science or applied business course may be approved on a case-by-case basis. Email your request to cmadvise@mtu.edu. Courses that are on the general education HASS lists are not approved for technical electives. Courses on the core engineering list are ABET engineering courses.