

# Technical Electives

2018-19 Academic Year

For catalog years 201808 through 201905

## B.S. in Chemical Engineering



Michigan Tech  
Chemical Engineering

Technical electives must **total to 16 credits**. Additional credits may be used towards free electives.

Plan ahead. Some electives are offered once every other year and most have prerequisites.

### 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

### At least 5 credits of Core Engineering Electives

CM 1000	Intro to Chemical Engineering	1	CM 5200	Advanced CM Thermodynamics	3
CM 2200	Intro Minerals and Materials	3	CM 5300	Advanced Transport Phenomena	3
CM 3450	Computer-Aided Problem Solving	3	CM 5400	Advanced Reactive Systems Analysis	3
CM 3825	Sampling, Stats, and Instrumentation	2	EE 3010	Circuits and Instrumentation	3
CM 3830	Mineral Processing and Extraction Lab	1	ENG 2120	Statics-Strength of Materials	4
CM/ENT 3979	Alternative Energy Tech & Processes	1	GE 4610	Formation Eval and Petroleum Engg	3
CM 4125	Bioprocess Engineering Laboratory	1	MEEM 2110	Statics	3
CM 4505	Particle Technology	3			
CM 4510	Interfacial Engineering	3			
CM 4650	Polymer Rheology	3			
CM 4655	Polymer Rheology Laboratory	1			
CM 4710	Biochemical Processes	3			
CM/MSE 4740	Hydrometallurgy/Pyrometallurgy	4			
CM 4770	Analytical Microdevice Technologies	3			
CM 4780	Biomanufacturing and Biosafety	3			
CM 5100	Applied Mathematics for CM	3			

#### Undergraduate Research Courses (repeatable)

No more than 6 credits from the following:

CM 4000	Chemical Engineering Research	1-3
CM 4020	UG Research in Mineral Proc Engg	1-3
CM 4040	UG Research in Biological Engg	1-3
CM 4060	UG Research in Polymer Engg	1-3
CM 4080	UG Research in Biofuels Engg	1-3

### Additional Technical Electives to get to 16 credits

BE 2110	Statistical Methods for Biomed Engg	3	CH 2212	Quantitative Analysis	5
BE 2400	Cellular and Molecular Biology	3	CH 2420	Organic Chemistry II	3
BE 4300	Polymeric Biomaterials	3	CH 2421	Organic Chemistry Lab II	2
BL 1010	General Biology I	4	CH 3520	Physical Chemistry II – Mol Structure	3
or BL 1020	General Biology II	4	CH 3521	Physical Chemistry Lab II	2
or BL 1040	Principles of Biology	4	CH 4110	Pharm Chem: Drug Action	3
BL 2010	Anatomy & Physiology I	3	CH 4120	Pharm Chem: Drug Design	3
BL 2011	Anatomy & Physiology I Lab	1	CH 4140	Intro to Pharmaceutical Analysis	3
BL 2020	Anatomy & Physiology II	3	CH 4212	Instrumental Analysis	5
BL 2021	Anatomy & Physiology II Lab	1	CH 4222	Bioanalytical Chemistry	5
BL 2100	Principles of Biochemistry	3	CH 4310	Inorganic Chemistry I	3
BL 2200	Genetics	3	CH 4311	Inorganic Chemistry Lab	2
BL 2210	Genetics Laboratory	1	CH 4320	Inorganic Chemistry II	3
BL 3210	General Microbiology	4	CH 4412	Spectroscopy of Organic Chem.	3
BL 3310	Environmental Microbiology	3	CH 4430	Intermediate Organic Chemistry	3
BL 3640	General Immunology	3	CH 4710	Biomolecular Chemistry I	3
BL 4010	Biochemistry I	3	CH 4720	Biomolecular Chemistry II	3
BL 4020	Biochemistry II	3	CM 1000	Intro to Chemical Engineering	1
BL 4030	Molecular Biology	3	CM 2200	Intro Minerals and Materials	3
BL 4380	Cardiopulmonary Physiology	3	CM 3450	Computer-Aided Problem Solv in ChE	3
BL 4820	Biochem Lab Techniques I	2	CM 3825	Sampling, Stats, and Instrumentation	2
BL 4840	Molecular Biology Techniques	3	CM 3830	Mineral Processing and Extraction Lab	1
CEE 3502	Envir Monitoring and Meas Analysis	3	CM/ENT 3979	Alternative Energy Tech & Processes	1
CEE 3503	Environmental Engineering	3	CM 3XXE	CM Elective ( <i>transfer credit only</i> )	var
CEE 4501	Envir Eng Chemical Processes	4	CM 4125	Bioprocess Engineering Laboratory	1

CM 4505	Particle Technology	3	MA 4525	Applied Vector and Tensor Math	3
CM 4510	Interfacial Engineering	3	MA 4620	Numerical Methods for PDEs	3
CM/CH 4610	Introduction to Polymer Science	3	MA 4760	Mathematical Statistics I	3
CM/CH 4620	Polymer Chemistry	3	MA 4770	Mathematical Statistics II	3
CM/CH 4631	Polymer Science Laboratory	2	MA 4908	Theory of Numbers with Technology	3
CM 4650	Polymer Rheology	3	MEEM 2110	Statics	3
CM 4655	Polymer Rheology Laboratory	1	MEEM 2150	Mechanics of Materials	3
CM 4710	Biochemical Processes	3	MEEM 2700	Dynamics	3
CM/MSE 4740	Hydrometallurgy/Pyrometallurgy	4	MEEM 4170	Failure of Materials in Mechanics	3
CM 4770	Analytical Microdevice Technologies	3	MEEM 4200	Principles of Energy Conversion	3
CM 4780	Biomanufacturing and Biosafety	3	MEEM 4220	Internal Combustion Engines I	3
CM 4XXE	CM Elective ( <i>transfer credit only</i> )	var	MEEM 4240	Combustion and Air Pollution	3
CM 5100	Applied Mathematics for CM	3	MEEM 4260	Fuel Cell Technology	3
CM 5200	Advanced CM Thermodynamics	3	MEEM 4405	Intro to the Finite Element Method	3
CM 5300	Advanced Transport Phenomena	3	MEEM 4635	Design with Plastics	3
CM 5400	Advanced Reactive Systems Analysis	3	MEEM 4650	Quality Engineering	3
CS 1111	Intro to Programming in C/C++	3	MEEM 5170	Finite Elem and Var Meth in Engg	3
CS 1121	Intro to Programming I	3	MEEM 5240	Comp Fluid Dynamics for Engg	3
CS 1131	Accelerated Intro to Programming	5	MSE 2100	Intro to Materials Sci and Engg	3
EE 2174	Digital Logic and Lab	4	MSE 2110	Intro to Materials Sci and Engg II	3
EE 3010	Circuits and Instrumentation	3	MSE 3100	Materials Processing I	4
EE 3120	Electric Energy Systems	3	MSE 3120	Materials Characterization I	4
EE 3140	Electromagnetics	3	MSE 4110	Introduction to Polymer Engg	3
EET 3373	Intro to Programmable Controllers	3	MSE 4310	Principles of Metal Casting	3
ENG 2120	Statics-Strength of Materials	4	MSE 4320	Corrosion and Environmental Effects	3
ENG 4510	Sustainable Futures I	3	MSE 4325	Fundamentals of Corrosion	1
ENG 5520	Sustainable Futures II	3	MSE 4430	Composite Materials	3
ENT 2950	Enterprise Project Work I	1	OSM 4650	Six Sigma Fundamentals	3
ENT 2960	Enterprise Project Work II	1	PH 2230	Electronics for Scientists	4
ENT 3950	Enterprise Project Work III	1	PH 2300	Univ Physics III – Fluids and Thermo	2
ENT 3960	Enterprise Project Work IV	1	PH 2400	Univ Physics IV – Waves and Mod Phy	3
ENT 3980	Pre-Capstone Enterprise Project Work	1	UN 2600	Fund of Nanoscale Sci and Eng	2
ENT 4950	Enterprise Project Work V Capstone	2	UN 3002	Undergrad Cooperative Ed I	1-2
ENT 4960	Enterprise Project Work VI Capstone	2	UN 3003	Undergrad Cooperative Ed II	1-2
ENT 4961	Enterprise Project Work VII	1	UN 3004	Undergrad Cooperative Ed III	1-2
FW 1035	Wood Anatomy and Properties	4	UN 3005	Undergrad Cooperative Ed IV	1-2
FW 3098	Adding Value to Forest Biomaterials	2			
GE 2020	Intro to Mining Eng and Mining Meth	3	<b>Enterprise Module Courses</b>		
GE 2300	Mineral Science	3	No more than 3 credits from the following:		
GE 2310	Introduction to Petrology	3	ENT 3953	Ignite: Ideate, Innovate, Create!	1
GE 2640	Atmos Observations and Meteorology	3	ENT 3954	Enterprise Market Principles	1
GE 3400	Drilling and Blasting	3	ENT 3958	Ethics in Eng Des and Impl	1
GE 4360	Material Handling	3	ENT 3959	Fundamentals of Six Sigma I	1
GE 4610	Formation Eval and Petroleum Engr	3	ENT 3961	Enterprise Strategic Leadership	1
MA 2600	Scientific Computing	3	ENT 3963	Deliver: Explore, Develop, Execute!	1
MA 2710	Introduction to Statistical Analysis	3	ENT 3964	Project Management	1
MA 2720	Statistical Methods	4	ENT 3966	Design for Manufacturing	1
MA 3210	Introduction to Combinatorics	3	ENT 3967	Design for Six Sigma	1
MA 3310	Introduction to Abstract Algebra	3	ENT 3971	Seven Habits of Highly Effective Peop	1
MA 3450	Introduction to Real Analysis	3	ENT 3982	Contin Improv Using Lean Principles	1
MA 3710	Engineering Statistics	3	ENT 3983	Culture of Continuous Improvement	1
MA 3740	Statistical Programming & Analysis	3	ENT 4951	Business Plans and Budging in the Ent	1
MA 3924	College Geometry with Technology	3	ENT 4954	Global Competition	1
MA 4330	Linear Algebra	3			
MA 4515	Intro to Partial Differential Eqns	3			

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](mailto: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.