



Michigan Technological University Chemical Engineering



Undergraduate Academic Advising

For chemical engineering students starting at Michigan Tech during the 2020-21
Academic Year

Catalog years: 202008, 202101, and 202105

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This document is available with active hyperlinks on the department's advising webpage, under Degree Requirements.

Accreditation and Educational Objectives

The chemical engineering undergraduate program is accredited by the Engineering Accreditation Commission of ABET. ABET is the recognized accreditor for college and university programs in applied science, computing, engineering, and engineering technology and is among the most respected accreditation organizations in the United States. ABET is recognized by the Council for Higher Education Accreditation.

Program Criteria for the Department of Chemical Engineering

The curriculum provides a thorough grounding in the basic sciences including chemistry and physics, with some content at an advanced level. The curriculum includes the engineering application of these basic sciences to the design, analysis, and control of chemical and physical processes, including the hazards associated with these processes.

Student Outcomes for the Department of Chemical Engineering

Michigan Tech chemical engineering graduates will have an ability to:

1. identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
2. apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.
3. communicate effectively with a range of audiences.
4. recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.
5. function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.
6. develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.
7. acquire and apply new knowledge as needed, using appropriate learning strategies.

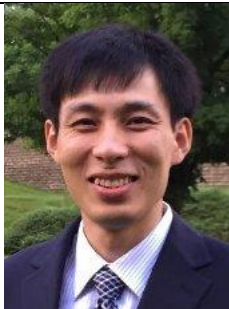

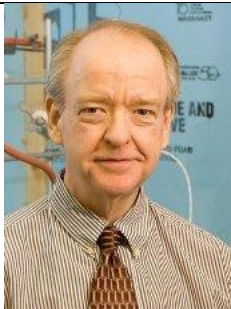





Educational Objectives for the Department of Chemical Engineering

Michigan Tech chemical engineering alumni:

1. are successful early and have sustained success in their professional careers.
2. are valued for their hands-on engineering ability and safety culture.
3. have effectively communicated their technical knowledge via publications, reports, the Internet, and other media.
4. are providing service to society.
5. are earning or have earned advanced degrees or have participated in continuing education.
6. have achieved leadership positions in their chosen professions.

Faculty and Staff Directory

 <p><i>Dr. Pradeep Agrawal, Professor</i></p>	 <p><i>Ms. Taana Blom, Administrative Aide</i></p>	 <p><i>Dr. Gerard T. Caneba, Professor</i></p>	 <p><i>Dr. Thomas B. Co, Associate Professor</i></p>	 <p><i>Dr. Jeana L. Collins, Lecturer</i></p>
 <p><i>Dr. Tim Eisele, Associate Professor</i></p>	 <p><i>Dr. Robert Handler, Operations Manager, Sustainable Futures Institute</i></p>	 <p><i>Dr. Caryn Heldt, Professor</i></p>	 <p><i>Ms. Leela Joshi, Assistant Research Engineer/Scientist</i></p>	 <p><i>Ms. Supreet Kaur, Laboratory Technician</i></p>
 <p><i>Dr. S. Komar Kawatra, Professor</i></p>	 <p><i>Dr. Julia A. King, Research Professor</i></p>	 <p><i>Dr. Yixin Liu, Assistant Professor</i></p>	 <p><i>Ms. Susan Mattila, Office Assistant</i></p>	 <p><i>Mr. Jay Meldrum, Director, Keweenaw Research Institute</i></p>
 <p><i>Mr. Jerry A. Norkol, Master Machinist</i></p>	 <p><i>Dr. Adrienne R. Minerick, Professor</i></p>	 <p><i>Dr. Faith A. Morrison, Professor</i></p>	 <p><i>Dr. Michael E. Mullins, Professor</i></p>	 <p><i>Dr. Rebecca Ong, Assistant Professor</i></p>

				
<i>Dr. Lei Pan, Assistant Professor</i>	<i>Dr. Kurt A. Rickard, Instructor</i>	<i>Dr. Tony N. Rogers, Associate Professor</i>	<i>Dr. John F. Sandell, Associate Professor</i>	<i>Dr. David R. Shonnard, Professor</i>
				
<i>Ms. Alexis E. Snell, Department Coordinator</i>	<i>Ms. Katie S. Torrey, Academic Advisor</i>	<i>Mr. Stefan G. Wisniewski, Research Associate</i>		

Department Office

Fall & Spring Semester Hours
Monday – Friday
8:00 AM – 5:00 PM
Closed: 12:00 PM – 1:00 PM

Location: Chem Sci (Bldg 19), room 203
Phone: 906-487-3132
Webpage: <https://www.mtu.edu/chemical/>
Email: ChemEng@mtu.edu

Summer Hours
Monday – Friday
8:00 AM – 4:00 PM

Department of Chemical Engineering
Michigan Technological University
1400 Townsend Drive
Houghton, MI 49931-1295

Career Advising

For help with career guidance and information on graduate school.

Dr. John Sandell
Office: Chem Sci, room 202C
Phone: 906-487-2557
E-mail: jfsandel@mtu.edu

Dr. Faith Morrison
Office: Chem Sci, room 304A
Phone: 906-487-2050
E-mail: fmorriso@mtu.edu

Dr. Pradeep Agrawal
Office: Chem Sci, room 203
Phone: 906-487-3132
E-mail: pkagrawa@mtu.edu

Dr. Becky Ong
Office: Chem Sci, room 202I
Phone: 906-487-2662
E-mail: rgong1@mtu.edu

Academic Advising

For help with schedule planning and degree audits.

Ms. Katie Torrey, Academic Advisor

Office: Chem Sci, room 202M

Phone: 906-487-4327

Email: cmadvise@mtu.edu (for advising questions)

Calendar: kt@mtu.edu (for scheduling meetings, see below)

Webpage: <https://www.mtu.edu/chemical/undergraduate/advising/>

Meetings, Virtual Meetings, Walk-in Hours

During busy times in fall and spring semesters (Orientation week, start of semester, registration times) Katie has walk-in advising, which is first-come, first-served. No appointments are needed. Walk-in hours are viewable on her Google calendar (kt@mtu.edu).

During less-busy times in fall and spring semesters Katie is typically available 9:30am-3pm, three days per week. Katie is available for virtual meetings using Google Meet, Zoom, or a phone conference. Use your Google calendar to request a meeting (kt@mtu.edu). [Instructions on how to do this are on the advising webpage.](#)

During summer semester priority is given to emergency issues in need of immediate attention because of limited work hours. If you have an issue during the summer, email cmadvise@mtu.edu; your patience is appreciated. Regular advising hours resume two weeks before fall semester starts.

Mission

The Department of Chemical Engineering's academic advising service exists to support students in developing an individualized plan to accomplish their career goals.

Student Responsibilities

Your academic advisor is here to help you, but there are certain things that you need to do to make this work. You are expected to:

- Take responsibility for your academic planning.
- Be open to revising your plans as interests, circumstances, and opportunities change.
- Understand degree requirements and learning goals.
- Follow academic procedures and policies.
- Read advising correspondences and communicate with your advisor.
- Attend advising meetings prepared.
- Seek assistance from instructors, learning centers, and other university services.
- Contact your advisor promptly when you have questions or concerns. When faced with a difficult question or challenging situation, your academic advisor is always a good place to start.

Degree Requirements and Online Degree Audits

The official list of requirements for graduation, including degree requirements and lists of approved general education courses, are maintained by the [Registrar's Office](#). Degree audits, which are the official list of degree requirements, are posted on the Registrar's Office webpage, under the Students menu, then Degree Services. Approved general education courses are posted under the Students menu, then General Education Requirements.

Lists, suggested schedules, and flowcharts in this book and on the department webpage are not official lists of degree requirements (alas!) and are provided for your convenience.

Online degree audits are used to check your progress toward graduation. You can access your online audit on [Banweb](#) and should run it every time you change your schedule. Be sure to run the audit labeled "Latest" because this will use your correct catalog year. New students will be able to run audits 30 days before the semester starts.

Unfortunately, the online audit is not perfect, which is why it's important for you to know where your classes should be counting. Are you taking a class as a technical elective? If so, does it show up in the technical elective area of your degree audit? If a class isn't counting where you think it should then contact your academic advisor to investigate.

Bookmark These Webpages!

You will reference the [Registrar's Office webpage \(https://www.mtu.edu/registrar/\)](https://www.mtu.edu/registrar/) and the [department's advising webpage \(https://www.mtu.edu/chemical/undergraduate/advising/\)](https://www.mtu.edu/chemical/undergraduate/advising/) because they contain most of the information you will need to make sure you are on track for graduation.

The image displays two overlapping screenshots of the Michigan Tech website. The top-left screenshot shows the Registrar's Office page, featuring a navigation bar with links for Students, Parents and Family, Alumni, Faculty and Staff, About Us, and Banweb. Below the navigation is a header for the Registrar's Office and a photograph of students. The bottom-right screenshot shows the Department of Chemical Engineering advising page. It has a navigation bar with links for Department, Undergraduate, Graduate, Research, Facilities, and Apply. The main content area includes sections for Undergraduate Advising (with a 24/7 Advising Help button), Advising Handouts, Contact Information (Academic Advising, email: cmadvise@mtu.edu, phone: 906-487-4327), and Advising Resources (with links to Frequently Asked Questions, Succeeding in Chemical Engineering, Advising PDFs, Registrar's Office, and Undergraduate Student Government).

Planning Your Schedule

Making sure you are enrolled in the correct classes for your first semester is very important. First-year students and transfer students with less than 30 credits will be enrolled in their first semester of classes by the Registrar's Office. Transfer students with over 30 credits will enroll themselves in their first semester of classes and should contact the academic advisor to review their transfer credit and come up with a list of recommend courses.

The most important step to make sure your first-semester classes are correct is to determine if all of your AP/dual enrollment/transfer credit is in place on your transcript because your schedule cannot be finalized without this information.

For students starting in the fall semester, this credit is usually in place by mid-July. Check your Michigan Tech transcript on [Banweb](#) to see if everything you expect to be there is in place. If not, contact your Admissions representative to determine what you need to do to receive your credit. It's important to track down all of your classes even if you think a class doesn't matter, because many times these "extra" classes can be used towards general education or technical electives and you'll want to know this.

Answers to many common questions are on the [department's advising webpage](#) and is a good place to start.

Future Semesters

Plan your future semesters based on your interests. Things to consider: co-ops, undergraduate research, Enterprise program, minors, study abroad, graduate school. The more credit you came in with the more flexibility you'll have and the sooner you can start doing some of these things. Remember that your plan is a draft and subject to change as you explore your interests.

The general process for planning out future semesters is as follows:

1. Find your [degree requirements](#) on the department's advising webpage or Registrar's Office webpage. This is based on your catalog year, which is usually the year that you start at Michigan Tech. Print out either the flowchart, 4- or 5-year schedule, or degree audit to use as a checklist.
2. Cross off requirements that are completed or in progress. Write down elective courses next to the corresponding requirement to keep track of them.
3. Run your online degree audit on [Banweb](#) to make sure classes are counting where you expect them to. If they are not, then contact your academic advisor to find out why. Online degree audits for new students will be available 30 days before the semester starts.
4. Print out a [blank academic plan sheet](#) from the department's advising webpage or set up a spreadsheet and start writing down the classes you plan to take for each future semester. It usually makes the most sense to start with the major required classes, then minor classes if you are doing a minor, and finally remaining elective classes.

There is a great deal that goes into step 4, and there's lots of information on the [department's advising webpage](#) to help you find your way through the process. Once you have a rough plan, you may want to make an appointment with your academic advisor to make sure you've got all the details right. Your academic advisor is available to review long term plans during less-busy times. Less-busy times are usually week 3-week 7, and week 11-week 14 of fall and spring semesters.

Academic and Career Planning Checklist

Orientation Week and before - preparing for your first semester

- Review your transcript on [Banweb](#). Are all of your AP credit and transfer credit in place? Is anything missing? AP and transfer credit should be in place by mid-July for students starting in fall semester.
- Review your class schedule. You will finalize your schedule during Orientation week.
- Meet your academic advisor. You will have an opportunity to meet your academic advisor during Orientation week.
- Explore Campus Resources:
 - ◆ [Chemical Engineering advising webpage](#)
 - ◆ [Registrar's Office](#)
 - ◆ [Undergraduate Catalog](#)
 - ◆ [Dean of Students Office](#)
 - ◆ [Library](#)
 - ◆ [Wellness and Counseling](#)

Year 1 - adjusting to college life

- Attend the first-year advising meeting with your academic advisor. If you are unsure about your major, meet with:
 - ◆ The [academic advisor for other majors](#) you are considering, or
 - ◆ The [general sciences/arts undeclared advisor](#), or
 - ◆ The [general/undecided engineering advisor](#), or
 - ◆ A [career advisor in Career Services](#).
- Explore careers with [Career Cruising](#).
- Review your [degree requirements](#).
- Run your [degree audit](#) each time you make changes to your schedule or register for classes.
- Review the your [major's learning goals](#) and the [university's student learning goals](#).
- Visit [Career Services](#), [create a resume](#), and [attend career fairs](#).
- Begin to explore and learn about career building opportunities, such as [internships and co-ops](#), [undergraduate research](#), [study abroad](#), [minors](#), [Enterprise program](#), [honors program](#).
- Get involved in [campus activities and student organizations](#). Try a mix of professional and social organizations.

Year 2 - career exploration and personal development

- Plan out your classes and review it with your advisor.
- Run your [degree audit](#) each time you make changes to your schedule or register for classes.
- Talk to people who can help you explore your interests, strengths, and careers. This includes instructors for all your classes, faculty in your major, students in their junior and senior year in your major, and company recruiters, many of whom are Michigan Tech alumni.
- Visit [Career Services](#) (again), [update your resume](#), [attend career fairs](#) (again), and expand your job search by using [Handshake](#) and [reaching out](#) directly to companies or people you know.
- Get involved in career building opportunities, such as [internships and co-ops](#), [undergraduate research](#), [study abroad](#), [minors](#), [Enterprise program](#), [honors program](#).
- Take on a leadership role in the [campus activities and student organizations](#) in which you are involved.

Year 3 – continued career exploration and personal development

- Repeat all year 2 activities, plus:
- Consider graduate school. Talk to faculty in your major to learn more. If you will be going to graduate school at Michigan Tech, there are two programs that allow you to start earning graduate credit while still an undergraduate:
 - ◆ [Accelerated Master's Program](#)
 - ◆ [Senior Rule](#)
- Challenge yourself to take on a larger leadership role within your favorite student organization.
- Challenge yourself to write down three career goals. They may or may not be related to your major and it's ok if you are unsure because your goals should change with time. You just need to start somewhere! Share with your academic advisor if you'd like help finding ways to work toward these goals.

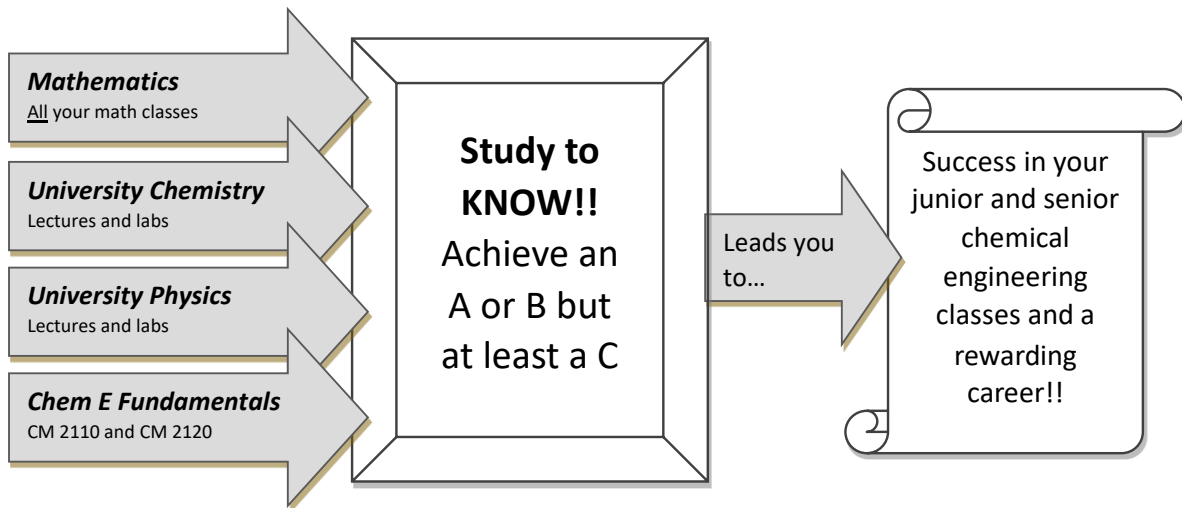
Final Year - transitioning into career or graduate school

- [Apply for graduation](#) by week 10 of the semester prior to graduation.
- Finalize career and/or graduate school plans. Career Services usually holds a "senior meeting" to help you with this.
- Complete the [First Destination](#) survey on Handshake.
- Complete loan exit counseling for [Financial Aid](#), if needed.
- Check that your name is on the [commencement](#) graduates candidate list.
- Participate in department and university events to celebrate your [graduation](#). Congratulations!

Succeeding in Chemical Engineering

Michigan Tech's chemical engineering program is known to be a tough program. So, what can you do to best prepare yourself to succeed?

Knowledge, problem-solving skills, and critical thinking skills gained in your early classes are vitally important to your continued success in the chemical engineering program and in your career.



If you receive a **CD or D** in any of the classes listed above, we strongly recommend that you retake the class **BEFORE** continuing on in the next class in the curriculum.

It can be really tempting to just "get through" a difficult class and celebrate the victory! However, with foundational classes it may take a while to realize how all the pieces fit together. For chemical engineering students, that moment of realization is often in the junior year, especially in Transport/Unit Operations I, which builds on all the math, physics, and chemical engineering fundamentals that you've put such effort into learning. So, when studying foundational subjects, remember that you will see this information again and are working to prepare yourself for the junior and senior classes.

Repeating Classes

If you retake a class, there is an important rule that you must consider:

The second grade always replaces the first.

For better or worse. You may only take a class three times, and you need special permission for that third attempt. For the details, visit the [Registrar's Office webpage](#) and search for "repeating."

Retaking classes you have previously passed may also impact your financial aid. Contact the [Student Financial Services Center](#) for an evaluation of your situation.

Prerequisites for Required Chemical Engineering Classes

The table below shows which courses are required for your later chemical engineering courses. This information is critical for planning out future semesters.

A "(C)" indicates a prerequisite that you can take concurrently, at the same time, with the course.

Year	Course	Title	Gen Ed Prereq Courses	Math Prereq Courses	Chemistry Prereq Courses	Physics Prereq Courses	Chem Engg Prereq Courses
2 nd Year	CM 2110	Fundamentals of Chem E I			CH 1150, CH 1151		
	CM 2120	Fundamentals of Chem E II					CM 2110
3 rd Year	CM 3110	Transport/Unit Operations I		MA 3160, Diff Eqns		PH 2100	CM 2120
	CM 3120	Transport/Unit Operations II		Diff Eqns			CM 2120, CM 3110
	CM 3215	Transport Lab	UN 1015	Diff Eqns			CM 3110 (C)
	CM 3230	Thermodynamics		MA 3160, Diff Eqns (C)	CH 3510		
	CM 3310	Process Control		Diff Eqns		PH 2200	CM 2110, CM 2120
	CM 3510	Chemical Reaction Engineering		Diff Eqns	CH 2410		CM 2110, CM 3110, CM 3230 (C)
4 th Year	CM 4110	Unit Operations Lab					CM 3120, CM 3215, CM 3230, CM 3510, CM 4310 (C)
	CM 4120	Chemical Plant Lab					CM 3215, CM 3310, CM 4110
	CM 4310	Safety/Environment					CM 3120, CM 3230
	CM 4855	Chem E Design I			CH 2410		CM 3120, CM 3215, CM 3230, CM 3510
	CM 4860	Chem E Design II					CM 4855
	CM 4861	Chem E Design II Lab					CM 4860 (C)

Typical Michigan Tech Semester

Below are some of the most requested dates during the semester. Since these events typically happen at the same time each semester, it is helpful to track the weeks of the semester so that you can plan ahead.

Note for Fall 2020: Classes will be starting on the Thursday before Week 1, to allow for a mid-semester break at the end of week 7.

Week	Day	Event
Week before classes start	Wednesday	Tuition bills and enrollment confirmation are due, late fee begins at 5pm
First half of term (weeks 1-7)		
Week 1	Friday	Last day to add full semester course without instructor permission
Week 2	Wednesday	Last day to add full semester courses or change a section, and Financial Aid full-time status established, and Last day to change majors or add minor effective for this semester
Week 3	Friday	Last day to drop full semester courses without a grade
Week 4		
Week 5		
Week 6		
Week 7	Monday	Mid-term grades available on Banweb after 5pm (first-year only)
Second half of term (weeks 8-14)		
Week 8		
Week 9	All Week	First week of the initial registration period for the following semester. Registration time is based on earned credits. During fall: register for spring and summer semesters. During spring: register for fall semester.
Week 10	All Week	Second week of the initial registration period for the following semester. Registration time is based on earned credits. During fall: register for spring and summer semesters. During spring: register for fall semester.
Week 10	Friday	Last day to drop full semester courses with a 'W'
Week 11		
Week 12		
Week 13		
Week 14		
Finals Week		

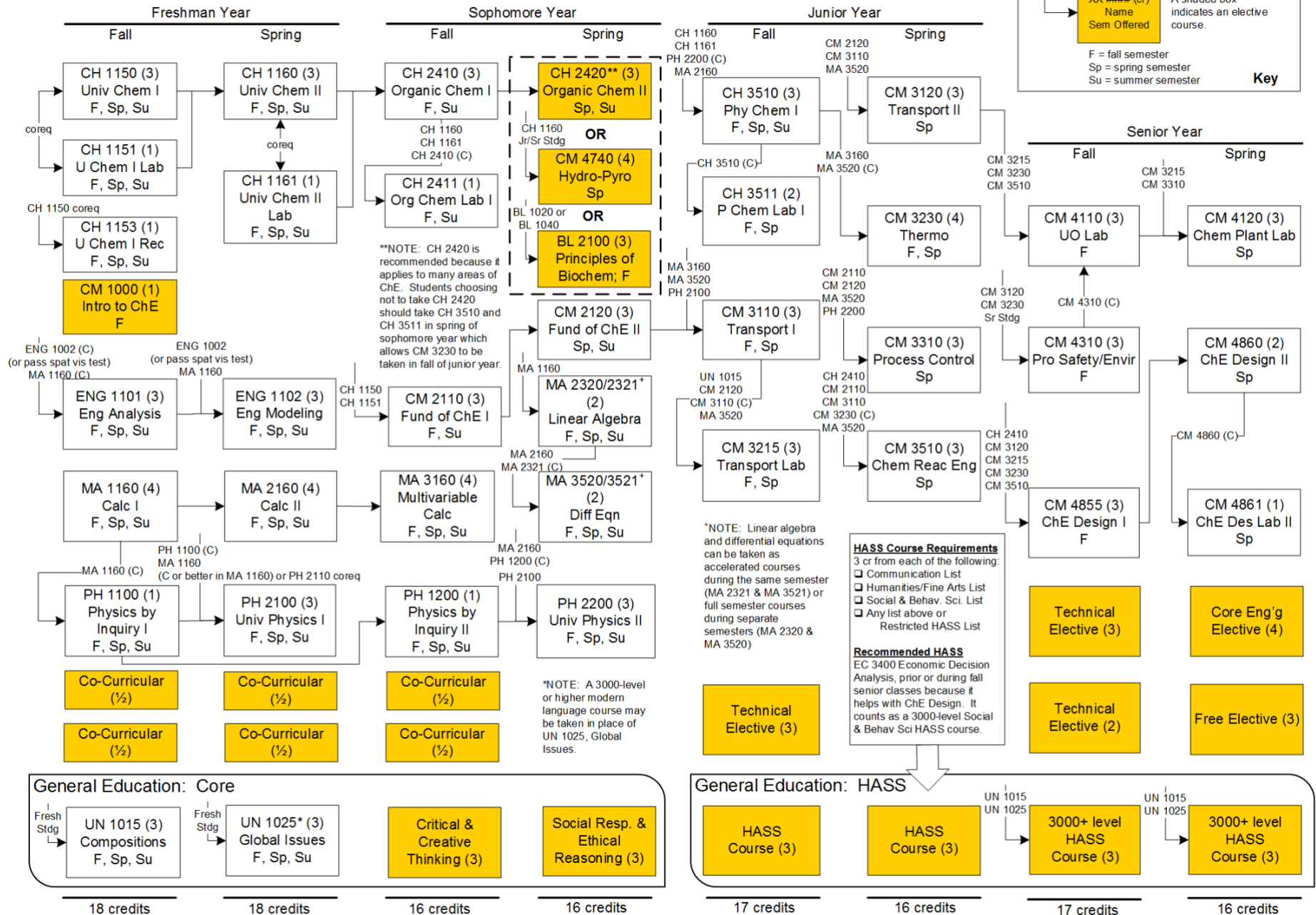
Academic calendars for each semester are available on the [Registrar's Office webpage](#), located under the Students menu, select Calendars, then Academic.

The information for adding/dropping/withdrawing from courses given above is for full-semester courses only. Dates for adding/dropping/withdrawing from half-semester courses can be found on the academic calendar on the Registrar's Office webpage.



Bachelor of Science in Chemical Engineering

For students starting in the 2020-21 Academic Year



This is not an official list of degree requirements. For an official list of degree requirements, go to the Registrar's Office webpage, Degree Services.

Four-year Schedule for Students Starting in Calculus

This is our recommended schedule for students starting in calculus.

Fall semester, First year

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	Intro 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
<i>Total</i>		18

Spring semester, First year

Course	Title	Cr
CH 1160	University Chemistry II	3
CH 1161	University Chemistry Lab II	1
ENG 1102	Engg Modeling and Design	3
MA 2160	Calculus with Technology II	4
PH 2100	University Physics I	3
UN 1025	Global Issues or mod language*	3
	Co-Curricular*	1
<i>Total</i>		18

Fall semester, Second year

Course	Title	Cr
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 & Creative Think course*	3
	Co-Curricular*	1
<i>Total</i>		16

Spring semester, Second year

Course	Title	Cr
CH 2420	Organic Chemistry II*	3
CM 2120	Fundamentals of ChE II	3
MA 2321	Elementary Linear Algebra	2
MA 3521	Elem Differential Equations	2
PH 2200	University Physics II	3
	Social Resp & Eth Reas course*	3
<i>Total</i>		16

Fall semester, Third year

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	3
	Technical Elective*	3
	HASS Course*	3
<i>Total</i>		17

Spring semester, Third year

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
<i>Total</i>		16

Fall semester, Fourth year

Course	Title	Cr
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*	2
	HASS Course (3000+ level)*	3
<i>Total</i>		17

Spring semester, Fourth year

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+ level)*	3
	Free Elective*	3
<i>Total</i>		16

*Elective course. You have some degree of choice with these courses. See the Description of Elective Courses section.

Five-Year Schedule for Students Starting in Precalculus

This is our recommended schedule for students starting in precalculus. Students who would like to graduate in less than five years should see their academic advisor and plan to take summer classes.

Fall semester, First year

Course	Title	Cr
CH 1150	University Chemistry I	3
CH 1151	University Chemistry I Lab	1
CH 1153	University Chemistry I Rec	1
CM 1000	Intro to Chemical Engg*	1
ENG 1001	Engineering Problem Solving	2
MA 1032	Precalculus	4
UN 1015	Compositions	3
	Co-Curricular*	1
<i>Total</i>		16

Spring semester, First year

Course	Title	Cr
CH 1160	University Chemistry II	3
CH 1161	University Chemistry II Lab	1
CH 1163	Univ Chem II Rec (recommended)	1
ENG 1100	Engineering Analysis	2
MA 1161	Calculus with Technology I	5
UN 1025	Global Issues or mod language*	3
	Co-Curricular*	1
<i>Total</i>		16

Fall semester, Second year

Course	Title	Cr
CH 2410	Organic Chemistry I	3
CH 2411	Organic Chemistry Lab I	1
ENG 1102	Eng Modeling and Design	3
MA 2160	Calculus with Technology II	4
PH 1100	Physics by Inquiry I	1
	Critical & Creative Think course*	3
	Co-Curricular*	1
<i>Total</i>		16

Spring semester, Second year

Course	Title	Cr
CH 2420	Organic Chemistry II*	3
MA 3160	Multivariable Calc with Techn	4
PH 2100	University Physics I	3
	Social Resp & Eth Reas course*	3
<i>Total</i>		13

Fall semester, Third year

Course	Title	Cr
CM 2110	Fundamentals of ChE I	3
MA 2320	Elementary Linear Algebra	2
PH 1200	Physics by Inquiry II	1
PH 2200	University Physics II	3
	HASS Course*	3
<i>Total</i>		12

Spring semester, Third year

Course	Title	Cr
CH 3510	Physical Chemistry I	3
CH 3511	Physical Chemistry Lab I	2
CM 2120	Fundamentals of ChE II	3
MA 3520	Elem Differential Equations	2
	HASS Course*	3
<i>Total</i>		13

Fall semester, Fourth year

Course	Title	Cr
CM 3110	Transport/Unit Operations I	3
CM 3215	Transport Lab	3
CM 3230	Thermodynamics for ChE	4
	Technical Elective*	3
<i>Total</i>		13

Spring semester, Fourth year

Course	Title	Cr
CM 3120	Transport/Unit Operations II	3
CM 3310	Process Control	3
CM 3510	Chemical Reaction Eng	3
	Technical Elective*	2
	HASS Course (3000+ level)*	3
<i>Total</i>		14

Fall semester, Fifth year

Course	Title	Cr
CM 4110	Unit Operations Lab	3
CM 4310	Process Safety/Environment	3
CM 4855	ChE Proc Anal & Design I	3
	Core Engineering Elective*	4
<i>Total</i>		13

Spring semester, Fifth year

Course	Title	Cr
CM 4120	Chemical Plant Operations Lab	3
CM 4860	ChE Proc Anal & Design II	2
CM 4861	ChE Design Lab II	1
	Technical Elective*	3
	HASS Course (3000+ level)*	3
<i>Total</i>		12

*Elective course. You have some degree of choice with these courses. See the Description of Elective Courses section.

Description of Elective Courses

There are five types of elective courses in our degree program: **Technical Electives** are set by the department; **General Education Core Courses**, **General Education HASS Courses**, and **General Education Co-curricular Courses** are set by the University and are the same for all Michigan Tech students; and **Free Electives**.

Courses marked with a * on the 4- and 5-year schedules or shaded gold in the flowchart are elective courses. They fit into the categories above as follows:

CM 1000

This is a technical elective course that can count towards your core engineering elective requirement. If you decide to take this course then we recommend taking it in your first fall semester as a chemical engineering student. See the Technical Elective Courses section for more details.

Co-Curricular

These are a part of the University's general education requirements and are active courses. They are primarily physical education, ROTC physical conditioning, and music performance courses. We recommend taking these as early as you can because they are fun, help you meet other people with similar interests, and can be a challenge to schedule around the senior chemical engineering labs. See the General Education Co-curricular section for more details.

UN 1025 or mod language

This is a part of the University's general education core requirements. All students must take either UN 1025 Global Issues or a 3000-level or higher modern language course. Michigan Tech offers Spanish, French, and German. The language option is a good choice if you would like to take language courses at Michigan Tech. See the General Education Core Courses section for more details.

Critical & Creative Think course and Social Resp & Eth Reas course

These are a part of the University's general education core requirements. You'll choose a class from a list of approved courses. See the General Education Core Courses section for more details.

Organic Chemistry II

This is a technical elective course that counts towards your Organic Chemistry II or Substitute requirement. We recommend organic chemistry II to all chemical engineering students and especially to those interested in minoring in Polymer Science and Engineering because the course is broadly applicable to many areas within the chemical engineering field. See the Technical Elective Courses section for more details.

HASS course and HASS course (3000+ level)

These are a part of the University's general education HASS requirements. HASS stands for Humanities, Arts, and Social Sciences. You'll choose classes from several different lists of approved courses and at least two of the classes will need to be upper-division. See the General Education HASS Courses section for more details.

If you're looking for a recommendation, we suggest EC 3400 Economic Design Analysis prior or during fall senior year because it helps with plant design senior year. It counts as a 3000-level Social and Behavioral Science HASS course.

Technical Elective and Core Engineering Elective

These are a part of the department's technical elective requirements. See the Technical Elective Courses section for more details.

Free Electives

These are a part of the department's degree requirements. Free electives are any course 1000-level or higher that are not co-curricular courses. If you have extra credits in another area of your degree audit then you can use those extra credits towards free electives. Students starting out in precalculus can use precalculus for their free elective requirement.

Technical Elective Courses

Students must take a minimum of 16 credits of technical electives meeting these requirements:

- Three or more credits from the Organic Chemistry II or Substitute list
- Five or more credits from the Core Engineering Electives list
- Enough additional technical electives to total 16 credits or more.

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

Courses on more than one list can only satisfy one requirement.

Additional higher-level engineering, mathematics, science or applied business course may be approved on a case-by-case basis.

Courses on the general education HASS lists are not approved for technical electives.

Courses on the core engineering list are ABET engineering courses.

Organic Chemistry II or Substitute List

Minimum of 3 credits required

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

Core Engineering Electives List

Minimum of 5 credits required

CM 1000	Intro to Chemical Engineering	1
CM 2200	Intro Minerals and Materials	3
CM 3450	Computer-Aided Problem Solving	3
CM 3825	Sampling, Stats, and Instrumentation	2
CM 3830	Mineral Processing and Extraction Lab	1
CM/ENT 3979	Alternative Energy Tech & Processes	1
CM 4125	Bioprocess Engineering Laboratory	1
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
CM 5200	Advanced CM Thermodynamics	3
CM 5300	Advanced Transport Phenomena	3
CM 5400	Advanced Reactive Systems Analysis	3
EE 3010	Circuits and Instrumentation	3
ENG 2120	Statics-Strength of Materials	4
GE 4610	Formation Eval and Petroleum Engg	3
MEEM 2110	Statics	3

Undergraduate Research (repeatable)

Counts as core engineering electives

Optional - No more than 6 credits maximum

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 List

Take enough additional credits to get to 16 credits total

BE 2110	Statistical Methods for Biomed Engg	3
BE 2400	Cellular and Molecular Biology	3
BE 4300	Polymeric Biomaterials	3
BL 1010	Gen Bio I: Intro to Organismal Biology	4
or BL 1020	Gen Bio II: Intro to Cellular Biology	4
or BL 1040	Principles of Biology	4

Additional Technical Electives List continued

BL 2010	Anatomy & Physiology I	3
BL 2011	Anatomy & Physiology I Lab	1
BL 2020	Anatomy & Physiology II	3
BL 2021	Anatomy & Physiology II Lab	1
BL 2100	Principles of Biochemistry	3
BL 2200	Genetics	3
BL 2210	Genetics Laboratory	1
BL 3210	General Microbiology	4
BL 3310	Environmental Microbiology	3
BL 3640	General Immunology	3
BL 4010	Biochemistry I	3
BL 4020	Biochemistry II	3
BL 4030	Molecular Biology	3
BL 4380	Cardiopulmonary Physiology	3
BL 4820	Biochem Lab Techniques I	2
BL 4840	Molecular Biology Techniques	3
CEE 3502	Envir Monitoring and Meas Analysis	3
CEE 3503	Environmental Engineering	3
CEE 4501	Envir Eng Chemical Processes	4
CH 2212	Quantitative Analysis	5
CH 2420	Organic Chemistry II	3
CH 2421	Organic Chemistry Lab II	2
CH 3520	Physical Chemistry II – Mol Structure	3
CH 3521	Physical Chemistry Lab II	2
CH 4110	Pharm Chem: Drug Action	3
CH 4120	Pharm Chem: Drug Design	3
CH 4140	Intro to Pharmaceutical Analysis	3
CH 4212	Instrumental Analysis	5
CH 4222	Bioanalytical Chemistry	5
CH 4310	Inorganic Chemistry I	3
CH 4311	Inorganic Chemistry Lab	2
CH 4320	Inorganic Chemistry II	3
CH 4412	Spectroscopy of Organic Chem.	3
CH 4430	Intermediate Organic Chemistry	3
CH 4710	Biomolecular Chemistry I	3
CH 4720	Biomolecular Chemistry II	3
CM 1000	Intro to Chemical Engineering	1
CM 2200	Intro Minerals and Materials	3
CM 3450	Computer-Aided Problem Solv in ChE	3
CM 3825	Sampling, Stats, and Instrumentation	2
CM 3830	Mineral Processing and Extraction Lab	1
CM/ENT 3979	Alternative Energy Tech & Processes	1
CM 3XXE	CM Elective (transfer credit only)	var
CM 4125	Bioprocess Engineering Laboratory	1
CM 4505	Particle Technology	3
CM 4510	Interfacial Engineering	3
CM/CH 4610	Introduction to Polymer Science	3
CM/CH 4620	Polymer Chemistry	3
CM/CH 4631	Polymer Science Laboratory	2
CM 4650	Polymer Rheology	3

Additional Technical Electives List continued

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 4XXE	CM Elective (transfer credit only)	var
CM 5100	Applied Mathematics for CM	3
CM 5200	Advanced CM Thermodynamics	3
CM 5300	Advanced Transport Phenomena	3
CM 5400	Advanced Reactive Systems Analysis	3
CS 1111	Intro to Programming in C/C++	3
CS 1121	Intro to Programming I	3
CS 1131	Accelerated Intro to Programming	5
EE 2174	Digital Logic and Lab	4
EE 3010	Circuits and Instrumentation	3
EE 3120	Electric Energy Systems	3
EE 3140	Electromagnetics	3
EET 3373	Intro to Programmable Controllers	3
ENG 2120	Statics-Strength of Materials	4
ENG 4510	Sustainable Futures I	3
ENG 5520	Sustainable Futures II	3
ENT 2950	Enterprise Project Work I	1
ENT 2960	Enterprise Project Work II	1
ENT 3950	Enterprise Project Work III	1
ENT 3960	Enterprise Project Work IV	1
ENT 3980	Pre-Capstone Enterprise Project Work	1
ENT 4950	Enterprise Project Work V Capstone	2
ENT 4960	Enterprise Project Work VI Capstone	2
ENT 4961	Enterprise Project Work VII	1
FW 1035	Wood Anatomy and Properties	4
FW 3098	Adding Value to Forest Biomaterials	2
GE 2020	Intro to Mining Eng and Mining Meth	2
GE 2300	Mineral Science	3
GE 2310	Introduction to Petrology	3
GE 2640	Atmos Observations and Meteorology	3
GE 3400	Drilling and Blasting	3
GE 4360	Materials Handling	3
GE 4610	Formation Eval and Petroleum Engr	3
MA 2600	Scientific Computing	3
MA 2710	Introduction to Statistical Analysis	3
MA 2720	Statistical Methods	4
MA 3210	Introduction to Combinatorics	3
MA 3310	Introduction to Abstract Algebra	3
MA 3450	Introduction to Real Analysis	3
MA 3710	Engineering Statistics	3
MA 3740	Statistical Programming & Analysis	3
MA 3924	College Geometry with Technology	3
MA 4330	Linear Algebra	3
MA 4515	Intro to Partial Differential Eqns	3
MA 4525	Applied Vector and Tensor Math	3
MA 4620	Numerical Methods for PDEs	3
MA 4760	Mathematical Statistics I	3

Additional Technical Electives List continued

MA 4770	Mathematical Statistics II	3
MA 4908	Theory of Numbers with Technology	3
MEEM 2110	Statics	3
MEEM 2150	Mechanics of Materials	3
MEEM 2700	Dynamics	3
MEEM 4170	Failure of Materials in Mechanics	3
MEEM 4200	Principles of Energy Conversion	3
MEEM 4220	Internal Combustion Engines I	3
MEEM 4240	Combustion and Air Pollution	3
MEEM 4260	Fuel Cell Technology	3
MEEM 4405	Intro to the Finite Element Method	3
MEEM 4635	Design with Plastics	3
MEEM 4650	Quality Engineering	3
MEEM 5170	Finite Elem and Var Meth in Engg	3
MEEM 5240	Comp Fluid Dynamics for Engg	3
MSE 2100	Intro to Materials Sci and Engg	3
MSE 2110	Intro to Materials Sci and Engg II	3
MSE 3100	Materials Processing I	4
MSE 3120	Materials Characterization I	4
MSE 4110	Introduction to Polymer Engg	3
MSE 4310	Principles of Metal Casting	3
MSE 4320	Corrosion and Environmental Effects	3
MSE 4325	Fundamentals of Corrosion	1
MSE 4430	Composite Materials	3
OSM 4650	Six Sigma Fundamentals	3
PH 2230	Electronics for Scientists	4
PH 2300	Univ Physics III – Fluids and Thermo	2
PH 2400	Univ Physics IV – Waves and Mod Phy	3
UN 2600	Fund of Nanoscale Sci and Eng	2
UN 3002	Undergrad Cooperative Ed I	1-2
UN 3003	Undergrad Cooperative Ed II	1-2
UN 3004	Undergrad Cooperative Ed III	1-2
UN 3005	Undergrad Cooperative Ed IV	1-2

Enterprise Module Courses

Counts as additional technical electives

Optional – No more than 3 credits maximum

ENT 3953	Ignite: Ideate, Innovate, Create!	1
ENT 3954	Enterprise Market Principles	1
ENT 3958	Ethics in Eng Des and Impl	1
ENT 3959	Fundamentals of Six Sigma I	1
ENT 3961	Building and Leading Teams	1
ENT 3963	Deliver: Explore, Develop, Execute!	1
ENT 3964	Project Management	1
ENT 3966	Design for Manufacturing	1
ENT 3967	Design for Six Sigma	1
ENT 3971	Seven Habits of Highly Effective Peop	1
ENT 3982	Contin Improv Using Lean Principles	1
ENT 3983	Culture of Continuous Improvement	1
ENT 4951	Business Plans and Budgeting in the Ent	1
ENT 4954	Global Competition	1

General Education Core Courses

Students must take a minimum of 12 credits of core courses meeting these requirements:

- Three credits from UN 1015 Compositions
- Three credits from UN 1025 Global Issues or 3000-level or higher modern language course
- Three credits from the Critical and Creative Thinking list
- Three credits from the Social Responsibility and Ethical Reasoning list

Courses on more than one list can only satisfy one requirement.

Critical and Creative Thinking List

Minimum of 3 credits required

FA 2330	Art Appreciation	3
FA 2520	Music Appreciation	3
FA 2720	Sound in Art and Science	3
FA 2820	Theatre Appreciation	3
HU 2130	Introduction to Rhetoric	3
HU 2324	Introduction to Film	3
HU 2501	American Experience in Literature	3
HU 2503	Introduction to Literature	3
HU 2538	British Experience in Literature	3
HU 2700	Introduction to Philosophy	3
HU 2820	Communication and Culture	3
HU 2910	Language and Mind	3
SS 2300	Environment and Society	3
TA 2XX4	Critical & Creative Thinking Core (MTA transfer credit only)	var

Social Resp and Ethical Reasoning List

Minimum 3 credits required

EC 2001	Principles of Economics	3
PSY 2000	Introduction to Psychology	3
SS 2100	Introduction to Cultural Anthropology	3
SS 2200	Introduction to Archaeology	3
SS 2400	Introduction to Human Geography	3
SS 2500	United States History to 1877	3
SS 2501	US History Since 1877	3
SS 2502	European History to 1650	3
SS 2503	European History Since 1650	3
SS 2504	World History to 1500	3
SS 2505	World History Since 1500	3
SS 2600	American Government and Politics	3
SS 2610	Introduction to Law and Society	3
SS 2700	Introduction to Sociology	3
TA 2XX8	Social Resp & Ethical Reasoning Core (MTA transfer credit only)	var

General Education HASS Courses

Students must take a minimum of 12 credits in HASS courses meeting these requirements:

- Three credits from the Communication/Composition list
- Three credits from the Humanities/Fine Arts list
- Three credits from the Social and Behavioral Science list
- Three credits from any list above or the Restricted HASS list
- Of the credits taken above, at least 6 credits must be taken at the 3000-level or higher.

All 3000-level or higher non-language HASS courses have prerequisites of UN1015 and (UN1025 or modern language – 3000 level or higher).

Courses on more than one list can only satisfy one requirement.

Repeatable courses may only be used once for General Education HASS requirements.

Communication/Composition List

Minimum of 3 credits required

HU 2810	Research & Writing in Communication	3
HU 2830	Public Speaking & Multimedia	3
HU 3015	Advanced Composition	3
HU 3120	Technical and Professional Comm	3
HU 3130	Rhetoric of Science and Technology	3
HU 3151	The Rhetoric of Everyday Texts	3
HU 3621	Introduction to Journalism	3
HU 3693	Science Writing	3
HU 3694	Grant Writing	3
HU 3832	Advanced Digital Presentation	3
HU 4625	Risk Communication	3
TA 1XX5	Communication Elective (MTA transfer credit only)	var
TA 3XX5	Communication Elective (MTA transfer credit only)	var

Humanities/Fine Arts List

Minimum of 3 credits required

FA 2050	Drawing I	3
FA 2110	Outdoor Sculpture	3
FA 2123	World Music	3
FA 2150	Creative Drawing Processes	3
FA 2160	Creative Practices: ...Visual Art	3
FA 2190	Art and Nature	3
FA 2222	Film Music	3
FA 2300	Art and Design Studio	3
FA 2305	Ceramics I	3
FA 2315	Beginning Wheel Throwing	3
FA 2330	Art Appreciation	3
FA 2520	Music Appreciation	3
FA 2600	Beginning Acting	3
FA 2720	Sound in Art and Science	3
FA 2820	Theatre Appreciation	3
FA 3133	Contemporary Music: ...New Sounds	3
FA 3305	Creative Ceramics	3

Humanities/Fine Arts List continued

FA 3330	Art History-Prehistory to Renaissance	3
FA 3333	Contemporary Sculpture Studio	3
FA 3335	Traditional Sculpture Studio	3
FA 3340	Art History-Renaissance to Today	3
FA 3550	History of Jazz	3
FA 3560	Music History	3
FA 3600	Advanced Acting	3
FA 3625	History of Rock	3
FA 3630	Beatles and Beach Boys	3
FA 3640	Puppetry: Puppet Construction...	3
FA 3760	Costume Design	3
FA 3810	Theatre History I	3
FA 3821	Theatre History II	3
FA 3860	Costume History	3
FA 4620	Musical Theatre Performance	3
HU 2130	Introduction to Rhetoric	3
HU 2241	Level I-A Less Commonly Taught Lang (transfer or study abroad credit only)	var
HU 2242	Level I-B Less Commonly Taught Lang (transfer or study abroad credit only)	var
HU 2271	Level I-A French Language & Culture	3
HU 2272	Level I-B French Language & Culture	3
HU 2273	Transitional Level I French Lang...	3
HU 2281	Level I-A German Language & Culture	3
HU 2282	Level I-B German Language & Culture	3
HU 2291	Level I-A Spanish Language & Culture	3
HU 2292	Level I-B Spanish Language & Culture	3
HU 2293	Transitional Level I Spanish Language	3
HU 2324	Introduction to Film	3
HU 2500	Ways of Reading	3
HU 2501	American Experience in Literature	3
HU 2503	Introduction to Literature	3
HU 2510	Intro to Creative Writing	3
HU 2538	British Experience in Literature	3
HU 2548	Young Adult Literature	3
HU 2633	Fundamentals of Digital Imaging	3
HU 2700	Introduction to Philosophy	3
HU 2702	Ethical Theory and Moral Problems	3
HU 2810	Research & Writing in Communication	3
HU 2820	Communication and Culture	3
HU 2830	Public Speaking & Multimedia	3
HU 2840	Interpersonal Communication	3
HU 2910	Language and Mind	3
HU 2920	Language and Society	3
HU 3015	Advanced Composition	3
HU 3120	Technical and Professional Comm	3
HU 3130	Rhetoric of Science and Technology	3
HU 3150	Topics in Literacy Studies	3
HU 3151	The Rhetoric of Everyday Texts	3
HU 3241	Level II-A Less Commonly Taught Lang (transfer or study abroad credit only)	var
HU 3242	Level II-B Less Commonly Taught Lang (transfer or study abroad credit only)	var
HU 3261	Communicating Across Cultures	3
HU 3262	Topics in Francophone Cultures	3
HU 3263	Topics in German-Speaking Culture	3
HU 3264	Topics in Spanish-Speaking Culture	3
HU 3271	Level II-A French Language & Culture	3
HU 3272	Level II-B French Language & Culture	3
HU 3274	Level III French Literature & Culture	3
HU 3275	French for Special Purposes	3
HU 3280	Level I-C German Language & Culture	3

Humanities/Fine Arts List continued

HU 3281	Level II-A German Language & Culture	3
HU 3282	Level II-B German Language & Culture	3
HU 3283	Level II German for Special Purposes	3
HU 3284	Level III German Literature & Culture	3
HU 3285	Level III German Film & Media	3
HU 3291	Level II-A Spanish Language & Culture	3
HU 3292	Level II-B Spanish Language & Culture	3
HU 3293	Level II-C Spanish Comp & Conv	3
HU 3294	Hispanic Literatures and Culture	3
HU 3295	Level III Advanced Spanish for Liter...	3
HU 3296	Intro to Hispanic Literatures & Cultures	3
HU 3326	Topics in World Cinema	3
HU 3327	Film Style and Genre	3
HU 3400	Topics in Diversity Studies	3
HU 3401	Gender and Culture	3
HU 3410	Introduction to Diversity Studies	3
HU 3502	Mythology	3
HU 3504	Studies in the Novel	3
HU 3505	Literary Forms, Genres, and Modes	3
HU 3506	Major Authors	3
HU 3507	Cultural Traditions in Literature	3
HU 3508	Literature and the Environment	3
HU 3513	Shakespeare	3
HU 3514	Workshop Creative Nonfiction	3
HU 3515	Workshop in Poetry	3
HU 3516	Workshop in Fiction	3
HU 3517	Literary Theory and Criticism	3
HU 3518	Workshop in Sci Fi Writing	3
HU 3519	Workshop in Nature Writing	3
HU 3545	Literature across Borders	3
HU 3554	Science Fiction	3
HU 3557	Literature and Science	3
HU 3621	Introduction to Journalism	3
HU 3693	Science Writing	3
HU 3694	Grant Writing	3
HU 3700	Philosophy of Science	3
HU 3701	Philosophy of Technology	3
HU 3702	Philosophy of Religion	3
HU 3710	Engineering Ethics	3
HU 3711	Biomedical Ethics	3
HU 3800	Media and Society	3
HU 3802	Media and Globalization	3
HU 3810	Technology and Culture	3
HU 3825	Environmental Communication	3
HU 3830	Creativity, Culture, & Change	3
HU 3832	Advanced Digital Presentation	3
HU 3840	Organizational Communication	3
HU 3850	Cultural Studies	3
HU 3852	Surveillance, Media, and Film	3
HU 3860	Popular Culture	3
HU 3871	New Media Theory	3
HU 3872	Color, Visuality, and Culture	3
HU 3882	Media Industries	3
HU 3890	Documentary	3
HU 3910	Language and Globalization	3
HU 3940	Language and Identity	3
HU 4271	Modern Language Seminar I-French	3
HU 4272	Modern Language Seminar II-French	3
HU 4273	Modern Language Seminar III-French	3
HU 4281	Modern Language Seminar I-German	3
HU 4282	Modern Language Seminar II-German	3
HU 4283	Modern Language Seminar III-German	3

Humanities/Fine Arts List continued

HU 4291	Modern Language Seminar I-Spanish	3
HU 4292	Modern Language Seminar II-Spanish	3
HU 4293	Modern Language Seminar III-Spanish	3
HU 4625	Risk Communication	3
HU 4701	Political Philosophy	3
HU 4725	Existentialism and Phenomenology	3
HU 4890	Topics in Communication	3
IS 2001	International Studies in situ-HU/FA (study abroad credit only)	var
IS 3001	International Studies in situ-HU/FA (study abroad credit only)	var

Social and Behavioral Science List

Minimum of 3 credits required

EC 2001	Principles of Economics	3
EC 3002	Microeconomic Theory	3
EC 3003	Macroeconomic Theory	3
EC 3100	International Economics	3
EC 3300	Industrial Organization	3
EC 3400	Economic Decision Analysis	3
EC 4050	Game Theory/Strategic Behavior	3
EC 4400	Banking and Financial Institutions	3
EC 4500	Public Sector Economics	3
EC 4620	Energy Economics	3
EC 4630	Mineral Industry Economics	3
EC 4640	Natural Resource Economics	3
EC 4650	Environmental Economics	3
EC 4710	Labor/Human Resource Economics	3
FW 3313	Sustainable Science	3
FW 3760	Human Dimensions of Natural Res...	3
GE 4630	Mineral Industry Economics	3
IS 2002	International Studies in situ-EC/PSY/SS (study abroad credit only)	var
IS 3002	International Studies in situ-EC/PSY/SS (study abroad credit only)	var
MGT 3650	Intellectual Property Management	3
PSY 2000	Introduction to Psychology	3
PSY 2080	Special Topics in Psychology	3
PSY 2110	Educational Psychology	3
PSY 2300	Developmental Psychology	3
PSY 2400	Health Psychology	3
PSY 2600	Death and Dying	3
PSY 2900	Introduction to Restorative Practices	3
PSY 3010	Theories of Personality	3
PSY 3030	Abnormal Psychology	3
PSY 3070	Cross-Cultural Psychology	3
PSY 3720	Social Psychology	3
PSY 4080	Topics in Psychology	3
SS 2100	Introduction to Cultural Anthropology	3
SS 2200	Introduction to Archaeology	3
SS 2210	Evolution of Cities	3
SS 2300	Environment and Society	3
SS 2400	Introduction to Human Geography	3
SS 2500	United States History to 1877	3
SS 2501	United States History since 1877	3
SS 2502	European History to 1650	3
SS 2503	European History since 1650	3
SS 2504	World History to 1500	3
SS 2505	World History since 1500	3
SS 2510	Gender and the Past	3
SS 2600	American Government & Politics	3
SS 2610	Introduction to Law and Society	3

Social and Behavioral Science List continued

SS 2635	Comparative Politics	3
SS 2700	Introduction to Sociology	3
SS 3105	Native Amer and Indig Communities	3
SS 3110	Food Systems and Sustainability	3
SS 3200	Archaeology of the Modern World	3
SS 3210	Field Archaeology	var
SS 3225	Capitalism and the Modern World	3
SS 3230	Archaeology of Industry	3
SS 3240	Reading the Landscape	3
SS 3250	Biological Anthropology	3
SS 3260	Latin American Cultural History	3
SS 3270	Archaeology of the African Diaspora	3
SS 3280	Anthropology of Energy	3
SS 3300	Environmental Problems	3
SS 3313	Sustainability Science	3
SS 3315	Population and Environment	3
SS 3400	Contemporary Europe	3
SS 3505	Military History of the U.S.	3
SS 3510	History of American Technology	3
SS 3511	History of Science in America	3
SS 3513	History of Making Things: Craft...	3
SS 3515	History of American Architecture	3
SS 3520	U.S. Environmental History	3
SS 3530	The Automobile in America	3
SS 3540	History of Michigan	3
SS 3541	The Copper Country	3
SS 3552	Renaissance & Reformation	3
SS 3553	Empires in World History	3
SS 3560	History of England I	3
SS 3561	History of England II	3
SS 3570	History of Canada	3
SS 3580	Technology and Western Civilization	3
SS 3581	History of Science	3
SS 3600	American Foreign Policy	3
SS 3612	International Relations	3
SS 3621	Intro to Public Policy and Management	3
SS 3630	Environmental Policy & Politics	3
SS 3636	Perceptions of Modern State and Gov	3
SS 3640	Selected Topics in Cyber-Law	3
SS 3650	Intellectual Property Management	3
SS 3660	Constitutional Law	3
SS 3661	Civil Rights & Civil Liberties	3
SS 3665	Crime, Incarceration, and Policy	3
SS 3760	Human Dimensions of Natural Resour	3
SS 3800	Energy Policy and Technology	3
SS 3801	Science, Technology, & Society	3
SS 3805	Environmental Justice	3
SS 3811	Energy Security and Justice	3
SS 3815	Energy and Society	3
SS 3910	Histories and Cultures	3
SS 3920	Topics in Anthropology/Archaeology	3
SS 3950	Topics in American History	3
SS 3951	Topics in European History	3
SS 3952	Topics in World History	3
SS 3961	Prep for Cross-Cultural Immersion Exp	3
SS 3990	Topics in the Social Science	3
SS 4001	History of Social Thought	3
SS 4120	Anthropology of International Develop	3
SS 4200	Environmental Anthropology	3
SS 4220	Archaeological Thought in Society	3
SS 4390	Seminar in Sustainability	3
SS 4530	Deindustrialization and the Urban Env	3

Social and Behavioral Science List continued

SS 4550	History of Technology	3
SS 4552	Historical Archaeology	3
SS 4553	Material Culture Studies	3
SS 4700	Communities and Research	3
SS 4921	Washington Experience Seminar	var

Restricted HASS List

Optional – No more than 3 credits maximum

BL 2001	Valuing the Great Lakes	3
BL 3970	Current Health Issues	3
ED 3510	Communicating Science I	3
ENT 2961	Teaming in the Enterprise	2
ENT 2962	Communication Contexts	1
FIN 2400	Financial Literacy	3
FW 3113	Alberta: Place, People, History	3
FW 3116	Ethnobotany	3
FW 3765	Maple Syrup Management and Culture	1
FW 4111	Indigenous Natural Resources Manag	3
GE 2100	Environmental Geology	3
HON 3150	Pavlis Seminar II	1
HON 3410	Culture, Language, and Project Dev...	3
HON 4150	Pavlis Seminar III	1
KIP 2600	Introduction to Public Health	2
MA 4945	History of Mathematics	3

Approved Transfer

Communication/Composition List

The following courses are available ONLY by transfer.

HU 1XX5	Approved Transfer HASS Comm/Comp	var
HU 2XX5	Approved Transfer HASS Comm/Comp	var
HU 3XX5	Approved Transfer HASS Comm/Comp	var
HU 4XX5	Approved Transfer HASS Comm/Comp	var

Approved Transfer

Humanities/Fine Arts List

The following courses are available ONLY by transfer.

FA 1XXX	Approved Transfer HASS Elective	var
FA 2XXX	Approved Transfer HASS Elective	var
FA 3XXX	Approved Transfer HASS Elective	var
FA 4XXX	Approved Transfer HASS Elective	var
HU 1XXX	Approved Transfer HASS Elective	var
HU 2XXX	Approved Transfer HASS Elective	var
HU 3XXX	Approved Transfer HASS Elective	var
HU 4XXX	Approved Transfer HASS Elective	var
HU 1XX5	Approved Transfer HASS Comm/Comp	var
HU 2XX5	Approved Transfer HASS Comm/Comp	var
HU 3XX5	Approved Transfer HASS Comm/Comp	var
HU 4XX5	Approved Transfer HASS Comm/Comp	var

Approved Transfer

Social and Behavioral Sciences List

The following courses are available ONLY by transfer.

EC 1XXX	Approved Transfer HASS Elective	var
EC 2XXX	Approved Transfer HASS Elective	var
EC 3XXX	Approved Transfer HASS Elective	var
EC 4XXX	Approved Transfer HASS Elective	var
PSY 1XXX	Approved Transfer HASS Elective	var
PSY 2XXX	Approved Transfer HASS Elective	var
PSY 3XXX	Approved Transfer HASS Elective	var
PSY 4XXX	Approved Transfer HASS Elective	var
SS 1XXX	Approved Transfer HASS Elective	var
SS 2XXX	Approved Transfer HASS Elective	var
SS 3XXX	Approved Transfer HASS Elective	var
SS 4XXX	Approved Transfer HASS Elective	var

General Education Co-curricular Courses

Students must take 3 units of co-curricular courses.

Co-curricular units:

- Count toward full-time status and satisfactory progress for financial aid purposes
- Appear on the transcript with a Pass/Fail grade
- Are not included in GPA calculation
- Are not included in the total credits required for a degree
- Do not count towards the 12 credits of gradable courses required for recognition of university honors.

Repeatability for general education:

- 0.5 unit co-curricular courses may be repeated once for the co-curricular requirement.
- 1 unit co-curricular courses may not be repeated for the co-curricular requirement.

Co-curricular List

Minimum of 3 units required

AF 0120	Physical Conditioning	0.5
AF 0130	Air Force Elite Forces Workout	1
AF 0230	Precision Drill Team	0.5
AF 0340	Field Training	1
AR 0340	Internship in Adv Military Leadership	3
AR 2068	Fall Military Physical Conditioning	1
AR 2069	Spring Military Physical Conditioning	1
AR 3068	Physical Training Leadership I	1
AR 3069	Physical Training Leadership II	1
FA 2400	Huskies Pep Band	1

Co-curricular List continued

FA 2402	Campus Concert Band	1
FA 2570	Private Music Instruction	0.5
PE 0101	Flag Football	0.5
PE 0103	Bait and Fly Casting	0.5
PE 0104	Ultimate Frisbee	0.5
PE 0105	Beginning Bowling I	0.5
PE 0106	Beginning Golf	0.5
PE 0107	Floor Hockey	0.5
PE 0108	Broomball	0.5
PE 0109	Aikido	0.5
PE 0113	Disc Golf	0.5

Co-curricular List continued

PE 0115	Beginning Swimming	0.5
PE 0116	Beginning Basketball	0.5
PE 0117	Beginning Hockey	0.5
PE 0118	Beginning Weight Training	0.5
PE 0119	Beginning Fitness Training	0.5
PE 0120	Beginning Alpine Skiing (Downhill)	0.5
PE 0121	Beginning Snowboarding	0.5
PE 0122	Softball	0.5
PE 0123	Telemark Skiing	0.5
PE 0125	Sand Volleyball	0.5
PE 0126	Beginning Volleyball	0.5
PE 0130	Water Aerobics	0.5
PE 0132	Beginning Soccer	0.5
PE 0135	Beginning Cross Country Skiing	0.5
PE 0137	Table Tennis	0.5
PE 0138	Beginning Racquetball/Squash	0.5
PE 0139	Beginning Badminton	0.5
PE 0140	Beginning Tennis	0.5
PE 0142	Introduction to Brazilian Jiu Jitsu	0.5
PE 0145	Beginning Rifle	0.5
PE 0146	Beginning Billiards	0.5
PE 0148	Beginning Skating	0.5
PE 0150	Outdoor Lifetime Activities	0.5
PE 0151	Indoor Lifetime Activities	0.5
PE 0152	Social Dance I	0.5
PE 0153	Aerobics I	0.5
PE 0155	Beginning Road Biking	0.5
PE 0156	Beginning Mountain Biking	0.5
PE 0165	Introduction to Rowing	0.5
PE 0166	Moving for Fitness	0.5
PE 0167	Beginning Yoga	0.5
PE 0169	Indoor Cycling	0.5
PE 0170	TaeKwonDo and Hapkido I	0.5
PE 0175	Hiking	0.5
PE 0177	Fundamentals of Laser Tag	0.5
PE 0205	Bowling II	0.5
PE 0206	Intermediate Golf	0.5
PE 0209	Intermediate Aikido	0.5
PE 0210	Special Topics in Physical Education	0.5
PE 0215	Intermediate Swimming	0.5
PE 0216	Intermediate Basketball	0.5
PE 0217	Intermediate Hockey	0.5
PE 0218	Intermediate Weight Training	0.5
PE 0219	Intermediate Fitness Training	0.5
PE 0220	Intermediate Alpine Ski (Downhill)	0.5
PE 0221	Intermediate Snowboarding	0.5
PE 0226	Intermediate Volleyball	0.5
PE 0230	Water Polo	0.5
PE 0232	Intermediate Soccer	0.5
PE 0235	Intermediate Cross Country Ski	0.5
PE 0237	Intermediate Table Tennis	0.5
PE 0238	Intermediate Racquetball/Squash	0.5
PE 0239	Intermediate Badminton	0.5
PE 0240	Intermediate Tennis	0.5
PE 0242	Brazilian Jiu Jitsu II	0.5
PE 0245	Intermediate Rifle	0.5
PE 0246	Intermediate Billiards	0.5
PE 0248	Intermediate Skating	0.5
PE 0250	Paintball	0.5
PE 0252	Social Dance II	0.5
PE 0253	Aerobics II	0.5

Co-curricular List continued

PE 0256	Intermediate Mountain Biking	0.5
PE 0266	Running for Fitness	0.5
PE 0267	Intermediate Yoga	0.5
PE 0270	Cardio TaeKwonDo	0.5
PE 0277	Strategies of Laser Tag	0.5
PE 0315	Fitness Swimming	0.5
PE 0320	Advanced Skiing	0.5
PE 0321	Advanced Snowboarding	0.5
PE 0330	Club Sports	0.5
PE 0352	Social Dance III	0.5
PE 0353	Aerobics III	0.5
PE 0355	Advanced Road Biking	0.5
PE 0367	Mindful Yoga	0.5
PE 0420	Ski Instructor Training	0.5
PE 0421	Snowboard Instructor Training	0.5
PE 0425	Intramurals	0.5
PE 0430	Club Sports Leadership	0.5
PE 0450	Physical Education Fusion – Full	1
PE 0451	Mountain/Road Bike Fusion	0.5
PE 0520	Alpine Skiing Fusion	0.5
PE 0521	Snowboard Fusion	0.5
PE 1000	Fitness Foundations	1
PE 1010	Active Michigan Tech	1
PE 1028	Ski Patrol (Hill)	1
PE 1101	Team Sports	1
PE 1105	Bowling	1
PE 1106	Golf	1
PE 1113	Disc Sports	1
PE 1118	Weight/Fitness Training	1
PE 1119	Conditioning	1
PE 1138	Racquet Sports	1
PE 1140	Tennis	1
PE 1169	Indoor Cycling	1
PE 1170	TaeKwonDo	1
PE 1210	Special Topics	1
PE 1215	Introduction to Backcountry Travel	1
PE 1220	Introduction to Canoeing	1
PE 1225	Indoor Rock Climbing	1
PE 1230	Introduction to Kayaking	1
PE 1235	Introduction to Log Rolling	1
PE 1240	Snowshoeing	1
PE 1245	Wilderness First Responder	1
PE 1435	Self-Defense for Women	1
PE 1436	Self-Defense for Men	1
PE 1470	Lifeguard Swimming	1
PE 2010	Varsity Football	1
PE 2020	Varsity Basketball	1
PE 2030	Varsity Hockey	1
PE 2040	Varsity Nordic Skiing	1
PE 2050	Varsity Soccer	1
PE 2080	Varsity Track	1
PE 2090	Varsity Tennis	1
PE 2130	Varsity Volleyball	1
PE 2140	Varsity Cross Country	1
PE 2150	Cross Training	1

Approved Transfer Co-curricular List

The following courses are available ONLY by transfer.

PE 0XXX	Co-Curricular Activities	0.5
PE 1XXX	Co-Curricular Activities	1

Academic Planning Worksheet

Semester _____	Semester _____	Semester _____			
<u>Course</u>	<u>Credits</u>	<u>Course</u>	<u>Credits</u>	<u>Course</u>	<u>Credits</u>
_____		_____		_____	
_____		_____		_____	
_____		_____		_____	
_____		_____		_____	
_____		_____		_____	
_____		_____		_____	
Total _____		Total _____		Total _____	

Semester _____	Semester _____	Semester _____			
<u>Course</u>	<u>Credits</u>	<u>Course</u>	<u>Credits</u>	<u>Course</u>	<u>Credits</u>
_____		_____		_____	
_____		_____		_____	
_____		_____		_____	
_____		_____		_____	
_____		_____		_____	
_____		_____		_____	
Total _____		Total _____		Total _____	

Semester _____	Semester _____	Semester _____			
<u>Course</u>	<u>Credits</u>	<u>Course</u>	<u>Credits</u>	<u>Course</u>	<u>Credits</u>
_____		_____		_____	
_____		_____		_____	
_____		_____		_____	
_____		_____		_____	
_____		_____		_____	
_____		_____		_____	
Total _____		Total _____		Total _____	