Oh, the things you will do!

**Cornerstone Design**

**Undergraduate Research**

**Internships**

**National Competitions**

**CAPSTONE DESIGN**

**Study Abroad**

**Co-op employment**

**Residential Experience**

**Student Organizations**

**ACADEMICS**

On behalf of all of our staff, Welcome Spartan Engineer!

You are embarking on a major journey in life. After 13 years of taking courses mostly in common with all of the other students your age, you are now beginning preparation for a profession, and investing time and resources in a college education directed to your specific goals.

Success in Engineering in the 21st century requires breadth beyond classroom studies and a standard curriculum. To reach your goals, the planning starts now. You need to spend your years as a Spartan Engineer developing the building blocks for a career in engineering or a related field and perhaps additional study in graduate school.

Making your plan starts today at your New Student Orientation (NSO) and will continue through your career by interacting with the various units in the office of Engineering Undergraduate Studies (UGS). Our many ways to provide you support and help you broaden your experiences are further described in this handbook. Keep this book for your planning and visit our offices to assist you in the many opportunities highlighted above. Our help starts today, in planning your first year of classes.

You are a Spartan Engineer. Welcome and ... Go Green!

Assistant Dean for Undergraduate Student Affairs
# Table of Contents

Campus Resources..........................................................................................................................1
Academic Calendar ..........................................................................................................................2
Advising
  Academic Advising ......................................................................................................................3
Getting Through
  Admission to the College of Engineering .....................................................................................5
  Calculating Your Grade Point Averages .......................................................................................6
Getting Started
  Univ. Requirements-WRA, ISS .....................................................................................................7
  Univ. Requirement- IAH .................................................................................................................7
  Univ. Requirement- Bioscience ......................................................................................................7
  College of Engineering Requirements ......................................................................................8
  Mathematics ..................................................................................................................................9
Chemistry .........................................................................................................................................9
Physics ..........................................................................................................................................10
Electives .......................................................................................................................................10
Biomedical Engineering ................................................................................................................11
Environmental Engineering .........................................................................................................13
Computer Science Cognate ...........................................................................................................14
Additional Minors ........................................................................................................................15
Schedule Planning Worksheets ....................................................................................................16
Getting Connected
  Academic Assistance ..................................................................................................................19
  Diversity Programs Office (DPO) & Guided Learning Center (GLC) .......................................19
  CoRe Experience .........................................................................................................................20
  Women in Engineering Programs ..............................................................................................20
  The Center/Spartan Engineering ..............................................................................................20
  Student Organizations ...............................................................................................................23
  Scholarship Information ..............................................................................................................23
  Engineering Education Abroad .................................................................................................23
  Engineering Disciplines at MSU ..............................................................................................25
  NSO Enrollment Preparation ....................................................................................................26
Engineering Degree Programs & Major Requirements
  Applied Engineering Sciences .....................................................................................................28
  Biosystems Engineering .............................................................................................................31
  Chemical Engineering ...............................................................................................................34
  Civil Engineering .......................................................................................................................38
  Computational Data Science .....................................................................................................41
  Computer Engineering ...............................................................................................................41
  Computer Science .....................................................................................................................45
  Electrical Engineering ...............................................................................................................47
  Environmental Engineering .......................................................................................................50
  Materials Science & Engineering .............................................................................................52
  Mechanical Engineering ............................................................................................................55
  Electives ...................................................................................................................................59
## Campus Resources

<table>
<thead>
<tr>
<th>Office/Department</th>
<th>Location</th>
<th>Phone #</th>
<th>Website</th>
</tr>
</thead>
<tbody>
<tr>
<td>College of Engineering Academic Advising</td>
<td>C101 Wilson Hall</td>
<td>517-355-6616 ext. 3</td>
<td>egr.msu.edu/undergraduate/academic/advisors</td>
</tr>
<tr>
<td>Admissions</td>
<td>250 Hannah Admin. Bldg.</td>
<td>517-355-8332</td>
<td>admissions.msu.edu</td>
</tr>
<tr>
<td>Campus Living Resources</td>
<td>1855 Place</td>
<td>1-877-9LIVEON</td>
<td>liveon.msu.edu</td>
</tr>
<tr>
<td>Chemistry Department</td>
<td>185 Chemistry</td>
<td>517-355-9715</td>
<td>chemistry.msu.edu</td>
</tr>
<tr>
<td>CoRe Experience</td>
<td>C101 Wilson Hall</td>
<td>517-355-6616 ext. 2</td>
<td>egr.msu.edu/core/</td>
</tr>
<tr>
<td>Counseling &amp; Psychiatric Services</td>
<td>3rd Floor Olin Health Center</td>
<td>517-355-8270</td>
<td>caps.msu.edu</td>
</tr>
<tr>
<td>Diversity Programs Office (DPO)</td>
<td>1108 EB</td>
<td>517-355-8310</td>
<td>egr.msu.edu/dpo</td>
</tr>
<tr>
<td>English Language Center (ELC)</td>
<td>B230 Wells Hall</td>
<td>517-353-0800</td>
<td>elc.msu.edu</td>
</tr>
<tr>
<td>Financial Aid</td>
<td>252 Student Services</td>
<td>517-353-5940</td>
<td>finaid.msu.edu</td>
</tr>
<tr>
<td>IAH Department</td>
<td>200 Linton Hall</td>
<td>517-355-9570</td>
<td>cisah.msu.edu</td>
</tr>
<tr>
<td>ISS Department</td>
<td>302 Berkey Hall</td>
<td>517-355-9733</td>
<td>cis-ss.msu.edu</td>
</tr>
<tr>
<td>Math Department</td>
<td>C212 Wells Hall</td>
<td>517-353-0844</td>
<td>math.msu.edu</td>
</tr>
<tr>
<td>Math Learning Center (MLC)</td>
<td>C126 A Wells Hall</td>
<td>517-884-7414</td>
<td>math.msu.edu/mlc</td>
</tr>
<tr>
<td>Office Intern'l. Stud. &amp; Scholars (OISS)</td>
<td>105 Internat'l Center</td>
<td>517-353-1720</td>
<td>oiss.msu.edu</td>
</tr>
<tr>
<td>Physics Department</td>
<td>1312 BPS Building</td>
<td>517-355-9200 ext. 3</td>
<td>pa.msu.edu</td>
</tr>
<tr>
<td>Department of Police &amp; Public Safety (DPPS)</td>
<td>1120 Red Cedar Rd.</td>
<td>517-355-2221</td>
<td>police.msu.edu (sign up for emergency text alerts here)</td>
</tr>
<tr>
<td>Registrar</td>
<td>150 Hannah Admin. Bldg.</td>
<td>517-355-3300</td>
<td>reg.msu.edu</td>
</tr>
<tr>
<td>Education Abroad</td>
<td>109 Internat'l Center</td>
<td>517-353-8920</td>
<td>educationabroad.isp.msu.edu/</td>
</tr>
<tr>
<td>The Center (internships, co-ops, career services)</td>
<td>C108 Wilson Hall</td>
<td>517-355-5163</td>
<td>egr.msu.edu/careers</td>
</tr>
<tr>
<td>Neighborhood Student Success Collaborative</td>
<td>170 Bessey Hall</td>
<td>517-884-4050</td>
<td><a href="http://nssc.msu.edu/">http://nssc.msu.edu/</a></td>
</tr>
<tr>
<td>Women in Engineering (WIE) Student Success</td>
<td>1108A EB</td>
<td>517-432-1354</td>
<td>egr.msu.edu/wie</td>
</tr>
<tr>
<td>Women in Engineering (WIE) K-12 Outreach</td>
<td>1410A EB</td>
<td>517-884-0054</td>
<td>egr.msu.edu/wie</td>
</tr>
<tr>
<td>Writing Center</td>
<td>300 Bessey Hall</td>
<td>517-432-3610</td>
<td>writing.msu.edu</td>
</tr>
</tbody>
</table>
2019 - 2020 Academic Calendar
For a complete listing of important dates, please visit the registrar’s website at reg.msu.edu/ROInfo/Calendar/academic.asp

Fall 2019

August 24  New Freshmen and Transfer students attending an AUGUST orientation can move into residence halls beginning at 8 am
August 25  New Freshmen and Transfer students who attended JUNE or JULY orientation can move into residence halls beginning at 8 am
August 26  New Student Orientation (NSO) students may begin to adjust their schedules
August 28  Classes begin
September 2  Labor Day- University closed
September 4  End of open add period; 8 pm
September 24  End of tuition refund period (no refunds after this date)
October 16  Middle of Semester
            LAST day to drop classes with no grade reported; 8 pm
November 28-29  Thanksgiving holiday- University closed
December 6  End of classes for Fall Semester
December 6  Engineering Design Day
December 9-13  Final exams

Spring 2020

January 6  Classes begin
January 10  End of open add period; 8 pm
January 20  Martin Luther King, Jr. Day, no classes, university remains open
February 26  Middle of Semester
            LAST day to drop classes w/ no grade reported; 8 pm
March 2-6  Spring break
April 24  Classes end
April 24  Engineering Design Day
April 27-May 1  Final exams
Academic Advising

Who are academic advisors?
Academic advisors are professionals with advanced degrees in counseling, education, university administration and related fields. Academic advisors are dedicated to student’s academic success and are knowledgeable about university policy. We are here to guide you along the way and provide valuable information to help you make good academic decisions.

FIRST-YEAR ADVISORS
- John Denny
- Evelyn Grace
- Candyce Hill
- Jeffrey Tsang

Walk-in advising is available:
Monday, Tuesday, Thursday & Friday: 10am-12pm and 1-4pm
Schedule an appointment online at msu.campus.eab.com

SOPHOMORE THROUGH SENIOR ADVISORS
For the most updated information, check egr.msu.edu/undergraduate/academic/advisors

Applied Engineering Sciences
- Joyce Samuel

Biosystems Engineering
- Hannah Brodhead

Chemical Engineering, Materials Science & Engineering
- Lindsay Naylor

Civil Engineering, Environmental Engineering
- Sharita Williamson

Computer Engineering, Electrical Engineering
- Sean Fochtman

Computer Science
- Sophomores, Hannah Brodhead
- Juniors and Seniors, Titun Maiti

Mechanical Engineering
- Sophomores, Jeffrey Tsang
- Juniors and Seniors, Gaile Griffore
How often should I meet with my advisor?

- At least once a semester
- To receive assistance with major selection, schedule planning, test-taking, study skills, utilizing resources, career planning, and much more
- We encourage you to meet with an advisor in person; while some questions can be handled by email, many issues benefit from a two-way conversation

Before visiting your advisor, you should:

- Reflect on how you are doing in your classes
- Review the major/degree requirements for the majors that interest you
- Review course pre-requisites [reg.msu.edu/Courses/Search.asp](http://reg.msu.edu/Courses/Search.asp) and schedule of courses [schedule.msu.edu](http://schedule.msu.edu)
- Bring a preliminary schedule of courses you intend to take
- Write down your questions and bring them to your appointment

Academic Programs Catalog
Students should consult with their advisors to learn which specific requirements apply to degree programs: It can be viewed at: [reg.msu.edu/AcademicPrograms/default.aspx](http://reg.msu.edu/AcademicPrograms/default.aspx)

Student Handbook
*Spartan Life: Student Handbook and Resource Guide* is a helpful resource guide to campus programs and services and also includes rules, regulations, rights and responsibilities that have been established in the interest of intellectual and personal development while protecting individual freedoms. It can be found at: [splife.studentlife.msu.edu](http://splife.studentlife.msu.edu)

How many credits do I need to be a Freshman, Sophomore, Junior, or Senior?

<table>
<thead>
<tr>
<th>Class</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Freshman</td>
<td>0-27</td>
</tr>
<tr>
<td>Sophomore</td>
<td>28-55</td>
</tr>
<tr>
<td>Junior</td>
<td>56-87</td>
</tr>
<tr>
<td>Senior</td>
<td>88+</td>
</tr>
</tbody>
</table>

Special Note
Academic advisors are here to connect students with resources to support their success at MSU. Students are encouraged to talk with their advisors about any concerns they may have inside and outside the classroom. Advisors are mandatory reporters, which means that we are legally required to report any disclosures of current or past child abuse/neglect, sexual assault or harassment, and relationship violence to the MSU Office of Institutional Equity and MSU Police. After a report, students will be contacted by a campus official. In most cases, students may choose whether or not to participate further. If students would like to speak with someone confidentially, there are resources on campus that are not held to the same reporting standards. Here is a list of those confidential resources: [titleix.msu.edu/make-a-report/confidential-report.html](http://titleix.msu.edu/make-a-report/confidential-report.html)
Admission to the College of Engineering

In order to enroll in 300 & 400 level engineering courses, students must be admitted to the college. Students can apply for admission DURING the semester that they expect to meet the following requirements:

- completed the required courses
- earned at least 28 college credits after matriculating at MSU (AP and Dual Enrollment do not count towards this)
- attained a specific combination grade point average
- have a minimum of 2.0 in MTH 132 & MTH 133 AND an average GPA of 2.0 in ALL MTH courses

Applications are available starting in the 2nd week of each semester at: egr.msu.edu/undergraduate/academic/admission-engineering. The application deadlines for each semester are as follows:

Fall semester: Dec. 1
Spring semester: April 1
Summer semester: Aug. 1

Applications will be reviewed during the week after final exams, and students will be notified of their admission status via the Confidential Message system through Stuinfo.

Courses Required for Admission to the College of Engineering

- MTH 132 - Calculus I (with a grade of at least 2.0)
- MTH 133 - Calculus II (with a grade of at least 2.0)
- CEM 141 - General Chemistry or CEM 151 - General and Descriptive Chemistry for all majors except Computational Data Science and Computer Science
  o CEM 151 is required for ChE, ENE, and MSE majors
- PHY 183 or 183B - Physics for Scientists and Engineers I
- EGR 100 - Introduction to Engineering Design
- EGR 102 - Introduction to Engineering Modeling OR CSE 231 - Introduction to Programming I, (for Computer Engineering, Computer Science and Mechanical Engineers majors only) OR CSE 220 - Programming in C (for Electrical Engineering majors only) OR CMSE 202 – Computational Modeling Tools & Techniques (Computational Data Science majors only)

Admission to Engineering majors requires the following combined (combo) GPA:

- Mechanical Engineering – 3.1
- Applied Engineering Sciences – 3.0
- Biosystems, Chemical, Civil, Computational Data Science, Computer Engineering, Computer Science, Electrical, Environmental, Materials Science – 2.9
Admission to the College of Engineering is based on your Combined (Combo) GPA. Your combined grade point average is the average of your cumulative GPA and your technical GPA.

Your Cumulative GPA is an average of the grades you received for all courses you have taken for credit at MSU. First, multiply the credits for each MSU course you have taken by grade you received to get your points. Then, divide your total points by your total credits to get your cumulative GPA. Example:

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
<th>Multiply</th>
<th>Grade Rec'd.</th>
<th>Equals</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENT 205</td>
<td>3</td>
<td>x</td>
<td>2.5</td>
<td>=</td>
<td>7.5</td>
</tr>
<tr>
<td>CEM 141</td>
<td>4</td>
<td>x</td>
<td>3.0</td>
<td>=</td>
<td>12.0</td>
</tr>
<tr>
<td>CEM 161</td>
<td>1</td>
<td>x</td>
<td>4.0</td>
<td>=</td>
<td>4.0</td>
</tr>
<tr>
<td>ISS 215</td>
<td>4</td>
<td>x</td>
<td>3.0</td>
<td>=</td>
<td>12.0</td>
</tr>
<tr>
<td>MTH 132</td>
<td>3</td>
<td>x</td>
<td>3.0</td>
<td>=</td>
<td>9.0</td>
</tr>
<tr>
<td>Total</td>
<td>15</td>
<td></td>
<td></td>
<td>=</td>
<td>44.5</td>
</tr>
</tbody>
</table>

44.5 (total points) ÷ 15 (total credits) = 2.966 cumulative GPA

Your Technical GPA is an average of the grades you have received for all technical courses, which include most courses taken in the College of Engineering, Natural Science, Biosystems Engineering courses, and selected courses from Lyman Briggs College. A more complete list of technical courses can be found at [www.egr.msu.edu/advising/gpa/gpa-calculations](http://www.egr.msu.edu/advising/gpa/gpa-calculations)

The technical GPA calculation is the same as the Cumulative GPA, except that it only includes your science and engineering related courses. If you have repeated a course, only the most recent grade should be used. In this example, notice that ISS 215 from the list above is not included because it is not technical. Example:

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
<th>Multiply</th>
<th>Grade Rec'd.</th>
<th>Equals</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENT 205</td>
<td>3</td>
<td>x</td>
<td>2.5</td>
<td>=</td>
<td>7.5</td>
</tr>
<tr>
<td>CEM 141</td>
<td>4</td>
<td>x</td>
<td>3.0</td>
<td>=</td>
<td>12.0</td>
</tr>
<tr>
<td>CEM 161</td>
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<td>x</td>
<td>4.0</td>
<td>=</td>
<td>4.0</td>
</tr>
<tr>
<td>MTH 132</td>
<td>3</td>
<td>x</td>
<td>3.0</td>
<td>=</td>
<td>9.0</td>
</tr>
<tr>
<td>Total</td>
<td>11</td>
<td></td>
<td></td>
<td>=</td>
<td>32.5</td>
</tr>
</tbody>
</table>

32.5 (total points) ÷ 11 (total credits) = 2.9545 technical GPA
Your Engineering Degree
Your engineering degree consists of four main parts:
1. University Requirements (required of every MSU student)
2. College Requirements (required of all Engineering students)
3. Major Requirements (set of courses just for your major)
4. General Electives (non-major courses to help you reach your total graduation credits)

There are also opportunities to add optional concentrations in most majors, minors in or out of the College of Engineering, and additional majors.

1. University Requirements

Writing
All MSU students must complete two writing courses.
- WRA 101 Tier I level (generally taken during the first year)
- One at the Tier II level (fulfilled through 300/400 level major courses)

Integrative Studies in Social Sciences (ISS)
All MSU students must complete two ISS courses. These courses can be completed at any time during the undergraduate program.
- One ISS 2XX level course
- One ISS 3XX level course (completion of 28 credits and ISS 2XX level)

Integrative Studies in Arts and Humanities (IAH)
All MSU students must complete two IAH courses. These courses can be completed at any time during the undergraduate program.
- IAH 201-210 (prerequisite is WRA 101)
- IAH 211 or higher (prerequisite is IAH 201-210)

Integrative Studies Diversity Requirement
MSU undergraduates must complete courses in at least two of three diversity categories (“D”, “N” & “I”) as part of their IAH and/or ISS requirements. “N” – emphasizes national diversity; “I” – emphasizes international and multicultural diversity and “D” – emphasizes both national and international/multicultural diversity.

Bioscience
- MOST of the engineering majors allow for any of the following: BS 161, ENT 205, IBIO 150, MMG 141, MMG 201, PLB 105, PSL 250
- Environmental Engineering (ENE) Chemical Engineering (ChE), & Biosystems Engineering (BE) majors must take BS 161
- Biomedical Concentrations: Need BS 161
2. College of Engineering Requirements

Design & Computing Courses
As part of the CoRe Experience academic program, first-year engineering students are introduced to the team design process and analytical tools used in the engineering profession. These courses immerse students in hands-on engineering activities from their first days on campus.

All majors take EGR 100 – Introduction to Engineering Design
Team-based, interdisciplinary projects will be used to introduce students to the principles of engineering design processes. Teamwork, oral and written communication, career preparation, engineering ethics and other topics will also be discussed.

One technical computing class must be taken, depending on your intended major
- EGR 102 – Introduction to Engineering Modeling. Students will learn how to systematically identify and deconstruct engineering problems using tools such as advanced spreadsheets and engineering software applications such as MATLAB. Students will analyze various engineering systems, through the use of a variety of mathematical models. For students in Applied Engineering Sciences, Biosystems Engineering, Civil Engineering, Chemical Engineering, Environmental Engineering, and Materials Science.
- CMSE 202 – Computational Modeling Tools & Techniques. CMSE 202 is a programming course geared toward Computational Data Science. It covers computational modeling focusing on standard methods and tools used for modeling and data analysis. Topics may include statistical analysis, symbolic math, linear algebra, simulation techniques, and data mining. For students in Computational Data Science.
- CSE 231 – Introduction to Programming I. CSE 231 is an introduction to programming course. Using the Python language students will learn how to design, implement, and test programs to solve problems such as those in engineering, mathematics and science. For students in Computer Science, Computer Engineering and Mechanical Engineering.
- CSE 220 – Programming in C. CSE 220 is a programming course geared toward electrical engineering. It covers basics of programming in C, including data types, operators, control, functions, arrays, pointers, file processing, testing and debugging. For students in Electrical Engineering.

Notes
**Mathematics**

Over the course of your studies, you are expected to display competency in calculus.

- **MTH 132**  
  Calculus I
- **MTH 133**  
  Calculus II
- **MTH 234**  
  Multivariable Calculus
- **MTH 235**  
  Differential Equations (not required for CSE major)

Placement in mathematics the first year is determined by the student’s high school math background as evaluated by the MSU Mathematics Placement Test, ACT or SAT Math Score, or Advanced Placement (AP) test.

Students who do not place directly into the calculus series must successfully complete one of the sequences below before enrolling in MTH 132:

**Sequence A:** **MTH 116** – College Algebra & Trigonometry

**Sequence B:** **MTH 103** – College Algebra
  
  *and MTH 114* – Trigonometry

**Sequence C:** **MTH 103A** – College Algebra I
  
  *and MTH 103B* – College Algebra II
  
  *and MTH 114* – Trigonometry

**Chemistry**

All engineering students (except CDS and CSE majors) are required to complete at least one introductory course in general chemistry, usually taken during the freshman year.

- **CEM 141** – General Chemistry

- **CEM 151** – General and Descriptive Chemistry
  
  - Required for Chemical Engineering, Environmental Engineering, and Materials Science and Engineering

**Special Note for Chemical Engineering and Materials Science and Engineering Majors,**

please keep in mind these courses are only offered once a year.

- CEM 151 – Fall Only
- CEM 152 – Spring Only
- CEM 351 – Fall Only
- CEM 352 – Spring Only
- CEM 355 – Spring Only
Physics
All engineering students are expected to develop an understanding of certain fundamental principles of physics as a prerequisite to future engineering coursework.

- **PHY 183** – Physics for Scientists and Engineers I
- **PHY 184** – Physics for Scientists and Engineers II

PHY 231 and PHY 232 are not calculus-based, and by themselves do not fulfill the College of Engineering Physics requirements. If you have test/dual enrollment credit for these, you will also need the “bridge” courses for the calculus components.

PHY 231 + PHY 233B = PHY 183
PHY 232 + PHY 234B = PHY 184

3. Major Requirements

Major requirements differ across the 10 majors. Specific courses can be found on the curriculum guides in the back half of this handbook, or at egr.msu.edu/undergraduate/academic/degree-programs. Some courses count in several majors, so if you are undecided, look for courses that count in multiple majors.

4. General Electives

Engineering degrees require 120 or 128 credits, depending on which one you choose. Degree requirements for your major will not total 120/128, so you get to fill those credits with *general electives*. You can “spend” your elective credits any way you wish, but know that they are a part of your degree.

Notes
Biomedical Engineering at Michigan State

What do biomedical engineers do?
Biomedical engineers develop devices and procedures that solve medical and health-related problems. Biomedical engineers develop new processes, materials, and devices which can be used in the prevention, detection, and treatment of disease, patient rehabilitation, and overall health.

Where is biomedical engineering at MSU?
Biomedical engineering solutions require knowledge of an underlying engineering discipline. At MSU, students choose an engineering major first and then select biomedical electives as part of the major curriculum. The biomedical engineering concentration may be added to the following six engineering disciplines: Biosystems, Chemical, Computer, Electrical, Materials Science, or Mechanical Engineering.

Students interested in biomedical engineering should speak with their academic advisor early in their careers, as the biomedical concentration has specific bioscience requirements.

1. Biomedical Concentration with Biosystems Engineering
Biosystems engineers identify and solve problems at the interface of engineering and biology. In the biomedical area, Biosystems Engineering students have opportunities for undergraduate research in areas such as microbial modeling and biosensors for rapid detection of pathogens. In this application area, biosystems engineers find employment with pharmaceutical/healthcare companies, medical supply companies, and federal agencies, as well as continuing their studies in medical, veterinary, and graduate school.

2. Biochemical/Biomedical Concentrations with Chemical Engineering
Historically, chemical engineers have designed devices, pharmaceutical processes, and artificial organs (such as the artificial kidney). Chemical engineers are making significant contributions in computational and functional genomics, biosensors, cell and tissue engineering, biomolecular engineering, gene therapy, metabolic engineering, high-throughput drug screening, and drug formulation and delivery.

3. Biomedical Concentration with Electrical and Computer Engineering
Electrical and Computer Engineering students can take courses in the areas of bio-imaging and biomedical applications of signals and systems, and are given opportunities to conduct independent research with faculty in the areas of biomedical engineering. With the department’s focus on developing physical systems and data analysis methods for biomedical applications, some of the current research includes: modeling of physiological systems, cardiovascular physiology, biomedical ultrasonics, medical imaging, neural engineering, development of implantable devices and biomedical signal processing.
4. Biomedical Materials Concentration with Materials Science & Engineering
Biomedical materials engineers create new materials and devices that are used to treat
diseases and repair damaged tissues by combining their knowledge and skills in
engineering materials design with biology and chemistry. They may conduct research in
areas such as tissue engineering (creating new tissues like bone and muscle) and implant
development (like total knee and hip replacements). It also serves for the design of devices
used in various medical procedures, such as screws and plates used in orthopedics. Some
will specialize in orthopedics and sports medicine, while others will work in areas such as
implant design and manufacturing.

5. Biomedical Concentration with Mechanical Engineering
Mechanical engineers combining biomedical engineering are trained in biomechanical
engineering and find employment designing, for example, prosthetics, artificial joints,
avtomotive safety equipment, robotics for telemedicine, heart valves, left ventricle assist
devices, and the whole range of medical devices. Research by biomechanical engineers
includes studying the strength of bones and soft tissues, the motion of cells, the kinematics
of human motion, and the flow of blood.

Notes
Environmental Engineering at Michigan State

What are Environmental and Ecosystems Engineers?
Environmental and ecosystems engineers integrate physical, chemical, biological, mathematical, and engineering principles to address environmental problems. They advance fundamental understanding of human impacts on the environment and the environment’s response to these impacts.
Examples of engineering for the environment:
- water and wastewater treatment
- treatment and prevention of diffuse source pollution
- industrial pollution control
- groundwater and hazardous waste site remediation
- constructed wetlands and vegetative buffers
- green process engineering
- air pollution monitoring, control, and permitting
- ecosystems restoration and adaptation to climate change impacts
- conversion of waste to resources

Where is Environmental and Ecosystems Engineering at MSU?

B.S. Environmental Engineering
The Environmental Engineering major prepares students with a solid background in chemical, biological, and physical processes, allowing them to analyze, design, and manage environmental systems and associated infrastructure, such as water supplies, wastewater treatment facilities, air pollution control systems, surface and groundwater resources, and landfills.

B.S. Biosystems Engineering (Ecosystems Engineering Concentration)
The Biosystems Engineering major (ecosystems engineering concentration) prepares students to analyze, design, and control systems and processes with critical biological components, with a focus on natural resources, such as ecosystems restoration, treatment wetlands, watershed management, biomass conversions, or other biologically-centered challenges.

B.S. Chemical Engineering (Environmental Engineering Concentration)
The Chemical Engineering major (environmental engineering concentration) prepares students to design and operate manufacturing facilities that chemical-physically-biologically transform raw materials to finished products, with a focus on environmentally friendly processing that reduces pollution and maximizes benefit.
Computer Science Cognate Possibilities

Computer Science majors are required to complete a 15-credit cognate. Students can meet the cognate requirement by taking a sequence of four courses in a foreign language, taking five pre-selected business-focused courses, or by taking 15 credits outside of the College of Engineering in a focus area the student selects, with 6 of the 15 credits being at the 300-400 level.

The following are examples of areas students could focus on for their cognate. Each example lists two initial courses a student could take to start their cognate. Students will need to complete more courses in the future for a total of at least 15 credits to meet the cognate requirement.

<table>
<thead>
<tr>
<th>Entrepreneurship and Innovation</th>
<th>Diversity and Global Studies</th>
</tr>
</thead>
<tbody>
<tr>
<td>BUS 190: The Art of Starting</td>
<td>AAAS 100: Race and Community</td>
</tr>
<tr>
<td>CAS 114: Creativity and</td>
<td>ANP 201: Intro to Cultural</td>
</tr>
<tr>
<td>Entrepreneurship</td>
<td>Anthropology</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Psychology</th>
<th>Math</th>
</tr>
</thead>
<tbody>
<tr>
<td>PSY 101: Intro to Psychology</td>
<td>MTH 299: Transitions</td>
</tr>
<tr>
<td>PSY 235: Social Psychology</td>
<td>MTH 309: Linear Algebra</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Environment/ Sustainability</th>
<th>Criminal Justice</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSUS 200: Intro to Sustainability</td>
<td>CJ 110: Intro to Criminal</td>
</tr>
<tr>
<td>ISP 203A: Global Change</td>
<td>Justice</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Media and Information</th>
<th>Business</th>
</tr>
</thead>
<tbody>
<tr>
<td>MI 101: Understanding Media</td>
<td>EC 201/202: Intro to</td>
</tr>
<tr>
<td>MI 201: Intro to Media and Info</td>
<td>Micro/Macroeconomics</td>
</tr>
<tr>
<td>Tech</td>
<td>ACC 230: Survey of</td>
</tr>
<tr>
<td></td>
<td>Accounting</td>
</tr>
</tbody>
</table>

Notes
Additional Minors

MSU has a number of minors available to students. See the Academic Programs Catalog at reg.msu.edu/AcademicPrograms/Programs.aspx?PType=MNUN for an updated list.

The College of Engineering offers 3 minors:

**Minor in Computer Science:** The academic minor in Computer Science will provide a foundation in Computer Science. Students wanting to complete the minor must apply to the Department of Computer Science at the time of completion of CSE 231 and CSE 260 and have an average of at least 3.0 for those two courses combined. Enrollment may be limited. Permission is required to take more than 18 CSE credits.

For requirements and application, please visit:
cse.msu.edu/Students/Current_Undergrad/Minor.php

**Minor in Energy:** The Minor in Energy, administered by the College of Engineering, provides students with a foundation in energy science that focuses on topics of fundamental physical principles guiding energy generation, utilization, conservation, engineering applications and the impact of energy within a societal and geological context. Students gain a perspective in energy science that is applicable to many disciplines and highly interdisciplinary. It offers opportunities for students to prepare to work in industry, research, or government, as well as preparation for graduate studies in energy science.

Application forms are available at egr.msu.edu/academics/multi-disciplinary

Requirements for the Minor in Energy can be found at reg.msu.edu/AcademicPrograms/ProgramDetail.aspx?Program=8075

**Minor in Materials Science:** The Minor in Materials Science and Engineering provides students with a basic foundation in materials science that is applicable to many disciplines. The minor also offers opportunities for students to work in industry, research, or government, as well as to prepare for graduate study in materials science.

Students who plan to complete the requirements for the minor must complete an online application to the Department of Chemical Engineering and Materials Science. To be accepted into the minor, the student must be admitted into the College of Engineering. Enrollment for some MSE courses may be limited.

For requirements and application, please visit:
chems.msu.edu/academics/undergraduate/mse/minor-application
Sample Schedule Planning Worksheets

Remember that your math placement will tell us where you will be starting with a number of courses. Listed on the next few pages are *sample* first- and second-year schedules for the possible starting points in math.

**MTH 103A placement, first year**

<table>
<thead>
<tr>
<th>Fall</th>
<th>Credits</th>
<th>Spring</th>
<th>Credits</th>
<th>Summer</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>WRA 101</td>
<td>4</td>
<td>MTH 103B</td>
<td>3</td>
<td>MTH 114</td>
<td>3</td>
</tr>
<tr>
<td>ISS 2XX</td>
<td>4</td>
<td>Elective</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MTH 103A</td>
<td>3</td>
<td>Bioscience</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Elective (EGR 160 or MSE 200)</td>
<td>2</td>
<td>IAH 201-210</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Elective (EGR 291)</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>14</strong></td>
<td><strong>Total</strong></td>
<td><strong>13</strong></td>
<td><strong>Total</strong></td>
<td><strong>3</strong></td>
</tr>
</tbody>
</table>

**MTH 103A placement, second year**

<table>
<thead>
<tr>
<th>Fall</th>
<th>Credits</th>
<th>Spring</th>
<th>Credits</th>
<th>Summer</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MTH 132</td>
<td>3</td>
<td>MTH 133</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>EGR 100</td>
<td>2</td>
<td>PHY 183</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CEM 141</td>
<td>4</td>
<td>ISS 3XX</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Major Course</td>
<td>3</td>
<td>EGR 102</td>
<td>2</td>
<td></td>
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</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>12</strong></td>
<td><strong>Total</strong></td>
<td><strong>14</strong></td>
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<td><strong>Total</strong></td>
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**MTH 103 placement, first year**

<table>
<thead>
<tr>
<th>Fall</th>
<th>Credits</th>
<th>Spring</th>
<th>Credits</th>
<th>Summer</th>
<th>Credits</th>
</tr>
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<tbody>
<tr>
<td>WRA 101</td>
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<td>CEM 141</td>
<td>4</td>
<td>MTH 132</td>
<td>3</td>
</tr>
<tr>
<td>MTH 103</td>
<td>3</td>
<td>CEM 161</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ISS 2XX</td>
<td>4</td>
<td>MTH 114</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bioscience</td>
<td>3-4</td>
<td>IAH 201-210</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>EGR 100 or Elective</td>
<td>2-3</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>14-15</strong></td>
<td><strong>Total</strong></td>
<td><strong>14-15</strong></td>
<td><strong>Total</strong></td>
<td><strong>3</strong></td>
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</table>
### MTH 103 placement, second year

<table>
<thead>
<tr>
<th>Fall</th>
<th>Credits</th>
<th>Spring</th>
<th>Credits</th>
<th>Summer</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>MTH 133</td>
<td>4</td>
<td>MTH 234</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PHY 183</td>
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<td>PHY 184</td>
<td>4</td>
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<tr>
<td>EGR 102</td>
<td>2</td>
<td>ISS 3XX</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Major course</td>
<td>3-4</td>
<td>Major course</td>
<td>3-4</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>13-14</strong></td>
<td><strong>Total</strong></td>
<td><strong>15-16</strong></td>
<td><strong>Total</strong></td>
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</table>

### MTH 116, placement, first year

<table>
<thead>
<tr>
<th>Fall</th>
<th>Credits</th>
<th>Spring</th>
<th>Credits</th>
<th>Summer</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ISS 2XX</td>
<td>4</td>
<td>EGR 100</td>
<td>2</td>
<td>MTH 133</td>
<td>4</td>
</tr>
<tr>
<td>CEM 141</td>
<td>4</td>
<td>MTH 132</td>
<td>3</td>
<td>OR</td>
<td></td>
</tr>
<tr>
<td>CEM 161</td>
<td>1</td>
<td>Bioscience</td>
<td>3</td>
<td>PHY 183</td>
<td>4</td>
</tr>
<tr>
<td>MTH 116</td>
<td>5</td>
<td>WRA 101</td>
<td>4</td>
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<td><strong>Total</strong></td>
<td><strong>14</strong></td>
<td><strong>Total</strong></td>
<td><strong>12-13</strong></td>
<td><strong>Total</strong></td>
<td><strong>4</strong></td>
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### MTH 116, placement, second year

<table>
<thead>
<tr>
<th>Fall</th>
<th>Credits</th>
<th>Spring</th>
<th>Credits</th>
<th>Summer</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MTH 234</td>
<td>4</td>
<td>MTH 235</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PHY 183</td>
<td>4</td>
<td>PHY 184</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IAH 201-210</td>
<td>4</td>
<td>ISS 3XX</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Major course</td>
<td>3-4</td>
<td>Major course</td>
<td>3-4</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>15-16</strong></td>
<td><strong>Total</strong></td>
<td><strong>14-15</strong></td>
<td><strong>Total</strong></td>
<td></td>
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</tbody>
</table>
**MTH 132 or higher placement, first year**

<table>
<thead>
<tr>
<th></th>
<th>Fall</th>
<th>Credits</th>
<th>Spring</th>
<th>Credits</th>
<th>Summer</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>EGR 100</td>
<td>2</td>
<td>EGR 102</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CEM 141</td>
<td>4</td>
<td>MTH 133</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CEM 161</td>
<td>1</td>
<td>PHY 183</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MTH 132</td>
<td>3</td>
<td>WRA 101</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ISS 2XX</td>
<td>4</td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>14</td>
<td><strong>Total</strong></td>
<td>14</td>
<td></td>
<td><strong>Total</strong></td>
<td></td>
</tr>
</tbody>
</table>

**MTH 132 or higher placement, second year**

<table>
<thead>
<tr>
<th></th>
<th>Fall</th>
<th>Credits</th>
<th>Spring</th>
<th>Credits</th>
<th>Summer</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MTH 234</td>
<td>4</td>
<td>MTH 235</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PHY 184</td>
<td>4</td>
<td>Bioscience</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IAH 201-210</td>
<td>4</td>
<td>ISS 3XX</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Major course</td>
<td>3-4</td>
<td>Major course</td>
<td>3-4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>15-16</td>
<td><strong>Total</strong></td>
<td>13-15</td>
<td></td>
<td><strong>Total</strong></td>
<td></td>
</tr>
</tbody>
</table>

**Notes**

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________________________________________________________________________
Academic Resources

Academic Assistance
There are many engineering and university resources available (free of cost!) to help you with the transition to an advanced and scholarly way of thinking and writing. Those resources include:

- Your academic advisor
- Chemistry Help Room, Rooms 81 and 83 Chemistry Building
- CoRe tutors and Peer Leaders in the South Neighborhood
- Guided Learning Center (GLC), 1109 EB
- Math Learning Center
- Neighborhood Engagement Centers
- Writing Center, 300 Bessey Hall

Diversity Programs Office (DPO) and Guided Learning Center (GLC)
The DPO is proud to support and provide resources for all students in Engineering. The DPO offers the following services, free of charge!

- Provide students with skills and strategies to navigate through engineering admissions to graduation.

The Guided Learning Center offers academic assistance in math, science and engineering courses through one-on-one and/or small group tutoring sessions.

- Professional development
- Resource materials
- Speakers, trips, events, and programs
- Opportunities for students to network with faculty, staff, and career professionals
- A freshman/sophomore course, Preparing for Academic Excellence and Professional Development, (EGR 160)
  - How to Get Admitted to the College of Engineering, resume writing, interviewing, and study skills
  - Practicing engineers come to class and discuss professional development

These services are made possible through cooperation with other Engineering and MSU departments, the volunteerism of our alumni and friends, and generous grants and gifts resulting from partnerships with numerous corporations and non-profit organizations. For more information, please visit our website at egr.msu.edu/dpo or call us at (517) 355-8310.

The DPO Staff:
- Kyle Foster, Director
- Lisa Henry, Educational Program Coordinator
- Ciera Trice, Programs Assistant
- Robin Smith, Administrative Assistant
CoRe Experience
The College of Engineering CoRe Experience is an integrated program designed around the success of early engineering students. The CoRe Experience consists of both academic and co-curricular activities. The mission of the CoRe Experience is to provide early engineering students with unmatched learning opportunities within a supportive community that encourages academic, personal, and professional achievement, foster life-enriching connections between students and their peers, faculty members, advisors, and corporate representatives, cultivate students’ skills that encourage lifelong learning, and demonstrate to students the critical roles of engineers in contributing to society. For more information, please visit our website at [egr.msu.edu/core](http://egr.msu.edu/core) or call us at (517) 355-6616 Ext. 2.

CoRe Staff-
Timothy Hinds, Director
Carmellia Davis-King, Co-Curricular Director
Jenahvive Morgan, Academic Specialist
Debjani Sarkar, Academic Specialist
Jason Smith, Academic Specialist
Aimee Reynolds, Office Assistant III

Women in Engineering Program (WIE)
The Women in Engineering Program (WIE) encourages and supports students of all backgrounds to pursue careers in engineering. While our particular emphasis is assisting women students, we collaborate with others in the college and university to provide an environment that is conducive to all students’ success, providing opportunities for academic, personal and professional growth. WIE programs include mentoring opportunities, outreach programs, community engagement and connection to important resources. WIE also supports the Society of Women Engineers, MSU Women in Computing and Phi Sigma Rho, three very active student organizations in the College of Engineering. For more information about WIE, visit our website at: [egr.msu.edu/wie](http://egr.msu.edu/wie)

WIE Staff-
Judy Cordes, Director of Women in Engineering for Student Success
Teresa VanderSloot, Director of Women in Engineering for Recruitment and K-12 Outreach

The Center for Spartan Engineering
Meeting your needs for Experiential Education & Career Exploration. Experiential Education is a broad term used to describe co-curricular programs that enhance the classroom educational experience. The Center assists with: co-ops and internships, job readiness, professional development, post graduate careers, first year students, research opportunities, and employer connections.

The Center Staff-
Bernadette Friedrich, Director of Student Engagement
Garth Motschenbacher, Director of Employer Engagement
Kyle Liechty, Co-op / Intern Coordinator
Rachel Mangiavellano, Career Consultant
Kylie Kenyon, Project / Event Coordinator
CO-OPS & INTERNSHIPS ARE THE #1 EXTRA-CURRICULAR ACTIVITY EMPLOYERS LOOK FOR

-2017 National Survey of Employers

GET STARTED TODAY!
CAREER PLANNING CHECKLIST

☐ Investigate job titles, companies, & industries of interest
☐ Create & build your Handshake account
☐ Explore student groups & find at least 1 to join & become actively involved
☐ Drop in for career advising - No appointment needed!

☐ Draft resume & have it critiqued
☐ Participate in a Mock Interview
☐ Attend ASK Sessions, Workshops & Company Presentations
☐ Enroll in EGR 393 when on internship/co-op

☐ Attend Career Fairs
☐ Search for positions on Handshake
☐ Participate in the Spring Break Corp Tour
☐ Build your LinkedIn profile
All Jobs (part-time, on and off-campus, full-time and internships), Career Fairs, Employer Events, and Off-Campus Career Events, will be posted on Handshake.

5 steps to get started with Handshake

Login to Handshake. You will receive an email from us with a link to join Handshake. If you don’t have that email, simply go to: MSU.joinhandshake.com. Click the ‘Sign up for an Account’ link in the lower left hand corner to get started.

Fill out your profile. Some of your information will already be in your Handshake profile. Check to be sure all this information is correct, fill out the remainder of your profile, and complete the Career Interest Questionnaire.

Upload a Document. You’ll likely want to have a public resume available in Handshake for employers to see. This will also help you complete your Handshake profile.

Take Handshake for a spin. Use the top search bar and filters to look for companies and jobs you’re interested in learning more about or applying to. You can always save your searches in Handshake, so finding relevant employers and jobs will be easy!

Favorite jobs and employers you’re interested in. When you follow an employer or a job, you’ll automatically start receiving information about the company or job so you won’t miss out on updates or new opportunities!

We’re Here to Help!

The Center (located in C108 Wilson Hall) offers walk-in advising to answer all career related questions and to help you get started with Handshake.

The Center
C108 Wilson Hall
(517) 355 5163
careers@egr.msu.edu

Note: Google Chrome is the recommended browser

Take Handshake with you by downloading the Handshake Mobile App! only available for iphone
Student Organizations

MSU student organizations: studentlife.msu.edu/student-organizations-activities

International-specific student groups: oiss.isp.msu.edu/students/clubs.htm

College of Engineering student organizations: egr.msu.edu/student-groups

Scholarship Information

The College of Engineering administers a variety of scholarships from corporate and private donors in addition to the various financial aid programs that are available through the Office of Financial Aid. The engineering awards are generally based on academic excellence and are available for returning students. Online scholarship applications will be available after the final exam week of the fall semester of each year and are due on the last day of February. Decisions are made by early summer. For further information visit: egr.msu.edu/undergraduate/resources/scholarships

Engineering Education Abroad

At MSU, we take pride in being a leader in education abroad. In the College of Engineering, we strive to help our students prepare to compete in this growing global climate. One of the many ways to do this is to study abroad during the course of your studies here at State. Education abroad options include year-long, semester, and summer stay options.

We recommend that students who plan to go abroad begin the planning process with their advisor early on in their academic careers. It is advisable to reserve at least one elective, IAH or ISS requirement for use while abroad if students intend to study abroad.

Besides Engineering-specific programs, you can also choose from other MSU-sponsored programs. The Education Abroad Office is located in 109 International Center, (517) 353-8920.

For more information on Engineering-specific programs, please visit our website at egr.msu.edu/study-abroad, stop by G55 Wilson Hall, or call us at (517) 432-2012.

Education Abroad Staff -
Maggie Blair-Ramsey, Education Abroad Coordinator
SPRING

SPAIN
Universidad Pontificia Comillas
Madrid, Spain
Early January - Early May
Courses: BS 161; MTH 235; MTH 314; IAH 241G; ME 201; ME 361; MSE 250; SPN 102, SPN 202, SPN 210, SPN 310
Deadline: October

SUMMER

FRANCE
CEA Paris
Paris, France
Late May - Late June
Option 1: MTH 234 & ISS 320
Option 2: MTH 235 & ISS 320
Option 3: CE 221 & ISS 320
Priority Deadline: February
École Catholique d’Arts et Métiers
Lyon, France
Option 1: ENE GCU & FRN GCU
Deadline: January 31

IRELAND
University College Dublin
Dublin, Ireland
Late June - Early August
Courses: PHY 184, PHY 192 & ISS 315
Deadline: February 17
University of Limerick: STEM Research
Dublin, Ireland
Late May - Early July
Research focus areas: advanced materials, manufacturing, process engineering and fluid dynamics (6 credits)
Deadline: November 30

AUSTRALIA
Sustainable Food, Environment, & Social Systems
Late June - Early August
Course Options: ISB 202/ISS 310/BE 475/ANR 475/CSUS 419
7 credits, graded

SPAIN
Summer Engineering in Madrid
Madrid, Spain
Late June - Early August
Courses: ME 222 & SPN 290 (no pre-req)
Deadline: March 1
What are the engineering disciplines?

Applied Engineering Sciences (AES) ~ egr.msu.edu/aes
Broad foundation across all engineering majors with a business component; students choose from business law, computer science, packaging, supply chain management, technical sales or media and information concentrations
Work in: EGR management, procurement, sales, marketing, IT, and logistics management

Biosystems Engineering (BE) ~ egr.msu.edu/BAE
Broad biological component, food processing & ecosystems
Work in: food quality & safety, renewable bioenergy, consulting and regulatory agencies

Chemical Engineering (ChE) ~ chems.msu.edu
Chemistry & engineering applied to full-scale industrial production
Work in: pharmaceuticals, bioenergy, consumer products

Civil Engineering (CE) ~ egr.msu.edu/cee
Transportation, structures, infrastructure design and management
Work with: roads, bridges, water, structures, construction, & infrastructure

Computational Data Science (CDS) ~ cse.msu.edu
Extracting value from large volumes of information; data acquisition, processing, and analysis
Work in: information technology, health care, financial services, manufacturing, & telecommunications

Computer Engineering (CpE) ~ egr.msu.edu/ece
Hardware & software; make computers smaller & faster
Work as: computer & embedded systems architects, real-time system design

Computer Science (CS) ~ cse.msu.edu
Software design & development; applications, databases, graphics, big data, & networks
Work in: Application and system development, cybersecurity, artificial intelligence, social networks, game development, & project management

Electrical Engineering (EE) ~ egr.msu.edu/ece
Integrated circuits, robotics & control, power, lasers, & materials
Work in: nanotechnology, fiber optic communication systems, automotive & aerospace industries

Environmental Engineering (ENE) ~ egr.msu.edu/CEE
Water and wastewater treatment, air quality, landfills and solid waste, permitting and regulation, hazardous waste cleanup, and protection of the environment
Work in: consulting, government agencies, and industry

Materials Science & Engineering (MSE) ~ chems.msu.edu
Develop new materials & the processes to create them
Work with: metals & ceramics, plastics, & polymers (non-metals)

Mechanical Engineering (ME) ~ egr.msu.edu/me
Anything with motion or moving parts, design
Work in: aerospace, automotive, manufacturing, & energy systems
NSO Enrollment Preparation

You **MUST** complete this sheet **before** meeting with your academic advisor to plan your schedule.

**Which Engineering major interests you most?** _____________________________

List all AP/IB/CLEP exams and their scores (if known) and any dual enrollment credits:

______________________________________________________________________________________________________

______________________________________________________________________________________________________

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Are you going to be a varsity athlete this year? ______YES ______NO

**General electives** are courses that are not required for your major that will help you reach the total required credits for graduation. Using the list on pages 59-62 please indicate at least 4 elective choices below:

Course Code #1 ______________

Course Code #2 ______________

Course Code #3 ______________

Course Code #4 ______________

* If you are a CSE student, you can select cognate courses. For options, see earlier in handbook

**What questions do you have for your advisor?**

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ENGINEERING

DEGREE PROGRAMS

AND

MAJOR

REQUIREMENTS

The information listed here is current as of Fall 2019.

Students are expected to know departmental policies and course prerequisites and are ultimately responsible for accurately completing degree requirements.

The most current information on major requirements is available at egr.msu.edu/undergraduate/academics/programs
Applied Engineering Sciences

1. University Requirements: (23-24)
   Writing, Rhetoric and American Cultures (WRA) 4
   Integrative Studies in Humanities (IAH) 8
   IAH 201-210 and IAH 211 or >
   Integrative Studies in Social Sciences (ISS) 8
   ISS 2XX and ISS 3XX
   Bioscience (one of the following):
   BS 161, ENT 205, IBIO 150, MMG 141
   MMG 201, PLB 105, PSL 250 3-4

2. College Requirements: (30)
   *CEM 141 General Chemistry 4
   *EGR 100 Introduction to Engineering Design 2
   *EGR 102 Introduction to Engineering Modeling 2
   *MTH 132 Calculus I 3
   *MTH 133 Calculus II 4
   MTH 234 Multivariable Calculus 4
   MTH 235 Differential Equations 3
   *PHY 183 Physics for Scientists & Engineers I 4
   PHY 184 Physics for Scientists & Engineers II 4
   *College Admission Requirement

3. Major Requirements: (61-64)
   a. Complete all of the following courses: (43)
      ACC 230 Survey of Accounting Concepts 3
      CE 221 Statics 3
      CEM 161 Chemistry Laboratory I 1
      EC 201 Introduction to Microeconomics 3
      EC 202 Introduction to Macroeconomics 3
      ECE 345 Electronic Instrumentation and Systems 3
      ENE 280 Principles of Environ Engr & Science 3
      AESC 210 Global Sys: Econ, Engr, Environment 3
      AESC 310 Sustainable Systems Analysis 3
      AESC 410 Capstone Project Applied Egr Sci (W) 3
      ME 201 Thermodynamics 3
      ME 280 Graphic Communications 2
      MKT 317 Quantitative Bus Research Methods 3
      MSE 250 Materials Science and Engineering 3
      PHY 191 Physics Lab for Scientists I 1
      STT 351 Probability and Statistics for Engineering 3
   b. Select one of the following courses: (3)
      COM 225 Intro to Interpersonal Communication 3
      MGT 325 Management Skills and Processes 3
   c. Concentrations: (15-19)
      In consultation with their academic advisor, students must select one of the following concentrations: business law, computer science, packaging, supply chain management, technical sales, or media and information. For students interested in computer science, the minimum criteria for acceptance is the completion of Computer Science and Engineering 231 and 260 with a combined grade-point average in those two courses of 3.0. The concentration will be noted on the student’s academic record.

1. Business Law: (16-17)
   1. All of the following courses: (13)
      EC 301 Intermediate Microeconomics 3
      EC 425 Law and Economics (W) 3
      GBL 385 Business Law & Ethical Leadership 3
      GBL 480 Environmental Law & Sustainability for Business: From Local to Global 3
      PHY 192 Physics Laboratory for Scientists II 1
   2. One of the following courses: (3-4)
      PHL 345 Business Ethics 4
      PHL 354 Philosophy of Law 3
      PLS 320 Judicial Politics 3
      PLS 321 Constitutional Law 3
      PLS 322 Comparative Legal Systems 3

2. Computer Science: (18-19)
   1. All of the following courses: (12)
      CSE 231 Introduction to Programming I 4
      CSE 232 Introduction to Programming II 4
      CSE 260 Discrete Structures in Computer Sci 4
   2. Two of the following courses: (6-7)
      CSE 320 Computer Organization & Architecture 3
      CSE 331 Algorithms and Data Structures 3
      CSE 325 Computer Systems 3
      CSE 335 Object-Oriented Software Design 4
      CSE 404 Introduction to Machine Learning 3
      CSE 420 Computer Architecture 3
      CSE 429 Interdisciplinary Topics in Cyber Security 3
      CSE 431 Algorithm Engineering 3
      CSE 440 Intro to Artificial Intelligence 3
      CSE 471 Media Processing & Multimedia Computing 3
      CSE 472 Computer Graphics 3
      CSE 476 Mobile Application Development 3
      CSE 477 Web Application Architecture and Development 3
      CSE 480 Database Systems 3
      CSE 482 Big Data Analysis 3
### Media and Information: (18)
- **MI 101**  Understanding Media and Information  3
- **MI 201**  Media & Information Technologies & Industries  3
- **MI 302**  Networks, Markets and Society  3
- **MI 305**  Media and Information Policy  3
- **MI 361**  IT Network Management & Security  3
- **MI 488**  Information & Communication Technology Development Project (W)

### Packaging: (17)
- **CEM 143**  Survey of Organic Chemistry  4
- **PKG 101**  Principles of Packaging  3
- **PKG 221**  Packaging with Glass and Metal  2
- **PKG 322**  Packaging with Paper and Paperboard  4
- **PKG 323**  Packaging with Plastics  4

### Supply Chain Management: (15)
- **FI 320**  Introduction to Finance  3
- **MKT 327**  Introduction to Marketing  3
- **SCM 303**  Introduction to Supply Chain Mgt  3
- **SCM 371**  Procurement & Supply Management  3
- **SCM 372**  Manufacturing Planning and Control  3

Note: Suggested Elective SCM 373

### Technical Sales: (18)
- **COM 360**  Advanced Sales Communication  3
- ****COM 483  Practicum in Sales Communication  1
- **FI 320**  Introduction to Finance  3
- **MKT 313**  Personal Selling and Buying Processes  3
- **MKT 327**  Introduction to Marketing  3
- **MKT 383**  Sales Management  3
- **SCM 474**  Negotiations  2

**Requires a sales-based internship**

### Other Electives (Variable)

### Total Credits Required for Degree  120

The requirements listed above apply to students admitted to the major of Applied Engineering Sciences in the Engineering Undergraduate Studies Office (UGS) beginning Fall 2019. The Engineering Undergraduate Studies Office constantly reviews requirements and reserves the right to make changes as necessary. Consequently, each student is strongly encouraged to consult with their advisor to obtain assistance in planning and appropriate schedule of courses. Students who have questions about Applied Engineering Sciences should contact the Engineering Undergraduate Studies Advising Office, 3508 Engineering Building, phone (517) 432-1352.

### NOTES:

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Last revised February 2019
Applied Engineering Sciences

Prerequisite Flowchart

These requirements are effective for students admitted to the Applied Engineering Sciences major beginning Fall 2019.

FRESHMAN YEAR

FALL Term 1

- CEM 161 - 1
  Cem Lab I

- CEM 141 - 4
  Gen Cem

SPRING Term 2

- EGR 100 - 2
  Intro Engr Design

- EGR 102 - 2
  Intro Engr Model

- MTH 132 - 3
  Calc I

- MTH 133 - 4
  Calc II

SOPHOMORE YEAR

FALL Term 3

- PHY 183 - 4
  Physics I

- PHY 184 - 4
  Physics II

- PHY 191 - 1
  Physics Lab

SPRING Term 4

- ACC 230 - 3
  Survey of Accounting

- CE 221 - 3
  Statics

- AESC 210 - 3
  Global Systems: Ec, Eng, Env

- CE 391 - 3
  Thermodynamics

- ME 201 - 3
  Thermodynamics

- MSE 250 - 3
  Matls Sci & Engr

- AESC 310 - 3
  Sustainable Systems Analysis

- STT 351 - 3
  Probability & Stats for Eng

JUNIOR YEAR

FALL Term 5

- PHY 291 - 1
  Physics Lab

- ME 201 - 3
  Thermodynamics

- MGT 325 - 3
  Management Skills and Processes OR
  COM 225 - 3
  Intro to Interpersonal Comm

- Elective - 3
  3 crs of Gen Elecs

SPRING Term 6

- ACC 235 - 3
  Intermediate Accounting

- MKT 317 - 3
  Quantitative Business Research Methods

- EC 201 - 3
  Introduction to Microeconomics

- ECE 345 - 3
  Electronic Instrumentation & Systems

- Elective - 3
  3 crs of Gen Elecs

SENIOR YEAR

FALL Term 7

- CEM 161 - 1
  Cem Lab I

- PHY 183 - 4
  Physics I

- PHY 184 - 4
  Physics II

- PHY 191 - 1
  Physics Lab

- ACC 230 - 3
  Survey of Accounting

- CE 221 - 3
  Statics

- AESC 210 - 3
  Global Systems: Ec, Eng, Env

- STT 351 - 3
  Probability & Stats for Eng

- AESC 310 - 3
  Sustainable Systems Analysis

- Elective - 3
  3 crs of Gen Elecs

SPRING Term 8

- Elective - 3
  3 crs of Gen Elecs

LEGEND

Prerequisite
Prerequisite or Concurrent
Rounded box: Offered only in the semester listed (excluding summer)

*DIV: Complete courses in at least 2 out of 3 diversity categories- "N", "I" or "D"

Last Revised: 02/05/19
Biosystems Engineering

Accredited by the Engineering Accreditation Commission of ABET, www.abet.org

1. University Requirements: (23)
   - Writing, Rhetoric and American Cultures (WRA) 4
   - Integrative Studies in Humanities, IAH 201-210 and IAH 211 or > 8
   - Integrative Studies in Social Sciences, ISS 2XX and ISS 3XX 8
   - Bioscience: BS 161 Cell and Molecular Biology 3

2. College Requirements: (30) *College Admission Requirement
   - CEM 141 General Chemistry 4
   - *CEM 100 Introduction to Engineering Design 2
   - CEM 102 Introduction to Engineering Modeling 2
   - *MTH 132 Calculus I 3
   - *MTH 133 Calculus II 4
   - MTH 234 Multivariable Calculus 4
   - MTH 235 Differential Equations 3
   - *PHY 183 Physics for Scientists & Engineers I 4
   - PHY 184 Physics for Scientists & Engineers II 4

3. Major Requirements: (64-66)
   a. Complete all of the following courses: (44)
      - BE 101 Introduction to Biosystems Engineering 1
      - BE 230 Engineering Analysis of Biological Systems 3
      - BE 332 Engineering Properties of Biological Materials 3
      - BE 334 Biosystems Engineering Laboratory Practice 3
      - BE 350 Heat and Mass Transfer in Biosystems 3
      - BE 351 Thermodynamics for Biological Engineering 3
      - BE 360 Microbial Systems Engineering 3
      - BE 385 Engineering Design & Optimization for Biological Sys 3
      - BE 485 Biosystems Design Techniques 3
      - BE 487 Biosystems Design Project (W) 3
      - BS 162 Organismal and Population Biology 3
      - CE 221 Statics 3
      - CE 274 Graphics for Civil & Environmental Engineers 1
      - CE 321 Introduction to Fluid Mechanics 4
      - CEM 143 Survey of Organic Chemistry 4
      - CEM 161 Chemistry Laboratory I 1
   b. Select one of the following courses: (2)
      - BS 171 Cell and Molecular Biology Laboratory 2
      - BS 172 Organismal and Population Biology Laboratory 2
   c. Select one of the following courses: (3-4)
      - IBIO 341 Fundamental Genetics 4
      - IBIO 355 Ecology 3
      - MMG 301 Introductory Microbiology 3
      - PLB 301 Introductory Plant Physiology 3
      - PSL 250 Introductory Physiology 4
   d. Select one of the following courses: (3-4)
      - CSS 442 Agricultural Ecology 3
      - CSS 451 Biotechnology Apps for Breeding & Genetics 3
      - FOR 406 Applied Forest Ecology: Silviculture 3
      - FSC 440 Food Microbiology 3
      - MMG 365 Medical Microbiology 3
      - MMG 425 Microbial Ecology 3
      - MMG 445 Microbial Biotechnology (W) 3
      - PLB 402 Biology of Fungi 4
      - PLB 424 Algal Biology 4
      - PSL 425 Physiological Biophysics 3
   e. Select four of the following courses: (12)
      - BE 444 Biosensors for Medical Diagnostics 3
      - BE 449 Human Health Risk Analysis for Eng Controls 3
      - BE 456 Electric Power and Control 3
      - BE 469 Sustainable Bioenergy Systems 3
      - BE 477 Food Engineering: Fluids 3
      - BE 478 Food Engineering: Solids 3
      - BE 481 Water Resources Sys Anlys & Modeling 3
      - BE 482 Diffuse-Source Pollution Engineering 3
      - BE 484 Water Resource Recovery Engineering 3
      - CHE 468 Biomass Conversion Engineering 3

Optional Concentrations
The department offers concentrations for students who wish to focus on a specific application area in the discipline. The concentrations are available to, but not required of, any student enrolled in the Bachelor of Science degree program in Biosystems Engineering. Courses completed to satisfy requirement 3. above may also be used to satisfy the requirements of a concentration. The concentration will be noted on the student’s transcript.

Bioenergy and Bioproduct Engineering Concentration: (15-17)
To earn a Bachelor of Science degree in Biosystems Engineering with a bioenergy and bioproduct engineering concentration, students must complete requirements 1., 2., and 3. above and the following:

1. All of the following courses: (9)
   - BE 469 Sustainable Bioenergy Systems 3
   - CHE 468 Biomass Conversion Engineering 3
   - CSS 467 Bioenergy Feedstock Production 3

2. Two of the following courses: (6-8):
   - CHE 481 Biochemical Engineering 3
   - CHE 882 Advanced Biochemical Engineering 3
   - CHE 883 Multidisciplinary Bioprocessing Laboratory 3
   - CSS 451 Biotechnology Applications for Plant Breeding & Genetics 3
   - FOR 406 Applied Forest Ecology: Silviculture 3
   - GLG 471 Applied Geophysics 4
   - MC 450 International Environmental Law & Policy 3
   - ME 417 Design of Alternative Energy Systems 3
   - ME 422 Introduction to Combustion 3
   - MMG 445 Microbial Biotechnology (W) 3
   - PLB 402 Biology of Fungi 4
   - PLB 424 Algal Biology 4
Biomedical Engineering Concentration: (14-15)
To earn a Bachelor of Science degree in Biosystems Engineering with a biomedical engineering concentration, students must complete requirements 1., 2., and 3. above and the following:

1. All of the following courses: (6)
BE 444 Biosensors for Medical Diagnostics 3
BE 449 Human Health Risk Analysis for Eng Controls 3

2. One of the following courses: (3)
MMG 365 Medical Microbiology 3
PSL 425 Physiological Biophysics 3

3. Two of the following: (5-6)
BLD 204 Mechanisms of Disease 3
BLD 313 Quality in Clinical Laboratory Practice 3
BLD 430 Molecular Laboratory Diagnostics 2
BLD 434 Clinical Immunology 3
ECE 445 Biomedical Instrumentation 3
ME 494 Biofluid Mechanics and Heat Transfer 3
MMG 365 Medical Microbiology 3
MSE 425 Biomaterials and Biocompatibility 3
PLB 400 Introduction to Bioinformatics 3
PSL 425 Physiological Biophysics 3

Courses used to fulfill requirement 2. in this concentration may not be used to fulfill this requirement.

Ecosystems Engineering Concentration: (14-15)
To earn a Bachelor of Science degree in Biosystems Engineering with an ecosystems engineering concentration, students must complete requirements 1., 2., and 3. above and the following:

1. All of the following courses: (9)
BE 481 Water Resources Systems Analysis and Modeling 3
BE 482 Diffuse-Source Pollution Engineering 3
MMG 425 Microbial Ecology 3

2. Two of the following courses: (5-6)
CE 422 Applied Hydraulics 3
CSS 210 Fundamentals of Soil Science 3
CSS 330 Soil Chemistry 2
CSS 360 Soil Biology 3
CSS 442 Agricultural Ecology 3
CSS 455 Pollutants in the Soil Environment 3
FOR 340 Forest Ecology 3
FW 417 Wetland Ecology and Management 3
FW 420 Stream Ecology 3
PLB 443 Restoration Ecology 3

Food Engineering Concentration: (15-16)
To earn a Bachelor of Science degree in Biosystems Engineering with a food engineering concentration, students must complete requirements 1., 2., and 3. above and the following:

All of the following courses: (9)
BE 477 Food Engineering: Fluids 3
BE 478 Food Engineering: Solids 3
FSC 440 Food Microbiology 3

Two of the following courses, one of which must be at the 400-level: (6-7)
BMB 200 Introduction to Biochemistry 4
FSC 211 Principles of Food Science 3
FSC 401 Food Chemistry 3
FSC 430 Food Processing: Fruits & Vegetables 3
FSC 431 Food Processing: Cereals 3
FSC 432 Food Processing: Dairy Foods 3
FSC 433 Food Processing: Muscle Foods 3

Other Electives (Variable)

Total Credits Required for Degree 128

These requirements are effective for students admitted to the Biosystems Engineering major beginning Fall 2019. The Department of Biosystems and Agricultural Engineering (BAE) constantly reviews program requirements and reserves the right to make changes as necessary. Consequently, each student is strongly encouraged to consult with their advisor to obtain assistance in planning an appropriate schedule of courses. Students who have questions about Biosystems Engineering should contact the Biosystems Engineering Advising Office, 103 B Farrall Hall or G68 Wilson Hall, phone (517) 884-8796. For scheduling academic advising appointments visit: https://msu.campus.eab.com

Last revised February 2019
Biosystems Engineering

Prerequisite Flowchart

These requirements are effective for students admitted to the Biosystems Engineering major beginning Fall 2019.

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**LEGEND**
- Prerequisite
- Prerequisite or Concurrent
- Corequisite

Rounded box: Offered only in the semester listed (excluding summer)  
*Div: Complete courses in at least 2 out of 3 diversity categories - “N”, “I” or “D”

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Last Revised: 02/05/19
# Chemical Engineering

1. **University Requirements: (23)**
   - Writing, Rhetoric and American Cultures (WRA) 4
   - Integrative Studies in Humanities (IAH) 8
   - IAH 201-210 and IAH 211 or > 8
   - Integrative Studies in Social Sciences (ISS) 8
   - ISS 2XX and ISS 3XX
   - Bioscience: BS 161 Cell and Molecular Biology 3

2. **College Requirements: (30)**
   - *CEM 151 General and Descriptive Chemistry 4
   - *EGR 100 Introduction to Engineering Design 2
   - *EGR 102 Introduction to Engineering Modeling 2
   - *MTH 132 Calculus I 3
   - *MTH 133 Calculus II 4
   - MTH 234 Multivariable Calculus 4
   - MTH 235 Differential Equations 3
   - *PHY 183 Physics for Scientists & Engineers I 4
   - PHY 184 Physics for Scientists & Engineers II 4
   - *College Admission Requirement

3. **Major Requirements: (67-69)**
   a. **Complete all of the following courses: (51)**
      - CEM 152 Principles of Chemistry 3
      - CEM 161 Chemistry Laboratory I 1
      - CEM 162 Chemistry Laboratory II 1
      - CEM 351 Organic Chemistry I 3
      - CEM 352 Organic Chemistry II 3
      - CEM 355 Organic Laboratory I 2
      - CHE 201 Material and Energy Balances 3
      - CHE 210 Modeling and Analysis of Transport Phenomena 3
      - CHE 301 Chemical Engineering as a Profession 1
      - CHE 311 Fluid Flow and Heat Transfer 3
      - CHE 312 Mass Transfer and Separations 4
      - CHE 316 Lab Practice and Statistical Analysis (W) 4
      - CHE 321 Thermodynamics for Chemical Engineering 4
      - CHE 431 Chemical Reaction Engineering 4
      - CHE 432 Process Analysis and Control 3
      - CHE 433 Process Design and Optimization I (W) 4
      - CHE 434 Process Design and Optimization II 2
      - CHE 473 Chemical Engineering Principles in Polymers & Materials Systems 3
   
   b. **One of the following groups: (4-6)**
      - **Group 1**
        - BMB 401 Comprehensive Biochemistry 4
      - **Group 2**
        - BMB 461 Advanced Biochemistry I 3
        - BMB 462 Advanced Biochemistry II 3
   
   c. **Select one of the following courses: (3)**
      - CHE 472 Composite Materials Processing 3
      - CHE 481 Biochemical Engineering 3
   
   d. **Select one of the following courses: (3)**
      - CEM 483 Quantum Chemistry 3
      - CEM 484 Molecular Thermodynamics 3
   
   e. **Technical Electives: (6)**
      - Students must complete at least 6 credits in courses selected from a list of approved technical electives available from the Department of Chemical Engineering and Materials Science.
      - Technical elective courses must include at least 3 credits of engineering topics, denoted with an ‘e’ next to the course number on the CHE technical elective list.

   **NOTE:** BMB 462 is taken to fulfill requirement 3.b. and will count as a technical elective credit in item 3.e., not as an engineering ‘e’ topics course.

## Concentrations in Chemical Engineering

In response to increasing interest in the application of chemical engineering principles to related fields, the Department of Chemical Engineering and Materials Science offers concentrations in biochemical engineering, bioenergy, biomedical engineering, environmental engineering, food science, and polymer science and engineering to students wishing to focus their studies in these areas. Concentrations are available to, but not required of, any student enrolled in the Bachelor of Science degree program in Chemical Engineering. The concentration will be noted on the student's transcript.

**NOTE:** Completing the Bachelor of Science degree in Chemical Engineering with a concentration may require more than 128 credits. For any concentration, up to 3 credits of Independent Study (CHE 490) related to the subject area may be applied with approval of the Department of Chemical Engineering and Materials Science.

## Biochemical Engineering Concentration: (18-21)

To earn a Bachelor of Science degree in Biochemical Engineering with a biochemical engineering concentration, students must complete requirements 1., 2., 3.a., and 3.d., above and the following:

**All of the following courses: (6)**
- CHE 481 Biochemical Engineering 3
- MMG 301 Introductory Microbiology 3

**One of the following tracks: (11-13)**

**Track 1 (12-13 credits)**
**The following course: (4)**
- BMB 401 Comprehensive Biochemistry 3

**Three of the following courses: (8-9 credits)**
- BMB 805 Protein Structure, Design, and Mechanism 3
- BMB 829 Methods of Macromolecular Analysis and Synthesis 2
- CHE 882 Advanced Biochemical Engineering 3
- CHE 883 Multidisciplinary Bioprocessing Laboratory 3
- MMG 409 Eukaryotic Cell Biology 3
- MMG 421 Prokaryotic Cell Physiology 3
- MMG 431 Microbial Genetics 3
Biochemical Engineering Concentration Continued:

Track 2 (11-12 credits)

Both of the following courses: (6)
- BMB 461 Advanced Biochemistry I 3
- BMB 462 Advanced Biochemistry II 3

Two of the following courses: (5-6 credits)
- BMB 805 Protein Structure, Design, and Mechanism 3
- BMB 829 Methods of Macromolecular Analysis & Synthesis 2
- CHE 882 Advanced Biochemical Engineering 3
- CHE 883 Multidisciplinary Bioprocessing Laboratory 3
- MMG 409 Eukaryotic Cell Biology 3
- MMG 421 Prokaryotic Cell Physiology 3
- MMG 431 Microbial Genetics 3

Bioenergy and Bioproducts Concentration: (15)
To earn a Bachelor of Science degree in Chemical Engineering with a bioenergy and bioproducts concentration, students must complete requirements 1., 2., 3.a., 3.b., and 3.d., above and the following:

All of the following courses: (9)
- CHE 468 Biomass Conversion in Engineering 3
- CHE 481 Biochemical Engineering 3
- CSS 467 Bioenergy Feedstock Production 3

One of the following courses: (3)
- BE 469 Sustainable Bioenergy Systems 3
- BE 869 Life Cycle Assessment for Bioenergy and Bioproduct Systems 3

One of the following courses: (3)
- AFRE 829 Economics of Environ Resources 3
- CHE 882 Advanced Biochemical Engineering 3
- CHE 883 Multidisciplinary Bioprocessing Laboratory 3
- FOR 466 Natural Resource Policy 3
- MC 450 International Environmental Law and Policy 3

Biomedical Engineering Concentration Continued:

One of the following courses not taken above: (3-4)
- BMB 471 Advanced Biochemistry Laboratory 3
- CHE 883 Multidisciplinary Bioprocessing Laboratory 3
- IBIO 341 Fundamental Genetics 4
- ME 494 Biofluid Mechanics and Heat Transfer 3
- MSE 425 Biomaterials and Biocompatibility 3

Environmental Concentration: (15)
To earn a Bachelor of Science degree in Chemical Engineering with an environmental concentration, the student must complete requirements 1., 2., and 3.a., 3.b., and 3.d. above and the following:

Both of the following courses: (6)
- CHE 481 Biochemical Engineering 3
- ENE 280 Principles of Environmental Eng & Science 3

Three of the following courses: (9)
- CSUS 465 Environmental and Natural Resource Law 3
- EEM 255 Ecological Economics 3
- EEM 320 Environmental Economics 3
- EEM 405 Corporate Environmental Management (W) 3
- ENE 481 Environmental Chemistry: Equilibrium Concepts 3
- ENE 483 Water and Wastewater Engineering 3
- ENE 489 Air Pollution: Science and Engineering 3
- IBIO 446 Environmental Issues and Public Policy 3

Food Science Concentration: (12)
To earn a Bachelor of Science degree in Chemical Engineering with a food science concentration, students must complete requirements 1., 2., 3.a., 3.b., 3.c., and 3.d., above and all of the following:

All of the following courses: (9)
- FSC 401 Food Chemistry 3
- FSC 440 Food Microbiology 3
- MMG 301 Introductory Microbiology 3

One of the following courses: (3)
- BE 477 Food Engineering: Fluids 3
- BE 478 Food Engineering: Solids 3
- FSC 325 Food Processing: Unit Operations 3
- FSC 455 Food and Nutrition Laboratory 3
- FSC 470 Integrated Approaches to Food Product Dev 3
**Polymer Science and Engineering Concentration: (15-16)**
To earn a Bachelor of Science degree in Chemical Engineering with a polymer science and engineering concentration, students must complete requirements 1., 2., 3. a., 3. b., 3.d., above and all of the following:

**All of the following courses: (9)**
- CE 221 Statics 3
- CHE 472 Composite Materials Processing 3
- ME 222 Mechanics of Deformable Solids 3

**Two of the following courses: (6-7)**
- CHE 871 Materials Surfaces and Interfaces 3
- CHE 872 Polymers & Composites: Mfg, Strc & Prfmrnce 3
- MSE 370 Synthesis and Processing of Materials 3
- MSE 426 Introduction to Composite Materials 3
- PKG 323 Packaging with Plastics 4

**Other Electives for Degree (Variable)**

**Total Credits Required for Degree** 128

These requirements are effective for students admitted to the Chemical Engineering major beginning Fall 2019. The Department of Chemical Engineering and Materials Science constantly reviews program requirements and reserves the right to make changes as necessary. Consequently, each student is strongly encouraged to consult with their advisor to obtain assistance in planning an appropriate schedule of courses. Students who have questions about Chemical Engineering should contact the Chemical Engineering and Materials Science Department Advising Office, G66 Wilson Hall, phone 517-432-4916. For scheduling academic advising appointments visit: https://www.egr.msu.edu/adcalendar/

Some courses may have prerequisites, which are not otherwise required in the program. Students should check course descriptions to ensure they are aware of prerequisites.
## Civil Engineering

**Accredited by the Engineering Accreditation Commission of ABET, www.abet.org**

### 1. University Requirements: (23-24)
- Writing, Rhetoric and American Cultures (WRA) 4
- Integrative Studies in Humanities IAH 201-210 & IAH 211 or > 8
- Integrative Studies in Social Sciences ISS 2XX & ISS 3XX 8
- Bioscience (one of the following):
  - BS 161, ENT 205, IBIO 150, MMG 141, MMG 201, PLB 105, PSL 250 3-4

### 2. College Requirements: (30)
- **CEM 141 General Chemistry** 4
  - OR
  - **CEM 151 General and Descriptive Chemistry** 4
- **EGR 100 Introduction to Engineering Design** 2
- **EGR 102 Introduction to Engineering Modeling** 2
- **MTH 132 Calculus I** 3
- **MTH 133 Calculus II** 4
- **MTH 234 Multivariable Calculus** 4
- **MTH 235 Differential Equations** 3
- **PHY 183 Physics for Scientists & Engineers I** 4
- **PHY 184 Physics for Scientists & Engineers II** 4

#### *College Admission Requirement*

### 3. Major Requirements: (67-68)

#### a. Complete all of the following courses: (40)
- **CE 221Statics** 3
- **CE 273Civil & Environmental Engineering Measurements** 2
- **CE 274Graphics for Civil & Environmental Engineers** 1
- **CE 305Introduction to Structural Analysis** 3
- **CE 312Soil Mechanics** 4
- **CE 321Introduction to Fluid Mechanics (W)** 4
- **CE 337Civil Engineering Materials** 4
- **CE 341Transportation Engineering (W)** 3
- **CE 371Sustainable Civil & Environmental Egr Systems** 3
- **CE 372Risk Analysis in Civil & Environmental Eng** 2
- **CE 495Senior Design in Civil & Environmental Eng** 4
- **CEM 161Chemistry Laboratory I** 1
- **ENE 280Principles of Environmental Eng & Science** 3
- **ME 222Mechanics of Deformable Solids** 3

#### b. Complete one of the following courses: (3-4)
- **GLG 201The Dynamic Earth** 4
- **GLG 301Geology of the Great Lakes Region** 3

#### c. Complete one of the following courses: (3)
- **CE 461Computational Methods in Civil Engineering** 3
- **ME 361Dynamics** 3

#### d. Complete one of the following courses: (3)
- **BE 351Thermodynamics for Biological Engineering** 3
- **ECE 345Electronic Instrumentation and Systems** 3
- **ME 201Thermodynamics** 3
- **MSE 250Materials Science and Engineering** 3

#### e. Design-Intensive Electives: (12)
Complete 12-13 credits of electives from the list below from at least four different areas (environmental, geotechnical, pavements, structures, transportation, and water resources).

**Environmental**
- **ENE 463Water & Wastewater Engineering** 4
- **ENE 489Air Pollution: Science & Engineering** 3

**Geotechnical**
- **CE 418Geotechnical Engineering** 3

**Pavements**
- **CE 431Pavement Design and Analysis I** 3

**Structures**
- **CE 405Design of Steel Structures** 3
- **CE 406Design of Concrete Structures** 3

**Transportation**
- **CE 444Principles of Traffic Engineering** 3
- **CE 449Highway Design** 3

**Water Resources**
- **ENE 421Engineering Hydrology** 3
- **ENE 422Applied Hydraulics** 3

#### f. Technical Electives: (6) Complete six additional credits, courses may include those on above list and
- **ENE 481Environmental Chem: Equilibrium Concepts** 3
- **ENE 487Microbiology for Environmental Sci & Eng** 3
- **CE 400Structural Mechanics** 3
- **CE 407Matls Eng: Properties, Selection & Processing** 3
- **CE 432Pavement Rehabilitation** 3
- **CE 448Transportation Planning** 3
- **CE 471Construction Eng-Eqpt, Methods & Planning** 3

#### Other Electives (Variable)

**Total Credits Required for Degree** 128

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The requirements listed above apply to students admitted to the Department of Civil & Environmental Engineering (CEE) beginning Fall 2018. The Department of Civil & Environmental Engineering (CEE) constantly reviews program requirements and reserves the right to make changes as necessary. Consequently, each student is strongly encouraged to consult with their advisor to obtain assistance in planning an appropriate schedule of courses. Students who have questions about Civil Engineering should contact the Civil & Environmental Engineering Department Advising Office, G67 Wilson Hall, phone (517) 355-3274. For scheduling academic advising appointments https://msu.campus.eab.com

Last Revised February 2019
Civil Engineering

Prerequisite Flowchart

These requirements are effective for students admitted to the Civil Engineering major beginning Fall 2018.

FRESHMAN YEAR

FALL Term 1
CEM 161 - 1
Cem Lab I

CEM 141 OR
CEM 151 - 4
Gen Cem

SPRING Term 2
EGR 100 - 2
Intro Engr Design

EGR 102 - 2
Intro Engr Model

MTH 132 - 3
Calc I

MTH 133 - 4
Calc II

CSEM 141

CE 273 - 2
Civil & Environmental Eng Measures

CE 274 - 1
Graphics

ENE 280 - 3
Prin of Env Engr and Sci

MTH 234 - 4
Multivar Calc

MTH 235 - 3
Diff Equations

CE 221 - 3
Statics

GLG 201 - 4
The Dynamic Earth

GLG 301 - 3
Geo of the Great Lakes Region

WRA 101 - 4
Univ Writing

PHYS 183 - 4
Physics I

ISS 2XX - 4
*Div- N, I or D

IAH 201-210 - 4
*Div- N, I or D

IAH 211 or > - 4
*Div- N, I or D

Legend:
- Prerequisite
- Prerequisite or Concurrent

Rounded box: Offered only in the semester listed (excluding summer)

*Div- Complete courses in at least 2 out of 3 diversity categories: "N", "I" or "D"

Last Revised: 02/13/19
## Computational Data Science

### 1. University Requirements: (23-24)
- Writing, Rhetoric and American Cultures (WRA) 4
- Integrative Studies in Humanities (IAH) 8
- IAH 201-210 and IAH 211 or 8
- Integrative Studies in Social Sciences (ISS) 8
- ISS 2XX and ISS 3XX 8
- Bioscience (See 3A Below) 8

### 2. College Requirements: (28)

* EGR 100 Introduction to Engineering Design 2
* CMSE 202 Computational Modeling Tools & Techniques 4
  - MTH 132 Calculus I 3
  - MTH 133 Calculus II 4
  - MTH 234 Multivariable Calculus 4
  - MTH 235 Differential Equations 3
  - PHY 183 Physics for Scientists & Engineers I 4
  - PHY 184 Physics for Scientists & Engineers II 4

### 3. Major Requirements: (59-62)

#### a. Bioscience: (4-6)
Select one course from Group 1 and one course from Group 2.

<table>
<thead>
<tr>
<th>Group 1</th>
<th>**</th>
<th>BS 161</th>
<th>Cell and Molecular Biology</th>
<th>3</th>
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<tbody>
<tr>
<td>**</td>
<td>ENT 205</td>
<td>Pests, Society, &amp; the Environment</td>
<td>3</td>
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<tr>
<td>**</td>
<td>IBIO 150</td>
<td>Integrating Biology: From DNA to Populations</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>**</td>
<td>MMG 141</td>
<td>Introductory Human Genetics</td>
<td>3</td>
<td></td>
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<tr>
<td>**</td>
<td>MMG 201</td>
<td>Fundamentals of Microbiology</td>
<td>3</td>
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<td>**</td>
<td>PLB 105</td>
<td>Plant Biology</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>**</td>
<td>PSL 250</td>
<td>Introductory Physiology</td>
<td>4</td>
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</table>

<table>
<thead>
<tr>
<th>Group 2</th>
<th>**</th>
<th>BS 171</th>
<th>Cell and Molecular Biology Laboratory</th>
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<tbody>
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<td>**</td>
<td>CEM 161</td>
<td>Chemistry Laboratory I</td>
<td>1</td>
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</tr>
<tr>
<td>**</td>
<td>CEM 162</td>
<td>Chemistry Laboratory II</td>
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<tr>
<td>**</td>
<td>PHY 191</td>
<td>Physics Laboratory for Scientists I</td>
<td>1</td>
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<tr>
<td>**</td>
<td>PHY 192</td>
<td>Physics Laboratory for Scientists II</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>**</td>
<td>PLB 106</td>
<td>Plant Biology Laboratory</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

- **These courses may have prerequisites, which are not otherwise required in the program. Students should check course descriptions to ensure they are aware of prerequisites.

#### b. All of the following courses: (43)
- CMSE 201 Intro to Computational Modeling & Data Analysis 4
- CMSE 381 Fundamentals of Data Sci Methods 4
- CMSE 382 Optimization Methods in Data Sci 4
- CMSE 495 Experiential Learning in Data Sci (W) 4
- CSE 232 Introduction to Programming II 4
- CSE 331 Algorithms and Data Structures 3
- CSE 404 Intro to Machine Learning 3
- CSE 482 Big Data Analysis 3
- CSE 480 Database Systems 3
- MTH 314 Matrix Algebra w/ Comp Applications 3
- STT 180 Introduction to Data Science 4
- STT 380 Probability and Stats for Data Sci 4

#### c. Two of the following courses: (6)
- CSE 402 Biometrics and Pattern Recognition 3
- CSE 415 Introduction to Parallel Computing 3
- CSE 431 Algorithm Engineering 3
- CSE 440 Introduction to Artificial Intelligence 3

#### d. Two of the following courses: (6-7)
- CSE 401 Methods for Parallel Computing 4
- CSE 402 Visualization of Scientific Datasets 3
- CSE 415 Introduction to Parallel Computing 3
- CSE 431 Algorithm Engineering 3
- CSE 440 Introduction to Artificial Intelligence 3
- CSE 471 Media Processing and Multimedia Computing 3
- CSE 472 Computer Graphics 3
- MTH 451 Numerical Analysis I 3
- MTH 468 Predictive Analysis 3
- STT 464 Statistics for Biologists 3
- STT 465 Bayesian Statistical Methods 3

***CSE 415 and CMSE 401 may not be used to fulfill requirements c and d

### Other Electives (Variable)

**Total Credits Required for Degree 120**

The requirements listed above apply to students admitted to the major of Computational Data Science in the Department of Computer Science and Engineering beginning Fall 2019. The Department of Computer Science and Engineering (CSE) constantly reviews program requirements and reserves the right to make changes as necessary. Consequently, each student is strongly encouraged to consult with their advisor to obtain assistance in planning an appropriate schedule of courses. Students who have questions about Computational Data Science should contact the Computer Science and Engineering Department Advising Office, 3201 Engineering Building, phone (517) 353-5455.

Last revised February 2019
Computational Data Science

These requirements are effective for students admitted to the Computational Data Science major beginning Fall 2019.

**Requirements and Program Flow**

**Freshman Year**
- Fall: MTH 132 - 3 Calc I
- Spring: EGR 100 - 2 Intro Engr Desgn
- Fall: CMSE 201 – 4 Intro to Computational Modeling & Data Analysis
- Spring: CMSE 202 – 4 Computational Tools & Techniques

**Sophomore Year**
- Fall: CMSE 382 – 4 Opt/Methods in Data Sci
- Spring: CSE 381 – 4 Fund of Data Sci Methods
- Fall: SIT 380 – 4 Prob and Statistics for Data Sci
- Spring: CSE 322 – 4 Introduction to Programming II
- Fall: CSE 331 – 4 Alg & Data Struct
- Spring: ISS 3XX – 4 *Div- N, I or D

**Junior Year**
- Fall: CMSE 234 – 4 Multivariable Calculus
- Spring: MTH 314 – 3 Matrix Algebra
- Fall: MTH 313 – 4 Calc I
- Spring: MTH 314 – 3 Calc II
- Fall: EGR 100 - 2 Intro Engr Design
- Spring: MTH 313 – 3 Calc III

**Senior Year**
- Fall: MTH 495 – 4 Experimental in Data Science (W)
- Spring: CSE 482 – 3 Big Data Systems
- Fall: CSE 404 – 3 Intro to Machine Learning
- Spring: ISS 2XX – 4 *Div- N, I or D

**Electives**
- Fall: Elective - 6
- Spring: Elective - 3

**Legend**
- Prerequisite: Prerequisite or Concurrent
- *Div: Complete courses in at least 2 out of 3 diversity categories – “N”, “I” or “D”

Michigan State University  |  College of Engineering  |  Engineering Undergraduate Studies
Wilson Hall, 219 W. K. Kellogg Road, Room C101, East Lansing, MI 48824-1322  |  Tel: (517) 355-6616

http://www.egr.msu.edu/undergraduate/academic/degree-programs

**Last Revised: 03/20/19**

**FALL Term 1**
- MTH 132 - 3
- EGR 100 - 2
- CMSE 201 – 4
- CMSE 202 – 4
- SIT 380 – 4
- CSE 331 – 4
- ISS 3XX – 4

**Spring Term 2**
- MTH 133 - 4
- CMSE 234 – 4
- SIT 180 – 4
- CSE 322 – 4
- CSE 381 – 4
- CSE 331 – 4
- ISS 3XX – 4

**FALL Term 3**
- CSE 495 – 4
- CSE 404 – 3
- ISS 2XX – 4
- Elective - 6

**Spring Term 4**
- CSE 482 – 3
- ISS 2XX – 4
- Elective - 3

**FALL Term 5**
- ISS 2XX – 4
- Elective - 3

**Spring Term 6**
- ISS 2XX – 4
- Elective - 4

**FALL Term 7**
- ISS 2XX – 4
- Elective - 3

**Spring Term 8**
- ISS 2XX – 4
- Elective - 4
Computer Engineering  
Accredited by the Engineering Accreditation Commission of ABET, www.abet.org

1. University Requirements: (23-24)
   Writing, Rhetoric and American Cultures (WRA) 4
   Integrative Studies in Humanities (IAH) 8
   IAH 201-210 and IAH 211 or > 8
   Integrative Studies in Social Sciences (ISS) 8
   ISS 2XX and ISS 3XX 8

Bioscience (one of the following):
   BS 161, ENT 205, IBIO 150, MMG 141, MMG 201, PLB 105, PSL 250 3-4

2. College Requirements: (32)
   *CEM 141 General Chemistry 4
   *CSE 231 Introduction to Programming I 4
   *EGR 100 Introduction to Engineering Design 2
   *MTH 132 Calculus I 3
   *MTH 133 Calculus II 4
   MTH 234 Multivariable Calculus 4
   MTH 235 Differential Equations 3
   *PHY 183 Physics for Scientists & Engineers I 4
   PHY 184 Physics for Scientists & Engineers II 4

*College Admission Requirement

3. Major Requirements: (65)
   a. Complete one of the following courses: (1)
      CEM 161 Chemistry Laboratory I 1
      PHY 191 Physics Laboratory for Scientists I 1
   b. All of the following courses: (39)
      CSE 232 Introduction to Programming II 4
      CSE 260 Discrete Structures in Computer Science 4
      CSE 331 Algorithms and Data Structures 3
      CSE 325 Computer Systems 3
      ECE 201 Circuits and Systems I 3
      ECE 202 Circuits and Systems II 3
      ECE 203 Electronic Circuits and Systems Lab 1
      ECE 230 Digital Logic Fundamentals 3
      ECE 280 Electrical Engineering Analysis 3
      ECE 302 Electronic Circuits 3
      ECE 303 Electronics Laboratory 1
      ECE 331 Microprocessors & Digital Systems 4
      ECE 366 Introduction to Signal Processing 3
      ECE 390 Ethics, Professionalism and Contemporary Issues 1
   c. One of the following courses: (4)
      ECE 480 Senior Design (W) 4
      ECE 489 Independent Senior Design 4
   d. Electives: (21)
      Complete 21 credits of electives as specified below. Take at least 15 credits from the Focus Tracks below including at least 6 credits from the Core track and at least one course with a lab (L). Additional credits to meet the 21 credit requirement may be taken from Focus Track courses, any 400-level Computer Science and Engineering (CSE) or Electrical and Computer Engineering (ECE) courses, or by completing an approved 3 or 4 credit experiential, out-of-classroom education experience obtained through engineering cooperative education or independent study.

Focus Tracks
   a. Core
      At least 6 credits from the following:
      CSE 335 Object-Oriented Software Design 4
      CSE 420 Computer Architecture 3
      ECE 430 Embedded Cyber Physical Sys (L) 4
      ECE 422 Computer Networks 3
      or
      ECE 442 Intro to Communication Networks 3
      CSE 425 Intro to Computer Security 3
      or
      ECE 456 Intro to Comm & Network Security 3
      Both CSE 422 and ECE 442 may not be used to fulfill this requirement.
      Both CSE 425 and ECE 456 may not be used to fulfill this requirement.
   b. Hardware
      ECE 402 App of Analog Integ Circuits (L) 4
      ECE 410 VSL Design (L) 4
      ECE 411 Electronic Design Automation (L) 4
      ECE 431 Smart Sensor Systems (L) 3
      ECE 445 Biomedical Instrumentation 3
   c. Software Systems
      CSE 410 Operating Systems 3
      CSE 415 Parallel Programming 3
      CSE 435 Software Engineering 3
      CSE 450 Translation of Prog Languages 3
      CSE 476 Mobile Applications Development 3
   d. Intelligent Systems
      ECE 446 Biomedical Signal Processing 3
      ECE 466 Digital Signal Processing 3
      ECE 440 Introduction to Artificial Intelligence 3
   e. Electrical Systems
      ECE 305 Electromagnetic Fields & Waves I 4
      ECE 313 Control Systems 3
      ECE 377 Principles of Electronic Devices 3
      ECE 404 Radio Frequency ELEC Circuits (L) 4
      ECE 417 Robotics (L) 3

Other Electives (Variable)
Total credits Required for Degree 128
Last revised February 2019
**Biomedical Engineering Concentration: (15)**
The department offers a concentration for students who plan to pursue graduate work in biomedical areas or seek employment in selected medical-related areas. The concentration is available to, but not required of, any student enrolled in the Bachelor of Science degree program in Computer Engineering. Courses completed to satisfy requirement 3. above may also be used to satisfy the requirements of the concentration. NOTE: Completing the Bachelor of Science degree in Computer Engineering with a concentration may require more than 128 credits. Upon completion of the required courses a concentration, certification will appear on the student's official transcript.

To earn a Bachelor of Science degree in Computer Engineering with a biomedical engineering concentration, students must complete requirements 1., 2., and 3. above and the following:

1. **Complete 6 credits from the following courses:**
   - ANTR 350 Human Gross Anatomy for Pre-Health Professionals 3
   - BS 161 Cell and Molecular Biology 3
   - PSL 250 Introductory Physiology 4
   - PSL 310 Physiology for Pre-Health Professionals 4

2. **Complete 9 credits from the following** or one 3 or 4 credit ECE 490 or ECE 491 course with biomedical engineering content as approved by the student's advisor.
   - BE 444 Biosensors for Medical Diagnostics 3
   - ECE 445 Biomedical Instrumentation 3
   - ECE 446 Biomedical Signal Processing 3
   - ECE 447 Introduction to Biomedical Imaging 3
   - ECE 448 Modeling and Analysis of Bioelectrical Systems 3
   - ECE 449 Fundamentals of Acoustics 3

The requirements listed apply to students admitted to the major of Computer Engineering beginning Fall, 2019. The Department of Electrical and Computer Engineering (ECE) constantly reviews program requirements and reserves the right to make changes as necessary. Students are encouraged to consult with their advisor to obtain assistance in planning an appropriate schedule. Students who have questions about Computer Engineering should contact the Electrical and Computer Engineering Department Advising Office, 2212 Engineering Building, phone (517) 355-5242.
Computer Engineering

Prerequisite Flowchart

These requirements are effective for students admitted to the Computer Engineering major beginning Fall 2019.

FRESHMAN YEAR

FALL
Term 1
- Bioscience - 3/4
  Choose 1 from approved list
- CEM 141 - 4
  Gen Cem
- EGR 100 - 2
  Intro Engr Design

SPRING
Term 2
- CSE 231 - 4
  Intro to Progr I
- CSE 232 - 4
  Intro to Progr II
- CEM 161 - 1
  Cem Lab 1
  (P: CEM 141) OR
  PHY 191 - 1
  Physics Lab 1
  (P: PHY 183 or conc)
- EGR 100 - 2
  Intro Engr Design

SOPHOMORE YEAR

FALL
Term 3
- CSE 260 - 4
  Disc Str in Cmp Sc
- ECE 201 - 3
  Circuits & Syst I
- MTH 132 - 3
  Calc I
- PHY 183 - 4
  Physics I

SPRING
Term 4
- CSE 260 - 4
  Disc Str in Cmp Sc
- ECE 202 - 3
  Circuits & Syst II
- MTH 133 - 4
  Calc II
- PHY 184 - 4
  Physics II

JUNIOR YEAR

FALL
Term 5
- CSE 303 - 3
  Electronics Lab
- ECE 230 - 3
  Digital Logic Fund
- ECE 201 - 3
  Circuits & Syst I
- ECE 202 - 3
  Circuits & Syst II
- ECE 280 - 3
  Elec Engr Analy
- ECE 331 - 4
  Micropr & Dig Sys
- Mjr Elect #1 - 4
  Choose 1 from approved list
- Mjr Elect #2 - 3
  Choose 1 from approved list
- Mjr Elect #3 - 3
  Choose 1 from approved list

SPRING
Term 6
- CSE 303 - 3
  Electr Circuits
- ECE 302 - 3
  Electr Circuits
- Mjr Elect #4 - 4
  Choose 1 from approved list
- Mjr Elect #5 - 4
  Choose 1 from approved list
- Mjr Elect #6 - 4
  Choose 1 from approved list
- Mjr Elect #7 - 4
  Choose 1 from approved list
- Mjr Elect #8 - 4
  Choose 1 from approved list

SENIOR YEAR

FALL
Term 7
- CSE 325 - 3
  Computer Systems
- CSE 331 - 3
  Alg & Data Struct
- ISS 3XX - 4
  *Div- N, I or D

SPRING
Term 8
- CSE 325 - 3
  Computer Systems
- CSE 331 - 3
  Alg & Data Struct
- WRA XXX
  *Div- N, I or D
- Mjr Elect #5 - 4
  Choose 1 from approved list
- Mjr Elect #6 - 4
  Choose 1 from approved list
- Mjr Elect #7 - 4
  Choose 1 from approved list
- Mjr Elect #8 - 4
  Choose 1 from approved list

LEGEND

- Prerequisite
- Prerequisite or Concurrent
Rounded box: Offered only in the semester listed (excluding summer)
*Div: Complete courses in at least 2 out of 3 diversity categories: “N”, “I” or “D”

ECE 480 - 4
Sr. Design OR
ECE 489 – 4
Independent Sr.
Design
(P: ECE 303, ECE 313, ECE 320, ECE 331, ECE 366, ECE 390 or conc)
OR
((CSE 410, ECE 390 or conc))
AND
WRA XXX

Last Revised 02/18/19
# Computer Science

1. **University Requirements:** (20)
   
   Writing, Rhetoric and American Cultures (WRA) 4
   Integrative Studies in Humanities (IAH) 8
   IAH 201-210 and IAH 211 or >
   Integrative Studies in Social Sciences (ISS) 8
   ISS 2XX and ISS 3XX
   Bioscience (See 3A Below)

2. **College Requirements:** (25)
   
   *CSE 231  Introduction to Programming I  4
   *EGR 100  Introduction to Engineering Design  2
   *MTH 132  Calculus I  3
   *MTH 133  Calculus II  4
   MTH 234  Multivariable Calculus  4
   *PHY 183  Physics for Scientists & Engineers I  4
   PHY 184  Physics for Scientists & Engineers II  4
   *College Admission Requirement

3. **Major Requirements:** (65-67)
   
   **a. Bioscience:** (4-6)
   Select one course from Group 1 and one course from Group 2.

   **Group 1**
   
   *BS 161  Cell and Molecular Biology  3
   ENT 205  Pests, Society & Environment  3
   IBIO 150  Integrating Biology: From DNA to Populations  3
   MMG 141  Introductory Human Genetics  3
   MMG 201  Fundamentals of Microbiology  3
   PLB 105  Plant Biology  3
   PSL 250  Introductory Physiology  4

   **Group 2**
   
   BS 171  Cell and Molecular Biology Laboratory  2
   **CEM 161  Chemistry Laboratory I  1
   CEM 162  Chemistry Laboratory II  1
   PHY 191  Physics Laboratory for Scientists I  1
   PHY 192  Physics Laboratory for Scientists II  1
   PLB 106  Plant Biology Laboratory  1

   **b. Complete all of the following:** (28)
   
   CSE 232  Introduction to Programming II  4
   CSE 260  Discrete Structures in Computer Science  4
   CSE 320  Computer Organization and Architecture  3
   CSE 331  Algorithms and Data Structures  3
   CSE 325  Computer Systems  3
   CSE 335  Object-Oriented Software Design  4
   CSE 498  Collaborative Design (W)  4
   STT 351  Probability and Statistics for Engineering  3

   **These courses may have prerequisites, which are not otherwise required in the program. Students should check course descriptions to ensure they are aware of prerequisites.**

   **c. Select five of the following courses:** (15)
   
   CSE 402  Biometrics and Pattern Recognition  3
   CSE 410  Operating Systems  3
   CSE 415  Parallel Programming  3
   CSE 420  Computer Architecture  3
   CSE 422  Computer Networks  3
   CSE 425  Introduction to Computer Security  3
   CSE 431  Algorithm Engineering  3
   CSE 435  Software Engineering  3
   CSE 440  Introduction to Artificial Intelligence  3
   CSE 450  Translation of Programming Languages  3
   CSE 460  Computability & Formal Language Theory  3
   CSE 471  Media Processing & Multimedia Computing  3
   CSE 472  Computer Graphics  3
   CSE 476  Mobile Application Development  3
   CSE 477  Web Application Architecture & Development  3
   CSE 480  Database Systems  3
   CSE 482  Big Data Analysis  3
   CSE 491  Selected Topics in Computer Science  1-4
   MTH 451  Numerical Analysis I  3

   **Required Cognate:** (15)
   
   Cognates in the following areas are available to students in Computer Science: business, communication arts and sciences, foreign language, mathematics, the natural sciences, philosophy, psychology, the social sciences, and telecommunication. Students may complete cognates in other areas with the approval of the Department of Computer Science and Engineering academic advisor. The cognate should enhance the student’s ability to apply analytical procedures in a specific subject area.

   The cognate is selected from (1), (2) or (3) below. The academic advisor of the Department of Computer Science and Engineering must pre-approve both the cognate and the cognate courses.

   **Cognate 1**
   
   A minimum of four courses totaling 15 or more credits outside the College of Engineering. At least 6 of the 15 credits must be in courses at the 300-400 level.

   **Cognate 2**
   
   Cognate in The Eli Broad College of Business consisting of this specific set of courses: ACC 230, (EC 201 or EC 202), FI 320, GBL 323 and MKT 327.

   **Cognate 3**
   
   A sequence of at least four courses in a foreign language.

   **Other Electives (Variable)**
   
   **Total Credits Required for Degree** 120
   
   The requirements listed above apply to students admitted to the major of Computer Science in the Department of Computer Science and Engineering beginning Fall 2019. The Department of Computer Science and Engineering (CSE) constantly reviews program requirements and reserves the right to make changes as necessary. Consequently, each student is strongly encouraged to consult with their advisor to obtain assistance in planning an appropriate schedule of courses. Students who have questions about Computer Science should contact the Computer Science and Engineering Department Advising Office, 3201 Engineering Building, phone (517) 353-5455.

   **Last revised February 2019**
Computer Science
Requirements and Program Flow

These requirements are effective for students admitted to the Computer Science major beginning Fall 2019.

**FRESHMAN YEAR**
- **Fall Term 1**
  - ISS 2XX - 4
    - *Div- N, I or D
  - CSE 231 - 4
    - Intro to Progr I
  - EGR 100 - 2
    - Intro Engr Design
  - CSE 130 - 4
    - Calc I

- **Spring Term 2**
  - CSE 232 - 4
    - Intro to Progr II
  - MTH 132 - 3
    - Calc I
  - MTH 133 - 4
    - Calc II
  - PHY 183 - 4
    - Physics I
  - PHY 184 - 4
    - Physics II

**SOPHOMORE YEAR**
- **Fall Term 3**
  - CSE 260 - 4
    - Disc Str in Cmp Sc
  - CSE 230 - 3
    - Comp Org & Arch
  - CSE 240 - 3
    - Intro to Progr I
  - CSE 325 - 3
    - Computer Systems
  - MTH 234 - 4
    - Multivar Calc

- **Spring Term 4**
  - CSE 326 - 3
    - Obj-Orien Soft Des
  - STT 351 - 3
    - Prob & Stat Engr
  - CSE 330 - 3
    - Alg & Data Struct

**JUNIOR YEAR**
- **Fall Term 5**
  - CSE 331 - 3
    - Comp Org & Arch
  - CSE 325 - 3
    - Computer Systems
  - STT 351 - 3
    - Prob & Stat Engr

- **Spring Term 6**
  - Major Elect - 3
    - Choose 1 400-level CSE course from approved list
  - ISS 2XX - 4
    - *Div- N, I or D
  - Cognate OR Elective - 3
  - Cognate OR Elective - 3

**SENIOR YEAR**
- **Fall Term 7**
  - Major Elect - 3
    - Choose 1 400-level CSE course from approved list
  - Major Elect - 3
    - Choose 1 400-level CSE course from approved list

- **Spring Term 8**
  - Cognate OR Elective - 3
  - Major Elect - 3
    - Choose 1 400-level CSE course from approved list
  - Cognate OR Elective - 3
  - Cognate OR Elective - 3

LEGEND
- Prerequisite
- Prerequisite or Concurrent
- *Div: Complete courses in at least 2 out of 3 diversity categories – “N”, “I” or “D”
Electrical Engineering

Accredited by the Engineering Accreditation Commission of ABET, www.abet.org

1. University Requirements: (23-24)
   Writing, Rhetoric and American Cultures (WRA) 4
   Integrative Studies in Humanities (IAH) 8
   IAH 201-210 and IAH 211 or >
   Integrative Studies in Social Sciences (ISS) 8
   ISS 2XX and ISS 3XX
   Bioscience (one of the following):
   BS 161, ENT 205, IBIO 150, MMG 141,
   MMG 201, PLB 105, PSL 250 3-4

2. College Requirements: (31)
   *CEM 141 General Chemistry 4
   *EGR 100 Introduction to Engineering Design 2
   *CSE 220 Programming in C 3
   *MTH 132 Calculus I 3
   *MTH 133 Calculus II 4
   MTH 234 Multivariable Calculus 4
   MTH 235 Differential Equations 3
   *PHY 183 Physics for Scientists & Engineers I 4
   PHY 184 Physics for Scientists & Engineers II 4
   *College Admission Requirement

3. Major Requirements: (61)
   a. Complete one of the following courses: (1)
      CEM 161 Chemistry Laboratory I 1
      PHY 191 Physics Laboratory for Scientists I 1
   b. Complete all of the following courses: (38)
      ECE 201 Circuits and Systems I 3
      ECE 202 Circuits and Systems II 3
      ECE 203 Electronic Circuits and Systems Lab 1
      ECE 230 Digital Logic Fundamentals 3
      ECE 280 Electrical Engineering Analysis 3
      ECE 302 Electronic Circuits 3
      ECE 303 Electronics Laboratory 1
      ECE 305 Electromagnetic Fields & Waves I 4
      ECE 313 Control Systems 3
      ECE 320 Energy Conversion & Pwr Electronics 3
      ECE 331 Microprocessors & Digital Systems 4
      ECE 366 Introduction to Signal Processing 3
      ECE 377 Principles of Electronic Devices 3
      ECE 390 Ethics, Professionalism and
         Contemporary Issues 1
   c. Select one of the following courses: (4)
      ECE 480 Senior Design (W) 4
      ECE 489 Independent Senior Design 4
   d. Major Electives: (18)
      Complete a minimum of 18 credits including at least 12 credits
      from the ECE focus areas below. The 12 ECE focus credits
      must include at least one laboratory course ("L") and at least
      one 3 or 4 credit course from two different focus areas.
      Additional credits to meet the 18 credit requirement may be
      taken from any 400-level engineering course or by completing
      an approved 3 or 4 credit experiential education experience
      obtained in a minimum of three out-of-classroom experiences
      through engineering cooperative education or independent
      study. Students interested in the experiential education
      experience must contact the department for approval. Note that
      400-level courses outside of ECE may have restrictions or
      require additional prerequisites not included within this degree
      program.

Computing and Electronics
   ECE 402 App of Analog Integrated Circuits (L) 4
   ECE 410 VLSI Design (L) 4
   ECE 430 Embedded Cyber Physical Systems (L) 4
   ECE 431 Smart Sensor Systems (L) 3
   ECE 442 Introduction to Communication Networks 3
   ECE 445 Biomedical Instrumentation (L) 3
   ECE 456 Intro to Communication & Networks Security 3

Electrosciences
   ECE 404 Radio Frequency Electronic Circuits (L) 4
   ECE 405 Electromagnetic Fields & Waves II (L) 4
   ECE 407 Electromagnetic Compatibility (L) 4
   ECE 447 Introduction to Biomedical Imaging 3
   ECE 449 Fundamentals of Acoustics 3
   ECE 476 Electro-Optics (L) 4
   ECE 477 Microelectronic Fabrication (L) 3

Systems
   ECE 415 Computer Aided Manufacturing (L) 3
   ECE 416 Digital Control 3
   ECE 417 Robotics (L) 4
   ECE 420 Machines and Power Laboratory (L) 1
   ECE 423 Power System Analysis 3
   ECE 425 Solid State Power Conversion 3
   ECE 446 Biomedical Signal Processing 3
   ECE 448 Modeling & Analysis of Bioelectrical Systems 3
   ECE 457 Communication Systems 3
   ECE 458 Communication Systems Laboratory (L) 1
   ECE 466 Digital Signal Processing 3
Concentration
The department offers the following concentration to students wishing an area of specialization in their degree. The concentration is available to, but not required of, any student enrolled in the Bachelor of Science degree program in Electrical Engineering. Courses completed to satisfy requirement 3.c above may also be used to satisfy the requirements of a concentration. NOTE: Completing the Bachelor of Science degree in Electrical Engineering with a concentration may require more than 128 credits. Upon completion of the required courses for a concentration, certification will appear on the student’s official transcript.

Biomedical Engineering (15)
This concentration is for students who plan to pursue graduate work in biomedical areas or seek employment in select medical-related fields. To earn a Bachelor of Science degree in Electrical Engineering with a biomedical engineering concentration, students must complete requirements 1., 2., and 3. above and the following:

1. Complete 6 credits from the following: (6)
   - ANTR 350  Human Gross Anatomy for Pre-Health Prof  3
   - BS 161  Cells and Molecular Biology  3
   - PSL 250  Introductory Physiology  4
   - PSL 310  Physiology for Pre-Health Professionals  4

2. Complete 9 credits from the following or a 3 or 4 credit ECE 490 or ECE 491 course with biomedical engineering content as approved by the student’s advisor: (9)
   - BE 444  Biosensors for Medical Diagnostics  3
   - ECE 445  Biomedical Instrumentation  3
   - ECE 446  Biomedical Signal Processing  3
   - ECE 447  Intro to Biomedical Imaging  3
   - ECE 448  Modeling & Analys of Bioelectrical Systems  3
   - ECE 449  Fundamentals of Acoustics  3

Other Electives (Variable)

Total Credits Required for Degree  128

The requirements listed above apply to students admitted to the major of Electrical Engineering beginning Fall 2019. The Department of Electrical and Computer Engineering (ECE) constantly reviews program requirements and reserves the right to make changes as necessary. Students are encouraged to consult with their advisor to obtain assistance in planning an appropriate schedule. Students who have questions about Computer Engineering should contact the Electrical and Computer Engineering Department Advising Office, 2212 Engineering Building, phone (517) 355-5242.

NOTES:

Last revised February 2019
Electrical Engineering

Prerequisite Flowchart

These requirements are effective for students admitted to the Electrical Engineering major beginning Fall 2019.

LEGEND

Prerequisite
Prerequisite or Concurrent

"Div": Complete courses in at least 2 out of 3 diversity categories – “N”, “I” or “D”

Last Revised: 02/18/19
Environmental Engineering
Accredited by the Engineering Accreditation Commission of ABET, www.abet.org

1. University Requirements: (23)
Writing, Rhetoric and American Cultures (WRA) 4
Integrative Studies in Humanities (IAH) 8
IAH 201-210 and IAH 211 or >
Integrative Studies in Social Sciences (ISS) 8
ISS 2XX and ISS 3XX
Bioscience: BS 161 Cell and Molecular Biology 3

2. College Requirements: (30)
*CEM 141 General Chemistry 4
*CEM 151 General and Descriptive Chemistry 4
*EGR 100 Introduction to Engineering Design 2
*EGR 102 Introduction to Engineering Modeling 2
*MTH 132 Calculus I 3
*MTH 133 Calculus II 4
MTH 234 Multivariable Calculus 4
MTH 235 Differential Equations 3
*PHY 183 Physics for Scientists & Engineers I 4
*PHY 184 Physics for Scientists & Engineers II 4
* College Admission Requirement

3. Major Requirements: (66-69)
a. Complete all of the following courses: (49)
BS 162 Organismal and Population Biology 3
CE 221 Statics 3
CE 273 Civil & Environmental Engineering Measurements 2
CE 274 Graphics for Civil & Environmental Engineers 1
CE 321 Introduction to Fluid Mechanics 4
CE 371 Sustainable Civil & Environmental Egr Systems 3
CE 372 Risk Analysis in Civil & Environmental Engineering 2
CE 495 Senior Design in Civil & Environmental Engineering 4
CEM 161 Chemistry Laboratory I 1
CHE 201 Material and Energy Balances 3
ENE 280 Principles of Environ Engineering and Science 3
ENE 421 Engineering Hydrology 3
ENE 422 Applied Hydraulics 3
ENE 480 Environmental Measurements Laboratory 1
ENE 481 Environmental Chemistry: Equilibrium Concepts 3
ENE 483 Water & Wastewater Engineering 4
ENE 487 Microbiology for Environmental Science & Egr 3
ENE 489 Air Pollution: Science and Engineering 3

b. Complete one of the following courses: (3)
CEM 142 General & Inorganic Chemistry 3
CEM 152 Principles of Chemistry 3
c. Complete one of the following courses: (3-4)
CHE 321 Thermodynamics for Chemical Engineering 4
ME 201 Thermodynamics 3
d. Complete one of the following courses: (3-4)
GLG 201 The Dynamic Earth 4
GLG 301 Geology of the Great Lakes Region 3
e. Technical Electives. Complete at least three courses for a minimum of 9 credits of electives from the list below or by approval of the department. Students may substitute a 3-credit experiential education experience for one of the three courses.
The experience is obtained in a minimum of three out-of-classroom experiences through engineering cooperative education. Students must contact the department for approval.

ANS 427 Environmental Toxicology and Society 3
BE 469 Sustainable Bioenergy Systems 3
BE 482 Diffuse-Source Pollution Engineering 3
CSS 455 Environmental Pollutants in Soil and Water 3
CSUS 320 Environmental Planning and Management 3
CSUS 425 Environmental Impact Assessment 3
FW 414 Aquatic Ecosystem Management 3
FW 417 Wetland Ecology and Management 3
FW 420 Stream Ecology 3
FW 443 Restoration Ecology 3
FW 472 Limnology 3
GLG 411 Hydrogeology 3
GLG 412 Glacial Geology & the Record of Climate Change 3

Other Electives (Variable)

Total Credits Required for Degree

The requirements listed above apply to students admitted to the Department of Civil & Environmental Engineering (CEE) beginning Fall 2018. The Department of Civil & Environmental Engineering (CEE) constantly reviews program requirements and reserves the right to make changes as necessary. Consequently, each student is strongly encouraged to consult with their advisor to obtain assistance in planning an appropriate schedule of courses. Students who have questions about Environmental Engineering should contact the Civil & Environmental Engineering Department Advising Office, G67 Wilson Hall, phone (517) 355-3274. For scheduling academic advising appointments visit: https://msu.campus.eab.com

Last revised February 2019
Environmental Engineering

Prerequisite Flowchart

These requirements are effective for students admitted to the Environmental Engineering major beginning Fall 2018.

FRESHMAN YEAR

FALL Term 1
- CEM 161 - 1 Cem Lab I
- CEM 141 - 4 OR CEM 151 SS Only Gen Cem

SPRING Term 2
- EGR 100 - 2 Intro Engr Design
- MTH 132 - 3 Calc I

SOPHOMORE YEAR

FALL Term 3
- CEM 142 - 3 OR CEM 152 SS Only Gen Cem
- EGR 102 - 2 Intro Engr Model

SPRING Term 4
- CE 273 - 2 CE/ENE Engr Measurements
- MTH 133 - 4 Calc II
- MTH 234 - 4 Multivar Calc
- PHY 183 - 4 Physics I

JUNIOR YEAR

FALL Term 5
- BS 161 - 3 Cell & Molec Biol
- MTH 234 - 3 Diff Equations

SPRING Term 6
- BS 162 - 3 Org & Pop Biol
- MTH 235 - 3 Applied Hydraulics
- PHY 184 - 4 Physics II

SENIOR YEAR

FALL Term 7
- CE 372 - 2 Risk Analysis in CE & ENE Eng
- ENE 422 - 3 Microbio for Env Sci & Engr

SPRING Term 8
- Tech Elective Course - 3/4
- Elective - 3/4
- Elective - 3/4

LEGEND
- → Prerequisite
- Prerequisite or Concurrent
- Rounded box: Offered only in the semester listed (excluding summer)
- *Div- Complete courses in at least 2 out of 3 diversity categories: "N", "I" or "D"

Last Revised: 02/18/19
1. University Requirements: (23-24)
Writing, Rhetoric and American Cultures (WRA) 4
Integrative Studies in Humanities IAH 201-210 & IAH 211 or > 8
Integrative Studies in Social Sciences ISS 2XX & 3XX 8
Bioscience (one of the following):
BS 161, ENT 205, IBIO 150, MMG 141, MMG 201, PLB 105, PSL 250 3-4

2. College Requirements: (30)
*CEM 151 General and Descriptive Chemistry 4
*EGR 100 Introduction to Engineering Design 2
*EGR 102 Introduction to Engineering Modeling 2
*MTH 132 Calculus I 3
*MTH 133 Calculus II 4
MTH 234 Multivariable Calculus 4
MTH 235 Differential Equations 3
*PHY 183 Physics for Scientists & Engineers I 4
PHY 184 Physics for Scientists & Engineers II 4

3. Major Requirements: (62)
a. Complete all of the following: (41)
CE 221 Statics 3
CEM 152 Principles of Chemistry 3
CEM 161 Chemistry Laboratory I 1
***ECE 345 Electronic Instrumentation & Systems 3
ME 222 Mechanics of Deformable Solids 3
MSE 250 Materials Science and Engineering 3
MSE 260 Electronic, Magnetic, Thermal & Optical Properties of Materials 3
MSE 310 Phase Equilibria in Materials 3
MSE 320 Mechanical Properties of Materials 3
MSE 331 Materials Characterization Methods I 2
MSE 360 Fundamentals of Microstructural Dsgn 3
MSE 370 Synthesis & Processing of Materials 3
MSE 381 Materials Characterization Methods II 2
MSE 466 Design and Failure Analysis (W) 3
STT 351 Probability & Statistics for Engineering 3
b. Select four of the following courses: (12)
MSE 425 Biomaterials & Biocompatibility 3
MSE 460 Electronic Struct, Bonding in Materials & Devices 3
MSE 465 Design & Application of Engr Materials 3
MSE 474 Ceramic and Refractory Materials 3
MSE 476 Phys Mturgy of Ferrous & Alumn Alloys 3
**MSE 477 Manufacturing Processes 3
c. Complete at least 6 credits from 400-level courses within the College of Engineering: (6)
d. Technical Electives: (3)
Complete at least 3 credits in courses selected from a list of approved technical electives available from the Department of Chemical Engineering and Materials Science.

Concentrations
Students may elect to complete a more focused set of courses to enhance their ability to function at the interface with another scientific, engineering, or business discipline. Concentrations are available to, but not required of, any student enrolled in the Bachelor of Science degree in Materials Science and Engineering. Completing the Bachelor of Science degree in Materials Science and Engineering with a concentration may require more than 128 credits. The concentration will be noted on the student's transcript.

Biomedical Materials Engineering Concentration: (28)
To gain interdisciplinary skills in human biology and earn a Bachelor of Science degree in Materials Science and Engineering with a biomedical materials engineering concentration, students must complete requirement 3.a. above and the following:

1. Complete all of the following: (16)
ANTR 350 Human Gross Anatomy for Pre Health Prof 3
CEM 351 Organic Chemistry I 3
IBIO 341 Fundamental Genetics 4
ME 495 Tissue Mechanics 3
MSE 425 Biomaterials and Biocompatibility 3

2. Complete two of the following courses: (6)
MSE 460 Electronic Struct, Bonding in Materials & Devices 3
MSE 465 Design and Application of Egr. Materials 3
MSE 474 Ceramics and Refractory Materials 3
MSE 476 Phys Metallurgy of Ferrous & Alumn Alloys 3
**MSE 477 Manufacturing Processes 3

3. Technical Electives: (6)
An approved list of Technical Electives is available from the advisor.

Manufacturing Engineering Concentration: (21)
To gain interdisciplinary skills with business and design engineers for manufacturing projects and earn a Bachelor of Science degree in Materials Science and Engineering with a manufacturing engineering concentration, students must complete requirement 3.a. above and the following:

1. Complete all of the following: (12)
ECE 415 Computer Aided Manufacturing 3
**MSE 477 Manufacturing Processes 3
ME 478 Product Development 3
MSE 465 Design and Application of Egr. Materials 3

2. Complete three of the following courses: (9)
GBL 323 Introduction to Business Law 3
**MSE 426 Introduction to Composite Materials 3
MSE 474 Ceramic and Refractory Materials 3
MSE 476 Phys Metallurgy of Ferrous and Alum Alloys 3
**Metallurgical Engineering Concentration: (21)**

To enhance the student's ability to characterize, process, and design with metals in association with mechanical engineers and earn a Bachelor of Science degree in Materials Science and Engineering with a metallurgical engineering concentration, students must complete requirement 3.a. above and the following:

1. Complete all of the following: (18)
   - ME 423 Intermediate Mechanics of Deformable Solids 3
   - ME 475 Computer Aided Design of Structures 3
   - **MSE 477 Manufacturing Processes 3**
   - MSE 465 Design and Application of Egr. Materials 3
   - MSE 476 Phys Metallurgy of Ferrous & Alum Alloys 3
   - MSE 481 Spectroscopic & Diffraction Analysis of Materials 3

2. Complete one of the following courses: (3)
   - ME 425 Experimental Mechanics 3
   - **MSE 426 Introduction to Composite Materials 3**

**Polymeric Engineering Concentration: (21)**

To gain interdisciplinary skills to facilitate interactions with chemical engineers and earn a Bachelor of Science degree in Materials Science and Engineering with a polymeric engineering concentration, students must complete requirement 3.a. above and the following:

Complete all of the following: (18)
   - CEM 351 Organic Chemistry I 3
   - CHE 311 Fluid Flow and Heat Transfer 3
   - CHE 472 Composite Materials Processing 3
   - CHE 473 Chem Engr Pmcls in Polymrs & Mats Sys 3
   - **MSE 426 Introduction to Composite Materials 3**
   - MSE 460 Electronic Structure & Bonding in Materials & Devices 3
   - Any approved 890-891 independent study or topics course 3

Complete the following: (3)

At least 3 credits in courses from a list of approved technical electives available from the Department of Chemical Engineering and Materials Science.

The requirements listed apply to students admitted to the major of Materials Science and Engineering in the Department of Chemical Engineering and Materials Science (CHEMS) beginning Spring 2016. The Department of Chemical Engineering and Materials Science constantly reviews program requirements and reserves the right to make changes as necessary. Consequently, each student is strongly encouraged to consult with their advisor to obtain assistance in planning an appropriate schedule of courses. Students who have questions about Materials Science and Engineering should contact Chemical Engineering and Materials Science Department Advising Office, G66 Wilson Hall, phone 517-432-4916. For scheduling academic appointments visit: https://msu.campus.eab.com

Some courses may have prerequisites, which are not otherwise required in the program. Students should check course descriptions to ensure they are aware of prerequisites.

* College Admission Requirement
  **To enroll MSE 426 & MSE 477, enroll in ME 426 & ME 477
  ***ECE 302 and ECE 303 may be substituted for ECE 345

Total Credits Required for Degree 128

Last Revised February 2019

NOTES:
Materials Science and Engineering

Prerequisite Flowchart

These requirements are effective for students admitted to the Materials Science and Engineering major beginning Spring 2016.

FRESHMAN YEAR

FALL Term 1
- CEM 161 - 1 (Cem Lab I)
- Elective - 1 (1 cr Gen Elecs)
- CEM 151 - 4 (Gen Cem)
- EGR 100 - 2 (Intro Engr Desgn)

SPRING Term 2
- CEM 152 - 3 (Princips of Cem)
- EGR 102 - 2 (Intro Engr Model)
- MTH 132 - 3 (Calc I)
- MTH 133 - 4

SOPHOMORE YEAR

FALL Term 3
- MTH 134 - 4
- PHY 183 - 4 (Physics I)
- PHY 184 - 4 (Physics II)
- Elective - 2

SPRING Term 4
- Elective - 3 (2 crs Gen Elecs)
- MSE 250 - 3 (Matls Sci & Engr)
- Elective - 1
- Elective - 3

JUNIOR YEAR

FALL Term 5
- Elective - 3
- MSE 260 - 3 (Properties Of Materials)
- MSE 230 - 3 (Mechanical Prop of Matls)
- ME 221 - 3 (Statics)
- MTH 234 - 4 (Multivar Calc)
- MTH 235 - 4 (Diff Equations)
- Elective - 3

SPRING Term 6
- MSE 261 - 3
- MSE 262 - 3
- MSE 263 - 3
- ME 222 - 3 (Mech of Defrm Sol)
- MSE 310 - 3 (Phase Eq in Matls)
- MSE 320 - 3 (Syn Proc of Matls)
- MSE 330 - 3 (Matls Char Meth I)
- MSE 340 - 3 (Matls Char Meth II)
- MSE 350 - 3
- MSE 360 - 3 (Fund of Microstructural Desgn)
- MSE 370 - 3 (Fund of Microstructural Desgn)
- MSE 380 - 3 (Fund of Microstructural Desgn)
- MSE 390 - 3

SENIOR YEAR

FALL Term 7
- Elective - 3
- MSE 360 - 3
- MSE 370 - 3
- MSE 380 - 3
- MSE 390 - 3
- MSE 425
- MSE 474
- MSE 476
- MSE 466 - 3 (Des & Failure Analysis [W])

SPRING Term 8
- MSE 466 - 3
- MSE 477
- Engr 400 level - 3
- Technical Elec - 3
- Choose 1 from:
- MSE 460
- MSE 465
- MSE 477

LEGEND

Prerequisites
Prerequisite or Concurrent
“P”: Prerequisite
“Div- N, I or D”: Complete courses in at least 2 out of 3 diversity categories- “N”, “I” or “D”

Rounded box: Offered only in the semester listed (excluding summer)

Last Revised: 03/20/19
Mechanical Engineering
Accredited by the Engineering Accreditation Commission of ABET, www.abet.org

1. University Requirements: (23-24)
   Writing, Rhetoric and American Cultures (WRA) 4
   Integrative Studies in Humanities (IAH) 8
   IAH 201-210 and IAH 211 or >
   Integrative Studies in Social Sciences (ISS) 8
   ISS 2XX and ISS 3XX
   Bioscience (one of the following):
     BS 161, ENT 205, IBIO 150, MMG 141,
     MMG 201, PLB 105, PSL 250 3-4

2. College Requirements: (32)
   *CEM 141 General Chemistry 4
   *CSE 231 Introduction to Programming I 4
   *EGR 100 Introduction to Engineering Design 2
   *MTH 132 Calculus I 3
   *MTH 133 Calculus II 4
   MTH 234 Multivariable Calculus 4
   MTH 235 Differential Equations 3
   *PHY 183 Physics for Scientists & Engineers I 4
   PHY 184 Physics for Scientists & Engineers II 4

*College Admission Requirement

3. Major Requirements: (65)

a. Complete all of the following courses: (13)
   CE 221 Statics 3
   CEM 161 Chemistry Laboratory I 1
   ECE 345 Electronic Instrumentation and Systems 3
   MSE 250 Materials Science and Engineering 3
   STT 351 Probability and Statistics for Engineering 3

b. Complete all of the following courses: (40)
   ME 201 Thermodynamics 3
   ME 222 Mechanics of Deformable Solids 3
   ME 280 Graphic Communications 2
   ME 300 Professional Issues in Mechanical Eng 1
   ME 332 Fluid Mechanics (W) 4
   ME 361 Dynamics 3
   ME 370 Mechanical Design & Manufacturing I 3
   ME 391 Mechanical Engineering Analysis 3
   ME 410 Heat Transfer 3
   ME 412 Heat Transfer Laboratory (W) 2
   ME 451 Control Systems (W) 4
   ME 461 Mechanical Vibrations 3
   ME 470 Mechanical Design & Manufacturing II 3
   ME 481 Mechanical Engr Design Projects (W) 3

c. Senior Electives: (9)
   Complete a minimum of nine credits from the following:
   ME 413 Cryogenic Systems Analysis 3
   ME 414 Cryogenic Systems Mechanical Design 3
   ME 416 Computer Asstd Design of Thermal Sys 3
   ME 417 Design of Alternative Energy Systems 3
   ME 422 Introduction to Combustion 3
   ME 423 Intermed Mech of Deformable Solids 3
   ME 425 Experimental Mechanics 3
   ME 426 Introduction to Composite Materials 3
   ME 433 Intro to Computational Fluid Dynamics 3
   ME 440 Aerospace Propulsion 3
   ME 441 Aerodynamics and Aircraft Performance 3
   ME 442 Turbomachinery 3
   ME 444 Automotive Engines 3
   ME 445 Automotive Powertrain Design 3
   ME 464 Intermediate Dynamics 3
   ME 465 Computer Aided Optimal Design 3
   ME 475 Computer Aided Design of Structures 3
   ME 477 Manufacturing Processes 3
   ME 478 Product Development 3
   ME 490 Independent Study in Mechanical Engr 1-4
   ME 491 Selected Topics in Mechanical Engr 1-4
   ME 494 Biofluid Mechanics and Heat Transfer 3
   ME 495 Tissue Mechanics 3
   ME 497 Biomechanical Design in Product Dev 3

4. Design-Intensive courses. Complete a minimum of three additional credits from: (3)
   ME 414 Cryogenic Systems Mechanical Design 3
   ME 416 Computer Asstd Design of Thermal Sys 3
   ME 417 Design of Alternative Energy Systems 3
   ME 442 Turbomachinery 3
   ME 445 Automotive Powertrain Design 3
   ME 465 Computer Aided Optimal Design 3
   ME 475 Computer Aided Design of Structures 3
   ME 478 Product Development 3
   ME 497 Biomechanical Design in Product Dev 3

Courses used to fulfill item 3.c. may not be used to fulfill 3.d.
Concentrations:
The Department offers concentrations in aerospace engineering, automotive powertrain, biomedical engineering, computational design, cryogenic engineering, energy, engineering mechanics, global engineering, and manufacturing engineering to students wishing an area of specialization in their degree. The concentrations are available to, but not required of, any student enrolled in the Bachelor of Science degree program in Mechanical Engineering. NOTE: Completing the Bachelor of Science degree in Mechanical Engineering with a concentration may require more than 128 credits. Upon completion of the required courses for one of these concentrations, certification will appear on the student's official transcript.

Aerospace Engineering Concentration: (12)
To earn a Bachelor of Science degree in Mechanical Engineering with an aerospace engineering concentration, students must complete requirements 1., 2., 3.a., 3.b., and 3.d. above and the following:

All of the following courses: (6)
ME 440 Aerospace Propulsion 3
ME 441 Aerodynamics & Aircraft Performance 3

One of the following courses: (3)
ME 423 Intermediate Mech of Deformable Solids 3
ME 426 Introduction to Composite Materials 3
ME 475 Computer Aided Design of Structures 3

Computational Design Concentration: (12)
To earn an Bachelor of Science degree in Mechanical Engineering with a computational design concentration, students must complete requirements 1.,2., 3.a.,3.b., and 3.d. and the following:

All of the following: (12)
ME 416 Computer Assisted Design of Thermal Systems 3
ME 433 Intr to Computational Fluid Dynamics 3
ME 465 Computer Aided Optimal Design 3
ME 475 Computer Aided Design of Structures 3

Biomedical Engineering Concentration: (16)
To earn a Bachelor of Science degree in Mechanical Engineering with a biomedical engineering concentration, students must complete requirements 1., 2., 3.a., 3.b., and 3.d. above and the following:

Both of the following courses: (7)
BS 161 Cell and Molecular Biology 3
PSL 250 Introductory Physiology 4

Select nine credits from the following courses: (9)
BE 444 Biosensors for Medical Diagnostics 3
ECE 445 Biomedical Instrumentation 3
ME 494 Biofluid Mechanics and Heat Transfer 3
ME 495 Tissue Mechanics 3
ME 497 Biomechanical Design in Product Dev 3
MSE 425 Biomaterials and Biocompatibility 3

Automotive Powertrain Concentration: (12)
To earn a Bachelor of Science degree in Mechanical Engineering with an automotive powertrain concentration, students must complete requirements 1., 2., 3.a., 3.b., and 3.d. above and the following:

All of the following: (9)
ME 422 Intro to Combustion 3
ME 444 Automotive Engines 3
ME 445 Automotive Powertrain Design 3

One of the following: (3)
ME 433 Intro to Computational Fluid Dynamic 3
ME 442 Turbomachinery 3

Cryogenic Engineering Concentration: (12)
To earn a Bachelor of Science degree in Mechanical Engineering with a cryogenic engineering concentration, students must complete requirements 1.,2.,3.a.,3.b.,and 3.d. and the following:

All of the following: (12)
ME 413 Cryogenic Systems Analysis 3
ME 414 Cryogenic Systems Mechanical Design 3
ME 416 Computer Assisted Design of Thermal Systems 3
ME 442 Turbomachinery 3
**Energy Concentration: (12)**
To earn a Bachelor of Science degree in Mechanical Engineering with an energy concentration, students must complete requirements 1., 2., 3.a., 3.b., and 3.d. and the following:

All of the following courses: (6)
- ME 416 Computer Assisted Design of Thermal Systems 3
- ME 417 Design of Alternative Energy Systems 3

Two of the following courses: (6)
- ME 422 Introduction to Combustion 3
- ME 440 Aerospace Propulsion 3
- ME 442 Turbomachinery 3
- ME 444 Automotive Engines 3

**Engineering Mechanics Concentration: (12)**
To earn a Bachelor of Science degree in Mechanical Engineering with an engineering mechanics concentration, students must complete requirements 1., 2., and 3.a., and 3.b. above and the following:

All of the following: (12)
- ME 423 Intermediate Mechanics of Deform Solids 3
- ME 425 Experimental Mechanics 3
- ME 464 Intermediate Dynamics 3
- ME 475 Computer Aided Design of Structures 3

**Global Engineering: (12)**
To earn a Bachelor of Science degree in Mechanical Engineering with a global engineering concentration, students must complete requirements 1., 2., 3.a., and 3.b. above and 12 credits of approved mechanical engineering courses from a MSU co-sponsored Study Abroad institution. At least 3 credits must include a team design project.

**Manufacturing Engineering Concentration: (13)**
To earn a Bachelor of Science degree in Mechanical Engineering with a manufacturing engineering concentration, students must complete requirements 1., 2., 3.a., 3.b., and 3.d. above and the following:

All of the following courses: (7)
- ME 372 Machine Tool Laboratory 1
- ME 477 Manufacturing Processes 3
- ME 478 Product Development 3

Select one of the following courses: (3)
- CHE 472 Composite Materials Processing 3
- ECE 415 Computer Aided Manufacturing 3
- ME 426 Introduction to Composite Materials 3

Select one of the following courses: (3)
- ACC 230 Survey of Accounting Concepts 3
- EC 201 Intro to Microeconomics 3

**Total Credits Required for Degree** 128

The requirements listed apply to students admitted to the major of Mechanical Engineering in the Department of Mechanical Engineering beginning Fall 2019. The Department of Mechanical Engineering (ME) constantly reviews program requirements and reserves the right to make changes as necessary. Consequently, each student is strongly encouraged to consult with their advisor to obtain assistance in planning an appropriate schedule of courses. Students who have questions about Mechanical Engineering should contact the Mechanical Engineering Department Advising Office, 2560 Engineering Building, phone (517) 355-3338.

Some courses may have prerequisites, which are not otherwise required in the program. Students should check course descriptions to ensure they are aware of prerequisites.
Mechanical Engineering

Prerequisite Flowchart

These requirements are effective for students admitted to the Mechanical Engineering major beginning Fall 2019.
### AGRICULTURE AND THE OUTDOORS

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>ABM 100 (3)</td>
<td>Decision-Making in the Agri-Food System</td>
</tr>
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<td>ABM 130 (3)</td>
<td>Farm Management I</td>
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<td>CSUS 250 (3)</td>
<td>Global Issues in Ag &amp; Natural Resources (P-WRA)(F)</td>
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<td>ANS 110 (4)</td>
<td>Introductory Animal Agriculture</td>
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<td>ANS 141L (2)</td>
<td>Draft Horse Basics</td>
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<td>ANS 242 (3)</td>
<td>Intro Horse Mgmt. (F)</td>
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<td>ANS 282 (3)</td>
<td>Companion Animal Biology and Mgmt.</td>
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<td>Intro to Sustainability</td>
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<td>FOR 101 (3)</td>
<td>Michigan's Forests (S)</td>
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<tr>
<td>FOR 110 (1)</td>
<td>Contem. Issues in Forests &amp; Environ. (F)</td>
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<tr>
<td>FOR 204 (4)</td>
<td>Forest Vegetation (F)</td>
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<td>FOR 222 (2)</td>
<td>Forestry Field Methods (F)</td>
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<td>FW 101 (3)</td>
<td>Fundamentals of Fisheries &amp; Wildlife</td>
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<tr>
<td>FW 110 (3)</td>
<td>Conservation &amp; Mgmt. of Marine Res. (S)</td>
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<td>FW 181 (3)</td>
<td>Science, Tech, Environ. &amp; Public Policy (F)</td>
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<td>GEO 206 (3)</td>
<td>Physical Geography</td>
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<tr>
<td>GEO 206L (1)</td>
<td>Physical Geography Lab</td>
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### AGRICULTURE AND THE OUTDOORS CONTINUED...

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<th>Course Code</th>
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<tr>
<td>GEO 215 (3)</td>
<td>Geography of Sports (F odd yrs)</td>
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<tr>
<td>GEO 330 (3)</td>
<td>Geography of the U.S. &amp; Canada</td>
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<tr>
<td>GEO 333 (3)</td>
<td>Geography of MI (S)</td>
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<tr>
<td>GLG 202 (3)</td>
<td>Geology of Michigan (F)</td>
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<td>HRT 100 (3)</td>
<td>Horticulture: Plants &amp; People (S)</td>
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<tr>
<td>HRT 102 (2)</td>
<td>Plants for Food, Fun &amp; Profit (F)</td>
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<tr>
<td>LA 200 (3)</td>
<td>Intro Landscape Architecture (F)</td>
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<tr>
<td>CSUS 276 (3)</td>
<td>Sustain. Our Nat'l Parks &amp; Rec. Lands (S)</td>
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<tr>
<td>CSUS 273 (3)</td>
<td>Intro to Travel &amp; Tourism (S)</td>
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<td>HDFS 238 (3)</td>
<td>Personal Finance</td>
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<td>FIM 220 (3)</td>
<td>Food Product Marketing (S)(P-ABM 100 or Concurrently)</td>
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<td>GEO 113 (3)</td>
<td>Intro to Economic Geography</td>
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<td>HB 100 (2)</td>
<td>Intro to Hospitality Business</td>
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<tr>
<td>HB 105 (2)</td>
<td>Service Mgmt. Principles (R-HB 100 or Concurrently)</td>
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<td>HB 210 (3)</td>
<td>Intro to Casino Industry (F)</td>
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<tr>
<td>HB 237 (3)</td>
<td>Mgt. of Lodging Systems (R-HB 100 or Concurrently)</td>
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<tr>
<td>HB 265 (3)</td>
<td>Food Mgt: Safety &amp; Nutrition (R-HB 100)</td>
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<td>HB 267 (3)</td>
<td>Food &amp; Beverage Mgt. (R-HB 100 or concurrently)</td>
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<td>Intro to Travel &amp; Tourism (S)</td>
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<tr>
<td>PSY 255 (3)</td>
<td>Industrial/Org. Psychology (P-PSY 101)(S)</td>
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### BUSINESS RELATED

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<tr>
<td>ACC 250 (1)</td>
<td>Preparing for an Account. Career</td>
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<tr>
<td>COM 240 (4)</td>
<td>Intro to Org. Communication</td>
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<td>EC 201 (3)</td>
<td>Intro to Microeconomics</td>
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<td>LS 250 (1)</td>
<td>Intro to Travel &amp; Tourism (S)</td>
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<tr>
<td>PSY 270 (3)</td>
<td>Community Psychology (P-PSY 101)(F)</td>
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<tr>
<td>SOC 215 (3)</td>
<td>Race &amp; Ethnicity</td>
</tr>
<tr>
<td>SOC 241 (3)</td>
<td>Social Psychology</td>
</tr>
<tr>
<td>SSC 293 (3)</td>
<td>Asian Pacific American Studies (S)</td>
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<tr>
<td>SW 200 (3)</td>
<td>Intro to Social Work</td>
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<tr>
<td>UP 201 (4)</td>
<td>Role of Planning in Urban &amp; Regional Devel.</td>
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### THE COMMUNITY

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<tr>
<td>CJ 110 (3)</td>
<td>Introduction to Criminal Justice</td>
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<td>CSUS 276 (3)</td>
<td>Sustaining our National Parks &amp; Rec. Lands</td>
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<td>PSY 270 (3)</td>
<td>Community Psychology (P-PSY 101)(F)</td>
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<td>SOC 215 (3)</td>
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<td>LIN 225 (3)</td>
<td>Language &amp; Gender</td>
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<td>MI 101 (3)</td>
<td>Understanding Media</td>
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<td>Intro to Media &amp; Info Tech.</td>
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<td>WRA 260 (3)</td>
<td>Rhetoric, Persuasion, &amp; Culture (P-WRA)(F)</td>
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<td>THR 110 (3)</td>
<td>Theatrical Play Analysis</td>
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<td>THR 111 (3)</td>
<td>Intro to Tech Theatre</td>
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<td>Intro to Tech Theatre Lab (lecture &amp; lab taken concurrent)</td>
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<td>HEALTH AND RECREATION</td>
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<td>Oral Language Development</td>
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<td>FW 101 (3)</td>
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<td>LA 200 (3)</td>
<td>GEO 333 (3)</td>
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<th><strong>FINE ARTS AND APPLIED ARTS</strong></th>
<th><strong>THE HUMANITIES</strong></th>
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<tbody>
<tr>
<td>HA 101 (3) Western Art: Paleolithic to Medieval Era (F)</td>
<td>AL 200 (3) Cultural Difference &amp; Study Abroad (F)</td>
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<td>HA 102 (3) Western Art: Renaissance to Contemp. (S)</td>
<td>AL 200 (2) Navigating Another Culture</td>
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<td>HA 230 (3) Renaissance &amp; Baroque Art (F)</td>
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<td>HA 240 (3) Modern Art</td>
<td>ENG 140 (4) Literature &amp; Society</td>
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<td>HA 250 (3) American Art (S)</td>
<td>ENG 142 (4) Intro to Popular Literary Genres</td>
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<td>HA 260 (3) East Asian Art (S)</td>
<td>ENG 226 (3) Intro to Creative Writing (P-WRA)</td>
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<td>HA 271 (3) African Art (S)</td>
<td>PH 101 (1) Intro to Philosophy</td>
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<td>IDES 152 (4) Interior Environments (F)</td>
<td>PH 130 (3) Logic and Reasoning</td>
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<td>IDES 240 (3) Comp.-Aided Design for Designers (F)</td>
<td>PH 211 (3) Modern Philosophy (R-PHL 210) (S)</td>
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<td>LA 200 (3) Intro to Landscape Architecture (F)</td>
<td>REL 101 (3) Exploring Religion</td>
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<td>MUS 116 (1) Campus Band</td>
<td>REL 150 (3) Intro to Biblical Literature (F)</td>
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<td>MUS 125 (1) MSU Glee Club, Men &amp; Women</td>
<td>REL 175 (3) Religion in Film (S)</td>
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<td>MUS 145 (1) Instruction in Voice I (non major sect. only)</td>
<td>REL 220 (3) Religion in America</td>
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<td>MUS 175 (2) Understanding Music</td>
<td>REL 185 (F) Intro to Religion and Non-Profits</td>
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<td>MUS 177 (2) Principles of School Music I</td>
<td>RUS 231 (3) 19th Century Russian Lit. in Translation (F)</td>
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<td>MUS 178 (2) Music Theory for Non Music Majors I (S)</td>
<td>RUS 232 (3) 20th Century Russian Lit. in Translation (S)</td>
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<td>STA 110 (3) Drawing</td>
<td>LIN 200 (3) Intro to Language</td>
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<td>STA 113 (3) Color &amp; Design</td>
<td>LIN 225 (3) Language &amp; Gender (Interdepartmental w/ WS)</td>
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<td>STA 114 (3) 3-D Form</td>
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<td>THR 101 (3) Acting</td>
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<th><strong>THE INDIVIDUAL &amp; FAMILY</strong></th>
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<tr>
<td>CEP 260 (3) Dynamics of Personal Adjustment</td>
<td>ANR 250 (3) Global Issues in Ag &amp; Natural Resources (P-WRA) (F)</td>
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<td>EAD 315 (3) Student Leadership Training</td>
<td>ANP 270 (3) Women &amp; Health: Anthr. &amp; Int'l Perspectives (F)</td>
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<td>HDFS 145 (3) The Individual, Marriage &amp; the Family</td>
<td>LIN 225 (3) Language &amp; Gender</td>
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<td>HDFS 211 (3) Child Growth &amp; Development</td>
<td>WS 201 (3) Intro to Women's &amp; Gender Studies</td>
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<td>HDFS 212 (3) Children, Youth &amp; Family</td>
<td>WS 202 (3) Intro Cont. Feminisms (P-WS 201 or Program Approval)</td>
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<td>HDFS 225 (3) Lifespan Human Development in the Family</td>
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<td>PSY 236 (3) Personality (P-PSY 101)</td>
<td>ANP 270 (3) Women &amp; Health: Anthropological &amp; Int'l Perspectives (F)</td>
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<td>PSY 244 (3) Dev. Psychology: Infant Through Child (P-PSY 101)</td>
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<td>PSY 280 (3) Abnormal Psychology (P-PSY 101)</td>
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<td>FW 101 (3) Fundamentals of Fish &amp; Wildlife</td>
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<td>SW 200 (3) Intro to Social Work</td>
<td>GEO 333 (3) Geography of Michigan (R-WRA)(S)</td>
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<td>ANP 270 (3) Women &amp; Health: Anthr. &amp; Int'l Perspectives (F)</td>
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<td>ENG 140 (4) Literature &amp; Society</td>
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<td>AFR African</td>
<td>MUS 114 (1) Marching Band (F)</td>
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<td>Chichewa Somali</td>
<td>MUS 115 (1) Spartan Brass (S)</td>
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<td>Hausa Swahili</td>
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<td>Igbo Twi</td>
<td>MUS 118 (1) Wind Symphony</td>
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<td>MUS 123 (1) Collegiate Choir</td>
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<td>Zulu KiKongo</td>
<td>MUS 125 (1) Glee Club, Men &amp; Women</td>
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<td>Mandinka Amharic</td>
<td>MUS 119 (1) Symphony Band</td>
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<td>Shona Bamana</td>
<td>MUS 120 (1) Symphony Orchestra</td>
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<td>Pulaar Lusoga</td>
<td>MUS 124 (1) Choral Union</td>
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<td>Mende</td>
<td>MUS 126 (1) State Singers</td>
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<td>ARB Arabic</td>
<td>MUS 127 (1) University Chorale</td>
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<td>CHS Chinese</td>
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<td>FRN French</td>
<td>MUS 131 (1) Jazz Combo</td>
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<td>HEB Hebrew</td>
<td>MUS 116 (1) Campus Band</td>
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<tr>
<td>ITL Italian</td>
<td>MUS 122 (1) Concert Orchestra</td>
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<tr>
<td>JPN Japanese</td>
<td>MUS 129 (1) Percussion Ensemble</td>
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<td>MUS 145 (1) Class Instruction in Voice I</td>
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<td>Thai Hindi</td>
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<td>MUS 152N (1) Strings for Non-Music Majors</td>
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<td>CJ 210 (3) Intro to Forensic Science</td>
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<td>R-background in General Chem &amp; Bio)(F)</td>
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<td>TE 150 (3) Reflections in Learning</td>
<td>CSS 120 (3) Current Issues in ANR</td>
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<td>TE 201 (3) Current Issues in Education</td>
<td>CSS 124 (1) Intro to Sustainable Ag Food Systems</td>
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<tr>
<td>TE 250 (3) Human Diversity, Power &amp; Opportunity in Social Institutions</td>
<td>CSS 151 (2) Seed &amp; Grain Quality (S)</td>
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<td>CSS 202 (2) The World of Turf</td>
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<td>AE 151 (2) Fabrication Technology</td>
<td>CSS 202L (1) The World of Turf Lab (P-CSS 202 or Conc.)</td>
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<td>AE 153 (3) Engine &amp; Equipment Technology (S)</td>
<td>CSS 222 (2) New Horizons in Biotechnology</td>
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<td>AS 111 (1) Foundation of the U.S. Air Force (F)</td>
<td>CSS 294 (1) Issues in International Ag (P- WRA) (S)</td>
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<td>AS 111L (1) USAF Foundation Lab (Coreq-AS 111)(F)</td>
<td>FSC 211 (3) Principles of Food Science (F)</td>
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<td>AS 112 (1) Foundation of the US Air Force II (S)</td>
<td>GEO 203 (3) Intro to Meteorology</td>
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<td>AS 112L (1) USAF Foundation Lab (Coreq-AS 112)(S)</td>
<td>GEO 206 (3) Physical Geography</td>
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<td>AS 211 (1) Evolution of USAF Air &amp; Space Power I (F)</td>
<td>GEO 206L (1) Physical Geo Lab (P-GEO 206 or conc.)</td>
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<td>AS 212 (1) Evolution of USAF Air &amp; Space Power II (S)</td>
<td>PSY 209 (3) Brain &amp; Behavior (P-PSY 101)</td>
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<td>EAD 315 (3) Student Leadership Training</td>
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<td>MS 110 (1-2) Army Lead &amp; Officer Dev. (F)(R- MS 110)</td>
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<td>MS 120 (1-2) Intro to Army Lead &amp; Problem Solving (S)</td>
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<td>UGS 101 (1) Freshmen Seminar</td>
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<td>VM 101 (1) Veterinary Medicine in Society (S)</td>
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<td>SOCIAL SCIENCES</td>
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<td>ANP 200 (2) Navigating Another Culture</td>
<td>CJ 210 (3) Intro to Forensic Science</td>
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<td>ANP 201 (3) Sociocultural Diversity</td>
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<td>ANP 220 (3) Gender Relations in Comp. Perpsective (S)</td>
<td>Chemistry &amp; Biology (F)</td>
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<td>ANP 203 (3) Introduction to Archaeology</td>
<td>CMP 101 (2) Princ. of Building Construction Mgmt (F)</td>
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<td>ANP 270 (3) Women &amp; Health: Anthro &amp; Int'l Persp. (F)</td>
<td>CMP 124 (3) Res. Construction Materials &amp; Methods</td>
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<td>CJ 110 (3) Intro to Criminal Justice</td>
<td>(R-CMP 101)</td>
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<td>HDFS 145 (3) The Individual, Marriage &amp; the Family</td>
<td>GEO 221 (3) Intro to Geographic Info</td>
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<td>HDFS 211 (3) Child Growth &amp; Development</td>
<td>IDES 240 (3) Computer-Aided Design for Designers (F)</td>
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<td>HDFS 212 (3) Children, Youth &amp; Family</td>
<td>MSE 200 (2) Materils &amp; Society (R-HS Phys &amp; Chem)(F)</td>
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<td>HDFS 225 (3) Ecology of Lifespan Human Development</td>
<td>PKG 101 (3) Principles of Packaging</td>
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<td>GEO 113 (3) Intro to Economic Geography</td>
<td>MI 291 (3) Special Topics</td>
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<td>GEO 151 (3) Human Geo Geography</td>
<td>EGR 291 (1) Selected Topics</td>
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<td>GEO 204 (3) World Regional Geography</td>
<td>ECE 101 (1) Intro to Electrical &amp; Computer Engineering</td>
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<td>HST 140 (4) World History to 1500 (F)</td>
<td>CSS 222 (2) New Horizons in Biotechnology</td>
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<td>HST 150 (4) World History since 1500 (S)</td>
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<td>HST 160 (4) Intro to Asian History and Culture (S)</td>
<td>KIN 101A (1) Swimming I</td>
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<td>HST 201 (3) Historical Methods &amp; Skills</td>
<td>KIN 101M (1) Great Lakes Sailing</td>
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<td>HST 202 (4) US History to 1876</td>
<td>KIN 101N (1) Intro to Aquatic Paddle Sports</td>
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<td>HST 203 (4) US History Since 1876</td>
<td>KIN 101T (1) Scuba Diving I</td>
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<td>HST 205 (4) Ancient Med. and the Medieval World (F)</td>
<td>KIN 101U (1) Sailing</td>
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<td>HST 206 (4) European History Since 1500 (S)</td>
<td>KIN 102A (1) Judo I</td>
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<td>PLS 100 (3) Intro to American National Government</td>
<td>KIN 102C (1) Karate I</td>
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<td>PLS 140 (3) Government &amp; Politics of the World</td>
<td>KIN 102K (1) Tae Kwon Do I</td>
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<td>PLS 160 (3) Intro to International Relations</td>
<td>KIN 102M (1) Kendo I</td>
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<td>PLS 170 (3) Intro to Political Philosophy</td>
<td>KIN 103A (1) Aerobic Exercise I</td>
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<td>PLS 200 (4) Intro to Political Science (F)</td>
<td>KIN 103C (1) Aerobic Exercise, Low Impact</td>
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<td>PSY 101 (4) Intro to Psychology</td>
<td>KIN 103D (1) General Conditioning I</td>
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<td>PSY 200 (3) Cognitive Psychology (P-PSY 101)</td>
<td>KIN 103G (1) Power Walking</td>
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<td>KIN 103R (1) Weight Training I</td>
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<td>PSY 235 (3) Social Psychology (P-PSY 101)</td>
<td>KIN 103S (1) Swim Conditioning</td>
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<td>PSY 236 (3) Personality (P-PSY 101)(S)</td>
<td>KIN 103T (1) Distance Running</td>
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<td>PSY 244 (3) Developmental Psyc (P-PSY 101)</td>
<td>KIN 103U (1) Step Aerobics</td>
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<td>PSY 255 (3) Industrial &amp; Organizational Psychology</td>
<td>KIN 103V (1) Boxing Conditioning</td>
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<td>PSY 270 (3) Community Psychology (P-PSY 101) (F)</td>
<td>KIN 106C (1) Bowling I</td>
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<td>PSY 280 (3) Abnormal Psychology (P-PSY 101)</td>
<td>KIN 106E (1) Golf I</td>
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<td>PSY 320 (3) Health Psychology (P-PSY 101)(S)</td>
<td>KIN 106S (1) Archery</td>
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<td>SO 100 (4) Intro to Sociology</td>
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<td>KIN 107B (1) Raquetball I</td>
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<td>SO 215 (3) Race &amp; Ethnicity</td>
<td>KIN 107E (1) Tennis I</td>
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<td>SO 216 (3) Sex &amp; Gender</td>
<td>KIN 107E (1) Basketball I</td>
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<td>SO 241 (3) Social Psychology</td>
<td>KIN 108C (1) Ice Hockey I</td>
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<td>SSC 293 (3) Intro to Asian Pacific American Studies (S)</td>
<td>KIN 108F (1) Soccer I</td>
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<td>SW 200 (3) Intro to Social Work</td>
<td>KIN 108K (1) Volleyball I</td>
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<td>UP 201 (4) Role of Planning in Urban &amp; Regional Dev.</td>
<td>KIN 108P (1) Softball I</td>
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<td>KIN 108R (1) Soccer, Indoor</td>
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<td>KIN 108W (1) Wheelchair Basketball</td>
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