Oh, the things you will do!

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
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<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  
  - **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

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>
<td>1</td>
<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.

* CE 151 – Fall Only
* CE 152 – Spring Only
* CE 351 – Fall Only
* CE 352 – Spring Only
* CE 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

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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,
Automotive 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 Entrepreneurship</td>
<td>ANP 201: Intro to Cultural 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 Justice</td>
</tr>
<tr>
<td>ISP 203A: Global Change</td>
<td>CJ 220: Criminology</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 Tech</td>
<td>Micro/Macroeconomics</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](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](egr.msu.edu/academics/multi-disciplinary)

Requirements for the Minor in Energy can be found at
[reg.msu.edu/AcademicPrograms/ProgramDetail.aspx?Program=8075](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](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></th>
<th>Fall Credits</th>
<th>Spring Credits</th>
<th>Summer Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>WRA 101</td>
<td>4</td>
<td>MTH 103B</td>
<td>3</td>
</tr>
<tr>
<td>ISS 2XX</td>
<td>4</td>
<td>Elective</td>
<td>3</td>
</tr>
<tr>
<td>MTH 103A</td>
<td>3</td>
<td>Bioscience</td>
<td>3</td>
</tr>
<tr>
<td>Elective (EGR 160 or MSE 200)</td>
<td>2</td>
<td>IAH 201-210</td>
<td>4</td>
</tr>
<tr>
<td>Elective (EGR 291)</td>
<td>1</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>
</tr>
</tbody>
</table>

### MTH 103A placement, second year

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

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

<table>
<thead>
<tr>
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<th>Spring</th>
<th>Credits</th>
<th>Summer</th>
<th>Credits</th>
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<tbody>
<tr>
<td>MTH 133</td>
<td>4</td>
<td></td>
<td>MTH 234</td>
<td>4</td>
<td></td>
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</tr>
<tr>
<td>PHY 183</td>
<td>4</td>
<td></td>
<td>PHY 184</td>
<td>4</td>
<td></td>
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</tr>
<tr>
<td>EGR 102</td>
<td>2</td>
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<td>ISS 3XX</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
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<td>Major course</td>
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<tr>
<td><strong>Total</strong></td>
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<td><strong>Total</strong></td>
<td><strong>15-16</strong></td>
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### MTH 116, placement, first year

<table>
<thead>
<tr>
<th></th>
<th>Fall</th>
<th>Credits</th>
<th>Spring</th>
<th>Credits</th>
<th>Summer</th>
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</thead>
<tbody>
<tr>
<td>ISS 2XX</td>
<td>4</td>
<td></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></td>
<td>MTH 132</td>
<td>3</td>
<td>OR</td>
<td></td>
</tr>
<tr>
<td>CEM 161</td>
<td>1</td>
<td></td>
<td>Bioscience</td>
<td>3</td>
<td>PHY 183</td>
<td>4</td>
</tr>
<tr>
<td>MTH 116</td>
<td>5</td>
<td></td>
<td>WRA 101</td>
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<td></td>
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<tr>
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<td><strong>Total</strong></td>
<td><strong>12-13</strong></td>
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<td><strong>Total</strong></td>
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### MTH 116, 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>
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<tbody>
<tr>
<td>MTH 234</td>
<td>4</td>
<td></td>
<td>MTH 235</td>
<td>3</td>
<td></td>
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</tr>
<tr>
<td>PHY 183</td>
<td>4</td>
<td></td>
<td>PHY 184</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IAH 201-210</td>
<td>4</td>
<td></td>
<td>ISS 3XX</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Major course</td>
<td>3-4</td>
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<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></td>
<td><strong>Total</strong></td>
<td><strong>14-15</strong></td>
<td></td>
<td><strong>Total</strong></td>
</tr>
</tbody>
</table>
### MTH 132 or higher 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>EGR 100</td>
<td>2</td>
<td>EGR 102</td>
<td>2</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>
</tr>
<tr>
<td>CEM 161</td>
<td>1</td>
<td>PHY 183</td>
<td>4</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>
</tr>
<tr>
<td>ISS 2XX</td>
<td>4</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>14</strong></td>
<td><strong>Total</strong></td>
<td><strong>Total</strong></td>
</tr>
</tbody>
</table>

### MTH 132 or higher 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 184</td>
<td>4</td>
<td>Bioscience</td>
<td>3</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>13-15</strong></td>
<td><strong>Total</strong></td>
<td><strong>Total</strong></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 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

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

LET US HELP YOU!

The Center SPARTAN ENGINEERING

C108 Wilson Hall
517-355-5163
careers@egr.msu.edu
www.egr.msu.edu/careers/

@MSUEngineers
@MSUEngineer
@MSUEngineers

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
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.

Explore majors and career paths
Sign up for workshops and events
Learn about career fairs
Connect with employers
Find job and internship opportunities
Search career resources

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

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

Note: Google Chrome is the recommended browser
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**

**ITALY**
CEA Rome
Rome, Italy
Late May - Late June
Course: CSE 231 & IAH 211A
Priority Deadline: February 1

John Cabot University
Rome, Italy
Session I: Mid May - Late June
Courses: CHE 201 & ITL 101 (no pre-req)
Session II: Early July - Early August
Option 1: ME 222 & ITL 101 (no pre-req)
Option 2: ME 201 & ITL 101 (no pre-req)
Option 3: IAH 211+ & ITL 101 (no pre-req)
Deadline: March 1

**SPAIN**
Summer Engineering in Madrid
Madrid, Spain
Late June - Early August
Courses: ME 222 & SPN 290 (no pre-req)
Deadline: March 1

**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
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:

______________________________________________________________________________________________________  
______________________________________________________________________________________________________  
______________________________________________________________________________________________________  
______________________________________________________________________________________________________  
______________________________________________________________________________________________________  

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?

______________________________________________________________________________________________________
______________________________________________________________________________________________________
______________________________________________________________________________________________________
______________________________________________________________________________________________________
______________________________________________________________________________________________________
______________________________________________________________________________________________________
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 greater
   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.

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

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 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
<table>
<thead>
<tr>
<th>Media and Information: (18)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>MI 101 Understanding Media and Information 3</td>
<td></td>
</tr>
<tr>
<td>MI 201 Media &amp; Information Technologies &amp; Industries 3</td>
<td></td>
</tr>
<tr>
<td>MI 302 Networks, Markets and Society 3</td>
<td></td>
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<tr>
<td>MI 305 Media and Information Policy 3</td>
<td></td>
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<tr>
<td>MI 361 IT Network Management &amp; Security 3</td>
<td></td>
</tr>
<tr>
<td>MI 488 Information &amp; Communication Technology Development Project (W) 3</td>
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</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Supply Chain Management: (15)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>FI 320 Introduction to Finance 3</td>
<td></td>
</tr>
<tr>
<td>MKT 327 Introduction to Marketing 3</td>
<td></td>
</tr>
<tr>
<td>SCM 303 Introduction to Supply Chain Mgt 3</td>
<td></td>
</tr>
<tr>
<td>SCM 371 Procurement &amp; Supply Management 3</td>
<td></td>
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<tr>
<td>SCM 372 Manufacturing Planning and Control 3</td>
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</tbody>
</table>

Note: Suggested Elective SCM 373

<table>
<thead>
<tr>
<th>Packaging: (17)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>CEM 143 Survey of Organic Chemistry 4</td>
<td></td>
</tr>
<tr>
<td>PKG 101 Principles of Packaging 3</td>
<td></td>
</tr>
<tr>
<td>PKG 221 Packaging with Glass and Metal 2</td>
<td></td>
</tr>
<tr>
<td>PKG 322 Packaging with Paper and Paperboard 4</td>
<td></td>
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<tr>
<td>PKG 323 Packaging with Plastics 4</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Technical Sales: (18)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>COM 360 Advanced Sales Communication 3</td>
<td></td>
</tr>
<tr>
<td>**COM 483 Practicum in Sales Communication 1</td>
<td></td>
</tr>
<tr>
<td>FI 320 Introduction to Finance 3</td>
<td></td>
</tr>
<tr>
<td>MKT 313 Personal Selling and Buying Processes 3</td>
<td></td>
</tr>
<tr>
<td>MKT 327 Introduction to Marketing 3</td>
<td></td>
</tr>
<tr>
<td>MKT 383 Sales Management 3</td>
<td></td>
</tr>
<tr>
<td>SCM 474 Negotiations 2</td>
<td></td>
</tr>
</tbody>
</table>

**Requires a sales-based internship**

<table>
<thead>
<tr>
<th>Other Electives (Variable)</th>
<th></th>
</tr>
</thead>
</table>

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:
Applied Engineering Sciences

Prerequisite Flowchart

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

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

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
   *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: (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 Farraill 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.

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”

Last Revised: 02/05/19
## Chemical 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 > 8
- Integrative Studies in Social Sciences (ISS) 8
- ISS 2XX and ISS 3XX 3
- Bioscience: BS 161 Cell and Molecular Biology 3

### 2. College Requirements: (30)
- CEM 152 Principles of Chemistry 4
- 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

### 3. Major Requirements: (67-69)
#### a. Complete all of the following courses: (61)
- 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 an area of concentration in the degree. 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 Chemical 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: (16-17)  

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

All of the following courses: (10)  
CHE 481  Biochemical Engineering  3  
MMG 409  Eukaryotic Cell Biology  3  
PSL 431  Human Physiology I  4  

One of the following courses: (3)  
CHE 883  Multidisciplinary Bioprocessing Laboratory  3  
ME 494  Biofluid Mechanics and Heat Transfer  3  
MSE 425  Biomaterials and Biocompatibility  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:

<table>
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<tr>
<th>All of the following courses: (9)</th>
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<tbody>
<tr>
<td>CE 221 Statics</td>
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<td>CHE 472 Composite Materials Processing</td>
</tr>
<tr>
<td>ME 222 Mechanics of Deformable Solids</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Two of the following courses: (6-7)</th>
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<tbody>
<tr>
<td>CHE 871 Materials Surfaces and Interfaces</td>
</tr>
<tr>
<td>CHE 872 Polymers &amp; Composites: Mfg, Strc &amp; Prfrmnce</td>
</tr>
<tr>
<td>MSE 370 Synthesis and Processing of Materials</td>
</tr>
<tr>
<td>MSE 426 Introduction to Composite Materials</td>
</tr>
<tr>
<td>PKG 323 Packaging with Plastics</td>
</tr>
</tbody>
</table>

**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.
Chemical Engineering
Prerequisite Flowchart

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

FRESHMAN YEAR

FALL Term 1
- CEM 161 - 1
  Cem Lab I
- CEM 151 - 4
  Gen Cem
- MTH 132 - 3
  Calc I
- ISS 2XX – 4
  *Div- N, I or D

SPRING Term 2
- CEM 162 - 1
  Cem Lab II
- CEM 152 - 3
  Princips of Cem
- EGR 100 - 2
  Intro Engr Design
- EGR 102 - 2
  Intro Engr Model
- WRA 101 - 4
  Univ Writing


SOPHOMORE YEAR

FALL Term 3
- CEM 351 - 3
  Organic Cem I
- BS 161 - 3
  Cell & Molecular Biology
- CHE 201 - 3
  Mat & Energy Bal

SPRING Term 4
- CEM 352 - 3
  Organic Cem II
- CEM 355 - 2
  Organic Lab I
- CHE 301 - 1
  Chem Engr Prof
- MTH 232 - 3
  Multivar Calc
- PHY 183 - 4
  Physics I
- PHY 184 - 4
  Physics II
- Elective - 2
  2 crs of Gen Elecs

JUNIOR YEAR

FALL Term 5
- CHE 311 - 3
  Fluid Flow & Heat Transfer
- CHE 302 - 4
  Chem Engr Prof
- CHE 312 - 4
  Mass Tms & Sep
- BMB 401 - 4
  Basic Biochem

SPRING Term 6
- CEM 355 - 3
  Organic Cem II
- CEM 356 - 3
  Organic Cem III
- CHE 312 - 4
  Lab Prac & Stat Analysis
- CHE 312 - 4
  Lab Prac & Stat Analysis
- CHE 430 - 4
  Process Design & Opt I
- CHE 431 - 4
  Cem Reac Engr
- Elective - 2
  2 crs of Gen Elecs
- IAH 201-210 - 4
  *Div- N, I or D

SENIOR YEAR

FALL Term 7
- CHE 317 - 4
  Process Control
- CHE 317 - 4
  Process Control
- CHE 312 - 4
  Mass Tms & Sep
- CHE 317 - 4
  Process Control
- CHE 312 - 4
  Mass Tms & Sep
- Elective - 3
  3 crs of Gen Elecs
- IAH 211 or > - 4
  *Div- N, I or D

SPRING Term 8
- CHE 432 - 3
  Process Control
- CHE 432 - 3
  Process Control
- Elective - 3
  3 crs of Gen Elecs
- IAH 211 or > - 4
  *Div- N, I or D

LEGEND
- Prerequisite
- Prerequisite or Concurrent
- "P:" Prerequisite
- * Div: 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
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): 3-4
      BS 161, ENT 205, IBIO 150, MMG 141,
      MMG 201, PLB 105, PSL 250

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: (67-68)
   a. Complete all of the following courses: (40)
      CE 221 Statics 3
      CE 273 Civil & Environmental Engineering Measurements 2
      CE 274 Graphics for Civil & Environmental Engineers 1
      CE 305 Introduction to Structural Analysis 3
      CE 312 Soil Mechanics 4
      CE 321 Introduction to Fluid Mechanics (W) 4
      CE 337 Civil Engineering Materials 4
      CE 341 Transportation Engineering (W) 3
      CE 371 Sustainable Civil & Environmental Egr Systems 3
      CE 372 Risk Analysis in Civil & Environmental Eng 2
      CE 495 Senior Design in Civil & Environmental Eng 4
      CEM 161 Chemistry Laboratory I 1
      ENE 280 Principles of Environmental Eng & Science 3
      ME 222 Mechanics of Deformable Solids 3

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

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

d. Complete one of the following courses: (3)
   BE 351 Thermodynamics for Biological Engineering 3
   ECE 345 Electronic Instrumentation and Systems 3
   ME 201 Thermodynamics 3
   MSE 250 Materials 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 483 Water & Wastewater Engineering 4
   ENE 489 Air Pollution: Science & Engineering 3

   Geotechnical
   CE 418 Geotechnical Engineering 3

   Pavements
   CE 431 Pavement Design and Analysis I 3

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

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

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

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

   Other Electives (Variable)

Total Credits Required for Degree 128

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.
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 >
   - Integrative Studies in Social Sciences (ISS) 8
   - ISS 2XX and ISS 3XX
   - Bioscience (See 3A Below)

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
   *College Admission Requirement

3. Major Requirements: (59-62)
   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, & the 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

   **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)
      - ***CMSE 401 Methods for Parallel Computing 4
      - CMSE 402 Visualization of Scientific Datasets 3
      - 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
      - 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.
Computational Data Science

Requirements and Program Flow

These requirements are effective for students admitted to the Computational Data Science 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"
# Computer Engineering

Accredited by the Engineering Accreditation Commission of ABET, [www.abet.org](http://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 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
        - ECE 442 Intro to Communication Networks 3
        - CSE 425 Intro to Computer Security 3
        - 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:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANTR 350</td>
<td>Human Gross Anatomy for Pre-Health Professionals</td>
<td>3</td>
</tr>
<tr>
<td>BS 161</td>
<td>Cell and Molecular Biology</td>
<td>3</td>
</tr>
<tr>
<td>PSL 250</td>
<td>Introductory Physiology</td>
<td>4</td>
</tr>
<tr>
<td>PSL 310</td>
<td>Physiology for Pre-Health Professionals</td>
<td>4</td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BE 444</td>
<td>Biosensors for Medical Diagnostics</td>
<td>3</td>
</tr>
<tr>
<td>ECE 445</td>
<td>Biomedical Instrumentation</td>
<td>3</td>
</tr>
<tr>
<td>ECE 446</td>
<td>Biomedical Signal Processing</td>
<td>3</td>
</tr>
<tr>
<td>ECE 447</td>
<td>Introduction to Biomedical Imaging</td>
<td>3</td>
</tr>
<tr>
<td>ECE 448</td>
<td>Modeling and Analysis of Bioelectrical Systems</td>
<td>3</td>
</tr>
<tr>
<td>ECE 449</td>
<td>Fundamentals of Acoustics</td>
<td>3</td>
</tr>
</tbody>
</table>

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
- MTH 132 - 3
  Calc I
- PHY 183 - 4
  Physics I
- WRA 101 - 4
  Univ Writing

SPRING Term 2
- CSE 231 - 4
  Intro to Progr I
- 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
- MTH 133 - 4
  Calc II
- MTH 234 - 4
  Multivar Calc
- PHY 184 - 4
  Physics II

Sophomore Year

FALL Term 3
- CSE 232 - 4
  Intro to Progr II
- CSE 260 - 4
  Disc Str in Cmp Sc
- ECE 201 - 3
  Circuits & Syst I
- ECE 202 - 3
  Circuits & Syst II
- ECE 203 - 1
  Elec Crc & Sys Lab
- ECE 280 - 3
  Elec Engr Analy
- EGR 100 - 2
  Intro Engr Design
- MTH 235 - 3
  Diff Equations
- MTH 234 - 4
  Calc II
- MTH 235 - 3
  Diff Equations
- MTH 236 - 4
  Intro to Signal Processing
- PHYS 183 - 4
  Physics I
- PHYS 184 - 4
  Physics II
- PHYS 185 - 4
  Physics III
- PHYS 186 - 4
  Physics IV

SPRING Term 4
- CSE 260 - 4
  Disc Str in Cmp Sc
- CSE 260 - 4
  Disc Str in Cmp Sc
- ECE 203 - 1
  Elec Crc & Sys Lab
- ECE 202 - 3
  Circuits & Syst II
- ECE 280 - 3
  Elec Engr Analy
- EGR 100 - 2
  Intro Engr Design
- MTH 235 - 3
  Diff Equations
- MTH 236 - 4
  Intro to Signal Processing
- PHYS 183 - 4
  Physics I
- PHYS 184 - 4
  Physics II
- PHYS 185 - 4
  Physics III
- PHYS 186 - 4
  Physics IV

Junior Year

FALL Term 5
- CSE 260 - 4
  Disc Str in Cmp Sc
- CSE 260 - 4
  Disc Str in Cmp Sc
- ECE 203 - 1
  Elec Crc & Sys Lab
- ECE 202 - 3
  Circuits & Syst II
- ECE 280 - 3
  Elec Engr Analy
- EGR 100 - 2
  Intro Engr Design
- MTH 235 - 3
  Diff Equations
- MTH 236 - 4
  Intro to Signal Processing
- PHYS 183 - 4
  Physics I
- PHYS 184 - 4
  Physics II
- PHYS 185 - 4
  Physics III
- PHYS 186 - 4
  Physics IV

SPRING Term 6
- CSE 260 - 4
  Disc Str in Cmp Sc
- CSE 260 - 4
  Disc Str in Cmp Sc
- ECE 203 - 1
  Elec Crc & Sys Lab
- ECE 202 - 3
  Circuits & Syst II
- ECE 280 - 3
  Elec Engr Analy
- EGR 100 - 2
  Intro Engr Design
- MTH 235 - 3
  Diff Equations
- MTH 236 - 4
  Intro to Signal Processing
- PHYS 183 - 4
  Physics I
- PHYS 184 - 4
  Physics II
- PHYS 185 - 4
  Physics III
- PHYS 186 - 4
  Physics IV

Senior Year

FALL Term 7
- CSE 260 - 4
  Disc Str in Cmp Sc
- CSE 260 - 4
  Disc Str in Cmp Sc
- ECE 203 - 1
  Elec Crc & Sys Lab
- ECE 202 - 3
  Circuits & Syst II
- ECE 280 - 3
  Elec Engr Analy
- EGR 100 - 2
  Intro Engr Design
- MTH 235 - 3
  Diff Equations
- MTH 236 - 4
  Intro to Signal Processing
- PHYS 183 - 4
  Physics I
- PHYS 184 - 4
  Physics II
- PHYS 185 - 4
  Physics III
- PHYS 186 - 4
  Physics IV

SPRING Term 8
- CSE 260 - 4
  Disc Str in Cmp Sc
- CSE 260 - 4
  Disc Str in Cmp Sc
- ECE 203 - 1
  Elec Crc & Sys Lab
- ECE 202 - 3
  Circuits & Syst II
- ECE 280 - 3
  Elec Engr Analy
- EGR 100 - 2
  Intro Engr Design
- MTH 235 - 3
  Diff Equations
- MTH 236 - 4
  Intro to Signal Processing
- PHYS 183 - 4
  Physics I
- PHYS 184 - 4
  Physics II
- PHYS 185 - 4
  Physics III
- PHYS 186 - 4
  Physics IV

LEGAL
- 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”

Elective - 3 crs of Gen Elecs

Prerequisite Flowchart

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
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 488 Collaborative Design (W) 4
      STT 351 Probability and Statistics for Engineering 3
      CSE 482 Big Data Analysis 3
      CSE 491 Numerical Analysis I 3

   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
EGR 100 - 2 Intro Engr Design
CSE 231 - 4 Intro to Progr I
MTH 132 - 3 Calc I
MTH 133 - 4 Calc II

SPRING Term 2
CSE 232 - 4 Intro to Progr II
CSE 260 - 4 Disc Strn Cmp Sc

SOPHOMORE YEAR
FALL Term 3
CSE 335 - 4 Obj-Orien Soft Des
CSE 320 - 3 Comp Org & Arch
MTH 234 - 4 Multivar Calc

SPRING Term 4
CSE 331 - 3 Alg & Data Struct
STT 351 - 3 Prob & Stat Engr

JUNIOR YEAR
FALL Term 5
CSE 325 - 3 Computer Systems
Major Elect - 3 Choose 1 400-level CSE course from approved list

SPRING Term 6
CSE 498 - 4 Collaborative Design (W)
(Also has a prerequisite of 1 of several 400-level CSE courses - See MSU Course Descriptions)

SENIOR YEAR
FALL Term 7
Cognate OR Elective - 3

SPRING Term 8
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
   PHYS 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 Electrical 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
   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

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Wilson Hall, 219 Wilson Hall, Room C101, East Lansing MI 48825 | (517) 355-6616
http://www.egr.msu.edu/undergraduate/academic/degree-programs
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:

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Last revised February 2019
Electrical Engineering

Prerequisite Flowchart

These requirements are effective for students admitted to the Electrical Engineering major beginning Fall 2019.
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
   *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: (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
      GLG 421 Environmental Geochemistry 4
      IBIO 303 Oceanography 4
      IBIO 353 Marine Biology (W) 4
      IBIO 355 Ecology 3
      IBIO 446 Environmental Issues and Public Policy 3
      ISS 310 People and Environment (I) 4

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.
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)

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

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)

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 Metalurgy 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 Metalurgy of Ferrous and Alumn 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 Prncpls in Polymers & 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.
Materials Science and Engineering

Prerequisite Flowchart

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

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**FRESHMAN YEAR**

**FALL Term 1**
- CEM 161 - 1 Cem Lab I
- Elective - 1 1 cr Gen Elecs

**SPRING Term 2**
- CEM 151 - 4 Gen Cem
- CEM 152 - 3 Princips of Cem
- EGR 100 - 2 Intro Engr Desgn
- EGR 102 - 2 Intro Engr Model

**FALL Term 3**
- MTH 132 - 3 Calc I
- MTH 133 - 4 Calc II

**SPRING Term 4**
- PHYS 183 - 4 Physics I
- ISS 2XX - 4 *Div- N, I or D

**SOPHOMORE YEAR**

**FALL Term 5**
- MSE 250 - 3 Maths Sci & Engr
- Bioscience - ¾ From approved list

**SPRING Term 6**
- MSE 260 - 3 Properties Of Materials
- ME 221 - 3 Statics
- ME 222 - 3 Mech of Defrm Sol
- PHY 184 - 4 Physics II
- STT 351 - 3 Prob & Stat Engr

**JUNIOR YEAR**

**FALL Term 7**
- MSE 290 - 3 Phase Eq in Matls
- MSE 310 - 3 Fund of Microstructural Desgn
- MSE 311 - 2 Matls Char Meth I

**SPRING Term 8**
- MSE 320 - 3 Mechanical Prop of Matls
- MSE 331 - 2 Matls Char Meth II
- MSE 360 - 3 Fund of Microstructural Desgn
- MSE 370 - 3 Syn Proc of Matls
- MSE 381 - 2 Matls Char Meth II

**SENIOR YEAR**

**FALL Term 9**
- Elective - 4 4 crs Gen Elecs

**SPRING Term 10**
- MSE 466 - 3 Des & Failure Analysis (W)
- MSE 460 - 3 Elect Engr
- MSE 465 - 3 Elect Engr
- MSE 467 - 3 Elect Engr

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**LEGEND**

- **Prerequisites**
- **Prerequisite or Concurrent**
- **P:** Prerequisite
- **Div:** 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)

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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

   d. 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

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

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

Computational Design Concentration: (12)
To earn a 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. above and the following:

All of the following: (12)
- ME 416  Computer Assisted Design of Thermal Systems 3
- ME 433  Intro Computational Fluid Dynamics 3
- ME 465  Computer Aided Optimal Design 3
- ME 475  Computer Aided Design of Structures 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. above 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  Intermed 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.

Last Revised February 2019
Mechanical Engineering

Prerequisite Flowchart

These requirements are effective for students admitted to the Mechanical 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"

Senior Elective - 3
From approved list

Senior Elective - 3
From approved list

Senior Elective - 3
From approved list

Michigan State University | College of Engineering | Engineering Undergraduate Studies
Wilson Hall, 219 Wilson Road, Room C101, East Lansing MI 48825 | (517) 355-6616
http://www.egr.msu.edu/undergraduate/academic/degree-programs

Last Revised: 02/05/19
<table>
<thead>
<tr>
<th>Subject</th>
<th>Course Code</th>
<th>Course Title</th>
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<tr>
<td>ABM 100 (3)</td>
<td>Decision-Making in the Agri-Food System</td>
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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>CSS 101 (3)</td>
<td>Intro to Crop Science</td>
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<td>CSS 120 (3)</td>
<td>Agricultural Industry Issues (F)</td>
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<td>CSS 124 (1)</td>
<td>Intro to Sustainable Ag &amp; Food Systems</td>
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<td>CSS 151 (2)</td>
<td>Seed and Grain Quality (S)</td>
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<td>CSS 201 (3)</td>
<td>Forage Crops (F)</td>
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<td>CSS 202 (2)</td>
<td>World of Turf</td>
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<td>Fund. of Soil Science (R-CEM 141)</td>
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<td>CSS 294 (1)</td>
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<td>Fundamentals of Fisheries &amp; Wildlife</td>
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<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>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>
<td>Race &amp; Ethnicity</td>
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<td>SOC 241 (3)</td>
<td>Social Psychology</td>
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<td>Role of Planning in Urban &amp; Regional Devel.</td>
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<td>Geography of Sports (F odd yrs)</td>
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<td>GEO 330 (3)</td>
<td>Geography of the U.S. &amp; Canada</td>
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<td>Horticulture: Plants &amp; People (S)</td>
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<td>Plants for Food, Fun &amp; Profit (F)</td>
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<td>ACC 250 (1)</td>
<td>Preparing for an Account. Career</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>Service Mgmt. Principles (R-HB 100 or Concurrently)</td>
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<td>HB 265 (3)</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>PSY 255 (3)</td>
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<td>ADV 205 (3)</td>
<td>Principles of Advertising</td>
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<td>Principles of Public Relations</td>
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<td>COM 100 (3)</td>
<td>Human Communication</td>
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<td>World of Media</td>
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<td>JRN 218 (3)</td>
<td>Sports Media (P-WRA) (F)</td>
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<td>LIN 200 (3)</td>
<td>Intro to Language</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>MI 201 (3)</td>
<td>Intro to Media &amp; Info Tech. (MI 101 or CSE 231 concurrently)</td>
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<td>THE ENVIRONMENT</td>
<td>GENDER ISSUES</td>
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<td>ANP 220 (3) Gender Rel. in Comp. Perspective (S)</td>
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<td>EGR 291 (1) Selected Topics</td>
<td>ANP 270 (3) Women &amp; Health: Anthr. &amp; Int'l Perspectives (F)</td>
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<td>LIN 225 (3) Language &amp; Gender</td>
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<td>CSUS 265 (3) Exploring the Environ. &amp; Sustain. Using Film (R-WRA) (S)</td>
<td>WS 201 (3) Intro to Women's &amp; Gender Studies</td>
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<td>FW 110 (3) Conservation &amp; Mgmt. of Marine Res. (S)</td>
<td>WS 202 (3) Intro Cont. Feminisms (P-WS 201 or Program Approval)</td>
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<td>FW 181 (3) Intro to Science, Tech, Environ. &amp; Public Policy (F)</td>
<td>WS 203 (3) Intro to Methods for WS Research (P-WRA)(F)</td>
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<td>ANP 270 (3) Women &amp; Health: Anthropological &amp; Int'l Perspectives (F)</td>
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<td>CEP 261 (3) Substance Abuse</td>
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<td>CSD 333 (3) Oral Language Development</td>
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<td>FW 101 (3) Fundamentals of Fish &amp; Wildlife</td>
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<td>GEO 333 (3) Geography of Michigan (R-WRA)(S)</td>
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<th>FINE ARTS AND APPLIED ARTS</th>
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<td>HA 101 (3) Western Art: Paleolithic to Medieval Era (F)</td>
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<td>HA 102 (3) Western Art: Renaissance to Contemp. (S)</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>
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<td>HA 250 (3) American Art (S)</td>
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<td>HA 260 (3) East Asian Art (S)</td>
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<td>HA 271 (3) African Art (S)</td>
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<td>IDES 152 (4) Interior Environments (F)</td>
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<td>IDES 240 (3) Comp.-Aided Design for Designers (F)</td>
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<td>MUS 116 (1) Campus Band</td>
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<td>MUS 125 (1) MSU Glee Club, Men &amp; Women</td>
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<td>MUS 145 (1) Instruction in Voice I (non major sect. only)</td>
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<td>MUS 175 (2) Understanding Music</td>
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<td>MUS 177 (2) Principles of School Music I</td>
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<td>MUS 178 (2) Music Theory for Non Music Majors I (S)</td>
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<td>STA 110 (3) Drawing I</td>
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<td>STA 113 (3) Color &amp; Design</td>
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<td>ANP 200 (2) Navigating Another Culture</td>
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<td>ENG 140 (4) Literature &amp; Society</td>
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<td>ENG 226 (3) Intro to Creative Writing (P-WRA)</td>
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<td>EAD 315 (3) Student Leadership Training</td>
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<td>HDFS 145 (3) The Individual, Marriage &amp; the Family</td>
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<td>HDFS 211 (3) Child Growth &amp; Development</td>
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<td>TEACHING/LEARNING</td>
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<td>TE 150 (3) Reflections in Learning</td>
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<td>TE 250 (3) Human Diversity, Power &amp; Opportunity in Social Institutions</td>
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<td>R-background in General Chem &amp; Bio(F)</td>
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<td>AS 211 (1) Evolution of USAF Air &amp; Space Power I (F)</td>
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<td>AS 212 (1) Evolution of USAF Air &amp; Space Power II (S)</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>
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<td>ANP 201 (3) Sociocultural Diversity</td>
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<td>Int'l Persp. (F)</td>
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<td>CJ 110 (3) Intro to Criminal Justice</td>
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<td>HDFS 211 (3) Child Growth &amp; Development</td>
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<td>HDFS 212 (3) Children, Youth &amp; Family</td>
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<td>HDFS 225 (3) Ecology of Lifespan Human</td>
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<td>Development</td>
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<td>GEO 151 (3) Human Geo Geography</td>
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<td>GEO 204 (3) World Regional Geography</td>
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