College of Engineering
Undergraduate
Student Handbook
2018-2019
Oh, the things you will do!

**Cornerstone Design**  
Internships

**National Competitions**  
**CAPSTONE DESIGN**  
Co-op employment

**Student Organizations**  
**Residential Experience**

**ACADEMICS**

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

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

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

Making your plan starts today at your Academic Orientation Program (AOP) 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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<thead>
<tr>
<th>Office/Department</th>
<th>Location</th>
<th>Phone #</th>
<th>Website</th>
</tr>
</thead>
<tbody>
<tr>
<td>College of Engineering Academic Advising</td>
<td>250 Hannah Admin. Bldg.</td>
<td>517-355-6616 ext. 3</td>
<td>egr.msu.edu/undergraduate/academic/advisors</td>
</tr>
<tr>
<td>Admissions</td>
<td>1855 Place</td>
<td>517-355-5832</td>
<td>admissions.msu.edu</td>
</tr>
<tr>
<td>Campus Living Resources</td>
<td>185 Chemistry</td>
<td>517-355-9715</td>
<td>chemistry.msu.edu</td>
</tr>
<tr>
<td>Chemistry Department</td>
<td></td>
<td>517-355-6616 ext. 2</td>
<td>egr.msu.edu/core/</td>
</tr>
<tr>
<td>CoRe Experience</td>
<td></td>
<td>517-355-6616 ext. 3</td>
<td>egr.msu.edu/academic/advisors</td>
</tr>
<tr>
<td>Counseling &amp; Psychiatric Services</td>
<td></td>
<td>517-355-5830</td>
<td>caps.msu.edu</td>
</tr>
<tr>
<td>Diversity Programs Office (DPO)</td>
<td></td>
<td>517-355-8310</td>
<td>egr.msu.edu/dpo</td>
</tr>
<tr>
<td>English Language Center (ELC)</td>
<td></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>517-353-3560</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</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></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>
2018 - 2019 Academic Calendar
For a complete listing of important dates, please visit the registrar’s website at reg.msu.edu/ROInfo/Calendar/academic.asp

Fall 2018

August 25    New Freshmen and Transfer students attending an AUGUST orientation can move into residence halls beginning at 8 am
August 26    New Freshmen and Transfer students who attended JUNE or JULY orientation can move into residence halls beginning at 8 am
August 29    Classes begin, Monday schedule is observed
September 3  Labor Day- University closed
September 5  **End of open add period; 8PM**
September 24 **End of tuition refund period**
October 17   **Middle of Semester, LAST day to drop classes with no grade reported; 8PM**
November 22-23  Thanksgiving holiday- University closed
December 7    End of classes for Fall Semester
December 7    Engineering Design Day
December 10-14 Final exams

Spring 2019

January 7   Classes begin
**January 11**  **End of open add period; 8PM**
January 21  Martin Luther King, Jr. Day, no classes, university remains open
**February 1**  **End of tuition refund period**
**February 27**  **Middle of Semester, LAST day to drop classes with no grade reported; 8PM**
March 4-8    Spring break
April 26    Classes end
April 26    Engineering Design Day
April 29-May 3  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.

Walk-in advising is available for first year students:
- Mondays & Wednesdays: 1-4pm
- Tuesdays & Thursdays: 10am-12pm and 1-4pm

Schedule an appointment online at msu.campus.eab.com

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

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 and schedule of courses 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

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

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
Admission to the College of Engineering

In order to enroll in 300 & 400 level engineering courses, students must be admitted to the college. Students in declared engineering majors are reviewed automatically every semester until they reach 56 credits and are admitted once they have:

- completed the required courses
- earned at least 28 college credits after matriculating at MSU (AP and Dual Enrollment do not count towards this)
- declared a degree-granting Engineering major (*No-Preference is not a degree-granting major*)
- 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

In some cases, an application to the college may be necessary.

- For engineering students with a high number of AP/transfer credits: If core courses are not completed prior to reaching 56 credits, you will have to temporarily change your major out of engineering
- Juniors and seniors who have a declared major outside of engineering
- An already admitted student who wishes to change to another engineering major

Applications available from the 3\textsuperscript{rd}-15\textsuperscript{th} weeks of each semester at: egr.msu.edu/undergraduate/academic/admission-engineering

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 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**)

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

- Mechanical Engineering – 3.1
- Applied Engineering Sciences – 3.0
- Biosystems, Chemical, Civil, 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 the grade you received to get your points. Then, divide your total points by your total credits to get your cumulative GPA. Example:

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

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

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

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

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
<th>Multiply</th>
<th>Grade Rec'd.</th>
<th>Equals</th>
<th>Points</th>
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</thead>
<tbody>
<tr>
<td>ENT 205</td>
<td>3</td>
<td>x</td>
<td>2.5</td>
<td>=</td>
<td>7.5</td>
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<tr>
<td>CEM 141</td>
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<td>3.0</td>
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<tr>
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<td>x</td>
<td>4.0</td>
<td>=</td>
<td>4.0</td>
</tr>
<tr>
<td>MTH 132</td>
<td>3</td>
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<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>
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</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 students)
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** (after 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.
- 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 CSE majors) are required to complete at least one introductory course in general chemistry, usually taken during the freshman year.

CEM 141  – General Chemistry

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

Special Note for Chemical Engineering and Materials Science and Engineering Majors, please keep in mind these courses are only offered once a year.

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

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

**PHY 231** and **PHY 232** are not calculus-based, and by themselves do **not** fulfill the College
of Engineering Physics requirements. If you have test/dual enrollment credit for these, you
will also need the “bridge” courses for the calculus components.
PHY 231 + PHY 233B = PHY 183
PHY 232 + PHY 234B = PHY 184

3. Major Requirements

Major requirements differ across the 10 majors. Specific courses can be found on the
curriculum guides in the back half of this handbook, or at
[egr.msu.edu/undergraduate/academic/degree-programs](http://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. See page 58 of this book for suggestions.

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,
avtomotive safety equipment, robotics for telemedicine, heart valves, left ventricle assist
devices, and the whole range of medical devices. Research by biomechanical engineers
includes studying the strength of bones and soft tissues, the motion of cells, the kinematics
of human motion, and the flow of blood.

Notes
Environmental Engineering at Michigan State

What are Environmental and Ecosystems Engineers?
Environmental and ecosystems engineers integrate physical, chemical, biological, mathematical, and engineering principles to address environmental problems. They advance fundamental understanding of human impacts on the environment and the environment's response to these impacts.
Examples of engineering for the environment:

- water and wastewater treatment
- treatment and prevention of diffuse source pollution
- industrial pollution control
- groundwater and hazardous waste site remediation
- constructed wetlands and vegetative buffers
- green process engineering
- air pollution monitoring, control, and permitting
- ecosystems restoration and adaptation to climate change impacts
- conversion of waste to resources

Where is Environmental and Ecosystems Engineering at MSU?

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

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

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

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

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

<table>
<thead>
<tr>
<th>Entrepreneurship and Innovation</th>
<th>Diversity and Global Studies</th>
</tr>
</thead>
<tbody>
<tr>
<td>BUS 190: The Art of Starting</td>
<td>AAAS 100: Race and Community</td>
</tr>
<tr>
<td>CAS 114: Creativity and Entrepreneurship</td>
<td>ANP 201: Intro to Cultural Anthropology</td>
</tr>
<tr>
<td><strong>Psychology</strong></td>
<td><strong>Math</strong></td>
</tr>
<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>
<tr>
<td><strong>Environment/ Sustainability</strong></td>
<td><strong>Criminal Justice</strong></td>
</tr>
<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>
<tr>
<td><strong>Media and Information</strong></td>
<td><strong>Business</strong></td>
</tr>
<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>
<tr>
<td></td>
<td>ACC 230: Survey of Accounting</td>
</tr>
</tbody>
</table>

Notes
Additional Minors

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

The College of Engineering offers 3 minors:

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

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

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

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

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

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

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

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

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

### MTH 103A placement, first year

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

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

<table>
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<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>WRA 101</td>
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<td>CEM 141</td>
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<td>MTH 132</td>
<td>3</td>
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<tr>
<td>MTH 103</td>
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<td>CEM 161</td>
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<tr>
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<td>4</td>
<td>MTH 114</td>
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<tr>
<td>Bioscience</td>
<td>3-4</td>
<td>IAH 201-210</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>EGR 100 or Elective</td>
<td>2-3</td>
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<td></td>
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<td><strong>Total</strong></td>
<td><strong>14-15</strong></td>
<td><strong>Total</strong></td>
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### MTH 103 placement, second year

<table>
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<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>
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<td>MTH 234</td>
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<tr>
<td>PHY 183</td>
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<td>PHY 184</td>
<td>4</td>
<td></td>
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</tr>
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<td>Major course</td>
<td>3-4</td>
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</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>13-14</strong></td>
<td><strong>Total</strong></td>
<td><strong>15-16</strong></td>
<td><strong>Total</strong></td>
<td><strong>Total</strong></td>
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### MTH 116, placement, first year

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

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

<table>
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<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>
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<td></td>
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<tr>
<td><strong>Total</strong></td>
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<td><strong>Total</strong></td>
<td>14</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>
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<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>
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<tr>
<td>Major course</td>
<td>3-4</td>
<td>Major course</td>
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<tr>
<td><strong>Total</strong></td>
<td>15-16</td>
<td><strong>Total</strong></td>
<td>13-15</td>
<td><strong>Total</strong></td>
<td><strong>Total</strong></td>
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</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, Promotions Coordinator
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:
Teresa VanderSloot, Director of Women in Engineering for Recruiting and Outreach
Judy Cordes, Director of Women in Engineering for Student Success

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
- Employer Connections
NOTES:
The requirements listed apply to students admitted to the major of Computer Engineering beginning Fall, 2018. 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.

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. The concentration will be noted on the student's transcript.

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

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

2. Complete 6 credits from the following courses:
   - ECE 445 Biomedical Instrumentation
   - ECE 446 Biomedical Signal Processing
   - ECE 447 Introduction to Biomedical Imaging
   - ECE 448 Modeling and Analysis of Bioelectrical Systems
   - ECE 449 Fundamentals of Acoustics

3. Complete 3 credits from the following courses:
   - BE 444 Biosensors for Medical Diagnostics
   - ME 494 Biofluid Mechanics and Heat Transfer
   - ME 495 Tissue Mechanics
   - MSE 425 Biomaterials and Biocompatibility

A 400-level listed above or other approved Electrical and Computer Engineering (ECE) courses with biomedical engineering content as approved by the student's advisor. The course used to fulfill this requirement may not be used to fulfill concentration requirement 1. or 2.
Handshake is your one stop shop for all things career related. It allows you to easily:
- 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

1. 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.

2. 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.

3. 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.

4. 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!

5. 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
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 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 1108 Engineering Building, or call us at (517) 432-2012.

Education Abroad Staff -
Maggie Blair-Ramsey, Education Abroad Coordinator
### Summer Options

**John Cabot University**  
Rome, Italy  
Mid May - Late June or Late June - Early August  
Courses: MTH 132; ME 201; ME 222; ISS 320 or IAH 209/221A

**CEA Paris: Engineering in Paris**  
Paris, France  
Late May - Early July  
Courses: MTH 234; MTH 235; CE 221; ISS 3XX

**École Catholique d'Arts et Métiers**  
Lyon, France  
Early June - Mid July  
Courses: ME 201; FRN GCU

**University College Dublin: Summer Physics**  
Dublin, Ireland  
Late June - Early August  
Courses: PHY 183, 191; PHY 184, 192

**Summer Engineering in Madrid**  
Madrid, Spain  
Early July - Early August  
Courses: ECE 201; SPN 290 (no pre-req)

**Pentatech: 5 Trending Technologies**  
Madrid, Spain  
Early July - Early August  
Courses: ME 222; EGR 291; SPN 290 (no pre-req)

**Hong Kong University of Science and Technology (HKUST)**  
Hong Kong, China  
Mid June - Mid August  
Courses: MTH 235; PHY 184; IAH 211B or ISS 330B

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### Fall or Spring Options

**University of New South Wales**  
Sydney, Australia  
Courses:  
Fall: MTH 132, 133, 235; PHY 183, 184; STT 315, 351; MSE 250; CSE 231; CHE 201; EC 202; ISS 3XX; IAH 211+
Spring: MTH 132, 234; PHY 183, 184; STT 315; CSE 231; ME 201; ME 222; BS 161; EC 202; ISS 3XX; IAH 211+

**Hong Kong University of Science and Technology (HKUST)**  
Hong Kong, China  
Courses:  
Fall: MTH 133, 234, 235; PHY 183, 184; CSE 231, 232; ME 201; CE 221; MSE 250; EC 202; STT 315; IAH 211+; ISS 3XX; BS 161
Spring: MTH 133, 234; PHY 183, 184; STT 315; CSE 231, 232; CE 221; ME 222; EC 202; IAH 211+; ISS 3XX

**Technical University of Denmark**  
Lyngeby, Denmark  
Courses:  
Spring: MSE 250; ECE 201; PHY 183; STT 351; BS 161; SCM 303; MKT 327

**Monash University**  
Melbourne, Australia  
Courses:  
Fall: MTH 132, 234, 235; ME 201; CSE 231; EC 201, 202; CHE 201; STT 351; IAH 211+; ISS 3XX
Spring: MTH 132, 234; PHY 183, 184; ME 201; ME 222; MSE 250; CSE 231; EC 201, 202; STT 351; IAH 211+; ISS 3XX

*Note: The courses shown are courses that have been taken on programs in the past or could be taken in the future. Students need to check with their advisers to make sure courses are offered and equivalent.*
**Education Abroad 101**

EA101 sessions provide an overview about education abroad at Michigan State. Topics covered include using the online program search, navigating the application process, finding funding opportunities and more.

**ONLINE:** educationabroad.msu.edu/EA101
**GROUP PRESENTATION:** Every Friday at 2:00 pm in the EA Advising Center (International Center Room 108)
**INDIVIDUAL SESSION:** By appointment, email abroad@msu.edu to schedule

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**Can I afford to study abroad?**

There are a variety of ways students can finance their education abroad program.

**Scholarships:**
Students are highly encouraged to apply for scholarships through the Office for Education Abroad, the College of Engineering, and other sources.

*For Engineering specific scholarships, visit: https://www.egr.msu.edu/study-abroad/scholarships*

**Financial Aid:**
Students can use financial aid to help pay for their programs. Students who complete a FAFSA for the term they will be abroad, should be able to use the financial aid to fund their programs.

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**Do I need a passport and visa?**

**Passport:** All students studying abroad must have a passport to participate on a program.

**Visa:** Whether or not a visa is required depends on the country and the length of the program. Students are responsible for determining if a visa is required for their program.

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**Do I need a foreign language?**

Although studying abroad is a great way to improve language proficiency, knowing a foreign language is NOT a requirement on all programs.

To determine if a program has a language requirement, check in the description found in the MSU EA online program search.

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**Can international students study abroad?**

International students and resident aliens are welcome to participate on education abroad programs at MSU. Students must apply for and obtain a visa for their intended program as soon as possible.

For more information visit:
**educationabroad.msu.edu**

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**How is health and safety addressed?**

The Office for Education Abroad works with the Office of International Health and Safety (OIHS) to oversee health, safety, security of students while they are participating on education abroad programs.

OIHS supports MSU students by:

- Offering a 24/7 International Emergency Assistance Line: +1 (517) 353-3784
- Monitoring international events and global public health concerns
- Collaborating with the Office for Education Abroad to offer comprehensive pre-departure orientation to program participants
- Coordinating international health and political unrest/natural disaster evacuation insurance
- Providing specialized training to Education Abroad Program Directors and Assistants.

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**#SPARTANSABROAD**

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**MICHIGAN STATE UNIVERSITY**

**College of Engineering**

Maggie Blair-Ramsey
blairram@egr.msu.edu
Engineering Building, Room 1108D
(517) 432-2012

**MICHIGAN STATE UNIVERSITY**

**Education Abroad**

abroad@msu.edu
International Center, Room 108
(517) 353-8922
What are the engineering disciplines?

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

**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 (CpS) ~ cse.msu.edu**
Software design & development; databases, graphics, webpages, & networks
Work in: cyber security, artificial intelligence, information technology, consulting, project management, & marketing

**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
**AOP Enrollment Preparation**

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

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

**What was your spatial skills assessment score?** _____/30

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 page 58, 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 page 4 in handbook.*

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

____________________________________________________________________________________________________

____________________________________________________________________________________________________

____________________________________________________________________________________________________

____________________________________________________________________________________________________
The information listed here is current as of Fall 2018.

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

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

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

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

3. Major Requirements: (61-64)
   a. Complete all of the following courses: (43)
      ACC 230 Survey of Accounting Concepts 3
      CE 221 Statics 3
      CEM 161 Chemistry Laboratory I 1
      EC 201 Introduction to Microeconomics 3
      EC 202 Introduction to Macroeconomics 3
      ECE 345 Electronic Instrumentation and Systems 3
      ENE 280 Principles of Environ Engr & Science 3
      AESC 210 Global Sys: Econ, Engr, Environment 3
      AESC 310 Sustainable Systems Analysis 3
      AESC 410 Capstone Project Applied Egr Sci (W) 3
      ME 201 Thermodynamics 3
      ME 280 Graphic Communications 2
      MKT 317 Quantitative Bus Research Methods 3
      MSE 250 Materials Science and Engineering 3
      PHY 191 Physics Lab for Scientists I 1
      STT 315 Intro to Prob & Statistics for Business 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: (15-18)
      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
      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)
   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. One of the following courses: (3)
      CSE 320 Computer Organization & Architecture 3
      CSE 331 Algorithms and Data Structures 3
      CSE 335 Object-oriented Software Design 4
   3. One of the following courses: (3)
      CSE 410 Operating Systems 3
      CSE 420 Computer Architecture 3
      CSE 440 Intro to Artificial Intelligence 3
      CSE 471 Media Processing & Multimedia Computing
      CSE 472 Computer Graphics 3
      CSE 476 Mobile Application Development 3
      CSE 477 Web Application Architecture and Development
      CSE 480 Database Systems 3
      CSE 482 Big Data Analysis 3
Courses used to fulfill requirement 2. in this concentration may not include:

- FW 443 Restoration Ecology
- FW 420 Forest Ecology
- FOR 404 Pollutants in the Soil Environment
- CSS 442 Agricultural Ecology
- CSS 360 Soil Biology
- CSS 210 Fundamentals of Soil Science
- MMG 425 Applied Hydraulics
- BE 481 Microbial Ecology
- 1. All of the following courses: (9)

To earn a Bachelor of Science degree in Biosystems Engineering with an Ecosystems Engineering Concentration: (14-15)

- PSL 425 Physiological Biophysics
- PLB 400 Introduction to Bioinformatics
- MSE 425 Biomaterials and Biocompatibility
- ME 494 Biofluid Mechanics and Heat Transfer
- ECE 445 Biomedical Instrumentation
- BLD 450 Eukaryotic Pathogens
- BLD 430 BLD 204

2. One of the following courses: (3)

3. Two of the following: (5-6)

- PSL 425**COM 483
- Note: Suggested Elective SCM 373

Other Electives (Variable)

Total Credits Required for Degree 120

The requirements listed above apply to students admitted to the major of Applied Engineering Sciences in the Engineering Undergraduate Studies Office (UGS) beginning Fall, 2018. 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 his/her adviser 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:

_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________

**Requires a sales-based internship

Last revised May 2018
Applied Engineering Sciences

Prerequisite Flowchart

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

**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”*
# Biosystems Engineering

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

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

2. **College Requirements:** (30) *College Admission Requirement
   - *CEM 141 General Chemistry 4
   - *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 191 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)
     - BLD 450 Eukaryotic Pathogens 3
     - 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 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
     - 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 Bioprocess Engineering Concentration: (15-17)

To earn a Bachelor of Science degree in Biosystems Engineering with a bioenergy and bioprocess 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):
   - BE 457 Bioenergy Feedstock Systems Analysis 3
   - 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

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[32]
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)
   BLD 450 Eukaryotic Pathogens 3
   PSL 425 Physiological Biophysics 3

3. Two of the following: (5-6)
   BLD 204 Mechanisms of Disease 3
   BLD 430 Molecular Laboratory Diagnostics 2
   BLD 434 Clinical Immunology 3
   BLD 450 Eukaryotic Pathogens 3
   ECE 445 Biomedical Instrumentation 3
   ME 494 Biofluid Mechanics and Heat Transfer 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 404 Forest Ecology 3
   FW 417 Wetland Ecology and Management 3
   FW 420 Stream Ecology 3
   FW 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 2016. 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 his/her advisor to obtain assistance in planning an appropriate schedule of courses. Students who have questions about Biosystems Engineering should contact the Biosystems Engineering Advising Office, 103 B Farrall Hall, phone (517) 884-8796. For scheduling academic advising appointments visit: https://msu.campus.eab.com

Last revised May 2018
Biosystems Engineering

Prerequisite Flowchart

These requirements are effective for students admitted to the Biosystems Engineering major beginning Fall 2016.

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: 05/04/18
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 >
   - Integrative Studies in Social Sciences (ISS) 8
   - ISS 2XX and ISS 3XX
   - Bioscience: BS 161 Cell and Molecular Biology 3

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

3. Major Requirements: (67-69)
a. Complete all of the following courses: (51)
   - CEM 152 Principles of Chemistry 3
   - CEM 161 Chemistry Laboratory I 1
   - CEM 162 Chemistry Laboratory II 1
   - CEM 351 Organic Chemistry I 3
   - CEM 352 Organic Chemistry II 3
   - CEM 355 Organic Laboratory I 2
   - CHE 201 Material and Energy Balances 3
   - CHE 210 Modeling and Analysis of Transport Phenomena 3
   - CHE 301 Chemical Engineering as a Profession 1
   - CHE 311 Fluid Flow and Heat Transfer 3
   - CHE 312 Mass Transfer and Separations 4
   - CHE 316 Lab Practice and Statistical Analysis (W) 4
   - CHE 321 Thermodynamics for Chemical Engineering 4
   - CHE 431 Chemical Reaction Engineering 4
   - CHE 432 Process Analysis and Control 3
   - CHE 433 Process Design and Optimization I (W) 4
   - CHE 434 Process Design and Optimization II 2
   - CHE 473 Chemical Engineering Principles in Polymers & Materials Systems 3

b. One of the following groups: (4-6)
   **Group 1**
   - BMB 401 Comprehensive Biochemistry 4

   **Group 2**
   - BMB 461 Advanced Biochemistry I 3
   - BMB 462 Advanced Biochemistry II 3

c. Select one of the following courses: (3)
   - CHE 472 Composite Materials Processing 3
   - CHE 481 Biochemical Engineering 3

d. Select one of the following courses: (3)
   - CEM 483 Quantum Chemistry 3
   - CEM 484 Molecular Thermodynamics 3

4. 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 49 0) 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
EEP 255 Ecological Economics 3
EEP 320 Environmental Economics 3
EEP 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>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CE 221</td>
<td>Statics</td>
<td>3</td>
</tr>
<tr>
<td>CHE 472</td>
<td>Composite Materials Processing</td>
<td>3</td>
</tr>
<tr>
<td>ME 222</td>
<td>Mechanics of Deformable Solids</td>
<td>3</td>
</tr>
</tbody>
</table>

**Two of the following courses: (6-7)**

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHE 871</td>
<td>Materials Surfaces and Interfaces</td>
<td>3</td>
</tr>
<tr>
<td>CHE 872</td>
<td>Polymers &amp; Composites: Mfg, Strc &amp; Prfrmnce</td>
<td>3</td>
</tr>
<tr>
<td>MSE 370</td>
<td>Synthesis and Processing of Materials</td>
<td>3</td>
</tr>
<tr>
<td>MSE 426</td>
<td>Introduction to Composite Materials</td>
<td>3</td>
</tr>
<tr>
<td>PKG 323</td>
<td>Packaging with Plastics</td>
<td>4</td>
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</tbody>
</table>

**Other Electives for Degree (Variable)**

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Credits Required for Degree</td>
<td>128</td>
</tr>
</tbody>
</table>

These requirements are effective for students admitted to the Chemical Engineering major beginning Fall 2017. 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 his/her 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, 3512 Engineering Building, 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 2017.
## 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*
  OR
- *CEM 151 General and Descriptive Chemistry 4*
- *EGR 100 Introduction to Engineering Design 2*
- *EGR 102 Introduction to Engineering Modeling 2*
- *MTH 132 Calculus I 3*
- *MTH 133 Calculus II 4*
- MTH 234 Multivariable Calculus 4
- MTH 235 Differential Equations 3
- *PHY 183 Physics for Scientists & Engineers I 4*
- PHY 184 Physics for Scientists & Engineers II 4
- "College Admission Requirement"

### 3. Major Requirements: (67)

#### a. Complete all of the following courses: (43)

- 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 Engineering 2
- CE 495 Senior Design in Civil & Environmental Engineering 4
- CEM 161 Chemistry Laboratory I 1
- ENE 280 Principles of Environmental Engineering & Science 3
- GLG 301 Geology of Continents and Oceans 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**

### Last Revised May 2018
Civil Engineering
Prerequisite Flowchart

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

FRESHMAN YEAR

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

SPRING Term 2
- EGR 100 - 2 Intro Engr Design
- EGR 102 - 2 Intro Engr Model
- MTH 132 - 3 Calc I
- MTH 133 - 4 Calc II

SOPHOMORE YEAR

FALL Term 3
- CE 273 - 2 Civil & Environmental Eng Measurements
- CE 274 - 1 Graphics
- MTH 234 - 4 Multivar Calc
- CE 221 - 3 Statics

SPRING Term 4
- ME 222 - 3 Mech of Defm Sci
- MTH 235 - 3 Diff Equations
- GLG 201 - 4 The Dynamic Earth OR GLG 381 - 3 Geo of the Great Lakes Region SS Only (P: PHY 183 & CEM 141 or CEM 151)
- PHY 183 - 4 Physics I

JUNIOR YEAR

FALL Term 5
- Bioscience - 3/4 Choose 1 from approved list
- CE 312 - 4 Soil Mechanics
- CE 337 - 4 Civil Engr Mat'l S

SPRING Term 6
- CE 305 - 3 Intro to Struct Analysis & Design
- CE 312 - 4 Mech of Defm Sci
- CE 337 - 3 Sustainable Sy
- PHY 184 - 4 Physics II

SENIOR YEAR

FALL Term 7
- Design Intensive Tech Elective - 3
- Elective - 3/4 3-4 crs of Gen Elective

SPRING Term 8
- CEM 495 - 4 Senior Design (P: CE 274 & CE 371 & CE 372)
- Elective - 3/4 3-4 crs of Gen Elective

TERM 1
- CEM 161 - 1
- CEM 141 OR CEM 151 - 4
- EGR 100 - 2 Intro Engr Design
- EGR 102 - 2 Intro Engr Model
- MTH 132 - 3 Calc I
- MTH 133 - 4 Calc II

TERM 2
- CE 273 - 2
- CE 274 - 1 Graphics
- ME 222 - 3
- MTH 234 - 4
- GLG 201 - 4
- PHY 183 - 4
- WRA 101 - 4
- ISS 2XX - 4

TERM 3
- CEM Lab I
- EGR 100 or 102
- MTH 132
- ME 222
- GLG 201
- PHY 183
- WRA 101
- ISS 2XX

TERM 4
- CEM 141 or 151
- EGR 102
- MTH 133
- ME 222
- GLG 201
- PHY 183
- WRA 101
- ISS 2XX

TERM 5
- Bioscience
- CE 312
- CE 337
- CE 305
- CE 312
- CE 337
- PHY 184

TERM 6
- Design Intensive Tech Elective
- Elective
- Design Intensive Tech Elective
- Design Intensive Tech Elective
- Design Intensive Tech Elective
- Tech Elective
- Tech Elective
- Tech Elective

TERM 7
- Elective
- Design Intensive Tech Elective

TERM 8
- CEM 495

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: 02/09/18
Computer Engineering
Accredited by the Engineering Accreditation Commission of ABET, www.abet.org

1. University Requirements: (23-24)
   - Writing, Rhetoric and American Cultures (WRA) 4
   - Integrative Studies in Humanities (IAH) 8
   - IAH 201-210 and IAH 211 or >
   - 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: (36)
      - CSE 232 Introduction to Programming II 4
      - CSE 260 Discrete Structures in Computer Sci 4
      - CSE 331 Algorithms and Data Structures 3
      - CSE 410 Operating 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 Electronic Engineering Analysis 3
      - ECE 302 Electronic Circuits 3
      - ECE 303 Electronics Laboratory 1
      - ECE 331 Microprocessors & Digital Systems 4
      - 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: (24)
      Complete 24 credits of electives as specified below. At least 18
credits must be from core and focus track electives combined,
with at least one course with a laboratory. Additional credits to
meet the 24 credit requirement may be taken from other courses
listed below, 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
cooperaativ education or independent study.

1. Core: (6)
   - At least 6 credits from the following:
     - CSE 420 Computer Architecture 3
     - CSE 422 Computer Networks 3
     or
     - ECE 442 Introduction to Communication Networks 3
     - ECE 410 VLSI Design (L) 4
     *Both CSE 422 and ECE 442 may not be used to fulfill this requirement

2. At least 3 credits from the following: (3)
   - ECE 305 Electromagnetic Fields and Waves I 4
   - ECE 313 Control Systems 3
   - ECE 366 Introduction to Signal Processing 3
   Focus Track: (9)
   - At least 9 credits from the following:
     Hardware
     - ECE 402 App of Analog Integrated Circuits (L) 4
     - ECE 411 Electronic Design Automation (L) 4
     - ECE 412 Intro to Mixed-Signal Circuits Design (L) 4
     - ECE 445 Biomedical Instrumentation 3
   Software
     - CSE 335 Object-oriented Software Design 4
     - CSE 450 Translation of Programming Languages 3
     - CSE 471 Media Processing & Multimedia Computing 3
     - ECE 366 Introduction to Signal Processing 3
   Recommended Electives:
     - ECE 305 Electromagnetic Fields & Waves I 4
     - ECE 313 Control Systems 3
     - ECE 404 Radio Frequency Electronic Circuits 4
     - ECE 415 Computer Aided Manufacturing 3
     - ECE 416 Digital Control 3
     - ECE 456 Intro to Communication & Network Security 3
     - ECE 457 Communication Systems 3
     - ECE 458 Communication Systems Laboratory 1
     - ECE 466 Digital Signal Processing & Filter Design 3
     - ECE 474 Principles of Electronics Devices 3

Other Electives (Variable)

Total Credits Required for Degree 128

Last revised May 2018
**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. The concentration will be noted on the student’s transcript.

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

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

2. **Complete 6 credits from the following courses:**
   - ECE 445 Biomedical Instrumentation 3
   - ECE 446 Biomedical Signal Processing 3
   - ECE 447 Introduction to Biomedical Imaging 3
   - ECE 448 Modeling and Analysis of Bioelectrical Systems 3
   - ECE 449 Fundamentals of Acoustics 3

3. **Complete 3 credits from the following courses:**
   - BE 444 Biosensors for Medical Diagnostics 3
   - ME 494 Biofluid Mechanics and Heat Transfer 3
   - ME 495 Tissue Mechanics 3
   - MSE 425 Biomaterials and Biocompatibility 3

A 400-level listed above or other approved Electrical and Computer Engineering (ECE) courses with biomedical engineering content as approved by the student’s advisor. The course used to fulfill this requirement may not be used to fulfill concentration requirement 1. or 2.

The requirements listed apply to students admitted to the major of Computer Engineering beginning Fall, 2018. 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 2018.

**FRESHMAN YEAR**

**FALL**
- Term 1
  - Biocience - 3/4
  - CSM 141 - 4
  - CSM 141 - 4
  - CSM 141 - 4
  - EGR 100 - 2
  - MTH 132 - 3

**SPRING**
- Term 2
  - CSM 231 - 4
  - CSM 232 - 4
  - CSM 232 - 4
  - CSM 232 - 4
  - Intro Prog I
  - Intro Prog II
  - Intro Prog II
  - Intro Prog II
  - Intro Engr Design
  - Calc I

**SOPHOMORE YEAR**

**FALL**
- Term 3
  - CSM 260 - 4
  - CSM 260 - 4
  - CSM 260 - 4
  - CSM 260 - 4
  - Disc Strin Cmp Sc

**SPRING**
- Term 4
  - CSM 331 - 3
  - CSM 331 - 3
  - CSM 331 - 3
  - CSM 331 - 3
  - Alg & Data Struct

**JUNIOR YEAR**

**FALL**
- Term 5
  - CSM 410 - 3
  - CSM 410 - 3
  - CSM 410 - 3
  - CSM 410 - 3
  - Operating Sysms

**SPRING**
- Term 6
  - Core Elect #1 - 3/4
  - Core Elect #1 - 3/4
  - Core Elect #1 - 3/4
  - Core Elect #1 - 3/4
  - Choose 1 from approved list

**SENIOR YEAR**

**FALL**
- Term 7
  - Elective – Var
  - Elective – Var
  - Elective – Var
  - Elective – Var
  - Elective – Var

**SPRING**
- Term 8
  - Expanded Eng Desn
  - Expanded Eng Desn
  - Expanded Eng Desn
  - Expanded Eng Desn
  - Expanded Eng Desn

**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 02/05/18
Computer Science

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

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: (62-64)
   - 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 335 Object-Oriented Software Design 4
      - CSE 410 Operating Systems 3
      - CSE 498 Collaborative Design (W) 4
      - STT 351 Probability and Statistics for Engineering 3

   - c. Select five of the following courses: (15)
      - CSE 402 Biometrics and Pattern Recognition 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 Introduction to Digital Logic Design 3
      - CSE 460 Computer Networks 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 484 Information Retrieval 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 adviser. 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 adviser 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 2018. 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 his/her 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 May 2018

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Computer Science
Requirements and Program Flow

These requirements are effective for students admitted to the Computer Science major beginning Fall 2018.

**FRESHMAN YEAR**

**FALL Term 1**
- **MTH 132 or higher placement**, first year
- **CSE 231 - 4 Intro to Progr I**

**SPRING Term 2**
- **EGR 100 - 2 Intro Engr Desgn**
- **MTH 132 - 3 Calc I**
- **Cognate OR Elective - 4**

**FALL Term 3**
- **CSE 232 - 4 Intro to Progr II**
- **CSE 260 - 4 Disc Str in Cmp Sc**
- **MTH 133 - 4 Calc II**

**SPRING Term 4**
- **CSE 320 - 3 Comp Org & Arch**
- **CSE 232 - 4 Intro to Progr II**
- **CSE 335 - 4 Obj-Orien Soft Des**
- **CSE 324 - 4 Multivar Calc**

**JUNIOR YEAR**

**FALL Term 5**
- **CSE 331 - 3 Alg & Data Struct**
- **CSE 320 - 3 Comp Org & Arch**
- **MTH 234 - 4 Multivar Calc**

**SPRING Term 6**
- **CSE 310 - 3 Operating Systems**
- **STT 351 - 3 Prob & Stat Engr**
- **Cognate OR Elective - 3**

**SENIOR YEAR**

**FALL Term 7**
- **Cognate OR Elective - 3**
- **Major Elect - 3**
- **STT 351 - 3 Prob & Stat Engr**

**SPRING Term 8**
- **Cognate OR Elective - 3**
- **Major Elect - 3**
- **CSE 498 - 4 Collaborative Design (W)**

**Notes**
- *Div: Complete courses in at least 2 out of 3 diversity categories – “N”, “I” or “D”*
- Last Revised: 05/04/18
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 > 8
- Integrative Studies in Social Sciences (ISS) 8
- ISS 2XX and ISS 3XX
- Bioscience (one of the following):
  - BS 161, ENT 205, IBIO 150, MMG 141, MMG 201, PLB 105, PSL 250 3-4

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

3. Major Requirements: (61)

a. Complete one of the following courses: (1)
- CEM 161 Chemistry Laboratory I 1
- PHY 191 Physics Laboratory for Scientists I 1

b. Complete all of the following courses: (35)
- ECE 201 Circuits and Systems I 3
- ECE 202 Circuits and Systems II 3
- ECE 203 Electronic Circuits and Systems Lab 1
- ECE 230 Digital Logic Fundamentals 3
- ECE 280 Electrical Engineering Analysis 3
- ECE 302 Electronic Circuits 3
- ECE 303 Electronics Laboratory 1
- ECE 305 Electromagnetic Fields & Waves I 4
- ECE 313 Control Systems 3
- ECE 320 Energy Conversion & Pwr Electronics 3
- ECE 331 Microprocessors & Digital Systems 4
- ECE 366 Introduction to Signal Processing 3
- ECE 390 Ethics, Professionalism and Contemporary Issues 1

c. Select one of the following courses: (4)
- ECE 480 Senior Design (W) 4
- ECE 489 Independent Senior Design 4

d. Select one of the following courses: (3)
- CE 221 Statics 3
- ME 201 Thermodynamics 3

e. Major Electives: (18)
A minimum of six courses totaling a minimum of 18 credits, of 3- or 4-credits each, selected from at least four different areas. A laboratory course (“L”) must be included. Students may substitute, for one of the six required courses, a 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.

Electromagnetics
- ECE 405 Electromagnetic Fields and Waves II (L) 4
- ECE 407 Electromagnetic Compatibility (L) 4

Power
- ECE 420 Machines and Power Laboratory 1
- ECE 423 Power System Analysis 3
- ECE 425 Solid State Power Conversion 3

Integrated Circuits / VLSI
- ECE 402 Applications of Analog Integrated Circuits (L) 4
- ECE 404 Radio Frequency Electronic Circuits (L) 4
- ECE 410 VLSI Design (L) 4
- ECE 411 Electronic Design Automation (L) 4
- ECE 412 Intro to Mixed-Signal Integrated Circuits (L) 4

Solid-State Electronics / Electro-optics
- ECE 474 Principles of Electronic Devices 3
- ECE 476 Electro-Optics (L) 4
- ECE 477 Microelectronic Fabrication (L) 3

Communications / Signal Processing
- ECE 442 Introduction to Communication Networks 3
- ECE 456 Intro to Communication & Networks Security 3
- ECE 457 Communication Systems 3
- ECE 458 Communication Systems Laboratory 1
- ECE 466 Digital Signal Processing and Filter Design 3

Control / Robotics
- ECE 415 Computer Aided Manufacturing (L) 3
- ECE 416 Digital Control (L) 3

Biomedical Engineering
- ECE 445 Biomedical Instrumentation (L) 3
- ECE 446 Biomedical Signal Processing 3
- ECE 447 Intro to Biomedical Imaging 3
- ECE 448 Modeling & Analysis of Bioelectrical Systems 3
- ECE 449 Fundamentals of Acoustics 3
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 Electrical Engineering. Courses
completed to satisfy requirement 3. above may also be used to
satisfy the requirements of the concentration. The concentration
will be noted on the student’s transcript.

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 Professionals 3
   BS 161 Cells and Molecular Biology 3
   PSL 250 Introductory Physiology 4
   PSL 310 Physiology for Pre-Health Professionals 4

2. Complete 6 credits from the following: (6)
   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

3. Complete 3 credits from the following: (3)
   BE 444 Biosensors for Medical Diagnostics 3
   ME 494 Biofluid Mechanics and Heat Transfer 3
   ME 495 Tissue Mechanics 3
   MSE 425 Biomaterials and Biocompatibility 3
   A 400-level listed above or other approved Electrical and
   Computer Engineering (ECE) courses with biomedical
   engineering content as approved by the student's advisor. The
   course used to fulfill this requirement may not be used to fulfill
   concentration requirement 1. or 2.

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 2018. The Department of Electrical and Computer
Engineering (ECE) constantly reviews program
requirements and reserves the right to make changes as
necessary. Students are encouraged to consult with their
advisor to obtain assistance in planning an appropriate
schedule. Students who have questions about Computer
Engineering should contact the Electrical and Computer
Engineering Department Advising Office, 2212
Engineering Building, phone (517) 355-5242.

NOTES:

Last revised May 2018
### 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 > 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 141 General Chemistry 4*
  - OR
  - *CEM 151 General and Description Chemistry 4*
  - *EGR 102* Introduction to Engineering Design 2
  - *EGR 103* Introduction to Engineering Modeling 2
  - *MTH 132* Calculus I 3
  - *MTH 132* 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 Continents and Oceans 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 his/her 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, 3579 Engineering Building, phone (517) 355-3274. For scheduling academic advising appointments visit: https://msu.campus.eab.com

**Last revised May 2018**
Environmental Engineering

Prerequisite Flowchart

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

**F R E S H M A N    Y E A R**

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

**SPRING Term 2**
- CE 273 - 2 CE/ENE Engr Measurements
- CE 274 - 1 Graphics for CE/ENE Engrs
- EGR 100 - 2 Intro Engr Design
- EGR 102 - 2 Intro Engr Model
- MTH 132 - 3 Calc I
- MTH 133 - 4 Calc II
- PHY 183 - 4 Physics I
- PHY 184 - 4 Physics II
- WRA 101 - 4 Univ Writing

**Term 3**
- Elective - 3 3 crs of Gen Elects
- CEM 142 - 3 OR CEM 152 SS Only Gen Cem/Inorgnc
- MTH 234 - 4 Multivar Calc
- MTH 235 - 3 Diff Equations

**Term 4**
- ENE 280 - 3 Pm of Env Engr
- IAH 201-210 - 4 *Div- N, I or D
- ISS 2XX - 4 *Div- N, I or D
- ISS 3XX - 4 *Div- N, I or D

**S O P H O M O R E    Y E A R**

**FALL Term 5**
- BS 161 - 3 Cell & Molec Biol
- GLG 201 - 4 Dynamic Earth FS or SS OR GLG 301 - 3 Continents & Oceans SS Only (P: MTH 132)
- CE 221 - 3 Statics

**SPRING Term 6**
- BS 162 - 3 Org & Pop Biol
- CE 371 - 3 Sustainable CE/ENE Eng Sys (P: MTH 234 or conc, & ENE 280)
- ENE 487 - 3 Microbio for Env Sa & Engr
- CHE 201 - 3 Matls & Energy Balances
- ENE 489 - 3 Air Pollution: Sci & Eng (P: CEM 141, MTH 133, ENE 280, ECE 211)

**J U N I O R    Y E A R**

**FALL Term 7**
- CE 372 - 2 Risk Analysis In CE & ENE Eng
- ENE 422 - 3 Applied Hydraulics
- ENE 481 - 3 Env Meas Lab (P: CEM 161 & ENE 280 & CEM 142 OR CEM 152 and ENE 481 conc OR ENE 483 conc & WRA 101)
- Elective - 3/4
- Tech Elective Course - 3/4

**SPRING Term 8**
- CE 321 - 4 Intro to Fluid Mech (P: MTH 235 & ENE 211 & WRA 101)
- ENE 3XX - 3 3/4 crs of Gen Elects
- CE 495 - 4 Senior Design (P: CE 274 & CE 371 & CE 372)
- Tech Elective Course - 3/4
- Elective - 3/4
- ENE 421 - 3 Engineering Hydrology
- ENE 480 - 3 Thermodynamics FS or SS (P: CEM 141, MTH 234, & PHY 183)
- ME 201 - 3 Thermodynamics FS or SS (P: CEM 141, MTH 234, & PHY 183)
- Tech Elective Course - 3/4
- ENE 280 - 3 Pm of Env Engr
- IAH 211 or > - 4 *Div- N, I or D

**S E N I O R    Y E A R**

**FALL Term 9**
- Elective - 3/4
- Tech Elective Course - 3/4
- Elective - 3/4
- Elective - 3/4
- ISS 3XX - 4 *Div- N, I or D

**SPRING Term 10**
- Elective - 3/4

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**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: 02/09/18
1. University Requirements: (23-24)
   Writing, Rhetoric and American Cultures (WRA) 4
   Integrative Studies in Humanities IAH 201-210 & IAH 211 or > 8
   Integrative Studies in Social Sciences ISS 2XX & 3XX 8
   Bioscience (one of the following):
   BS 161, ENT 205, IBIO 150, MMG 141, MMG 201, PLB 105, PSL 250 3-4

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

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

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

Biomedical Materials Engineering Concentration: (28)
To gain interdisciplinary skills in human biology and earn a Bachelor of Science degree in Materials Science and Engineering with a biomedical materials engineering concentration, students must complete requirement 3. a. above and the following:
   1. Complete all of the following: (16)
      ANTR 350 Human Gross Anatomy for Pre Health Prof 3
      CEM 351 Organic Chemistry I 3
      IBIO 341 Fundamental Genetics 4
      ME 495 Tissue Mechanics 3
      MSE 425 Biomaterials and Biocompatibility 3
   2. Complete two of the following courses: (6)
      MSE 460 Electronic Struct, Bonding in Materials & Devices 3
      MSE 465 Design and Application of Egr. Materials 3
      MSE 474 Ceramics and Refractory Materials 3
      MSE 476 Phys Metallurgy of Ferrous & Alum Alloys 3
      **MSE 477 Manufacturing Processes 3
   3. Technical Electives: (6)
      An approved list of Technical Electives is available from the adviser.

Manufacturing Engineering Concentration: (21)
To gain interdisciplinary skills with business and design engineers for manufacturing projects and earn a Bachelor of Science degree in Materials Science and Engineering with a manufacturing engineering concentration, students must complete requirement 3. a. above and the following:
   1. Complete all of the following: (12)
      ECE 415 Computer Aided Manufacturing 3
      **MSE 477 Manufacturing Processes 3
      ME 478 Product Development 3
      MSE 465 Design and Application of Egr. Materials 3
   2. Complete three of the following courses: (9)
      GBL 323 Introduction to Business Law 3
      **MSE 426 Introduction to Composite Materials 3
      MSE 474 Ceramic and Refractory Materials 3
      MSE 476 Phys Metallurgy of Ferrous and Alum Alloys 3

   .
Metallurgical Engineering Concentration: (21)
To enhance the student’s ability to characterize, process, and design with metals in association with mechanical engineers and earn a Bachelor of Science degree in Materials Science and Engineering with a metallurgical engineering concentration, students must complete requirement 3.a. above and the following:

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

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

Polymeric Engineering Concentration: (21)
To gain interdisciplinary skills to facilitate interactions with chemical engineers and earn a Bachelor of Science degree in Materials Science and Engineering with a polymeric engineering concentration, students must complete requirement 3. a. above and the following:

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

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

The requirements listed apply to students admitted to the major of Materials Science and Engineering in the Department of Chemical Engineering and Materials Science (CHEMS) beginning Spring 2016. The Department of Chemical Engineering and Materials Science constantly reviews program requirements and reserves the right to make changes as necessary. Consequently, each student is strongly encouraged to consult with his/her advisor to obtain assistance in planning an appropriate schedule of courses. Students who have questions about Materials Science and Engineering should contact Chemical Engineering and Materials Science Department Advising Office, 3512 Engineering Building, phone 517-432-4916. For scheduling academic appointments visit: https://msu.campus.eab.com

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

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

Total Credits Required for Degree  128

Last Revised May 2018

NOTES:
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 Requirements

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

   *Courses used to fulfill item 3.c. may not be used to fulfill 3.d.

   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

Michigan State University | College of Engineering | Engineering Undergraduate Studies
Engineering Building, 428 S. Shaw Lane, Room 1415, East Lansing MI 48824 | (517) 355-6616
http://www.egr.msu.edu/undergraduate/academic/degree-programs

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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: (9)**
- ME 440 Aerospace Propulsion 3
- ME 441 Aerodynamics & Aircraft Performance 3
- ME 475 Computer Aided Design of Structures 3

**One of the following courses: (3)**
- ME 422 Introduction to Combustion 3
- ME 426 Introduction to Composite Materials 3
- ME 433 Computational Fluid Dynamics 3
- ME 442 Turbomachinery 3
- ME 464 Intermediate Dynamics 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 Cells 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 an Bachelor of Science degree in Mechanical Engineering with a computational design concentration, students must complete requirements 1..2., 3.a.,3.b.,and 3.d. and the following:

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

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

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

- All of the following courses: (9)
  - ME 416 Computer Assisted Design of Thermal Systems 3
  - ME 417 Design of Alternative Energy Systems 3
  - ME 422 Introduction to Combustion 3

- One of the following courses: (3)
  - ME 440 Aerospace Propulsion 3
  - ME 442 Turbomachinery 3
  - ME 444 Automotive Engines 3

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

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

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

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

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

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

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

**Total Credits Required for Degree** 128

The requirements listed apply to students admitted to the major of Mechanical Engineering in the Department of Mechanical Engineering beginning Fall 2018. 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 his/her 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 May 2018
Admission to the College of Engineering requires the following:

- **MTH 132 - Calculus I** (with a grade of at least 2.0)
- **MTH 133 - Calculus II** (with a grade of at least 2.0)
- **EGR 100 - Introduction to Engineering Design** OR **CSE 231 - Introduction to Programming I**
- **EGR 102 - Introduction to Engineering Modeling** OR **HRT 102 - Plants for Food, Fun & Profit**
- **HRT 203 - Principles of Horticulture**
- **CSUS 276 - Sustain. Our Nat'l Parks & Rec. Lands**
- **CSUS 273 - Intro to Travel & Tourism**

**CONNECTING AREAS OF INTEREST/EXPLORATORY COURSES WITH FEW OR NO PREREQUISITES**

<table>
<thead>
<tr>
<th>AGRICULTURE AND THE OUTDOORS</th>
<th>AGRICULTURE AND THE OUTDOORS CONTINUED...</th>
</tr>
</thead>
<tbody>
<tr>
<td>ABM 100 (3) Decision-Making in the Agri-Food System (Interdepartmental w/ FIM 100)</td>
<td>GEO 215 (3) Geography of Sports (F odd yrs)</td>
</tr>
<tr>
<td>ABM 130 (3) Farm Management I (F)</td>
<td>GEO 330 (3) Geography of the U.S. &amp; Canada</td>
</tr>
<tr>
<td>CSUS 250 (3) Global Issues in Ag &amp; Natural Resources (Interdepartmental w/ ANR) (P-WRA)(F)</td>
<td>GEO 333 (3) Geography of MI (S)</td>
</tr>
<tr>
<td>ANR 250 (3) Global Issues in Ag &amp; Natural Resources (Interdepartmental w/ CSUS, P-WRA)(F)</td>
<td>GLG 202 (3) Geology of Michigan (F)(P-WRA)</td>
</tr>
<tr>
<td>ANS 110 (4) Introductory Animal Agriculture</td>
<td>HRT 100 (3) Horticulture: Plants &amp; People (S)</td>
</tr>
<tr>
<td>ANS 141L (2) Draft Horse Basics</td>
<td>HRT 102 (2) Plants for Food, Fun &amp; Profit (F)</td>
</tr>
<tr>
<td>ANS 242 (3) Intro Horse Mgmt. (F)</td>
<td>HRT 203 (3) Principles of Horticulture (F)</td>
</tr>
<tr>
<td>ANS 282 (3) Companion Animal Biology and Mgmt.</td>
<td>CSUS 276 (3) Sustain. Our Nat'l Parks &amp; Rec. Lands (S)</td>
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<tr>
<td>CSS 101 (3) Intro to Crop Science (F)</td>
<td>CSUS 273 (3) Intro to Travel &amp; Tourism (S)</td>
</tr>
<tr>
<td>CSS 120 (3) Agricultural Industry Issues (F)</td>
<td><strong>BUSINESS RELATED</strong></td>
</tr>
<tr>
<td>CSS 124 (1) Intro to Sustainable Ag &amp; Food Systems (Interdepartmental w/ CSUS &amp; HRT 124)</td>
<td>ABM 100 (3) Decision Making in Agri-Food</td>
</tr>
<tr>
<td>CSS 151 (2) Seed and Grain Quality (S)</td>
<td>ACC 250 (1) Preparing for an Account. Career</td>
</tr>
<tr>
<td>CSS 201 (3) Forage Crops (F)</td>
<td>COM 240 (4) Intro to Org. Communication</td>
</tr>
<tr>
<td>CSS 202 (2) World of Turf</td>
<td>EC 201 (3) Intro to Microeconomics</td>
</tr>
<tr>
<td>CSS 202L (1) World of Turf Lab</td>
<td>EC 202 (3) Intro to Macroeconomics</td>
</tr>
<tr>
<td>CSS 210 (3) Fund. of Soil Science (R-CEM 141) (Interdepartmental course with FOR)</td>
<td>EEM 255 (3) Ecological Economics (P-EC 201 or concurrently)</td>
</tr>
<tr>
<td>CSS 222 (2) New Horizons in Biotechnology (F)</td>
<td>HDFS 238 (3) Personal Finance</td>
</tr>
<tr>
<td>CSS 294 (1) Issues International Agric. (P-WRA)(S)</td>
<td>FIM 220 (3) Food Product Marketing (S)(P-ABM 100 or concurrently)</td>
</tr>
<tr>
<td>EEP 260 (3) World, Food, Population and Poverty (F) (P-ABM 100 or EC 201 or EEP 255)</td>
<td>GEO 113 (3) Intro to Economic Geography</td>
</tr>
<tr>
<td>EEP 255 (3) Ecological Economics (R-EC 201)</td>
<td>HB 100 (2) Intro to Hospitality Business</td>
</tr>
<tr>
<td>ENT 205 (3) Pests, Society and Environment</td>
<td>HB 105 (2) Service Mgmt. Principles (R-HB 100 or Concurrently)</td>
</tr>
<tr>
<td>CSUS 200 (3) Principles of Sustainable</td>
<td>HB 210 (3) Intro to Casino Industry (F)</td>
</tr>
<tr>
<td>FW 207 (3) Great Lakes: Biology and Management (Interdepartmental w/ CSUS 207)(F)</td>
<td>HB 237 (3) Mgt. of Lodging Systems (R-HB 100 or Concurrently)</td>
</tr>
<tr>
<td>FOR 101 (3) Michigan's Forests (S)</td>
<td>HB 265 (3) Food Mgt. Safety &amp; Nutrition (R-HB 100)</td>
</tr>
<tr>
<td>FOR 110 (1) Contem. Issues in Forests &amp; Environ. (F)</td>
<td>HB 267 (3) Food &amp; Beverage Mgt. (R-HB 100 or concurrently)</td>
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<tr>
<td>FOR 202 (3) Intro to Forestry</td>
<td>CSUS 273 (3) Intro to Travel &amp; Tourism (S)</td>
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<td>FOR 204 (4) Forest Vegetation (F)</td>
<td>PSY 255 (3) Industrial/Org. Psychology (P-PSY 101)(S)</td>
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<td>FOR 222 (2) Forestry Field Methods (F)</td>
<td><strong>COMMUNICATION/MEDIA</strong></td>
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<tr>
<td>FW 101 (3) Fundamentals of Fisheries &amp; Wildlife</td>
<td>ADV 205 (3) Principles of Advertising</td>
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<td>FW 110 (3) Conservation &amp; Mgmt. of Marine Res. (S)</td>
<td>ADV 260 (3) Principles of Public Relations</td>
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<td>FW 181 (3) Science, Tech. Environ. &amp; Public Policy (F)</td>
<td>COM 100 (3) Human Communication</td>
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<td>GEO 206 (3) Physical Geography</td>
<td>COM 275 (3) Effects of Mass Communication</td>
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<td>GEO 206L (1) Physical Geography Lab (P-GEO 206 or concurrently)</td>
<td>JRN 108 (3) World of Media</td>
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<td><strong>AGRICULTURE AND THE OUTDOORS CONTINUED...</strong></td>
<td>JRN 218 (3) Sports Media (P-WRA)(F)</td>
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<td>LIN 200 (3) Intro to Language</td>
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<td>LIN 225 (3) Language &amp; Gender</td>
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<td>(Interdepartmental w/ WS 225)</td>
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<td>MI 101 (3) Understanding Media</td>
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<td>MI 201 (3) Intro to Media &amp; Info Tech. (P-MI 101 or CSE 231)</td>
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<td>WRA 260 (3) Rhetoric, Persuasion, &amp; Culture (P-WRA)(F)</td>
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THE COMMUNITY

**Theatrical Play Analysis**
- THR 110 (3) Theatrical Play Analysis (S)
- THR 111 (3) Intro to Tech Theatre
- THR 111L (1) Intro to Tech Theatre Lab (lecture & lab taken concurrently)

**Gender Issues**
- ANP 220 (3) Gender Rel. in Comp. Perspective (S)
- ANP 270 (3) Women & Health: Anthr. & Int'l Perspectives (F)
- LIN 225 (3) Language & Gender (Interdepartmental w/ WS 225)
- WS 201 (3) Intro to Women's & Gender Studies
- WS 202 (3) Intro Cont. Feminisms (P-WS 201 or Program Approval)

**Health and Recreation**
- ANP 270 (3) Women & Health: Anthropological & Int'l Perspectives
- CSUS 265 (3) Exploring the Environ. & Sustain. Using Film
- HNF 150 (3) Intro to Human Nutrition
- KIN 101M (1) Great Lakes Sailing
- KIN 125 (3) First Aid and Personal Safety
- KIN 202 (3) Aerobic Exercise Instruction (R-Aerobic Exercise Exp)(F)
- KIN 204 (2) Sailing and Cruising (R-Sailing Sm. Craft)
- KIN 205 (2) Lifeguarding (R-Advanced Swimmer)(S)
- OST 401 (1) Special Topics in Osteopathic Medicine

**The Environment**
- ANR 250 (3) Global Issues in Ag & Natural Resources (P-WRA, Interdepartmental w/ CSUS 250)(F)
- EEM 255 (3) Ecological Economics (P-EC 201 or concurrently)
- EGR 291 (1) Selected Topics
- ENT 205 (3) Pests, Society & the Environment
- CSUS 200 (3) Intro to Environmental Studies
- CSUS 265 (3) Exploring the Environ. & Sustain. Using Film (R-WRA)(S)
- FW 110 (3) Conservation & Mgmt. of Marine Res. (S)
- FW 181 (3) Intro to Science, Tech, Environ. & Public Policy (F)
- GLG 201 (4) Dynamic Earth
- LA 200 (3) Intro to Landscape Architecture (F)
- HA 101 (3) Western Art: Paleolithic to Medieval Era (F)
- HA 102 (3) Western Art: Renaissance to Contemp. (S)
- HA 200 (3) Intro to Landscape Arch. (F)
- HA 210 (3) Medieval Art (S)
- HA 230 (3) Renaissance & Baroque Art (F)
- HA 240 (3) Modern Art
- HA 250 (3) American Art (F)
- HA 260 (3) East Asian Art (S)
- HA 271 (3) African Art (S)
- HA 291 (4) Topics in Art History (S)
- IDES 152 (4) Interior Environments (F)
- IDES 240 (3) Comp.-Aided Design for Designers (F)
- LA 200 (3) Intro to Landscape Architecture (F)
- MUS 116 (1) Campus Band
- MUS 125 (1) MSU Glee Club, Men & Women
- MUS 145 (1) Instruction in Voice I (non major sect. only)
- MUS 175 (2) Understanding Music
- MUS 177 (2) Intro to Music Education
- MUS 178 (2) Music Theory for Non Music Majors I (S)
- STA 110 (3) Drawing I (Open to all on 7/31 or 11/21)
- STA 113 (3) Color & Design (Open to all 7/31 or 11/21)
- STA 114 (3) 3-D Form (Open to all on 7/31 or 11/21)
- STA 491 (3) Special Topics (Approval of Dept.) (F)
- THR 101 (3) Acting I

**Fine Arts and Applied Arts**
- CSUS 273 (3) Intro to Travel & Tourism
- CSUS 276 (3) Sustaining National Parks & Rec. Lands (S)

**Health and Wellbeing**
- CSUS 276 (3) Sustaining National Parks & Rec. Lands (S)
- GSAH 220 (3) Global Interactions & Identities (F)
- GSAH 200 (1-3) Questions, Issues, & Debates in Global Studies
- GSAH 220 (3) Global Interactions & Identities
- SW 200 (3) Intro to Tech Theatre Lab (lecture & lab taken concurrently)

**The Humanities**
- AL 200 (3) Cultural Difference & Study Abroad (F)
- ANP 200 (2) Navigating Another Culture
- ENG 140 (4) Literature & Society
- ENG 142 (4) Intro to Popular Literary Genres
- ENG 226 (3) Intro to Creative Writing (P-WRA)
- ENG 232 (3) Writing as Exploration (P-WRA)
- GSAH 200 (1-3) Questions, Issues, & Debates in Global Studies
- GSAH 230 (3) Values, Exp., & Diff. in Global Contexts (F)
- HNF 150 (3) Intro to Human Nutrition
- PHL 101 (3) Intro to Philosophy
- PHL 130 (3) Logic and Reasoning
- PHL 210 (3) Ancient Greek Philosophy (F)
- PHL 211 (3) Modern Philosophy (R-PHL 210)(S)
- REL 101 (3) Exploring Religion
- REL 150 (3) Intro to Biblical Literature (F)
- REL 175 (3) Religion in Film (S)
- REL 220 (3) Religion in America
- RUS 231 (3) 19th Century Russian Lit. in Translation (F)
- RUS 232 (3) 20th Century Russian Lit. in Translation (S)
**THE INDIVIDUAL & FAMILY**

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<td>CEP 260 (3)</td>
<td>Dynamics of Personal Adjustment</td>
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<td>EAD 315 (3)</td>
<td>Student Leadership Training</td>
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<td>HDFS 145 (3)</td>
<td>The Individual, Marriage &amp; the Family</td>
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<tr>
<td>HDFS 211 (3)</td>
<td>Child Growth &amp; Development</td>
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<td>HDFS 212 (3)</td>
<td>Children, Youth &amp; Family</td>
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<td>HDFS 225 (3)</td>
<td>Ecology of Lifespan Human Development</td>
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<td>HDFS 238 (3)</td>
<td>Personal Finance</td>
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<td>PSY 236 (3)</td>
<td>Personality (P-PSY 101) (S)</td>
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<td>PSY 244 (3)</td>
<td>Dev. Psychology: Infant Through Child</td>
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<td>PSY 280 (3)</td>
<td>Abnormal Psychology (P-PSY 101)</td>
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<td>SOC 241 (3)</td>
<td>Social Psychology</td>
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<td>SW 200 (3)</td>
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**FOREIGN LANGUAGES**

*Level In all languages courses is determined by placement*

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<td>Hausa</td>
<td>Swahili</td>
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<td>Igbo</td>
<td>Twi</td>
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<td>Wolof</td>
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<td>JPN</td>
<td>Japanese</td>
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**MUSIC PERFORMANCE ACTIVITIES**

Audition is required Fall Semester for the following performance classes:

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<tbody>
<tr>
<td>MUS 114 (1)</td>
<td>Marching Band (F)</td>
</tr>
<tr>
<td>MUS 115 (1)</td>
<td>Spartan Brass (S)</td>
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<tr>
<td>MUS 117 (1)</td>
<td>Concert Band</td>
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<td>MUS 118 (1)</td>
<td>Wind Symphony</td>
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<td>MUS 123 (1)</td>
<td>Collegiate Choir</td>
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<tr>
<td>MUS 125 (1)</td>
<td>Glee Club, Men &amp; Women</td>
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<tr>
<td>MUS 119 (1)</td>
<td>Symphony Band</td>
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<tr>
<td>MUS 120 (1)</td>
<td>Symphony Orchestra</td>
</tr>
<tr>
<td>MUS 124 (1)</td>
<td>Choral Union</td>
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<tr>
<td>MUS 126 (1)</td>
<td>State Singers</td>
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<tr>
<td>MUS 127 (1)</td>
<td>University Chorale</td>
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<tr>
<td>MUS 130 (1)</td>
<td>Jazz Band</td>
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<tr>
<td>MUS 131 (1)</td>
<td>Jazz Combo</td>
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<tr>
<td>MUS 151N (1)</td>
<td>Voice for Non-Music Majors</td>
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<tr>
<td>MUS 152N (1)</td>
<td>Strings for Non-Music Majors</td>
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<tr>
<td>MUS 153N (1)</td>
<td>Woodwinds for Non-Music Majors</td>
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<tr>
<td>MUS 154N (1)</td>
<td>Brass for Non-Music Majors</td>
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<tr>
<td>MUS 155N (1)</td>
<td>Percussion for Non-Music Majors</td>
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**NO AUDITION REQUIRED:**

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<td>MUS 116 (1)</td>
<td>Campus Band</td>
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<td>MUS 122 (1)</td>
<td>Concert Orchestra</td>
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<tr>
<td>MUS 129 (1)</td>
<td>Percussion Ensemble</td>
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<td>MUS 145 (1)</td>
<td>Class Instruction in Voice I</td>
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**SCIENTIFIC LANGUAGES**

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<tr>
<td>ANP 203 (3)</td>
<td>Intro to Archaeology</td>
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<td>ANP 206 (3)</td>
<td>Intro to Physical Archaeology</td>
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<tr>
<td>AST 101 (1)</td>
<td>The Celestial Clockworks (S)</td>
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<tr>
<td>BMB 101 (1)</td>
<td>Frontiers in Biochemistry (F)</td>
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<tr>
<td>CJ 210 (3)</td>
<td>Intro to Forensic Science (Interdepartmental w/ FRS 210, R-background in General Chem &amp; Bio)(F)</td>
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<tr>
<td>CSS 101 (3)</td>
<td>Intro to Crop Science</td>
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<td>CSS 105 (1)</td>
<td>Agricultural Industry Seminar</td>
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<td>CSS 120 (3)</td>
<td>Current Issues in ANR</td>
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<td>CSS 124 (1)</td>
<td>Intro to Sustainable Ag Food Systems (Interdepartmental w/ ESA/HRT 124)</td>
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<tr>
<td>CSS 151 (2)</td>
<td>Seed &amp; Grain Quality (S)</td>
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<td>CSS 202 (2)</td>
<td>The World of Turf</td>
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<td>CSS 202L (1)</td>
<td>The World of Turf Lab</td>
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**SCIENCE & APPLIED SCIENCES**

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<tr>
<td>LTN 200 (3)</td>
<td>Cultural Diff. &amp; Study Abroad (F)</td>
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<td>PRT 202 (2)</td>
<td>The World of Turf Lab (P-CSS 202 or concurrently)</td>
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<tr>
<td>RUS 151 (2)</td>
<td>Seed &amp; Grain Quality (S)</td>
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<tr>
<td>SPN 202 (2)</td>
<td>The World of Turf Lab</td>
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<tr>
<td>AL 200 (3)</td>
<td>Intro to Language</td>
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<td>LIN 225 (3)</td>
<td>Language &amp; Gender (Interdepartmental w/ WS)</td>
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<td>LIN 200 (3)</td>
<td>Intro to Language</td>
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<td>MUS 120 (1)</td>
<td>Symphony Orchestra</td>
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<td>MUS 124 (1)</td>
<td>Choral Union</td>
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<tr>
<td>MUS 130 (1)</td>
<td>Jazz Band</td>
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<tr>
<td>MUS 131 (1)</td>
<td>Jazz Combo</td>
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<tr>
<td>MUS 151N (1)</td>
<td>Voice for Non-Music Majors</td>
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<tr>
<td>MUS 152N (1)</td>
<td>Strings for Non-Music Majors</td>
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<tr>
<td>MUS 153N (1)</td>
<td>Woodwinds for Non-Music Majors</td>
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<td>MUS 154N (1)</td>
<td>Brass for Non-Music Majors</td>
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<td>MUS 155N (1)</td>
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Call Department for Overrides: 355-4585
### SCIENCES AND APPLIED SCIENCES CONTINUED...

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<tr>
<td>CSS 222</td>
<td>New Horizons in Biotechnology</td>
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<tr>
<td>CSS 294</td>
<td>Issues in International Ag <em>(P-WRA)(S)</em></td>
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<td>ENT 205</td>
<td>Pests, Society &amp; The Environment</td>
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<td>FSC 211</td>
<td>Principles of Food Science <em>(F)</em></td>
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<td>GEO 203</td>
<td>Intro to Meteorology</td>
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<td>GEO 206</td>
<td>Physical Geography</td>
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<td>GEO 206L</td>
<td>Physical Geo Lab <em>(P-GEO 206 or concurrently)</em></td>
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<td>PLB 105</td>
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<td>PLB 106</td>
<td>Plant Biology Lab <em>(P-PLB 105 or concurrently)</em></td>
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<tr>
<td>PSY 209</td>
<td>Brain &amp; Behavior <em>(P-psy 101)</em></td>
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<td>MMG 141</td>
<td>Intro to Human Genetics</td>
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### SOCIAL SCIENCES CONTINUED...

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<tr>
<td>PSY 235</td>
<td>Social Psychology <em>(P-psy 101)</em></td>
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<td>PSY 236</td>
<td>Personality <em>(P-psy 101)(S)</em></td>
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<td>PSY 244</td>
<td>Developmental Psych: Infancy - Childhood <em>(P-psy 101)</em></td>
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<tr>
<td>PSY 255</td>
<td>Industrial &amp; Organizational Psychology <em>(P-psy 101)(S)</em></td>
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<td>PSY 270</td>
<td>Community Psychology <em>(P-psy 101)(F)</em></td>
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<td>PSY 280</td>
<td>Abnormal Psychology <em>(P-psy 101)</em></td>
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<td>PSY 320</td>
<td>Health Psychology <em>(P-psy 101)(S)</em></td>
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<td>SOC 100</td>
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<td>SOC 161</td>
<td>International Development &amp; Change <em>(S)</em></td>
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<td>SOC 215</td>
<td>Race &amp; Ethnicity</td>
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<td>SOC 216</td>
<td>Sex &amp; Gender</td>
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<td>SOC 241</td>
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<td>SSC 293</td>
<td>Intro to Asian Pacific American Studies <em>(S)</em></td>
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<tr>
<td>UP 201</td>
<td>Role of Planning in Urban &amp; Regional Dev.</td>
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### TEACHING/LEARNING

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<td>CEP 260</td>
<td>Dynamics of Personal Adjustment</td>
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<td>EAD 363</td>
<td>Diversity in Higher Education <em>(F)</em></td>
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<td>TE 150</td>
<td>Reflections in Learning</td>
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<td>TE 201</td>
<td>Current Issues in Education <em>(Interdepartmental with CEP 201, EAD 201)</em></td>
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<td>TE 250</td>
<td>Human Diversity, Power &amp; Opportunity in Social Institutions</td>
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### TECHNICAL

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<td>Intro to Biosystems Engineering <em>(P- MTH 116 or concurrently)(F)</em></td>
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<td>CE 273</td>
<td>Civil &amp; Environmental EGR Measurements <em>(P- MTH 132 or concurrently)</em></td>
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<td>CJ 210</td>
<td>Intro to Forensic Science <em>(Interdepartmental w/ FRS 210, R-background in General Chemistry &amp; Biology)(F)</em></td>
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<td>CMP 101</td>
<td>Princ. of Building Construction Mgmt <em>(F)</em></td>
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<td>CMP 124</td>
<td>Res. Construction Materials &amp; Methods <em>(R-CMP 101)</em></td>
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<td>CSE 101</td>
<td>Computing Concepts &amp; Competencies</td>
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<td>CSE 201</td>
<td>Fundamentals of Info Technology <em>(P-CSE 101 and MTH 103)</em></td>
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<td>CSE 231</td>
<td>Intro to Programming I <em>(P-MTH 124/132 or concurrently)</em></td>
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<td>New Horizons in Biotechnology <em>(Interdepartmental w/ ENT 222)(F)</em></td>
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<td>IDES 240 (3) Computer-Aided Design for Designers (F)</td>
<td>KIN 108C (1) Ice Hockey I</td>
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<td>KIN 108F (1) Soccer I</td>
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<td>KIN 108K (1) Volleyball I</td>
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<td>MI 291 (3) Special Topics</td>
<td>KIN 108P (1) Softball I</td>
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**MISCELLANEOUS**

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<td>AE 151 (2) Fabrication Technology</td>
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<td>AE 153 (3) Engine &amp; Equipment Technology (S)</td>
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<tr>
<td>AS 211 (1) Evolution of USAF Air &amp; Space Power I (F)</td>
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<tr>
<td>AS 212 (1) Evolution of USAF Air &amp; Space Power II (S)</td>
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<tr>
<td>EAD 315 (3) Student Leadership Training</td>
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<tr>
<td>MS 110 (1-2) Army Lead &amp; Officer Dev. (F)(R- MS 110)</td>
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<tr>
<td>MS 120 (1-2) Intro to Army Lead &amp; Problem Solving (S)</td>
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<tr>
<td>UGS 101 (1) Freshmen Seminar (F)</td>
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<tr>
<td>VM 101 (1) Veterinary Medicine in Society (S)</td>
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</tbody>
</table>

**KINESTHETIC PERFORMANCE/ACTIVITIES**

*Beginning courses are P/N grades*

| KIN 101A (1) | Swimming I |
| KIN 191M (1) | Great Lakes Sailing |
| KIN 101N (1) | Intro to Aquatic Paddle Sports |
| KIN 101T (1) | Scuba Diving I |
| KIN 101U (1) | Sailing |
| KIN 102A (1) | Judo I |
| KIN 102C (1) | Karate I |
| KIN 102K (1) | Tae Kwon Do I |
| KIN 102M (1) | Kendo I |
| KIN 103A (1) | Aerobic Exercise I |
| KIN 103C (1) | Aerobic Exercise, Low Impact |
| KIN 103D (1) | General Conditioning I |
| KIN 103G (1) | Power Walking |
| KIN 103R (1) | Weight Training |
| KIN 103S (1) | Swim Conditioning |
| KIN 103T (1) | Distance Running |
| KIN 103U (1) | Step Aerobics |
| KIN 103V (1) | Boxing Conditioning |
| KIN 106C (1) | Bowling I |
| KIN 106E (1) | Golf I |
| KIN 106S (1) | Archery |
| KIN 106V (1) | Self Defense |
| KIN 106W (1) | Yoga |
| KIN 107B (1) | Raquetball I |
| KIN 107E (1) | Tennis I |
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 Academic Orientation Program (AOP) 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

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Co-op employment

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Academics

Student Organizations

National

Competitions

Residential Experience

Go Green!

Assistant Dean for Undergraduate Student Affairs