

MICHIGAN STATE UNIVERSITY

...Oh, the things you will do!

Cornerstone Design

Internships

Undergraduate Research

National
Competitions

CAPSTONE DESIGN

Co-op employment

Study Abroad

Student Organizations

Residential Experience

ACADEMICS

Welcome Spartan Engineer!

You are embarking on a major journey in life. After 12 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.

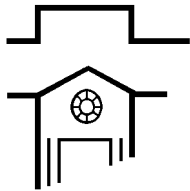
Making your plan starts today at your Academic Orientation Program (AOP) and will continue through your career by interacting with the various units in the office of Engineering Undergraduate Studies (UGS). Our many ways to provide you support and help you broaden your experiences are further described 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!

Thomas F. Wolff, Ph.D., P.E.
Associate Dean

Amanda G. Idema
Director of Academic Advising

and the rest of the UGS staff...



COLLEGE OF
ENGINEERING

Undergraduate Studies

Michigan State University
1415 Engineering Building
East Lansing, MI
48824-1226

517/355-5128

FAX: 517/432-1356

<http://www.egr.msu.edu/ugs>

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Academic Advising Agreement

As the *STUDENT*, I agree to:

- Take ownership of my education and be accountable for my decisions
- Learn policies, procedures and requirements – this includes what is required for my university, college and major requirements and what I need to graduate
- Manage my time and workload appropriately
- Make an appointment to meet with my advisor at least once a semester
- Be on time and prepared for my appointment. If I know I will not make it to my appointment, I will call or email to cancel – I don't want to be a "no show"
- Read my MSU email often and be professional in communications with advisors, faculty and other MSU staff

As your *ADVISOR*, I agree to:

- Help you define your academic and career goals
- Listen carefully to what you are saying
- Help guide you in making life decisions
- Provide you with accurate academic and curriculum information (curriculums change often!)
- Provide you with a safe place for you to share your thoughts, concerns, interests and ambitions
- Be accessible to you during regular business hours through appointments or the phone. Respond to your email in a reasonable time
- Teach you how to identify and use campus and Engineering resources

Student Signature

Date

Adviser Signature

Date

2009- 2010 Academic Calendar

Fall 2009

September 2	Classes begin
September 7	Labor Day, University closed
September 9	End of drop/add period (8PM)
September 28	Last day to drop a class and get tuition refund (8PM)
October 21	Middle of semester, last day to drop a class (8PM)
November 26, 27	Thanksgiving holiday, university closed
December 11	Last day of classes
December 14-18	Final exams

Spring 2010

January 11	Classes begin
January 15	End of drop/add period (8PM)
January 18	Martin Luther King, Jr. Day, no classes, university open
February 4	Last day to drop a class and get tuition refund (8PM)
March 3	Middle of semester, last day to drop a class (8PM)
March 8-12	Spring break
April 30	Classes end
May 3-7	Final exams



Engineers are people who....

- Can think conceptually
- Work with abstract ideas and principles
- Apply math and science to real problems
- Work in teams
- Solve problems with little information or resources
- Create methods and templates for future use
- Turn ideas into reality
- Make things happen

In the real world, Engineers...

- Design
- Build
- Create
- Teach
- Conduct research
- Creatively integrate math and science
- Make technology smaller and faster
- Solve problems
- Help people and communities
- Improve the quality of life

Sound like you?

**We are excited to have you here and
look forward to working with you during
your time at State!**

Academic Advising FAQs

Who are advisors?

Academic advisors are professionals with advanced degrees in counseling, education, university administration and related fields. Academic advisors are here to guide you along the way and provide you with valuable information to help you make good academic decisions, including:

- Choosing a major
- Required courses
- Test-taking and study skills
- How to get admitted to the college
- Scholarship information
- Campus resources

Advisors in the College of Engineering (Wilson Hall and EB)

- Amanda G. Idema, Director of Academic Advising
- Carmellia Davis-King
- Monica Marcelis Fochtman
- Sean Fochtman
- Gaile Griffore
- Dan King
- Colleen McDonough
- Cynthia Sarver
- Teresa VanderSloot

Associate Dean's Office (1410/1415 EB)

- Thomas F. Wolff, Associate Dean
- Drew Kim, Assistant to the Dean for Recruiting and K-12 Outreach
- Denyse Adkins
- Denise Barnstead
- Wendy Booth
- Jamie Lynn Marks
- Jamie Ramos
- Jeanette Robertson

How do I know who my advisor is?

Your advisor is assigned to you based on your major, your class standing, and your last name. If you are involved in certain programs, such as Spartan Engineering/The Residential Experience or the Honors College, you will have a specific advisor for that program in addition to your College of Engineering advisor. To schedule an appointment with an academic advisor, stop by 1410 Engineering Building, or call (517) 355-6616 ext. 1. More information is also available at: www.egr.msu.edu/undergraduate/advising/adviser.

How often should I meet with my advisor?

We suggest that you meet with your advisor regularly, **at least once a semester**, to receive assistance with major selection, schedule planning, test-taking, study skills, utilizing resources, career planning, and much more. Students should also see their advisor during the annual enrollment period (Spring of each year) to plan courses for the next academic year. You should also contact your advisor any time you have an academic question. While some questions can be handled by email, many issues benefit from a two-way conversation.

How should I prepare for my advising appointment?

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 and schedule of courses.
- Bring a preliminary schedule of courses you intend to take.
- Think about any questions you might have about your major, the College of Engineering, or the University.

University Requirement Writing, Rhetoric and American Cultures (WRA)

As a Michigan State University student, you will need to complete a 4-credit Tier I writing course in Writing, Rhetoric and American Cultures (WRA), which is usually taken during the freshman year. Students have the option of selecting from a variety of courses, each of which emphasizes unique aspects of American culture. The WRA course requirement must be fulfilled before students are eligible to enroll in the Integrative Studies in Arts and Humanities (IAH) courses.

Students needing additional help in writing (as determined by ACT/SAT scores) will be required to enroll in WRA 1004: Preparation for College Writing and WRA 0102: Preparation for College Writing (lab) before completing the Tier I WRA course.

WRA 110 Writing: Science and Technology
WRA 115 Writing: Law and Justice in the United States
WRA 125 Writing: The American Ethnic and Racial Experience
WRA 130 Writing: American Radical Thought
WRA 135 Writing: Public Life in America
WRA 140 Writing: Women in America
WRA 145 Writing: Men in America
WRA 150 Writing: The Evolution of American Thought
WRA 195H Writing: Major Topics in American Thought (Honors)

Note: Students must complete the Tier I writing requirement with a grade of 2.0 or above **before** enrolling for IAH courses. Students who earn a grade of less than 2.0 in WRA are required to repeat WRA or enroll in AL 201 writing tutorial (2 credits) concurrently with IAH. Students should plan to take an IAH A course after completing the Tier I WRA requirement.

University Requirement Integrative Studies in Arts and Humanities (IAH)

Students are expected to complete 16 credits total across the two ISS and two IAH requirements. Some courses emphasize national diversity (designated “N”), international and multicultural diversity (designated “I”) or national, international and multicultural diversity (designated “D”). Students must include at least one “N” and one “I” course in the integrative studies programs. A “D” course designation may meet either an “N” or an “I” requirement, but not both. Students may have any combination of the three designations, but **not** two of the same. For example, two “D” designations will **not** fulfill the university diversity requirement.

All Michigan State University students must complete 8 credits (2 courses) of Integrative Studies in Arts and Humanities (IAH). Students must first complete an IAH Choice A course followed by an IAH Choice B course. Choice A cannot be taken until the WRA requirements have been completed. These courses can be completed at any time during the undergraduate program.

Choice A courses:

- IAH 201 United States & the World (D)
- IAH 202 Europe & the World (I)
- IAH 203 Latin America & the World (I)
- IAH 204 Asia & the World (I)
- IAH 205 Africa & the World (I)
- IAH 206 Self, Society & Technology (D)
- IAH 207 Literatures, Cultures, Identities (I)
- IAH 208 Music & Culture (I)
- IAH 209 Arts, the Visual, & Culture (D)
- IAH 210 Middle East & World (I)

Choice B courses:

- IAH 211A Area Studies & Multicultural Civilizations: Africa (I)
- IAH 211B Area Studies & Multicultural Civilizations: Asia (I)
- IAH 211C Area Studies & Multicultural Civilizations: The Americans (D)
- IAH 211D Area Studies & Multicultural Civilizations: Middle East (I)
- IAH 221A Great Ages: The Ancient World (I)
- IAH 221B Great Ages: The Medieval & Early Modern Worlds (I)
- IAH 221C Great Ages: The Modern World (I)
- IAH 231A Themes & Issues: Human Values & the Arts and Humanities (D)
- IAH 231B Themes & Issues: Moral Issues & the Arts and Humanities (D)
- IAH 231C Themes & Issues: Roles of Language in Society (D)
- IAH 241A Creative Arts & Humanities: Music & Society in the Modern World (D)
- IAH 241B Creative Arts & Humanities: Philosophy in Literature (D)
- IAH 241C Creative Arts & Humanities: Cultural and Artistic Traditions of Europe (I)
- IAH 241D Creative Arts & Humanities: Theater and Society in the West (I)
- IAH 241E Creative Arts & Humanities: The Creative Process (D)

University Requirement Integrative Studies in Social Sciences (ISS)

Students are expected to complete 16 credits total across the two ISS and two IAH requirements. Some courses emphasize national diversity (designated “N”), international and multicultural diversity (designated “I”) or national, international and multicultural diversity (designated “D”). Students must include at least one “N” and one “I” course in the integrative studies programs. A “D” course designation may meet either an “N” or an “I” requirement, but not both. Students may have any combination of the three designations, but **not** two of the same. For example, two “D” designations will not fulfill the university diversity requirement. In addition, students should note that there are some courses which do not have a D, I, or N designation; these courses fulfill the ISS requirement, but will **not** fulfill the university diversity requirement.

All Michigan State University students must complete 8 credits (2 courses) of Integrative Studies in Social Sciences (ISS). Students must complete one 200-level ISS course followed by one 300-level course. These courses can be completed at any time during the undergraduate program.

- ISS 210 Society & the Individual (D)
- ISS 215 Social Differentiation & Inequality (D)
- ISS 220 Time, Space, & Change in Human Society (D)
- ISS 225 Power, Authority, & Exchange (D)
- ISS 235 Liberal Democracy (D)

- ISS 305 Evaluating Evidence: Becoming a Smart Research Consumer (N)
- ISS 310 People & Environment (I)
- ISS 315 Global Diversity & Interdependence (I)
- ISS 318 Lifespan Development Across Cultures (I)
- ISS 320 World Urban Systems (I)
- ISS 325 War & Revolution (I)
- ISS 330A Africa: Social Science Perspectives (I)
- ISS 330B Asia: Social Science Perspectives (I)
- ISS 330C Latin America: Social Science Perspectives (I)
- ISS 335 National Diversity & Change: United States (N)
- ISS 336 Canada: Social Science Perspectives (I)

University Requirement

Bioscience: Alternative Track to Integrative Studies in Biological (ISB) and Physical Science (ISP)

Engineering students are **not** required to take courses in Integrative Studies in Biological (ISB) and Physical Science (ISP). Instead, this University requirement is met by taking one of the following bioscience courses:

BS 110 Organisms and Populations
BS 111 Cells and Molecules
ENT 205 Pests, Society and Environment
MMG 201 Fundamentals of Microbiology
PLB 105 Plant Biology
PSL 250 Introductory Physiology
ZOL 141 Introductory Human Genetics

Biosystems Engineering majors must take: BS 110 to satisfy the Alternative Track to Integrative Studies in Biological Science requirement *and* must also take BS 111 to satisfy a major requirement.

Chemical Engineering majors *must* take BS 111 to satisfy both the Alternative Track to Integrative Studies in Biological Science requirement *and* the chemical engineering bioscience requirement.

The **Computer Science** major also has stipulations regarding the bioscience requirement. Please refer to the Computer Science curriculum guide for this information.

College of Engineering Requirements

In the first year, engineering students complete two foundation courses which introduce them to the team design process and analytical tools used in the engineering profession. This is accomplished by taking the following sequence, required for engineering students.

Introductory Engineering Design and Computing

EGR 100 (2cr.) - Introduction to Engineering Design: prerequisite (MTH 116 or concurrently) or (MTH 132 or concurrently)

Team-based, interdisciplinary projects will be used to introduce students to the principles of engineering design processes. Teamwork, career preparation, engineering ethics and other topics will also be discussed.

EGR 102 (2cr.) - Introduction to Engineering Modeling: prerequisite (EGR 100 or concurrently) and (MTH 132 or concurrently)

Students will learn how to systematically identify and deconstruct engineering problems using tools such as advanced spreadsheets and MATLAB applications. Students will understand various engineering systems, through the use of various mathematical models.

CSE 231 (4 cr.)- Introduction to Programming I: prerequisite (EGR 100 and MTH 132 or concurrently)

CSE 231 is an introduction to programming course. Using the Python program students will learn how to design, implement, and test programs to solve problems such as those in engineering, mathematics and science.

EGR 102 is required for students in Applied Engineering Sciences, Biosystems Engineering, Civil Engineering, Chemical Engineering, Electrical Engineering, Materials Science, and Mechanical Engineering. **CSE 231** is required for Computer Science and Computer Engineering majors *only*.

Mathematics

The College of Engineering expects engineering students to display competency in mathematics for introductory calculus through at least differential equations, except for Computer Science students who are not required to take MTH 235.

MTH 132 (3 cr.)	Calculus I
MTH 133 (4 cr.)	Calculus II
MTH 234 (4 cr.)	Multivariable Calculus
MTH 235 (3 cr.)	Differential Equations (not required for CpS)

Placement in mathematics 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 score high enough for placement directly into the calculus series must successfully complete one of the sequences below *before* enrolling in MTH 132:

Sequence A: **MTH 116** (5 cr.) College Algebra & Trigonometry

Sequence B: **MTH 103** (3 cr.) College Algebra *and* **MTH 114** (3 cr.) Trigonometry

Sequence C: **MTH 1825** (3 cr.) Intermediate Algebra *and* **MTH 116** (5cr.) College Algebra & Trigonometry.

**The credits earned in MTH 1825 do *not* count toward graduation.

Chemistry

All engineering students (except Computer Science majors) are required to complete at least one introductory course in general chemistry, taken during the freshman year. The introductory chemistry requirements for the College of Engineering are:

CEM 141 (4cr.)- General Chemistry and **CEM 161** (1cr.)- Chemistry lab

Prerequisite: MTH 103 or concurrently; MTH 116 or concurrently

Required for: Applied Engineering Sciences, Biosystems Engineering, Civil Engineering, Computer Engineering, Electrical Engineering, and Mechanical Engineering

Computer Engineering and Electrical Engineering students may choose *either* Chemistry (CEM 161) *or* Physics (PHY 191) lab.

OR

CEM 151 (4cr.)- General and Descriptive Chemistry and **CEM 161** (1cr.)- Chemistry lab

Prerequisite: MTH 116 or concurrently

Required for: Chemical Engineering, Civil Engineering with Environmental Option, and Materials Science and Engineering

Physics

All engineering students are expected to develop an understanding of certain fundamental principles of physics as a prerequisite to future engineering coursework. This requirement is met by taking two semesters of calculus-based physics. Check curriculum guides for physics lab requirements.

PHY 183 (4cr.) – Physics for Scientists and Engineers I

Prerequisite: MTH 132

Online Version: (Summer) PHY 183B (4 cr.)

AND

PHY 184 (4cr.)– Physics for Scientists and Engineers II

Prerequisite: MTH 133; PHY 183 or 193H

Online Version: (Summer) PHY 184B (4 cr.)

PHY 231 and **PHY 232** do not fulfill the College of Engineering Physics requirements. Please see your academic advisor for more information.

List of suggested electives for EGR students

Business/Communications

ADV 205	Principles of Advertising	3cr
COM 100	Human Communications	3cr
COM 225	Introduction to Interpersonal Communication	3 cr
COM 240	Introduction to Organization Communication	4cr
TC 100	The Information Society	3cr

Computers/Engineering

CSE 100	Computer Science Profession	1cr
CSE 101	Computing Concepts and Competencies	3cr
EGR 160	Diversity and Engineering	2cr
EGR 291	Selected Topics	varies
ME 280	Graphic Communications	2cr

Construction/Infrastructure/Materials

AE 150	Metal Fabrication Technology	2cr
CMP 101	Principles of Building Construction Mgmt	2cr
HRT 111	Landscape Design	3cr
IDES 240	Computer-Aided Design for Designers	3cr
LA 200	Introduction to Landscape Architecture	3cr
PKG 101	Principles of Packaging	3cr

Economics/Finance

EC 201	Introduction to Microeconomics	2cr
EC 202	Introduction to Macroeconomics	2cr
EC 210	Economics Principles Using Calculus	3cr
FCE 238	Personal Finance	3cr

Environment

AST 101	The Celestial Clockworks	1cr
HRT 111	Landscape Design	3cr
GLG 201	The Dynamic Earth	4cr
LA 200	Introduction to Landscape Architecture	3cr

Safety and Security

CJ 110	Introduction to Criminal Justice	3cr
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Other

EAD 315	Student Leadership Training	3cr
ISP 215	The Science of Sound	3cr
KIN 121	The Healthy Lifestyle	3cr
KIN 125	First Aid and Personal Safety	3cr
MUS 175	Understanding Music	2cr
MUS 178	Music Theory for Non Music Majors I	2cr
SOC 100	Introduction to Sociology	4cr
SOC 215	Race and Ethnicity	3cr
TE 250	Human Div. Power & Opp. In Soc. Inst.	3cr
WS 201	Introduction to Women's Studies	4cr

Schedule Planning Worksheet

A typical first year Engineering schedule might look like this:

Fall	Credits		Spring	Credits		Summer	Credits
EGR 100	2		EGR 102	2			
CEM 141	4		MTH 133	4			
CEM 161	1		PHY 183	4			
MTH 132*	3		WRA 1**	4			
ISS 2**	4						
Total	14		Total	14		Total	

* If you are starting in a Math course other than MTH 132, your advisor will help you with appropriate Math sequencing.

A second year Engineering schedule might look like this:

Fall	Credits		Spring	Credits		Summer	Credits
MTH 234	4		MTH 235	3			
PHY 184	4		Bioscience	3-4			
IAH 20*	4		ISS 3**	4			
Major course	3-4		Major course	3-4			
Total	15-16		Total	13-15		Total	

After reading the university and College of Engineering requirements on the previous pages, use the guide to plan your preliminary schedule in the space below:

Fall	Credits		Spring	Credits		Summer	Credits
Total			Total			Total	

Admission to the College of Engineering

Students are admitted to the College of Engineering as soon as they have completed the required core courses and have met specific GPA requirements for their declared major. Students must be admitted to the college to enroll for 300 and 400 level courses. Eligible students are automatically reviewed every semester and admitted once they have:

- completed the required courses
- declared a degree granting Engineering major
- and achieved a specific grade point average within that major.

Admission to the College of Engineering is based on a student's *combined* grade point average.

Your combination grade point average is calculated as follows:

- 1) the cumulative grade point average of *all* courses taken added to
- 2) the technical grade point average based on all technical classes taken at MSU (generally those in the College of Engineering and the College of Natural Science), then divided by 2.

For more information about the combined grade point average required for admission, refer to the information on the following page, and to the website:

www.egr.msu.edu/undergraduate/admission/admit

Students whose major is listed as Engineering No-Preference will not be admitted until they declare a degree-granting major. In some cases, an application to the College may be necessary. Juniors and seniors who have a declared major outside the College of Engineering and wish to change to Engineering should submit an application which can be found at:

www.egr.msu.edu/undergraduate/admission/admit

You must be admitted to a degree-granting major by the time you have attained 56 credits.

Courses Required for Admission

- **MTH 132**
- **MTH 133**
- (Students must have a minimum 2.0 grade point average or higher in *all* mathematics courses completed at the time of admission. This does not include MTH 1825.)
- **CEM 141** or **151** for all majors except Computer Science
- **PHY 183** or **183B**
- **EGR 100**
- **EGR 102 OR CSE 231** (for Computer Engineering and Computer Science majors *only*.)

An admitted student who wishes to change to a different engineering major must submit an application that will be reviewed at the end of the semester in which the application was submitted. Please see our website for more information:

www.egr.msu.edu/undergraduate/admission/admit.

Calculating Your Combined Grade Point Average

Admission to the College of Engineering is based on your Combined (“Combo”) GPA, which is calculated like this:

$$\frac{\text{Cumulative GPA} + \text{Technical GPA}}{2} = \text{Combined (“Combo”) GPA}$$

Your Cumulative GPA is an average of the grades you received for **all** courses you have taken for credit at MSU. Your cumulative GPA can be found in STUINFO (Click on “Credits and GPA”). First, multiply the credits for each MSU course you have taken by grade you received to get your points. Then, divide your total points by your total credits to get your cumulative GPA. Example:

Course	Credits		Grade	=	Points
ENT 205	3	X	2.5	=	7.5
CEM 141	4	X	3.0	=	12.0
CEM 161	1	X	4.0	=	4.0
ISS 215	4	X	2.5	=	10.0
MTH 132	3	X	3.5	=	9.0
TOTAL	15				42.5

Cumulative GPA: $42.5 / 15 = 2.8333$

Your Technical GPA is an average of the grades you have received for all technical courses taken in the College of Engineering, Natural Science, or Veterinary Medicine. An official list of technical courses can be found at http://www.egr.msu.edu/files_egr/TechGPACrses.pdf

The calculation is the same as the Cumulative GPA, *except* that it only includes your science and engineering related courses. Students should note that technical courses are counted twice, once in the cumulative GPA and then again in the technical GPA. 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:

Course	Credits		Grade	=	Points
ENT 205	3	X	2.5	=	7.5
CEM 141	4	X	3.0	=	12.0
CEM 161	1	X	4.0	=	4.0
MTH 132	3	X	3.0	=	9.0
TOTAL	11				32.5

Technical GPA: $32.5 / 11 = 2.9545$

Finally, the **Combo GPA** for these courses would be calculated like this:

$$\frac{2.8333 + 2.9545}{2} = 2.8939$$

Undergraduate Studies Resources

The Center/Spartan Engineering

Experiential Engineering Education is a broad term used to describe co-curricular programs that enhance the classroom educational experience. These opportunities may include traditional cooperative education and internship programs, on-campus research or intern positions, study abroad opportunities, service-learning, and other non-traditional approaches to learning.

If you are ready to start exploring experiential education opportunities, or just want to see what positions might be available, sign up on MySpartanCareer.com to access Experiential Education's online application and job postings. Depending on the opportunity, you can begin working your freshman year. For more information, please visit our website: www.egr.msu.edu/thecenter, stop by 1340 Engineering Building, or call us at (517) 355-5163.

The Center Staff – Garth Motschenbacher, Director of Employer Relations
Bernadette Friedrich, Director of Student Advancement
Jennifer Jennings, Field Career Consultant

Diversity Programs Office (DPO) and Guided Learning Center (GLC)

The DPO is proud to support and provide resources for all students, with a particular emphasis on assisting groups underrepresented in Engineering. The DPO offers the following services

- The Guided Learning Center:
 - Academic assistance in any course
 - Drop-in and one-on-one sessions.
 - All services free of charge!
- Professional development
- Resource materials
- Programs
- Opportunities for students to network with faculty, staff, and career professionals
- A freshman/sophomore course, *Diversity and Engineering*, (EGR 160)
 - Business protocol, 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 www.egr.msu.edu/dpo or call us at (517) 355-8310.

The DPO Staff – Theo Caldwell, Director
Kyle Foster, Assistant Director
James Stewart, Secretary
Rickey Caldwell, Guided Learning Center Coordinator
Tonisha Lane, Academic Coordinator

Engineering Study Abroad

At MSU we take pride in being a leader in study 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. We are waiting to assist you in choosing a study abroad experience that is right for you. Come to the Engineering Study Abroad Office at 1108D EB to begin planning this important part of your college experience. Engineering Study Abroad has programs in:

- Australia
- France
- Germany
- Italy
- Mexico
- Russia
- Sweden
- Taiwan
- United Kingdom

For more information, please visit our website at www.egr.msu.edu/study-abroad, stop by 1108 Engineering Building, or call us at (517) 355-8310.

The Study Abroad Staff – Maggie Blair-Ramsey, Study Abroad Coordinator

Scholarship Information

The College of Engineering administers a variety of scholarships from corporate and private donors in addition to the various financial aid programs available through the Office of Financial Aid. These engineering awards are generally based on academic excellence and are available for returning students. Scholarship applications will be available after January 1st and should be returned to room 1415 Engineering Building. For further information visit:

www.egr.msu.edu/undergraduate/resources/scholarships.

Engineering Student Groups and Organizations

Student organizations play an important role in the College of Engineering. They provide students with the opportunity to affiliate with their major department, to meet other students in their major, and to connect with faculty and company representatives. You are encouraged to join and participate in professional or student-run groups and organizations. Participation in student organizations can help you connect with new people and develop leadership skills. Research has also shown that involvement in student organizations increases students' grade point averages and their satisfaction with and persistence in college. Below is a list of the engineering student groups and organizations available in the College:

Amateur Radio Club (W8SH)

American Institute of Aeronautics and Astronautics (AIAA)

American Institute of Chemical Engineers (AIChE) – www.egr.msu.edu/aiche

American Society of Agricultural and Biological Engineers (ASABE)-
www.egr.msu.edu/beclub

American Society of Civil Engineers (ASCE) – www.egr.msu.edu/asce

American Society for Engineering Education (ASEE) – www.asee.org

American Society of Mechanical Engineers (ASME) – www.egr.msu.edu/asme

Association for Computing Machinery (ACM) – www.acm.cse.msu.edu

Baja SAE – www.egr.msu.edu/baja

Biomedical Engineering Society (BMES) – www.egr.msu.edu/bmes

Engineers Without Borders (EWB) – www.msu.edu/~ewb

Environmental Engineering Student Society (EESS) – www.egr.msu.edu/eess

Eta Kappa Nu (HKN) – www.egr.msu.edu/hkn

Formula SAE – www.egr.msu.edu/fsae

Institute of Electrical and Electronics Engineers (IEEE) MSU Student Branch –
www.egr.msu.edu/ieee

International Society of Pharmaceutical Engineering (ISPE) –
www.egr.msu.edu/ispe

Leadership Advantage- www.egr.msu.edu/la

Materials Science Society (MSE Society) – www.egr.msu.edu/msesoc

National Society of Black Engineers (NSBE) – www.egr.msu.edu/nsbe

National Society of Professional Engineers (NSPE) – www.egr.msu.edu/nspe

Omega Chi Epsilon – www.egr.msu.edu/oxe

Pi Tau Sigma – www.egr.msu.edu/pts

Science Theatre – www.pa.msu.edu/sci_theatre

Society of Applied Engineering Sciences (SAES) – www.egr.msu.edu/saes

Society of Hispanic Professional Engineers (SHPE) – www.egr.msu.edu/shpe

Society of Women Engineers (SWE) – www.egr.msu.edu/swe

Solar Car Team – www.egr.msu.edu/solar

Student Engineering Council (SEC) – www.egr.msu.edu/sec

Tau Beta Pi MSU Chapter

Triangle Fraternity MSU Chapter – www.egr.msu.edu/triangle

Upsilon Pi Epsilon – www.cse.msu.edu/~upe

Women in Computing - www.egr.msu.edu/msuwic

For more information on Engineering Student Groups and Organizations, check out the College of Engineering Student Groups and Organizations website:
www.egr.msu.edu/egr/services/student/studentgroups.php.

Engineering Majors

What are they and where do they work?

Applied Engineering Sciences (AES)

Broad foundation across all engineering majors, students choose business or communications cognate

Work in: EGR consulting, recruiting, sales, marketing, logistics management

Biosystems Engineering (BE)

Broad biological component, food process & equipment design

Work in: food quality & safety, renewable bioenergy, and ecosystems engineering

Chemical Engineering (ChE)

Chemistry and engineering applied to full-scale industrial production

Work in: pharmaceuticals, bioenergy, consumer products

Civil Engineering (CE)

Transportation and structures, environmental concentration available

Work with: roads, bridges, structures, construction, and infrastructure

Computer Engineering (CpE)

Hardware & software, make computers smaller & faster

Work as: computer & chip architects, real-time system design

Computer Science (CpS)

Software design & development of: databases, graphics, webpages, & networks

Work in: cyber security, artificial intelligence, information technology, consulting, project management, marketing, etc.

Electrical Engineering (EE)

Integrated circuits, robotics & control, power, and lasers

Work in: nanotechnology, fiber optic communication systems, electric cars

Materials Science & Engineering (MSE)

Develop new materials & the processes to create them

Work with: metals & ceramics, plastics, polymers (non-metals)

Mechanical Engineering (ME)

Anything with motion or moving parts, design

Work in: aerospace, automotive, manufacturing, and energy systems

Engineering Undergraduate Academic Curriculum

1. UNIVERSITY REQUIREMENTS

(What every MSU student should know):

- How to locate and use *Schedule of Courses*
- How to find course *prerequisites*
- Where to find *degree requirements*
- What *academic services* are available
- How to read your *MSU email* (and make sure you check it often!)
- How to ask for an *override* (from the department offering the course!)

2. COLLEGE REQUIREMENTS

(What every ENGINEERING student should know):

- Where to find *major requirements*
- College of Engineering *admission requirements*
- Where the *Diversity Programs Office*, *The Center*, and *Undergraduate Studies* are located and what they do
- What the *Engineering Major* are and what you can do with them
- Average *graduation time* is 4.5 years
- How to get to and use *Degree Navigator* and *Stu-Info*
- Keep going with *math courses* every semester – no breaks!

3. MAJOR REQUIREMENTS

(What you should know about your MAJOR):

- What are the *course requirements* in your major
- How to find and utilize *job/internship* opportunities
- At least one *faculty member* – well enough for a recommendation
- How to find and participate in *research opportunities*

4. CONCENTRATIONS

(What you can do to enhance your EDUCATION):

- How to locate and participate in *an internship or co-op* (and how to get credit for it!)
- Where, when, and how to *study abroad*
- How to find and participate in *undergraduate research opportunities*
- What engineering *student organizations* exist, what they do and how to participate
- How to get information about graduate school
- How to participate in service learning opportunities

CONTACT INFORMATION FOR ENGINEERING ADVISING CENTER

Office: 1410 Engineering Building, East Lansing, MI 48824-1226
Phone: (517) 355-6616 ext. 1 Fax: (517) 432-1356
Website: <http://www.egr.msu.edu/undergraduate/advising>
Office Hours: 8am – 5pm, Monday through Friday, except on official University Holidays

ENGINEERING DEGREE PROGRAMS AND MAJOR REQUIREMENTS

The information listed here is current as of May 2009. Please check the Engineering website for more information. **Students** are expected to know departmental policies and course prerequisites and **are ultimately responsible** for accurately completing degree requirements.

Applied Engineering Sciences (AES)

1. University Requirements: (23-24)

Writing, Rhetoric and American Cultures (WRA)	4
Integrative Studies in Humanities (IAH)	8
Integrative Studies in Social Sciences (ISS)	8
Bioscience (one of the following):	
BS 110, BS 111, ENT 205, MMG 201, MMG 301, PLB 105, PSL 250, ZOL 141	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

3. Major Requirements: (30)

A. Complete all of the following courses:

CE 221 Statics	3
CEM 161 Chemistry Laboratory I	1
EGR 300 Technology, Society and Public Policy	2
EGR 410 System Methodology	2
ME 222 Mechanics of Deformable Solids	4
ME 280 Graphic Communications	2
MGT 325 Management Skills and Processes	3
MSE 250 Materials Science and Engineering	3
PSY 101 Introductory Psychology	4
PSY 255 Industrial & Organizational Psychology	3
STT 351 Probability & Statistics for Engineering	3

B. Select one of the following courses: (3)

ECE 201 Circuits and Systems I	3
ECE 230 Digital Logic Fundamentals	3
ECE 345 Electronic Instrumentation & Systems	3

C. Select one of the following courses: (3)

BE 230 Engineering Anlys of Biological Systems	3
CE 280 Principles of Environ Engr & Science	3
CHE 201 Material and Energy Balances	3

D. Select one of the following courses: (3)

ME 201 Thermodynamics	3
MSE 310 Phase Equilibria in Materials	3

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.

E. Cognates

Cognates in Business-Supply Chain Management and Telecommunication are available to majors in Applied Engineering Sciences. Students should consult with their adviser prior to selection of a cognate. Students must select one of the following cognates.

Business-Supply Chain Management: (24)

A. All of the following courses:

ACC 201 Principles of Financial Accounting	3
ACC 202 Principles of Management Accounting	3
EC 210 Economics Principles Using Calculus	3
FI 320 Introduction to Finance	3
GBL 323 Introduction to Business Law	3
MKT 327 Introduction to Marketing	3
SCM 303 Introduction to Supply Chain Mgt	3
SCM 372 Manufacturing Planning and Control	3

B. One of the following courses: (3)

BE 431 Bio-resource Optimization	3
ME 477 Manufacturing Processes	3
ME 497 Biomechanical Design	3
STT 471 Statistics for Quality and Productivity	3
MSE 425 Biomaterials and Biocompatibility	3
MSE 426 Introduction to Composite Materials	3

Telecommunication: (30)

ACC 230 Survey of Accounting Concepts	3
EC 201 Introduction to Microeconomics	3
TC 100 The Information Society	3
TC 200 History & Economics of Telecommunication	4
TC 201 Introduction to Telecommunication Tech	4
TC 310 Basic Telecommunication Policy	4
TC 361 Data Communication	3
TC 463 Network Design and Implementation I	3
TC 465 Network Design & Implementation II (W)	3

Other Electives (Variable)

128

Total credits Required for Degree

The requirements listed above apply to students admitted to the major of Applied Engineering Sciences in the Engineering Undergraduate Studies Office (UGS) beginning Fall, 2008. 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, 1410 Engineering Building, phone (517) 355-6616 extension 1.

Sample Program

Freshman Year				Sophomore Year			
Fall	Credits	Spring	Credits	Fall	Credits	Spring	Credits
CEM 141	4	Bioscience	3/4	Cognate #1	3	CE 221	3
CEM 161	1	EGR 102	2	IAH 20X	4	Cognate #2	3
EGR 100	2	MTH 133	4	MTH 234	4	ISS 2XX	4
ME 280	2	PSY 101	4	PHY 183	4	MTH 235	3
MTH 132	3	Elective	3	PSY 255	3	MSE 250	3
WRA 1XX	4						
Total	16	Total	14/15	Total	18	Total	16

Junior Year				Senior Year			
Fall	Credits	Spring	Credits	Fall	Credits	Spring	Credits
Cognate #3	3	Cognate #5	3	Cognate #6	3	Cognate #8	3
Cognate #4	3	IAH XXX	4	Cognate #7	3	Cognate #9	3
EGR 300	2	Item B Choice	3	ISS 3XX	4	EGR 410	2
ME 222	4	Item C Choice	3	MGT 325	3	Elective	3
PHY 184	4	Item D Choice	3	STT 351	3	Elective	3
Total	16	Total	16	Total	16/17	Total	14

Program Objectives

The Applied Engineering Sciences major is an undergraduate, interdisciplinary program that combines scientific and technical course work with a complementary cognate resulting in a Bachelor of Science degree awarded by the College of Engineering. It is the intent of the Applied Engineering Sciences major to provide educational opportunities for the undergraduate student who wishes to gain a broad foundation in the engineering sciences, core engineering disciplines and their application to one of the cognate areas. Cognates are available in Business - Supply Chain Management and Telecommunication. On a space available basis, an Information Technology Specialization can be combined with either of the two cognates.

The program is designed to develop an individual who:

1. Brings to the workplace a knowledge of business, management, and logistics, grounded in calculus, basic sciences, and engineering sciences;
2. Can apply the rigor of their education and training to a diverse set of problems;
3. Is prepared to work at the interfaces of planning, design, production, procurement, marketing, distribution, sales, and management;
4. Can effectively communicate across diverse professional disciplines; and
5. Is knowledgeable of contemporary technological and societal issues and can facilitate the effective deployment of new technologies.

Biosystems Engineering (BE)

Accredited by the Engineering Accreditation Commission of ABET,
111 Market Place, Suite 1050, Baltimore, MD 21202-4012 – telephone (410) 347-7700.

1. University Requirements (24)

Writing, Rhetoric and American Cultures (WRA)	4
Integrative Studies in Humanities (IAH)	8
Integrative Studies in Social Sciences (ISS)	8
Bioscience: BS 110 Organisms and Populations	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

3. Major Requirements: (47)

a. Complete all of the following courses:

BE 101 Introduction to Biosystems Engineering	1
BE 230 Engineering Analysis of Biological Systems	3
BE 332 Engineering Properties of Biological Materials	3
BE 333 Biosystems Engineering Laboratory	1
BE 350 Heat and Mass Transfer in Biosystems	3
BE 351 Thermodynamics for Biological Engineering	3
BE 360 Microbial Systems Engineering	3
BE 385 Egr Design & Optimization for Biological Sys	3
BE 485 Biosystems Design Techniques	3
BE 487 Biosystems Design Project (W)	3
BS 111 Cells and Molecules	3
CE 221 Statics	3
CE 321 Introduction to Fluid Mechanics	4
CEM 143 Survey of Organic Chemistry	4
CEM 161 Chemistry Laboratory I	1
ECE 345 Electronic Instrumentation and Systems	3
STT 351 Probability and Statistics for Engineering	3

b. Select one of the following courses: (3-4)

MMG 301 Introductory Microbiology	3
PLB 301 Introductory Plant Physiology	3
PSL 250 Introductory Physiology	4

c. Select one of the following courses: (3)

CSS 440 Soil Biophysics	3
FOR 404 Forest and Agricultural Ecology	3
FSC 440 Food Microbiology	3
MMG 425 Microbial Ecology	3
MMG 445 Microbial Biotechnology	3
PSL 425 Physiological Biophysics	3

d. Select three of the following courses (9):

BE 445 Biosensors for Medical Diagnostics	3
BE 456 Electric Power and Control	3
BE 468 Biomass Conversion Engineering	3
BE 469 Sustainable Bioenergy Systems	3
BE 477 Food Engineering: Fluids	3
BE 478 Food Engineering: Solids	3
BE 481 Land & Water Conservation Engineering	3
BE 482 Non-point Source Pollution Control	3

e. Technical Electives (6)

Complete at least 6 credits selected from a list of approved engineering, technical, or science electives available from the academic adviser. Approved courses include, but are not limited to, those listed in the various concentrations/specializations listed below and additional courses from item d. above.

Optional Concentrations

The department offers several 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 program in Biosystems Engineering. Courses completed to satisfy requirement 3. above may also be used to satisfy the requirements of a concentration. Upon completion of the required courses for a given concentration, certification will appear on the student's official transcript.

Bioenergy Engineering Concentration (15-16)

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

All of the following courses: (12)

BE 467 Bioenergy Feedstock Production	3
BE 468 Biomass Conversion Engineering	3
BE 469 Sustainable Bioenergy Systems	3
MMG 445 Microbial Biotechnology	3

One of the following courses: (3-4):

CHE 481 Biochemical Engineering	3
CHE 882 Advanced Biochemical Engineering	3
CHE 883 Multidisciplinary Bioprocessing Laboratory	3
FW 829 The Economics of Environmental Resources	3
GLG 471 Applied Geophysics	4
MC 450 International Environmental Law & Policy	3
ME 417 Design of Alternative Energy Systems	3

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:

All of the following courses (9):

BE 445	Biosensors for Medical Diagnostics	3
ME 494	Biofluid Mechanics and Heat Transfer	3
PSL 425	Physiological Biophysics	3

Two courses from 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
MSE 425	Biomaterials and Biocompatibility	3
PLB 400	Introduction to Bioinformatics	3

Ecosystems Engineering Concentration: (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:

All of the following courses: (9)

BE 481	Land and Water Conservation Engr	3
BE 482	Non-point Source Pollution Control	3
MMG 425	Microbial Ecology	3

Two of the following courses: (6)

At least one course must be at the 400-level

CE 280	Principles of Env. Engineering and Sci	3
CE 422	Applied Hydraulics	3
CE 487	Microbiology for Env. Sci. and Engineering	3
CSS 210	Fundamentals of Soil Science	3
CSS 440	Soil Biophysics	3
CSS 455	Pollutants in the Soil Environment	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: (6-7)

At least one course must be at the 400-level

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 2009. 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 adviser to obtain assistance in planning an appropriate schedule of courses. Students who have questions about Biosystems Engineering should contact the Biosystems Engineering Advising Office, 1410 Engineering Building, phone (517) 355-6616 extension 1.

Last revised May 2009

Biosystems Engineering (BE)

Sample Program

Freshman Year				Sophomore Year			
Fall	Credits	Spring	Credits	Fall	Credits	Spring	Credits
BE 101	1	BS 111	3	BS 110	4	BE 230	3
CEM 141	4	EGR 102	2	IAH 201-210 (A)	4	CE 221	3
CEM 161	1	ISS 2XX	4	MTH 234	4	CEM 143	4
EGR 100	2	MTH 133	4	PHY 184	4	IAH 2XX (B)	4
MTH 132	3	PHY 183	4			MTH 235	3
WRA 1XX	4						
Total	15	Total	17	Total	16	Total	17

Junior Year				Senior Year			
Fall	Credits	Spring	Credits	Fall	Credits	Spring	Credits
BE 332	3	BE 350	3	BE 485	3	BE 487	3
BE 333	1	BE 360	3	BE Choice D	3	BE Choice D	3
BE 351	3	BE 385	3	Choice C	3	BE Choice D	3
CE 321	4	ECE 345	3	ISS 3XX	4	Tech Elective	3
Choice B	3-4	Tech Elective	3	Elective	3	Elective	2/3
STT 351	3						
Total	17/18	Total	15	Total	16	Total	14/15

PROGRAM EDUCATIONAL OBJECTIVES

The overall purpose of the MSU biosystems engineering undergraduate program is to prepare graduates who will integrate and apply principles of engineering and biology to a wide variety of socially important problems. To achieve that purpose, the primary objectives of the biosystems engineering program are to prepare graduates to:

- identify and solve problems at the interface of biology and engineering, using modern engineering techniques and the systems approach, and
- analyze, design, and control components, systems, and processes that involve critical biological components.

Additionally, the biosystems engineering program is designed to help graduates succeed in diverse careers by developing a professional foundation that includes vision, adaptability, a practical mindset, effective communication skills, the ability to work in cross-disciplinary teams, an appreciation for global, economic, and societal issues, and a commitment to continuing professional growth and ethical conduct.

(Approved by the Biosystems Engineering faculty, student group, and Industry Advisory Board, April 2004)

Chemical Engineering (ChE)

Accredited by the Engineering Accreditation Commission of ABET,
111 Market Place, Suite 1050, Baltimore, MD 21202-4012 - telephone (410) 347-7700.

1. University Requirements: (23)

Writing, Rhetoric and American Cultures (WRA)	4
Integrative Studies in Humanities (IAH)	8
Integrative Studies in Social Sciences (ISS)	8
Bioscience: BS 111 Cells and Molecules	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

3. Major Requirements: (54)

A. Complete all of the following courses:

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 Laboratory Practice and Statistical Analysis	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	4
CHE 434 Process Design and Optimization II	2
CHE 473 Chemical Engr Princ in Polymers & Mats Sys	3

B. One of the following groups: (4-6)

Group 1

BMB 401 Basic Biochemistry	4
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Group 2

BMB 461 Biochemistry I	3
BMB 462 Biochemistry II	3

C. Select one of the following courses: (3)

CHE 472 Composite Materials Processing	3
CHE 481 Biochemical Engineering	3

D. Select one of the following courses: (3)

CEM 483 Quantum Chemistry	3
CEM 484 Molecular Thermodynamics	3

E. Technical Electives: (6)

Students must complete at least 6 credits of technically oriented, subject-related courses approved by the student's adviser. Acceptable subjects include, but are not limited to: electronic materials, environment, advanced mathematics, transport phenomena, advanced chemistry, food, legal and regulatory issues, advanced materials, advanced biology, statistics, polymers, and biomedical engineering. If both biochemical engineering and composite materials processing are taken to fulfill requirement 3.c., one may count as a technical elective.

Note: At least one course in the technical elective area must include 3 credits of engineering topics, which includes courses taught in the College of Engineering and advanced courses taught in mathematics, chemistry, biology, physics, and statistics.

BMB 462, taken to fulfill requirement 3.b, counts as technical elective credit; but cannot be used to satisfy 3 credits of engineering topics.

Concentrations in Chemical Engineering

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. Completing the Bachelor of Science degree in chemical engineering with a concentration may require more than 128 credits. **Students who complete a concentration are not required to complete Technical Electives.**

Biochemical Engineering Concentration: (11-15)

To earn a Bachelor of Science degree in Chemical Engineering with a biochemical engineering concentration, students must complete requirements 1., 2., 3.a., 3.b., 3.d.

All of the following courses: (6)

CHE 481 Biochemical Engineering	3
MMG 301 Introductory Microbiology	3

Two or three of the following courses. Students who choose BMB 401 from 3.b. above must select three courses from the following. Students who choose BMB 461 and 462 from 3.b. above must select two courses: (5-9)

BMB 829 Methods Of Macromolecular Anlys & 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
MMG 445 Basic Biotechnology	3

Bioenergy Concentration: (15-16)

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

All of the following courses: (12)

BE 469	Sustainable Bioenergy Systems	3
CHE 468	Biomass Conversion in Engineering	3
CHE 481	Biochemical Engineering	3
CSS 467	Bioenergy Feedstock Production	3

One of the following courses (3-4 credits):

CHE 882	Advanced Biochemical Engineering	3
CHE 883	Multidisciplinary Bioprocessing Laboratory	3
FW 450	International Environmental Law & Policy	3
FW 829	The Economics of Environmental Resources	3
GLG 471	Applied Geophysics	4
MMG 445	Basic Biotechnology	3

Biomedical Engineering Concentration: (15-16)

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., 3.d. above and the following:

All of the following courses: (9)

CHE 481	Biochemical Engineering	3
MMG 409	Eukaryotic Cell Biology	3
PSL 431	Human Physiology I	3

Two of the following courses: (6-7)

BMB 471	Biochemistry Laboratory (W)	3
CHE 883	Multidisciplinary Bioprocessing Laboratory	3
ME 494	Biofluid Mechanics and Heat Transfer	3
ZOL 341	Fundamental Genetics	4

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., 3.d. above and the following:

All of the following courses: (6)

CE 280	Principles of Environmental Engr and Science	3
CHE 481	Biochemical Engineering	3

Three of the following courses: (9)

CE 481	Environmental Engineering Chemistry	3
CE 483	Unit Operations & Processes in Envrn Engr.	3
CE 485	Landfill Design	3
EEP 255	Ecological Economics	3
EEP 320	Environmental Economics	3
EEP 405	Corporate Environmental Management	3
ESA 200	Intro to Environmental Studies & Agriscience	3
ESA 430	Environmental and Natural Resource Law	3
ZOL 446	Environmental Issues and Public Policy	3

Food Science Concentration: (12-13)

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., 3.d. above and 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: (3-4)

BE 477	Food Engineering: Fluids	3
BE 478	Food Engineering: Solids	3
FSC 325	Food Processing: Unit Operations	4
FSC 455	Food Analysis	3
FSC 470	Integrated Approaches to Food Product Dev	3

Polymer Science and Engineering Concentration: (16-17)

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 the following:

All of the following courses: (10)

CE 221	Statics	3
CHE 472	Composite Materials Processing	3
ME 222	Mechanics of Deformable Solids	4

Two of the following courses: (6-7)

CHE 871	Materials Surfaces and Interfaces	3
CHE 872	Polymers & Cmposites: Mfg, Strc & Prfrmnce	3
MSE 370	Physical Processing of Materials	3
MSE 426	Introduction to Composite Materials	3
PKG 323	Packaging with Plastics	4

Other Electives (Variable)**Total Credits Required for Degree****128**

These requirements are effective for students admitted to the Chemical Engineering major beginning Fall 2009. 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 adviser 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, 1415 Engineering Building, phone (517) 355-6616 extension 1.

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.

Sample Program

Freshman Year				Sophomore Year			
Fall	Credits	Spring	Credits	Fall	Credits	Spring	Credits
CEM 151	4	CEM 152	3	CEM 351	3	CEM 352	3
CEM 161	1	CEM 162	1	CHE 201	3	CEM 355	2
EGR 100	2	EGR 102	2	BS 111	3	CHE 210	3
ISS 2XX	4	MTH 133	4	MTH 234	4	MTH 235	3
MTH 132	3	WRA 1XX	4	PHY 183	4	PHY 184	4
Total	14	Total	14	Total	17	Total	15

Junior Year				Senior Year			
Fall	Credits	Spring	Credits	Fall	Credits	Spring	Credits
CEM 483/484	3	BMB 401	4	CHE 432	3	CHE 434	2
CHE 301	1	CHE 312	4	CHE 433	4	CHE 473	3
CHE 311	3	CHE 316	4	CHE 472/481	3	Elective	3
CHE 431	4	CHE 321	4	Elective	3	IAH XXX	4
IAH 20X	4			ISS 3XX	4	Technical Elective	3
Elective	2					Technical Elective	3
Total	17	Total	16	Total	17	Total	18

CHE Program Educational Objectives

The undergraduate program in chemical engineering builds a strong foundation for the professional development of its students and prepares them to meet the technological challenges of the future. With a bachelor's degree, the graduates are well equipped for a wide variety of positions as practicing chemical engineers or for graduate studies in engineering and scientific disciplines. The intensive program encourages continued learning and professional development by providing the proper knowledge and stimulation in a setting that promotes personal growth. The program emphasizes its historic, nationally recognized strength in chemical process design, yet draws on the scholarly accomplishments of its faculty to integrate traditional chemical engineering topics with specialized studies in the contemporary fields of materials, bioprocessing, environmental engineering, and food engineering.

The faculty of the chemical engineering program is committed to sharing the responsibility of learning with the students, providing a rigorous academic environment that encourages active learning, high quality student performance, and ethical conduct. While the faculty recognizes that the professional accomplishments of the program graduates stem from personal aspirations and individual initiative, the program faculty seeks to optimize their opportunities for success and their continued professional growth and development. Through the integration of knowledge and skills acquired in a demanding set of courses, extracurricular experiences, and faculty expertise and scholarship, the Chemical Engineering Program seeks to prepare its graduated:

- to become successful in their chosen career path, whether it be in the practice of chemical engineering, in advanced studies in engineering or science or in other complementary disciplines;
- to assume leadership roles in industry business and/or their communities;
- to contribute to the economic environment of their communities; and
- to maintain career skills through life-long learning.

Civil Engineering (CE)

Accredited by the Engineering Accreditation Commission of ABET,
111 Market Place, Suite 1050, Baltimore, MD 21202-4012 - telephone (410) 347-7700

1. University Requirements: (23)

Writing, Rhetoric and American Cultures (WRA)	4
Integrative Studies in Humanities (IAH)	8
Integrative Studies in Social Sciences (ISS)	8
Bioscience (one of the following):	3-4
BS 110, BS 111, ENT 205, MMG 201,	
MMG 301, PLB 105, PSL 250, ZOL 141	

2. College Requirements: (30)

¹ 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

3. Major Requirements: (40)

A. Complete all of the following courses:

CE 221 Statics	3
CE 271 Introduction to Civil Engineering	4
CE 280 Principles of Environ Engr and Science	3
CE 305 Introduction to Structural Analysis & Design	4
CE 312 Soil Mechanics	4
CE 321 Introduction to Fluid Mechanics	4
² CE 337 Civil Engineering Materials I	4
² CE 341 Transportation Engineering	3
CE 495 Senior Design in Civil Engineering	3
CEM 161 Chemistry Laboratory I	1
ME 222 Mechanics of Deformable Solids	4
STT 351 Probability and Statistics for Engineering	3

B. Complete one of the following courses: (3)

² CE 461 Computational Methods in Civil Engineering	3
² ME 361 Dynamics	3

³C. Complete one of the following courses: (3)

BE 351 Environmental Thermodynamics	3
ECE 345 Electronic Instrumentation and Systems	3
ME 201 Thermodynamics	3
MSE 250 Materials Science and Engineering	3

D. Major Tracks: (18)

Complete 18 credits of electives as specified below. At least 9 credits of one primary track must be completed as specified. The additional 9 credits must include one course each from three other (and different) tracks. Construction Engineering and Management courses may count towards the additional 9 credits. See the Civil Engineering Academic Adviser for specific track sample programs.

Environmental Track: (9)

1. Complete both of the following courses:

CE 481 Environmental Engineering Chemistry	3
CE 483 Unit Operations & Proc in Env Engr	3

2. Complete one of the following courses:

CE 421 Engineering Hydrology	3
CE 485 Landfill Design	3
CE 487 Microbiology for Environ Health Engr	3

Geotechnical Track: (9)

1. Complete both of the following courses:

CE 418 Geotechnical Engineering	3
CE 485 Landfill Design	3

2. Complete one of the following courses:

CE 431 Pavement Design and Analysis I	3
CE 815 Selected Topics in Geotechnical Engr	3
CE 818 Advanced Geotechnical Design	3

Pavements Track: (9)

1. Complete both of the following courses:

CE 431 Pavement Design and Analysis I	3
CE 432 Pavement Rehabilitation	3

2. Complete one of the following courses:

CE 418 Geotechnical Engineering	3
CE 831 Advanced Concrete Pavemnt Anlys & Desn	3
CE 832 Advanced Asphalt Pavemnt Anlys & Design	3

Structures Track: (9)

1. Complete both of the following courses:

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

2. Complete one of the following courses:

CE 400 Structural Mechanics	3
CE 805 Advanced Design of Steel Structures	3
CE 806 Advanced Structural Concrete Design	3

¹ Choose CEM 151 if pursuing Environmental Engineering Concentration.

² CE 337, CE 341 CE 461 and ME 361 may not be required if pursuing Environmental Engineering Concentration.

³ Choose BE 351 or ME 201 if pursuing Environmental Engineering Concentration.

Transportation Track: (9)**1. Complete both of the following courses:**

CE 448	Transportation Planning	3
CE 449	Highway Design	3

2. Complete one of the following courses:

CE 431	Pavement Design and Analysis I	3
CE 432	Pavement Rehabilitation	3
CE 444	Principles of Traffic Engineering	3

Water Resources Track: (9)**1. Both of the following courses:**

CE 421	Engineering Hydrology	3
CE 422	Applied Hydraulics	3

2. One of the following courses:

CE 423	Applied Hydrologic Analysis & Design	3
CE 822	Groundwater Modeling	3
GLG 411	Hydrogeology	3
GLG 412	Glacial Geology & Rcrd of Climate Chng	4

General Track

Students may choose a general track in fulfillment of the Primary Track requirement. Students must complete 12 credits with courses from each of four different tracks above. Students must also complete 6 additional credits across all tracks which may include course work from Construction Engineering and Management courses below.

Construction Engineering and Management Courses

CE 471	Construction Engr-Equip, Mthds & Png	3
CMP 411	Construction Project Scheduling	3
CMP 415	Cost Estimating Analysis	3
CMP 423	Construction Project Management	3

Enrollment in CMP courses require the approval of the Construction Management Program department.

Other Electives (Variable)

Total Credits Required for Degree **128**

The requirements listed above apply to students admitted to the Department of Civil & Environmental Engineering (CEE) beginning Fall 2009. 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 adviser to obtain assistance in planning an appropriate schedule of courses. Students who have questions about Civil Engineering should contact the Civil & Environmental Engineering Department Advising Office, 3579 Engineering Building, phone (517) 355-3274. For scheduling academic advising appointments visit: <https://ntweb11.ais.msu.edu/AAS/>

Last revised May 2009

Environmental Engineering Concentration for Civil Engineering

The environmental engineering concentration is available to students who are enrolled in the Bachelor of Science degree program in civil engineering. Students who elect this concentration must complete the following courses. The concentration will be noted on the student's transcript. See the Civil Engineering Academic Adviser for a sample program specific to the Environmental Engineering Concentration.

1. Complete all of the following courses: (23)

CE 480	Environmental Measurements Laboratory	1
CE 481	Environmental Engineering Chemistry	3
CE 483	Unit Operations & Proc in Env Engr	3
CE 485	Landfill Design	3
CE 487	Microbiology for Environ Health Engr	3
CEM 151	General and Descriptive Chemistry	4
CEM 152	Principles of Chemistry	3
CHE 201	Material and Energy Balances	3

Note: CEM 151 may be used to satisfy both the requirements for the Environmental Engineering concentration and the requirements for the Bachelor of Science in Civil Engineering. CE 481, 483 and 485 may be used to satisfy both the requirement for the Environmental Engineering concentration and 9 credits of the track requirements for the Bachelor of Science in Civil Engineering.

2. Complete one of the following courses: (3)

BE 351	Environmental Thermodynamics	3
CHE 321	Thermodynamics for Chemical Engr	3
ME 201	Thermodynamics	3

Note: BE 351 and ME 201 may be used to satisfy both the requirements for the Environmental Engineering concentration and the requirements for the Bachelor of Science in Civil Engineering.

3. Complete one of the following courses: (3)

CE 421	Engineering Hydrology	3
CE 422	Applied Hydraulics	3

Note: CE 421 or CE 422 may be used to satisfy both the requirements for the Environmental Engineering concentration and 3 credits of the track requirements for the Bachelor of Science in Civil Engineering.

4. Complete one of the following courses: (3-4)

CE 337	Civil Engineering Materials I	4
CE 341	Transportation Engineering	3
CE 461	Computational Methods in Civil Engineering	3
CEM 251	Organic Chemistry I	3
CEM 351	Organic Chemistry I	3
ME 361	Dynamics	3

5. Major Tracks

Complete 6 credits from two Major Tracks (d.), excluding the Environmental Track and the Water Resources Track. Eighteen credits total are required from the Major Track; 9 credits from Section 1 above, 3 credits from Section 3 above, plus an additional 6 credits from two other tracks.

Civil Engineering General Sample Program

(A different sample program applies to the Environmental Engineering Concentration.
See the Civil Engineering Academic Adviser for that sample program.)

Freshman Year				Sophomore Year			
Fall	Credits	Spring	Credits	Fall	Credits	Spring	Credits
CEM 141/151	4	CE 271	4	CE 221	3	Bioscience	3/4
CEM 161	1	EGR 102	2	Elective	Va	CE 280	3
EGR 100	2	MTH 133	4	IAH 20X	4	IAH 2XX	4
ISS 2XX	4	PHY 183	4	MTH 234	4	ME 222	4
MTH 132	3	WRA 1XX	4	PHY 184	4	MTH 235	3
Total	14	Total	18	Total	15+/Va	Total	17/18

Junior Year				Senior Year			
Fall	Credits	Spring	Credits	Fall	Credits	Spring	Credits
CE 3XX	4	CE 3XX	4	CE 461 or ME 361	3	CE 495	3
CE 3XX	4	CE 3XX	4	Elective	Va	Elective	Va
CE 3XX	3	Elective	Va	Primary Track	3	ISS 3XX	4
STT 351	3	Item C. Elec.	3	Other Track	3	Primary Track	3
		Primary Track	3	Other Track	3	Other Track	3
Total	14	Total	14+/Va	Total	12+/Va	Total	13+/Va

Civil Engineering

The general sample civil engineering course program above will satisfy the course requirements for a BS degree in civil engineering, except for the BS degree in civil engineering with the environmental engineering concentration. Students interested in pursuing this concentration should consult with the civil engineering academic adviser. The sample civil engineering course program recommends freshman and sophomore year course work that is common for all areas of specific civil engineering interest except for the environmental engineering concentration. Please note that it is strongly recommended that CE 221 and ME 222 be taken in the sophomore year.

Statement of Program Educational Objectives

The Department of Civil and Environmental Engineering provides opportunities to obtain the knowledge, skills and professional prospective needed for:

- entry to civil engineering practice and the pursuit of advanced studies;
- life-long learning;
- continuing professional development and leadership; and
- licensure;

all leading to career success.

Computer Engineering (CpE)

1. University Requirements (23-24)

Writing, Rhetoric and American Cultures (WRA)	4
Integrative Studies in Humanities (IAH)	8
Integrative Studies in Social Sciences (ISS)	8
Bioscience (one of the following):	
BS 110, BS 111, ENT 205, MMG 201,	
MMG 301, PLB 105, PSL 250, ZOL 141	3-4

2. College Requirements: (28)

CEM 141	General Chemistry	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

3. Major Requirements: (41)

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: (40)

CSE 231	Introduction to Programming I	4
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	Circuits and Systems Laboratory	1
ECE 230	Digital Logic Fundamentals	3
ECE 280	Electrical Engineering Analysis	3
ECE 302	Electronic Circuits	3
ECE 303	Electronics Laboratory	1
ECE 331	Microprocessors & Digital Systems	4
ECE 390	Ethics, Professionalism and Cont. Issues	1
ECE 480	Senior Design	4

The requirements listed above apply to students admitted to the major of Computer Engineering beginning Fall, 2008. 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.

C. Major Electives: (24)

Complete 24 credits of electives as specified below. At least 18 credits must be from core and focus track electives combined. 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 experiential education substitution.

Core Electives: (6)

At least 6 credits from the following:

ECE 410	VSI Design (L)	4
CSE 420	Computer Architecture	3
*CSE 422	Computer Networks	
OR		
*ECE 442	Intro to Communication Networks	3

Focus Track Electives: (12)

At least 12 credits from the following:

Hardware

ECE 402	Appl of Analog Integrated Circuits (L)	4
ECE 411	Electronic Design Automation (L)	4
ECE 412	Mixed-Signal Integrated Circuits (L)	4

Software

ECE 366	Introduction to Signal Processing	3
CSE 335	Object-oriented Software Design	3
CSE 450	Translation of Programming Languages	3
CSE 471	Media Processing & Multimedia Computing	3

Recommended Electives: (6)

At least 6 additional credits from above Core or Focus areas or from the following courses:

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 457	Communication Systems	3
ECE 458	Communication Systems Laboratory	1
ECE 466	Digital Signal Processing & Filter Desn	3
ECE 474	Principles of Electronics Devices	3

Experiential Education Substitution

Students may use registered "out of classroom" experiences to waive one 400-level requirement outside of the major elective requirement. This is a combination of 3 or more experiences documented by pre-approved EGR/ECE credits (EGR 393, ECE 490/499).

Other Electives (Variable)

Computer Engineering Sample Program

Freshman Year				Sophomore Year			
Fall	Credits	Spring	Credits	Fall	Credits	Spring	Credits
WRA 1XX or ISS 2XX	4	WRA 1XX or ISS 2XX	4	CSE 232	4	CSE 260	4
Bioscience (AT)	3/4	CSE 231	4	ECE 201	3	ECE 202/203	4
CEM 141	4	MTH 133	4	MTH 234	4	ECE 230	3
EGR 100	2	PHY 183	4	PHY 184	4	ECE 280	3
MTH 132	3	Elective	2	PHY 191 or CEM 161	1	MTH 235	3
Total	16/17	Total	18	Total	16	Total	17
Junior Year				Senior Year			
Fall	Credits	Spring	Credits	Fall	Credits	Spring	Credits
ECE 302/303	4	CSE 410	4	Core Elect	3/4	ECE 480	4
ECE 331	4	CSE 331	3	IAH 2XX	4	Elective	3
IAH 20X	4	ISS 3XX	4	Major Elective	3/4	Major Elective	4
Major Elective I	3/4	Core Elect	3/4	Major Elective	4	Major Elective	4
		Major Elect	3/4	ECE 390	1		
Total	15/16	Total	17/19	Total	16/17	Total	15

Program Objectives

The computer engineering program provides its graduates with a solid foundation on which they can build successful and sustainable careers. Within the first several years following graduation, graduates of the computer engineering program will:

1. **have accrued an understanding of the discipline**, built on an exposure to a broad range of computer engineering topics including the latest and emerging techniques and technologies.
2. **have established expertise within the discipline** originating with in-depth study in selected curricular areas emphasizing the solution to engineering problems using proper tools, practical approaches, and creative problem solving.
3. **be engaged in lifelong learning** in computer engineering, based on a strong foundation in the core sciences and mathematics.
4. **have an appreciation for the global and societal impact of the discipline** through an exposure to contemporary issues, and a knowledge and respect for ethical standards and professional responsibilities.
5. **have successfully utilized essential professional skills** such as teamwork and communications, both oral and written, within the context of engineering problem solving and design.

The computer engineering program is accredited by the Accreditation Board for Engineering and Technology (ABET)

Computer Science (CpS)

1. University Requirements: (20)

Writing, Rhetoric and American Cultures (WRA)	4
Integrative Studies in Humanities (IAH)	8
Integrative Studies in Social Sciences (ISS)	8

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

3. Major Requirements (28)

A. Bioscience: (4-6)

Select one course from Group 1 and one course from Group 2.
A selection of BS 110 satisfies both Group 1 and Group 2.

Group 1

BS 110	Organisms & Populations	4
BS 111	Cells & Molecules	3
ENT 205	Pests, Society & Environment	3
MMG 205	Allied Health Microbiology	3
PLB 105	Plant Biology	3
PSL 250	Introductory Physiology	4
ZOL 141	Introductory Human Genetics	3

Group 2

BS 110	Organisms & Populations	4
BS 111L	Cells and Molecular Biology Laboratory	2
CEM 161	Chemistry Laboratory I	1
CEM 162	Chemistry Laboratory II	1
MMG 206	Allied Health Microbiology Laboratory	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: (32)

CSE 100	Computer Science as a Profession	1
CSE 231	Introduction to Programming I	4
CSE 232	Introduction to Programming II	4
CSE 260	Discrete Structures in Computer Science	4
CSE 320	Computer Organization	3
CSE 331	Algorithms and Data Structures	3
CSE 335	Object-Oriented Software Design	3
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)

Students may substitute two of the five courses with mathematics or statistics courses. All substitutions must be preapproved by the student's academic adviser.

CSE 420	Computer Architecture	3
CSE 422	Computer Networks	3
CSE 425	Introduction to Computer Security	3
CSE 435	Software Engineering	3
CSE 440	Introduction to Artificial Intelligence	3
CSE 450	Translation of Programming Languages	3
CSE 452	Organization of Programming Languages	3
CSE 460	Computability & Formal Language Theory	3
CSE 471	Media Processing & Multimedia Computing	3
CSE 472	Computer Graphics	3
CSE 475	Introduction to Computational Linguistics	3
CSE 480	Database Systems	3
CSE 484	Information Retrieval	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 requires a minimum of four courses totaling 15 or more credits outside the College of Engineering selected from (1) or (2) below. The academic adviser of the Department of Computer Science and Engineering must pre approve both the cognate and the cognate courses..

Cognate 1

At least 6 of the 15 credits must be in courses at the 300-400 level. The cognate in The Eli Broad College of Business requires a specific set of courses: ACC 230, EC 210, FI 320, GBL 323, and MKT 327.

Cognate 2

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 2008. 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, 3115 Engineering Building, phone (517) 353-3148.

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.

Computer Science (CpS)

Sample Program

Freshman Year				Sophomore Year			
Fall	Credits	Spring	Credits	Fall	Credits	Spring	Credits
CSE 100	1	WRA 1XX	4	IAH 20X	4	CSE 320	3
CSE 231	4	CSE 232	4	CSE 260	4	CSE 335	3
EGR 100	2	MTH 133	4	MTH 234	4	Elec./Cognate	3
ISS 2XX	4	Elec./Cog.	3	PHY 183	4	Elec./Cognate	3
MTH 132	3			STT 351			4
Total	14	Total	15	Total	16	Total	16

Junior Year				Senior Year			
Fall	Credits	Spring	Credits	Fall	Credits	Spring	Credits
CSE 331	3	Bioscience	4	Elec./Cognate	3	CSE 4XX	3
CSE 410	3	Cognate	3	CSE 4XX	3	CSE 498	4
IAH 2XX	4	CSE 4XX	3	CSE 4XX	3	Elec./Cog	3
PHY 184	4	CSE 4XX	3	Elec./Cognate	3	Elec./Cog	3
		ISS 3XX	4	Elec./Cognate	3		
Total	14	Total	17	Total	15	Total	13

Program Objectives

A graduate of the MSU Computer Science Program should be prepared to:

1. apply fundamental computing principles and software development skills to the design and implementation of systems that meet specifications.
2. use computing to solve complex problems.
3. be successful in a computing-related profession or graduate study .
4. communicate effectively with a range of audiences .
5. be an effective team member.
6. act professionally and ethically in the global workplace.
7. be actively engaged in learning and applying new ideas and technologies as the field evolves.

Electrical Engineering (EE)

1. University Requirements: (23-24)

Writing, Rhetoric and American Cultures (WRA)	4
Integrative Studies in Humanities (IAH)	8
Integrative Studies in Social Sciences (ISS)	8
Bioscience (one of the following):	
BS 110, BS 111, ENT 205, MMG 201,	
MMG 301, PLB 105, PSL 250, ZOL 141	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

3. Major Requirements: (44)

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: (40)

CSE 251	Programming in C	1
ECE 201	Circuits and Systems I	3
ECE 202	Circuits and Systems II	3
ECE 203	Circuits and Systems Laboratory	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 Cont. Issues	1
ECE 480	Senior Design	4

C. Select one of the following courses: (3)

CE 221	Statics	3
ME 201	Thermodynamics	3

D. 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 423	Power System Analysis & Lab	3
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Integrated Circuits / VLSI

ECE 402	Applications of Analog Integrated Circuits (L)	4
ECE 404	Radio Frequency Electronic Circuits	4
ECE 410	VSI Design (L)	4
ECE 411	Electronic Design Automation (L)	4
ECE 412	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 457	Communication Systems & Lab	3
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	Biomedical Imaging	3
ECE 448	Modeling & Analysis of Bioelectrical Systems	3

Experiential Education Substitution

Students may use registered "out of classroom" experiences to waive one 400-level requirement outside of the major elective requirement. This is a combination of 3 or more experiences documented by pre-approved EGR/ECE credits (EGR 393, ECE 490/499).

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.

Biomedical Engineering Concentration: (15)

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. Completion of courses in this concentration may also satisfy Major and Elective course requirements. Check with the academic adviser for guidance.

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

ANTR 350	Human Gross Anatomy & Structural Biology	3
BS 111	Cells and Molecules	3
PSL 250	Introductory Physiology	4
PSL 431	Human Physiology I	3
PSL 432	Human Physiology II	3

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

ECE 445	Biomedical Instrumentation	3
ECE 446	Biomedical Signal Processing	3
ECE 447	Biomedical Imaging	3
ECE 448	Modeling & Anlys of Bioelectrical Systems	3

3. Complete at least 3 credits from 1) the list below or 2) any 400-level course listed above but not otherwise counted toward the concentration, or 3) other approved course such as ECE 490 or ECE 491 with biomedeical engineering content. (3)

ME 494	Biofluid Mechanics and Heat Transfer	3
ME 495	Tissue Mechanics	3
MSE 425	Biomaterials and Biocompatibility	3

Other Electives (Variable)

Total Credits Required for Degree

128

The requirements listed above apply to students admitted to the major of Electrical Engineering beginning Fall, 2008. 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.

Last revised May 2009

Electrical Engineering Sample Program

Freshman Year				Sophomore Year			
Fall	Credits	Spring	Credits	Fall	Credits	Spring	Credits
WRA 1XX or ISS 2XX	4	WRA 1XX or IAH 20X	4	ECE 201	3	ECE 202/203	4
Bioscience (AT)	3/4	EGR 102	2	IAH 20X or ISS 2XX	4	ECE 230	3
CEM 141	4	MTH 133	4	MTH 234	4	ECE 280	3
EGR 100	2	PHY 183	4	PHY 184	4	ME 201 / CE 221	3
MTH 132	3	ECE 101 or Elective	2/3	PHY 191 or CEM 161	1	MTH 235	3
Total	16/17	Total	16/17	Total	16	Total	16

Junior Year				Senior Year			
Fall	Credits	Spring	Credits	Fall	Credits	Spring	Credits
ECE 302/303	4	ECE 320	3	ECE 390	1	ECE 480	4
ECE 305	4	ECE 331	4	Major Elective	3/4	Elective	3
ECE 313	3	ECE 366	3	Major Elective	3/4	Major Elective	4
ISS 3XX	4	IAH 2XX	4	Major Elective	3/4	Major Elective	4
Elective	3	CSE 251 Elective	1 3	Major Elective	4		
Total	18	Total	18	Total	14/17	Total	15

Program Objectives

The electrical engineering program provides its graduates with a solid foundation on which they can build successful and sustainable careers. Within the first several years following graduation, graduates of the electrical engineering program will:

1. **have accrued an understanding of the discipline**, built on an exposure to a broad range of electrical engineering topics including the latest and emerging techniques and technologies.
2. **have established expertise within the discipline** originating with in-depth study in selected curricular areas emphasizing the solution to engineering problems using proper tools, practical approaches, and creative problem solving.
3. **be engaged in lifelong learning** in electrical engineering, based on a strong foundation in the core sciences and mathematics.
4. **have an appreciation for the global and societal impact of the discipline** through an exposure to contemporary issues, and a knowledge and respect for ethical standards and professional responsibilities.
5. **have successfully utilized essential professional skills** such as teamwork and communications, both oral and written, within the context of engineering problem solving and design.

The electrical engineering program is accredited by the Accreditation Board for Engineering and Technology (ABET)

Materials Science and Engineering (MSE)

Accredited by the Engineering Accreditation Commission of ABET,
111 Market Place, Suite 1050, Baltimore, MD 21204-4012 - telephone (410) 347-7700.

1. University Requirements: (23-24)

Writing, Rhetoric and American Cultures (WRA)	4
Integrative Studies in Humanities (IAH)	8
Integrative Studies in Social Sciences (ISS)	8
Bioscience (one of the following):	
BS 110, BS 111, ENT 205, MMG 201,	
MMG 301, PLB 105, PSL 250, ZOL 141	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: (44)

A. Complete all of the following:

CE 221	Statics	3
CEM 152	Principles of Chemistry	3
CEM 161	Chemistry Laboratory I	1
ECE 345	Electronic Instrumentation and Systems	3
ME 222	Mechanics of Deformable Solids	4
MSE 250	Materials Science and Engineering	3
MSE 310	Phase Equilibria in Materials	3
MSE 320	Mechanical Properties of Materials	3
MSE 331	Materials Characterization Methods I	1
MSE 350	Electronic Structure & Properties of Matls	3
MSE 360	Fundamentals of Microstructural Design	3
MSE 370	Physical Processing of Materials	3
MSE 381	Materials Characterization Methods II	2
MSE 466	Design and Failure Analysis (W)	3
MSE 477	Manufacturing Processes	3
STT 351	Probability and Statistics for Engineering	3

B. Select two of the following courses: (6)

MSE 454	Ceramic and Refractory Materials	3
MSE 465	Desn & Application of Engr Materials (W)	3
MSE 476	Phys Metallurgy of Ferrous & Alum Alloys	3

C. Complete at least 5 credits from 400-level courses within the College of Engineering: (5)

D. Technical Electives: (7)

Complete at least 7 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: (25)

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 & Structural Biol	3
CEM 351	Organic Chemistry I	3
ME 495	Tissue Mechanics	3
MSE 425	Biomaterials and Biocompatibility	3
ZOL 341	Fundamental Genetics	4

2. Complete one of the following courses: (3)

MSE 454	Ceramics and Refractory Materials	3
MSE 465	Design and Application of Egr. Materials	3
MSE 476	Phys Metallurgy of Ferrous & Alum Alloys	3

3. Technical Electives: (6)

An approved list of Technical Electives is available from the adviser.

Manufacturing Engineering Concentration (18):

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: (9)

ECE 415	Computer Aided Manufacturing	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 454	Ceramics and Refractory Materials	3
MSE 476	Phys Metallurgy of Ferrous and Alum Alloys	3
STT 471	Statistics for Quality and Productivity	3

Completion of this concentration fulfills requirement 2 of the admission requirements for the Master of Science degree in Manufacturing and Engineering Management offered by The Eli Broad College of Business.

Metallurgical Engineering Concentration: (18)

The requirements listed above apply to students admitted to

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: (12)

ME 423	Intermed Mechanics of Deformable Solids	3
ME 475	Computer Aided Design of Structures	3
MSE 465	Design and Application of Egr. Materials	3
MSE 476	Phys Metallurgy of Ferrous and Alum Alloys	3

2. Complete one of the following courses (3):

MSE 426	Introduction to Composite Materials	3
STT 471	Statistics for Quality and Productivity	3

3. Complete one of the following courses (3):

ME 425	Experimental Mechanics	3
MSE 451	Microscopic & Diffraction Anlys of Matls	3

Polymeric Engineering Concentration (18):

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:

1. Complete all of the following:

CEM 351	Organic Chemistry I	3
CHE 311	Fluid Flow and Heat Transfer	3
CHE 472	Composite Materials Processing	3
CHE 473	Chem Engr Prncpls in Polymrs & Matls Sys	3
MSE 426	Introduction to Composite Materials	3
STT 471	Statistics for Quality and Productivity	3

Other Electives (Variable)

Total Credits Required for Degree 128

the major of Materials Science and Engineering in the Department of Chemical Engineering and Materials Science (CHEMS) beginning Fall, 2008. 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 adviser to obtain assistance in planning an appropriate schedule of courses. Students who have questions about Materials Science and Engineering should contact the Engineering Undergraduate Studies Advising Office, 1415 Engineering Building, phone (517) 355-6616, extension 1.

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.

Materials Science and Engineering (MSE) Sample Program

Freshman Year				Sophomore Year			
Fall	Credits	Spring	Credits	Fall	Credits	Spring	Credits
CEM 151	4	CEM 152	3	CE 221	3	Bioscience	3/4
CEM 161	1	EGR 102	2	ISS 3XX	4	ME 222	4
EGR 100	2	Elective	1/2	MSE 250	3	MSE 350	3
ISS 2XX	4	MTH 133	4	MTH 234	4	MTH 235	3
MTH 132	3	WRA 1XX	4	PHY 183	4	PHY 184	4
Total	14	Total	14/15	Total	18	Total	17/18

Junior Year				Senior Year			
Fall	Credits	Spring	Credits	Fall	Credits	Spring	Credits
Elective	3	ECE 345	3	MSE 454/466/476	3	Elective	3
IAH 20X	4	Elective	3	MSE 454/466/476	3	Elective	3
MSE 310	3	IAH 2XX	4	MSE 477	3	Engr 400-IV	3
MSE 320	3	MSE 360	3	Technical Elective	3	MSE 465	3
MSE 331	1	MSE 370	3	Technical Elective	3	Technical Elective	3
STT 351	3	MSE 381	2				
Total	17	Total	18	Total	15	Total	15

Materials Science and Engineering Program Educational Objectives

Approved to replace the document adopted on 5/11/05

The MSE program prepares students to apply their understanding of the processing, application, and sustainable use of engineering materials essential to the realization of new ideas coming from engineers, scientists, enterprises, and society. Our overarching objectives are to equip graduates with the confidence that comes from professionalism, and provide them with the tools needed to contribute meaningfully within any of the diverse professional career paths they may choose. Since the discipline creates bridges between science and engineering, MSE majors must communicate effectively with people in many different specialties, and work effectively in multi-disciplinary teams. MSE graduates must be aware of the economic, social, and environmental implications entailed in the processing and use of materials, and must have a solid grounding in professional engineering ethics.

The faculty provide a rigorous academic environment so that graduates will have mastered the analytical and technical skills needed to successfully compete as professionals, entrepreneurs, or as postgraduate scholars.

The MSE Program prepares our graduates to:

- I. Achieve success in Materials Science & Engineering or another chosen career;
- II. Advance to leadership roles within their profession and community;
- III. Contribute effectively to their disciplines, economies and society;
- IV. Compete with confidence for opportunities for postgraduate education;
- V. Enjoy the benefits of a lifetime of learning and professional development.

Mechanical Engineering (ME)

Accredited by the Engineering Accreditation Commission of ABET,
111 Market Place, Suite 1050, Baltimore, MD 21202-4012 - telephone (410) 347-7700.

1. University Requirements: (23-24)

Writing, Rhetoric and American Cultures (WRA)	4
Integrative Studies in Humanities (IAH)	8
Integrative Studies in Social Sciences (ISS)	8
Bioscience (one of the following):	
BS 110, BS 111, ENT 205, MMG 201,	
MMG 301, PLB 105, PSL 250, ZOL 141	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

3. Major Requirements: (54)

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 ME courses: (42)

ME 201 Thermodynamics	3
ME 222 Mechanics of Deformable Solids	4
ME 280 Graphic Communications	2
ME 332 Fluid Mechanics	4
ME 361 Dynamics	3
ME 371 Mechanical Design I	3
ME 391 Mechanical Engineering Analysis	3
ME 410 Heat Transfer	3
ME 412 Heat Transfer Laboratory	2
ME 451 Control Systems	4
ME 461 Mechanical Vibrations	4
ME 471 Mechanical Design II	3
ME 481 Mechanical Engineering Design Projects	3

C. Senior Electives: (9)

Complete a minimum of nine credits from the following:

ME 416 Computer Assisted 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 432 Intermediate Fluid Mechanics	3
ME 440 Aerospace Engineering Fundamentals	3
ME 442 Turbomachinery	3
ME 444 Automotive Engines	3
ME 445 Automotive Powertrain Design	3
ME 456 Mechatronic System Design	3
ME 457 Mechatronic Sys Modeling & Simulation	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 486 Int'l Networked Teams/ Engr Design	3
ME 490 Independent Study in Mechanical Engr	1-3
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	3

D. Design-Intensive courses. Complete a minimum of three *additional* credits from: (3)

ME 416 Computer Assisted Design of Thermal Sys	3
ME 417 Design of Alternative Energy Systems	3
ME 442 Turbomachinery	3
ME 445 Automotive Powertrain Design	3
ME 456 Mechatronic System Design	3
ME 465 Computer Aided Optimal Design	3
ME 475 Computer Aided Design of Structures	3

Additional Senior Elective choices can be found in the ME Bulletin which is the undergraduate newsletter for Mechanical Engineering majors.

Mechanical Engineering Sample Program

Freshman Year				Sophomore Year			
Fall	Credits	Spring	Credits	Fall	Credits	Spring	Credits
Bioscience	3/4	CEM 161	1	CE 221	3	IAH 20X	4
CEM 141	4	EGR 102	2	Elective	3	ME 201	3
EGR 100	2	MTH 133	4	ME 280	2	ME 222	4
ISS 2XX	4	PHY 183	4	MTH 234	4	MSE 250	3
MTH 132	3	WRA 1XX	4	PHY 184	4	MTH 235	3
Total	16/17	Total	15	Total	16	Total	17
Junior Year				Senior Year			
Fall	Credits	Spring	Credits	Fall	Credits	Spring	Credits
Elective	3	ECE 345	3	ME 410	3	ME 412	2
ISS 3XX	4	Elective	3	ME 451	4	ME 461	4
ME 361	3	IAH 2XX	4	ME 471	3	ME 481	3
ME 391	3	ME 332	4	Senior Elective	3	Senior Elective	3
STT 351	3	ME 371	3	Senior Elective	3	Senior Elective	3
Total	16	Total	17	Total	16	Total	15

**Program Educational Objectives for the Undergraduate Program
in Mechanical Engineering
Department of Mechanical Engineering
Michigan State University
(Approved by the Department Faculty February 17, 2005)**

- Objective 1:** *Our graduates will be competent engineers practicing in a diverse range of activities.*
- Objective 2:** *Our graduates will use their mechanical engineering education as an impetus for personal & professional growth.*
- Objective 3:** *Our graduates will have achieved a noteworthy level of workplace responsibility through understanding their environment and capabilities, including the importance of knowledge management.*
- Objective 4:** *Our graduates will be independent thinkers who take ownership in identifying problems and determining effective solution strategies in a timely manner.*

BIOMEDICAL ENGINEERING AT MICHIGAN STATE

What is Biomedical Engineering?

Biomedical engineering integrates physical, chemical, mathematical, and computational sciences and engineering principles to study biology, medicine, behavior, and health. It advances fundamental concepts; creates knowledge from the molecular to the organ systems level; and develops innovative biologics, materials, processes, implants, devices and informatics approaches for the prevention, diagnosis, and treatment of disease, for patient rehabilitation, and for improving health.

Examples of biomedical engineering:

- Artificial organs
- Biosensors
- Medical imaging systems
- Biomaterials
- Biomechanics of injury and wound healing
- Sports medicine
- Robotics
- Tissue engineering

For more information on careers, go to the Biomedical Engineering Society (BMES) website at:
<http://www.bmes.org/mc/page.do?sitePagelD=70515&orgId=bes> .

Where is Biomedical Engineering at MSU?

Active programs in biomedical engineering are distributed across four departments. A student may elect to complete a concentration as part of a B.S. program by taking groups of biomedical electives. These electives apply the fundamental engineering science of their discipline to solve biomedical problems.

Why is there no Biomedical Engineering degree?

Biomedical engineering solutions require knowledge of an underlying engineering discipline. For example, building better knee replacements requires understanding of mechanical engineering and materials science. Students at MSU choose an engineering discipline and select biomedical electives as part of that department's curriculum to get a concentration in biomedical engineering.

What is the advantage of a concentration?

Completing a biomedical engineering concentration within a traditional engineering discipline increases the career options for students. Employers in the biomedical industry hire engineers for engineering expertise, often teaming them with health professionals. By completing a B.S. with a biomedical concentration, a student is fully qualified in biosystems, chemical, electrical, materials, or mechanical engineering, but with documented expertise in solving biomedical problems. In this way, a student is fully prepared for either a professional position in biomedical engineering or for graduate or professional school (M.D., D.O., D.V.M., J.D.) or any other employment in the underlying engineering discipline studied.

BIOMEDICAL ENGINEERING COURSES

How do I know the type of engineering I want to study? One way is to look at the types of courses offered, below are course descriptions for each type of engineering offered at MSU.

BIOSYSTEMS ENGINEERING

Biosensors for Medical Diagnostics

This course will cover biosensors, their components, properties, and associated electronics for applications in medical diagnostics.

CHEMICAL ENGINEERING

Biochemical Engineering

Study applications of microbiology and biochemistry to biochemical engineering. Transport phenomena in biological systems. Bioreactor design and scale-up.

ELECTRICAL & COMPUTER ENGINEERING

Biomedical Instrumentation

Fundamentals of biomedical measurement, sensors, and instrumentation electronics. Hands-on experience with sensors, instrumentation electronics, and biomedical devices.

Biomedical Signal Processing

Digital signal processing theory in the context of biomedical applications with computer projects on the analysis of real physiologic signals.

Modeling & Analysis of Bioelectrical Systems

Basics of deterministic and stochastic linear systems, principles of biophysics and electrophysiology, applications to neural systems and neuroprosthetics.

MATERIALS SCIENCE & ENGINEERING

Biomaterials and Biocompatibility

Materials science of human implants. Design requirements imposed by the human body, and need for bodily protection.

MECHANICAL ENGINEERING

Biofluid Mechanics & Heat Transfer

Applications of fluid mechanics, heat transfer, and thermodynamics to biological processes, including blood flow, heart function, effects of heating and cooling on cells, tissues, and proteins.

Tissue Mechanics

Application of solid mechanics to understanding mechanical responses of biological tissues. Microstructure and biological function for soft and hard connective tissues and muscle.

Biomechanical Design

Biomechanical product design with application to people or animals. Synthesis, prototyping, and analysis of designs.

INTERDISCIPLINARY COURSES

Quantitative Human Biology

Qualitative description and quantitative engineering analysis of selected, tractable human-biological systems.

Independent Study in Clinical Biomechanics

Individualized reading and research in the application of biomechanics to clinical cases.

What if I still want more information?

The curricula for each department that offers a biomedical engineering concentration may be found at the following websites:

Biosystems Engineering

http://www.egr.msu.edu/files_egr/biosystems-deg-req_1.pdf

Chemical Engineering

http://www.egr.msu.edu/files_egr/files-ugs/che.pdf

Electrical Engineering

http://www.egr.msu.edu/files_egr/files-ugs/ee.pdf

Materials Science and Engineering

<http://www.chems.msu.edu/undergrad/MSEcurr.pdf>

Mechanical Engineering

http://www.egr.msu.edu/files_egr/files-ugs/me.pdf

Specialization in Information Technology

The specialization in information technology is available to students enrolled in bachelor's degree programs in the Eli Broad College of Business, the College of Communication Arts and Sciences, and the College of Engineering. These three colleges jointly offer this specialization. The Eli Broad College of Business is the primary administrative unit.

The specialization is designed to provide students with a broad, multidisciplinary understanding of the role and basic mechanics of information technology in contemporary society. Students will develop core competencies in their primary area of study and will broaden their horizons as they interact with others from different academic backgrounds. Students completing the specialization will be well prepared for employment in technology-oriented environments and will understand the evolving impact of information technology on society.

Admission

Students seeking admission to the specialization should contact their college-advising center. To be considered for admission, a student must have been formally accepted as a junior to a degree program in one of the participating colleges. Applicants must have completed (a) Computer Science and Engineering 101; or Computer Science and Engineering 131 or 231 and (b) Mathematics 103 or 110 or 112 or 116 or 124 or 132. Selection will be conducted through an application process. Students are encouraged to apply at the time they reach junior standing. To apply, students need to complete an application with their respective associate dean. Admission is based on a combination of cumulative grade-point average, stated interest and experience in information technology. Students are required to provide a written statement and resume.

Requirements for the Specialization in Information Technology

Students must complete the requirements specified below (19 credits):

1. All of the following courses (13 credits):

CSE	240	Informatics	3
ITM	311	Systems Analysis and Design	3
ITM	444	Information Technology Project Management	3
TC	201	Introduction to Telecommunication Technology	4
2. At least six credits from the following courses (6 credits):

ACC	321	Accounting Information Systems	3
ADV	354	Interactive Advertising Design	3
ADV	456	Interactive Advertising Management	3
CSE	131	Technical Computing and Problem Solving	3

CSE	231	Introduction to Programming I	4
CSE	232	Introduction to Programming II	4
CSE	490	Independent Study in Computer Science	1 to 3
ITM	309	Business Information Systems and Technology	3
ITM	412	Marketing Technology and E-Commerce	3
ITM	413	Fundamentals of Data Base Information Systems	3
ITM	414	Enterprise Resource Planning Systems	3
ITM	490	Independent Study in Information Technology	1 to 3
ITM	491	Special Topics in Information Technology	1 to 3
TC	310	Basic Telecommunication Policy	4
TC	361	Data Communication	3
TC	462A	Wireless Networks and Applications	3
TC	462B	Teleconferencing and Computer Supported Cooperative Work	3
TC	462C	Introduction to Electronic Commerce	3
TC	463	Network Design and Implementation I	3
TC	464	Network Security	3

With the approval of the department that administers the student's degree program, courses that are used to satisfy the requirements of the specialization may also be used to satisfy the requirements for the bachelor's degree. In certain cases, prerequisites for specialization electives may be waived with advance approval. Students should consult with their college advising office.

Upon completion of the requirements of the Specialization in Information Technology, the student should contact the adviser for the specialization and request certification for the specialization. After the certification is approved by the Dean of the College, the Office of the Registrar will enter on the student's academic record the name of the specialization and the date that it was completed. This certification will appear on the student's transcript.

Specialization in Game Design and Development

The Specialization in Game Design and Development complements the depth of knowledge students acquire in their majors with a multidisciplinary understanding of game design and development. Students learn the foundations and develop core competencies in their primary area of study and broaden their horizons as interdisciplinary team members, learning game design theories and principles, collaborating on the design and development of game projects, and engaging in active learning and authentic, situated creative problem-solving.

The specialization is open to Computer Science majors and is administered by the Department of Telecommunication, Information Studies and Media in the College of Communication Arts and Sciences. Students are eligible to apply for the specialization if they: (1) have completed or are currently enrolled in the prerequisites applicable to their major as listed below; and (2) are of junior standing.

To apply, students must submit an application stating their interest in the specialization and a portfolio demonstrating their expertise in media design, computer science, or art. Applications are due by the second week of the fall semester. Depending on the number of students applying, oral interviews may be requested. Academic performance will also be considered.

Students accepted into the specialization may begin the specialization in the spring semester. The adviser for the game design and development specialization must approve the student's program of study.

Prerequisites

Computer Science Majors

CSE	231	Introduction to Programming I	4
CSE	232	Introduction to Programming II	4
CSE	331	Algorithms and Data Structures	3

Studio Art Majors

STA	110	Drawing I	3
STA	111	Drawing II	3
STA	360	Graphic Design I: Graphic Form	3

Media Arts and Technology Majors

TC	242	The Digital Image	3
TC	243	Story, Sound, and Motion	3
TC	247	Three-Dimensional Design of the Virtual Form	3
TC	331	Introduction to Interactive Media Design	3

Requirements for the Specialization in Game Design and Development

Complete all of the following courses (15 credits):

TC	339	Digital Games and Society	3
TC	445	Digital Game Design (W)	4
TC	455	3D Game and Simulation Design (W)	4
TC	498	Collaborative Game Design (W)	4

Upon completion of the requirements for the degree and the requirements for the Specialization in Game Design and Development, the student shall contact the Chairperson of the department that administers the student's degree program and request certification for the completion of the specialization. After the certification is approved by the Chairperson of the Department and the Dean of the Communication Arts and Sciences, the Office of the Registrar will enter on the student's academic record the name of the specialization and the date that it was completed. This certification will appear on the student's transcript.

Spartan Engineering

A N S O S Y D U T S C I E N C E N
N O D E E O I S J O B R I O A S H
L A C I T A N E R M B E A I I S C
T S T S V A T N A T R C D T L A R
A E C R N E E L L O C A L A L D A
R O R I A R R R A P S C I C E N E
E T A E S P N S C R S R U U M A S
S M E T S Y S O I B E L B D R M E
I C O T H A H E N T U E M E A A R
D N H Y A P I P A S Y A N R C N C
E A G E R P P M H N T E G I E C O
N A R I M L T E C H N O L O G Y L
T L E R S I S H E C R O R O O N L
I R E T N E C O M P U T E R D T E
A L H C T D D A D V I S O R A H G
L A C I R T C E L E L I A G R I E
N S H E L E S E E I M O N I C A R

Advisor
Build
Chemical
Cornerstone
Design
Engineer
Materials
Physics
Science
Technology

Amanda
Calculus
Colleen
Create
Diversity
Gaile
Math
Programs
Sean
Teresa

Applied
Carmellia
College
Cynthia
Education
Internship
Mechanical
Research
Spartan

Biosystems
Center
Computer
Dan
Electrical
Job
Monica
Residential
Study

