WHAT IS MATERIALS SCIENCE AND ENGINEERING?
Everything is made of materials. Whether natural or man-made, materials comprise everything we see and use - computer chips, cellphones, airplanes, buildings, clothes, etc. The list is endless. By focusing on the materials themselves, Materials Science and Engineering is at the core of all other engineering disciplines. Materials scientists and engineers combine basic principles of physics and chemistry with applied engineering judgement and computational tools to solve engineering problems and make discoveries. They are involved in the design, development, processing, and testing of the materials. They work with metals, ceramics, plastics, semiconductors, and composites to create new materials. They thrive to understand why materials have the properties they have so we can alter them to make them lighter, stronger, greener, and smarter.

CRITICAL SKILLS DEVELOPED:
- Scientific methods
- Critical thinking
- Interdisciplinary thinking
- Written & verbal communication
- Reading comprehension
- Life-long learning

INDUSTRIES AND OCCUPATIONS
- Automotive industry
- Aerospace industry
- Energy production industry
- Semiconductor industry
- Manufacturing
- Production industry (metals, plastic)
- Public administration/government/education
- Scientific research (industrial and academic)
- Engineering consulting
- Business management
- Utilities, recycling, and waste management

JOB TITLES
- Material Analyst
- Metallurgical Engineer
- Ceramic Engineer
- Materials Researcher
- Welding Engineer
- Corrosion Engineer
- Process Engineer
- Failure Analysis Engineer

SALARIES
$92,390
The nationwide average salary for employees with a bachelor’s degree in Materials Science Engineering
Information from http://www.bls.gov/ooh/

$65,762
UM graduates average starting salaries
Courtesy of the Engineering Career Resource Center

JOB OUTLOOK
The MSE graduates can choose to work in a wide range of industry or academia settings. There is continuing demand for materials scientists and engineers who can develop new materials and applications in a wide range of industrial application, that include automotive and aerospace, biomedical devices, energy generation and storage, and consumer goods. Some MSE graduates also pursue careers in public policy, entrepreneurship, or education. The B.S. degree can also be complemented with M.S or M. Eng. degrees in MSE or a wide range of disciplines.

MORE INFORMATION
- mse.engin.umich.edu (MSE Department)
- materialsadvantage.org (Student program)
- remadeinstitute.org (Sustainable manufacturing)
- asminternational.org, mrs.org, tms.org (Materials Professionals Societies)
- Visit the Engineering Career Resource Center, 230 Chrysler
- See an MSE Advisor: set an appointment; call 764-3275; stop by 2146 Dow.
WHICH MSE CLASSES SHOULD YOU START WITH?
The MSE major begins with taking MATSCIE 220 OR MATSCIE 250, and MATSCIE 242. These introductory courses are followed by MATSCIE 330 (Thermodynamics), MATSCIE 350 (Structures), and MATSCIE 360 (Advanced Lab I). Students are also encouraged to join the student-run Michigan Materials Society (MMS), which provides social events and professional development, and to engage in undergraduate research, design projects, or engineering project teams.

COURSE DESCRIPTIONS

**MATSCIE 220 / MATSCIE 250 – 4 credits**
Introduction to Materials and Manufacturing / Principles of Engineering Materials

Prerequisite: Chem 130 or Chem 210.
Introductory course to engineering materials. Properties (mechanical, thermal and electrical) of metals, polymers, ceramics and electronic materials. Correlation of these properties with their internal structures (atomic, molecular, crystalline, micro-and macro-), service conditions (mechanical, thermal, chemical, electrical, magnetic, and radiation), and processing. Each section of these courses differs in instructional style and content emphasis. Matsci 250 emphasizes bio-materials. Some sections emphasize writing, some demos and activities, others problem solving, or team-based discussions and projects.

**Note that students may elect to take either MATSCIE 220 or MATSCIE 250**

**MATSCIE 330 – 4 credits**
Thermodynamics of Materials
ONLY OFFERED FALL TERM

Prerequisites: Physics 140/141, Math 215, and MATSCIE 220 or 250.

**MATSCIE 350 – 4 credits**
Structures of Materials
ONLY OFFERED FALL TERM

Prerequisite: MATSCIE 220 or 250.
Basic principles and fundamental tools of Materials Science & Engineering: bonding, crystal structures. Amorphous systems; Materials imperfections.

**MATSCIE 242 – 4 credits**
Physics of Materials
ONLY OFFERED WINTER TERM

Prerequisites: Physics 240 and preceded or accompanied by Math 216.
Basic principles and applications of solid state physics. Mathematical and physical description of classical and quantum mechanics, crystallography and diffraction. Applications to solid, including brand structure, bonding and physical properties.

**MATSCIE 360 – 3 credits**
Materials Lab I
ONLY OFFERED FALL TERM

Prerequisite: MATSCIE 220 or 250.
Laboratory experience focusing on processing, properties, and structure with a focus on microstructural analysis and relationships between processing, materials structure and mechanical property. Emphasis on team work, communication. Continued as MATSCIE 365.

**MATSCIE 335 – 4 credits**
Kinetic and Transport in Materials Engineering
ONLY OFFERED WINTER TERM

Prerequisites: MATSCIE 330 and Math 216.
Introduction to and applications of basic principles of molecular transport and mass, energy, and momentum balance to the solution of heat, diffusion, and fluid flow problems relevant to materials processing. Introduction to radiative heat transfer.