WHAT IS MATERIALS SCIENCE ENGINEERING?
Materials engineers are involved in the development, processing, and testing of the materials used to create a range of products, from computer chips and television screens to golf clubs and snow skis. They work with metals, ceramics, plastics, semiconductors, and composites to create new materials that meet certain mechanical, electrical, and chemical requirements. They also are involved in selecting materials for new applications. Materials engineers have developed the ability to create and then study materials at an atomic level, using advanced processes to replicate the characteristics of materials and their components with computers. Most materials engineers specialize in a particular material. For example, metallurgical engineers specialize in metals such as steel, and ceramic engineers develop ceramic materials and the processes for making ceramic materials into useful products such as glassware or fiber optic communication lines.*

NEEDED SKILLS:
- Scientific method skills
- Critical thinking skills
- Writing skills
- Reading comprehension
- Logical reasoning skills
- Active listening skills**

INDUSTRIES AND OCCUPATIONS
- Manufacturing
- Scientific research
- Semiconductor industry
- Aerospace industry
- Iron, steel, and alloy industry
- Public administration/government
- Chemical, metal, or mineral trade
- Business management
- Utilities and waste management**

JOB TITLES
- Material Analyst
- Metallurgical Engineer
- Ceramic Engineer
- Materials Researcher
- Welding Engineer
- Corrosion Engineer
- Process Engineer
- Failure Analysis Technician
- Plating Engineer
- Metallographer**

JOB OUTLOOK
Employment of materials science engineers is expected to show little or no change from 2012 to 2022. Materials engineers will be needed to design uses for new materials both in traditional industries, such as aerospace manufacturing, and in industries focused on new medical or scientific products. Materials engineers are in demand in growing fields such as biomedical engineering.*

SALARIES
$85,150 *
The nationwide average salary for employees with a bachelor’s degree in Materials Science Engineering

$64,278
UM graduates average starting salaries

MORE INFORMATION
- www.myplan.com
- stats.bls.gov/ooh
- http://www.asminternational.org (Materials Information Society)
- Engineering Career Resource Center, 230 Chrysler
- See an MSE advisor. Sign up on the EAC website or contact the MSE Department at 764-3275; 2146 Dow.

*Information from http://www.bls.gov/ooh/
**Information from: www.myplan.com

Updated July 2015
WHICH MSE CLASSES SHOULD YOU START WITH?
To begin the MSE major, a good option is to take Matscie 220 or Matscie 250, followed by Matscie 330, Matscie 242, and Matscie 335. Note that with the exception of Matscie 220 and 250, all other Matscie courses are only offered one term each year. Also, the MSE Department requires students to take either Econ 101 or 102; this course will count toward your Intellectual Breadth core requirement for engineering. Read more about the MSE Department at: http://www.mse.engin.umich.edu

COURSE DESCRIPTIONS

^ MATSCIE 220 – 4 credits
Introduction to Materials and Manufacturing

Prerequisite: Chem 130 or Chem 210.
Introduction to materials engineering and materials processing in manufacturing. The engineering properties of metals, polymers, semiconductors, ceramics, and composites are correlated with the internal structure of the materials and the service conditions.

MATSCIE 220

^ MATSCIE 250 – 4 credits
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.

MATSCIE 250

MATSCIE 330 – 4 credits
Thermodynamics of Materials

ONLY OFFERED FALL TERM

Prerequisites: Chem 130 or Chem 210, Physics 140/141, Math 215, and MATSCIE 220 or MATSCIE 250.

MATSCIE 330

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

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 242

MATSCIE 335 – 4 credits
Kinetic and Transport in Materials Engineering

ONLY OFFERED WINTER TERM

Prerequisites: MATSCIE 220 or 250, MATSCIE 330, and Math 216.
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. Empirical approaches to and dimensional analysis of complex transport problems including convection, turbulence, and non-Newtonian flow.

MATSCIE 335

MATSCIE 350 – 4 credits
Structures of Materials

ONLY OFFERED FALL TERM

Prerequisite: MATSCIE 220 or MATSCIE 250.
Basic principles and fundamental tools of Materials Science & Engineering; including bonding, structure, microstructure, thermodynamics, and kinetics.

MATSCIE 350