# Materials Science & Engineering

## Materials Science Engineering (MATSCIE)

**220 Intro Mat & Man** **4.00 ENFORCED**
10833 A R LEC 100 MWF 1130-1230PM 220 CHRYS Wynarsky
Structure, properties, and processing relationships in engineering materials. This section is particularly well-suited for Aerospace and NERS students (minor added emphasis on composites and radiation effects on materials).
10834 P RW DIS 101 TH 1130-1230PM 3427 EECS
10835 P RW DIS 102 TH 1030-1130AM 1006 DOW
10836 P RW DIS 103 TH 130-230PM 1010 DOW
25293 P RW DIS 104 TH 1130-1230PM 185 EWRE
28166 P RW DIS 105 TH 130-230PM 1018 DOW

**242 Physics of Matls** **4.00 ENFORCED**
10837 P R LEC 001 F 1130-1230PM 1670 BEYSTER

**242 Physics of Matls** **4.00 ENFORCED**
P R LEC 001 MW 12-130PM 1014 DOW Kioupakis

**250 Prin Engr Matl** **4.00 ENFORCED**
10838 A R LEC 100 MWF 930-1030AM ARR Goldman
16089 P RW DIS 101 TH 1130-1230PM 1006 DOW Huang
19444 P RW DIS 102 TH 130-230PM 2166 DOW Huang
31680 A R LEC 200 MWF 930-1030AM 133 CHRYS Wynarsky
31681 P R DIS 201 TH 1030-1130AM 1045 GGBL Luce
31682 P R DIS 202 TH 130-230PM 1690 BEYSTER Luce

**280 MSE Ugrad Res Opp** **1.00-4.00 ADVISORY**
D IND + ARR ARR

**335 Kin&Transport** **4.00 ENFORCED**
10841 P RW LEC 001 F 830-930AM 1500 EECS

**335 Kin&Transport** **4.00 ENFORCED**
P RW LEC 001 MW 8-930AM 1500 EECS Marquis

**365 Materials Lab II** **3.00 ENFORCED**
10839 S R LEC 001 M 330-430PM ARR Chambers
Labs for MSE 365 are held in the Van Vlack Undergraduate Lab, second floor of the H.H. Dow building. For permission to register, contact Patti Vogel at pvogel@umich.edu.
16538 P RW LAB 002 T 1230-430PM ARR Gupta
10840 P RW LAB 003 W 130-530PM ARR Saud
28844 P RW LAB 004 TH 12-4PM ARR Chou

**440 Ceramic Materials** **3.00 ADVISORY, ENFORCED**
17411 P R LEC 001 MW 130-3PM ARR Poudeu-Poudeu

**465 Struc Chm Char Matls** **3.00 ENFORCED**
31704 P R LEC 001 TTH 830-10AM 107 GFL Hovden

**480 Matls Engr Design** **3.00 ENFORCED**
16947 A R LEC 001 TTH 2-330PM ARR Taub, Gladstein, Shtein
22569 P R LAB 002 TTH 1-2PM ARR Taub, Shtein

**485 Design Problems** **1.00-4.00 ENFORCED**
R IND + ARR ARR

**490 Research Problems** **1.00-3.00 ENFORCED**
R IND + ARR ARR

**512 Phys Polymers** **3.00 ADVISORY**
20975 P LEC 001 MW 430-6PM ARR Kim

**514 Comp Matrls** **3.00 ENFORCED**
18133 P RW LEC 001 TTH 10-1130AM ARR Sevener, Cheng
22517 P R LEC 881 TTH 10-1130AM ARR Sevener

**520 Adv Mech Behavior** **3.00 ADVISORY**
31678 P LEC 001 TTH 10-1130AM ARR Misra, Qi

**535 Kin,Ph Trnsfm&Trnsp** **3.00 ADVISORY**
16090 P LEC 001 MW 9-1030AM ARR Shahani

**556 Molecular Sim** **3.00**
31703 P LEC 001 TTH 130-3PM ARR Kieffer

**559 Foundations Nano II** **3.00 ADVISORY**
31683 P LEC 001 MW 1230-2PM 1045 GGBL Laine

**577 Failure Analys** **3.00 ADVISORY**
31679 P LEC 001 MW 1030-12PM ARR Allison

**593 MSE Special Topics** **3.00 ADVISORY**
31696 P LEC 040 MW 130-3PM 1006 DOW Love
Engagement in Research Process
Engagement in the Research Process - a course aimed at directing incoming students to develop a coherent idea into a more completed product. The product could take the form of a proposal, white paper, or review paper of interest to each student. Students will be encouraged to bring individual ideas worthy of further development or as part of their engagement in their individual research groups.
31698 P LEC 043 TTH 430-6PM 1024 FXB Tuteja
Surface and Interfacial Engr
Surface and Interfacial Engineering - This course will present and analyze the surfaces of a wide range of biological species, such as lotus leaves, rose petals, water striders, arctic spring tails, sharks, desert beetles, and pitcher plant leaves. We will understand the unique surface functionality associated with each of these biological species by examining the roles of surface composition and surface texture. Subsequently, we will discuss how this fundamental understanding can be used to engineer bio-inspired surfaces of the future for a range of applications such as stain resistant fabrics, micro-robots, anti-fingerprint displays, drag reduction for ships,

fog harvesting and ice-shedding.
31699 P LEC 053 MW 830-10AM ARR Mehta
Cancer Bioengineering
Cancer Bioengineering - Cancer refers to a collection of heterogeneous but related diseases recognized primarily by uncontrolled cellular proliferation, invasion, and spread into surrounding tissues. This course is designed to be an introduction to cancer biology from an engineering and systems perspective. It will provide a basic understanding of cancer biology including (but not limited to) cancer genetics, signal transduction, metabolism, angiogenesis, tumor microenvironment and the metastatic cascade, and will discuss how new technologies and engineering approaches improve our understanding of the tumorigenesis process and our ability to diagnose or treat cancer. The course is designed primarily for engineering graduate students and senior undergraduate students. It will cover both basic concepts and engineering approaches as applied to cancer biology. This is a highly interdisciplinary field where knowledge from various disciplines needs to be presented and integrated. It will be divided into three sections: (1) biological concepts and cancer biology, (2) engineering and systems approaches to the study of these concepts, and (3) engineering solutions to cancer diagnostics and treatment.
31697 P LEC 058 TTH 230-4PM ARR Heron
Fundamentals of Quantum Matrls
Fundamentals of Quantum Materials - This class will serve as an introduction to recent materials and topics of interest in the field. The class focuses on synthesis and characterization of quantum materials as well as the control and manipulation of quantum materials for applications. Topical systems are those with electronic correlations and systems with topological order, particularly systems with ferroic order and spin textures. The course will focus on magnetism, frustration, non-trivial electronic and magnetic structures, multiferroics, phase transitions, metal-insulator transitions, spin-orbit coupling and Hall effects, and interfaces. The course will also impart practical knowledge through the discussion of: 1) synthesis methods for the growth of bulk materials, thin film materials, controlled interfaces, and nanostructures and 2) characterization methodologies such as electron microscopy, optical spectroscopy, charge and spin transport.
31700 P LEC 068 TTH 830-10AM 3150 DOW Sun, Thornton
Data-Driven Matls Design & Gen
Data-Driven Materials Design and Genomics
The Materials Genome Initiative (MGI) is an ongoing U.S. initiative to discover, manufacture, and deploy advanced materials twice as fast, at a fraction of the cost. Many MGI efforts are enabled by large-scale materials informatics employing methods such as high-throughput computing, data-driven materials optimization, and knowledge discovery in materials databases. In this course, students will learn how to use Python to access big-data from existing materials databases, and how to design and execute a data-driven research project in MSE. State-of-the-art methods in statistical analysis, supervised and unsupervised machine-learning, and data visualization will be covered, with computational labs to teach proficiency in these techniques. We will review examples of MGI efforts in the design of novel lithium ion batteries and structural alloys. A capstone project will provide an opportunity for students to design and propose new MGI initiatives.

**622 Ion Beam Mod** **3.00 ADVISORY**
30131 P LEC 001 MW 930-11AM 2918 COOL Wang
**690 Research Problems** **1.00-16.00**
IND + ARR ARR
**890 Colloq in Mat Sci** **1.00**
19007 P R SEM 001 F 10-1130AM 1670 BEYSTER Heron, Shahani, Qi, Hovden
**990 Diss-Precand** **1.00-8.00 ADVISORY**
IND + ARR ARR
**995 Diss-Cand** **8.00 ENFORCED**
R IND + ARR ARR