

# MSE - MATERIALS SCIENCE AND ENGINEERING

## **MSE 5350 Polymer Science Cr. 3**

Fundamental relationships between chemical structure and physical properties of high polymers. Basic structures, states and transitions of polymers. Polymerization reactions and processes. Molecular weight, viscous flow and mechanical properties of polymers. Offered Fall.

**Prerequisites:** MAT 2150 with a minimum grade of C- (may be taken concurrently)

**Fees:** \$10

**Equivalent:** CHE 5350

## **MSE 5360 Polymer Processing Cr. 3**

A detailed analysis of polymer processing. Rheology of polymers, flow in tubes, calendaring, extrusion, coating and injection molding. Offered Intermittently.

**Prerequisites:** CHE 3200 with a minimum grade of C-

**Fees:** \$10

**Equivalent:** CHE 5360

## **MSE 5385 Biocompatibility Cr. 4**

Introduces concepts and applications of biocompatibility. Cellular response to implants (e.g. prosthetics, gene therapies, cells, etc.) will be covered in detail, including wound healing, immune response, and foreign body response. Topics include stem cell effects; in vitro and in vivo studies; and synthetic and natural material body response. The course material will be applicable to implant design, gene therapies, and stem cell treatments. Offered Winter.

**Prerequisites:** BIO 1050 with a minimum grade of C-, BIO 1500 with a minimum grade of C-, or BIO 1510 with a minimum grade of C-

**Equivalent:** BME 5380

## **MSE 5650 Surface Science Cr. 3**

An introduction to the science and technology of surface phenomena, including surface structure, surface energy, surface diffusion, crystal growth and selected applications of technological importance. Offered Intermittently.

**Prerequisites:** BE 1300 with a minimum grade of D- and CHM 5440 with a minimum grade of D-

## **MSE 7100 Advanced Engineering Mathematics Cr. 3**

Presentation, evaluation and use of mathematical methods within the framework of engineering problems; including ordinary and partial differential equations, transforms and vector operations. Offered Fall.

**Restriction(s):** Enrollment is limited to Graduate level students.

**Equivalent:** CHE 7100

## **MSE 7180 Advanced Topics in Biomaterials and Tissue Biomechanics Cr. 4**

Seminar format: advanced topics presented to the class; lectures by the instructor and by the participants based on literature reviews. Topics determined by student interest. Offered Every Other Fall.

**Prerequisite:** BME 5210 with a minimum grade of C or BME 5370 with a minimum grade of C

**Restriction(s):** Enrollment is limited to Graduate level students.

**Equivalent:** BME 7300, ME 7180

## **MSE 7300 Advanced Thermodynamics Cr. 3**

Advanced presentation of the principles of thermodynamics; application to open systems, phase diagrams and chemical equilibria. Offered Fall.

**Restriction(s):** Enrollment is limited to Graduate level students.

**Equivalent:** CHE 7300

## **MSE 7400 Mechanical Behavior of Materials Cr. 3**

Analysis of elastic and plastic deformation of single crystals and polycrystalline materials, emphasizing the relations between metallurgical microstructure and material properties. Offered Intermittently.

**Restriction(s):** Enrollment is limited to Graduate level students.

## **MSE 7530 Materials Characterization and Computational Data Analysis for Engineers Cr. 3**

Principles of data acquisition and analysis from a wide range of experimental measurements, with an emphasis on high-throughput and automated processing, data visualization, and effective communication. Data management and functional Python skills (no prior programming experience needed, though students with concerns should reach out to the instructor early). Experimental techniques covered in lessons and examples include microscopies, spectroscopies, thermal characterization, ellipsometry, rheology, and X-ray and neutron scattering and reflectivity. Offered Fall.

**Restriction(s):** Enrollment is limited to Graduate level students.

**Equivalent:** CHE 7530

## **MSE 7990 Directed Study Cr. 1-6**

Library investigation of an approved project in materials science and engineering. Independent study, conferences with supervisor and preparation of a comprehensive report. Offered Every Term.

**Restriction(s):** Enrollment is limited to Graduate level students.

## **MSE 7995 Special Topics in Materials Science II Cr. 1-4**

A consideration of special subject matter in materials science. Topics to be announced in Schedule of Classes . Offered Intermittently.

**Restriction(s):** Enrollment is limited to Graduate level students.

**Repeatable for 12 Credits**

## **MSE 8996 Research Cr. 1-10**

Library and laboratory investigation of an approved proposal for advanced research project. Conferences and periodic oral progress reports. Comprehensive report of entire project upon completion. Offered Every Term.

**Restriction(s):** Enrollment is limited to Graduate level students.

## **MSE 8997 Seminar Cr. 0.5**

Offered Fall, Winter.

**Restriction(s):** Enrollment is limited to Graduate level students.

## **MSE 8999 Master's Thesis Research and Direction Cr. 1-8**

Offered Every Term.

**Restriction(s):** Enrollment limited to students with a class of Candidate Masters; enrollment is limited to Graduate level students.

**Repeatable for 8 Credits**

## **MSE 9990 Pre-Doctoral Candidacy Research Cr. 1-8**

Research in preparation for doctoral dissertation. Offered Every Term.

**Restriction(s):** Enrollment is limited to Graduate level students.

**Repeatable for 12 Credits**

## **MSE 9991 Doctoral Candidate Status I: Dissertation Research and Direction Cr. 3-9**

Offered Every Term.

**Restriction(s):** Enrollment is limited to Graduate level students.

**Repeatable for 9 Credits**

## **MSE 9992 Doctoral Candidate Status II: Dissertation Research and Direction Cr. 1-18**

Offered Every Term.

**Prerequisite:** MSE 9991 with a minimum grade of S

**Restriction(s):** Enrollment is limited to Graduate level students.

**Repeatable for 18 Credits**

**MSE 9993 Doctoral Candidate Status III: Dissertation Research and Direction Cr. 7.5**

Offered Every Term.

**Prerequisite:** MSE 9992 with a minimum grade of S

**Restriction(s):** Enrollment is limited to Graduate level students.

**MSE 9994 Doctoral Candidate Status IV: Dissertation Research and Direction Cr. 7.5**

Offered Every Term.

**Prerequisite:** MSE 9993 with a minimum grade of S

**Restriction(s):** Enrollment is limited to Graduate level students.

**MSE 9995 Candidate Maintenance Status: Doctoral Dissertation Research and Direction Cr. 0**

Offered Every Term.

**Restriction(s):** Enrollment is limited to Graduate level students.

**Repeatable for 0 Credits**