**Department of Materials Science and Engineering**

University of Maryland, College Park, Maryland

**ENMA 496: Processing and Engineering of Polymers**

**Course Description:** A comprehensive analysis of processing and engineering techniques for the conversion of polymeric materials into useful products. Evaluation of the performance of polymer processes, design of polymer processing equipment, effect of processing on the structure and properties of polymeric materials.

**Class Schedule:** Monday/Wednesday, 6:30 PM – 7:45 PM

**Prerequisites:** ENMA 300 and permission of the Department

**Textbook:** *Required:*  Osswald, Tim A., Understanding Polymer Processing: Processes and Governing Equations, Hanser Publications, ISBN: 978-3-446-42404-3.

**Course Objectives:**

The main objective of this course is to analyze processing and engineering techniques used for the conversion of polymeric materials into useful products, and how microstructure and properties affect the performance of the polymeric materials.

Satisfactory completion of this course should demonstrate ability to

1. Evaluate the relationship of polymer microstructure to processed product properties and performance.
2. Understand the flow properties of polymer melts and how they influence the design of polymer processing equipment.
3. Identify the features and design parameters of major industrial polymeric processing equipment.

**Topics Covered:**

Specialized Methods of Polymer Synthesis

Phase Structure and Morphology of Polymers and Multicomponent Polymer Systems

Polymer Viscoelasticity and Flow

Polymer Processing Methods and Equipment

Polymer Yield, Crazing, Fracture, and Toughening

Polymer Reinforcement and Composites

Electrical, Magnetic, and Optical Properties

Specialty Polymer Applications: Biomaterials, Electronics, and Nanomaterials

Degradation and Stabilization of Polymer Systems

Sustainability Considerations

**Grading:** Midterm Exams: 20% x 2; Final Exam: 30%; Homework: 10%; Special Project: 20%

**Academic Integrity:** <http://shc.umd.edu/SHC/Default.aspx>

**Instructor:** Dr. Brian Pate **Office: 2124** email: [bpate@umd.edu](mailto:bpate@umd.edu)

**Attendance Policy:** Regular attendance and participation in this class is the best way to grasp the concepts and principles being discussed. However, if a class must be missed due to an illness, the policy in this class is as follows:

1. For every medically necessary absence from class, a reasonable effort should be made to notify the instructor in advance of the class. When returning to class, students must bring a note identifying the date of and reason for the absence, and acknowledging that the information in the note is accurate.
2. If a student is absent for more than three classes, the instructor may require documentation signed by a health care professional.
3. If a student is absent on days when tests or presentations are scheduled, he or she is required to notify the instructor in advance, and upon returning to class, bring documentation of the illness, signed by a health care professional.

**CourseEvalUM:** Your participation in the evaluation of courses through CourseEvalUM is a responsibility you hold as a student member of our academic community. Your feedback is confidential and important to the improvement of teaching and learning at the University as well as to the tenure and promotion process.

**Relationship of the class to the program objectives** This course is a specialization elective course. It teaches students the basic information that they will need to understand conversion of polymeric materials into useful products.

**Counseling Center/Learning Assistance Service**

“If you are experiencing difficulties in keeping up with the academic demands of this course, contact the Learning Assistance Service, 2202 Shoemaker Building, 301-314-7693. Their educational counselors can help with time management, reading, math learning skills, note-taking and exam preparation skills. All their services are free to UM students.” http://www.counseling.umd.edu/

**Relationship of course to program objectives:** This senior level course provides the skills to students to allow them to apply structure properties and process engineering principles for the design of commercial polymeric products.