

MSE/CME 404G
University of Kentucky
Department of Chemical and Materials Engineering
Fall, 2009

TR 2:00-3:15 PM
255 Anderson Tower (FPAT)

Instructor: Prof. D.S. Kalika
177 Anderson Tower (FPAT)
257-5507 kalika@engr.uky.edu

Course Description: MSE 404G POLYMERIC MATERIALS. (3)
Synthesis, structure, and processing of polymers, useful geometric forms, mechanical and thermal properties, crystallinity, polymer blends, evaluation of polymers for specific applications.

Prereq: Engineering standing. CHE 230 or CHE 236. MSE 301 or consent of instructor.

The course is designed primarily for upper-division undergraduates in Materials Science and Chemical Engineering. Although no specific prior knowledge of polymeric systems is assumed, students should have foundational knowledge in the areas of materials (*i.e.*, MSE 201) and chemistry (*i.e.*, CHE 230 or 236). Students from outside chemical or materials engineering should consult with the instructor relative to their specific background.

Text: There is no specific text for the course. Detailed course notes will be made available on the class website.

Office Hours: Dr. Kalika will hold office hours on Mondays from 3:00 to 4:30PM; other times by appointment. The best way to contact Dr. Kalika is via e-mail at kalika@engr.uky.edu. Dr. Kalika will make every effort to respond to e-mail inquiries promptly (*i.e.*, within 24 hours).

Web Site: The instructor will maintain a course website:

http://www.engr.uky.edu/~kalika/MSE404_Fall2009/

This site will contain postings pertaining to all elements of the course (course schedule, announcements, homework assignments, exam information, etc.). Lecture notes for the course will be posted in PDF format. Specifics for accessing the website will be provided at the first class meeting.

Homework Sets: **8** homework sets will be assigned during the course of the semester; due dates are indicated on the course schedule. Assignments are due at the start of class on the date indicated, and must be submitted in hardcopy form. Homework submitted electronically (*i.e.*, via e-mail attachment) will only be accepted in rare cases, and requires the advance approval of the instructor.

Students are permitted to consult with each other during the preparation of the homework sets. However, the final submission should be the work of the individual student. Problem sets that

show evidence of verbatim copying, or the sharing of computer printouts (*e.g.*, plots; spreadsheets) will receive zero credit, regardless of the source of the solution. Late homework will be accepted only in exceptional circumstances.

Quizzes and Exams: Four quizzes will be administered during the semester. The quizzes will be 15-20 minutes in length, and will typically be a mix of multiple choice and short answer questions intended to test on broad concepts. For each student, the lowest quiz score will be dropped in calculating the final course grade.

Two in-class exams are scheduled for the semester (October 8th and November 17th); the exams will most likely occupy the entire class period, and will involve more in-depth exercises as compared to the quizzes.

For students who miss a quiz, the first missed quiz will automatically correspond to the “dropped” quiz score for the semester (*i.e.*, grade of “0”). An unexcused absence from an exam (or the final exam) will result in a grade of “0” for that exam. If an excused absence is anticipated (*e.g.* illness, family emergency) please contact Dr. Kalika (257-5507 or kalika@engr.uky.edu) before the exam, if at all possible. University policies regarding excused absences are detailed in the “*Students Rights and Responsibilities*” (<http://www.uky.edu/StudentAffairs/Code/>).

Grading: The final grade will be determined based on the following formula:

In-Class Exams (2)	40%
Quizzes (3 out of 4)	20%
Final Exam	25%
Homeworks & Class Participation	15%

Grading will be based on each student’s composite (raw) score; scores in the range $\geq 85\%$ will be guaranteed a grade of “A”, 75% or above at least a “B”, 65% or above at least a “C”, and 55% or above at least a “D”. The instructor will provide approximate letter grade equivalents after each quiz and exam, in order to assist students in determining their status in the course. For students with grades near the endpoints in the above distribution, consideration may be given to attendance and class participation, as well as to performance trends over the course of the semester. Please note that the last day to withdraw from a class for the Fall term is November 6th.

The final exam is scheduled for Thursday, December 17th, at 1:00 PM.

Attendance: The lectures presented in MSE 404G will be based on PowerPoint slides that will also be posted to the course website. Students can review the slides before class, and are encouraged to take additional notes, as needed. Students should recognize that they will be responsible for *all* material presented in class (for example, additional discussions on particular topics), and not just the material covered in the powerpoints. As such, regular class attendance is expected. If, for some reason, regular class attendance becomes a problem, formal attendance will be taken and factored into the homework and class participation grade.

Cheating: The engineering profession is one where individuals are held to the highest ethical and professional standards. Consistent with this philosophy, cheating in MSE 404G will not be tolerated. The definition of cheating at the University is presented in the “*Student Rights and Responsibilities*”:

6.3.2 CHEATING: Cheating is defined by its general usage. It includes, but is not limited to, the wrongfully giving, taking, or presenting any information or material by a student with the intent of aiding himself/herself or another on any academic work which is considered in any way in the determination of the final grade. Any question of definition shall be referred to the University Appeals Board.

Complete policies and procedures regarding cheating and other academic misconduct can be reviewed at: (<http://www.uky.edu/StudentAffairs/Code/>)

STUDENT OUTCOMES FOR MSE 404G:

At the conclusion of MSE 404G, the student should be able to...

- 1.] Identify the major classes of engineering polymers, their chemical structure, macromolecular architecture, and bulk properties.
- 2.] Understand the definitions for polymer molecular weight and polydispersity, the experimental methods used for the determination of molecular weight, and the influence of molecular weight on polymer properties.
- 3.] Describe the relationships between polymer structure and glass transition temperature, melting temperature, and bulk crystallinity. Discuss appropriate methods for the determination of crystal structure and fraction crystallinity.
- 4.] Describe the underlying molecular mechanisms for step-growth and chain-growth polymerization, and the classes of polymers associated with these mechanisms.
- 5.] Discuss the mechanical properties of polymers in terms of fundamental quantities, and describe the experimental methods used for the determination of these properties.
- 6.] Describe the behavior of polymers in both the melt and solution states as related to their macromolecular characteristics.
- 7.] Identify appropriate processing techniques for the production of common polymer products; *i.e.*, fibers, films, bottles, molded articles, etc.
- 8.] Analyze polymer physical property data as needed for intelligent materials selection.