

Department of Chemical Engineering
West Virginia University

ChE 462
Polymer Processing
Spring 2013

- Instructor: Dr. Rakesh Gupta
Room 407 ESB
(304) 293-9342
Rakesh.Gupta@mail.wvu.edu
- Class: 3 hr lecture, 3 hr credit
MW 3:00 – 4:40, Room 401 ESB
(Class will not meet every week)
- Textbook: D.G. Baird and D.I. Collias, Polymer Processing,
Wiley, New York, 1998.
- Objectives: To present the fundamental principles by which one may analyze any
polymer processing operation and develop relationships amongst design,
material and operating variables.
- Grading: 3 Exams @ 30% 90%
Homework 10%
- Grade Assignment: Grading is relative, with the class average being a C. At the instructor's
discretion, performance required for a given grade may be lowered, but
not raised.
- Homework Grading: Dr. Chris Yurchick
- Policies: Exams are open textbook and open notes
No make-up exams except by prior arrangement with the instructor
Exam grading appeals in writing only on the day exam is returned
No late homework
Homework submitted must be individual work
No cell phone usage in class. You may be asked to leave the class if your
phone rings

Standard Books on Polymer Processing

1. Middleman, S., Fundamentals of Polymer Processing, McGraw-Hill, New York, 1977.
2. Rauwendaal, C., Polymer Extrusion, 3rd ed., Hanser, Munich, 1994.
3. Tadmor, Z. and I. Klein, Engineering Principles of Plasticating Extrusion, Reinhold, New York, 1970.
4. Tadmor, Z. and C.G. Gogos, Principles of Polymer Processing, 2nd edition, Wiley, New York, 2006.

Expected Learning Outcomes:

By the end of the course

1. Students will have an understanding of non-Newtonian fluid flow behavior.
2. Students will have an understanding of the flow behavior of particulate solids.
3. Students will be familiar with the technological details of the major polymer processing operations such as extrusion and injection molding.
4. Students will learn the process of developing simple mathematical models of the flow of polymer in a given processing situation based on the principles of transport phenomena.
5. Students will be able to use simple mathematical models of a polymer process to solve for design variables in terms of geometrical, material and processing variables.
6. Students will realize that production rates are often limited by the occurrence of fluid flow instabilities.
7. Students will get a feel of the nature, size and method of operation of the polymer industry.

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Course Outline

Introduction to polymers
Rheology
Polymer viscoelasticity
Instabilities
Calendering
Roll coating
Blade coating
Wire coating
Dip coating

First Exam

Single-screw extrusion
 Flow of particulate solids
 Polymer melting
 Pressurization and pumping
Twin-screw extrusion and mixing

Second Exam

Injection molding
Fiber spinning
Film blowing
Reacting systems
Thermosets processing
Mass transfer through polymers

Final Exam (Thursday, 11:00 am, May 9, 2013)

Note 1: We will proceed at a comfortable pace, and we may or may not be able to cover all the topics listed above.

Note 2: If schedules permit, we may drive to Parkersburg, WV to visit the polymer processing operations of either DuPont or SABIC Innovative Plastics.

Social Justice Statement: West Virginia University is committed to social justice. I concur with that commitment and expect to maintain a positive learning environment based upon open communication, mutual respect, and non-discrimination. Our University does not discriminate on the basis of race, sex, age, disability, veteran status, religion, sexual orientation, color or national origin. Any suggestions as to how to further such a positive and open environment in this class will be appreciated and given serious consideration.

Academic Integrity Statement: The integrity of the classes offered by West Virginia University solidifies the foundation of its mission and cannot be sacrificed to expediency, ignorance, or blatant fraud. Therefore, I will enforce rigorous standards of academic integrity in all aspects and assignments of this course. For the detailed policy of West Virginia University regarding the definitions of acts considered to fall under academic dishonesty and possible ensuing sanctions, please see the Student Conduct Code http://studentlife.wvu.edu/office_of_student_conduct/student_conduct_code . Should you have any questions about possibly improper research citations or references, or any other activity that may be interpreted as an attempt at academic dishonesty, please see me *before* the assignment is due to discuss the matter.