

Department of Chemical Engineering
Indian Institute of Technology - Bombay
Polymer Processing (CL624)
Semester I, 2008-09

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Course Outline

The basic objective of the course is to provide an understanding of the fundamentals of polymer processing operations. The emphasis will be on using fluid mechanics and heat transfer analysis for design of polymer processing operations. The principles will be illustrated by focussing on some of the important thermoplastic polymer processing operations, with realistic examples.

Introduction

1. *Preliminaries* (2): Processes. Importance of processing.

Fundamentals

1. *Viscous non-Newtonian flow* (4): Behaviour of polymer melts. One-dimensional isothermal flows. Approximations.
2. *Visco-elastic non-Newtonian flow* (5): Phenomena and material functions. Constitutive equations. Rheometry.
3. *Non-isothermal aspects* (5): Effect on rheological properties. Thermal transport properties. Transient heat conduction. Radiation. Crystallization, morphology and orientation.
4. *Mixing* (5): Characterization of mixed state. Dispersive and distributive mixing. Thermodynamics.

Operations

1. *Extrusion dies* (6): Visco-elastic phenomena. Sheet and film dies. Annular dies. Profile extrusion dies. Multilayer extrusion.
 2. *Extruders* (5): Extruder types. Hopper design. Plasticating single screw extruder.
 3. *Forming operations* (5): Injection moulding, Compression moulding
 4. *Postdie processing* (5): Fibre spinning, Film casting and stretching
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Text book:

D. G. Baird and D. I. Collias, Polymer processing. Principles and design.

Reference books:

Z. Tadmor and C. G. Gogos, Principles of Polymer Processing.

S. Middleman, Polymer Processing.

J. R. A. Pearson, Mechanics of Polymer Processing.

Evaluation:

Homework assignments	10%
Quiz (2)	10%
Mid-semester test	30%
Final examination	50%

Meeting times:

All lectures in Room 235.

Monday	8:30	-	9:30
Tuesday	10:30	-	11:30
Friday	9:30	-	10:30