MIE1705HS Thermoplastics Polymer Processing **Syllabus**

Course Outline

Instructor
Prof. Patrick C. Lee
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Office Hours
By email

Teaching Assistant
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Course Schedule

- Lectures
  Fridays
  Hours: 9:00-11:00
  Room: MC 306

Contact Hours

- 0.5 credits
- Lectures:
  2 hrs x 16 wks/term = 32 hrs

Prerequisites
N/A

Course Website
Quercus Portal

Important Dates

Final Report & Presentation
Dec 6th, 2019

Course Description

This course is designed to provide the background for an understanding of the wide field of polymer processing, and provide a strong foundation including fundamentals and applications of polymer processing. Topics include: fundamentals of polymers, extrusion, injection molding, die forming, mixing, and other common plastics processes such as fiber spinning, blow molding, rotational molding, coating, etc.

Textbook

Textbooks are for references only.

- Extrusion of Polymers: Theory and Practice, C. I. Chung, Hanser (2010).
- Understanding Polymer Processing: Processes and Governing Equations, T. Ossward, Hanser (2010).
- Principles of Polymer Processing, 2nd ed. Z. Tadmor and C. G. Gogos, Wiley, NY (2006).
- Rheology: Principles, Measurements, and Applications, C. W. Macosko, VCH, New York, NY, (1994).
- Melt Rheology and Its Role in Plastics Processing: Theory and Applications, J. M. Dealy and K. F. Wissbrun, Springer (1999).
- Manufacturing Processes for Engineering Materials (6th Edition), by Serope Kalpakjian and Steven Schmid, Prentice Hall (2017).
- Polymer Processing: Principles and Design, D. G. Baird and D. I. Collias, Wiley, NY (2014).

Requirements/Regulations

https://portal.engineering.utoronto.ca/sites/calendars/current/Academic_Regulations.html

List of Topics

- **Introduction**
  - Course outline & Introduction;
  - Current and future trends of polymer processing technologies;
- **Polymeric Materials**
  - Introduction to polymers;
  - Mechanical behavior of polymers;
  - Melt rheology;
- **Extrusion**
  - Solid conveying;
  - Melting;

- Metering;
- Screw types and design;

- **Injection Molding**
  - Injection molding cycle;
  - Injection molding machine;
  - Special injection molding processes;

- **Die Forming**
  - Capillary flow;
  - Sheet forming and film casting;
  - Tube and blown film;
  - Die types and design;

- **Mixing**
  - Distributive mixing;
  - Dispersive mixing;
  - Mixing devices;

- **Other Plastics Processes (Optional Topics)**
  - Fiber spinning;
  - Blow molding;
  - Thermoforming;
  - Coating;
  - Rotational molding

Learning Objectives

At the end of the course, students should be able to:

- Develop potential application-driven solutions to real-life polymer processing problems with targeted quantitative estimation
- Recommend potential improvements over currently available polymer processing technologies and platforms
- Understand the key practical theory with the operation principles of polymer processing technologies and their potential limitations
- Select and justify appropriate processing technologies for specific applications

Evaluation

- Journal Article Reviews/Discussions; Simulation Assignments (30%)
- Project Reports and Presentations (30%)
- Final examination (40%)
- Total: 100 %

Academic Integrity

Students are expected to conduct themselves in accordance with the highest ethical standards of the Profession of Engineering and evince academic integrity in all their pursuits and activities at the university. As such, in accordance with the General Academic Regulations on Academic Integrity, students are reminded that plagiarism or any other form of cheating in examinations, term tests, assignments, projects, or laboratory reports is subject to serious academic penalty (e.g. suspension or expulsion from the faculty or university). A student found guilty of contributing to cheating by another student is also subject to serious academic penalty.