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.

- Understanding Polymer Processing: Processes and Governing Equations, T. Ossward, Hanser (2010).

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.