CAYUGA COMMUNITY COLLEGE
Mechanical Technology

Fundamentals of Plastics Technology-MMT 141
4 Credit Hours

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Course or Catalog Description:

Introduces students to all discipline of plastics converting (extrusion, EBM, ISBM, IM, Vacuum forming, compression molding). Covers the equipment related to each discipline (primary and auxiliary), and the materials used along with their properties and applications. Students learn about what drives the need for this industry and product life cycles. Visits to industry sites are part of the curriculum.

Three class hours and three lab hours weekly.

Prerequisites:

Completion of concurrent enrollment in MMT101

Machine Tools I
This course introduces the student to a hands-on study of basic theory and laboratory experiences for lathes, milling, drilling, grinding, bench work, and bulk manufacturing operations. Study of cutting speeds and feeds, surface finishes, as well as, machine capabilities is included. An introduction to welding, materials, and welding processes will be included. Hands on skills with basic part layout, measurement, inspection, and technical drawing reading skills used by machinist will be emphasized.

Two class hour and two lab hours weekly.

Course Goals & Objectives:

Upon successful completion of the course, a student will be able to:

- Identify the critical factors and issues that affect the plastics industry

- Identify cost, manufacturability and shipping factors in the plastics industry
- Explain and identify common plastics material classifications
- Explain and identify plastic material structures and characteristics of each
- Identify the mechanical properties of common plastic materials
- Select an appropriate plastic material for various product applications
- Identify the effects that polymer additives have on plastic properties
- Explain and identify the factors that affect polymer flow properties
- Explain the effect of plastic part features on function and manufacturability
- Identify the processing steps and equipment for the standard plastic conversion processes
- Identify the auxiliary equipment required for the standard plastic conversion processes
- Interpret standard quality assurance test and inspection protocols used in the plastics Industry

Required Texts, Reading, Materials:

Suggested Text:

Fundamental Principles of Polymeric Materials, 3rd Edition, Christopher S. Brazel & Stephen L. Rosen, Wiley 2012

Method of Evaluation:

Tests	35%
Homework	40%
Final Exam	25%
Total	100%

Grading Policies:

A	93
A-	90
B+	87
B	83
B-	80
C+	77
C	73
C-	70
D+	67
D	63
D-	60
F	0

Detailed Course Outline and Schedule:

1. The Plastics Industry
    a. Evolution of the modern plastics industry
    b. What drives the industry and what will continue to make it grow
    c. Area plastics manufacturers
    d. Factors and issues that affect the industry
    e. Technical careers in the plastics industry

2. Plastic Conversion Processes: process and equipment overview
    a. Extrusion
    b. Mixing
    c. Injection molding
    d. Blow molding
    e. Thermoforming

3. Plastic Materials
    a. Plastic material structures: amorphous and crystalline
    b. Plastic material classifications: thermo plastics, thermosets, hydroscopic materials, and others
    c. Copolymers and polymer blends
    d. Mechanical properties of polymers: tensile strength, impact strength, fatigue strength
    e. Time dependent properties
    f. Material selection for different product applications

4. Polymer additives
    a. Types of polymer additives: plasticizers, stabilizers, fillers, others
    b. Effect of additives on polymer properties

5. Introduction to Viscous Flow
    a. Time dependent flow behavior
    b. Effect of temperature on flow properties
    c. Effect of pressure on flow properties
    d. Effect of molecular weight on flow properties
    e. Shear force and shear rate

6. Plastic part features
    a. capturing form, fit, and function
    b. snap legs
    c. pintels and orifices
    d. ribs and bosses,
    e. latching features
    f. threads

7. Quality Assurance in the Plastics Industry
    a. Standard inspection procedures
    b. Standard test procedures

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