

SPRINGFIELD TECHNICAL COMMUNITY COLLEGE

ACADEMIC AFFAIRS

Course Number: MECH 390 Department: MET

Course Title: Materials and Processing for World-Class Manufacturing Semester: Fall Year: 2004

Objectives/Competencies

Course Objective	Competencies
<p>1. Understand and identify commonly used engineering materials.</p> <p>2. Understand the behavior and manufacturing properties of metals, plastics, ceramics and composites.</p>	<ul style="list-style-type: none">• Define the four classifications of materials: Metals, Polymers, Ceramics, and Composites.• Compare and contrast the mechanical and physical properties of the different classifications of materials• Define and visualize a BCC, FCC, and HCP unit cell• Compare the density and relative strength between BCC, FCC, and HCP crystal structures• Visualize mechanical properties of a metal• Calculate stress as $\sigma = \text{Force/Area}$• Calculate strain as $\epsilon = \Delta L/L$• Generate a Stress-Strain Diagram from supplied Test Data• Identify different points on the curve of the Stress-Strain Diagram• Calculate Modulus of Elasticity as $E = \Delta \sigma / \Delta \epsilon$ in the Elastic Region of the Stress-Strain Diagram• Identify the physical properties that change given different heat treatment applications.

Course Objective	Competencies
<p>3. Understand why various manufacturing processes are used, and the advantages of the different processes.</p>	<ul style="list-style-type: none"> • Identify Quenching • Identify Annealing • Identify Martensite formation • Identify Tempering • Determine the correct method of quenching for a given engineering requirement. The student will determine the method using the Jominy End Quench method. • Introduce the concepts and vocabulary of “polymers” with simple models • Understand the terminology of casting processes, forming and shaping processes, and joining processes. • Define Extrusion, Injection Molding, Compression and Transfer Molding, Blow Molding, Thermoforming, Powder • Metallurgy • Define green sand, plaster, investment casting, expanded polystyrene, die casting, and centrifugal casting as expendable or permanent casting methods • Define Bulk deformation processes as Rolling, Forging, Extrusion, or Drawing. • Define Sheetmetal processes as Bending, Drawing, or Shearing • Define the various joining processes in manufacturing • Define the elements that make up the manufacturing costs for a plastic injection molded part: part material cost, equipment operating cost, and tooling cost.

Course Objective	Competencies
	<ul style="list-style-type: none">• Define the elements that drive tooling costs for an injection-molded part: part geometry, mold closure direction, and parting surface location.• Visualize how the effects of changing part geometry, mold closure direction, and parting line selection can affect tooling costs.