

## Engineering Program

**Specialization** Production and Computer Aided Manufacturing Technology

**Course Number** 0202131

**Course Title** Forming Technology

**Credit Hours** (2)

**Theoretical Hours** (2)

**Practical Hours** (0)

**Brief Course Description:**

This course covers the basics of major of forming processes used in manufacturing. Topics include forming metal casting, extrusion, rolling, forging, sheet metal forming and wire and pipe drawing.

**Course Objectives:**

At the end of this course student will be able to:

1. Understand the basics of forming processes to be able to select the proper technique to manufacture a certain product
2. Control the performance of the specified forming process and product quality as a result of the concepts and hypotheses that gained after performing sets of experiments and studies regarding the variables and factors affecting each of the forming processes
3. Understand the most important and various forming processes of plastics and study these processes for their importance in industry
4. Comparing hot/warm/cold working

**Detailed Course Description:**

Number	Title	Content	Time
	Introduction	Revision for the types of engineering materials: <ul style="list-style-type: none"> <li>• Metallic; Ferrous, non-ferrous</li> <li>• Nonmetallic; woods, polymers, ...</li> <li>• Composites</li> </ul> Properties of Engineering Materials: <ul style="list-style-type: none"> <li>• Physical</li> <li>• Chemical</li> <li>• Mechanical (stress-strain diagram, engineering stress/strain, true stress/strain, plane stress/strain, plastic flow, yielding, principle stresses, ...)</li> </ul>	<b>1 week</b>
	Initially liquid state metal forming: <b>Casting</b>	Casting Operation introduction Expendable-Mold Casting Processes, Sand mold casting: Procedures Patterns and Cores design and preparation/tolerances calculation Molds and Mold Making; Sand mold preparation Sand types/properties/testing; strength, permeability, hardness Melting and casting Cast cleaning/ finishing/ inspection/ treatment Types of defects and defects elimination Advantages and disadvantages	<b>3 weeks</b>

		<p>Other casting technologies:  Permanent mold casting Processes  Die casting  Squeeze Casting  Semisolid Metal Casting  Centrifugal casting  Pressure permanent mold casting  Vacuum Molding  Investment casting: lost pattern (wax/polystyrene), Shell Molding, Expandable Polystyrene Process, Plaster-Mold and Ceramic-Mold Casting  Types of defects  Advantages and disadvantages</p>	
	Initially solid state metal forming/ bulk deformation processes in metal working	<p>Mechanical warm forming  Mechanical hot forming:  Hot rolling (slab/sheet metal), rolling forces/stresses/moments/energy, roller types, shape rolling, ...,  Hot extrusion (direct, indirect, impact, hollow shapes), dies, tapered dies  Hot forging (open die, closed die; impression, flash less), die design, lubrication, pressure forging, upset forging, hill friction  Hot centrifugal forming  Hot drawing (multi-pass drawing, tube drawing, wire drawing)  Types of defects  Advantages and disadvantages  Comparing hot/warm/cold working</p> <hr/> <p>Mechanical cold forming:  Cold rolling  Cold drawing: wire drawing, deep drawing, centrifugal cold forming  Cold extrusion (pressure or impact extrusion)  Cold pressing/cold liquid or rubber pressing  Types of defects  Advantages and disadvantages</p>	<b>2 weeks</b>
	Metal sheet forming	<p>Manual metal sheet forming  Press working:  Shearing; punching, parting, blanking, piercing, fine blanking, trimming  Deforming; bending, (spring back), deep drawing, redrawing, ironing</p>	<b>1 week</b>

	Relatively modern forming technologies	Powder metallurgy forming Types of defects Advantages and disadvantages High speed forming Explosive forming	<b>1 week</b>
	Polymer forming	Types of polymeric materials and their properties Advantages/ disadvantages Polymer forming processes: Polymer injection forming/ molds/ machines/ products Polymer extrusion forming/ machines/ products Polymer blow molding /machines / products Polymer blow/extrusion forming Polymer forming by pressing Polymer forming by Transfer molding Foams	<b>5 weeks</b>

**Evaluation Strategies:**

<b>Evaluation</b>		<b>Percentage</b>	<b>Date</b>
Exams	Midterm	40%	
	Final Exam	50%	
Projects and Assignments		10%	

**Teaching Methodology:**

- Lecturing
- Technical videos watching

**Text Books & References:**

**Text Books:**

- تقنية التشكيل، الإدارة العامة لتصميم وتطوير المناهج، المؤسسة العامة للتعليم الفني والتدريب المهني، المملكة العربية السعودية
- مبادئ عمليات تشكيل المعادن، حارث الجبوري

**References:**

- Groover, Fundamentals of Modern Manufacturing, 4<sup>th</sup> Ed
- Kalpakjian, Manufacturing Engineering and Technology, 6th Edition in Si Units