

School of Engineering and Computer Science
MECH 310 Introduction to Design and Manufacturing

Catalog Data:	310 Introduction to Design and Manufacturing 4 (3-3) Course Prerequisite: MECH 103; MECH 309; Certified major in Mechanical Engineering. Basic mechanical engineering drawing; shaping and non-shaping manufacturing processes; exposure to 3D-CAD; manufacturing processes laboratory. Typically offered Spring.
Class Schedule:	Three 50-minute lecture sessions per week, for one semester.
Laboratory Schedule:	One three-hour lab sessions per week, for one semester.
Prerequisites by Course:	Certified MECH major, MECH 103, MECH 309
Prerequisites by Topic:	<ol style="list-style-type: none"> 1. Orthographic theory, conventions, and visualization 2. Equilibrium phase diagrams and time-temperature transformation characteristics of plain carbon steels 3. Engineering stress, engineering strain, Hooke's law 4. Structure and mechanical properties of engineering materials
Textbook:	Mikell P. Groover, <i>Fundamentals of Modern Manufacturing: Materials, Processes, and Systems</i> , 5th Edition, Wiley, 2012.
Course Coordinator:	Dr. Dave Kim
Course Objectives:	<ol style="list-style-type: none"> 1. Introduce students to use a modern CAD/CAM system to generate 3-D engineering drawings and machining tool paths. 2. Provide students with an introductory look at a number of shaping processes including casting, material removal processes, deformation processes, and joining. 3. Provide students with hands-on experience with familiar machine tools and other processes used in the metal fabrication industry - mill, lathe, band saw, CNC mill, hand tools, fusion welding (various types). 4. Introduce the elements of engineering communications, including graphical representation of artifacts and written reports to professional audiences.
Topics Covered:	<ol style="list-style-type: none"> 1. Computer aided design and computer aided manufacturing (CAD/CAM) 2. Geometric dimensioning and tolerances (GD&T) 3. Solidification of metals and metal casting processes 4. Bulk polymer production 5. Metal forming (Rolling, forging, extrusion, drawing, and sheet-metal working) 6. Metal cutting (Metal cutting theories, machining processes) 7. Welding processes
Lab Experiments and Activities:	<ol style="list-style-type: none"> 1. Introduction to the machine shop: shop safety, hand tools, and layout tools 2. Measurement: precision measurement of sizes and features 3. Casting: pattern design consideration, gating system, and metal casting 4. Injection molding: design of experiments and plastic processing 5. Deformation processes: forging, and springback phenomenon 6. Joining: spot welding, arc welding, and mechanical assembly 7. Machining: band saw, grinding wheels, manual lathe, and manual mill 8. CAD/CAM: 3-D CAD/CAM software 9. CNC: CNC milling and turning

Course Outcomes:	Students will be able to:		
	Assessed for Student Outcomes	<p>3-a. Produce a variety of lab reports for professional audiences, using discipline-specific conventions including graph/tables, citations, etc.</p> <p>6-b. Use appropriate machine tool equipment, standardized methods and apparatus for the gyroscope term project.</p> <p>6-c. Conduct data analysis and interpretation for the injection molding lab report.</p> <p>6-d. Draw useful conclusions through validating experimental results with respect to assumptions, constraints, and theories in manufacturing engineering for the injection molding lab report.</p> <p>7-a. Use resources to discuss new material not taught in class for lab reports.</p>	
	Other	<p>1-a. Demonstrate knowledge of engineering principles (metallurgy, mechanics, and/or material science) in manufacturing processes and machine tool systems.</p> <p>1-d. Applies engineering principles (metallurgy, mechanics, and/or material science) toward solving engineering problems in manufacturing.</p>	
Required or Elective Course:	Required		
Relationship of Course to Program:	Meets: Educational Objectives <u>1, 2, 4</u> Student Outcomes <u>1, 3, 6, 7</u>		
Prepared by:	Dr. Dave Kim	Date:	4/6/2018 (4.6.18 mb) Rev. 5-23-19
Approved by USC:	4/16/18		