

School of Mechanical Engineering and Computer Science
Mech 310 Introduction to Design and Manufacturing

Catalog Data:	Mech 310 Introduction to Design and Manufacturing; 4 (3-3) Basic mechanical design: visual thinking, engineering drawing, and design process. Manufacturing process: shaping and non-shaping processes. Exposure to 3D-CAD.
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
Required Texts:	<i>Fundamentals of Modern Manufacturing</i> , Mikell P. Groover, 2nd Edition, Prentice-Hall, 2002
Course Coordinator:	Dr. Dave (Dae-Wook) Kim
Course Objectives:	<ol style="list-style-type: none"> 1. Introduce students to use a modern CAD system to generate 3-D engineering drawings. 2. Provide students with an introductory look at a number of shaping processes including casting, material removal processes, deformation processes, and joining. 3. Introduce students various non-shaping processes including heat treatment and surface treatment. 4. 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). 5. Introduce the elements of engineering communications, including graphical representation of artifacts, teamwork, written reports, and oral presentations.
Topics Covered:	<ol style="list-style-type: none"> 1. Engineering drawing and Computer Aided Design (CAD) 2. Geometric dimensioning and tolerances (GD&T) 3. Solidification of metals and metal casting processes 4. Bulk polymer production 5. Powder processing and sintering modern ceramics 6. Rolling, forging, extrusion, and drawing 7. Cutting, bending, and drawing of sheet metal 8. Traditional, shear process machining 9. Nontraditional machining 10. Heat treatment and surface treatment
Lab Experiments and Activities:	<ol style="list-style-type: none"> 1. CAD: 3-D CAD S/W. 2. Introduction to the machine shop: shop safety, hand tools, and layout tools. 3. Casting: pattern design consideration, gating system, and metal casting.

	<p>4. Injection molding: plastic mold design and plastic processing.</p> <p>5. Deformation processes: forging, and springback phenomenon.</p> <p>6. Machining: band saw, grinding wheels, manual lathe, and manual mill.</p> <p>7. CNC and CAM: 3-D CAM S/W.</p> <p>8. Joining: spot welding, arc welding, and mechanical assembly.</p>	
Course Outcomes:	<p>Students will be able to:</p> <p>A-3. Demonstrate knowledge of engineering principles (metallurgy, mechanics, and/or material science) in manufacturing processes and machine tool systems.</p> <p>A-4. Apply engineering principles (metallurgy, mechanics, and/or material science) toward solving engineering problems in manufacturing.</p> <p>B-2 Use appropriate machine tool equipment, standardized methods and apparatus for manufacturing processes.</p> <p>B-3 Use appropriate tools and/or statistical tools to analyze data.</p> <p>B-4 Validates experimental results with respect to assumptions, constraints, and theory.</p> <p>C-3 Work within realistic constraints, (such as economical, manufacturability, health and safety, and sustainability) in realizing systems.</p> <p>C-4 Build prototypes that meet design specifications.</p> <p>E-3. Use experimental methods to obtain solutions.</p> <p>G-1 Produce a variety of lab and/or project reports, using appropriate formats, grammar, and mechanics with discipline-specific conventions including citations.</p> <p>I-1 Find, evaluate & use resources to learn new material not taught in class.</p> <p>I-2. List sources for continuing education opportunities (such as professional society, six-sigma black belt program, etc) in the manufacturing field.</p> <p>K-1 Set-up and/or operate machine tools such as hand tools, manual lathe/mill, press, fusion welding, and CNC tools for projects.</p> <p>K-4 Use software such as CAD/CAM and Excel for analysis, synthesis and presentation.</p>	
Required or Elective Course:	Required	
Contribution to Professional Component:	Engineering Topics	
Relationship of Course to Program:	Meets: Educational Objectives <u>1, 2, 4</u> Program Outcomes <u>A, B, C, E, G, I, K</u>	
Prepared by:	Dr. Dave (Dae-Wook) Kim	Date: November 1, 2006
Approved by CAC:		