ME 3210 Design, Materials, and Manufacture (Required)

Catalog Description: ME 3210 Design, Materials, and Manufacture (3-0-3)
Prerequisites: MSE 2001 Principles and Applications of Engineering Materials and ME 2110 Creative Decisions and Design
Major manufacturing processes, capabilities, and costs. Interaction between design, materials, and manufacturing process selection.

Faculty course notes.

Software: CES EduPack, Granta Design

Topics Covered:

1. Basics:
   a) Review of design processes
   b) Review of materials
   c) Taxonomy of manufacturing processes
   d) Selection under constraints and objectives
   e) Cost modeling of manufacturing processes
   f) Eco-selection issues
   g) Selection of manufacturing processes based on design and material constraints and objectives

2. Manufacturing Processes:
   a) Casting
   b) Bulk deformation (e.g., forging, rolling, drawing, extrusion)
   c) Sheet metal forming
   d) Mechanical material removal (e.g., cutting, grinding)
   e) Non-mechanical material removal (e.g., ECM, EDM, laser, electron beam, water jet)
   f) Polymer and polymer composites processing (e.g., injection molding, extrusion)
   g) Joining and fastening (e.g., welding, adhesives, rivets)

Course Outcomes:

Outcome 1: To train the student to be able to understand the major manufacturing processes.
1.1 Students will demonstrate the ability to identify and describe the major manufacturing processes and their capabilities and limitations.
1.2 Students will demonstrate knowledge of process capabilities of major manufacturing processes.

Outcome 2: To train the student to convert design requirements into selection constraints and objectives.
2.1 Students will demonstrate the ability to convert design requirements into constraints and objectives for selection of manufacturing processes.
Outcome 3: To train the student to select manufacturing processes based upon design requirements and to synthesize manufacturing processes and systems.

3.1 Students will demonstrate the ability to select manufacturing processes under single and multiple constraints.
3.2 Students will demonstrate the ability to select manufacturing processes under single and multiple objectives.
3.3 Students will demonstrate the ability to make use of process capability information to select and/or synthesize manufacturing processes and systems.

Correlation between Course Outcomes and Student Outcomes:

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<th>Course Outcomes</th>
<th>Mechanical Engineering Student Outcomes</th>
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GWW School of Mechanical Engineering Student Outcomes:

(a) an ability to apply knowledge of mathematics, science and engineering
(b) an ability to design and conduct experiments, as well as to analyze and interpret data
(c) an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
(d) an ability to function on multidisciplinary teams
(e) an ability to identify, formulate, and solve engineering problems
(f) an understanding of professional and ethical responsibility
(g) an ability to communicate effectively
(h) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
(i) a recognition of the need for, and an ability to engage in life-long learning
(j) a knowledge of contemporary issues
(k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice

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