

ME 3210 Design, Materials, and Manufacture (Required)

Catalog Description

Major manufacturing processes, capabilities, and costs. Interaction between design, materials and manufacturing process selection.

Course information

- prerequisites and co-requisites* *ME 2110 Creative Decisions and Design, MSE 2001 Engineering Materials, COE 3001 Mechanics of Deformable Bodies*
- (3-0-0-3) 3 hours of lecture per week, 3 credit hours

Textbook

- *S. Kalpakjian and S. Schmid, Manufacturing Processes for Engineering Materials, 6th Ed., Pearson, 2016*
- *M.F. Ashby, Materials Selection in Mechanical Design, 5th Edition, Butterworth-Heinemann, 2017.*
- Other references:
CES EduPack, Granta Design

Course coordinator

Dr. Jonathan S. Colton

Topics Covered

Basics:

- a) Review of design processes*
- b) Review of materials*
- c) Taxonomy of manufacturing processes*
- d) Selection under constraints and objectives*
- e) Cost analysis of processes*
- f) Selection of manufacturing processes based on design and material constraints and objectives*

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)*
- h) Additive manufacturing techniques*

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, describe, and analyze 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 process analysis

3.1 Students will demonstrate the ability to select manufacturing processes under single and multiple constraints based upon process analysis

3.2 Students will demonstrate the ability to select manufacturing processes under single and multiple objectives based upon process analysis

3.3 Students will demonstrate the ability to make use of process capability information to select and/or synthesize manufacturing processes and systems