Materials Selection

MATSCEN 4181

Credit Hours:
2.00

Course Levels:
Undergraduate (1000-5000 level)

Course Components:
Lecture

Course Description:
Systematic and quantitative strategies for selecting materials and processes as a foundation for designing with materials.

Prerequisites and Co-requisites:
Prereq: 2241, 2331, 2251, 2321, and enrollment as MatScEn-BS major; or permission of instructor.

Course Goals / Objectives:
- Learn how to select the best material to achieve a given performance or functionality from a large database
- How to select materials by successive application of property limits and indices with multiple constraints and compound objectives
- Learn relationships between processing, properties, structure, and performance of various materials
- Learn about process design
Course Topics:
- Design with Materials, Introductory case study
- Materials data, databases and graphical representation of materials properties
- Deriving material indices and basic materials selection
- Checking and estimating materials data
- Materials selection by successive application of property limits and indices
- Materials Selection problems with multiple constraints and compound objectives. Penalty functions. Value functions
- Selection of material and shape. Shape factors. Structural sections and mechanical efficiency. Material indices that include shape. Material limits for shape factors. Microscopic and microstructural shape factors
- Materials processing and its influence on design, Process attributes, systematic process selection, Process selection diagrams, Process cost and cost modeling
- Designing hybrid materials
- Materials selection for sustainable and environmentally conscious design
- Design Project Presentations

Designation:
Required