MATSCEN 4181 (Approved): Materials Selection

Course Description
This course provides students with systematic and quantitative strategies for selecting materials and processes as a foundation for designing with materials.

Prior Course Number: MSE600
Transcript Abbreviation: Matls Selection
Grading Plan: Letter Grade
Course Deliveries: Classroom
Course Levels: Undergrad
Student Ranks: Senior
Course Offerings: Autumn
Flex Scheduled Course: Never
Course Frequency: Every Year
Course Length: 14 Week
Credits: 2.0
Repeatable: No
Time Distribution: 2.0 hr Lec
Expected out-of-class hours per week: 4.0
Graded Component: Lecture
Credit by Examination: No
Admission Condition: No
Off Campus: Never
Campus Locations: Columbus
Prerequisites and Co-requisites: Senior standing in MSE or instructor permission.
Exclusions:
Cross-Listings:

The course is required for this unit's degrees, majors, and/or minors: Yes
The course is a GEC: No
The course is an elective (for this or other units) or is a service course for other units: No

Subject/CIP Code: 14.1801
Subsidy Level: Baccalaureate Course

Programs

Abbreviation	Description
MATSCEN	Materials Science and Engineering

Course Goals

Students will learn how to select the best material to achieve a given performance or functionality from a large database.
Students will learn how to select materials by successive application of property limits and indices with multiple constraints and compound objectives.
Students will learn relationships between processing, properties, structure, and performance of various materials.
Students will learn about process design.

Course Topics

Topic	Lec	Rec	Lab	Cli	IS	Sem	FE	Wor
Design with Materials, Introductory case study	1.5							
Materials data, databases and graphical representation of materials properties	1.5							
Deriving material indices and basic materials selection	6.0							
Checking and estimating materials data	3.0							
Materials selection by successive application of property limits and indices	1.0							
Materials Selection problems with multiple constraints and compound objectives. Penalty functions. Value functions	4.0							
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	4.0							
Materials processing and its influence on design, Process attributes, systematic process selection, Process selection diagrams, Process cost and cost modeling	3.0							
Designing hybrid materials	3.0							
Materials selection for sustainable and environmentally conscious design	3.0							
Design Project Presentations	2.0							

Representative Assignments

Elementary homework problems from text.
Advanced homework problems from instructor.
Course project equivalent to two advanced homework sets.

Grades

Aspect	Percent
Homework and Projects	40%
Mid-term Examination	30%
Final Examination	30%

Representative Textbooks and Other Course Materials

Title	Author
Materials Selection in Mechanical Design, 3rd Ed., Butterworth-Heineman, New York (2005).	M.F. Ashby

ABET-EAC Criterion 3 Outcomes

Course Contribution		College Outcome
***	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.
*	d	An ability to function on multi-disciplinary teams.
***	e	An ability to identify, formulate, and solve engineering problems.
*	f	An understanding of professional and ethical responsibility.

Course Contribution		College Outcome
*	g	An ability to communicate effectively.
*	h	The broad education necessary to understand the impact of engineering solutions in a global 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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