

EMA 3124 Design and Selection of Materials (3 Credit Hours) FALL SEMESTER 2007

Instructor:

Dr. Nina Orlovskaya, Assistant Professor, Mechanical, Materials and Aerospace Engineering

Office Hours: Monday, 11:00-12:00 or by appointment

Location: RPV (Research Pavilion) 478

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Class Time and Location:

4:30-5:45 pm, Tue, Thu

Classroom HPA Building 112 Main Campus

Course Description:

This course extensively focuses on the relationship between processing, structure and properties of various engineering materials and their selection in engineering design.

Course Objectives:

1. To appreciate the relationship between processing, structure and properties of various engineering materials and their selection in engineering design
2. To develop a methodology for selecting materials and processes in engineering design, through case studies, examples and design projects
3. To develop familiarity with materials and process selection charts and data sources

Prerequisites:

EGM 3601:Solid Mechanics and EGN 3365: Structure and Properties of Materials or EMA 3706:Structure and Properties of Aerospace Materials.

Verification form must be submitted.

Required Text:

- M. F. Ashby, Materials Selection in Mechanical Design, 2nd Ed., Butterworth-Heinemann, 2003
- Class notes and handouts

Supplemental Texts:

- G. E. Dieter, Engineering Design: A Materials and Processing Approach, 3rd Ed., McGraw-Hill Higher Education, 2000.
- J. A. Charles, F. A. A. Crane, J. A. G. Furness, Selection and Use of Engineering Materials, 3rd Ed., Butterworth-Heinemann, 1997
- D. G. Ullman, The Mechanical Design Process, 3rd Ed., McGraw-Hill, 2003
- J. A. Jacobs, T. F. Kilduff, Engineering Materials Technology: Structures, Processing, Properties, and Selection, 4th Ed., Prentice Hall, 2001
- W. D. Callister, Jr., Materials Science and Engineering: An Introduction, 5th Ed., John Wiley and Sons, Inc., 2000.

- M.F. Ashby and D.R. Jones, Engineering Materials, 2nd Ed., Butterworth-Heinemann, 1996
- W. F. Smith, Structure and Properties of Engineering Alloys, 2nd Ed., McGraw-Hill, 1993

Evaluation and Grading:

A-F, Plus/Minus grading

- Homework (Total 5 assignments) 20%
- Midterm (Oct. 11) 10%
- Pop quizzes (Will be given during the class without pre-announcement), 10%
- Team Project 25% (Prospectus due on Oct . 4, Final report due on Nov. 22)
- Comprehensive Final 35% (4:00-6:50 pm, Dec. 8)

A = 80-100; 83 and above (0), 80 and above (-)

B = 70-79; 77 and above (+), 73 and above (0), 70 and above (-)

C = 60-69; 67 and above (+), 63 and above (0), 60 and above (-)

D = 50-59; 57 and above (+), 53 and above (0), 50 and above (-)

F = below 50

- For all assignments, past due submission will not be accepted unless there is a legitimate reason substantiated by adequate documentation.
- Make-up exam should be arranged with and accepted by the instructor in advance only if there is a legitimate reason substantiated by adequate documentation.
- There is no extra credit work for missed assignments and exams.

Topics:

- Design process
- Engineering materials and properties
- Materials selection chart
- Shape and processing
- Multiple constraints and data source
- Design issues
- Case study

Class calendar*:

Date	Topic	
21-Aug	Introduction (Ch1)	
23-Aug	Design process (Ch2)	
28-Aug	Engineering materials and properties (Ch3)	
30-Aug	Engineering materials and properties (Ch3)	
4-Sep	Engineering materials and properties (Ch3)	
6-Sep	Engineering materials and properties (Ch3)	
11-Sep	Materials selection chart (Ch4)	
13-Sep	Materials selection chart (Ch4)	
18-Sep	Materials selection(Ch5)	
20-Sep	Materials selection(Ch5)	
25-Sep	Case study(Ch6)	
27-Sep	Case study(Ch6)	
2-Oct	Case study(Ch6)	Prospectus due
4-Oct	Case study(Ch6)	Review
9-Oct	Shape (Ch7)	Midterm
11-Oct	Shape (Ch7)	
16-Oct	Shape: Case study (Ch8)	
18-Oct	Shape: Case study (Ch8)	
23-Oct	Multiple Constraints (Ch 9)	
25-Oct	Multiple Constraints: Case Study (Ch 10)	
30-Oct	Materials processing (Ch11)	
1-Nov	Materials processing (Ch11)	
6-Nov	Materials processing (Ch11)	
08-Nov	Special Topic	
13-Nov	Process: Case study (Ch12)	
15-Nov	Process: Case study (Ch12)	
20-Nov	Data sources: Case study (Ch14)	Project paper due
22-Nov	Design and other issues (Ch15/16)	Project presentation
27-Nov	Data sources: Case study (Ch14)	Project paper due
29-Nov	Design and other issues (Ch15/16)	Project presentation
4-Dec	Exam	Final

*Subject to change slightly based on the instructor's discretion.