Course Description

Materials selection is an essential component of mechanical design. Using a combination of lectures, case histories, open-ended assignments and computer based materials selectors, this course will cover procedures for selection the optimum materials(s) under multiple constraints resulting from functional, reliability, safety, cost and environmental issues. A variety of problems that illustrate materials-limited design and relationship between design and materials selection will be covered.

Instructor: Dr. R. Srinivasan, RC 128, 775-5093

Textbook: M. F. Ashby, MATERIALS SELECTION IN MECHANICAL DESIGN, 3rd Edition. The textbook includes a materials and process selection software package CES4 by Granta Design. The students get a 1 year license to use the software.

Reference Books:

- Materials Science and Engineering – An Introduction, William D. Callister, Jr., John Wiley

Prerequisites:

Students taking this course are expected to have had one or more courses in the fundamentals of materials science and engineering and in strength of materials that are equivalent to ME 371 – Engineering Materials and ME 313 – Strength of Materials at Wright State University.

Learning Outcomes:

After completion of this course, a student is expected to:

- Recognize and develop lists of independent and dependent parameters for a mechanical design from which to develop quantitative measures of performance.
- Develop optimization equations for selection of materials for defined design projects.
- Use material property plots to identify the best performing materials for a given application.
- Use materials property databases for identification of candidate materials.
Course Content:

1. Introduction to Materials Selection in the Design Process
2. Performance indices
3. Optimal materials selection without shape
4. Introduction to computer based materials selectors
5. Materials selection under multiple constraints
6. Shape factors for different types of loading
7. Optimal materials selection with shape

Grading:

- Prerequisite test: 5%
- Homework Assignments: 15%
- Two tests: 40%
- Two Design Projects: 40%