**Course number and name: MTSC 4060: Materials Selection and Performance**

**Credits and contact hours:** 3 Credits. Walk-in, by appointment, or answer via email.

**Instructor’s or course coordinator’s name**: Dr. **Srinivasan Srivilliputhur**

**Text book, title, author, and year**

M. F. Ashby, Materials Selection in Mechanical Design, Elsevier, 2011, ISBN: 978-1-85617-663-7

1. *Other supplemental materials*: M. Ashby, H. Shercliff, D. Cebon, Materials – engineering, science, processing and design, Elsevier, 2010, ISBN: 978-1-85617-743-6

**Specific Course Information**

1. *Brief description of the content of the course (catalog description)*

Integration of structure, properties, processing and performance principles to formulate and implement solutions to materials engineering problems.

1. *Prerequisites or co-requisites*

MTSE 3000, 3001, MTSE 3010. The student must be familiar with fundamentals of materials science – crystal structure, bonding, and processing. We will emphasize concepts and use “case studies” format.

1. *Indicate whether a required, elective, or selected elective course in the program*

Required

**Specific goals for the course**

*a. Specific outcomes of instruction*

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| **Specific Course Learning Outcome** |
| 1. Students will learn how materials structure, properties, and processing interact to affect their performance
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| 1. Students will devise, design and conduct computational exercises to explore the essential elements of materials science and engineering in materials performance using case study format.
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| 1. Students will use CES EduPack Software from Granta Design to explore challenges in materials selection using a number of practical problems.
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| 1. Students will learn to recognize new design opportunities with materials and communicate their ideas with their peers
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1. *Explicitly indicate which of the student outcomes listed in Criterion 3 or any other outcomes are addressed by the course.*

This course addresses ABET Student Outcomes 1 and 7

**Brief list of topics to be covered**

I. Introduction to Materials Selection and Design (3 weeks)

Review of engineering materials and their properties

Organizing materials and processes

Strategic thinking: matching material to design

The design process

II. Materials Property Charts, and Material and Process Selection Basics (4 weeks)

Material indices

Structural index

Selection strategy including computer-aided selection

Selection with multiple constraints and conflicting objectives

Processing for properties and systematic process selection

III. Case Studies (7 weeks)

Materials selection for strength-limited, fracture-limited, toughness-limited design; Ashby property charts

Materials selection for electric, magnetic, and optical design

Materials selection for wear, friction, and creep applications

Designing hybrid materials

Materials and environment – materials lifecycle, energy footprint, eco-attributes, eco-selection, and eco-audit