

## ETM 593 – Fall Semester 2018

### ETM 593 Materials and Process Selection in Engineering Design

The product design process. Technological innovation and the design process. Team behaviour and problem solving tools. Gathering information. Creativity and inventive problem solving. The role of materials in economic growth. Selection of materials and shape. Materials processing and design. Interaction of materials, processing and design. Performance of materials in service. Examples of new materials. Case studies.

#### TOPICS

1. The Product Design Process (Dieter, Engineering Design)
2. Need Identification and Problem Definition
3. Team Behaviour and Tools
4. Gathering Information
5. Concept Generation and Evaluation
6. Introduction: Structure and Function of Materials Engineering (The Role of Materials in Economic Growth, Scientific American October 1986)
7. Review of Materials Properties (Ashby, Engineering Materials)
  - mechanical (strength, elastic modulus, toughness)
  - physical (density, thermal expansion, conductivity)
8. Overview of Ashby's Method for Selection in Mechanical Design
  - context in design processes
  - property/performance relations
  - property cross plots
  - selection criteria
9. Examples of Materials Selection
  - table legs
  - springs
  - pressure vessels
10. Process Selection

- method
- examples

11. Interaction of Materials, Processing and Design

12. Performance of Materials in Service

13. Case Studies

Textbooks:

Michael F. Ashby, Materials Selection in Mechanical Design, Pergamon, Oxford, 1992

Mike Ashby and Kara Johnson, Materials and Design: The Art and Science of Material Selection in Product Design, Elsevier, London, 2004.

George E. Dieter, Engineering Design: A Materials and Processing Approach, McGraw Hill, NY, 2000.

The Role of Materials in Economic Growth, Scientific American, October 1986.

George E. Dieter, Materials Selection and Design, ASM Handbook, Vol.20.

M. F. Ashby and D. R. H. Jones, Engineering Materials 1&2, Pergamon, Oxford, 1986.

Reference: Boğaziçi University Library, MRC Gebze Library, US Patent Office, Internet.

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