

**SUBJECT** : **MTS 226 - Materials and Manufacturing Processes**  
**CREDIT HOURS** : **3-0**  
**CONTACT HOURS** : 3 Hours per Week  
**TEXT BOOKS** : 1. **Elements of Material Science and Engineering** by Van Vlack, Addison Wesley Publishing Co., Latest Edition.  
2. **Introduction to Physical Metallurgy** by Sidney H. Avner, McGraw Hill publishing Co., Latest Edition.  
3. **Engineering with Polymers** by P.C. Powell, , Latest Edition  
4. **Manufacturing Processes** by Amstead, Begeeman and Ostwald, John Wiley & Sons, Latest Edition.  
5. **Lecture Notes, Subject Web Page.**

**MODE OF TEACHING:** Lectures

**COURSE OBJECTIVES:** This course is designed to introduce the non-MSE student to the structures and properties of metals, ceramics, polymers, and composites. The students will gain an understanding of the processing and design limitations of these materials, as well as being introduced to new classes of materials being developed to meet the ever expanding range of material requirements. This course also provides the students an insight into different manufacturing processes used in the industry. The latest advancements in manufacturing technology are introduced to the students. The course has two modules: Engineering Materials and Manufacturing processes.

**COURSE OUTCOMES:** The following will be the learning outcomes of this course:

1. Understanding important properties of engineering materials.
2. Familiarizing with various types of materials.
3. Acquiring understanding and skill in selection of right materials for different applications.
4. Learning various techniques for testing materials quality.
5. Familiarizing with conventional manufacturing processes e.g. casting, machining, welding, soldering, and brazing.
6. Familiarizing with advanced manufacturing processes e.g. ECM, EDM, EBM, ultrasonic machining, electronic fabrication and rapid prototyping.

7. Acquiring understanding and skill in selection of most appropriate manufacturing process for different materials and products.

**TOPICS COVERED:**

**1. Engineering Materials**

- a. Desired Engineering Properties
- b. Concept of Structure
- c. Metals and Alloys
- d. Phase Diagrams
- e. Ceramics
- f. Polymers
- g. Composites
- h. Semiconductors
- i. Materials Characterization
  - (1) Scanning Probe Microscopy
  - (2) Non-Destructive Testing
- j. Material Selection
- k. Failure Analysis

**2. Manufacturing Processes**

- a. Manufacturing Systems
- b. Foundry Practice and Modern Casting
- c. Machining Processes
- d. Welding, Brazing and Soldering
- e. Non-traditional Manufacturing Processes
- f. Heat Treatment
- g. Electronic Fabrication
- h. Rapid Prototyping