



COURSE OUTLINE

Course Number AMT 220	Course Title Material and manufacturing process	Credits 3
Hours: Lecture/lab 3/0	Co-or Pre-requisite AMT110	Implementation Fall 2022

Catalogue Description

Introduces students to the study of engineering material and manufacturing process. Topics include physical and mechanical properties of metals, ceramics and plastics, classification of steels, manufacturing processes: casting, welding, stamping, bending, soldering and manufacturing costs.

General Education

Category:
Not GenEd

Course coordinator:

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Required Text:

Fundamentals of Modern Manufacturing: Materials, Processes, and Systems 6th Edition
Publisher: Wiley ISBN-13: 978-1119128694

Student Learning Outcomes (SLO):

Course Competencies/Goals

Students will be able to:

1. Explain physical and mechanical properties, molecular structure and manufacturing methods for ferrous and non-ferrous metals, ceramics and plastics. **(ILG 10, PLO,9)**
2. Explain and identify the common sheet metal operations performed with the help of dies and presses. **(ILG 10, PLO,9)**
3. Describe key factors that affect a bending operation on the press brake and explain the common types of forming and bending operations. **(ILG 10, PLO,9)**
4. Explain the welding processes as well as describe the general attributes and applications of welding. Identify weld types and the most commonly used welding processes. **(ILG 10, PLO,9)**
5. Identify threaded and non-threaded fasteners and explain the key properties of steel fasteners as well as common fastener failures that may occur. **(ILG 10, PLO,9)**
6. Calculate the basic costs associated with manufacturing and describe how these costs are typically controlled. **(ILG 10, PLO,9)**

Institutional Learning Goals (ILG)

Institutional Learning Goal 1 Written and Oral Communication in English: Students will communicate effectively in both speech and writing.

Institutional Learning Goal 2 Mathematics: Students will use appropriate mathematical and statistical concepts and operations to interpret data and to solve problems.

Institutional Learning Goal 3 Science: Students will use the scientific method of inquiry, through the acquisition of scientific knowledge.

Institutional Learning Goal 4 Technology: Students will use computer systems or other

appropriate forms of technology to achieve educational and personal goals.

Institutional Learning Goal 10 Information Literacy: Students will recognize when information is needed and have the knowledge and skills to locate, evaluate, and effectively use information for college level work.

Institutional Learning Goal 11 Critical Thinking: Students will use critical thinking skills understand, analyze, or apply information or solve problems.

Program Learning Outcomes (PLO)

1. Maintain a safe and organized workspace.
2. Interpret blueprints to manufacture parts.
3. Apply shop and tool room mathematics as needed.
4. Complete part inspection using appropriate instruments such as micrometers, calipers, and scales.
5. Set up and operate a manual drill press, lathe, milling machine, grinder and press brake.
6. Set up and operate CNC machines (lathe and mill).
7. Use NC programming (G and M codes) to control movement and cutting processes.
8. Understanding of statistical quality control.
9. Understanding of the broad spectrum of manufacturing technologies.
10. Pursue NIMS certification.

Unit Objectives

Unit I Materials (SLO 1,6)

The student will be able to:

1. Identify popular ferrous and nonferrous metals and their properties.
2. Describe the three types of metal crystal structures, how grains develop in metal, the purpose of heat treating and how these aspects impact a material's characteristics.
3. Explain and describe the steps to produce commercial steel from its original ore.
4. Identify thermoplastics and thermosets. Describe their physical and mechanical properties, polymer structure and arrangement, manufacturing methods and common additives.
5. Identify physical and mechanical properties of ceramics, their atomic structure and different types of traditional and advanced ceramics, as well as processing and manufacturing methods and end-user applications.
6. Describe composite materials and their properties.
7. Calculate the basic costs associated with manufacturing and describe how these costs are typically controlled.

Unit II Sheet metal operations (SLO 2,3)

The student will be able to:

1. Describe key factors that affect a bending operation on the press brake and explain the common types of forming and bending operations.
2. Explain and identify the common sheet metal operations performed with the help of dies and presses.
3. Describe the press brake components and the different types of bends that can be formed on the press brake.
4. Describe the stamping press components and the steps that take place during a cutting operation.

Unit III Welding (SLO 4)

The student will be able to:

1. Explain the welding processes as well as describe the general attributes and applications of welding. Identify weld types and the most commonly used welding processes.
2. Describe the welding practices for ferrous and non-ferrous material.
3. Identify common welding defects and their causes.
4. Read and understand welding blueprints.
5. Describe the most common thermal cutting processes and their uses.

Unit IV Fasteners (SLO 5)

1. Identify threaded and non-threaded fasteners and explain the key properties of steel fasteners as well as common fastener failures that may occur.
2. Explain the importance of torque as well as how torque is derived and applied to bolted joints.
3. Select a threaded fastener as well as how to install a bolt and nut combination into a joint.

Method of Instruction

Learning will take place via classroom instruction, demonstrations and student activities, as well as through textbook reading and homework assignments.

Student Evaluation

Students' achievement of the course objectives will be evaluated through the use of the following:

- Three unit tests assessing students' comprehension of terminology, calculations and practices related to the unit objectives.
- Lab grade based on shop projects and lab assignment results.
- In class participation, homework and attendance.

Evaluation Tools	Percentage of Grade
3 Unit Tests	50%
Lab Assignments/ Shop Projects	25%
Homework / In-Class Assignments	25%
Total	100%