

INTRODUCTION TO MANUFACTURING

Introduction to Manufacturing is a course that specializes in how people use modern manufacturing systems with an introduction to manufacturing technology and its relationship to society, individuals, and the environment. An understanding of manufacturing provides a background toward developing engineering & technological literacy. This understanding is developed through the study of the two major technologies, material processing and management technology, used by all manufacturing enterprises. Students will apply the skills and knowledge of using modern manufacturing processes to obtain resources and change them into industrial materials, industrial products, and consumer products. Students will investigate the properties of engineered materials such as: metallics; polymers; ceramics; and composites. After gaining a working knowledge of these materials, students will study six major types of material processes: casting and molding; forming; separating; conditioning; finishing; and assembling.

- DOE Code: 4784
- Recommended Grade Level: 10
- Recommended Prerequisites: None
- Credits: 2 semester course, 2 semesters required, 1 credit per semester, maximum of 2 credits
- Fulfills a Directed Elective or Elective requirement for all diploma types

Application of Content

Intensive laboratory applications are a component of this course and may be either school based or work based or a combination of the two. Work-based learning experiences should be in a closely related industry setting. Instructors shall have a standards-based training plan for students participating in work-based learning experiences.

Content Standards

Domain 1 – Manufacturing: History and Relevance

Core Standard 1 Students analyze the evolution of manufacturing to determine the effect it has had and will have on society.

Standards

- ITM-1.1 Describe the history and relevance of manufacturing
- ITM-1.2 Students will explain the societal impact of manufacturing
- ITM-1.3 Describe the impact manufacturing has had on the environment, the economy, and society
- ITM-1.4 Identify and describe the development of the manufacturing enterprise

Domain 2 – Product Design

Core Standard 2 Students adapt and apply knowledge and skills of the product design process to develop products.

Standards

- ITM-2.1 Utilize the basics of product design
- ITM-2.2 Explain the concepts of engineering and its importance within manufacturing
- ITM-2.3 Relate the systems, components, and processes of a technological system to manufactured products

- ITM-2.4 Communicate the lifecycle of a product
- ITM-2.5 Demonstrate the design process for developing a product for production
- ITM-2.6 Differentiate between different manufacturing systems

Domain 3 – Product Manufacturing

Core Standard 3 Evaluate manufacturing processes to determine how a product is or will be made.

Standards

- ITM-3.1 Differentiate between the various types of materials and their applications
- ITM-3.2 Determine the appropriate product processes and equipment used to create a product
- ITM-3.3 Explain and identify the significance of quality control within product manufacturing
- ITM-3.4 Examine the steps and process of product assembly
- ITM-3.5 Investigate the different types of manufacturing processes
- ITM-3.6 Differentiate between the different tools of manufacturing and the different tools used in production
- ITM-3.7 Discuss the impact of manufacturing processes on the environment
- ITM-3.8 Describe the procedures used in selecting and sequencing operations
- ITM-3.9 Define and describe destructive and nondestructive testing
- ITM-3.10 Examine quality control and quality assurance as an important part of the entire manufacturing company

Domain 4 – Safety

Core Standard 4 Students assess the impact of safety practices in a manufacturing environment.

Standards

- ITM-4.1 Identify hazards and apply safety methods for working in manufacturing jobs
- ITM-4.2 Recognize the importance of safety, products, and people
- ITM-4.3 Recognize and properly use safety equipment
- ITM-4.4 Communicate prevention strategies in a workplace or lab to make it safer by reducing the possibility of injuries and illnesses
- ITM-4.5 Operate equipment and tools using the appropriate safety rules
- ITM-4.6 Demonstrate proper maintenance and storage of equipment and tools
- ITM-4.7 Choose the right equipment or tool for the project/job
- ITM-4.8 Identify the use and safe operation of tools used in manufacturing

Domain 5 – Materials and Resources

Core Standard 5 Students analyze manufacturing materials and resources used to produce products for consumer safety, production, durability, and usability.

Standards

- ITM-5.1 Identify and describe the resources associated with manufacturing
- ITM-5.2 Explain how production is affected by of the availability, quality and quantity of resources
- ITM-5.3 Demonstrate managing of resources
- ITM-5.4 Research ways materials can be changed to meet product requirements
- ITM-5.5 Identify and explain the properties and characteristics of engineering materials

- ITM-5.6 Differentiate among a raw material standard stock and finished products
- ITM-5.7 Explain relationships between function, materials characteristics and properties, material selection and material processing
- ITM-5.8 Formulate an understanding of material handling and its significance

Domain 6 – Technical Drawing

Core Standard 6 Students incorporate technical drawing and sketching to produce a product.

Standards

- ITM-6.1 Identify and describe how precision and consistency are essential to the process of manufacturing
- ITM-6.2 Interpret basic drawings and symbols of technical sketching
- ITM-6.3 Create prototypes in solid modeling software
- ITM-6.4 Identify, develop, and communicate the specifications for a product

Domain 7 – Manufacturing Careers

Core Standard 7 Students evaluate the education, training, and certification needed for careers in manufacturing.

Standards

- ITM-7.1 Communicate employment and career opportunities in manufacturing
- ITM-7.2 Identify and describe variety of skill levels and educational requirements involved for careers in manufacturing
- ITM-7.3 Examine major work activities, average income, educational requirements, and helpful courses for the careers related to manufacturing

Domain 8 – Automation

Core Standard 8 Students will adapt and apply the safe use of automation in manufacturing systems with emphasis on the role of robotics in the process.

Standards

- ITM-8.1 Define and describe automation systems
- ITM-8.2 Program and use automated and robotic systems
- ITM-8.3 Identify reasons for implementing automation
- ITM-8.4 Identify the impact of automation in individuals, society and the environment
- ITM-8.5 Create a manufacturing cell for use
- ITM-8.6 Describe the history and relevance of logistics

Career and Technical Student Organizations

Career and Technical Student Organizations are considered a powerful instructional tool when integrated into Career and Technical Education programs. They enhance the knowledge and skills students learn in a course by allowing a student to participate in a unique program of career and leadership development. Students should be encouraged to participate in a Career and Technical Student Organization, such as the **Technology Student Association (TSA)**.