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: Grade 9-12
- Recommended Prerequisites:
- Credits: 1 credit per semester, 2 semesters maximum, maximum of 2 credits
- Counts as a Directed Elective or Elective for the General, Core 40, Core 40 with Academic Honors and Core 40 with Technical Honors diplomas

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 Business Professional of America, DECA, or Future Business Leaders of America.