

ADVANCED MANUFACTURING I

Advanced Manufacturing I is a course that includes classroom and laboratory experiences in two broad areas: Industrial Technology/Software Controls and Manufacturing Trends. Domains include safety and impact, electricity, manufacturing essentials, fluid power principals, mechanical principals, lean manufacturing, and careers in advanced manufacturing. Hands-on projects and team activities will allow students to apply learning on the latest industry technologies. Students take this course with the goal of being a skilled machine operator, repair technician, or working in management at any company that produces goods and services using advanced manufacturing techniques. Work-based learning experiences and industry partnerships are highly encouraged for an authentic industry experience.

- DOE Code: 5608
- Recommended Grade Level: Grade 11, 12
- Recommended Prerequisites: Introduction to Advanced Manufacturing and Logistics
- Credits: 2 semester course, 2 semesters required, 1-3 credits per semester, 6 credits maximum
- Counts as a Directed Elective or Elective for all diploma types

Career and Technical Student Organizations (CTSOs)

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 SkillsUSA.

Content Standards

Domain – Safety and Impact

Core Standard 1 – Students demonstrate safe practices and procedures with tools and equipment

Standards

- AMI-1.1 Monitor equipment operation and design parameters to determine if machine is operating safely
- AMI-1.2 Make adjustments to equipment to ensure that it is operating within established safety and environmental parameters
- AMI-1.3 Interpret Hazardous Materials (HAZMAT) procedure information and Material Safety Data Sheets (MSDS)
- AMI-1.4 Demonstrate appropriate use of personal protective equipment
- AMI-1.5 Report conditions that present a threat to healthy, safety, or the environment as related to advanced manufacturing
- AMI-1.6 Document safety concerns according to local policies and procedures
- AMI-1.7 Identify corrective actions for safety concerns

Domain - Manufacturing Impact

Core Standard 2 Students will analyze how advanced manufacturing impacts local, national, and global economies.

- AMI-2.1 Analyze how advanced manufacturing impacts individuals, society, and the environment
- AMI-2.2 Examine the role of advanced manufacturing in global economies
- AMI-2.3 Report new and emerging technologies related to advanced manufacturing
- AMI-2.4 Differentiate between internal and external customers
- AMI-2.5 Apply current and emerging technologies utilized in industry

Domain - Electricity

Core Standard 3 Students analyze the laws, principles, and types of electricity needed to utilize, repair, and maintain equipment used in an industrial environment.

Standards

- AMI-3.1 Apply principles of electrical wiring safety in commercial settings
- AMI-3.2 Apply Ohm's Law and the Power Law
- AMI-3.3 Differentiate between series and parallel circuits
- AMI-3.4 Solve series and parallel circuit using basic laws of electricity
- AMI-3.5 Discuss power supply and voltage regulation as applied to basic electricity
- AMI-3.6 Examine relay operation and applications
- AMI-3.7 Demonstrate the understanding of the theory and function of switches, loads, resistors, capacitors, coils, and other basic electronic components
- AMI-3.8 Troubleshoot solid state switching devices using basic circuits

Domain - Programmable Logic Circuits

Core Standard 4 Students analyze the fundamentals of Programmable Logic Circuits (PLC's) to assess their role in manufacturing processes.

Standards

- AMI-4.1 Distinguish between PLC components and their function
- AMI-4.2 Select the most appropriate type of circuit logic for each application
- AMI-4.3 Understand varying types of hardware used throughout industry
- AMI-4.4 Apply suitable commands for PLC circuits

Domain – Manufacturing Essentials

Core Standard 5 Students analyze essential aspects of manufacturing processes.

Standards

- AMI-5.1 Describe the functional layout of a manufacturing plant based upon process flow
- AMI-5.2 Report the history of and contemporary use computer numerical control (CNC) in machining
- AMI-5.3 Apply basic CNC theory and process to manufacturing operations
- AMI-5.4 Apply the Cartesian coordinate system in defining points, shape, form, and function in a machining environment
- AMI-5.5 Examine major components and types of lathes and turning processes common in CNC operations

Domain – Fluid Power Principles

Core Standard 6 Students analyze fluid power fundamentals to explore its role in equipment operation and performance.

Standards

- AMI-6.1 Compare and contrast hydraulic and pneumatic systems
- AMI-6.2 Explain flow rate and correctly utilize industry abbreviations
- AMI-6.3 Analyze the effects of fluid power on society
- AMI-6.4 Construct a simple fluid power system

Domain – Mechanical Principles

Core Standard 7 Students evaluate principles of mechanical advantage in equipment operations.

Standards

- AMI-7.1 Describe the importance of machine specifications and how they are used
- AMI-7.2 Examine the role of heat and friction in machine operations
- AMI-7.3 Generate appropriate provisions for chips
- AMI-7.4 Explain the relationships between rpm, horsepower, and torque
- AMI-7.5 Apply simple machines to achieve mechanical advantage
- AMI-7.6 Distinguish between a variety of industrial motors and motor controls
- AMI-7.7 Perform mechanical power transmission safety procedures
- AMI-7.8 Examine the relationship between bearings, couplings, and gear drives
- AMI-7.9 Investigate belt drive concepts and chain drive operations
- AMI-7.10 Demonstrate chain tensioning and tension measurement procedures
- AMI-7.11 Perform fixed center chain installation procedures

Domain – Welding Fundamentals

Core Standard 8 Students apply basic cutting and welding principles needed to utilize, repair, and maintain equipment used in an industrial environment.

Standards

- AMI-8.1 Select appropriate cutting techniques for specific manufacturing processes
- AMI-8.2 Apply appropriate welding joints for different applications
- AMI-8.3 Select the appropriate welding technique for various scenarios
- AMI-8.4 Examine the role of assembly operations in advanced manufacturing
- AMI-8.5 Utilize material layout strategies for efficiency in fabrication
- AMI-8.6 Demonstrate a basic understanding of automated processes related to welding and cutting

Domain – Fundamentals of Lean Manufacturing

Core Standard 9 Students analyze the impact of Lean principles and concepts on manufacturing to improve processes.

Standards

- AMI-9.1 Investigate principles of Lean Manufacturing
- AMI-9.2 Outline the goals of Lean Manufacturing
- AMI-9.3 Differentiate advantages of Lean over conventional operating methods
- AMI-9.4 Identify the sources and types of waste streams in manufacturing
- AMI-9.5 Identify common types of waste in industrial situations
- AMI-9.6 Examine methods manufacturers use to keep production costs low
- AMI-9.7 Interpret a production schedule and manufacturing work order
- AMI-9.8 Assess benefits of just-in-time (JIT) inventory control
- AMI-9.9 Assess Manufacturing Resource Planning (MRP & MRP II) and Enterprise Resource Planning (ERP)
- AMI-9.10 Implement the concepts of lean manufacturing to enhance operations
- AMI-9.11 Examine methodologies required to achieve continuous improvement
- AMI-9.12 Differentiate between value-added and non-value activities

Domain – Careers in Advanced Manufacturing

Core Standard 10 – Students will explore careers relating to advanced manufacturing.

Standards

- AMI-10.1 Investigate careers relating to the advanced manufacturing pathway
- AMI-10.2 Analyze education and skill requirements for careers relating to advanced manufacturing
- AMI-10.3 Report the outlook, demand, and projected wages for careers related to advanced manufacturing