Introduction to Manufacturing

Course Credit	1.0
Grade Levels	9-12 **Note:** This course may be offered to 8th grade students as an exploratory, non-credit-bearing option. Standards under the topics Foundational Standards, Safety, Drafting Design, Blueprint Reading, and General Standards are required to be taught in an 8th grade course.
Prerequisites	

Introduction to Manufacturing focuses on the fundamental knowledge and skills needed in the manufacturing industry. Emphasis is placed on job safety, use of manufacturing materials, primary manufacturing processes, secondary manufacturing processes, and manufacturing systems. Upon successful completion of this course, students perform basic tasks related to the manufacturing industry. This entry-level course may be taken in any program within the Manufacturing cluster.

Foundational standards, shown in the table below, are an important part of every course. Through these standards, students learn and apply safety concepts, explore career opportunities and requirements, practice the skills needed to succeed in the workplace, develop leadership qualities and take advantage of the opportunities afforded by Career and Technical Student Organizations (CTSOs), and learn and practice essential digital literacy skills. The foundational standards are to be incorporated throughout the course.

Each foundational standard completes the stem *"**Students will**..."*

Foundational Standards	
	1. Incorporate safety procedures in handling, operating, and maintaining tools and machinery; handling materials; utilizing personal protective equipment; maintaining a safe work area; and handling hazardous materials and forces. 2. Demonstrate effective workplace and employability skills, including communication, awareness of diversity, positive work ethic, problem-solving, time management, and teamwork. 3. Explore the range of careers available in the field and investigate their educational requirements, and demonstrate job-seeking skills including resume-writing and interviewing. 4. Advocate and practice safe, legal, responsible, and ethical use of information and technology tools specific to the industry pathway.

	5. Participate in a Career and Technical Student Organization (CTSO) to increase knowledge and skills and to enhance leadership and teamwork.

INTRODUCTION TO MANUFACTURING CONTENT STANDARDS

Each content standard completes the stem *"**Students will**…"*

Safety	1. Apply safety rules, regulations, and procedures related to manufacturing. *Example: plant floor, interpretation of Safety Data Sheets (SDS), Environmental Protection Agency (EPA) and Occupational Safety and Health Administration (OSHA) rules and regulations*
Manufacturing Materials	2. Identify types of manufacturing materials, including metallic, polymeric, ceramic, and composites. 3. Assess properties of manufacturing materials, including physical, mechanical, chemical, thermal, academic, electrical and magnetic, acoustical, and optical.
Primary Manufacturing Processes	4. Differentiate among thermal, mechanical, and chemical changes in manufacturing materials.
Secondary Manufacturing Processes	5. Demonstrate casting and molding processes, including mold preparation and pouring or forcing liquids. 6. Demonstrate die forming and roll forming of materials. 7. Explain separating processes for cutting and shearing material. 8. Explain processes for thermal conditioning, mechanical force, and chemical action. 9. Demonstrate temporary, permanent, two-part, and multiple-part assembling processes. 10. Demonstrate finishing processes, including processes for product protection and appearance.

Manufacturing Systems	11. Compare custom, intermittent, and continuous manufacturing systems. 12. Describe ways to make improvements in manufacturing processes, including value adding, non-value adding, control systems, and factors to control.
Drafting Design	13. Explain the importance of drafting design in today's technological workforce. 14. Demonstrate the safe use of drafting design tools following established procedures and regulations. 15. Demonstrate mathematics skills related to drafting design, including basic fractions, scale reading, and conversion between customary and metric measurements.
Blueprint Reading	16. Relate information on blueprints to actual locations on the print, including terms, components, and symbols. 17. Construct basic multiview, two-dimensional drawings, including visualizing principal views, creating third-angle projections, selecting proper drawing scale, and organizing layout of primary views.
General	18. Interpret technical information related to the manufacturing process. 19. Demonstrate financial management, budgeting, and investing as they relate to career goals and objectives in manufacturing industries. 20. Describe the use of slings, common rigging hardware, basic hitch configuration, proper connections, and basic load-handling safety practices. 21. Demonstrate correct use of hand tools and power tools utilized in the manufacturing industries.