Manufacturing

Course Description:

This is a beginning level course that introduces the student to basic knowledge and skills that are foundational to manufacturing. Safety, measuring, planning and production processes will be covered. Target Grades 9-11.

Course Code:

Program(s) of Study to which This Course Applies

- Manufacturing Production
- Manufacturing Process Development

Course Framework	Reference Standards	Academic Crosswalk
Standard 1. Students will demonstrate a complete understanding of need for shop safety and rules governing the use of equipment.	INCT 1400 Course Objective	LA12.1.5.b (1)
Benchmark 1.1 The students will understand the main hazards that are possible in the shop setting. <u>Sample performance indicators:</u> • Identify the types of risks of injury/illness in the lab. • Identify and describe how common hazards in the lab. • Explain the role of government agencies in providing a safe workplace. • Identify and describe major sources of information about hazards in the workplace. (e.g., MSDS, work procedures, exposure control plans, training materials, labels, and signage.) • Interpret safety signs and symbols.	KS MNC06.01 Sample Indicators KS MNC06.03 Sample Indicators KS MNC06.05 Sample Indicators	SC12.1.1d (1) LA 12.1.6.d (1) LA 12.1.6.f (1) LA 12.2.2.a (1)
Benchmark 1.2 The students will observe proper dress and use of personal protective equipment. <u>Sample performance indicators:</u>	KS MNC06.04 Sample Indicators KS MNPB07.01.03	

• Wear proper clothing for each particular content area. (e.g., Welding- long sleeves, high-buttoned collar, no baggy clothing, pants long enough to cover top of boots, proper foot protection, welding caps). • Inspect and use personal protective equipment (PPE). • Verify that safety and personal protective equipment is available, performs correctly, and has current certification.		
Benchmark 1.3 The students will demonstrate proper handling and storing of materials. <u>Sample performance indicators:</u> • Understand the proper storage of flammable chemicals. • Identify methods of disposing of hazardous materials. • Demonstrate principals of safe physical movement to avoid slips, trips, and spills. • Learn the correct way to lift and move materials. • Proper handling of cylinders in a welding shop. • Make sure work area is clean and free of obstructions. • Identify procedures necessary for maintaining a safe work area. • Follow good housekeeping procedures.	KS MNC06.04 Sample Indicators KS MNC06.05 Sample Indicators KS MNPB07.01.03	SC12.1.1d (1) LA 12.1.6.d (1) LA 12.1.6.f (1)
Benchmark 1.4 The students will demonstrate proper machine and tool safety and operation. <u>Sample performance indicators:]</u> • Understand proper use of hand and power tools. • Understand proper operating procedures of machines for wood, welding, metal, plastics, and other non-metal operations of power equipment. • Give operators a complete orientation of equipment. • Demonstrate proper operation. • Make sure all important information regarding equipment safety is communicated clearly and effectively.	KS MNC10.01.02 KS MNPB07.01.01	SC12.1.1d (1) LA 12.3.1.a (2)
Standard 2. Students will develop the ability to analyze precision measurement devices by applying mathematical skills while working with fractions and decimals. Distinguish symbols and identify line usage used in blueprints and plan reading.	INCT 1400 Course Objectives 1 and 2	LA12.1.5.b (1)
Benchmark 2.1 The students will use common measurement systems. <u>Sample performance indicators:</u>	INCT 1400 Course Objectives 1 and 2	SC12.1.1.l (2) MA 12.1.3 (1)

• Incorporate both Metric and Customary systems of measurement. • Review fractions, decimals, and their conversions.		
Benchmark 2.2 The students will understand mathematical equations and computations. <u>Sample performance indicators:</u> • Figure board footage. • Figure square footage. • Implement geometry calculations. (e.g., area, volume, and mass) • Implement trigonometry.		SC12.1.1.l (2) MA 12.1.3 (2) MA 12.2.1 (2) MA 12.2.5 (2)
Benchmark 2.3 The students will properly use and handle precision measuring tools. <u>Sample performance indicators:</u> • Understand proper use and reading of micrometers. • Understand proper use and reading of Dial Calipers. • Understand proper use and reading of Rules and Tape Measures. • Understand proper use and reading of Protractor. • Understand proper use and reading of Compass. • Understand proper use and reading of Architect Scale.	MSSC Standards-Quality Practices and measurement 9 and 10	SC12.1.1.E (2) MA 12.2.4 (2) MA 12.2.5 (2)
Benchmark 2.4 The students will identify fundamentals of blueprint reading. <u>Sample performance indicators:</u> • Identify line types, lettering, and symbols. • Understand Scale. • Identify and explain detail drawings. • Identify and explain lines, material fills, and sections. • Identify and explain object views. • Identify and explain dimensioning. • Identify and explain notes and bill of materials. • Interpret elements of the different types of drawings.	NCCER Module 29201-03 NCCER Module 29202-03	MA 12.2.4 (2) MA 12.2.5 (2) MA 12.1.3 (2) LA 12.2.2.a (1) LA 12.1.6.d (1) LA 12.1.6.f (1)
Standard 3. Students will demonstrate the planning and layout processes used in manufacturing.	KS MNC10.01.01	LA12.1.5.b (1)
Benchmark 3.1 The students will read and/or produce prints. <u>Sample performance indicators:</u> • Develop sketches of a product.	KS MNC10.01.01 NCCER Module 29202-03	SC12.1.1.c (1) MA 12.2.4 (2) MA 12.2.5 (2) MA 12.1.3 (2)

• Develop basic drawings. • Develop working drawings. • Identify line types, lettering, and symbols. • Understand Scale. • Identify and explain detail drawings. • Identify and explain lines, material fills, and sections. • Identify and explain object views. • Identify and explain dimensioning. • Interpret elements of the different types of drawings.		LA 12.1.6.a (2) LA 12.1.6.d (2)
Benchmark 3.2 The students will understand the scheduling process. <u>Sample performance indicators:</u> • Identify the steps required to create the product. • Identify the equipment used to create the product. • Make sure the production schedules are met effectively. • Be aware of schedule requirements in a timely way.	KS MNPB06.01.04	SC12.1.3.b (1) LA 12.1.6 a (2) LA 12.1.6 f (2) LA 12.1.6 d (2)
Benchmark 3.3 The students will be able to identify and understand materials used in the manufacturing process. <u>Sample performance indicators:</u> • Study and select raw materials that best fits the needs of the production process. • Acquire knowledge of materials, their properties and methods to use them. • Identify and explain the selection of materials. • Identify and explain the composition and classification of materials. • Identify and explain the physical characteristics and mechanical properties of materials. • Identify and explain forms and shapes of structural materials. • Describe and give examples of materials used in common manufacturing products.	KS MNPB08.01.02 KS MNC10.01 NCCER Module 29201-03 NCCER Module 29202-03	SC8.2.1.b (1) MA 12.2.5 (2) LA 12.3.1.a (2) LA 12.2.2 a (2)
Benchmark 3.4 The students will understand estimating materials and cost of materials and products. <u>Sample performance indicators:</u> • Develop parts list and bill of materials. • Develop cost analysis. • Identify and explain notes and bill of materials. • Figure product cost. • Estimate materials needed for products.	INCT 1400	MA 12.1.4 (2) MA 12.1.3 (2) LA 12.1.6.d (1) LA 12.1.6.f (1) LA 12.2.2.a (1)
	KS MNC10.01.02	[TBD by NDE]

Standard 4. Students will understand and demonstrate how products can be manufactured.		
Benchmark 4.1. The students will demonstrate various types of assembling processes used in manufacturing. <u>Sample performance indicators:</u> • Apply appropriate fastening or joining procedures to the design and production of a manufactured part of product. • Use tools and processes of cutting, shaping, combining, forming, etc. of materials to manufacture a part or product. • Set up equipment for the production process. • Perform and monitor the process to make the product. • Understand and Perform mechanical fastening, mechanical force, joining, fusion bonding, adhesive bonding. • The student will use tools and the processes of cutting, shaping, combining, forming, etc. of materials to manufacture a part or product.	KS MNC10.01.02 KS MNC10.01.03	SC12.2.1c (1) MA 12.2.5 (2) LA12.1.5.b (1)
Benchmark 4.2. The students will demonstrate how materials can be processed using tools and machines. <u>Sample performance indicators</u> • Make adjustments to equipment prior to putting into service. • The student will set up equipment for the production process. • Verify that set-up meets process specifications. • Document set-up procedures to ensure repeatability. • Verify that production operations comply with safety procedures.	KS MNPB08.01.03 KS MNPB08.01.05	SC12.1.3.f (1) SC 12.1.3g (1) SC12.1.3h (1) SC12.1.1d (2) SC12.1.3d (2) MA 12.1.3 (2) MA 12.2.5 (2) MA 12.2.2 (2) LA12.1.5.b (1) LA 12.1.6.d (2) LA 12.1.6.f (2)
Benchmark 4.3. The students will properly finish the selected product. (e.g., types of finishing materials, surface preparation, methods, of application) used in manufacturing. <u>Sample performance indicators:</u> • Select a finishing process for a product appropriate to the job it must perform, environment in which it functions, and its aesthetic appeal.	KS MNC10.01.04	SC12.1.1d (2) MA 12.2.5 (5) LA12.1.5.b (1) LA 12.1.6.d (2) LA 12.1.6.f (2)
Benchmark 4.4. The students will explain the processes of inspection and quality control used in manufacturing.	KS MNC10.01.05 KS MNPB04.01 KS MNPB08.01.05	SC12.1.3e (2) SC12.1.1d(2) MA 12.2.1 (2)

Sample performance indicators: • Perform continuous inspections to ensure that parts or products meet design specifications. • Sample and inspect in accordance with schedule and procedures. • Select correct inspection tools and procedures and use them correctly. • Inspect materials against correct specifications. • Identify materials not meeting specifications. • Make necessary adjustment in the manufacturing process in a timely manner. • Take corrective action on out-of specification material. • Document inspection results properly and report them to the correct parties in a timely manner.		LA 12.6.1 d (2) LA 12.6.1d (2) LA 12.2.2.a (2) LA 12.3.1 a (2) MA 12.2.5 (2) LA12.1.5.b (1)

Reference Standards Sources

- MSSC = MSSC Standards Certification
- WSC = ITE 108 Manufacturing Systems
- NCCER = National Center for Construction Education and Research-Welding
- MCC = Introduction to Precision Machine Technology INCT 1400
- KS = Career Clusters Knowledge and Skills Statements. Revised 2008. National Career and Technical Education Foundation, Silver Spring, MD. www.careerclusters.org

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Other Information

Suggestions for innovative teaching and learning strategies:	•
Related assessments:	•
Extended learning opportunities:	• SkillsUSA contests (e.g., Cabinetmaking, Welding, CNC, etc.)