Advanced Fabrication and Manufacturing

Course Description

A study of the processes used by modern industry to manufacture consumer products, safety, measurement, planning, machining, fabrication processes, and finish processes will be included. Career opportunities will also be explored.

Course Code:

Program(s) of Study to which This Course Applies

- Manufacturing Production

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	
Benchmark 1.1. 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	LA12.3.2.a (2) LA12.3.2.b (2)
Benchmark 1.2. Observe proper dress and use of personal protective equipment.	KS MNC06.04 Sample Indicators	

<u>Sample performance indicators:</u> • 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.	KS MNPB07.01.03	
Benchmark 1.3. 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	LA12.3.2.a (2) LA12.3.2.b (2) LA12.1.5.b (1) LA12.1.6.d (2) LA12.1.6.f (2)
Benchmark 1.4. The student 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	LA12.3.2.a (2) LA12.3.2.b (2) LA12.1.6.d (2) LA12.1.6.f (2)
Standard 2. Students will develop the ability to analyze precision measurement devices by applying mathematical skills while working with fractions and decimals.	INCT 1400 Course Objectives 1 and 2	

Distinguish symbols and identify line usage used in blueprints and plan reading.		
Benchmark 2.1 The student will use common measurement systems. <u>Sample performance indicators:</u> • Incorporate both Metric and Customary systems of measurement. • Review fractions, decimals, and their conversions.	INCT 1400 Course Objectives 1 and 2	LA12.1.6.f (2) SC12.1.1.l (1) MA 12.2.5 (2) MA 12.1.3 (1)
Benchmark 2.2 The student 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.e (1) MA12.2.1 (1) MA12.2.5 (1)
Benchmark 2.3 The student 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	LA12.1.5.b (1) SC12.1.1.e (1) MA 12.2.5 (1) MA 12.2.4 (1)
Benchmark 2.4 The student will identify fundamentals of blueprint reading. <u>Sample performance indicators:</u> • Identify line types, lettering, and symbols. • Understand Scale. • Identify and explain detail drawings.	NCCER Module 29201-03 NCCER Module 29202-03	LA12.1.6.f (2) LA12.3.1.a (2) LA12.3.1.c (2) LA12.1.5.b (1) MA 12.2.4 (1) MA 12.2.2 (1) MA 12.1.3 (1)

• 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.		MA 12.1.4 (2) MA 12.2.5 (2)
Standard 3. Students will be able to analyze, select, organize, plan, and produce manufacturing products and activities. (Research and Development).	WSC	[TBD by NDE]
Benchmark 3.1 The student will do basic and applied research for a product. <u>Sample performance indicators:</u> • Identify needs of the product. • 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. • Explain and demonstrate field identification methods for materials. • Identify and explain the physical characteristics and mechanical properties of materials. • Identify and explain forms and shapes of structural materials. • Explain metallurgical considerations for welding metals. • Describe and give examples of materials used in common manufacturing products. • Set production goals.	KS MNC10.01 NCCER Module 29201-03 NCCER Module 29202-03 MSSC	LA12.3.2.a (2) LA12.3.2.b (2) LA12.1.6.d (2) LA12.1.6.f (2) LA12.3.1.a (2) LA12.3.1.c (2) LA12.1.5.b (1) MA 12.1.4 (2)
Benchmark 3.2 The student will develop product plans. <u>Sample performance indicators:</u> • Develop sketches of a product. • Develop basic drawings. • Develop working drawings. • Develop parts list and bill of materials.	NCCER Module 29202-03 KS MNC10.01	LA12.3.1.a (2) LA12.3.1.c (2) LA12.2.2.a (2) LA12.2.2.c(2) LA12.1.5.b (2) MA 12.1.3 (1) MA 12.2.4 (1)

• Develop cost analysis. • Identify the steps required to create the product. • Identify the equipment used to create the product. • Use tools and processes of cutting, shaping, combining, forming, etc. of materials to manufacture a part or product. • Explain Finishing Processes (e.g., types of finishing materials, surface preparation, methods of application) used in manufacturing. • Summarize how materials can be processed using tools and machines.		MA 12.2.5 (2)
Benchmark 3.3 Inspect materials at all stages of process to determine quality or condition. <u>Sample performance indicators:</u> • 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. • Take corrective action on out-of specification material. • Document inspection results properly and report them to the correct parties in a timely manner. • Adjust equipment and processes as required.	KS MNCB04.01.01 KS MNPB07.01.04	LA12.1.6.f (2) LA12.1.6.d (2) LA12.3.1.a (2) LA12.1.5.b (2) SC12.1.1.d (1) MA 12.2.5 (2) MA 12.2.1 (1)
Standard 4. The student will employ technical skills and knowledge required for careers in manufacturing in order to perform basic workplace activities common to manufacturing.	KS MNC10.01	
Benchmark 4.1. Demonstrate the planning and layout processes (e.g., designing, print reading, measuring) used in manufacturing. <u>Sample performance indicators:</u> • Read prints and use the information to design, layout, and produce parts or products. • Use measuring and layout tools to complete the processes.	KS MNC10.01.01	MA 12.2.5 (2) MA 12.2.4 (1) MA 12.1.3 (1)

Benchmark 4.2. The student will demonstrate how materials can be processed using tools and machines**.** <u>Sample performance indicators:</u> • Set up equipment for the production process. • Use tools and the processes of cutting, shaping, combining, forming, etc. of materials to manufacture a part or product. • Perform and monitor the process to make the product.	KS MNC10.01.02 MSSC	MA 12.1.1 (2) MA 12.2.2 (2) MA 12.2.1 (2) MA 12.2.5 (2) MA 12.1.3 (2)
Benchmark 4.3. The student will demonstrate various types of assembling processes (e.g., mechanical fastening, mechanical force, joining, fusion bonding, adhesive bonding) 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.	KS MNC10.01.03	MA 12.2.5 (2) MA 12.1.3 (3)
Benchmark 4.4. The student 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	
Standard 5. The student will know and understand the importance of employability skills. Explore, plan, and effectively manage careers.	KS MNC09	
Benchmark 5.1. The student will research possible career opportunities in the content area. <u>Sample performance indicators:</u> • Research possible careers in the particular content area. • Select a career of choice to research and present.		LA12.1.6.d (2) LA12.1.6.f (2) LA12.1.6.j (2) LA12.3.1.a (2) LA12.3.1.c (2) LA12.2.2.a (2) LA12.2.2.c (2)

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.)