# 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: 101401, 101921, 101940, 101951

## Program(s) of Study to which This Course Applies

- Manufacturing Production

| Course Framework | Reference Standards | Academic Crosswalk |
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| **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.<br><br><u>Sample performance indicators:</u><br>• Identify the types of risks of injury/illness in the lab.<br>• Identify and describe how common hazards in the lab.<br>• Explain the role of government agencies in providing a safe workplace.<br>• 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.)<br>• Interpret safety signs and symbols. | KS MNC06.01 Sample Indicators<br>KS MNC06.03 Sample Indicators<br>KS MNC06.05 Sample Indicators | LA12.3.2.a (2)<br>LA12.3.2.b (2) |
| Benchmark 1.2. Observe proper dress and use of personal protective equipment. | KS MNC06.04 Sample Indicators | |

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| Sample performance indicators:<br>• 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)<br>• Inspect and use personal protective equipment (PPE).<br>• 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.<br><br>Sample performance indicators:<br>• Understand the proper storage of flammable chemicals.<br>• Identify methods of disposing of hazardous materials.<br>• Demonstrate principals of safe physical movement to avoid slips, trips, and spills.<br>• Learn the correct way to lift and move materials.<br>• Proper handling of cylinders in a welding shop.<br>• Make sure work area is clean and free of obstructions.<br>• Identify procedures necessary for maintaining a safe work area.<br>• Follow good housekeeping procedures. | KS MNC06.04<br>Sample Indicators<br>KS MNC06.05<br>Sample Indicators<br>KS MNPB07.01.03 | LA12.3.2.a (2)<br>LA12.3.2.b (2)<br>LA12.1.5.b (1)<br>LA12.1.6.d (2)<br>LA12.1.6.f (2) |
| Benchmark 1.4. The student will demonstrate proper machine and tool safety and operation.<br><br>Sample performance indicators:]<br>• Understand proper use of hand and power tools.<br>• Understand proper operating procedures of machines for wood, welding, metal, plastics, and other non-metal operations of power equipment.<br>• Give operators a complete orientation of equipment.<br>• Demonstrate proper operation.<br>• Make sure all important information regarding equipment safety is communicated clearly and effectively. | KS MNC10.01.02<br>KS MNPB07.01.01 | LA12.3.2.a (2)<br>LA12.3.2.b (2)<br>LA12.1.6.d (2)<br>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 | |

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| **Distinguish symbols and identify line usage used in blueprints and plan reading.** | | |
| Benchmark 2.1 The student will use common measurement systems.<br><br>Sample performance indicators:<br>• Incorporate both Metric and Customary systems of measurement.<br>• Review fractions, decimals, and their conversions. | INCT 1400 Course Objectives 1 and 2 | LA12.1.6.f (2)<br>SC12.1.1.l (1)<br>MA 12.2.5 (2)<br>MA 12.1.3 (1) |
| Benchmark 2.2 The student will understand mathematical equations and computations.<br><br>Sample performance indicators:<br>• Figure board footage.<br>• Figure square footage.<br>• Implement geometry calculations.(e.g., area, volume, and mass)<br>• Implement trigonometry. | | SC12.1.1.e (1)<br>MA12.2.1 (1)<br>MA12.2.5 (1) |
| Benchmark 2.3 The student will properly use and handle precision measuring tools.<br><br>Sample performance indicators:<br>• Understand proper use and reading of micrometers.<br>• Understand proper use and reading of Dial Calipers.<br>• Understand proper use and reading of Rules and Tape Measures.<br>• Understand proper use and reading of Protractor.<br>• Understand proper use and reading of Compass.<br>• Understand proper use and reading of Architect Scale. | MSSC Standards-Quality Practices and measurement 9 and 10 | LA12.1.5.b (1)<br>SC12.1.1.e (1)<br>MA 12.2.5 (1)<br>MA 12.2.4 (1) |
| Benchmark 2.4 The student will identify fundamentals of blueprint reading.<br><br>Sample performance indicators:<br>• Identify line types, lettering, and symbols.<br>• Understand Scale.<br>• Identify and explain detail drawings. | NCCER Module 29201-03<br>NCCER Module 29202-03 | LA12.1.6.f (2)<br>LA12.3.1.a (2)<br>LA12.3.1.c (2)<br>LA12.1.5.b (1)<br>MA 12.2.4 (1)<br>MA 12.2.2 (1)<br>MA 12.1.3 (1) |

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| • Identify and explain lines, material fills, and sections.<br>• Identify and explain object views.<br>• Identify and explain dimensioning.<br>• Identify and explain notes and bill of materials.<br>• Interpret elements of the different types of drawings. | | MA 12.1.4 (2)<br>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.<br><br><u>Sample performance indicators:</u><br>• Identify needs of the product.<br>• Acquire knowledge of materials, their properties and methods to use them.<br>• Identify and explain the selection of materials.<br>• Identify and explain the composition and classification of materials.<br>• Explain and demonstrate field identification methods for materials.<br>• Identify and explain the physical characteristics and mechanical properties of materials.<br>• Identify and explain forms and shapes of structural materials.<br>• Explain metallurgical considerations for welding metals.<br>• Describe and give examples of materials used in common manufacturing products.<br>• Set production goals. | KS MNC10.01<br>NCCER Module 29201-03<br>NCCER Module 29202-03<br>MSSC | LA12.3.2.a (2)<br>LA12.3.2.b (2)<br>LA12.1.6.d (2)<br>LA12.1.6.f (2)<br>LA12.3.1.a (2)<br>LA12.3.1.c (2)<br>LA12.1.5.b (1)<br>MA 12.1.4 (2) |
| Benchmark 3.2 The student will develop product plans.<br><br><u>Sample performance indicators:</u><br>• Develop sketches of a product.<br>• Develop basic drawings.<br>• Develop working drawings.<br>• Develop parts list and bill of materials. | NCCER Module 29202-03<br>KS MNC10.01 | LA12.3.1.a (2)<br>LA12.3.1.c (2)<br>LA12.2.2.a (2)<br>LA12.2.2.c(2)<br>LA12.1.5.b (2)<br>MA 12.1.3 (1)<br>MA 12.2.4 (1) |

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| • Develop cost analysis.<br>• Identify the steps required to create the product.<br>• Identify the equipment used to create the product.<br>• Use tools and processes of cutting, shaping, combining, forming, etc. of materials to manufacture a part or product.<br>• Explain Finishing Processes (e.g., types of finishing materials, surface preparation, methods of application) used in manufacturing.<br>• 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.<br><br><u>Sample performance indicators:</u><br>• Sample and inspect in accordance with schedule and procedures.<br>• Select correct inspection tools and procedures and use them correctly.<br>• Inspect materials against correct specifications.<br>• Identify materials not meeting specifications.<br>• Take corrective action on out-of specification material.<br>• Document inspection results properly and report them to the correct parties in a timely manner.<br>• Adjust equipment and processes as required. | KS MNCB04.01.01<br>KS MNPB07.01.04 | LA12.1.6.f (2)<br>LA12.1.6.d (2)<br>LA12.3.1.a (2)<br>LA12.1.5.b (2)<br>SC12.1.1.d (1)<br>MA 12.2.5 (2)<br>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.<br><br><u>Sample performance indicators:</u><br>• Read prints and use the information to design, layout, and produce parts or products.<br>• Use measuring and layout tools to complete the processes. | KS MNC10.01.01 | MA 12.2.5 (2)<br>MA 12.2.4 (1)<br>MA 12.1.3 (1) |

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| Benchmark 4.2. The student will demonstrate how materials can be processed using tools and machines**.**<br><br>Sample performance indicators:<br>• Set up equipment for the production process.<br>• Use tools and the processes of cutting, shaping, combining, forming, etc. of materials to manufacture a part or product.<br>• Perform and monitor the process to make the product. | KS MNC10.01.02<br>MSSC | MA 12.1.1 (2)<br>MA 12.2.2 (2)<br>MA 12.2.1 (2)<br>MA 12.2.5 (2)<br>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.<br><br>Sample performance indicators:<br>• 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)<br>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.<br><br>Sample performance indicators:<br>• 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.<br><br>Sample performance indicators:<br>• Research possible careers in the particular content area.<br>• Select a career of choice to research and present. | | LA12.1.6.d (2)<br>LA12.1.6.f (2)<br>LA12.1.6.j (2)<br>LA12.3.1.a (2)<br>LA12.3.1.c (2)<br>LA12.2.2.a (2)<br>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

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