Alabama Department of Postsecondary Education

Representing the Alabama Community College System

STATEWIDE CAREER/TECHNICAL EDUCATION COURSE ARTICULATION REVIEW MINUTES

Articulation Agreement Identifier: MTT 147 (2006-1) Identifier is the postsecondary course prefix followed by Plan-of-Instruction version number (e.g.; INT 100 (2005-1)).

Applicable CIP code(s): 48.0507

Postsecondary course prefix, number, and title: MTT 147 – Introduction to Machine Shop I

Secondary course prefix, number, and title: 480511/540041 - Introduction to Precision Machining + 480513/540048 - Introduction to Milling, Drill Press, and Surface Grinder, + 480515/540047 - Introduction to Lathe

Initial Review: September 17, 2009 DPE Annual Review: March 13, 2012

Effective date: **Fall Semester 2011**.

Course Content Analysis (all postsecondary course objectives must be sufficiently addressed in the secondary courses):

Notes:

1. **Skills and knowledge contained in the postsecondary course objectives must be present in the corresponding secondary objectives for a "match" to occur.**
2. **Postsecondary and Secondary objectives must reflect similar content and performance levels before the course articulation agreement will be recommended to the TEDAC Oversight Committee.**
3. **More than one Secondary course may be used in order to articulate to a Postsecondary course.**

Postsecondary Course Objectives	Secondary Course(s)	TEDAC Comments
MODULE A – SAFETY AND TOOL USE **Competencies:** A1.0 Perform tasks in a safe manner. **Performance Objectives:** A1.1 Given a variety of lab situations, perform assigned tasks in a safe manner. **Learning Objectives:** A1.1.1 Explain the purpose and importance of safety policies. A1.1.2 Explain the use of personal protective equipment. A1.1.3 Explain Lock Out/Tag Out procedures. A1.1.4 Explain good housekeeping practices. A1.1.5 Explain the importance of practicing tool safety A1.1.6 Explain the importance of performing machine safety checks of equipment and accessories. A1.1.7 Describe an appropriate response to various safety hazards. A1.1.8 Explain procedures for safe lifting, transporting, and storing heavy objects. A1.1.9 Describe how to safely handle coolants, cutting fluids, and lubricants. A1.1.10 Describe the identification, handling, and storage of hazardous materials. A1.1.11 Explain the importance of the Occupational Safety & Health Act (OSHA). A1.1.12 Differentiate between employer and employee responsibilities as outlined by OSHA. A.1.1.13 Explain the purpose of material data safety sheets (MSDSs). **Competency:** A2.0 Value the importance of adhering to safety policies. **Performance Objective: -** None **Learning Objective:** A2.1.1 Prioritize safety issues in relation to machine shop	**Introduction to Precision Machining** **Unit 2 - Safety** **Content Standard(s)** 2. Apply safety rules, regulations, and procedures for precision machining technology. **Learning Objective(s)** 1. Explain the role that safety plays in the classroom/lab (machine shop). 2. Explain the appropriate safety precautions applicable to common manufacturing facilities. 3. Demonstrate the use and care of appropriate personal protective equipment (PPE). 4. Properly don and remove personal protective equipment (safety goggles, hearing protection, and hard hat). 5. Explain the importance of Hazard Communications (HazCom) and material safety data sheets (MSDS). 6. Describe fire prevention and firefighting techniques. 7. Demonstrate correct selection and use of hand tools.	This is an ongoing evaluation spanning all lessons and subjects.

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activities. **Competency:** A3.0 Use and maintain common machine shop tools. **Performance Objective: -** None **Learning Objectives:** A3.1.1 Identify common and specialty tools used in a machine shop. A3.1.2 Match the proper tool to its use. A3.1.3 Describe procedures for effective maintenance of machine shop tools. **MODULE B – GENERAL MACHINE SHOP PRACTICES** **Competency:** B1.0 Apply machine shop practices to setup and layout materials. **Performance Objective:** B1.1 Given mechanical drawing, transfer the specifications for machine shop applications. B1.2 Perform specified basic machine operations on machine tools **Learning Objectives:** B1.1.1 Define terms used in machine shop practices. B1.1.2 Perform specified mathematical operations. B1.1.3 Interpret mechanical drawings. B1.1.4 Differentiate the various applications for machining measurement instruments. B1.1.5 Read various machining measurement instruments B1.1.6 Explain the use of various layout tools. B1.1.7 Differentiate between types and applications of various lubricants, coolants, and cutting fluids used in machine shop practices. B1.1.8 Describe various considerations when performing basic machining operations.	**Introduction to Precision Machining** **Unit 3 – Print Reading** **Content Standard(s)** 3. Identify blueprint symbols and lines related to precision machining. **Learning Objective(s)** 1. Identify line types (Object, Hidden, Center , Dimension, Cutting Plane, Cross section, Extension) 2. Identify blueprint views 3. Identify basic geometric dimensioning and tolerancing, notations, symbols, etc.	Content is reinforced in other machining classes to allow student mastery of content. Students demonstrate sufficient knowledge.

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Competency: B2.0 Calculate speed and feeds. **Performance Objective: -** None **Learning Objectives:** B2.1.1 Calculate speeds and feeds for various machine shop applications. **Competency:** B3.0 Describe the industry requirement of producing parts within specified limits. **Performance Objectives: -** None **Learning Objectives:** B3.1.1 Explain the importance of quality control in machining operations. B3.1.2 Explain the importance of inspecting the tolerances and specifications of machined parts. **MODULE C – METAL WORKING PRINCIPLES** **Competency:** C1.0 Describe principles of material properties and metal working. **Performance Objective: -** None **Learning Objectives:** C1.1.1 Recognize common materials and their principal properties relevant to machining tasks. C1.1.2 Recognize differences between ferrous and non-ferrous, magnetic, and ductile materials. C1.1.3 Explain the relationship of cutter and work piece. **Competency:** C2.0 Describe the use of cutting and holding tools and devices. **Performance Objectives: -** None **Learning Objectives:** C2.1.1 Identify and explain the use of various cutting tools.		While not listed here, the competencies for Precision Machining are taught throughout the program as other machines are introduced. Recommend approval as

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C2.1.2 Identify and explain the use of various tool-holding devices. C2.1.3 Identify and explain the use of various work holding devices. **MODULE D – POWER SAW FUNDAMENTALS** **Competency:** D1.0 Describe principles of setting up and operating a power saw. **Performance Objectives –** None **Learning Objectives:** D1.1.1 Identify common types of power saws found in machine shops. D1.1.2 Match the saw blade to its application. D1.1.3 Identify the major components of a power saw and their functions. D1.1.4 Describe how to set up a power saw for safe operations. D1.1.5 Describe considerations for determining proper speeds for various power saw applications. D1.1.6 Describe how to perform various types of cuts using a power saw. D1.1.7 Estimate the amount of material needed for a project. D1.1.8 Describe how to layout materials for a sawing application. **MODULE E – BASIC LATHE FUNDAMENTALS** **Competency:** E1.0 Describe principles of setting up and operating a lathe. **Performance Objectives –** None **Learning Objectives:** E1.1.1 Identify common types of lathes found in machine shops. E1.1.2 Match the tool shaping to its lathe application.	**Introduction to Precision Machining** **Unit 6 – 7 – Power Saws** **Content Standard(s)** 6. Demonstrate care and safety for vertical and horizontal power saws. 7. Demonstrate saw operations, including installing a saw blade, straight cutting a work piece, sawing an angle, and sawing a slot on a vertical saw. **Learning Objectives:** 1. Know safe power saw practices. 2. Practice proper maintenance and care for the power saw. 3. Learn multiple saw operations (content standard). **Introduction to Lathe** **Unit 2-3 – Lathe Operations** **Content Standard(s)** 2. Demonstrate engine lathe operations, including mounting the chuck on the lathe, indicating the round stock in an independent jaw chuck, indicating the square stock in an independent jaw chuck, sharpening the lathe tool bit, centering or positioning cutting tools, face cutting a work	written.

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E1.1.3 Identify the major components of a lathe and their functions. E1.1.4 Describe how to set up a lathe for safe operations. E1.1.5 Describe proper speeds for various lathe applications. E1.1.6 Describe how to perform various functions using a lathe.	piece, turning multiple diameters, center drilling a work piece, demonstrating angle cuts, knurling a work piece, threading a work piece, calculating speed and feed per material, and tooling. 3. Demonstrate the ability to turn stock to specifications using a variety of methods and materials related to lathe operations. **Learning Objective(s)** 1. Demonstrate safe operation and set up of an engine lathe. 2. Indicate round and irregular shaped work pieces in a independent 4 jaw chuck. 3. Perform multiple cutting operations. 4. Calculate surface speed and feed and determine RPM for turning operations. **Unit 4-5 – Project** **Content Standard(s)** 4. Demonstrate the ability to produce a completed lathe project according to specifications. 5. Demonstrate use of measuring tools, including calipers, dial indicators, and micrometers to produce precision lathe projects. **Learning Objective(s)** 1. Complete NIMS Level I chucking part. 2. Interpret blueprints for project completion. 3. Utilize precision measuring instruments, to obtain dimensional accuracy.	
MODULE F – GRINDING MACHINE FUNDAMENTALS **Competency**: F1.0 Describe principles of setting up and operating a grinding machine. **Performance Objectives –** None **Learning Objectives:**	**Introduction to Milling, Drill Press, and Surface Grinder** **Unit 5-6 – Surface Grinder Safety and Operations** **Content Standard(s)** 5. Explain care and safety for a surface grinder. 6. Demonstrate grinding techniques, including mounting a grinding wheel, dressing a grinding wheel, grinding a flat	

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F1.1.1 Identify common types of grinders found in machine shops. F1.1.2 Match the grinding wheel to its application. F1.1.3 Explain how to ring test a grinding wheel. F1.1.4 Explain the function of the major components of a grinder. F1.1.5 Describe how to set up a grinder for safe operations. F1.1.6 Determine proper speeds and feeds for various grinding applications. F1.1.7 Describe how to perform safe grinding functions.	surface, and grinding a work piece square and parallel. **Learning Objective(s)** 1. Utilize safe operation and maintenance procedures (lubrication, no air blast cleaning). 2. Properly set up and prepare for grinding operations. 3. Execute precision grinding techniques.	
MODULE G – MILLING MACHINE FUNDAMENTALS **Competency:** G1.0 Describe principles of setting up and operating a milling machine. **Performance Objective:** None **Learning Objectives:** G1.1.1 Identify common types of milling machines found in machine shops. G1.1.2 Identify the major components of a milling machine and their functions. G1.1.3 Describe how to set up a milling machine for safe operations. G1.1.4 Determine proper speeds for various basic milling applications. G1.1.5 Describe how to safely perform various functions while using a milling machine.	**Introduction to Milling, Drill Press, and Surface Grinder** **Unit 1 – 4 – Mill Safety and Operation** **Content Standard(s)** 1. Apply safety rules, regulations, and procedures related to milling, drill press, and surface grinder applications. 2. Explain the care and safety for milling machines. 3. Demonstrate types of milling cutters and applications, including center drill, drill, reamer, taps, end mills, fly cutter, and carbide insert cutters. 4. Demonstrate milling machine operations, including verifying that a machining vice is true to machine axis, verifying that the machine head is perpendicular to the machine table, using work piece clamping techniques, milling a flat surface, milling steps in a work piece, performing slot milling, milling a square block, calculating speed and feed per material and tooling, and milling a pocket in a work piece. **Learning Objective(s)** 1. Explain the role that safety plays in the classroom/lab (machine shop). 2. Explain the appropriate safety precautions applicable to common manufacturing facilities. 3. Demonstrate the use and care of appropriate	

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	personal protective equipment (PPE). 4. Properly don and remove personal protective equipment (safety goggles, hearing protection, and hard hat). 5. Explain the importance of Hazard Communications (HazCom) and material safety data sheets (MSDS). 6. Describe fire prevention and firefighting techniques. 7. Demonstrate correct selection and use of hand tools. 8. Identify various mill cutters. 9. Properly align head and attachments. 10. Perform basic milling operations. 11. Perform basic machining calculations. 12. Perform preventative maintenance on mill.	
MODULE H – EMPLOYABILITY SKILLS Competency: H1.0 Demonstrate knowledge of career opportunities and job requirements in the machining field. **Performance Objective –** None **Learning Objectives:** H1.1.1 Explain how personal aptitudes and abilities relate to career choices. H1.1.2 Describe the career opportunities in the field of machining. H1.1.3 Relate local educational opportunities to the regional machining employment demands. H1.1.4 Relate local educational opportunities to the national/international machining employment demands. H1.1.5 Discuss the job descriptions and associated wages and salary trends of the machining industry. H1.1.6 Explain industrial attendance and punctuality	**Introduction to Precision Machining** **Unit 1** **Content Standard(s)** 1. Summarize purposes, rules, and regulations relative to the precision machining technology program. **Learning Objective(s)** 1. Learn relevant safety rules and regulations to be applied in the classroom/lab setting. 2. Obtain knowledge of the advancement of machine tools throughout history. 3. Gain an understanding of the multiplicity of career opportunities related to precision machining.	

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requirements for employees. H1.1.7 Discuss the code of dress appropriate to the machining field. H1.1.8 Explain interpersonal skill requirements to be successful in the machining field. H1.1.9 Describe the necessity to plan and schedule work in order to meet production requirements. H1.1.10 Explain the requirements needed for a resume. H1.1.11 Explain the components of a successful job interview.		
MODULE I – DRILL PRESS FUNDAMENTALS Competency: I1.0 Describe principles of setting up and operating a drill press. **Performance Objective –** None **Learning Objectives:** I1.1.1 Identify common types of drill presses found in machine shops. I1.1.2 Match drill bits to various applications. I1.1.3 Identify the major components of a drill press and their functions. I1.1.4 Describe how to set up a drill press for safe operation. I1.1.5 Describe considerations for determining proper speeds for various drill press applications.	**Introduction to Precision Machining** **Unit 4-5 – Drill Press** **Content Standard(s)** 4. Demonstrate care and safety for a drill press. 5. Demonstrate drill press operations to include hand sharpening a drill bit, center drilling and drilling a work piece, countersinking a hole, counter boring a hole, and calculating speed and feed per material and tooling. **Learning Objective(s)** 1. Learn proper care and safety of a drill press (maintenance, lubrication, etc.). 2. Know proper techniques for sharpening a drill bit. 3. Know how to determine speeds/feeds. 4. Perform drilling operations (countersinking, counterboring, spotfacing, centerdrilling, etc). **Introduction to Milling, Drill Press, and Surface Grinder** **Unit 7-9 – Drill Press Safety and Operations** **Content Standard(s)** 7. Demonstrate care and safety for a drill press. 8. Demonstrate drill press techniques. 9. Demonstrate a hardness test on a work piece, including a file test and a Rockwell hardness test.	

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	Learning Objective(s) 1. Utilize safe operating and maintenance procedures. 2. Center drill, counter boring, countersinking, spot facing, etc. 3. Evaluate hardness of various materials to be drilled (file, test, spark test, hardness tester).	