



Alabama Department of Postsecondary Education

Representing the Alabama Community College System

STATEWIDE CAREER/TECHNICAL EDUCATION COURSE ARTICULATION REVIEW MINUTES

Articulation Agreement Identifier: AUT 149 (2011-1) Identifier is the postsecondary course prefix followed by Plan-of-Instruction version number (e.g.; INT 100 (2007-1)).

Applicable CIP code(s): 15.0613

Postsecondary course prefix, number, and title: AUT 149 - Basic Machining Technology

Secondary Education course(s) title and number 480701/540041 - Introduction to Precision Machining + 480708/540048 - Introduction to Milling, Drill Press, and Surface Grinder + 480707/540047 - Introduction to Lathe

Initial Review: February 18, 2010 DPE Annual Review: January 30, 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 Objectives and Location(s)	TEDAC Comments
<p>Module A <u>SAFETY AND TOOL USE</u></p> <p>PROFESSIONAL COMPETENCIES A1.0 Perform tasks in a safe manner. A2.0 Value the importance of adhering to safety policies. A3.0 Use and maintain common machine shop tools.</p> <p>PERFORMANCE OBJECTIVES</p> <p>A1.1 Given a variety of lab situations, perform assigned tasks in a safe manner to include but not limited to the use of personal protective equipment, lockout/tag out, tool use, and housekeeping responsibilities. NOTE: This is an ongoing evaluation. A2.1 This competency is measured affectively. A3.1 Given various lab assignment, select, use, and maintain tools commonly found in a machine shop.</p> <p>LEARNING OBJECTIVES</p> <p>A1.1.1 Explain the purpose and importance of safety policies. A1.1.2 Explain the purpose and 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,</p>	<p><u>Introduction to Precision Machining, Unit 2, Safety Content Standard(s)</u></p> <p>2. Apply safety rules, regulations, and procedures for precision machining technology.</p> <p>Learning Objective(s)</p> <p>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.</p>	

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<p>and storing heavy objects.</p> <p>A1.1.9 Describe how to safely handle coolants, cutting fluids, and lubricants.</p> <p>A1.1.10 Describe how to and identify, handle, and store hazardous materials.</p> <p>A1.1.11 Explain the importance of the Occupational Safety & Health Act (OSHA).</p> <p>A1.1.12 Differentiate between employer and employee responsibilities as outlined by OSHA.</p> <p>A.1.1.13 Explain the purpose of material data safety sheets (MSDSs).</p> <p>A2.1.1 Prioritize safety issues in relation to machine shop activities.</p> <p>A3.1.1 Identify common and specialty tools used in a machine shop.</p> <p>A3.1.2 Match and use the proper tool for an appropriate application.</p> <p>A3.1.3 Describe procedures for effective maintenance of machine shop tools.</p>		
<p>Module B <u>BASIC MACHINE SHOP PRACTICES</u></p> <p>PROFESSIONAL COMPETENCIES</p> <p>B1.0 Apply machine shop practices to setup and layout materials.</p> <p>B2.0 Calculate speed and feeds.</p>	<p><u>Introduction to Precision Machining, Unit 8-9, Benchwork</u></p> <p>Content Standard(s)</p>	

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<p>B3.0 Describe the industry requirement of producing parts within specified limits.</p> <p>PERFORMANCE OBJECTIVES</p> <p>B1.1 Given mechanical drawing, transfer the specifications for machine shop applications.</p> <p>B1.2 Perform specified basic machine operations on machine tools.</p> <p>B2.1 Calculate speeds and feeds for various machining projects.</p> <p>B3.1 This competency is measured cognitively.</p> <p>LEARNING OBJECTIVES</p> <p>B1.1.1 Define terms used in machine shop practices.</p> <p>B1.1.2 Perform specified mathematical operations.</p> <p>B1.1.3 Interpret mechanical drawings.</p> <p>B1.1.4 Differentiate the various applications for machining measurement instruments.</p> <p>B1.1.5 Read various machining measurement instruments</p> <p>B1.1.6 Explain the use of various layout tools.</p> <p>B1.1.7 Differentiate between types and applications of various lubricants, coolants, and cutting fluids used in machine shop practices.</p> <p>B1.1.8 Describe various considerations when performing basic machining operations.</p> <p>B2.1.1 Calculate speeds and feeds for various machine shop applications.</p>	<p>8. Apply bench work skills and safety practices related to precision machining.</p> <ul style="list-style-type: none"> •Demonstrating layout with combination square and scribe <p>Examples: whole circle using length of chord; layout with vernier height gage; hand tapping internal threads, producing external threads with threading die; ring testing grinding wheel, mounting grinding wheel on bench grinder and adjusting safety guards; hand grinding various cutting tools</p> <p>9. Demonstrate skills in mathematics concepts related to precision machining.</p> <p><u>Learning Objective(s)</u></p> <ol style="list-style-type: none"> 1. Learn safe use of lay-out tools and chemicals Lay-out dye, etc. 2. Know proper hand tapping and die threading techniques. 3. Be able to safely test and install bench grinding wheels, guards, etc. 4. Apply math concepts to lay-out operations (trigonometry, geometry, etc). 5. Demonstrate surface plate lay-out techniques. <p><u>Introduction to Lathe, Unit 2-3, Lathe Operations Content Standard(s)</u> Speed and Feed (See Module E below)</p>	

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<p>B3.1.1 Explain the importance of quality control in machining operations.</p> <p>B3.1.2 Explain the procedures used to inspect a part for tolerance compliance.</p>		
<p>Module C <u>METAL WORKING PRINCIPLES</u></p> <p>PROFESSIONAL COMPETENCIES C1.0 Describe principles of material properties and metal working. C2.0 Describe the use of cutting tools, and holding tools and devices.</p> <p>PERFORMANCE OBJECTIVES C1.1 This competency is measured cognitively. C2.1 This competency is measured cognitively.</p> <p>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. C2.1.1 Identify and explain the use of various cutting tools. 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.</p>	<p>Myron can you add this to Intro to Precision Machinery?</p>	

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<p>Module D <u>BASIC POWER SAW OPERATIONS</u></p> <p>PROFESSIONAL COMPETENCIES D1.0 Set up and operate a power saw.</p> <p>PERFORMANCE OBJECTIVES D1.1 Perform specified cuts using a power saw</p> <p>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 Determine proper speeds and feeds/surface footage for various power saw applications. D1.1.6 Describe how to safely 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.</p> <p>Module E <u>BASIC LATHE OPERATIONS</u></p> <p>PROFESSIONAL COMPETENCIES E1.0 Set up and operate a lathe.</p>	<p><u>Introduction to Precision Machining, Unit 6 – 7, Power Saws</u> Content Standard(s)</p> <p>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.</p> <p>Learning Objectives:</p> <p>1. Know safe power saw practices. 2. Practice proper maintenance and care for the power saw. 3. Learn multiple saw operations (content standard).</p> <p><u>Introduction to Lathe, Unit 2-3, Lathe Operations</u> Content Standard(s)</p> <p>2. Demonstrate engine lathe operations, including</p>	

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<p>PERFORMANCE OBJECTIVES E1.1 Manufacture a part using a lathe per print specifications.</p> <p>LEARNING OBJECTIVES E1.1.1 Identify common types of lathes found in machine shops. E1.1.2 Match the tool shaping to its lathe applications. 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 Determine proper speeds for various lathe applications. E1.1.6 Describe how to perform various functions using a lathe.</p>	<p>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 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.</p> <p>3. Demonstrate the ability to turn stock to specifications using a variety of methods and materials related to lathe operations.</p> <p>Learning Objective(s)</p> <ol style="list-style-type: none"> 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. <p><u>Introduction to Lathe, Unit 4-5, Project</u></p> <p>Content Standard(s)</p> <ol style="list-style-type: none"> 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. 	

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<p>Module F <u>BASIC GRINDING MACHINE OPERATIONS</u></p> <p>PROFESSIONAL COMPETENCIES F1.0 Set up and operate a grinding machine.</p> <p>PERFORMANCE OBJECTIVES F1.1 Manufacture a part using a grinding machine per print specifications.</p> <p>LEARNING OBJECTIVES 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.</p>	<p>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.</p> <p><u>Introduction to Milling, Drill Press, and Surface Grinder, Unit 5-6, Surface Grinder Safety and Operations</u></p> <p>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 surface, and grinding a work piece square and parallel.</p> <p>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.</p>	

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<p>Module G <u>BASIC MILLING MACHINE OPERATIONS</u></p> <p>PROFESSIONAL COMPETENCIES G1.0 Set up and operate a milling machine.</p> <p>PERFORMANCE OBJECTIVES G1.1 Manufacture a part using a milling machine per print specifications.</p> <p>LEARNING OBJECTIVES G1.1.1 Identify common types of milling machines found in machine shops. G1.1.1 Identify the major components of a milling machine and their functions. G1.1.2 Describe how to set up a milling machine for safe operations. G1.1.3 Determine proper speeds for various basic milling applications. G1.1.4 Describe how to safely perform various functions while using a milling machine.</p>	<p><u>Introduction to Milling, Drill Press, and Surface Grinder.</u> <u>Unit 1 – 4, Mill Safety and Operation</u> Content Standard(s)</p> <ol style="list-style-type: none"> 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. <p>Learning Objective(s)</p> <ol style="list-style-type: none"> 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 	

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<p>Module H <u>EMPLOYABILITY SKILLS</u></p> <p>PROFESSIONAL COMPETENCIES H1.0 Demonstrate knowledge of career opportunities and job requirements in the machining field.</p> <p>PERFORMANCE OBJECTIVES H1.1 This competency is measured cognitively.</p> <p>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.</p>	<p>Communications (HazCom) and material safety data sheets (MSDS).</p> <ol style="list-style-type: none"> 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. <p><u>Introduction to Precision Machining, Unit 1, Content Standard(s)</u></p> <ol style="list-style-type: none"> 1. Summarize purposes, rules, and regulations relative to the precision machining technology program. <p>Learning Objective(s)</p> <ol style="list-style-type: none"> 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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<p>H1.1.4 Relate local educational opportunities to the national/international machining employment demands.</p> <p>H1.1.5 Discuss the job descriptions and associated wages and salary trends of the machining industry.</p> <p>H1.1.6 Explain industrial attendance and punctuality requirements for employees.</p> <p>H1.1.7 Discuss the code of dress appropriate to the machining field.</p> <p>H1.1.8 Explain interpersonal skill requirements to be successful in the machining field.</p> <p>H1.1.9 Describe the necessity to plan and schedule work in order to meet production requirements.</p> <p>H1.1.10 Explain the requirements needed for a resume.</p> <p>H1.1.11 Explain the components of a successful job interview.</p>	<p><u>Introduction to Precision Machining, Unit 4-5, Drill Press</u> Content Standard(s)</p> <p>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.</p> <p>Learning Objective(s)</p>	
<p>Module I <u>BASIC DRILL PRESS OPERATIONS</u></p> <p>PROFESSIONAL COMPETENCIES I1.0 Set up and operate a drill press.</p> <p>PERFORMANCE OBJECTIVES I1.1 Perform specified basic machine operations on a drill press.</p> <p>LEARNING OBJECTIVES I1.1.1 Identify common types of drill presses found in industry. I1.1.2 Match the drill bits to various applications.</p>		

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11.1.3	Identify the major components of a drill press and their functions.	<ol style="list-style-type: none"> 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). <p><u>Introduction to Milling, Drill Press, and Surface Grinder, Unit 7-9, Drill Press Safety and Operations</u> Content Standard(s)</p> <ol style="list-style-type: none"> 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. <p>Learning Objective(s)</p> <ol style="list-style-type: none"> 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). 	
11.1.4	Describe how to and set up a drill press for safe operations.		
11.1.5	Determine proper speeds and feeds for various drill press applications.		