STATEWIDE CAREER/TECHNICAL EDUCATION COURSE ARTICULATION REVIEW MINUTES

Articulation Agreement Identifier: CNC 111 (2009-1) Identifier is the postsecondary course prefix followed by Plan-of-Instruction version number (e.g.; INT 100 (2007-1)).

Applicable CIP code(s):   48.0599

Postsecondary course prefix, number, and title: CNC 111 Introduction to Computer Numerical Control

Secondary Education course(s) title and number: 540042 Introduction to Computer Numerical Control + 540043 Intermediate Computer Numerical Control

Initial Review: February 18, 2010   Annual DPE Review: February 15, 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
Module A PRINCIPLES OF CNC **PROFESSIONAL COMPETENCIES** Explain the principles of CNC. **PERFORMANCE OBJECTIVES** A1.1 This competency is measured cognitively. **LEARNING OBJECTIVES** A1.1.1 Define terms associated with CNC. A1.1.2 Describe common uses of CNC in machining applications. A1.1.3 Describe various axis motions A1.1.4 Describe various tooling compensation methods. A1.1.5 Describe various fixture or work offset compensation methods	**Introduction to Computer Numerical Control, Unit 1-2, Safety** **Content Standard(s)** 1. Apply safety rules, regulations, and procedures when using CNC equipment. 2. Demonstrate care and maintenance for CNC machines. **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. 8. Maintain CNC machine to keep it running at optimum performance.	

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Module B CNC PROGRAMMING CONCEPTS **PROFESSIONAL COMPETENCIES** Explain the basic principles of CNC programming. **PERFORMANCE OBJECTIVES** B1.1 The competency is measured cognitively. **LEARNING OBJECTIVES** B1.1.1 Describe word types and letter address specifications. B1.1.2 Describe decimal point programming. B1.1.3 List other programming functions. B1.1.4 Differentiate between various program formats. B1.1.5 Differentiate between the applications of various methods of programming. B1.1.6 Describe methods for storage and retrieval of program information. **Module C CNC MACHINE CHARACTERISTICS** **PROFESSIONAL COMPETENCIES** Describe components and capabilities of machines commonly used for CNC applications. **PERFORMANCE OBJECTIVES** C1.1 This competency is measured cognitively. **LEARNING OBJECTIVES** C1.1.1 Describe basic machining practices. C1.1.2 Describe various machine components. C1.1.3 Describe the properties of machine capacity and	**Introduction to Computer Numerical Control,** **Unit 3-5, Operations** **Content Standard(s)** 3. Identify basic G and M codes, speed and feed codes, and cutter positioning. 4. Demonstrate skills for writing a basic CNC mill program for straight and circular moves. 5. Demonstrate skills for writing a basic CNC lathe program for turning, facing, and corner radii. **Learning Objective(s)** 1. Create basic CNC milling programs utilizing cutter compensation for positioning. 2. Create basic CNC lathe program utilizing tool nose compensation for positions. 3. Create CNC milling and lathe programs using canned cycles. **Introduction to Computer Numerical Control, Unit 6-7, Projects** **Content Standard(s)** 6. Create a finished project using CNC mill. 7. Create a finished project using CNC lathe **Learning Objective(s)** 1. Input CNC mill programs into controller. 2. Input CNC lathe programs into controller. 3. Edit, graph and simulate mill and lathe programs. **Intermediate Computer Numerical Control,** **Unit 3-5, Operations**	

Postsecondary Course Objectives	Secondary Objectives and Location(s)	TEDAC Comments
construction. C1.1.4 Explain axis of motion. C1.1.5 Describe various common programmable functions. C1.1.6 Differentiate between various operation modes. C1.1.7 Explain various sequences of operation for CNC machines. C1.1.8 Explain why a given sequence of operation is used. **Module D CNC PROGRAMMING APPLICATIONS** **PROFESSIONAL COMPETENCIES** Develop basic CNC programs for milling and turning machines. **PERFORMANCE OBJECTIVES** D1.1 Write a basic CNC program for various lathe applications. D1.2 Write a basic CNC program for various milling machine applications. **LEARNING OBJECTIVES** D1.1.1 Describe safety considerations for lathe operations. D1.1.2 Describe considerations for writing a CNC program for turning. D1.1.3 Describe considerations for writing a CNC program for facing. D1.1.4 Describe considerations for writing a CNC program for cornering. D1.2.1 Describe safety considerations for milling machine	**Content Standard(s)** 3. Demonstrate intermediate skills for writing a CNC program. 4. Demonstrate advanced skills for writing a CNC program. 5. Demonstrate proper setup of CNC machines, including homer setup and tool setup. **Learning Objective(s)** 1. Identify G and M codes. 2. Identify speed and feed codes. 3. Identify cutter positioning codes. 4. Write an intermediate CNC mill program for straight, angular, and circular moves. 5. Write an intermediate CNC lathe program for turning, facing, angle cuts, and corner radii. 6. Define G and M codes. 7. Define speed and feed codes. 8. Write advanced CNC milling programs for straight, angle, radii, and circular cuts. 9. Write advanced CNC lathe program for turning, facing, corner radii, threading, and angle cuts. 10. Set up and machine part according to specifications of blueprint.	

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operations. D1.2.2 Describe considerations for writing a CNC program for straight moves. D1.2.3 Describe considerations for writing a CNC program for angular moves. D1.1.4 Describe considerations for writing a CNC program for circular moves.		